Gemmology Today

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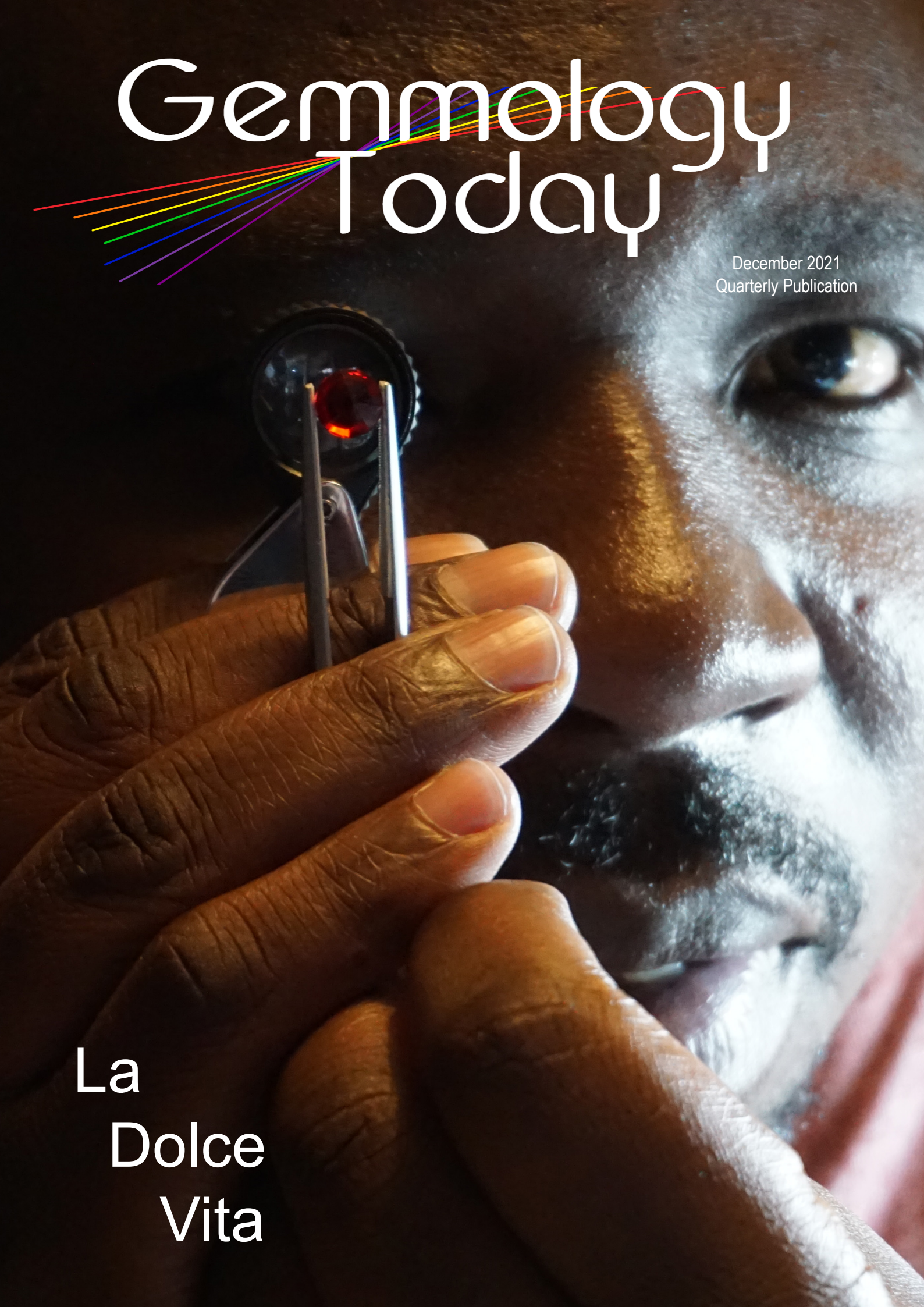
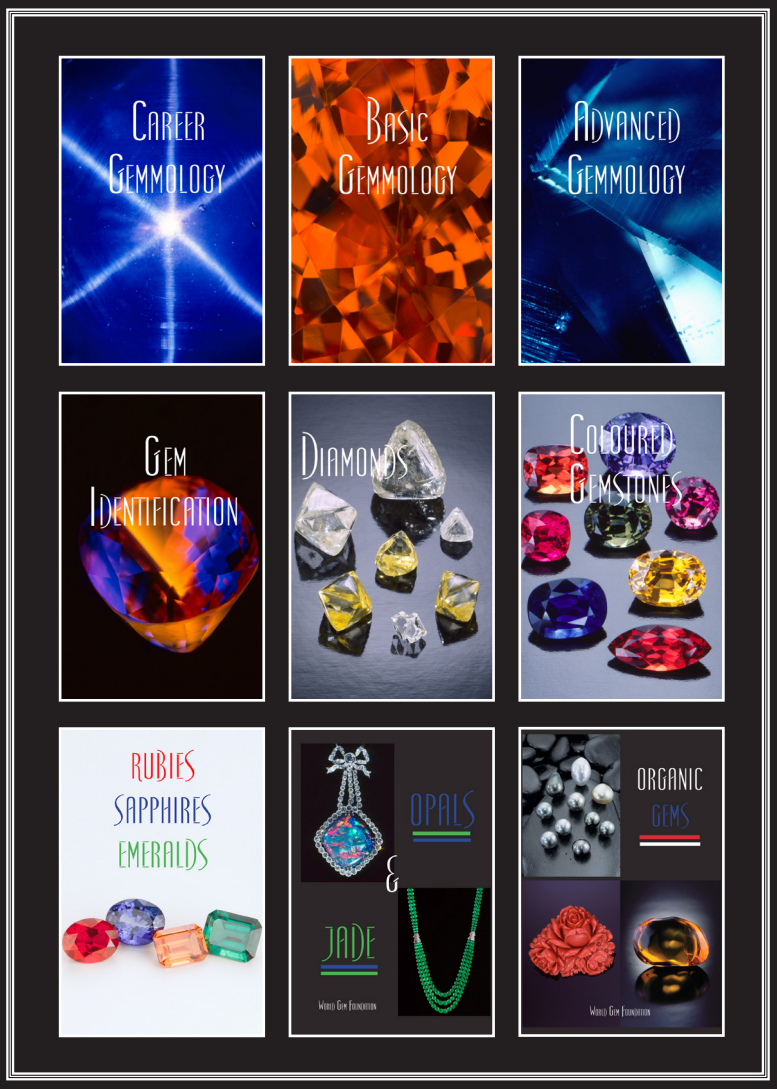


La Dolce Vita



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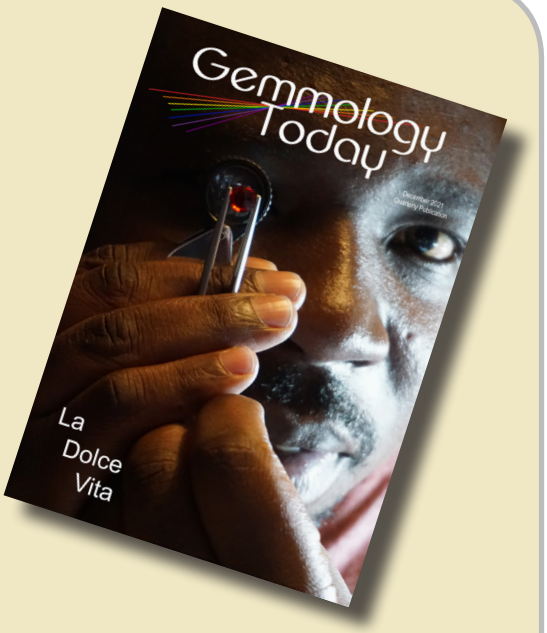

Clever Sithole (Photo by Cecilia Chiappai)

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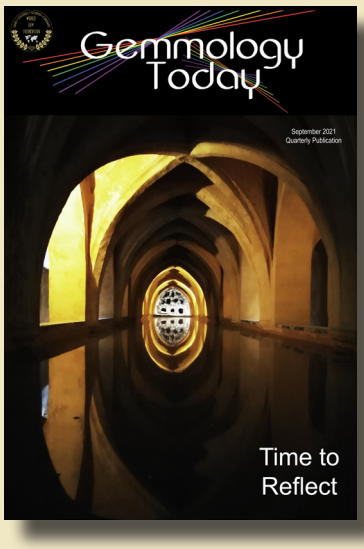


September 2021 Issue

Editor at Work

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

It is hard to believe that Christmas is just around the corner. By the time you settle down to read this issue, the turkey will have been eaten and we will all be making our New Year's resolutions.

It has been a strange year. Better than the last but certainly nowhere near what we had all hoped it would be. I am not sure what 2022 will hold but I know that whatever happens, life will go on. It has to. If we look back throughout history, mankind has always bounced back. It is part of our DNA. Yes we must have contingency plans but there is nothing to be gained by putting things on hold. This is the new reality we are living in. We must learn to accept it and adapt to it. There is no magic potion to cure all ills, just our indomitable spirit. It has worked before and it will work again.

With the undeniable benefits of an interconnected world also come the pitfalls. We cannot have the best of both worlds. For every upside there is a downside. That is a given.

In November, I had the opportunity to work with students from Africa and Spain, attending our practical workshops here in Mallorca. It was a gamble for everyone but it paid off. Yes things could have gone terribly wrong but in the end they did not. Sure there were obstacles that had to be overcome but we all knew that going in. We had contingency plans in place.

For one of my students the trip back to Zimbabwe became a nightmare. Originally scheduled to fly from Palma to Madrid, then onto Doha and finally Harare in Zimbabwe, he was greeted in Madrid with news that Qatar Airways had cancelled his flight from Madrid to Doha. Fortunately he found an alternative way home but that took him from Madrid to Doha, then onto Kenya and Zambia before he finally reached Zimbabwe. It involved almost three days of travelling! I know he must have been frustrated and tired. I know I would have been. If you are going to sell a return airline ticket then you have an obligation to fulfil that contract. Why would the flight be cancelled? The passengers had all been tested for COVID so what was the problem? It seems that in the 'Age of COVID', companies are taking liberties and abusing the rights of their customers. The old 'dog ate my homework' routine. It really angers me. Happy to reap the benefits when things are going well but the moment things go badly, they are the first to complain. When it comes to business, we all make choices, fully aware that certain events could affect them so why expect special treatment when they do? Again it comes back to forward planning and having a contingency plan. There are many companies that need to take a good hard look at themselves in the mirror because unless they change, they will cease to exist. Time waits for no-one! That is also a given.

So what's in this issue?

An interview with French gemmologist Marine Bouvier and her stunning inclusion photography, Dick Hughes examines rubies from Mozambique, I conclude my look at the different diamond grading systems and relive a memorable twenty-two gemmological marathon here in Mallorca, Nina Gold looks at the minerals of Bulgaria, Leone Langeslag explores one of my favourite gemstones (Tanzanite) and Wilma van der Giessen recounts a memorable moment in time that changed the diamond industry.

I hope you enjoy the 21st issue of Gemmology Today! A slightly different look but still the same hidden gems!

GT Feature

Marine Bouvier is a French expert gemologist, a professor of gemology, public speaker and a very talented inclusionist photomicrograph artist. 'I have always been keen to work in a field that fascinates me, which is why I chose to orient myself towards the fabulous world of precious stones and gemology ...'

Meet Marine Bouvier

Marine Bouvier

GT: Who is Marine Bouvier? Tell us about yourself.

MB: My name is Marine Bouvier, I'm a French expert gemologist based in Nice. I'm also a professor of gemology, a public speaker and inclusionist photomicrograph artist.

I have always been keen to work in a field that fascinates me, which is why I chose to orient myself towards the fabulous world of precious stones and gemology.

Loving both Science for its cartesian and educational side (I'm currently finishing my Diploma in Scientific Gemmology in Nantes), but also Art for its creative and emotional side, I couldn't conceive of my professional activity without combining one with the other. As a student, I discovered the world of inclusions in precious stones and fully immersed myself in it, never to come to the surface again ...

I was immediately fascinated by the infinity of their shapes and colors and by the immensity of the knowledge they offered, from their creation to their geological environments, up to the formation of the Earth itself!

I did not want to just explain their scientific significance, I wanted to immortalize their inner beauty through photographs taken with my microscope (photomicrographs) and create fabulous pictures that combined Art and Science.

After many years of thinking about it, I was finally able to realize my dream by creating 'Gemmartistic: a trip to the heart of gems', where I invite you to find the picture of your dreams, the one that will allow you to travel into my universe 'at the heart of gems'.

Now, I want to continue to travel the world and attend mineral and gem shows to collect the most beautiful inclusion gems and reveal them through unique photomicrographs. The adventure has only just begun!

GT: When did you first develop a passion for gemstone and inclusion photography? Was there a defining moment when you realised this was an area you wanted to specialize in?

MB: I started to develop my passion for inclusion photomicrographs when I was still a student. The 10x magnification of a magnifying glass wasn't enough for me, so I quickly bought a microscope in my first year and started taking pictures right away. At the beginning, these photos mostly helped me recognize and learn inclusions. I couldn't imagine having to learn such visual things 'by heart' without at least some photo support. I had already started to build up my personal collection by buying stones in the various gem shows throughout France.

As I went through my photos, I quickly began to look for a more artistic side. I realized then that I had the opportunity to make my photos both educational (by explaining the scientific side of inclusions), and artistic. I must admit that I always knew that I would have to mix education, Science and Art in my future profession to feel 'whole'. That forced me to work harder, to improve the quality of my equipment and to perfect my technique.

In 2016, I started to share my photos and my ideas with friends and colleagues. Their positive feedback gave me the confidence to move forward.

Since that time, I have spent a large part of my time researching and collecting rough and cut precious stones (rare and common) with inclusions searching for the most beautiful photos. I currently have more than 1000. I publish my favorites on my Instagram and Facebook profiles (@ Marine_Bouvier_Gemmartistic), and recently I have started making them into artistic pictures and decorative objects and offering them for sale on my 'Gemmartistic' Esty site.

As amazing as it may seem, I realized that I wanted to specialize in inclusions when I was 28. Many projects will be put in place in 2022 and I can't wait to achieve them!

GT: What is the one gemstone or inclusion photograph that sticks in your mind the most, either through its sheer beauty or the challenge you had capturing it on film?

MB: That's a very difficult question (laughs). My relatives know that I love the Zoisite family very much, and particularly tanzanite for its trichroism, the different colors seen along its different axes (which can be blue / purple / red or yellow or green) and its incredible history! I collect many different colors of zoisite and recently acquired a colorless cat's eye zoisite thanks to a collector friend of mine. The 'Holy Grail'! (laughs) But as I often say, 'my favorite stone will be the next, especially if it has a nice inclusion!'

Regarding my favorite inclusion photomicrograph, the question is even more complicated! My habit is to select and share only the photomicrographs that I particularly like, the ones that make me feel really emotional. In my opinion, this is the true definition of Art: to trigger an emotion. Sometimes I can take several hours to do a single stone shoot, and sometimes I even come back to it a second or third time until I'm satisfied with the result. Out of 50 photos, I may only select one. I usually know when I am taking a photo if this will be THE ONE to share.

What I love most about gemstone photomicrography is that moment when I first see the 'gem heart' under my microscope. It's always a moment of incredible astonishment, especially when the inclusions weren't especially visible to the naked eye. Nature is extraordinary, and I love that my photos allow them to be revealed to everyone!

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

MB: Whether you are a woman or a man, you must always follow your passion and your heart. It may sound simple, but I think life should be about the pursuit of happiness. There is no point working in a job or an environment that you do not like. In France, we are fortunate enough to be able to acquire new skills and change jobs, however passion isn't enough in this industry. To be successful, you must have attention to detail, respect for others and perseverance.

In addition, I always advise my students to make sure they see as many gems as possible. Internships, collecting stones, traveling, or visiting mineral and gem shows are the best ways to see stones and meet experienced people. I also advise them to try to discover the different areas of gemology to open their professional horizons and improve their skills. This is exactly what I plan to do in the future: to discover all the facets of gemology, to travel and to live off this passion.

It is also important to listen to advice and continue to update one's knowledge. However, you must always be in control of your future and make your own decisions. Whether in my personal or professional life, I always try to keep around me the people who support me, those who push me to show the best of myself and to exceed my limits without ulterior motives of self-interest. The human aspect is absolutely essential for me, and if I left medical studies to choose gemology, it was to have a good reason to get up in the morning, a pleasure, and not an obligation or worse, a malaise. As Confucius said 'Choose a job you love and you will never have to work a day in your life', I'm convinced of that too!

However, I understood that the question also involved the integration of women in our industry. I may have been lucky so far but being a woman in this industry has never stopped me so far.

The most important advice I can give to a woman thinking of studying gemmology and entering our industry is to surround yourself with the right people and to believe in yourself and your projects!

Of course, as in life in general, it is always possible to confront mentalities or men who aren't yet willing to let a woman enter an industry or aspire to the most important positions. Fortunately, not all men are like that and I myself have been fortunate enough to grow up with people who have never had a problem with me being a woman. But if one day you are faced with getting a more or less important position in a male environment, I think that you should not be afraid to be a precursor, a pioneer and to be a role model for women in the future.

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

MB: While I'm not yet familiar with the whole industry, let alone globally, it would still seem overly optimistic to say that women are equal to men, whether in the world of gems or jewelry.

Unfortunately, there is still far too much difference in the professional world between genders, whatever the profession. But I personally find that women are still too under-represented in certain fields, for their recognition in academia or in the highest or most 'prestigious' positions.

And yet we have no shortage of examples of very beautiful female figures in our industry, whether they are professors, doctoral students, gemologists, lecturers, businesswomen, designers, jewelers, curators, laboratory gemologists, etc. Little by little, they succeed in making a place for themselves in the highest spheres of gemology while showing the way to younger ones.

But fortunately, mentalities tend to change in particular on gender equality, and little by little women are accessing, through their talents and skills (and not just their gender), interesting positions of the future, of power and influence (in the correct meaning of the term).

Of course, the balance isn't yet achieved from this point of view, and although it will take some time for new habits to form, I am optimistic and convinced that society will tend to move closer to this, sooner or later.

GT: With software such as Photoshop, many photographers are finding it easier to create stunning imagery. Are you a purist or have you embraced this new technology?

MB: As amazing as it may sound, I am a purist who has adopted this new technology! I can see you are already skeptical (laughs), so I'll explain. My only desire is to use this photo editing software for the sole purpose of making my photos as close as possible to what my eye sees. Indeed, some sensors will tend to saturate certain colors more than others, sometimes lacking in tone or contrast. So, I work with the possibilities of this software in order to make the photo as realistic as possible, but of course, a sapphire will never become a ruby! (laughs)

I also use this software to take '3D' photomicrographs of the inclusion. This is because at high magnification the focus isn't on the entire inclusion and it's useful to 'stack' multiple photos to get a clear photo to the full depth of the inclusion.

GT: Tell us about Gemmartistic?

MB: Gemmartistic is a project that I have just set up and which is centered around the photomicrography of inclusions in gemstones.

Photomicrography is the field - and the Art - of photographing samples through a microscope. Inclusions are everything inside a gemstone whether cut or rough, natural, synthetic or treated, and by extension, marks on the surface of gems.

With a clever blend of lights, techniques, patience and passion, photomicrography allows me to reveal the 'heart of gems' by associating Art & Science for the first time and in an exclusive way. Indeed, I like the idea of being able to highlight an interesting inclusion from a scientific point of view, and to explain its gemological interest but to also reveal its inner beauty, to provoke an emotion and to please someone who isn't necessarily in the gem industry.

To this end, I offer my photomicrographs in the form of artistic pictures and decorative objects on my Etsy online store called Gemmartistic.

For my artistic pictures, I use dibond aluminum, a strong and light material used for professional photographic exhibitions. I currently offer two formulas:

Unlimited Prints: taken from photomicrographs of stones from my own collection. They are 50 x 50 centimeters (19.685 inches) in size and 3 millimeters (0.12 inches) thick, and the colors are vivid and hold up perfectly over time. Customizations are possible on request.

Personalized Prints: created from photomicrographs from other people's stones. Indeed, individuals appreciate having a picture of their own precious stones (set or not). They also make very good gift ideas for a loved one who is offered a special piece of jewelry! It's great to highlight the inner beauty of the stones they sell (alone or set) with a beautiful, personalized picture. It's an added service that sets them apart from their competition, and it's a proposition that their customers greatly appreciate.

I am also excited to reveal here the third formula of artistic pictures which will be available from 2022 on my Etsy shop Gemmartistic:

Limited Prints: limited to only 10 pictures, the first with the precious stone photographed, then nine other prints (without the stone). This is a unique concept in France, and to my knowledge, the World and will satisfy customers who want exclusive pictures produced in small series.

Three of these pictures and precious stones are featured in this article (photos n° 18, 19 and 20)!

I also offer decorative photo objects such as calendars, mugs, posters and sets of coasters. There are many more surprises to come!

It is important to make my 'Art' accessible to everyone. I wish everyone could afford one of my pictures, even a student without a salary! This is why I offer my pictures in unlimited prints at the price of 250 euros (282 USD). For luxury and custom models, a personalized quote will be offered.

Future artistic and / or scientific collaborations and photography exhibitions may be planned in the course of the coming year.

If you are interested, you can contact me through Gemmartistic or contact me on social networks (Instagram and Facebook under the profile name Marine Bouvier_ Gemmartistic) and my personal website named 'Au Cœur des Gemmes'.

GT: Guitarists are always asked about the equipment they use and the ones they most prefer. What are the 'essentials' in your photographic arsenal?

MB: I recognize here the musician side of Geoffrey! There are a lot of important things needed to take a good photomicrograph. The very first and one of the most important is the 'eye' of the gemologist. The choice of the inclusion and the gem is also essential. I remember finding a small Russian demantoid garnet with a 'horsetail' inclusion among numerous small boxes at a gem show. Fortunately, the seller had not realised that he had a gemstone with an inclusion that increases its value and remains extremely sought-after). This resulted in photo n°13.

Sometimes a gemstone needs to be 'prepared' through repolishing or by creating a window (a polished facet that allows you to see inside the stone). Once the gem is prepared, it must be cleaned. It might sound obvious, but so often students mistake specks of dust for inclusions! Most people have never looked under a microscope, and so it takes some practice to recognize things at high magnification that you can hardly see with the naked eye.

Of course, the choice of the microscope is important, and there are many parameters to take into account. Fortunately, there are microscopes, specially designed for gemology that are available at reasonable prices. The choice of magnification is also important. With my current microscope, I can take photos up to 150x, which is a lot for a traditional photomicrograph. I have even had the opportunity to use a scanning electronic microscope (SEM) during my university degree in gemology in Nantes - called DUG de Nantes. This instrument can magnify up to 1 million times. I literally fell in love with it!! (laughs)

Then, you must choose the right positioning of the stone and the correct lighting. The latter is essential for any photography, it's no exception for the world of gems. There are many options available including white, yellow, or ultraviolet and how you position it: transmitted light (passing through the gem), grazing light (on the side of the gem), or reflected light (over the stone). You must be familiar with the inclusions to know how to highlight them because some only reveal themselves with the right angle and the right light (for example the inclusion of confetti in the beryls in photo n° 6). You can also add lots of accessories to your microscope.

Only when this is in place can we start to look at the equipment needed to take great photos. I often teach my students to take their own photomicrographs using their phones. The first couple of times it takes dexterity but generally they enjoy the 'game' and learn from it! For my part I use a Canon camera installed on my trinocular MOTIC microscope. When I teach or attend mineral and gemstone shows, I connect the microscope to a screen to show clients and other exhibitors the stones I used to make my photos (you can see all the photos and videos from the Nice Gem Show on my Instagram profile). Finally, as explained above, I rework some photos to make them look as close as possible to 'real' life.

It's all these steps that give a good photo and a beautiful picture, but I will add three additional essential things: passion, patience and an artistic eye!

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

MB: While I have only been involved in gemmology for six years, even I can see how much this industry has changed, especially in the fields of education, buying and trading, and the ethical aspects. Indeed, COVID has already changed the way we teach (development of online courses and conferences, for example) and buy (distance shopping and on the Internet or social networks). Society also tends to be more careful about the products it eats, buys, and uses, and stones are no exception. Some customers, for example, want to know where the gemstones they are buying come from and that the social and ethical considerations have been respected.

I imagine the industry will continue to evolve. New technologies and social networks will become increasingly important for buying and selling while favoring sectors that are more environmentally and humanly responsible. I also hope that women will have more opportunities to access conferences and higher positions.

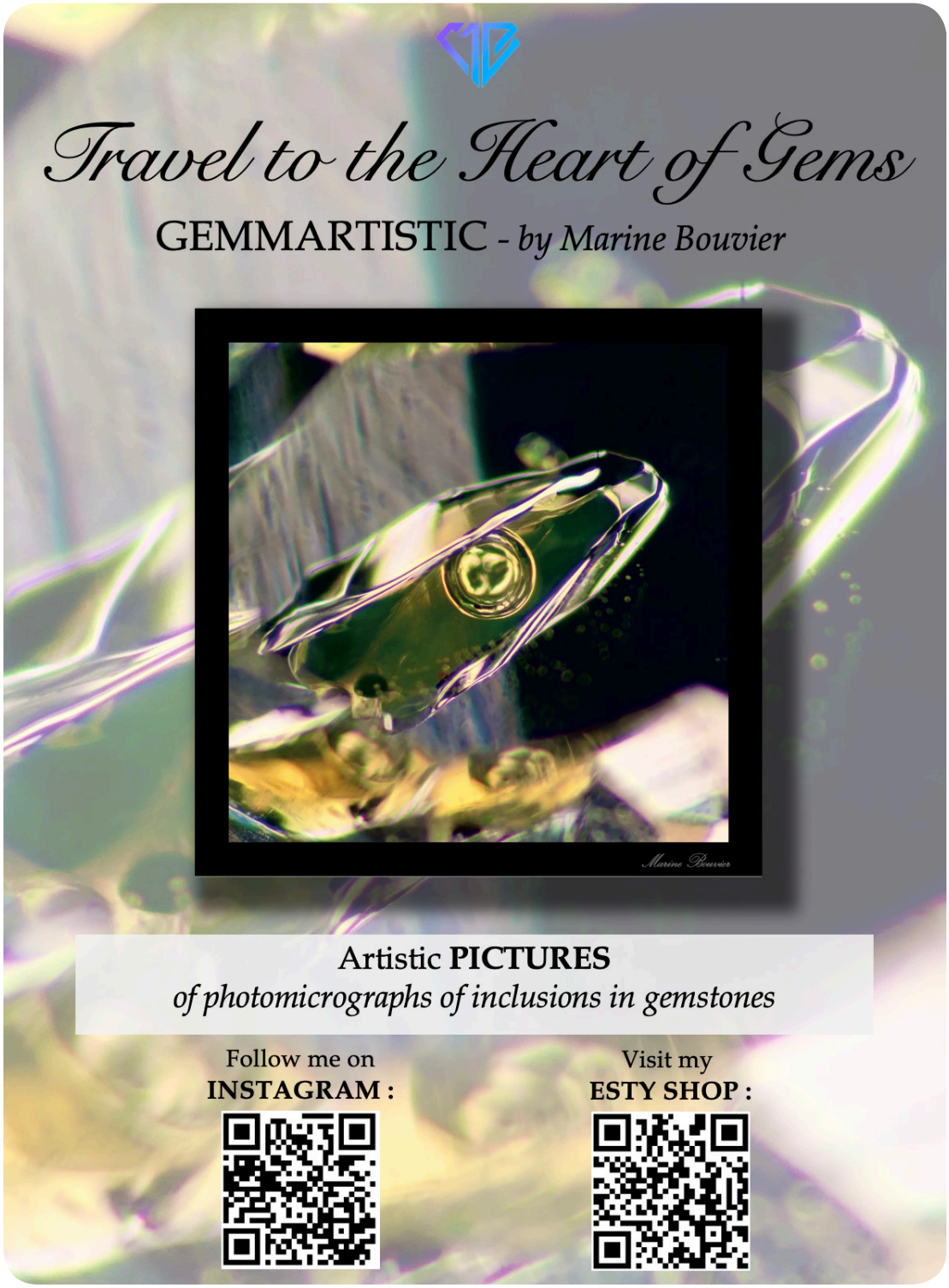
Personally, all I hope for in 10 years is to be able to continue to live from my passion, my photos and my classes, and any new projects to come, whether personal or collaborative!

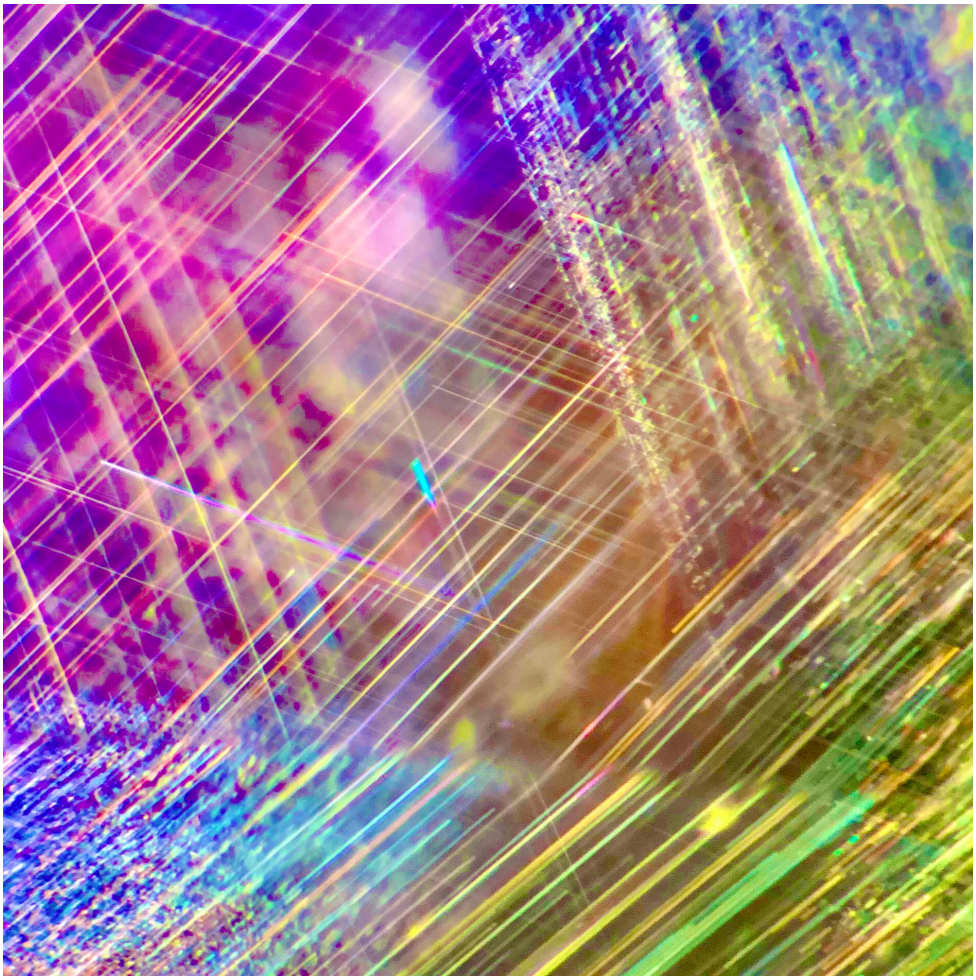
GT: If we were sitting here a year from now celebrating what a great year it's been for Marine Bouvier professionally, what would you say was the reason?

MB: The first thing I wish for is the continued support of my family and friends, especially those involved in the gemology groups here in Nice and Lyon. They were the first to support and push me to start my own business, and I feel very lucky to have them all with me. The success would also come from my trading friends who think of me especially during their travels and bring me back fabulous inclusion gems. I hope to travel with them to buy my own inclusion stones in the producing countries in the coming year if COVID allows us.

Finally, I hope that my work, and especially my passion, will allow me to continue to develop my ideas in the wonderful field of gemology. I am particularly excited about the new photomicrographs unveiled in this article and focusing on GEMMARTISTIC.

I would like to thank you Geoffrey for being so caring. I was fortunate enough to meet him during the enormous project of translating the World Gem Foundation courses. Thank you for offering this amazing magazine and for making it available to everyone to download and thank you for allowing me to share my work and passion with your loyal readers.





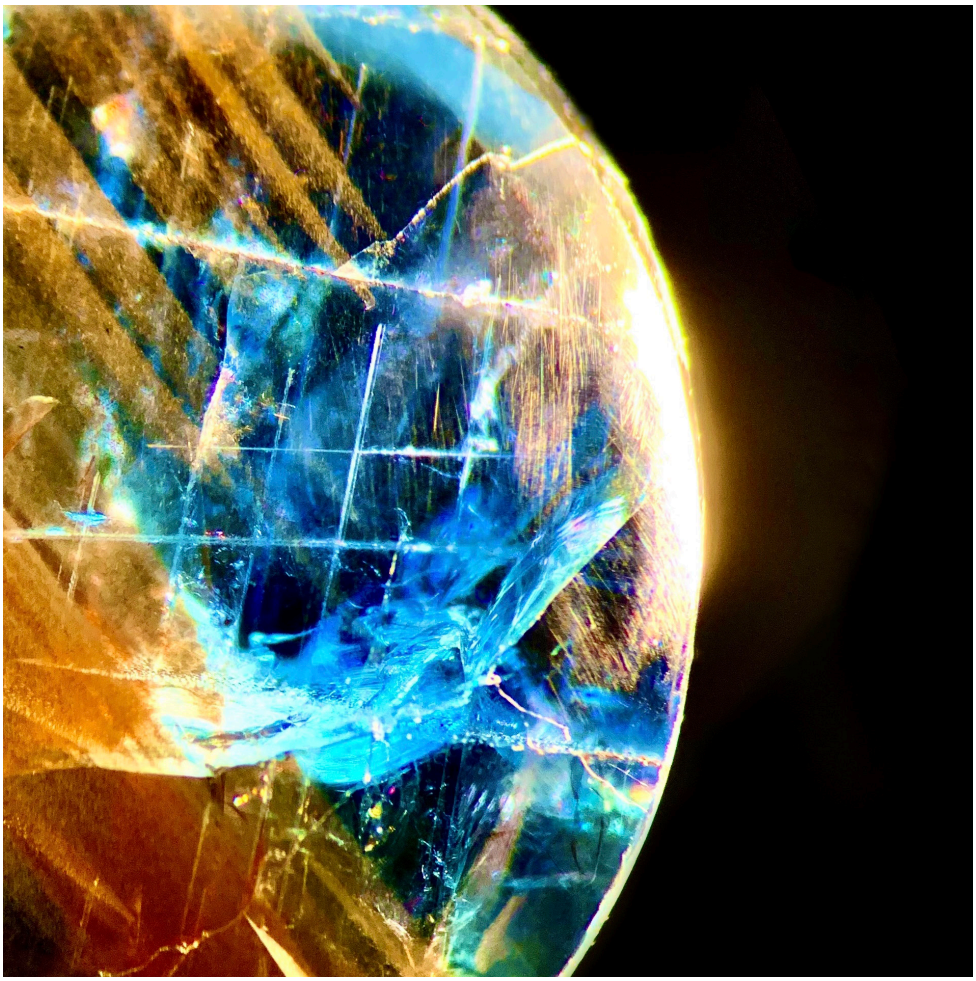
Nº 1 RAINBOW

Long needles of rutile, poetically called ‘silks’, which are intact and which prove that this Sri Lankan sapphire is natural and untreated.

Their orientations, following the three crystallographic directions, make it possible, in cabochon cut stones, to exhibit asterism, a luminous moving star, observed when the light is reflected from the surface of the gem.

In this case, the rutile is found in a faceted 0.82 carat violet sapphire at 60x with darkfield illumination.

© Marine Bouvier



Nº 2 PLANET

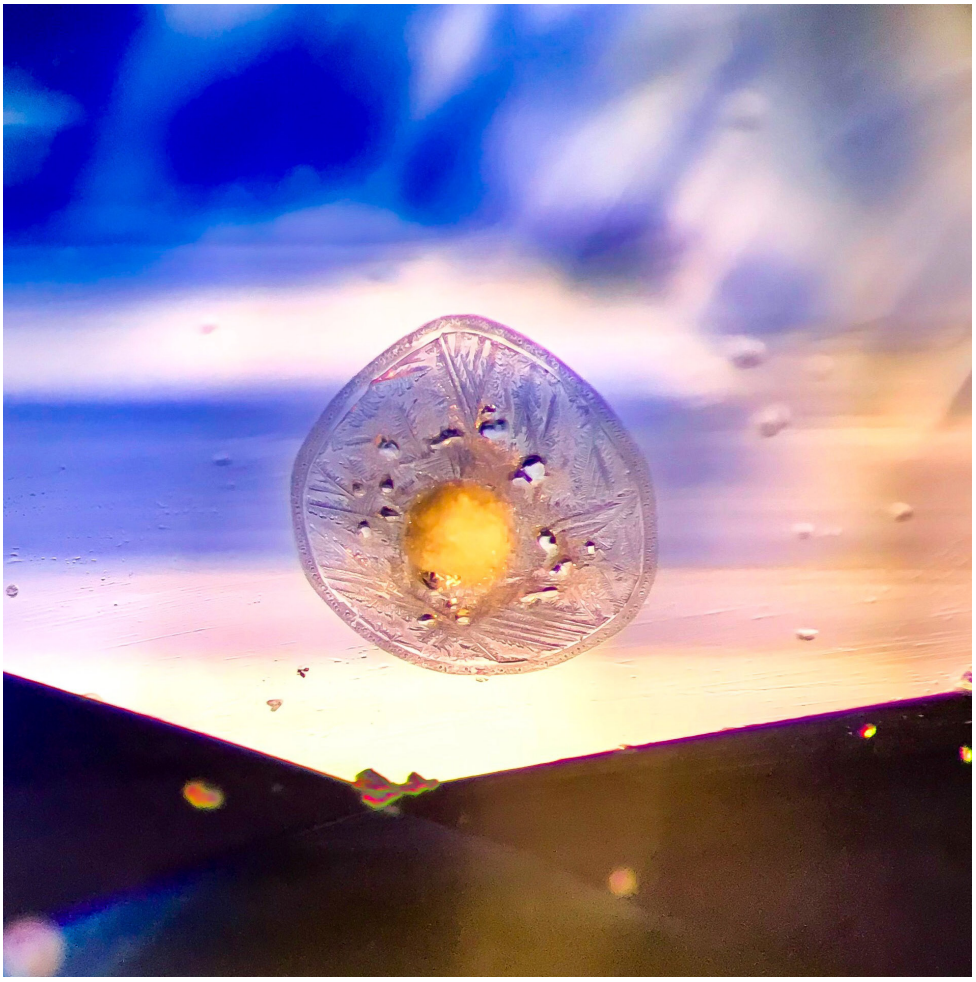
Rutile needles and rose channels that are intact and prove that this golden sheen star sapphire from Kenya is natural and untreated.

This sapphire is rare as it comes from a depleted deposit in Kenya which was only productive from 2009 to 2013.

Also known as ‘Zawadi Sapphire’, these sapphires are sold by only one marketer in the world.

Kenyan gold sheen star sapphire weighing 2.86 carats at 45x with darkfield and grazing illumination.

© Marine Bouvier



Nº 3 FRIED EGG

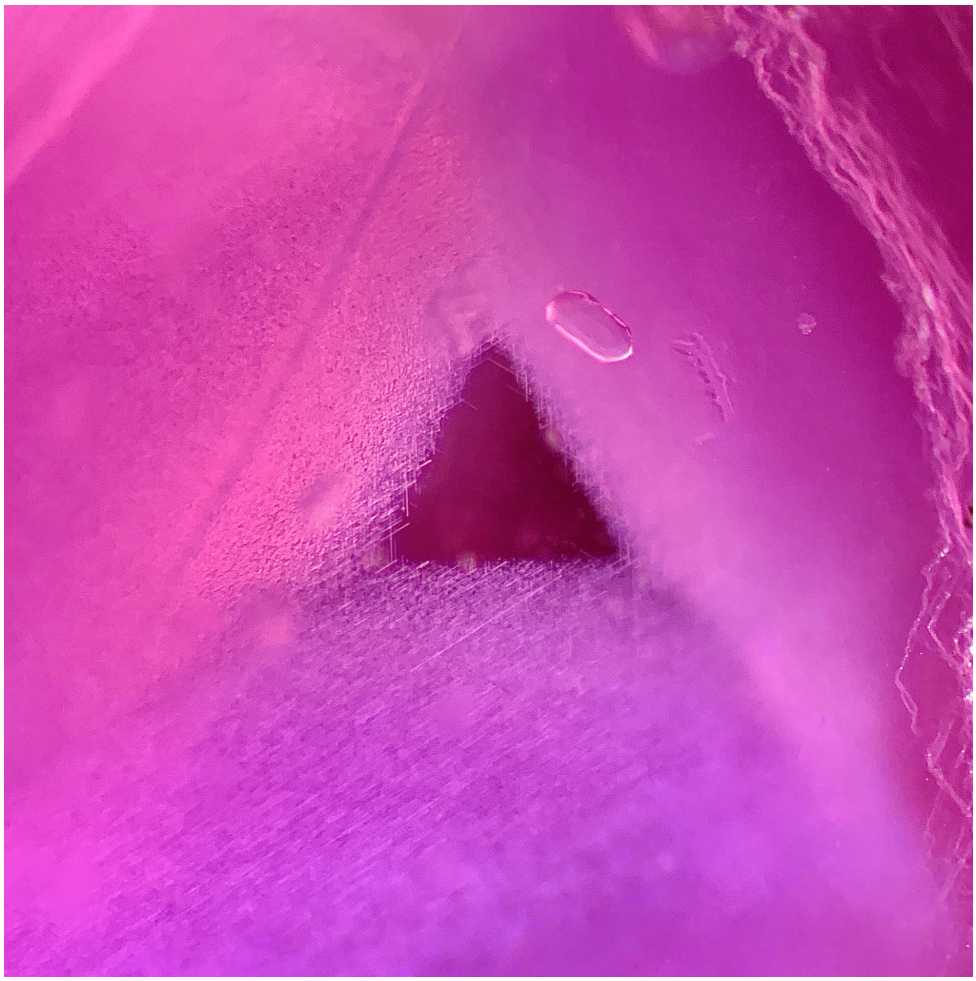
Features an included crystal (which can be nicknamed 'snowball') in a Sri Lankan sapphire treated at high temperature (> 1800 degrees).

When subjected to high heat, the inclusion melted and then recrystallized in the matrix of the sapphire, creating discord tension cracks around it. On rapid cooling, the inclusion then solidified forming a particular crystallization visible on this photomicrograph (vitrification).

In the background, we can also see the straight-edge color (blue color concentration of angular shape) characteristic of sapphires.

Sri Lankan sapphire weighing 2.12 carats at 90x with darkfield illumination.

© Marine Bouvier



Nº 4 PINK TRIANGLE

Short rutile needles, characteristic of a Burmese ruby (Myanmar).

As they are intact, this proves that the ruby is natural and unheated.

The center has no needles, which reveals a beautiful triangle. There is also a small colorless crystal on the front, further proof that the ruby is untreated.

Ruby rough from Burma weighing 1.35 carats at 45x with darkfield illumination.

© Marine Bouvier

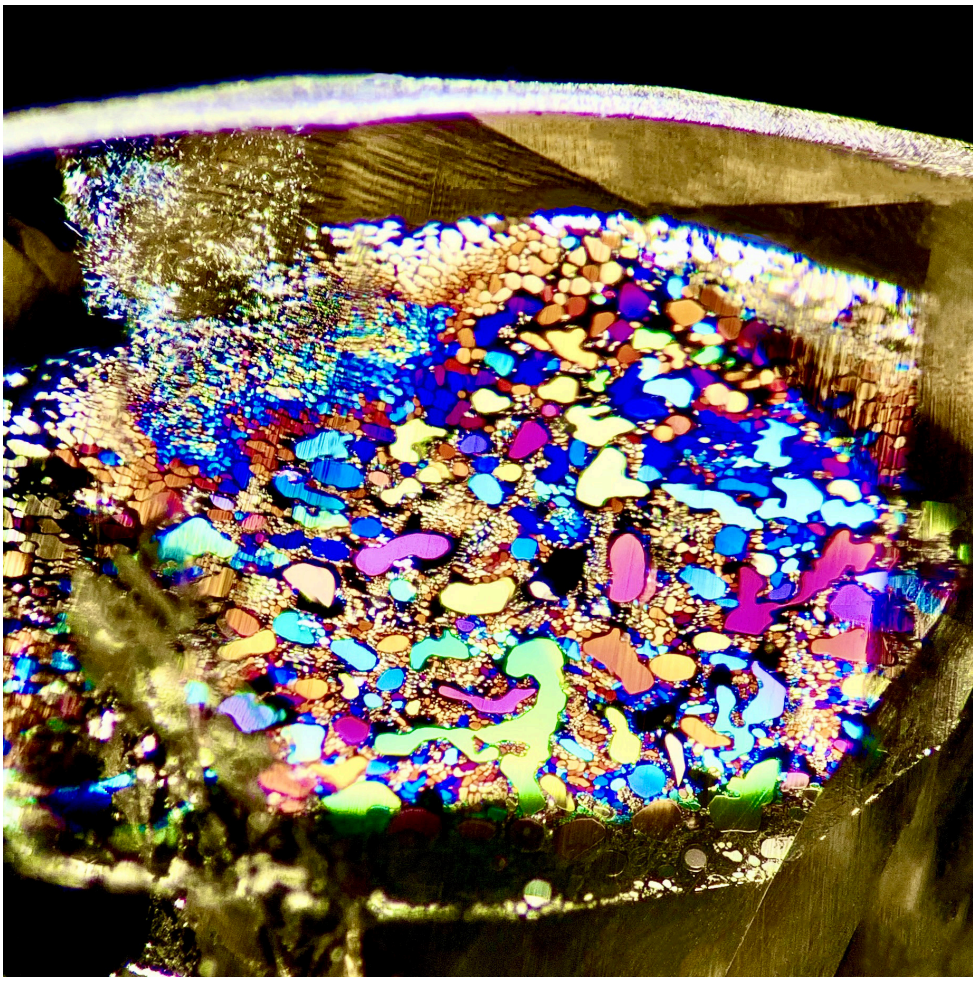
Nº 5 TRAPICHE EMERALD

Photomicrograph representing a trapiche emerald from Colombia.

We can see the six-rayed 'trapiche' structure caused by the black inclusions of shale (among other things) pushed back to the sides during the growth of the six crystal faces of this rare and unusual emerald.

Trapiche emerald from Colombia weighing 0.16 carats at 45x with darkfield illumination.

© Marine Bouvier

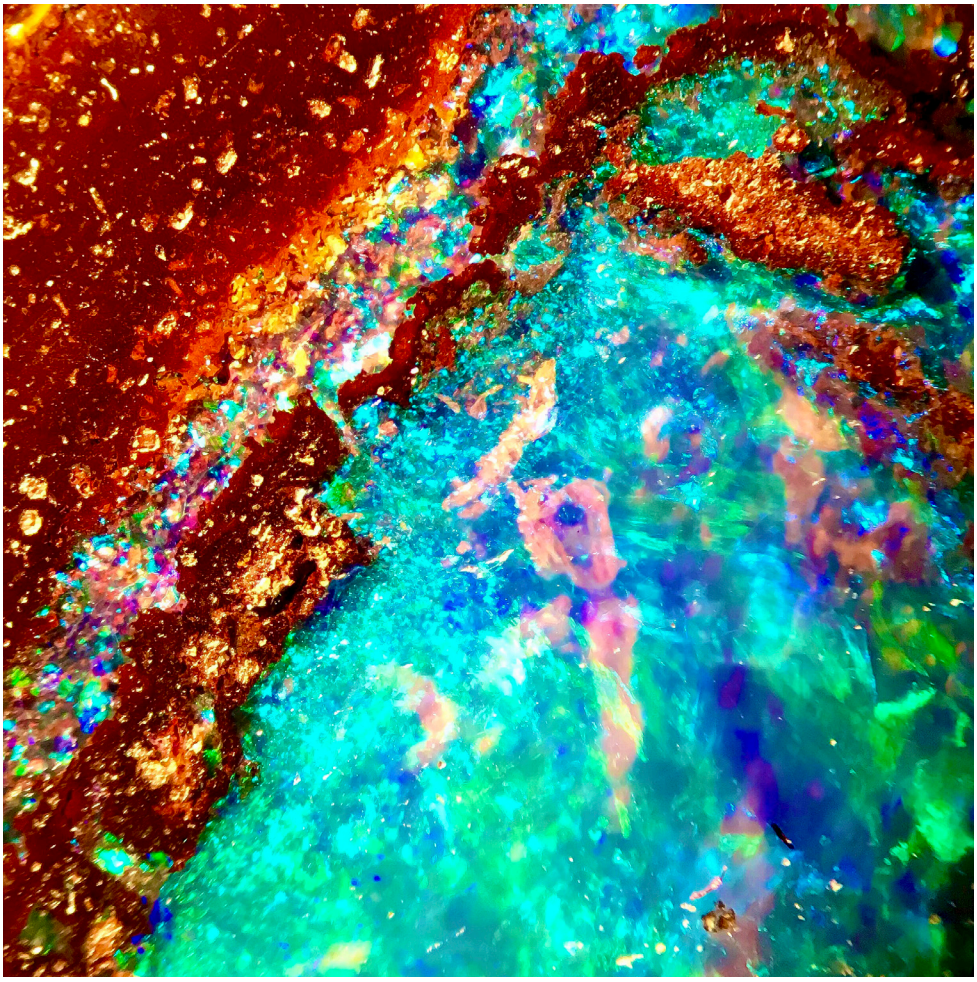


Nº 6 CONFETTI

Incredible biphasic inclusion in the form of a thin film (liquid and gas) in a heliodor (yellow beryl) revealed by a grazing light at a very particular angle. This inclusion characteristic of beryls remains very rare and difficult to find!

Heliodor weighing 4.27 carats at 22.5x with darkfield illumination and grazing light.

© Marine Bouvier



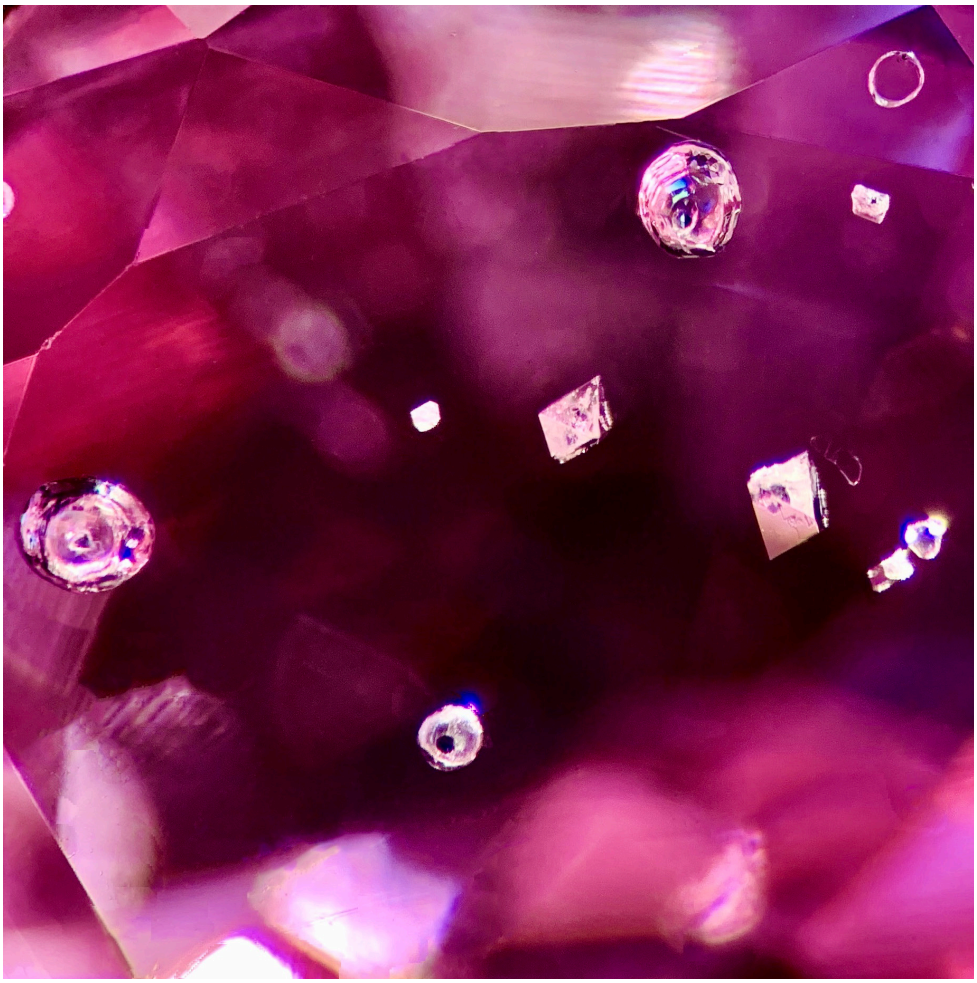
Nº 7 AUSTRALIA

Photomicrograph showing play-of-color in a superb boulder opal from Queensland, Australia.

Boulder opals consist of a layer of opal on a ferruginous matrix. It remains in high demand and their prices have doubled since the COVID crisis.

Boulder opal from Queensland, Australia weighing 6.127 grams at 22.5x with reflected light.

© Marine Bouvier



Nº 8 MORNING DEW

In this photomicrograph we can see negative crystals of octahedral shapes and apatite crystals in a spinel from Burma (Myanmar).

The near-round apatite crystals have a small black ilmenite or graphite plate, nicknamed ‘belly button’, on the front, which is characteristic of Burmese spinels.

Pink spinel from Burma weighing 1.24 carats at 120x with darkfield illumination.

© Marine Bouvier

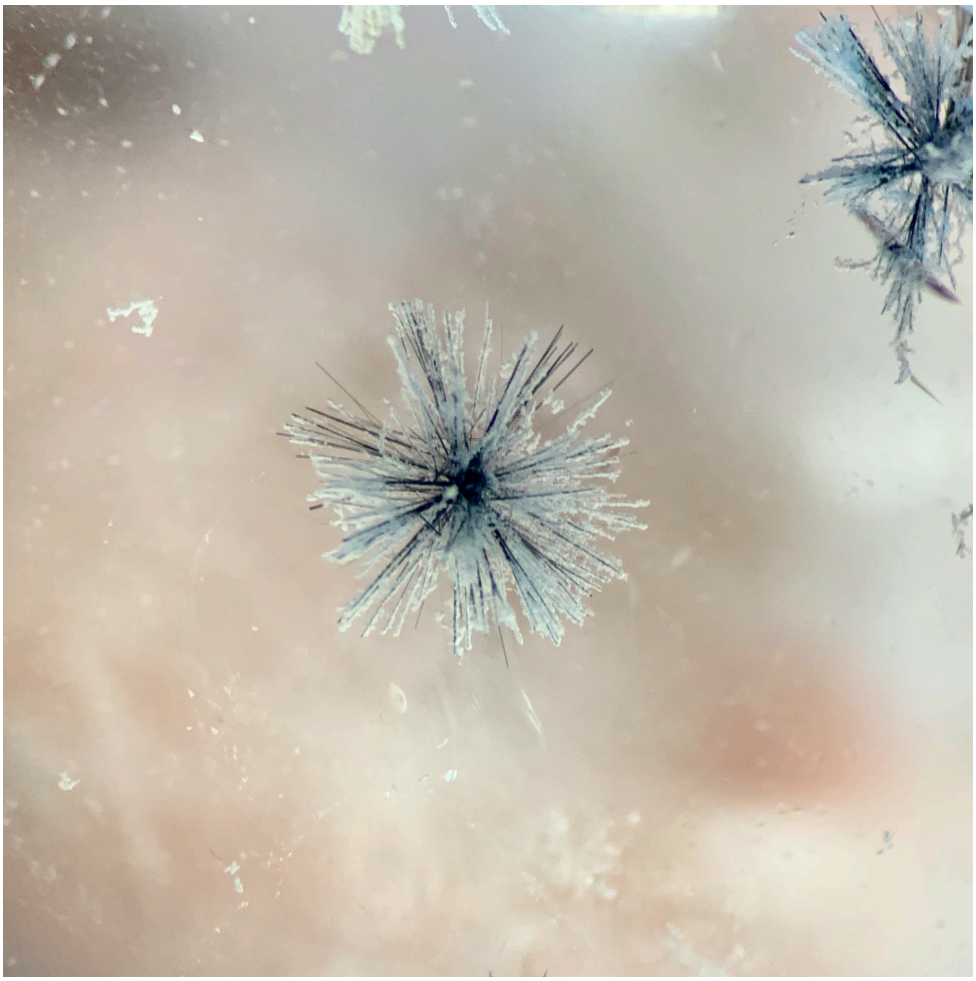
Nº 9 METEOR SHOWER

Inclusions of goethite in the shape of a 'broom' or 'ear of wheat' in an amethyst.

It is often possible to observe goethite in combination with several other minerals in some amethyst. This gem is sometimes called commercially 'Super Seven' (because of the seven minerals it is 'supposedly' composed of). Sometimes goethite is even mistakenly referred to as 'cacoxenite' (this term actually designates another mineral species of the same color but in a different shape).

Amethyst with goethite inclusions weighing 28.52 carats at 60x with darkfield illumination and grazing light.

© Marine Bouvier



Nº 10 SNOWFLAKE

Hollandite crystal in the shape of a snowflake. This particularly inclusion was observed in a quartz from Madagascar.

Quartz with hollandite inclusions is sometimes sold under the trade name of 'spider quartz'. It is very rare nowadays because it only comes from one deposit in Madagascar. One of the facets had to be polished in order to allow it to be photographed.

Quartz with hollandite inclusions weighing 9.308 grams at 60x with darkfield illumination and reflected light.

© Marine Bouvier

Nº 11 SNAKE

Three phase inclusion of liquid petroleum (yellow), hydrocarbons (black crystals) and a methane bubble observed in a rough biterminated Pakistani quartz crystal. These quartzes are remarkable for several reasons. Firstly, the province of Baluchistan in Pakistan is one of the few sources worldwide where we can find petroleum embedded in quartz. Secondly, the methane bubble moves when the gem is moved and finally the petroleum fluoresces with UV light. It's magical!

Petroleum quartz from Pakistan weighing 0.412 grams at 60x with darkfield illumination and reflected light.

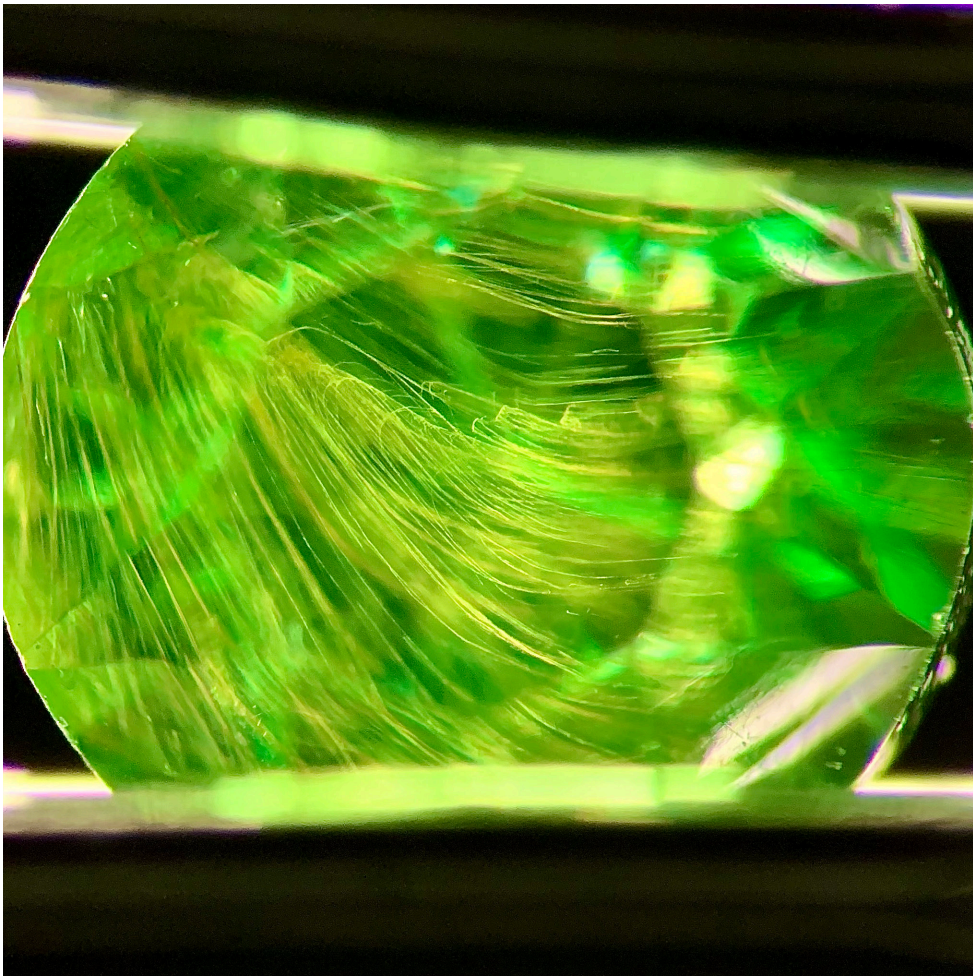
© Marine Bouvier

Nº 12 ICE CUBES

This photomicrograph represents a quartz with inclusions of blue fluorite. Fluorite can occur in octahedral and cubic form and is particularly beautiful. Again, this very rare type of quartz comes from only one deposit in the world (located in Madagascar), which has now been exhausted. This is why it remains particularly expensive and highly sought-after by collectors.

Quartz with blue fluorite inclusions from Madagascar weighing 9.304 grams at 22.5x with darkfield illumination.

© Marine Bouvier



Nº 13 DEMANTOID

Russian demantoid is the most expensive and sought-after variety of garnet because of its bright green color and its chrysotile fiber inclusions, commonly referred to as 'horsetail'.

This highly sought-after inclusion greatly increases the value of a demantoid garnet.

Demantoid garnet from Oural, Russia weighing 0.11 carats at 60x with darkfield illumination and reflected light.

© Marine Bouvier

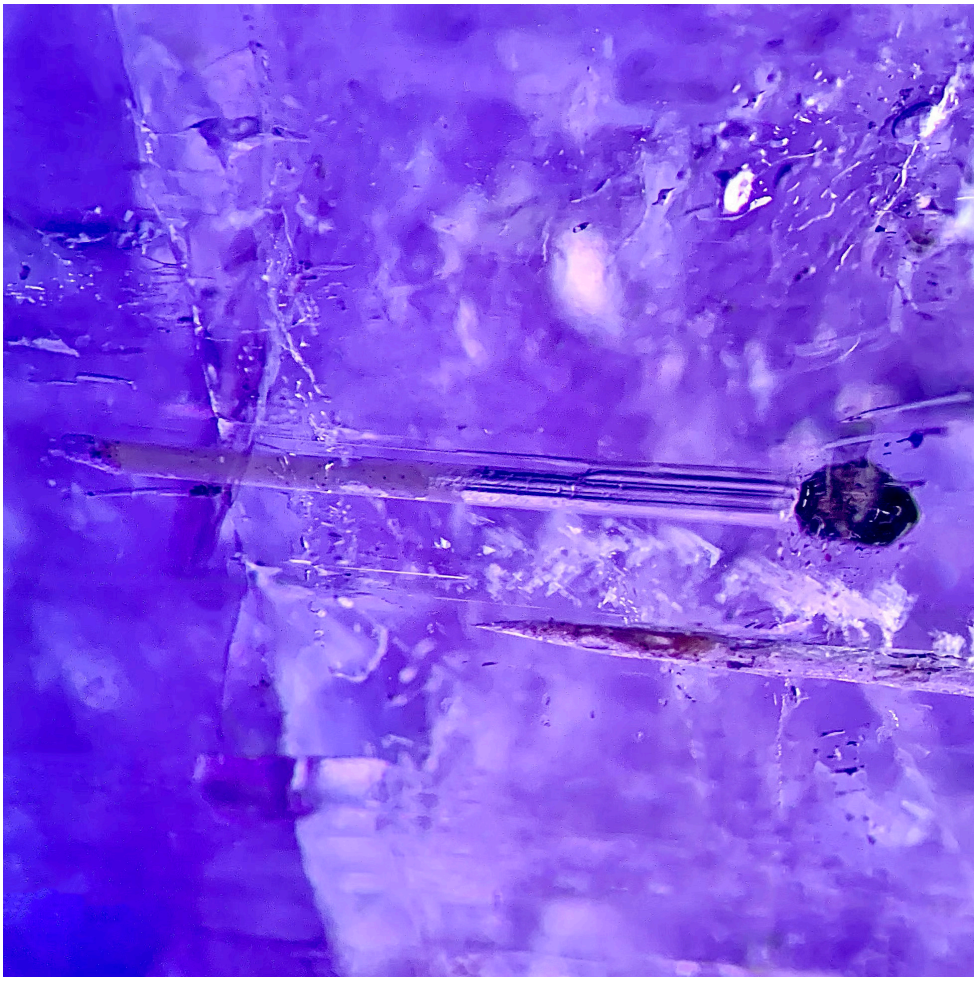
Nº 14 BIRTH OF THE UNIVERSE

This was taken by passing strong light through an amber cabochon from the Baltic Sea.

Amber is an essential source of information on the appearance and development of many animal species. Indeed, more than 1000 extinct animal species and different plants have been found. Recent research has also made it possible to date the age of Baltic amber to the Eocene era, ranging from 34 to 55 million years. Often imitated or processed, this amber cabochon is natural and untreated.

Amber from the Baltic Sea weighing 20.61 carats at 22.5x with darkfield illumination.

© Marine Bouvier



Nº 15 COMET

A black crystal of graphite in a tanzanite (blue-purple variety of zoisite) from Merelani Hill, near Mount Kilimanjaro in Tanzania.

The hexagonal platelet appears to have caused a comet-shaped crystal defect. This sphere cut gem has many inclusions of this type as well as growth tubes inducing a very strong cat's eye (linear shimmering) or even the beginning of a four-pointed star.

Although tanzanite is usually heated in order to bring out its blue color, the intact inclusions in this specimen show that this gem is unheated.

Tanzanite from Tanzania weighing 4.444 carats at 60x with darkfield illumination and grazing light.

© Marine Bouvier

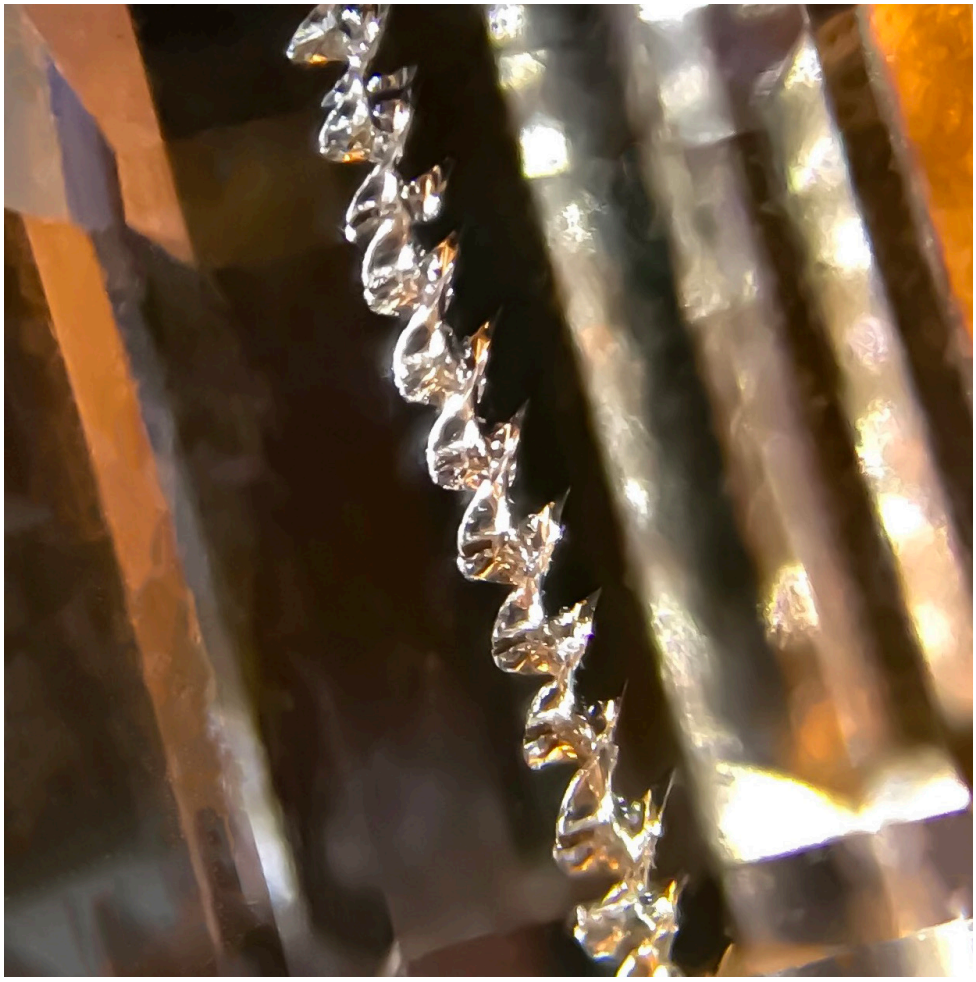
Nº 16 MOSQUITO

This Madagascar copal contains many trapped mosquitoes. We can see very precisely the impressive details of this insect trapped in this natural resin in the process of fossilization. While Copal is often confused with amber, it is much younger and is believed to be between a few thousand to a few million years old.

Like amber, it is well studied because some animals found in copal are now extinct.

Mosquitoes trapped inside copal from Madagascar weighing 3.702 grams at 60x with darkfield illumination and grazing light.

© Marine Bouvier

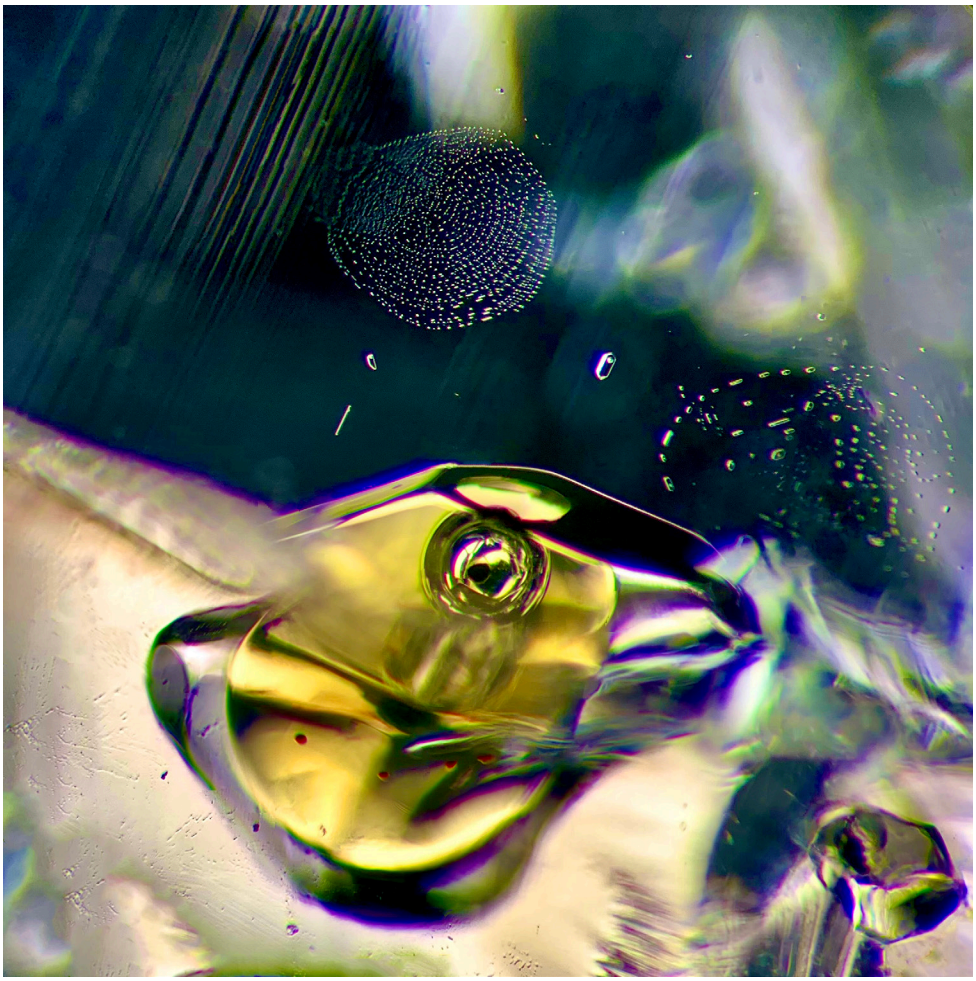


Nº 17 SCREW

This double helix inclusion observed in a colorless topaz, is rarely this visible and stems from a dislocation (a linear defect of the atoms that has propagated a deformation). It is 100% natural and a very rare inclusion!

Natural topaz weighing 3.10 carats at 60x with darkfield illumination and grazing light.

© Marine Bouvier



Nº 18 PETROLEUM QUARTZ

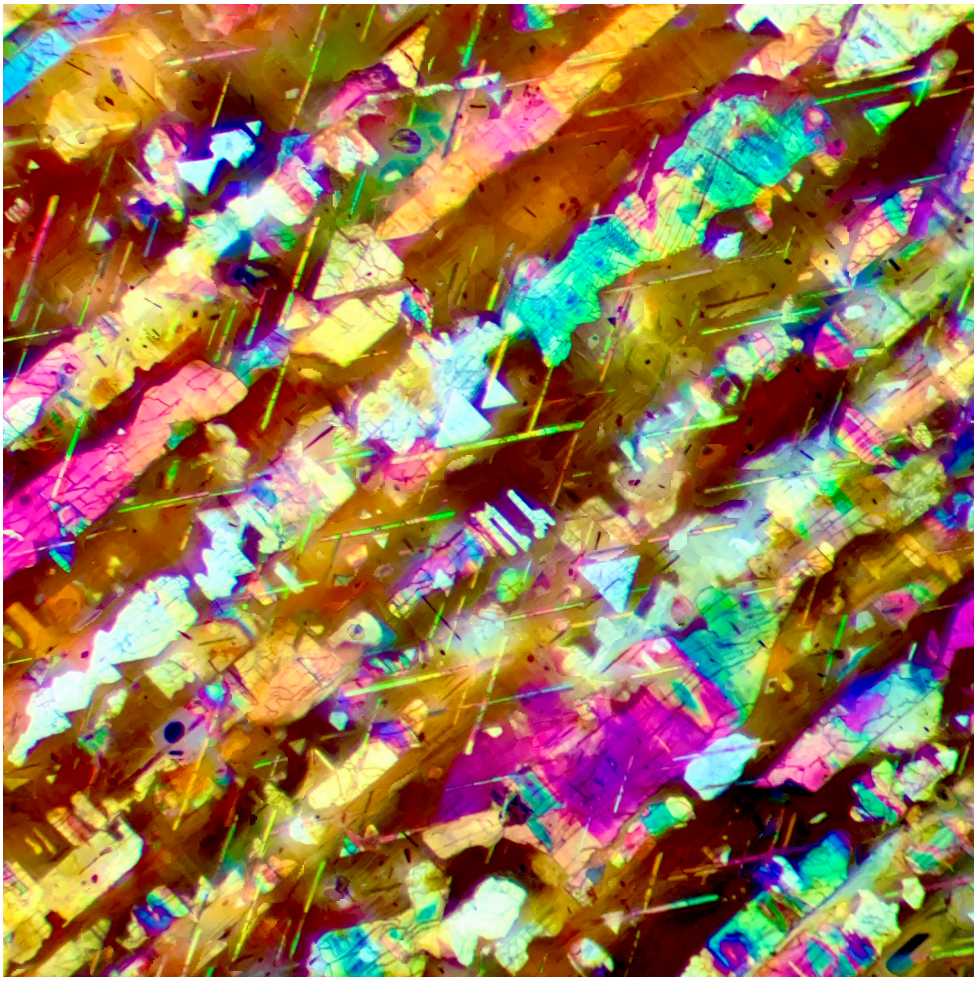
Just like the 'Snake' inclusion, this photomicrograph shows a cavity filled with yellow liquid petroleum and transparent water (immiscible), in which the methane bubble moves (even visible with the naked eye) when the gem is set in motion.

This photograph is composed of six photomicrographs allowing sharpness of the entire inclusion including the fluid aqueous inclusions in the background.

Petroleum quartz from Pakistan weighing 0.366 grams at 60x with darkfield illumination and reflected light.

© Marine Bouvier

Editors Note: We are excited to premiere this exclusive image. Marine will be offering this for sale in 2022 with the gemstone photographed.



Nº 19 STAR SUNSTONE

These inclusions of hematite platelets were photographed in a sunstone from India (feldspar family) and show a star with four branches when it is illuminated.

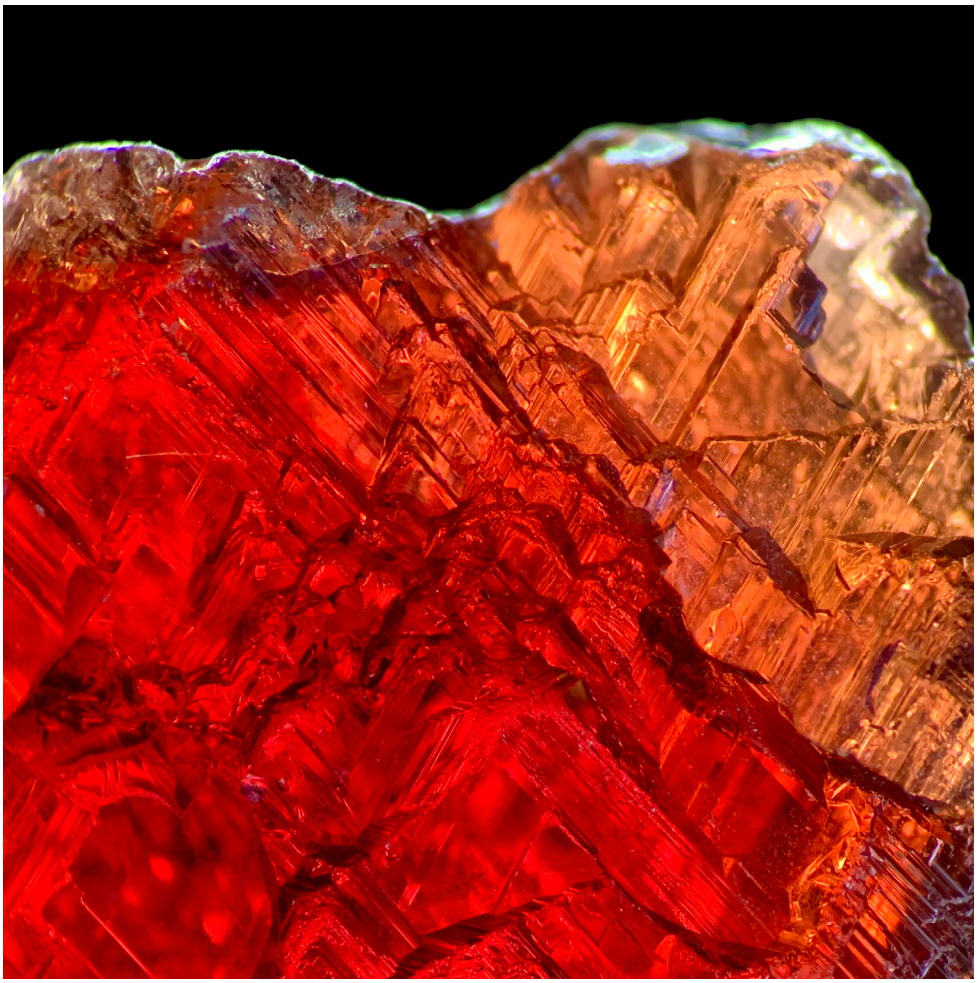
Its cabochon cut and pear shape make it a particularly beautiful gem that would be stunning if set in a pendant or a ring.

The inclusion shows saturated colors due to the reflection of light from the hematite platelets.

Star sunstone from India weighing 2.83 carats at 120x with reflected light.

© Marine Bouvier

Editors Note: We are excited to premiere this exclusive image. Marine will be offering this for sale in 2022 with the gemstone photographed.



Nº 20 ETCHED SPESSARTITE GARNET FROM NAVEGADOR

This photomicrograph shows the extraordinary surface area of a spessartite garnet from Navegador, Minas Gerais, Brazil. Their unique crystallization makes them rare garnets that are particularly sought-after.

When the light illuminates the interior of the crystal, we see an extremely saturated orange-red color and some fluid inclusions, some with a trapped bubble.

Etched garnet from Brazil weighing 1.584 grams at 45x with darkfield illumination.

© Marine Bouvier

Editors Note: We are excited to premiere this exclusive image. Marine will be offering this for sale in 2022 with the gemstone photographed.

GEMMOLOGY TODAY
QUIZ #21

This proved to be so popular in the last issue, we thought we would once again ask the question 'Who am I?'.

We will give you some clues as to the identity of the gemstone and it is up to you to figure it out. You only have one chance to find the correct answer so take your time. All participants who answer the questions correctly (100%) will be entered into a draw to win our Diamonds course. The course is available in English, French and Spanish.

ENTRY DEADLINE: January 15th, 2022

GOOD LUCK!

Big Brother

It was a gamble. A huge gamble. How would our gemmological equivalent of Big Brother work out? Twenty-two days of practical instruction in a twenty-six day period with our students living and studying under the same roof! Welcome to La Dolce Vita

La Dolce Vita

Gemmology is a science that relies on two things: theoretical knowledge and practical experience. While the former is relatively simple to provide (especially now that online courses are so popular and tutoring can be offered through various formats such as ZOOM, Skype or WhatsApp), the latter is far more problematic. It is not just a matter of holding 'on site' classes but making sure that it viable to do so. Practical classes are costly to run. You need a location, equipment, study stones and instructors. You also need a minimum number of students. There is a fine line between making a profit and incurring a loss. If a student decides at the last moment to cancel, this can have significant ramifications.

Holding practical classes where the students are all drawn from the surrounding area is relatively easy but what happens when you have students coming from all over the world? Even before COVID, this was difficult. The need for Visas, the cost of flights, accommodation, and food all must be considered. Unless you reside in the city or town where the classes are being held, you will be forced to incur additional costs. In some cases, these costs can amount to more than the cost of the courses. Of course, there is no alternative. You cannot become a professional gemmologist by watching 'YouTube' videos. You need the practical experience of working with the various instruments and the experience of identifying and grading stones. There is no substitute for 'on site' instruction.

Without question, the offering of practical classes has become even more complicated since COVID. It is no longer a question of offering the practical classes and finding enough students to make it economically viable. It is also a question of having contingency plans, of thinking outside the box, anticipating every possible situation that might arise and having a solution at hand. We live in a new world where the only thing that is certain is that things will remain uncertain. Life must go on and it will go on. While the journey may change, it is the 'final' destination we must always focus on.

After almost two years of inactivity here in Spain, the decision was made to offer all five practical workshops consecutively starting on November 1st. I knew that once we had made this decision there could be no going back. My logic was quite simple. If we offered the classes and no one attended, we had at least made them available. You see students need to know when they enrol that they will have the opportunity to finish what they started. This is one of the 'key' questions students ask. Where will they be able to take the practical requirements? Naturally the decision is theirs. No-one can force a student to take courses but if you do not offer them, then you have failed. At the World Gem Foundation, we have a responsibility to our students, a responsibility I take very seriously. They place their faith in us, and therefore it is incumbent on us to never let them down.

While it is not the responsibility of any school to provide 'added services' such as arranging accommodation and flight connections, I do believe that in these extraordinary times we need to offer as much assistance as possible. To me, it is not the physical possessions we own that bring us pleasure but the 'life' experiences that shape who we are and often stay with us for the rest of our lives. Studying should be a memorable experience. Not just the quality of the instruction but the total experience.

Experiment 101

Over the years, I have offered practical classes in a variety of formats, from schools, colleges, and universities to hotel conference rooms. Sometimes the situation requires a different approach, the need to be creative and flexible. With students coming from Zimbabwe, Central African Republic, and Spain, we had three problems to solve: how to get them here, how to provide reasonably priced accommodation and how we would run the practical workshops.

After looking at a variety of options, the decision was made to rent a house and provide a 'living and studying under the same roof' format. I must admit I was reluctant. This was well beyond my personal comfort zone but the more and more people I consulted, the more convinced I became that this was a viable format to use in this situation. It ticked all the boxes. The problem was finding a venue that would work.

The Venue (Badia Blava - Mallorca)

Front Terrace

Swimming Pool

Living & Dining Room

Each student had their own private bedroom

After scouring Airbnb and Booking.com, I managed to find a house in Badia Blava, a small community situated between Palma and Llucmajor in Mallorca. Anything closer was significantly more expensive and while I was concerned that the students would be one hour from Palma (by bus) and in a quiet residential area, I also knew that they were here to study. It was not a vacation; it was a mission, and the goal was to complete the 168 hours of practical instruction.

Normally we offer our workshops in five day (Gem Identification #1 and #2, Lab-created and Treated Gems and Coloured Gemstone Grading #1) and eight-day formats (Diamond Grading and Lab-created Diamonds) studying six hours a day. Under this format, the students would have needed to be in Mallorca for well over a month factoring in days off. I suggested that we change the format to four days (7.5 hours a day) with one day off in between. This meant that we could complete everything in twenty-six days (twenty-two days of study with four days off). Not a format I was relishing but something that I felt we needed to do. They all agreed. Game on….

The journey begins - October 31st, 2021

Cecilia and I arrived at the house to meet the owner, to set up the equipment and to greet everyone when they arrived. One of the problems of working at a remote location is not having the opportunity to see the 'venue' beforehand. In a classroom, everything is set up a certain way but in a house. Would it even work? Could we adapt a 'living' environment into a classroom? What would the students think? There were so many unanswered questions going through my mind. How can you make something perfect when you have little or no control over the variables? After seeing what we had to work with, we quickly developed a plan, moved some furniture around and started to unpack and set up the equipment. Two hours later I was happy with the outcome.

Santi arrived first from Madrid and later in the evening Tendai and Clever arrived. In Tendai's case, she had travelled non-stop from Harare (Zimbabwe) to Doha (Qatar) to Madrid and then onto Palma. Clever had also travelled from Zimbabwe but had arrived in Madrid a day earlier. He had at least had a good night's sleep. I was unsure how Tendai would function the next day. Would I find her asleep at the microscope? To compound the challenge we were facing, all the shops were closed on the Sunday and on the Monday due to All Saints Day. This meant more planning was needed to ensure that the fridge was stocked with the basics. We did not want them to starve!

We left them to settle in. Classes would start in the morning at 10am. We had agreed on a study schedule from 10am to 2pm, one hour for lunch and an afternoon session from 3pm to 6.30pm. The first day was going to be challenging for everyone.

Day One to Day Four (Gem Identification #1)

We approach the identification of gemstones based on colour and transparency. The logic is quite simple. If you are given a red transparent gemstone to identify, your entire focus is on what gemstones are found in that colour and transparency. Of course, many gemstones appear in a variety of colours but at that moment, your only concern is what occurs in that particular colour and transparency.

During the morning session, the students familiarized themselves with the various instruments. It is one thing to read about an instrument but quite another to use it. It was a whole new world for Tendai, but she quickly adapted to the situation. She was here to learn, and you could sense her will and determination.

Teaching practical classes is always challenging because so often you find yourself working with students who are at different 'developmental' levels. The trick is to quickly assess where they are and how you can help them reach the finishing line. There is no tried-and-true method, everyone is unique and different, and it is up to you to work to their strengths while helping them overcome the areas where they feel uncertain.

After coffee, we launched into the identification of colourless, red, pink, orange, yellow and green gemstones. Over the next four days they would be seeing a wide variety of stones including:

Colourless gemstones: cubic zirconia, lab-created moissanite, GGG, YAG, zircon, natural sapphire, lab-created sapphire, lab-created spinel, quartz, topaz, scapolite, beryl and glass.

Red gemstones: natural ruby, lab-created ruby, natural spinel, tourmaline, almandine garnet, rhodolite garnet, pyrope garnet, zircon, coral, rhodochrosite, fire opal, topaz, clinohumite, sunstone and glass.

Pink gemstones: natural sapphire, natural spinel, kunzite, topaz, beryl, tourmaline, rose quartz, natural spinel and glass.

Orange gemstones: natural sapphire, topaz, citrine quartz, spessartite garnet, hessonite garnet, zircon, sunstone, fire opal amber, copal resin and glass.

Yellow gemstones: natural sapphire, zircon, chrysoberyl, topaz, beryl, citrine, tourmaline, cubic zirconia, sphene, grossular garnet and glass.

Green gemstones: natural emerald, green beryl, tsavorite, sapphire, peridot, chrome tourmaline, verdelite tourmaline, alexandrite, demantoid garnet, jadeite, nephrite,

chrysophrase, emerald triplet, andradite, vesuvianite, prasealite, kyanite, malachite and glass.

Colourless gemstones pose quite a challenge because many of the diamond 'imitations' fall beyond the range of the refractometer. It is also the most important colour category because diamonds are used extensively in our trade, more than any other gemstone.

My fears that the 'workspace' was too compact were quickly allayed during the first day. The students clearly loved it and were adapting quickly to their 'new' study environment. I also quickly adapted to my 'new routine'. Commuting two hours a day to get to and from class. To be honest, I had dreaded this part of my day, but I decided to use the time to prepare for the class each day and to unwind at the end of the day. It is amazing how quickly we can adapt to a 'new' reality. Today, more than ever, adaptability is the name of the game.

One of the things I love about teaching is watching students evolve before your eyes. In the case of Tendai, she had never touched a gemstone before or used any of the instruments. She had only read about them in the course notes, but you see her confidence growing. There was a light in her eyes that burned brighter as each day passed.

Day Five (Day Off)

While I thought it would be a day of rest, Santi, Clever and Tendai decided to take the bus into Palma to do some sightseeing.

Day Six to Nine (Gem Identification #2)

Back to their workstations and identifying a new set of gemstones (blue, violet, brown, black, and phenomenal stones) including:

Blue gemstones: natural sapphire, natural spinel, tanzanite, tourmaline, aquamarine, topaz, lab-created spinel, iolite, apatite, lapis lazuli, sodalite, turquoise, stained howlite, kyanite, hauynite and chalcedony.

Violet gemstones: natural sapphire, natural spinel, tanzanite, amethyst, iolite, scapolite, lab-created quartz, sugilite, charoite, rhodolite, garnet top doublet and tourmaline.

Brown gemstones: tourmaline, smoky quartz, hessonite garnet, chrysoberyl and andalusite.

Black gemstones: hematite, jadeite, jet, star sapphire, onyx, spinel, moissanite, star diopside and epidote.

Unusual gemstones: star sapphire, star ruby, star almandine, bi colour tourmaline, ametrine quartz, cat's eye chrysoberyl, cat's eye quartz, black opal, crystal opal, jelly opal, labradorite, moonstone and shell cameo.

Black gemstones, like colourless gemstones are tricky to identify because they are either cut en-cabochon or fall beyond the range of the refractometer. It is perhaps the one colour category I dislike the most. Filled with gemstones that have little or no value but are very tricky to identify!

The daily routine was now set, and I must admit, the 'new' format created a far more relaxed atmosphere. Identifying gemstones is serious business but you can still have fun doing it. The students were bonding, and I could see that the 'total experience' was unfolding before my eyes.

Day Ten (Day Off)

Santi had left the night before having completed Gem Identification # 1 and #2. We were now more than a third of the way through the program and I felt very positive that the decision I had made was the right one. Tendai and Clever were clearly delighted with their 'new' home.

Day Eleven to Fourteen (Coloured Gemstone Grading)

It was now time to reorganize the workspace, to put the refractometers, the polariscopes, the dichroscopes, spectroscopes, Chelsea Filters, fibre optic light source and the UV light away and concentrate on an area that fascinates me, the grading of coloured gemstones.

In our workshops, we teach four different colour grading systems: GemDialogue, the World of Color, Gemewizard and ColourWise. Giving our students the opportunity to work with each system while using the same set of grading stones. Since everyone perceives colour differently, the goal of this workshop is to familiarize students with the mechanics of each system, to allow them to grade stones for colour, clarity and cut and to assess how consistent their grading is. Consistency is the most important aspect of grading gemstones. Will a student grade the same gemstone the same way a second time?

For the next four days they worked with each system using our glass colour samples to assess colour and natural and lab-created gemstones to assess the colour, clarity, and cut.

We do not dictate which system a student should use. This is completely up to them. At the end of the day, their decision will be based on two factors: how user-friendly the system is and how consistent their grades are. By using the same study stones for each system, it allowed us to create a level playing field so that they could make an informed choice.

Tendai and Clever also used ColourWise to colour grade our new jadeite collection and to complete some of the online exercises that come with the ColourWise system.

Working with Gemewizard | Clever in action | Diamond Grading - Measuring Table %'s

Tendai estimating pavilion depth %'s | Clever clarity grading diamonds | Tendai & Clever using ColourWise

Tendai and Geoff working on the refractometer

Tendai, Santi, Cleverand Geoff

Working remotely with Salomon in French

Tendai - relaxed and happy

Tendai working with GemPen

Santi focused and studying hard

Using ColourWise to grade jadeite

Exploring lab-created gemstones

Day Fifteen (Day Off)

We were now almost two-thirds of the way through the program. Next up? Lab-created gemstones.

Day Sixteen and Seventeen (Lab-created Gemstones)

Tendai and Clever were very excited to examine a set of rare and unusual lab-created gemstones provided by Wilma van der Giessen, one of our licensees in Belgium. The set included flux-melt alexandrite, Chatham, Inamori, Gilson, Regency and Lechleitner emeralds, Chatham, Douros, Ramaura, Kniskcha and Kashan rubies, hydrothermal aquamarine, flux-melt spinel, and Chatham opals. While many of these lab-created gemstones are no longer manufactured, it is important to remember that every gemstone ever created is somewhere in the system, therefore it is imperative that we familiarize ourselves with the unique characteristics that allow us to separate them from their natural counterparts. In this workshop they also worked with The PhotoAtlas of Inclusions in Gemstones by Eduard Gübelin and John Koivula. I wanted them to see in the book exactly what they were seeing under the microscope. This was an area that particularly interested Clever. As a seasoned gemmologist, he was attending these workshops to hone his skills but also to learn the 'World Gem Foundation' way of teaching. His goal is to set up a gemstone research centre in Zimbabwe.

Day Eighteen (Practice Day)

With their practical gem identification examination set for the next day, out came all the instruments and the day was spent simulating the final examination. Identifying gemstones under a time restriction. I wanted to fully prepare them for what they were going to face the next day.

Day Nineteen (Practical Examination)

Judgment Day! I am sure that I am not alone when I say this, but examinations not only assess the knowledge of a student but also the effectiveness and skill of the teacher. If a student fails, so too does the teacher. I wanted them to succeed but also realised that once the examination started, I was at the mercy of the gemmological gods.

I cannot describe how happy I was with the results. In Clever's case, I knew that he would pass. If he didn´t, it would not be because of a lack of knowledge but because he had made a silly mistake. In Tendai's case, she had only been working for nine days with the equipment. Would she be able to identify the stones? The test stones I selected were fair but also challenging and included lab-created, imitation, assembled, singly refractive, uniaxial, and biaxial stones. It was certainly a time to celebrate, and I could see the relief and belief in her eyes.

Day Twenty (Day Off)

Another day off and time to prepare for the homestretch, diamond grading and lab-created diamonds. Boniface joined the class from the Central African Republic.

Day Twenty-One to Day Twenty-Six (Diamond Grading)

While I love coloured gemstone grading, diamond grading has always been a personal favourite of mine to teach. There is so much more I can tell you about a diamond than a coloured gemstone. Its colour and clarity, table %, crown angle, girdle thickness, pavilion depth %, polish and symmetry and if it is natural or lab-created. Over the next four days, they would work on each of these independently so that on Day Twenty-Five they could produce a lab report and on Day Twenty-Six, take the practical examination.

One of the keys to this workshop is working with well-cut diamonds. While clarity and colour can be assessed regardless of cut, estimating the various 'cut' components can only be done with stones that are symmetrical.

We started out with clarity, assessing diamonds without magnification and then under 10X. This was followed by colour grading. Again, the goal was to check consistency so over the course of the next two days, students encountered the same diamond on a variety of occasions. This is a part of the course where things move very quickly. The clarity and colour grading of diamonds takes a matter of seconds. The longer you look, the less likely you are to be right, so I wanted to emphasize the importance of speed. With our strict policy of one diamond at a time, I certainly hand my hands full!

On Day Twenty-Three we started to look at two different methods of estimating the table % of a diamond: the bowing method and the direct measurement method. It is amazing how accurate you can be if the stones are well cut.

During this time, I challenged Clever with the new Objective Diamond Clarity Grading technique developed by Michael Cowing. He was thrilled to learn this new system and spent a large part of each day honing his skills. I knew that he had already studied diamond grading, so it was important to keep him motivated and this was exactly what he needed. We both agreed that you must never stop learning. Personally, I believe in Michael's technique, and I was happy to see my enthusiasm shared by Clever.

Day Twenty-Four included assessing the crown angles, the girdle thickness, and the pavilion depth % of the diamonds. These are tricky concepts to teach because in the case of the crown angles it requires focusing on the reflection of the pavilion main facets in the bezel facets, while in the case of the pavilion depth %, the reflection of the star facets in the

Tendai, Santi and Clever

Tendai learning the proper technique

Clever showing us how it is done

pavilion. What makes this even harder is that it is impossible for both the instructor and the student to view what is happening at the same time. Something we need to work on for future practical sessions by incorporating a video camera. In the case of the pavilion depth percentages, you can also use good quality diamond images and once they realised what they were looking for, the pieces of the jigsaw seemed to fall into place.

Day Twenty-Five started with a demonstration of the new GemPen developed by Gemometrics to identify the natural, CVD and HPHT diamonds in the collection, followed by how to assess polish, symmetry and cut. The rest of the day was spent compiling reports based on everything they had learned so far. Preparation for what lay ahead.

Judgment Day #2. Once again it was time to see how far they had progressed. This is a very challenging examination requiring the compiling of four diamond reports with points awarded for the different components of the reports. For me it is impossible not to become emotionally involved. Your students have placed their faith in you, and you know that failure at this point will be soul destroying for them and for you. At the same token, our mandate is to teach concepts and to train people who want to become professional gemmologists and coloured gemstone / diamond graders. We want our graduates to be good ambassadors for the World Gem Foundation, so it is important that we provide quality instruction. It is all about quality, not quantity.

Once again, the gemmological gods were smiling, and I was delighted with the results. We had ended the twenty-two days of practical instruction on yet another high. All their hard work had paid off. They came, they saw, and they conquered. A triumph for everyone!

Day Twenty-Seven to Thirty-Two

A well-earned rest! Since the changes to the schedule had been made after Tendai and Clever had booked their flights, they decided to spend the next six days in Palma and we were very lucky to find them a very nice apartment in Can Pastilla, one block from the beach. We also arranged a trip to Valldemossa, a quintessential Spanish town in the Tramuntana Mountains. We wanted them to see more than just Palma and Can Pastilla.

Now the only thing standing between them, and their Career Gemmologist, Diamond Professional and Coloured Gemstone Professional diplomas is the final theory examination that they will take after Christmas.

Closing thoughts

I joked with everyone that in addition to being their instructor, I had also become their part-time travel agent. Logistically, putting on these practical workshops was challenging. There were so many variables, so many things that could have gone wrong. Even without the cloud of COVID hanging over us, the odds were against us, but we all made it happen and I could not be more thrilled with the outcome. There were many times when we had to improvise but we achieved our objective. In twenty-six days, we had completed all the practical requirements (168 hours of instruction), adapted a living space into a study space, provided beautiful accommodation that was also affordable, given our students a taste of what it is like to live in Spain and created a memorable experience that I hope they will never forget. I had told Clever that my students are like family to me. I think he understands now what I meant. I love to have fun, but I also take my job very seriously. When a student registers with us, they place their faith and trust in us, and it is our job to deliver on the promise we had made.

Would I do this again? It's a good question. If the circumstances dictated it, absolutely. Would I do things differently? Yes, to some extent. It was a steep learning curve for all of us, but I can see that this 'format' works and produced the desired results. At the end of the day, we found a solution that worked for everyone and that is what matters most. We created a 'lifetime' experience for our students, and I could not be happier. I miss them already!

VIDEO
CHECK IT OUT

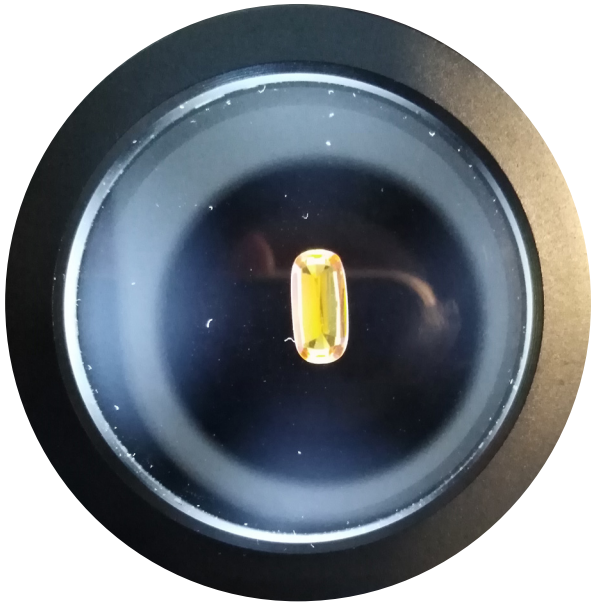
Time to have some fun!

Tendai, Cecilia, Clever and Geoff in beautiful Valldemossa

Lab Talk

I love a good mystery and this stone certainly had us all scratching our heads. It was not a complicated stone to identify, just not what we expected. Testament that if you follow a set protocol, you will eventually find the correct answer!

The 'Mystery' Stone



The 'mystery' stones my students encountered

Data	Observation
Colour	Orange/Yellow
Transparency	Transparent
Visual Features	Slight abrasions and a waxy appearance.
R.I. Crown	1.766
R.I. Pavilion	1.680
Optic Character	Singly Refractive
Uniaxial or Biaxial (+/-)	-
Magnetic Response	Drag Response
Dichroscope	-
Diffraction Spectroscope	-
Chelsea Filter Reaction	Orange
U.V LW Response	None
Microscopic Analysis	Gas bubbles and a join line mid-crown
Gemstone Identity	Almandine Garnet Topped Glass Doublet

One of the things that I love about gemstone identification is the challenge. To identify a gemstone by collecting data from different instruments and then analyzing the results. The more data you collect, the easier it becomes. However, it is not just a question of collecting data but ensuring that it is correct. If you make one simple mistake, you can find yourself chasing shadows. Experience often helps but sometimes even seasoned pros can be fooled.

I have to admit that this stone was not what I or my students expected. Initially we thought it was glass but the more data we collected, the more intrigued we became. It was Santi who decided to take an R.I. reading of the pavilion and this was the 'key' to unlocking the secret of this gemstone.

It is amazing when a group of like-minded people put their heads together and solve a puzzle. This stone certainly created a very lively discussion and I was very proud of the logic they used and the way they went about it.

Over the years, I have seen lots of doublets but this was a very clever stone that I suspect was created to imitate a yellow sapphire. Certainly the R.I. of the crown gave that impression but since it did not vary, as the stone was rotated, we knew it could not be a sapphire. It was clearly singly refractive.

Of course the microscope revealed the 'other key' characteristic, the almandine-garnet cap that unlike most garnet-topped doublets did not go extend down to the girdle. It only extended half-way down the crown. Clearly the makers of this stone realised that by doing this, the 'red halo effect' would be less pronounced.

I love imitation stones. They are great stones for my students to examine and yet another example of why we have to be diligent when it comes to testing gemstones.

One mistake can be fatal!

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 introduced two new 'Diploma' programs (Diamond Professional and Coloured Gemstone Professional) in 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.

Career Gemmologist Program

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 (5 modules - 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 60 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, HPHT, CVD, Detonation, Ultrasonic Cavitation Skull Crucible, Zone Melt, Horizontally Oriented Crystallization, the Sublimation Method, and the Modified Stöber 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 module looks specifically at diamonds, their physical and optical properties, geology, localities, principle mines, crystal system, chemical composition and classification, causes of colour (fancy coloured diamonds), absorption spectra, inclusions, fluorescence, diamond cutting and mining 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, pricing 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 our online / practical Coloured Gemstone Grading #2 course where you will work with the Gemewizard and ColourWise Colour Grading systems.

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 60 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 Coloured Gemstone Professional 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 online / practical Coloured Gemstone Grading #2 course.

Residency Programs

We are delighted to announce that our Career Gemmologist, Diamond Professional and Coloured Gemstone Professional Diploma Programs are now available as a full-time residency program through the Gem Academy of Canada in Montreal, Canada.

Integrating the theoretical and practical components of these programs, students can earn their Career Gemmologist Diploma in six-months, their Diamond Professional in one month and their Coloured Gemstone Professional Diploma in five months.

Courses in Other Languages

All of our diploma and general interest courses are now available in English, Spanish & French. We are currently translating all the courses into Russian. These will be available in 2022.

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 five theoretical courses (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). Students taking any of the three 'General Interest' courses will receive a credit equal to the cost of the course if they upgrade to our Coloured Gemstones course.

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 world 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 in a classroom or 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 outlines the number of online tutoring hours that are included in our courses. If you require additional tutoring, you can talk to your tutor 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

Once a Student, Always a Student

We appreciate that the science of gemmology is constantly evolving. Every year new lab-created gemstones and treatments and enhancements are emerging in the market place along with new techniques and advanced technology to detect them. While your knowledge in certain areas may be relevant today, it may be obsolete tomorrow.

To meet this challenge, the World Gem Foundation has introduced our 'One a Student, Always a Student' policy, an innovative program that is unique to the World Gem Foundation and our affiliated gem academies.

Once you register for one of our courses or programs, we provide you with lifetime access to your student page so that every two years when we update our courses, you will receive the latest digital course notes free of charge.

Flexible Study Schedules

Benjamin Franklin once said 'An investment in knowledge pays the best interest' and this is as true today as it was back then. But how can we achieve this when we all lead such busy lives?

At the World Gem Foundation, we appreciate that we all have responsibilities and commitments that can make studying a challenge.

To meet this challenge, we offer a flexible study schedule that allows you to register at any time and study at your own pace.

Enrol in one of our three diploma programs, take the theory and practical diploma courses separately and receive course credits or take our general interest courses. The choice is yours! Our goal is to help you devise a study schedule that works for you!

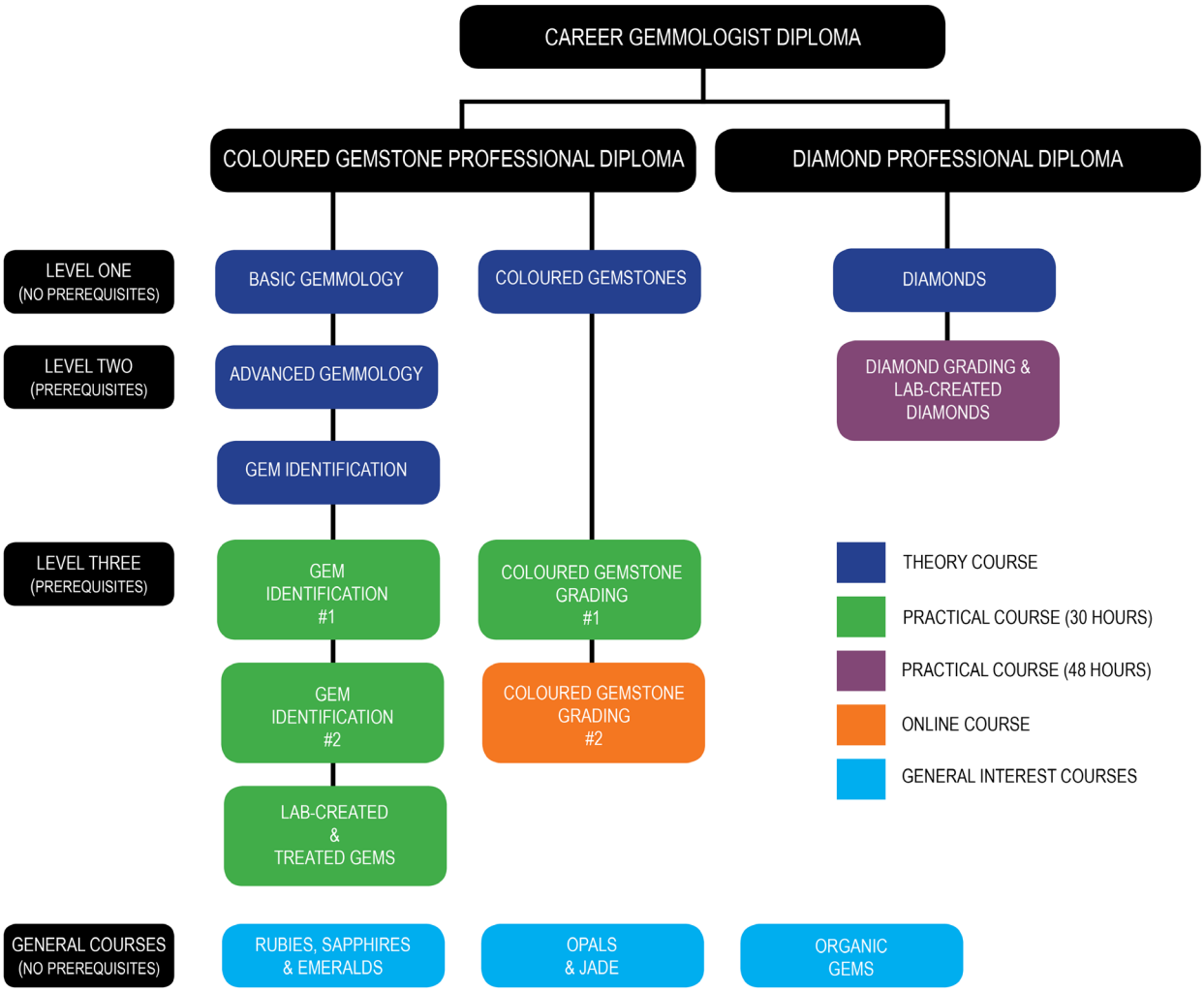
Whether you are taking our online tests, writing our final theoretical examinations or taking a practical test, we provide you with the flexibility to make it possible. Our students are our major stakeholders and we believe it is our responsibility to offer them every opportunity to achieve their educational goals.

Available in Print

All our diploma theoretical courses are available in print.

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.



GEMMOLOGY SEVEN PROGRAM

Career Gemmology
5 Modules - 78 Lessons

Gem Identification #1
5 Days

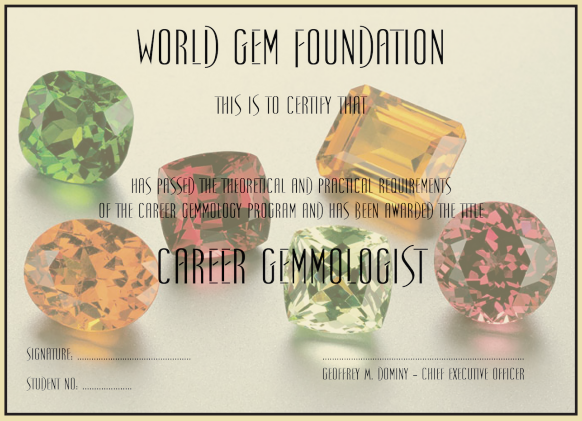
Gem Identification #2
5 Days

Lab-created & Treated Gems
5 Days

Diamond Grading & Lab-created Diamonds
8 Days

Coloured Gemstone Grading #1
5 Days

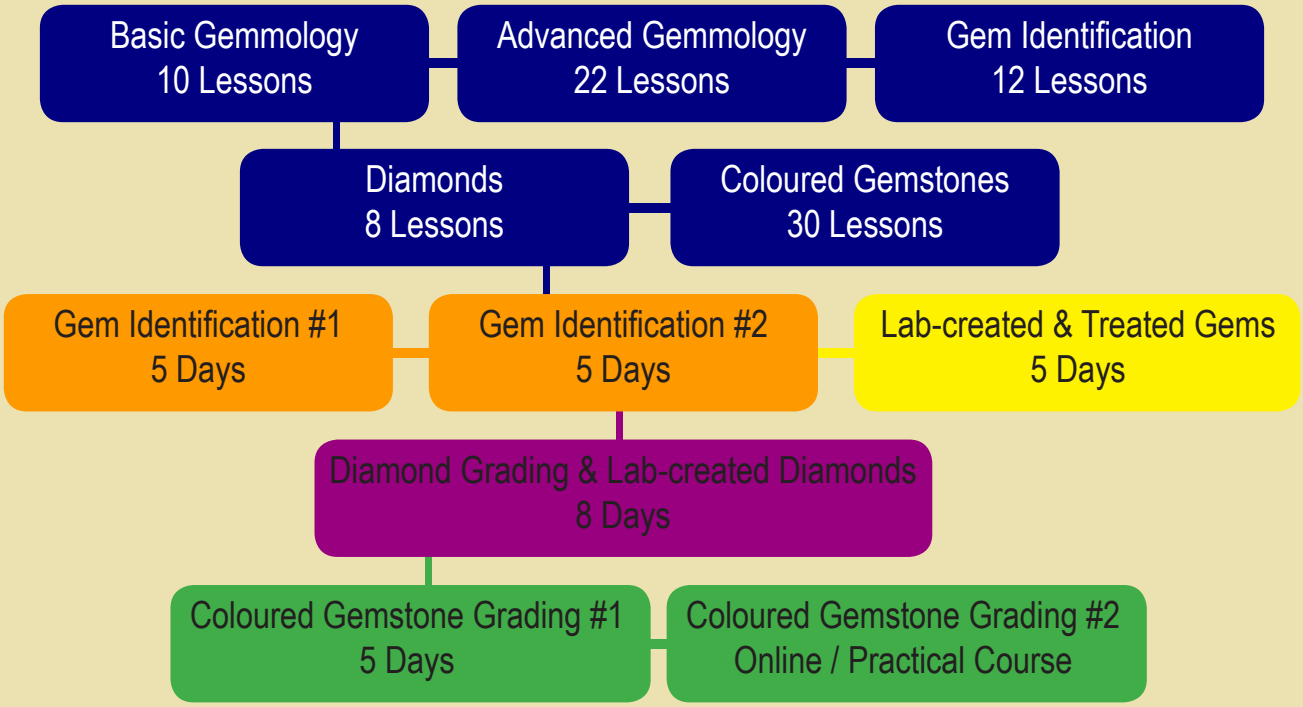
Coloured Gemstone Grading #2
Online / Practical Course



Career Gemmology Seven — Digital Fees

Course Name	Euros	Pounds Sterling	USD
Career Gemmology (Theory)	1400	1250	1600
Gem Identification #1	500	450	550
Gem Identification #2	500	450	550
Coloured Gemstone Grading #1	500	450	550
Coloured Gemstone Grading #2	1000	900	1150
Diamond Grading/Lab-created Diamonds	1750	1575	2000
Lab-created & Treated Gems	500	450	550
Examinations Fees (Final Exam)	250	225	280
Total Cost	6400	5750	7230

GEMMOLOGY ELEVEN PROGRAM



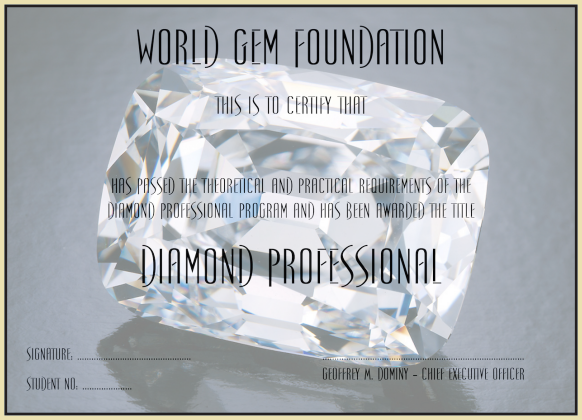
Career Gemmology Eleven — Digital Fees

Course Name	Euros	Pounds Sterling	USD
Basic Gemmology (Theory)	200	180	225
Advanced Gemmology (Theory)	400	360	450
Gem Identification (Theory)	225	200	250
Diamonds (Theory)	225	200	250
Coloured Gemstones (Theory)	500	450	550
Gem Identification #1	500	450	550
Gem Identification #2	500	450	550
Coloured Gemstone Grading #1	500	450	550
Coloured Gemstone Grading #2	1000	900	1150
Diamond Grading/Lab-created Diamonds	1750	1575	2000
Lab-created & Treated Gems	500	450	550
Examinations Fees (Final Exam)	250	225	280
Total Cost	6550	5890	7355

DIAMOND PROFESSIONAL

Diamonds
Theory
8 Lessons

Diamond Grading & Lab-created Diamonds
Practical Workshop
8 Days



Diamond Professional	Digital Fees		
Course Name	**Euros**	**Pounds Sterling**	**USD**
Diamonds (Theory)	225	200	250
Diamond Grading/Lab-created Diamonds	1750	1575	2000
Examinations Fees (Final Exam)	250	225	280
Total Cost	2225	2000	2530

COLOURED GEMSTONE PROFESSIONAL

Basic Gemmology
10 Lessons

Advanced Gemmology
22 Lessons

Gem Identification
12 Lessons

Coloured Gemstones
30 Lessons

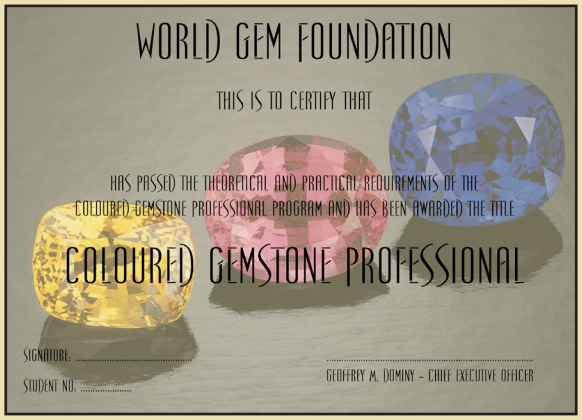
Gem Identification #1
5 Days

Gem Identification #2
5 Days

Lab-created & Treated Gems
5 Days

Coloured Gemstone Grading #1
5 Days

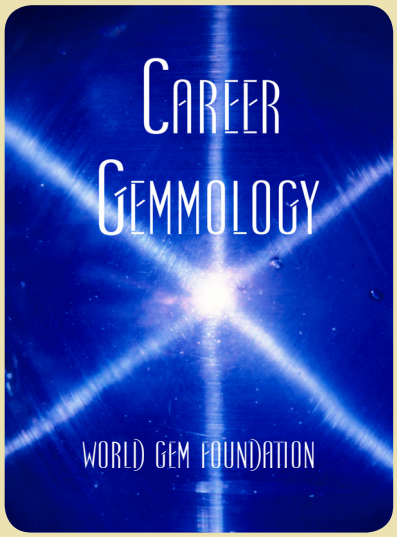
Coloured Gemstone Grading #2
Online / Practical Course

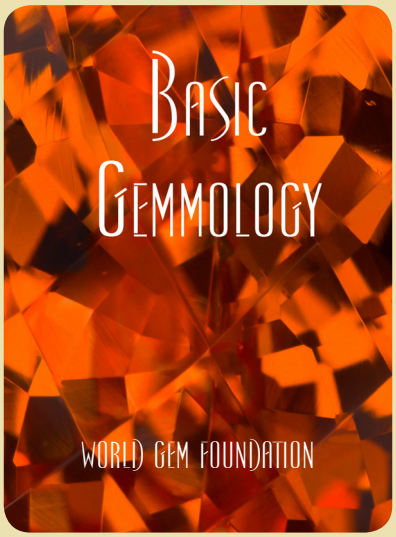


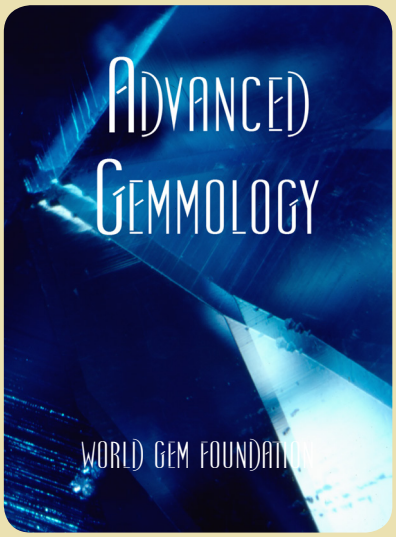
Coloured Gemstone Professional **Digital Fees**

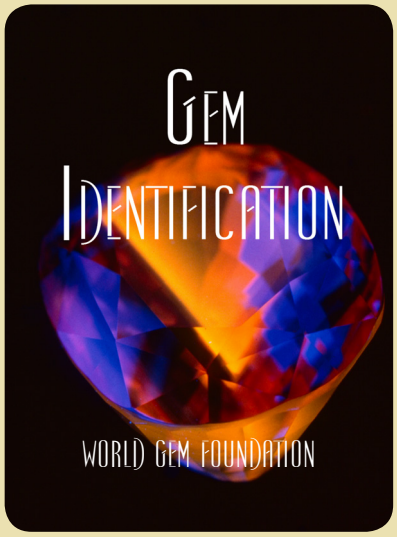
Course Name	Euros	Pounds Sterling	USD
Basic Gemmology (Theory)	200	180	225
Advanced Gemmology (Theory)	400	360	450
Gem Identification (Theory)	225	200	250
Coloured Gemstones (Theory)	500	450	550
Gem Identification #1	500	450	550
Gem Identification #2	500	450	550
Coloured Gemstone Grading #1	500	450	550
Coloured Gemstone Grading #2	1000	900	1150
Lab-created & Treated Gems	500	450	550
Examinations Fees (Final Exam)	250	225	280
Total Cost	4575	4115	5105

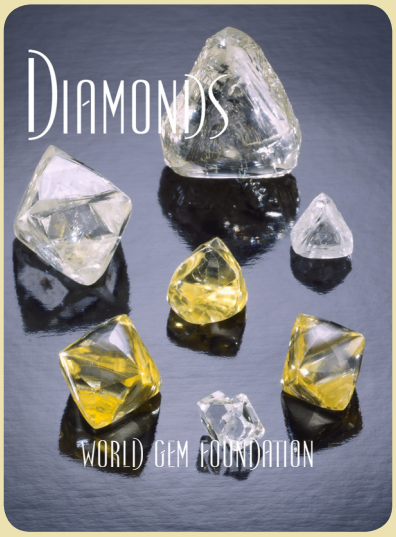
Diploma Courses

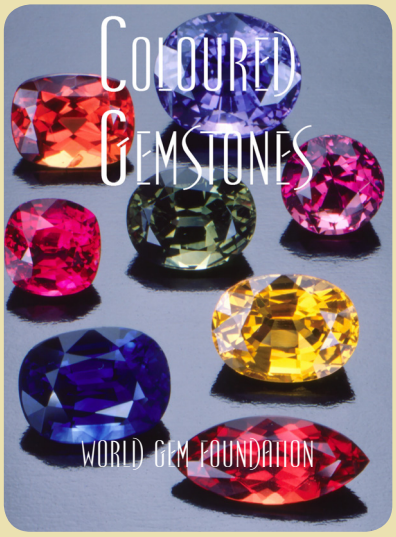




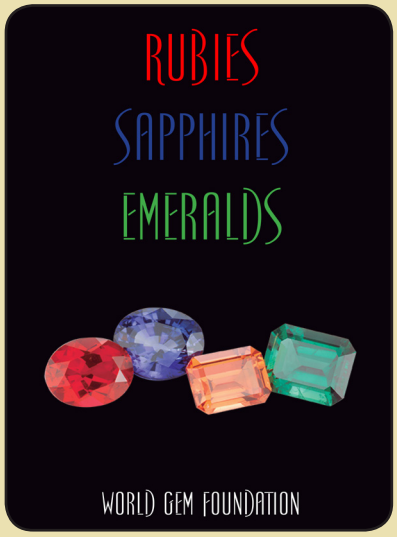


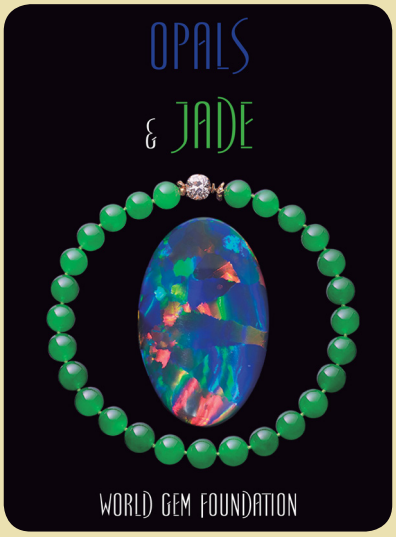


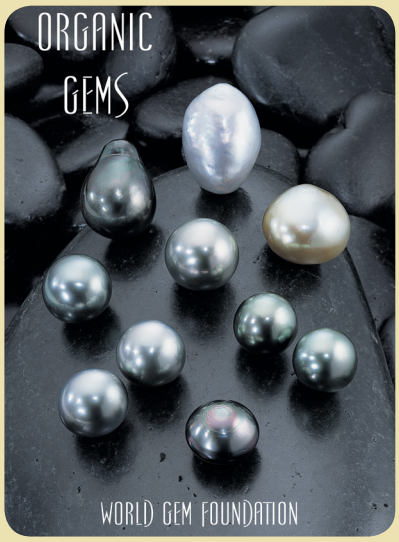




General Interest Courses







To learn more about our Diploma and General Interest courses, please click on the course icons above.
All of our diploma courses are available in English, Spanish & French.
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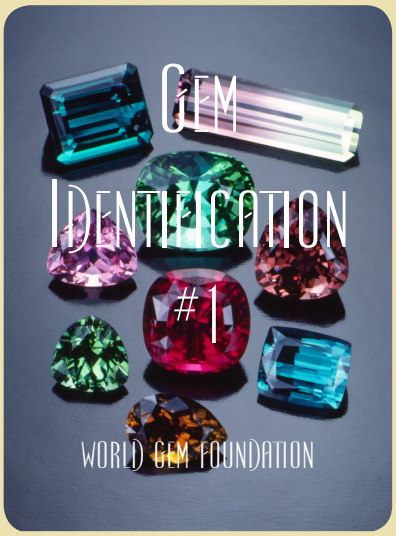
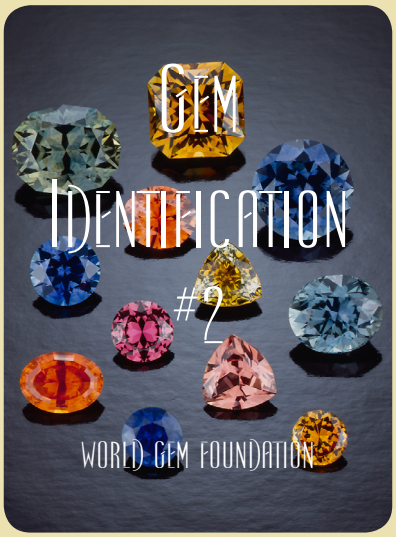
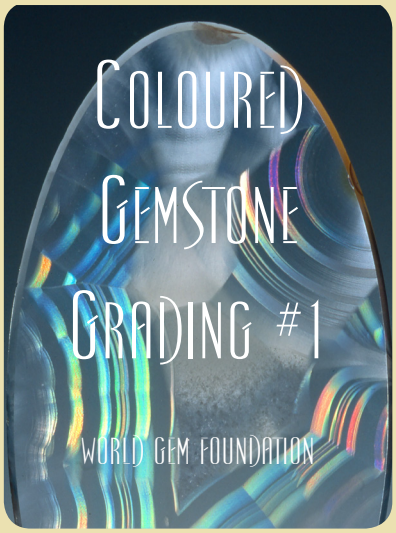
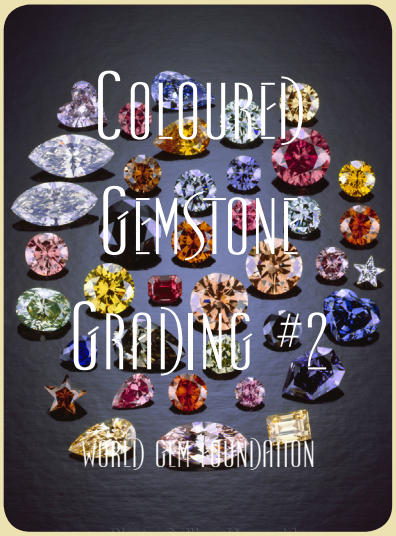
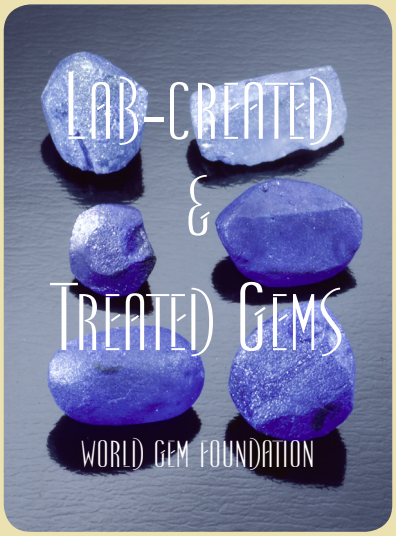
Practical Workshops

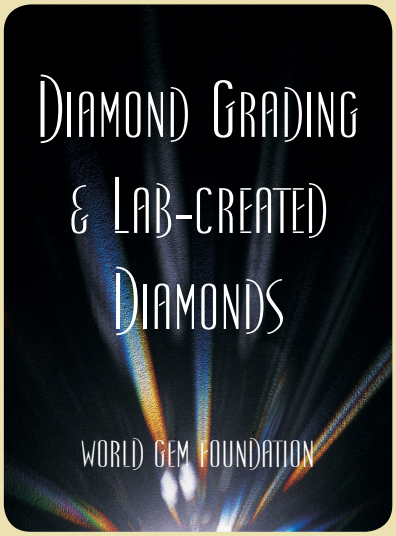












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This is one more reason to choose the World Gem Foundation, because to us, you should never stop learning!

Out in the field

Is the Mozambique stone the bejesus of bird's blood? Lotus Gemology's resident ruby wallah, Richard Hughes, weighs in on the state of the market and how Mozambique stacks up to historical heavyweights like Burma and Thailand/Cambodia.

Mozambique Ruby • Red Rain Pours into the Market

You see that real ruby red and oh, it does something to you. I think those of us in this business are in love with the stones we're dealing with. It's nature's finest creation; there's just something about it. I'd like to own a fine Burmese ruby just to gaze upon it. It's not the value. If I wanted the value, I'd just buy a ton of gold.

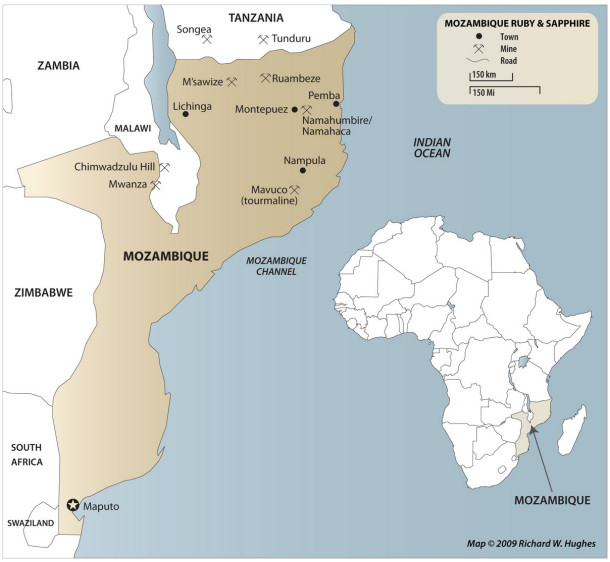
— Richard Hughes to journalist Rod Nordland in 1982

Further downtown

23 March 2015—In the autumn of 2007, I spent a month in East Africa, visiting gem dealers and mines in Kenya and Tanzania. The principle aim was to explore the sapphire mines of southern Tanzania at Songea and Tunduru and the spinel mines of Mahenge (described in Downtown) for an updated edition of my book, Ruby & Sapphire, but my team also visited the tanzanite mines at Merelani (detailed in Working the Blueseam).

While in southern Tanzania's Tunduru district, we witnessed a number of miners crossing the Muhuwesi river that separates Tanzania from Mozambique. Just a few short months later, it became clear why. Ruby had been discovered in Mozambique.

Flash forward to 2009. My close friend, Vincent Pardieu, who I had asked to join me on the 2007 journey, was now working as the GIA's first field gemologist. His job? Hunt down ruby and sapphire, wherever it might be found.



Gimme danger

Shortly after the discovery of ruby in Mozambique, Pardieu visited two different locales (M'sawize and Ruambeze). But the prize location, Namahumbire, just near Montepuez, remained out of reach. Vince has often said to me (with

his wry smile) that he does not like “unfinished business.” Thus Vince and I, with my old travel buddy, Mark Smith, found ourselves touching down at Pemba, Mozambique in December 2009, desperately seeking to scratch yet another mine off our ever-expanding bucket list.

We had no idea what lay ahead. I personally think Vince invited me along because he thought it would be an easy trip and I wouldn’t complain too much. The food would be good, we would not have to hike through mud and, if I flashed a copy of my book, it might provide just the entrée needed. But more importantly, as there would be no rat-infested hovels where we slept, I could not poke fun at him regarding his rodent phobia. Similarly, because there would be no creaky bridges to cross, he could not tease me in the same way. So we would do a trip on neutral ground. These were the best laid plans involving mice, and a man with acrophobia.

Mark Smith (left) and Vincent Pardieu (center), who arrived with the author at Pemba, Mozambique in December 2009. Photo: Richard Hughes/Lotus Gemology.

We arrived in Pemba in good condition, but the entry was not without its quirks. Visa-on-arrival was available, but apparently returning-change-when-paying-with-large-note-for-visa-on-arrival was not. It took serious effort to recover my money before we could exit the airport.

Roughing it abroad. Vincent Pardieu enjoys a small lobster in Pemba. Photo: Richard Hughes/Lotus Gemology.

Richard Hughes discovers that even the starfish like rubies. Photo: Mark Smith.

Pemba is a wonderful place. Sitting astride the Indian Ocean, it has beautiful beaches and terrific seafood. Mark and I made the best of our downtime while Vince negotiated for access to the mines. Vince chatted with officials; Mark and I went diving. It was one of my more pleasant mining trips.

To the mines!

Following several days of negotiations in Pemba, the owner of the property consented to allow us a visit. The next day, we drove down towards Montepuez, but not without incident. Shortly before turning off the main road, a bicycle swerved directly in front of us. Having your life appear before your eyes doesn’t begin to describe the scene. Our driver swerved and miraculously did not run over the bicyclist. But that set us careening directly into a local market packed with people. We ended up halting less than a meter from disaster. Getting out, our driver apologized to the stunned onlookers, and then got back on the road towards the mines, still shaking from this close encounter with death-by-mob.

Garimpeiros (independent prospectors) on the road to the ruby mines in the bush near Montepuez, Mozambique, December 2009. Photo: Richard Hughes/Lotus Gemology.

Arriving at the site, we were told that the unlicensed miners had been pushed out. The cooking utensils laying about suggested their exit had been both recent and hasty. What was most remarkable was what else they had left behind. Amidst the coal-black embers we discovered red fire everywhere. That was ruby and this was about to become the world's richest ruby mine.

Upon our arrival at the site, we found ruby everywhere on the ground and were able to collect a significant number of samples in just minutes (inset photo), more so than at any other ruby mine I had ever visited. Photo: Mark Smith; inset photo: Richard Hughes/ Lotus Gemology.

Upon our arrival back in Pemba that night, I put in a call to a friend in Hong Kong. When he picked up the phone, I told him I had just visited the world's richest ruby deposit and the owner was looking for an investor. He asked me where I was. Mozambique, I said. "That's Africa, isn't it?" Yes, I said. "I'm afraid to put money into a mine in Africa," he replied.

Red Gold from Mozambique
Rough to cut Top from left: 15.79, 19.77 and 22.30 ct rough. Middle: Preforms from the same rough (9.30 ct and right 14.29 ct). Bottom from left: Cut stones from the same rough (8.52, 8.41 and 13.22 ct, giving 54%, 43% and 60% yields respectively). These are extraordinarily high yields, attesting to the quality of the rough stone. Photos: Wimon Manorotkul/Lotus Gemology. Gems: Sukhadia Stones, Bangkok.

After my return to Bangkok, I called another friend, this one with experience mining gems in Africa. After listening to my tale, he took his geologist to Mozambique, surveyed the property and came to the same conclusion as me. But try as he might, he could not raise the financing.

Two up, two down. In their wake, Gemfields successfully negotiated a lease for a huge chunk of the deposit and are now into full production—and it's raining rubies.

Let me say this. Mozambique ruby is not just about Gemfields. While Gemfields has the largest concession, there are other companies with leases and hundreds, if not thousands of garimpeiros who are bringing the stone to market. When it comes to the Montepuez deposit, think big. It's like Mogok or Madagascar. Far too much for any single company. My guess is that Gemfields' production represents less than half of all the stones in the market, and it could be much less than that.

Mozambique ruby: Elvis is in the building

For much of human history, the only two major producers of ruby were Sri Lanka and Mogok (Burma). In the 19th century, the now-exhausted mines along the Thai/ Cambodian border also began production. Since then, East Africa and Madagascar have shown great promise, but deposits have either been quickly depleted (Winza, Vatomandry, Matombo), or have not produced enough facet quality (John Saul, Penny Lane). As for the various marble-based deposits formed from the India-Asia collision (Afghanistan, Tajikistan, Pakistan, Nepal, Vietnam & China), none have produced enough clean material over a significant period of time.

Lotus Gemology's Richard Hughes examining a lot of rough Mozambique ruby at Gemfields' December 2014 Singapore auction. Photo: E. Billie Hughes/Lotus Gemology.

The Mozambique deposit near Montepuez has now joined an elite club. In just six years, an unprecedented quantity of fine stones has entered the market in almost unheard-of sizes. Ten years ago if you asked me to source a ten-carat ruby, I might have come up with one or two decent stones. Might. Today I can find a dozen or more.

What this means for the market is incredible. It allows ruby to be used in previously unheard of ways. If I were a designer, I would be over-the-moon ecstatic.

Should I buy Mozambique ruby?
Let me state the following with the utmost clarity. My crystal ball broke just prior to publication. So you are on your own. But…

…if this deposit proves to be short-lived, in a couple decade's time we will all be looking back saying "I was there during the glory days. I was so there!"

…and if Mozambique continues to produce at the same rate it has since 2009, we will all be looking back and saying "Thank god(s) for Mozambique ruby."

Why? Many believe that if a gem becomes too plentiful, prices will drop. Tell that to those who waited for sapphire prices to drop when Kashmir sapphires first entered the market in the 1880's. Tell that to those who waited on Paraíba tourmaline during the 1980's.

I'll never forget a story a close friend once told me. He made a trip to Brazil in search of alexandrite, which at that time was pouring out of Hematita, in Minas Gerais. In the park at Teófilo Otoni, where many gem dealers and brokers held court, someone showed him a stone that blew his mind. He quickly phoned his wife and asked her to wire him $100,000. She said "Oh, you found the alex?" No, honey, I'm buying tourmaline. Her reply is unpublishable. But he convinced her and eventually ended up with an oil drum full of Paraíba rough. Just guess what that's worth now.

Weighing in at a massive 40.22 ct, the "Rhino ruby" was auctioned at Gemfields' December 2014 Singapore sale. It was the largest fine ruby mined by Gemfields to date. Photo: E. Billie Hughes/ Lotus Gemology.

Bangkok's Por Kuang Tang examines the Rhino ruby at Gemfields' December 2014 auction in Singapore. Photo: E. Billie Hughes/ Lotus Gemology.

Auction inaction
A number of dealers have told me that the major auction houses have resisted offering Mozambique rubies. Why? Because there is no history. They prefer to wait it out.

That's like waiting until Warhol to admit that Rembrandt knew his way around a paintbrush.

In any event, it has created opportunities for others, who are rushing to fill the void. Tiancheng International sold a matched pair of Mozambique ruby earrings featuring two 7 ct stones for US$1.7 million in December 2014.

Lotus Gemology's Gold Report featured prominently in the auction catalog for the sale of this matched pair of 7 ct Mozambique rubies by Tiencheng International. These sold for US $1.7 million in December 2014.

Pigeon-holing pigeon's blood (Burmese: kho thwe)

I have written a lot about pigeon's blood in the past (Hughes, 1990, 1996, 1997). It is one of those glorious concepts that conjures up spectacular visions and yet is impossible to pin down. How so? Let's take a quick look at the historical record.

The first recorded appearance of the term "pigeon's blood" ruby in the English language I have located is from the 1839 catalog of the Hope collection:

> *"A superlatively fine Oriental ruby, of an ovate octagonal form, very spread, and cut on the surface with step facets; it is of a pigeon blood-colour, and of the purest tint; free from any flaw or defect whatever; and though not of a perfect shape, it may, on account of its perfection in colour and transparency, be put among the "Pierres d'échantillon." It is set as a ring with small roses.*
>
> *— Bram Hertz, 1839, A Catalogue of the Collection of Pearls and Precious Stones formed by Henry Philip Hope, Esq.*

From this date on, references to "pigeon's blood" are frequent, and yet none of the sources describe what the actual color is. It is not until the 20th century that we find an actual definition of pigeon's blood red. And when we do find such references, guess what? They do not agree. Witness the following from two authorities writing in the 1930's:

> The most prized colour in a ruby is what is commonly termed pigeon's blood, a term of Chinese origin, the colour being likened to the two spots of blood which appear at the nostrils of a freshly killed pigeon. The descriptions of this colour as being that of fresh arterial blood, or of the centre red ray of the solar spectrum are not correct and therefore misleading; it may perhaps best be described as a deep bright carmine without the slightest trace of visible blue, and very closely resembles the colour of a good clear red currant jelly. It may be said at once that this colour is of the greatest rarity, and is only accurately known to a very few people; which accounts for the many people who regard themselves as being authoritative experts on rubies utterly failing to recognise it when they do see it. It is therefore most decidedly the work of a thoroughly experienced expert to decide what is really true pigeon's blood colour and what is not.
>
> Under the dichroscope, stones of this colour will show two distinct shades of red, that of the ordinary ray being the lightest. Blue or any trace of it will be entirely absent. It must, however, be noted that twin colours of red alone do not of necessity indicate that the colour of the stone is the true pigeon's blood, as other grades of colour will also produce the same effect; but if the faintest trace of blue is detectable it is at once decisive that the colour is not true pigeon's blood, however near to it the appearance may be.
>
> The term pigeon's blood is commonly stated to be of Burmese origin, but such is not the case as it has no significance to them, neither do they recognise or use it. It is of very great antiquity, and undoubtedly originated with the Chinese in the very early days when they owned the present Burmese ruby mining area.
>
> — J.F. Halford-Watkins, 1934, *The Book of Ruby & Sapphire*

Yet another experienced observer, J. Coggin Brown, had a very different take:

> …the clear, limpid, deep crimson red of the Mogok ruby is incomparable. The shade which is most admired is a transparent carmine-red with a suggestion of a bluish tinge which gives the famous 'pigeon's blood' stone. (The term is derived from the Hindustani, the Indian lapidaries comparing a faultless ruby with the blood-red colour of a living pigeon's eye.)
>
> — J. Coggin Brown, 1936, *India's Mineral Wealth*

Does the new Mozambique ruby have a pigeon's blood red color? Given the above, I think that's the wrong question. We should be asking if Mozambique ruby can resemble the best from Burma. In my opinion, that's a qualified yes.

The recently deceased trader, W.K. Ho, once told me that the best Burma ruby was one that looked like a Thai ruby and the best Thai ruby was one that looked Burmese. What he meant was that it was rare to find a Mogok stone that was pure red. Most tend towards purple. Similarly, it was hard to find a Thai ruby that looked Burmese, as they were missing the silk and strong red fluorescence of the Mogok stone.

Mozambique ruby has silk. It also has more iron than the Burma stone, which shifts the color away from purple

to more of a straight red. That iron does quench the fluorescence a bit, but there is not as much as we find in Thai/Cambodian rubies. So the Mozambique stone is somewhere in between a mixture of the best features of each, a Thai ruby that appears Burmese, a Burmese ruby that appears Thai.

One major difference between Burma and Mozambique is the strength of color. The color of Mogok stones tends to improve with size, whereas the Moz ruby's sweet spot is in the smaller end of the range, with stones of ten carats or more tending to go a bit dark. Of course Mogok rubies of large size are practically impossible to find as most are full of cracks.

In the end, when it comes to pigeon's blood, I like what the rebel Shan State Army's ruby broker told journalist Rod Nordland back in 1982:

> *We asked to see a stone the color of pigeon blood, the most valued of Burmese reds, the epitome of the great Mogok ruby. No one had one. "Asking to see the pigeon blood," said Khun Cha with a shrug, "is like asking to see the face of God."*
>
> *— Rod Nordland, 1982,*
> *On the Treacherous Trail to the Rare Ruby Red*

While color type terms can serve as a useful guide for newcomers, providing a crude map through the wilderness, experienced buyers understand that such terms are subjective. As they buy and sell more, they learn to trust their own judgment. This is normal. In any market, one will find a variety of participants. Some are new and still learning, while others have more experience and sophistication in their judgment. A colored gemstone's appearance is dependent on many factors, not just the color. The idea that one could craft a single "correct" definition for a subjective term such as pigeon's blood is not supported by the historical record, nor should it be, since what one person decides is beautiful is heavily influenced by that person's history and experience.

In my experience, the most important lesson here is thus: Beauty and attraction are personal choices absolutely apart from grading systems or definitions. Pardon me for saying so, but these emotions cannot be "pigeon-holed."

Honestly, I can cite numerous references, both old and new, in support of what my opinion is on the definition of pigeon's blood. But that would be silly, as so few of the historical definitions agree with one another. Which brings us back to what I believe is the best position for a buyer. Don't fear emotion. Buy what your own eyes find attractive. Buy with your head and your heart.

Red rain

It's common for people to speak about things they have never seen. No one can have personal experience about everything, because no one can possibly visit every place and even if they could, their experiences would only represent their impressions at the exact time and location of their visit. Similarly, no one can look at every stone or read every book.

Experience is not just a function of places or gems seen, but also the perspective derived from those experiences, filtered through a lifetime's previous experiences and perspectives. We are all a product of our past. The following is my opinion, based on my lifetime's experiences and perspectives.

Over the previous three and a half decades I have visited almost every single major ruby mine on the planet. This includes many visits to the classic deposits of Burma, Sri Lanka and Thailand/Cambodia, along with others in Africa and Madagascar.

My entire adult life I've been involved with ruby. And as I write these words, I've never seen as much fine ruby as is now available, thanks to Mozambique.

Hand on heart, I've probably done more research on the history of ruby than not just anyone alive, but anyone who has ever lived. Based on my study of the historical record, when it comes to production of large, fine gems, there has never been a find of ruby as significant as what was discovered in Mozambique in 2009. Right now, it's raining ruby.

> *'I stand outside, let the red rain splash me, let the rain fall on my skin. I'm bathing in red rain. Sell the gold, let the red rain splash you, let the rain fall on your skin…*
> *Come out with me, defenses down, with the trust of a child'*

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Scholarships

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 2022, the World Gem Foundation will award five scholarships allowing deserving students to take the World Gem Foundation theoretical 'Career Gemmology' course.

The deadline for submitting your application is December 31st, 2021. 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.

W.E. Hunn Memorial Gemmological Scholarship

Each recipient will also automatically receive a second scholarship (W.E. Hunn Memorial Gemmological Scholarship) that will provide funding of up to 50% of the cost of the practical workshops and final examinations.

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

Scholarship Application PDF

Grade School

In Part Four, we look at two final grading systems, Accredited Gem Appraisers and the International Diamond Council. How do they differ from the systems developed by GIA and AGS. Good question!

Speaking the Same Language - Diamonds (Part Four)

According to the Merriam-Webster dictionary, communication is defined as 'a process by which information is exchanged between individuals through a common system of symbols, signs, or behavior'.

As we have already seen in the previous three articles, commonality in terms of terminology or even the grading systems is often non-existent when it comes to the grading of coloured gemstones or diamonds. This makes communication almost impossible.

Having lived in Spain for the last seven and a half years, I have witnessed first hand how frustrating it can be when you do not understand what the other person is saying. Of course, this lack of understanding is largely due to a long list of excuses, on my part, as to why I am not more fluent but what about when we travel?

The recent experiences of my students here in Mallorca demonstrated how difficult it can be when you do not speak the same language. Yes we have technology that can help us but try having a conversation with a voice activated translation program. Firstly it requires the speaker to speak slowly and secondly, depending on how they enunciate the words, you often get nonsensical results. I tried using 'Speak and Translate' with a French speaking student and it was a disaster. How can the 'girdle' of a diamond be translated into the 'girlie' of a diamond? Well with 'Speak and Translate' anything is possible. It frightens me to think that at some point in the near future we will cease to use keypads and everything will be voice activated. We will not only lose our ability to type but also our understanding of grammar.

In this issue we are going to complete our look at the different diamond grading systems by exploring two more systems, one that was developed by the Accredited Gem Appraisers and the other by the International Diamond Council.

I used the AGA system for many years and I personally found it to be a very good way of classifying cut. It was especially helpful in defining the cut of fancy shapes. While times have changed and great strides have been made by GIA and AGSL in the realm of 'cut' grading, the AGA system still has some validity.

In researching this article, I reached out to David Atlas, one of the creators of this system and I was happy to see that he still believes there is value in the system. David wrote

'The AGA system still has value, but has been greatly overshadowed by the GIA and AGSL systems which tend to deal with round diamonds and overlook all or most of the fancy shapes. I suspect they are working on systems to cover fancy shapes in the coming years. I think the system still has value for appraisers and retailers because it helps to define the best ranges of most fancy shapes just as it clearly did for rounds'.

I agree.

The IDC system differs not just in terms of how they define cut but also in how they grade diamonds for clarity.

Will we have some degree of 'clarity' at the end of the article? I will let you be the judge.

Accredited Gem Appraisers

Colour

Like GIA, AGA grades diamonds from D to Z, with D exhibiting the least colour (colourless) and Z having a noticeable brownish or yellowish tint.

Clarity

Consistent with GIA, the AGA system uses the same grading classifications and terminology.

Cut Grade

The AGA system was a modified version of the original cut grade classification system established by the Gemological Institute of America (GIA). However, instead of using the original four cut classifications, they further divided each category into two sub-categories.

ROUND BRILLIANTS

	1A	1B	2A	2B
Table %	58% - 53%	60% - 52%	63% - 51.5%	64% - 51%
Crown Angle	34 - 34.7	33 - 35.1	35.8 - 32.1	36.4 - 31.6
Crown Height %	16.3% - 14.3%	16.8% - 13.5%	17.9% - 11.6%	18.1% - 11.1%
Pavilion Depth %	42.8% - 43.2%	43.5% - 42.5%	44% - 42%	44.9% - 41.5%
Girdle Thickness	Thin to Medium or Medium to Slightly Thick		Very Thin to Medium or Thin to Slightly Thick	
Total Depth %	62.3% - 58%		62.99% - 58.3%	
Polish/Symmetry	Excellent or Very Good		Excellent to Good	
	3A	**3B**	**4A**	**4B**
Table %	67% - 50.5%	70% - 50%	72% - 49%	>72% - <49%
Crown Angle	37.9 - 30.1	39.4 - 29.6	40.5 - 29	>40.5 - < 29
Crown Height %	19.3% - 9.6%	20.5% - 8.5%	21.8% - 7.8%	> 21.8% - < 7.8%
Pavilion Depth %	45.5% - 41.0%	46% - 40.5%	48% - 38%	> 48% - < 38%
Girdle Thickness	Very Thin to Slightly Thick		Very Thin to Medium or Thin to Slightly Thick	
Total Depth %	>62.99% or <58.3%		62.99% - 58.3%	
Polish/Symmetry	Good to Fair		Poor	

PEAR HEART OVAL MARQUISE

	1A	1B	2A	2B
Table %	60% - 55%	61.5% - 53%	62% - 52%	64% - 51%
Crown Height %	15% - 12%	16% - 11.5%	16.6% - 11%	17.5% - 10.1%
Girdle Thickness	Very Thin to Slightly Thick or Thin to Thick			Very Thin to Thick
Total Depth %	63% - 59%			65.4% - 58%
Common Length to Width Ratios	Pear 1.50 to 1.75: 1		Heart 0.98 to 1.02: 1	
Polish/Symmetry	Excellent or Good			
	3A	**3B**	**4A**	**4B**
Table %	67% - 51%	70% - 49%	72% - 48%	>72% - <48%
Crown Height %	18% - 9%	18.9 - 8.3%	19.5% - 7.8%	>19.5% - <7.8%
Girdle Thickness	Very Thin to Very Thick		Extremely Thin to Extremely Thick	
Total Depth %	68.5 - 56%	71 - 46%	73 - 43%	>73 - <43%
Common Length to Width Ratios	Marquise 1.75 to 2.25: 1		Oval 1.33 to 1.66 : 1	
Polish/Symmetry	Good to Fair		Fair to Poor	

PRINCESS CUTS

	1A	1B	2A	2B
Table %	68% - 62%	72% - 60%	74% - 59%	78% - 58%
Crown Height %	15% - 10%	16% - 8.5%	16.9% - 8%	18% - 6%
Girdle Thickness	Very Thin to Slightly Thick or Thin to Thick			Very Thin to Thick
Total Depth %	74% - 64%			80% - 58%
Common Length to Width Ratios	1 : 1 for Square stones or 1 : 1.50 to 1.75 for Rectangular shapes			
Polish/Symmetry	Excellent or Good			Good to Fair
	3A	**3B**	**4A**	**4B**
Table %	82% - 56%	85% - 53%	88% - 50%	>88% - <50%
Crown Height %	19% - 5%	19.9% - 4%	20.9% - 3%	>21% - <3%
Girdle Thickness	Very Thin to Very Thick		Extremely Thin to Extremely Thick	
Total Depth %	83% - 57%	84% - 56%	85% - 53%	>85% - <53%
Common Length to Width Ratios	1 : 1 for Square stones or 1 : 1.50 to 1.75 for Rectangular shapes			
Polish/Symmetry	Fair to Poor			

EMERALD & RADIANT CUTS

	1A	1B	2A	2B
Table %	65.5% - 60%	68% - 59%	69.5% - 58%	72% - 57%
Crown Height %	15% - 12%	16% - 11%	16.5% - 10%	17.2% - 9%
Girdle Thickness	Very Thin to Slightly Thick or Thin to Thick			Very Thin to Thick
Total Depth %	65% - 60%			69% - 58%
Common Length to Width Ratios	1 : 1 for Square stones or 1 : 1.50 to 1.75 for Rectangular shapes			
Polish/Symmetry	Excellent or Good			Good or Fair
	3A	**3B**	**4A**	**4B**
Table %	74% - 56%	76% - 53%	78% - 50%	>78% - <50%
Crown Height %	18% - 8%	19.5% - 7%	20.5% - 6%	>20.5% - <6%
Girdle Thickness	Very Thin to Very Thick		Extremely Thin to Extremely Thick	
Total Depth %	74% - 57%	78% - 56%	80% - 53%	>80% - <53%
Common Length to Width Ratios	1 : 1 for Square stones or 1 : 1.50 to 1.75 for Rectangular shapes			
Polish/Symmetry	Fair to Poor			

They also produced charts for fancy cuts including pear, heart, oval, marquise, princess, emerald and radiant cuts.

What made this system somewhat complicated was the 'Class Rules' for determining the overall cut grade. They were a necessary part of the system because not all diamonds fit into a particular grade classification but it was still confusing for some to use.

AGA Cut Class Rules For Determining 'Overall' Cut Grade

1A Grade: 1A characteristics are best but may include a single 1B characteristic.

1B Grade: All characteristics must be 1B or 1A to 2B. Only a single Class 2 characteristic is permitted. The Class 2 characteristic should be within 2% or 2 degrees of the 1B characteristic.

2A Grade: All characteristics must be 2A or 1A thru 2B. Only a single 2B parameter is permitted and it must be within 2% or 2 degrees of the 2A characteristic (crown angle degree for rounds only).

2B Grade: All characteristics must be 2B or 1A thru 3A. Only a single 3A characteristic is permitted and the 3A characteristic cannot be a very thick girdle or more than 1 degree too shallow a crown angle. The 3A characteristic must be within 2% or 1 degree of the 2B characteristic (crown angle degree for rounds only).

3A Grade: All characteristics must be 3A or 1A thru 4A. Any characteristics of 4A must be within 2% or 1 degree of the 3B characteristic. More than a single 4A characteristic and the stone cannot be graded 3A. An overall class 4 girdle thickness cannot be graded 3A overall. An overall girdle thickness is determined by the thickness that constitutes the major portion of the girdle (crown angle degree for rounds only).

3B Grade: All the characteristics must be 3B or 1A thru 4B. Any single characteristic of grade 4B must be within 2% or 1 degree of the 4A measurement. Only one Class 4 characteristic is permitted. Stones with Class 4 extremely thick or extremely thin overall girdles may not be graded 3B (crown angle degree for rounds only).

4A Grade: All characteristics must be 4A or 1A thru 4B. Only two 4B characteristics are permitted at most (crown angle degree for rounds only).

4B Grade: All characteristics must be 4B or may be any combination from 1A thru 4B. Stones with more than two 4B characteristics are automatically graded 4B.

NAJA/AGA Cut Class Grader

The 'Cut Class Grader' was a free online system created by David Atlas, assisted by James Jolliff and the late Joseph Tenhagen, along with several other diamond traders. Users input the following data into the program; shape, dimensions, table %, crown height %, girdle thickness (minimum and maximum), crown angle and pavilion depth % (for round brilliant cuts only), polish and symmetry and the program calculated the overall 'Cut Grade' based on the aforementioned determining rules.

Unfortunately the AGA/NAJA Cut Class Calculator is no longer available due 'to maturation of the trade's approach to defining the quality of diamond cut' (Atlas 2020). There were also apparently 'software issues' with the old programming that were no longer worth upgrading.

International Diamond Council

Colour

Like GIA, IDC grades diamonds from D to Z, with D exhibiting the least colour (colourless) and Z having a noticeable brownish or yellowish tint.

Clarity

While their clarity grades are similar to GIA, different terminology is used for some of the grades. Instead of Flawless (FL) and Internally Flawless (IF) categories, IDC use LC (Loupe-clean). The controversial 'SI-3' clarity grade is not used and instead of I-1, I-2 and I-3, IDC use P-1, P-2 and P-3.

The complete clarity grading system used by IDC includes:

LC (Loupe-clean)
VVS-1 (Very, Very Slightly Included 1)
VVS-2 (Very, Very Slightly Included 2)
VS-1 (Very Slightly Included 1)
VS-2 (Very Slightly Included 2)
SI-1 (Slightly Included 1)
SI-2 (Slightly Included 2)
P-1 (Piqué (or Included) 1)
P-2 (Piqué (or Included) 2)
P-3 (Piqué (or Included) 3)

Cut Grade

The International Diamond Council (IDC) cut-grade system is based on three grades; proportion, symmetry and polish, each classified into four categories; excellent, very good, good, and fair and is defined in their 'Rules for Grading Polished Diamonds' (6th Edition).

Parameters	Fair	Good	Very Good	Excellent	Very Good	Good	Fair
Crown Angle (β)	up to 25.9 °	26.0 - 27.9 °	28.0 - 31.9 °	32.0 - 36.0 °	36.1 - 37.7 °	37.8 - 40.0 °	40.1 ° and up
Pavilion Angle (α)	up to 38.4 °	38.5 - 39.5 °	39.6 - 40.5 °	40.6 - 41.8 °	41.9 - 42.1 °	42.2 - 43.1 °	43.2 ° and up
Table Width %	up to 49.0%	50.0 - 51.0%	52.0 - 53.0%	54.0 - 62.0%	63.0 - 66.0%	67.0 - 70.0%	71.0% and up
Crown Height %	up to 8.5%	9.0 - 10.5%	11.0 - 11.5%	12.0 - 16.0%	16.5 - 18.0%	18.5 - 19.5%	20.0% and up
Pavilion Depth %	up to 39.5%	40.0 - 41.0%	41.5 - 42.5%	43.0 - 44.5%	45.0%	45.5 - 46.5%	47.0% and up
Girdle %	up to 0.5%	1.0 - 1.5%	2.0%	2.5 - 4.0%	4.5 - 5.0%	5.5 - 7.5%	8.0% and up
Culet	-	-	-	0.0 - 0.9%	1.0 - 1.9%	2.0 - 3.9%	4.0% and up
Total Depth %	up to 52.9%	53.0 - 55.4%	55.5 - 58.4%	58.5 - 63.0%	63.1 - 64.4%	64.5 - 66.9%	67.0% and up
Sum of (α) **&** (β)	up to 67.9 °	68.0 - 69.9 °	70.0 - 72.4 °	72.5 - 77.0 °	77.1 - 79.4 °	79.5 - 80.0 °	80.1 ° and up
Half-Length Crown	up to 30.0%	35.0%	40%	45.0 - 55.0%	60%	65%	70.0% and up
Half-Length Pavilion	up to 60.0%	65.0 - 70.0%	75%	75.0 - 85.0%	85%	90%	95.0% and up
Fish Eye Effect	-	-	-	Excellent	-	Good	Fair
Culet Effect in Bezels	-	-	-	Excellent	-	-	Fair

The proportions are determinative for the brilliancy and the fire of the diamond, the symmetry describes the variation of the different parameters which defines the proportions and the polish describes the finish of the facets.

Rule 4.2.1 (Determination of Proportions)

For a diamond to show an optimal combination of brilliancy and fire, it has to be polished with due attention to the angles of inclination and proportional relations between the various parts of the diamond. If the angles and proportions are not optimal, this can lead to the appearance of one or more specific effects in the diamond, which are detrimental to its beauty. When grading the proportions of a polished diamond, the main issue is therefore to evaluate if, and if so to what extent, these effects occur.

The most important effects that can be perceived when observing the diamond perpendicular to the table are:

Fish Eye: The reflection of the girdle is partially or completely visible in the table (small pavilion angle and a large table width).

Culet visible in the bezels: The diamond shows an abnormal amount of scintillation, due to the culet and the surrounding facets being visible through the bezels (a large total depth and crown angle).

The list of effects above is not exhaustive; there are other proportions-related phenomena which are considered to be undesirable, for instance the diameter being too small in proportion to the total depth, making the diamond appear smaller than its actual weight.

Rule 4.2.2 (Basic Parameters of the Proportions)

The basic parameters that can characterize the proportions for the brilliant-shape are:

- the crown angle (β)
- the pavilion angle (α)
- the proportion of the table width to the diameter (% t)
- the proportion of the crown height to the diameter (% h_c)
- the proportion of the pavilion depth to the diameter (% h_p)
- the proportion of the girdle thickness to the diameter (% a)
- the culet size (% culet)
- the proportion of the total depth to the diameter (% t_d)
- the sum of the crown and pavilion angle
- the half length of the crown facets
- the half length of the pavilion facets
- the fish eye effect (visual grading)
- the effect culet visible in the bezels (visual grading)

Rule 4.2.3 (Grading of Proportions)

For the brilliant-shapes, next to the actual values an appreciation can be given. The categories are: Excellent, Very Good, Good and Fair.

The measurements of the different parts of the diamond can be a useful aid in determining the proportions grade, since there exists an obvious relation between this data and the appearance of the visual effects discussed in 4.2.1.

If the measurements of the diamond are situated in different categories, the lowest proportion grade is considered to be the overall reading.

In addition to the proportional measurements mentioned above, there are others, which can have a negative influence on the final grade if they are not within certain limits.

Rule 4.2.4 (Girdle Thickness)

The girdle thickness is described in the following terms: Extremely thin, Very thin, Thin, Medium, Thick, Very thick and Extremely thick. The nature of the girdle can be described in the following terms: Faceted, Polished or Bruted.

Description of Girdle	Measured Value	Proportion Grade
Extremely Thin	0.0% to 0.5%	Fair
Very Thin	1.0% to 1.5%	Good
Thin	2.0%	Very Good
	2.5%	Excellent
Medium	3.0% to 4.0%	
	4.5% to 5.0%	Very Good
Thick	5.5% to 6.0%	Good
Very Thick	6.5% to 7.0%	
Extremely Thick	8.0% and up	Fair

Rule 4.2.5 (Description of the Culet)

The culet is described in the following terms: Pointed, Large, Linear, Polished or Natural.

Description	Culet Size	Proportion Grade
Pointed	0.0% (< 0.033mm)	Excellent
	0.1% (0.033mm) to 1.9%	Excellent
	1.0% to 1.9%	Very Good
	2.0% to 3.9%	Good
Large	4.0% and higher	Fair

The culet is called 'pointed' when the culet diameter is <0.033 mm. When the culet is described as 'polished' or 'natural', an additional description of the culet size can be given, expressed by means of the terms 'small', 'medium', 'large' and/or by noting the proportional size of the culet as compared to the diameter of the diamond.

Symmetry

Symmetry Deviations	Excellent	Very Good	Good	Fair
Roundness	< 1.0%	<2.0%	<4.0%	4.0% +
Crown Height Variation	< 1.0%	< 2.0%	< 5.0%	5.0% +
Pavilion Depth Variation	< 2.0%	< 3.0%	< 6.0%	6.0% +
Table Out of Centre	< 1.0%	< 2.0%	< 5.0%	5.0% +
Culet Out of Centre	< 1.0%	< 2.0%	< 5.0%	5.0% +
Table and Culet Out of Centre	< 1.0%	< 2.0%	< 5.0%	5.0% +
Variations in Table Width	< 2.0%	< 4.0%	< 8.0%	8.0% +
Single Cut	< 0.5%	< 0.8%	< 2.0%	2.0% +
Variations on Bezel Angles	< 2.0%	< 4.0%	< 8.0%	8.0% +
Variations on Pavilion Angles	< 1.0%	<2.0%	<4.0%	4.0% +
Variations on the Upper Girdle Angles	< 2.0%	<4.0%	<8.0%	8.0% +
Variations on the Lower Girdle Angles	< 1.0%	<2.0%	<4.0%	4.0% +

Rule 4.3.1 (Determination of Symmetry)

The symmetry describes the variations of the different parameters, which define the proportions. The parameters that can characterize the symmetry of the brilliant-shapes are:

- Unroundness
- Variation on the crown height
- Variation on the pavilion depth
- Table out of centre
- Culet out of centre
- Table and culet out of centre
- Variation on the table width
- Variation on the girdle thickness (on max and min)
- Single cut
- Variation on the bezel angles
- Variation on the pavilion angles
- Variation on the angles of the upper girdle facets
- Variation on the angles of the lower girdle facets
- Deviations of the bezels (visual grading)
- Deviation of the pavilions (visual grading)
- Cone-shaped girdle (visual grading)
- Bow-tie effect (visual grading)
- Misalignment (visual grading)
- Girdle partly faceted (visual grading)

The most important effects that can be perceived when observing the diamond perpendicular to the table are:

Single Cut Effect: The diamond looks as if it has less facets than are really present. A single cut effect is caused by the angles of the bezels/pavilions and the halves of the bezels/ pavilion side.

Bow-Tie Effect: Through the crown side, two dark zones in the shape of a bow-tie can be seen.

The list of effects above is not exhaustive; there are other symmetry-related phenomena which are considered to be undesirable and which have an influence on the brilliancy of the diamond.

Rule 4.3.2 (Grading of Symmetry)

For all shapes of a diamond, an appreciation of the symmetry must be given. The categories are: Excellent, Very Good, Good and Fair.

The latest technology makes it possible to measure the deviations accurately. The variation on the measurements of the different parts of the stone can be a useful aid in determining the symmetry grade, since there exists an obvious relation between these variations and the appearance of the visual effects discussed in 4.3.1.

Some of the symmetry deviations have to be done by visual grading because these measurements are not accurate enough.

- Deviation of the bezels
- Deviation of the pavilions
- Cone-shaped girdle
- Bow-tie effect
- Misalignment
- Girdle partly faceted
- Variation on the girdle thickness (on max & min)
- Variation on the angles of the upper girdle facets

Polish

Polish	Observation with Loupe 10X
Excellent	Characteristics, not or very difficult to find with a loupe 10X
Very Good	Characteristics, difficult to find with a loupe 10X
Good	Characteristics, easy to find with a loupe 10X
Fair	Characteristics, very easy to find with a loupe 10X

Rule 4.4.1 (Determination of Polish)

Polish defines all external characteristics of a diamond. These characteristics are mostly the result of processing the diamond from rough to polished.

The following belong to the external characteristics:

- Scratches
- Percussion figure
- Beard
- Polishing lines
- Abraded facet edges
- Pit
- Nick
- Burn marks
- Laser marks
- Extra facets
- Naturals

Rule 4.4.2 (Grading of Polish)

External characteristics are graded as described in the following definitions, which are valid for use by an experienced grader.

Major external characteristics, visible from the crown side, may influence the clarity grading.

Interdependency

The proportion grade is based on the average of the measured values. If there is a large deviation on one or more values, the beauty of the diamond can be influenced. The table below shows the influence of symmetry and/or polish on the final proportion grade.

Proportions	Polish & Symmetry			
	Excellent	**Very Good**	**Good**	**Fair**
Excellent	Excellent	Excellent	Very Good	Good
Very Good	Very Good	Very Good	Very Good	Good
Good	Good	Good	Good	Good
Fair	Fair	Fair	Fair	Fair

Conclusion

Certainly the presence of different grading systems poses a huge problem for our industry. We are an industry that has been built on trust. Without an effective means of communication, the very core of our industry, credibility, is threatened.

Yes there is commonality in some instances but unfortunately, in my opinion, not enough. It is important to remember that the vast majority of 'end users' are not in the trade and have no knowledge of gemmology. They are consumers. This is a fact that seems lost on many. Why? It's a very good question that quite frankly, I cannot answer. It would be nice if everyone was rowing in the same direction but that is not the case.

As an industry, we should always look at the end user and work backwards. As a science, we cover everything from the creation of a gemstone deep within the earths surface to the ear, neck, wrist, belly-button or finger of a consumer. Without an end user, there would be no gem business. Think about it!

No consumer is ever going to understand why the highest colour in a diamond is either a 'D' or a '0' or why there are 23 colours (D to Z) in the GIA Colour System but only 21 AGSL numerical colour grades. Similarly, how can you compare a GIA Flawless to an AGSL '0' or rationalize the inclusion of SI-3 in the EGL Clarity System but not in any of the other systems. Why did IDC choose to replace two clarity grades (Flawless and Internationally Flawless) with one clarity grade (Loupe Clean)?

No consumer is going to equate value (used by the World of Color along with tone) to describe how light or dark a gemstone is. Value will always represent how much something is worth. At the same token, who is going to understand that color mask defines the tonal level of a coloured gemstone.

When you are forced to write about something, it forces you to deconstruct the subject and then reconstruct it. During this process, you often see how nonsensical certain things are and how much easier it would be for everyone if we just used a little common sense and thought about who ultimately will use it.

I recently purchased an IKEA T.V Console. I laid out all the pieces, ensured that everything was there and then studied the instruction manual. Instead of numbering or alphabetizing the various pieces, I was left scratching my head, wondering if the piece in my hand was the same as the sketch in the instruction manual. It took me two hours to construct something that should have taken me 30 minutes. I appreciate that the person who wrote the manual knew how to put it together but unfortunately, he did not come with the console.

If we want to be viewed as professionals, we need to start rethinking many of the things we do.

Commonality is not a bad thing. Trust me!


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NINA ZOLOTUKHINA explores Bulgaria geographically, geologically and gemmologically. There is more to Bulgaria than you might expect.....a lot more!

Minerals of Bulgaria

Calcite Rose & Galena from Bulgaria, Madan, Borieva Mine
(Photo by Nina Gold)

I would like to tell you about the country I have been living in for almost 7 years, Bulgaria, from a geographical, geological and gemological point of view.

First if all, I want to thank the Museum 'Earth and Man' in Sofia and especially Larisa Nesheva for the huge amount of information she kindly provided to me about the geological structure and mineralogical composition of Bulgaria, without which, this article would not have been possible.

Geographically, Bulgaria is located in the south – east region of Europe with the capital Sofia. On the eastern part it is surrounded by the Rhodope Mountains and on the west it is washed by the Black Sea.

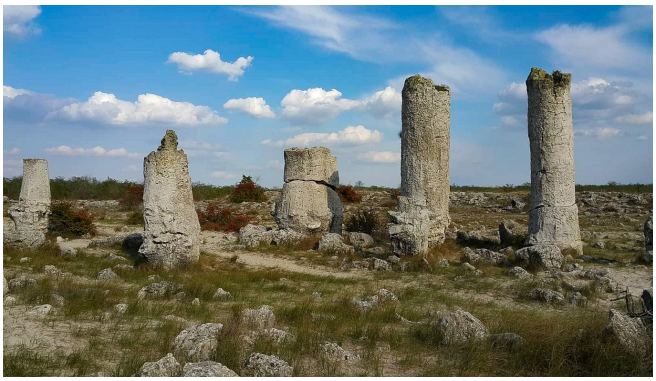
It borders Romania on the North, Serbia and Macedonia on the West and Greece and Turkey on the South.

Bulgaria is beautiful, one of the ancient countries of Europe full of mystics, legends and history! Its nature is very diverse, fascinating and, sometimes, really surprising! You just have a look at some of local famous geological formations, to understand just how beautiful and diverse it is!

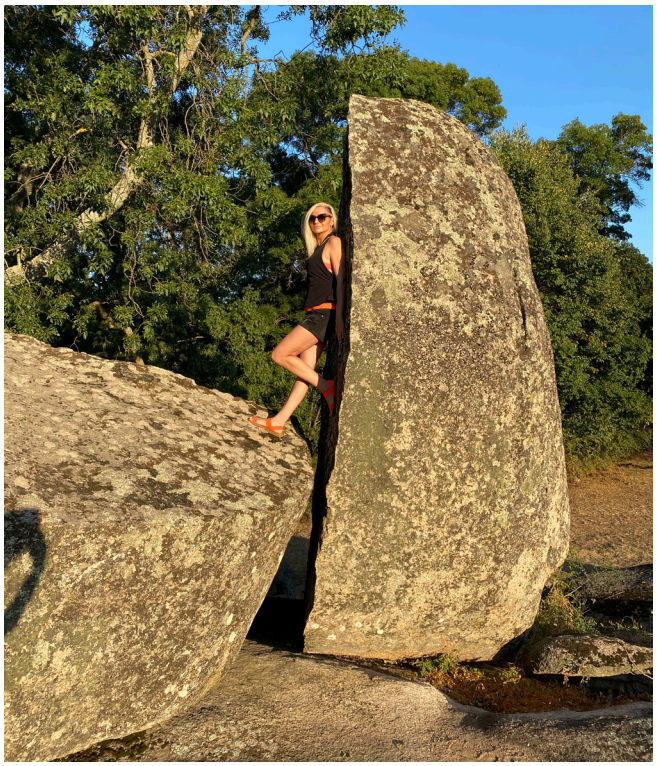
For example, the Stone Forest or 'Pobiti Kamani' (Stones beaten into the ground) – is a large area, that covers 13 sq. kms. Seven large and several separate small groups are located to the north and south of Beloslav Lake. Here the limestone pillars are as high as 10 m, hollow or solid cylinders, truncated cones and single rocks and cliffs.

The origin of these columns is unknown, but according to one of the versions, they are the remains of the ancient Lutheran Sea and were formed as a result of the deep-sea volcanic activity. More likely these columns were formed from the sand and protozoa sea creatures which surrounded the exit points of geysers. The 'Stone Forest' has been one of the first protected areas in Bulgaria since 1938 and is part of the ecological network Natura 2000.

Map of Bulgaria
(Picture courtesy of zlotabulgaria.com)

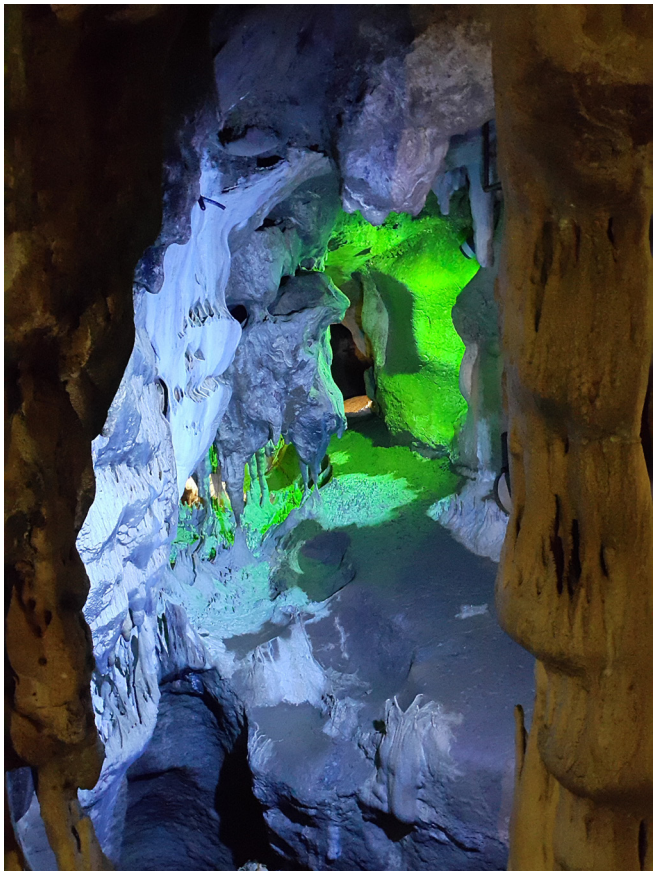


Stone Forest or 'Pobiti Kamani'
(Photo by Nina Gold)



'Beglik Tash'
(Photo with Nina Gold)

Beglik Tash is located in the south of Bulgaria, 55km from Burgas in the direction of Turkish border. Here you can find a natural rock-formation consisting of megaliths of hardened magma that erupted from a Mesozoic era volcano. The biggest megalith is 6m height and nearly 50m in diameter.



Bacho Kiro Cave (Photo with Nina Gold)

Bacho Kiro Cave
(Photo by Nina Gold)

As with all mystical places, the ancients could not pass it by and it was used as a Tracian sanctuary from the 14th to 4th centuries BC. When you see these giant megaliths expelled from the volcano, you can truly appreciate the magnitude and the unbelievable power of the ancient volcano that used to be in this area.

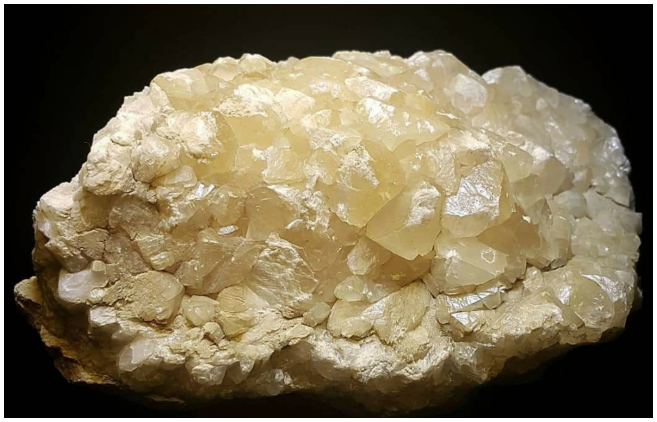
In the central part of Bulgaria there is the magnificent and absolutely stunning Bacho Kiro cave. It is situated 5 km west of the town of Dryanovo and consists of 3600m cave corridors and galleries full of fantastically formed stalactites and stalagmites. The remains of ancient people and animals found in the cave date back 43000 – 46000 years ago as well as ancient ornaments that currently represent the oldest ornaments known in Europe. The cave produces perfect acoustics and is sometimes used for the concerts.

"The Eyes of the Lord" cave (Courtesy of visitmybulgaria.com)

'Devetashka', 'Passable' and 'The Eyes of the Lord' caves are also located in central Bulgaria (Karlukova) and appear as karst caves. The latter is one of the best-known caves thanks in part to the eerily symmetrical holes in the cave's ceiling, which provide visitors with a rather striking subterranean image. These holes are located in the middle chamber of the 262m long cave, illuminating the interior and providing a uniquely framed view of the firmament above. Remarkable in size, similar in shape, and 'eyeish' in appearance, these holes are thought to be the result of natural erosive forces.

Wonderful Rocks
(Photo by Nina Gold)

Due to their unusual formation, location and magnificent sizes, these caves have become a place of habitat for more than 30,000 bats and some amphibians, snakes and birds that are included on the 'Red' list and are the part of the micro-world created in these caves.



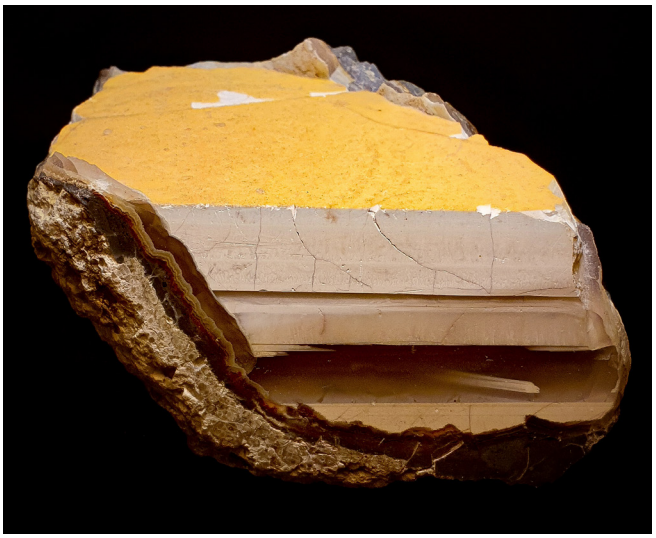
Calcite from Bulgaria, Lake Tsonevo
(Photo by Nina Gold)

Geological Map of Bulgaria
(Courtesy of Minerals and Mineral Deposits of Bulgaria)

Rhodochrosite from Bulgaria, Madan, 9th September Mine
(Photo / Specimen courtesy of Georgi Bozukov)

'Wonderful Rocks' – is another nature phenomena that is located 4 km tfrom the village 'Asparuchovo' on the banks of Lake Tsonevo. It is a complex of massif and steep cliffs with a height of 40-50 meters, covering 12,5 hectares.
The cliffs consist of limestone rock and were formed as a result of erosion caused by water, sun and wind, and look like a 'Fairytale' castle with a number of tall white towers. Along the entire length of the cliffs tunnels have been dug and have become a favorite place for tourists because of unusual and beautiful view and easy transport accessibility. Calcite carriers are also found in the area.

Geologically, Bulgaria covers a territory of 110,994 km^2 and is situated in the south-eastern part of the Balkan peninsula, which lies entirely within the Alpine folded belt. The territory of Bulgaria covers part of the Moesian platform (to the north) and almost the entire Rhodope massive (to the south), as well as the northern part of the Alpine folded belt known as Balkanides.



Opal with Agate and Siderite from Bulgaria Madan, Madzharovo
(Photo by Nina Gold)

Calcite with Galena from Bulgaria Madan, Krushev-Dol Mine (Photo by Nina Gold)

Amethyst with Quartz Rock Crystal from Bulgaria Madan, Chala (Photo / Specimen courtesy of Shuki Sirakov)

The major tectonic and metallogenic units important for different mineral deposits in Bulgaria are:

1. Moesian Platform
2. Balkanides
3. Srednogorie zone
4. Rhodope massif

The most important mineral deposits and unique mineral species and samples in Bulgaria, both economically and from a mineralogical point of view, are located in the Srednogorie zone and the Rhodope massif.

The Moesian Platform covers the northern part of Bulgaria and has a Precambrian and Paleozoic basement and Mezosoic cover of shallow marine sediments. The sedimentary deposits of gypsum (Koshava), fireclays (Pleven), kaolinite (Razgrad), salt (Provadia) and manganese (Obrochishte) are characteristic of the Moesian Platform.

The Balkanides are a segment of the northern branch of the Alpine folded belt in south-eastern Europe that includes: External, Intermediate and Internal Balkanides. The External Balkanides are located immediately to the south of the Moesian Platform and include the Balkan Mountains (Stara Planina Mountain).

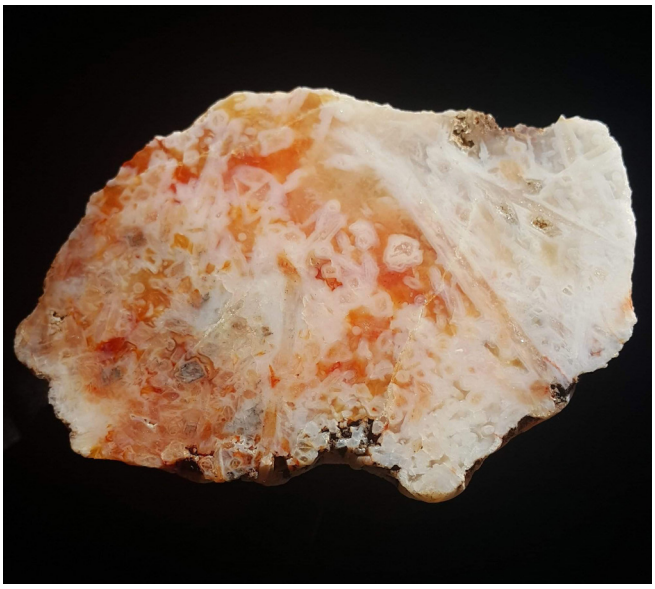
The Srednogorie Zone is a part of the Intermediate Balkanides and has been developed as Upper Cretaceous island arc system, strongly affected by subduction related magmatism. The porphyry-copper (Assarel, Medet, Tsar Assen, Elatsite) and epithermal gold–copper deposits (Chelopech, Krassen,Radka, Elshitsa) are the most important sources for Au, Ag, Se,Te,Ga, Ge, In and some rare minerals such as kostovite, germanite, roquesite, etc.

The Internal Balkanides with: a) Sakar – Strandga zone: composed of metamorphosed Triassic and Jurassic sediments; and b) Kraishte zone.

The Rhodope Massif is built up of regional metamorphic rocks, such as granitised gneisses, mica gneisses, amphibolites, schists and marbles, intruded by large bodies of post metamorphic granitoides, as a result of Upper Cretaceous to Tertiary extension.

Pink Calcite with Galena and Quartz from Bulgaria Madan, Krushev-Dol Mine (Photo by Nina Gold)

Galena from Bulgaria, Madan, 9th September mine (Photo / Specimen courtesy of Georgi Bozukov)



Agate from Bulgaria, Rhodope
(Photo by Nina Gold)

Fluorite from Bulgaria, Sandanski, Slavyanka Mine
(Photo by Nina Gold)

The most important types of ore deposits in Bulgaria are: Copper deposits (Porphyry-copper, Epithermal Cu-Au-sulphide deposits, Cu-vein type deposits, Scarn type deposits); Gold deposits (Mesothermal vein type and Epithermal (LS) and (HS) type); Lead-zinc-silver deposits (Mesothermal veins and replacement type); Iron and Manganese deposits; Pegmatite deposits.

The distribution of the main types of mineral deposits in the different tectonic and metallogenic units in Bulgaria is specific. Base-metal and gold deposits occur in the Balkan zone (External Balkanides). Copper, gold and iron deposits are characteristic of the Srednogorie zone, while the lead-zinc-silver deposits and fluorite deposits are the most typical for the Rhodope Massif. The pegmatite deposits are characteristic for the Srednogorie zone, the External Balkanides and the Rhodope massif. Salt, gypsum, manganese and fire clay deposits are important for the Moesian platform, while zeolite (clinoptilolite deposit Beli Plast) deposits occur in the Eastern Rhodopes.

The porphyry - copper deposits (Medet, Assarel, Tsar Assen and Elatsite) from the Srednogorie and Balkan zones of Bulgaria are connected to subvolcanic granodiorite and quartz-diorite porphyryte intrusions, while the volcanic hosted epithermal deposits Elshitsa, Radka, Krassen and Chelopech are related to andesite - dacite magmatic activity that took place about 65 - 94 million years ago.

The base-metal (Pb-Zn-Cu-Ag)and epithermal low and high sulphidation gold deposits in the eastern part of the Rhodope massif are results of the Late Paleogene collisional stage of the development of the tectono-magmatic and hydrothermal processes during the long lasting subduction processes of the African and the Eurasian tectonic microplates as a final stage of the Tethys closure. Madjarovo, Spahievo, Zvezdel and Lozen base-metal Au-Ag deposits were formed during Miocene hydrothermal activity in the eastern part of the Rhodope massif. The main ore veins and lenses of galena-sphalerite-chalcopyrite are hosted by Tertiary volcano - plutonic and terrigeneous sequences. The different geodynamic scenarios and the ore-remobilisation processes during the Phanerozoic metallogeny in Bulgaria led to significant, but also different behavior of the mineral assemblages, which are important Au-Ag-carriers and their isotope and fluid evolution.

The Pb-Zn(-Cu-Ag-Au) hydrothermal vein deposits in the Madan extensional core complex in the Bulgarian Rhodope Mountains are the most important source for Pb-Zn and Ag in Bulgaria. More than 30 Pb-Zn-Ag deposits represented by mesothermal veins and johannsenite - rhodonite scarn type ore bodies, are emplaced along six subparallel NW striking faults in the Madan ore field. The Pb-U age of the deposits is 30-40 million years. They consist of quartz, pyrite, galena, sphalerite, tennantite, Mn carbonates, barite that were deposited at the temperature range 350-105 ^{o}C as a result of fluid boiling, interaction and neutralization in marble horizons (G.Palas, Ribnitsa, Strashimir,Mogilata ,Osikovo, Krushev Dol mines, etc.).

Madan's minerals and deposits

The lead – zinc deposits of Madan ore field were operated by the Turks in the Middle Ages. Greek coins from Tassos island dating from 14th century AD, have been found in the ancient galleries, as well as the name of the 'Madan' field, which in Turkish means 'ore' originates from that time. During 1947-1995, the Madan ore field produced 94,887 tons of ore with significant quantities of Pb and Zn ore.

The Madan ore field is built up mainly of the highly crystalline rocks of the lower (Ar) and upper (Pt) metamorphic units which form the Madan dome structure. The lead – zinc deposits of the Madan ore field are represented by: 1. Ore veins of quartz – carbonate – sulphide composition, and 2.

Pyrite with Galena from Bulgaria Madan, Borieva Mine
(Photo / Specimen courtesy of Georgi Bozukov)

Galena from Bulgaria Madan, 9th September Mine
(Photo / Specimen courtesy of Georgi Bozukov)

Metasomatic scarn deposits of johannsenite – rhodonite, or quartz – sulphide composition.

The principal part of the lead – zinc ores in the ore field is concentrated in ore veins emplaced along five subparallel faults striking NW and cutting rhyolitic dykes and Oligocene conglomerates and breccias. The host rocks alternations are of quartz – sericite – chlorite type. The main minerals in the ore veins are: galena and sphalerite, which are almost accompanied by pyrite, chalcopyrite, arsenopyrite, alabandite, tetrahedrite, etc. Native silver and silver bearing minerals, Ag-sulphosalts, gold and electrum are also found. Among the vein minerals quartz, rhodochrosite, mangancalcite, and calcite are of widest occurrence. Scarn and massive sulphide metasomatic deposits in the Madan ore field are formed at the intersections between the marble beds and the ore veins.

The scarn deposits comprise radial aggregates of johannesite, bustamite and rhodonite. They are formed at the very beginning of the hydrothermal infiltration scarns.

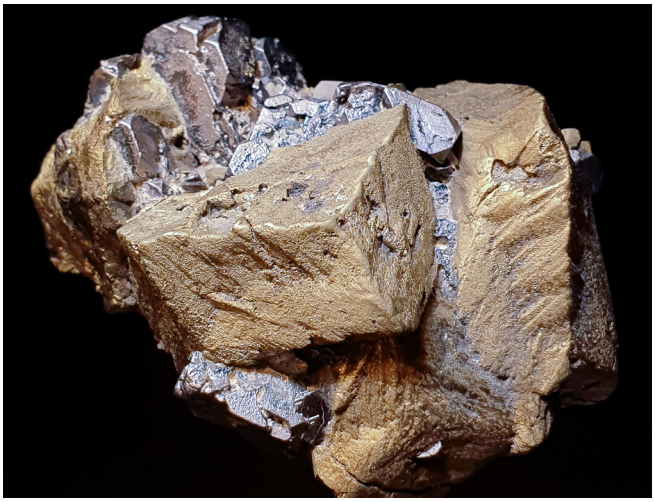
The studies of the filling temperatures of the fluid inclusions in quartz, sphalerite, carbonites and barite show that the scarns were formed at over 400 degrees C, the quartz – pyrite ore at 320 – 350 degrees C, the quartz – sphalerite – galena ore at 210 – 300 degrees C, carbonates at 90 – 180 ^{o} C and baryte at 50 ^{o} C.

As you can see now, Bulgaria is a very rich country for certain minerals, but there are some of them that can be called as ‘business card’ for Bulgaria, because they are quite widespread and provide various beautiful specimens in a big choice of forms and I do want to take a closer look and pay special attention to them.

We will start from pyrite, galena, sphalerite and chalcopyrite which are the most frequent minerals in the Cu-Au and Pb-Zn-Ag deposits in the Srednogorie and Madan areas of Bulgaria. All the four sulphide minerals display a great diversity of crystal habits due to the local variations of the crystallization environment in the different genetical type of mineral deposit.

Galena from Bulgaria Madan, Borieva Mine
(Photo / Specimen courtesy Georgi Bozukov)

Sphalerite from Bulgaria, Madan, 9th September Mine
(Photo by Nina Gold)



Chalcopyrite from Bulgaria Madan, 9th September Mine
(Photo by Nina Gold)

Orpheus Agate from Vishegrad
(Photo by Nina Gold)

Pyrite is the most widespread mineral in different ore deposits types in Bulgaria. The most common crystal forms and habits of pyrite are in the mineral deposits from the Srednogorie zone and the Rhodopes in Bulgaria. The temperatures of formation are 270-150 °C. In some cases (Lozen ore field, Eastern Rhodopes), the habit type is characteristic for the zones of the mineral deposits enriched in Au. This habit is regarded as more high temperature type. The diploidal habit of pyrite is rare, but can be found in the pyrite from the Madan ore field.

Galena is the most characteristic mineral in the Madan ore field. The most common crystal forms and habits of galena are found in the mineral deposits in the Rhodopes. You can find very interesting specimens showing incredible sizes, unbelievable forms and surfaces both mat and glossy showing sometimes unearthly figures that make them look more like 'Anobtanium' from Pandora in the 'Avatar' movie, than just usual looking ore.

One of the biggest galena crystals 20 cm tall was reported from Madan and still can be found there. The habit type of some Bi rich zones of mineral deposits can be totally different from the one that can be found in Ag rich zones. Epitaxy phenomena, etch figures and galena twins by spinel law are frequently observed.

The Sphalerite displays most of basic forms in the mineral deposits from the Rhodopes. Large green 7 cm crystals were reported last wears from Madan and still can be found in some mines. Colors of the mineral can vary from totally black to brown, greenish-brown, green and yellow. Sphalerite twins by spinel law are also frequently observed.

The Chalcopyrite displays most of basic forms in the mineral deposits from the Rhodopes. Chalcopyrite whiskers from Madan have also been reported. The great diversity of the mineral habits could be a result of specific local variations of crystallization environment as well as to the changes of the P/T conditions of mineral formations. A large amount of crystals are oxidized and show from rust brown to fancy blue-yellow-pink color, combination which is common for copper rich minerals.

Bulgarian Quartz also has specific characteristics. The most popular and easily recognized is Orpheus Agate, which can be called the national stone of Bulgaria. It is popular with its coloration in green – yellow – white, sometimes even red colors that are weaved into a lace pattern. It owes its color to the presence of following minerals: Celadonite, that gives green coloration, Goethite produces yellow colored zones and red color is connected with presence of Hematite. Its deposits can be found in the region of Vishegrad which is in 5km from Kardzhali city, but they are nearly exhausted and it mostly can be found now in the deeper layers of the ground. The story of the Orpheus stone is shrouded in mystery. According to legend, the mythical Thracian Orpheus wore a ring of this type of floral agate, which was his 'secret muse'. In the times before Christ, the priests of the sanctuaries Perperikon and Tatul used its properties. They reached for the semi-precious stone of prophecy and miracles. There are theories that Orpheus was aware of the magical and healing properties of all Rhodope minerals, including manganese calcite and rock crystal.

Amethyst with Quartz Rock Crystal from Bulgaria Madan, Chala
(Photo / Specimen courtesy of Shuki Sirakov)

Mangano Calcite from Bulgaria Madan, Zlatograd
(Photo / Specimen courtesy of Georgi Bozukov)

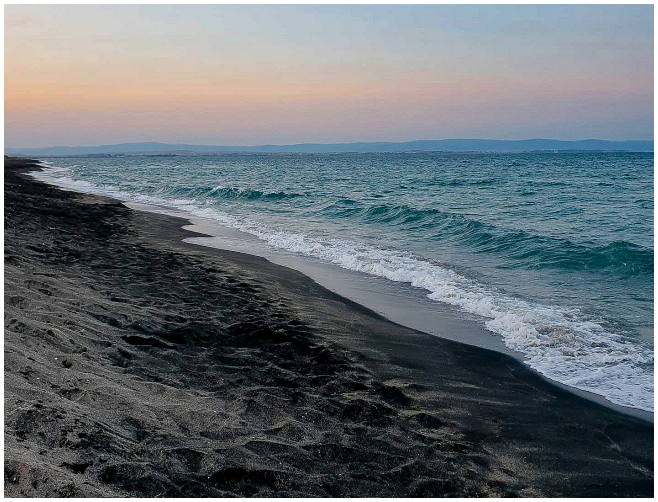
Another legendary Bulgarian quartz is amethyst, associated with pyrite, a unique and beautiful combination that is not commonly found. The amethyst crystals can vary in the color saturation from very pale violet to the very dark violet ones.

What also needs to be mentioned is white rock crystal with extra clarity and high luster, pale colored rose quartz, brownish – yellow to yellow quartz, which owes its color to Fe oxides and green quartz crystals, colored by presence of chlorite inclusions.

Besides quartz, I should mention Mangano calcite, which is so-called 'The stone of Morpheus' from Rhodopes. This stone can be found in various forms, sizes and saturation. It can be met both in the first and in the second, recrystallized, generations. The most beautiful specimens are found in Zlatograd and Borieva mine. Calcite from these areas shows a very intense rose coloration, strong fluorescence, very well-shaped crystals and can be found in big sizes.

Alternatively I would like to mention the seaside part of Bulgaria. On the west-north it is covered with white cliffs consisted of sedimentary rocks such as sandstone and limestone in Varna region.

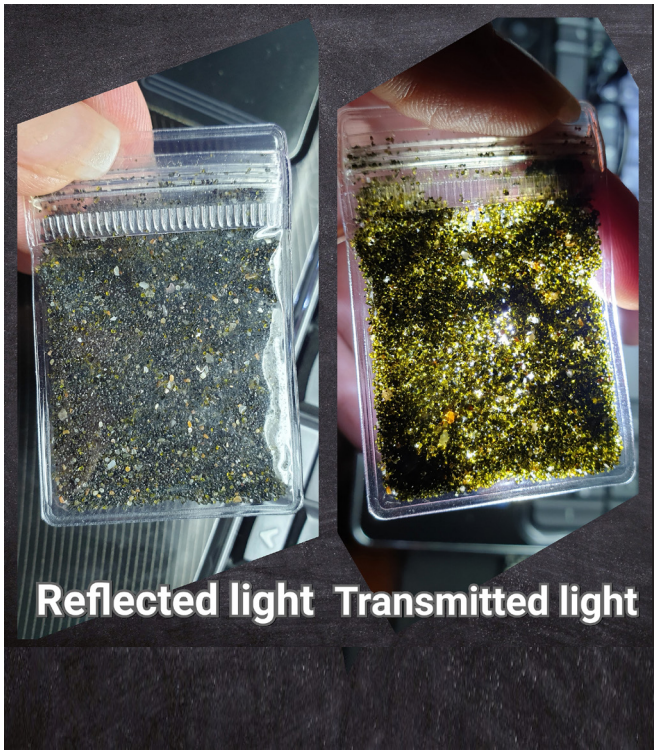
Bones of the ancient creatures
(Photo by Nina Gold)



Diopside beach
(Photo by Nina Gold)

Here you can find a variety of fossils such as: belemnites, ammonites, corals, balanocidaris of gibberula and spine of Pseudocidaris clunifera, gastropod Harpagodes, Aptian, Oligocene and Cretaceous echinoids, sea urchins and many others can also be found there. Besides, you can find here bones of the ancient creatures, pretty calcite druses and abstract paintings made by manganese oxides.

In the region of Burgas and Aytos circulated Upper Cretaceous volcanic rocks, such as dark gray-black colored alkaline basaltoids to alkaline andesites with porphyries of pyroxene (Diopside). Recently I made a small research in collaboration with Museum of the 'Earth and Man' in Sofia and found out that the black coloration in the sand in Burgas region was due to diopside. Diopside beaches look incredible and unique!



Tourmaline from Bulgaria
(Photo by Nina Gold)

They appear black, but in fact they have a dark green coloration. Due to magnetite inclusions, sand shows magnetism and is used for rehabilitation health treatments. To be honest, I have never heard of diopside beaches and had no information about anything similar elsewhere in the World.

Trachyte is also found in some parts of the region - with a lighter green color, light beige with plagioclase porphyries, feldspar, biotite. Later, Paleogene conglomerates, sandstones and clays are deposited on the lava rocks. Minerals in Burgas ore region are discovered in two copper deposits - 'Varli Bryag' - a copper deposit and 'Zidarovo' - 15 km south of Burgas and is a copper-gold polymetallic deposit.

Generally, 825 mineral species have been discovered and described in Bulgaria by 2021 year.

Eleven of them are new to the science minerals and they have been included by IMA to the IMA list of minerals were first discovered here:

1. Kostovite ($AuCuTe_4$) origin and year of discovery: Chelopech, G. Terziev, 1966

2. Strashimirite ($Cu_4(AsO_4)2(OH)2{\cdot}2.5H_2O$) origin and year of discovery: Zapachitsa, J. Mincheva - Stefanova, 1967

3. Hemusite ($Cu_1+ 4Cu_2+2SnMoS_8$) origin and year of discovery: Chelopech, G. Terziev, 1971

4. Balkanite ($Ag_5Cu_9HgS_8$) origin and year of discovery: Sedmochislenitsi, V. Atanasov, G. Kirov, 1973

Orpheus Agate cabochons
(Photo by Nina Gold)

5. Ardaite ($Pb_{17}Sb_{15}S_{35}C_{l9}$) origin and year of discovery: Madzharovo V. Breskovska, 1982

6. Vasilite ($((Pd,Cu)_{16}(S,Te)_7$) origin and year of discovery: Novoseltsi, A. Atanasov, 1990

7. Germanocolusite ($Cu_{13}VGe_3S_{16}$) origin and year of discovery: Chelopech, V. Kovachev et al., 1992

8. Stibiocolusite ($Cu_4(AsO_4)2(OH)2{\cdot}2.5H_2O$) origin and year of discovery: Chelopech, V. Kovachev et al., 1992

9. Manganilvaite ($CaFe_2+Fe_3+Mn_2+(Si_2O_7)O(OH)$) origin and year of discovery: Mogilata, Iv. Bonev, R. Vasileva, N. Zotov, N Kuzmanov, 2005

Tourmaline from Bulgaria (Photo by Nina Gold)

Fluorite and Apophyllite cabochons (Photo by Nina Gold)

Amethyst from Bulgaria, Madan, Madzharovo
(Photo / Specimen courtesy of Shuki Sirakov)

10. Dachiardite-K ($K_4(Si_20A_{l4})O_{48}\cdot 13H_2O$) origin and year of discovery: Austa, N. Chukanov, I. Pekov, St. Encheva, P. Petrov, 2015

11. Potassic-magnesio-arfvedsonite ($KNa_2(Mg_4Fe_3+)Si_8O_{22}(OH)2$) origin and year of discovery: Buhovo-Seslavski pluton, M. Dyulgerov and others, 2016

Gemmologically, at the same time, the Bulgarian region produces more decorative stones than precious stones that are good enough for faceting. Despite the fact that such mineral specimens such as rubies and spinel can be found in marble veins, garnets which are usually found in local rivers and tourmalines from quartz veins can be found, but they cannot be used for faceting purposes. The reasons are that rubies do not have enough transparency and are usually too small for the cutting, tourmalines and spinel are found in black colors or very dark hues and garnets are very small and cannot be facetted.

Quartz with Amethyst phantoms from Bulgaria Madan, Djurkovo mine, Lucky (Photo / Specimen courtesy of Shuki Sirakov)

The most suitable for faceting for now are amethysts and sphalerites. However, there are also some factors that hinder their usage in jewelry purposes. Amethysts from some regions can easily lose their coloration and need color treatment to be done. There are also stones with stable coloration, but bigger crystals predominantly show pale colors. Sphalerite due to its rarity in good quality and big sizes costs a lot in the rough.

Sadly, the gemstone market is not developed enough and locally cut stones are more of a rarity than common. This is largely due to the fact that there are very few professional cutters in the region. Sometimes people are forced to send the stones to Turkey for faceting, which can increase prices.

Conclusions

Although, Bulgaria is a very beautiful country that is rich in minerals, in my opinion, the potential of the country is not developed enough. Due to absence of strong government support there are no official programs aimed at the exploration of new minerals and new mineral deposits, no strategy for their processing and further usage in environmental purposes.

All ore mines that are working at the moment are the property of a few private Bulgarian companies, such as ‘Geotechmin’, ‘Asarel-Medet’, ‘Minstroy’ and ‘Euromangan’ that work exclusively for export. These companies are mining and producing concentrates of the following metals: lead, zinc and copper. The gold production is controlled by the Canadian company ‘Dandy’.

Students do not choose to pursue geological education because of the lack of career possibilities in the sector, the lack of scholarships and the extremely low salaries.

The jewelry sector is also not developed as well. The majority of jewelry is imported to the country. There is an absence of jewelry education and as a consequence, the overall quality of jewelry service is rather low.

Surely there are exceptions and there are some jewelry companies and jewelry artists who produce interesting pieces of jewelry that deserve attention, but they are few and far between. True jewelry masters share their skill within their family circle or with one apprentice. If they do not have this option – their mastery goes with them.

Quartz covered with Iron oxides from Bulgaria, Madan
(Photo / Specimen courtesy of Shuki Sirakov)

On a positive note, there are some Bulgarian mineral dealers who have started attending shows in Tucson and Munich. Perhaps now, Bulgaria will slowly enter the world arena and Bulgarian minerals will start to be better known worldwide.

Silver jewelry made by Bulgarian jeweler from Etar
(Photo by Nina Gold)

The Museum of 'Earth and Man' makes a great contribution in growing the 'stone culture' in Bulgaria, organizing temporary and permanent exhibitions, providing educational programs for young people, conducting researches and maintaining international relations and information sharing with colleagues by holding annual symposiums.

In conclusion I believe that Bulgaria has a very good mineral potential in environmental purpose, mineral wholesale, mineral exploration and science development, but needs support at the governmental level, industry development strategy, nurturing the domestic market and also support and development of the scientific sector.

Moreover, Bulgaria has big deposits of nickel, cobalt and lithium bearing minerals as well as rare-earth elements and can become one of only a few countries in Europe capable of producing accumulators of high capability which are in high demand on the world market.

In addition, Bulgaria has huge uranium deposits, more than 45 mines that are already known, which is the main component for the fuel needed to power nuclear stations, so lacking in Bulgaria and in such demand worldwide.

Bulgaria certainly has lots to offer and with its rich geological resources may very well surprise the world with new, unusual, and beautiful finds!

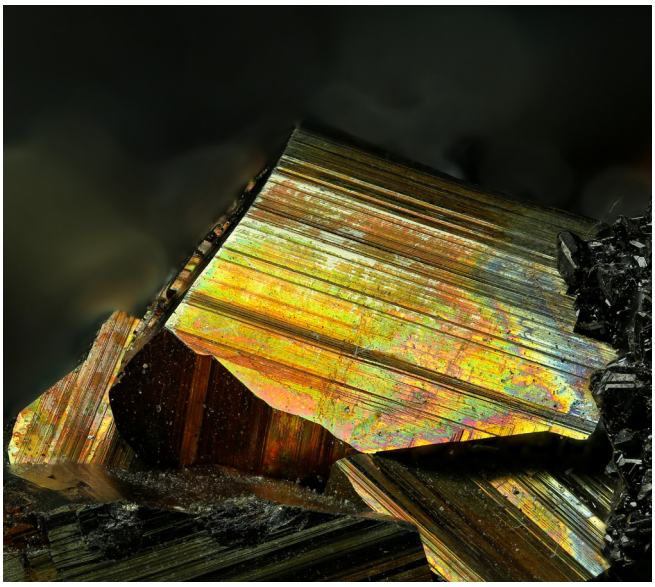
Special thanks to:

Bulgarian mineral dealers: Shuki Sirakov and Goergi Bozukov for the pictures of minerals they have provided.

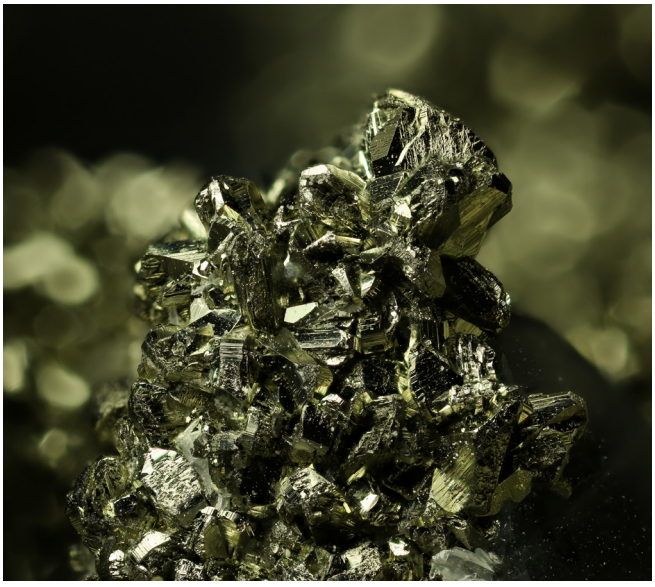
Quartz with Chlorite from Bulgaria
(Photo by Nina Gold)

Pyrite with Quartz from Bulgaria
(Photo by Nina Gold)

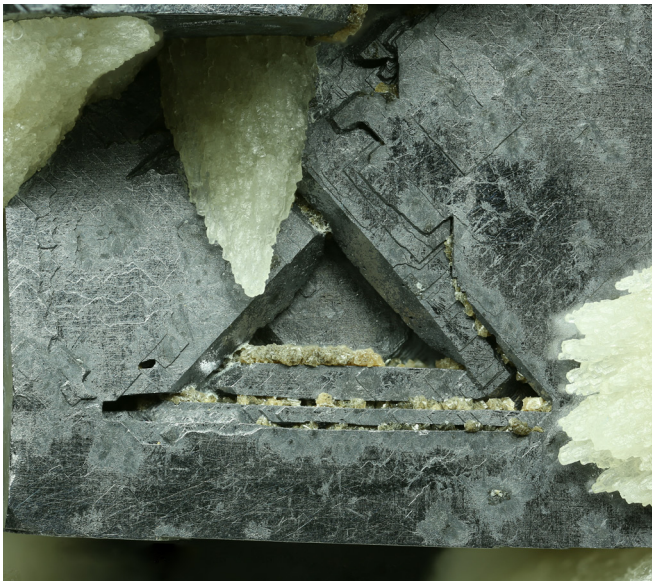
Amethyst with Pyrite from Bulgaria, Haskovo, Chala
(Photo by Nina Gold)



Iridescent Pyrite from Bulgaria
(Photo by Nina Gold)

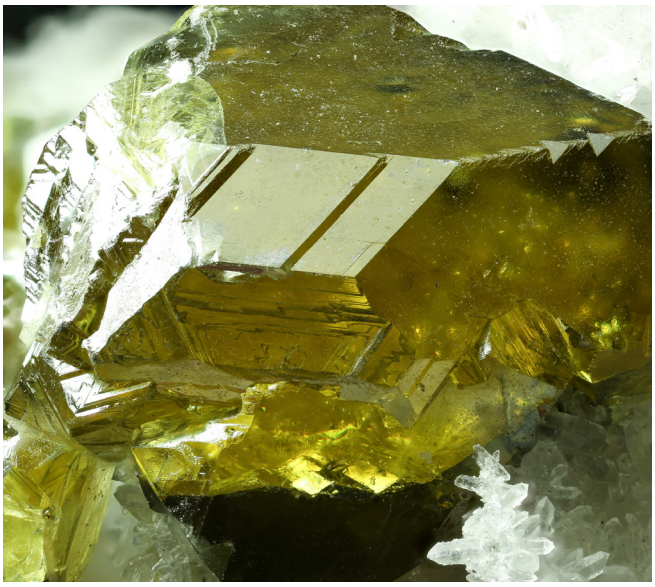


Pyrite from Bulgaria
(Photo by Nina Gold)

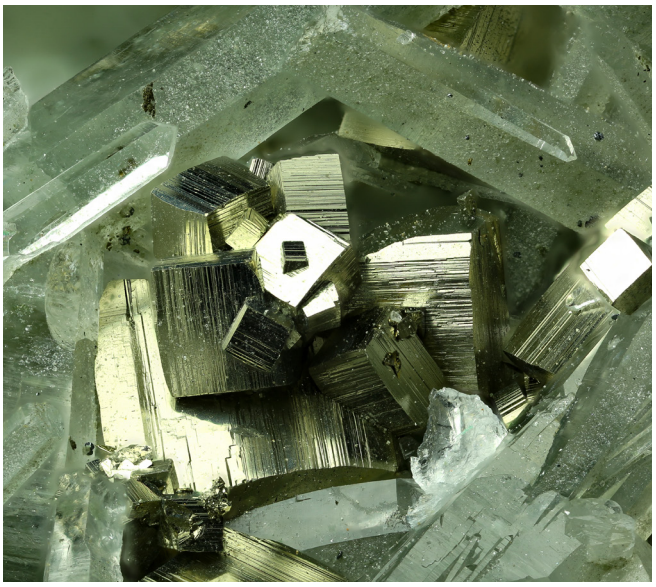


Galena with Calcite (Bulgaria, Madan, Gudurska Mine)
(Photo by Nina Gold)

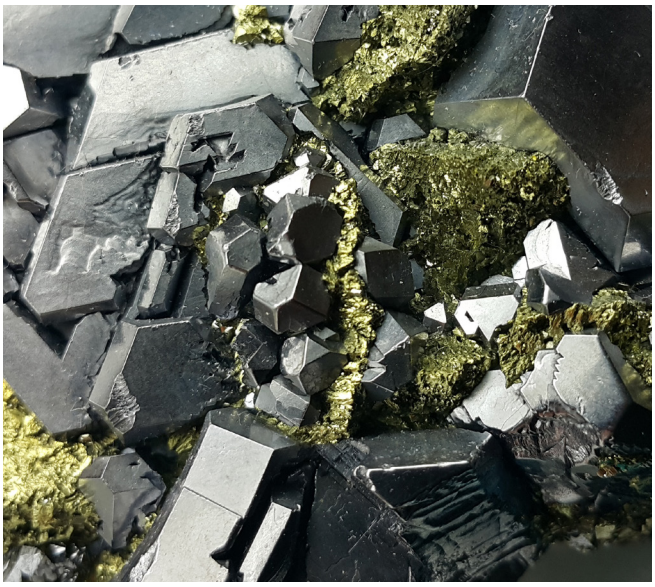
Second Generation Calcite from Bulgaria
(Photo by Nina Gold)



Sphalerite (Bulgaria, Madan, 9 September Mine)
(Photo by Nina Gold)

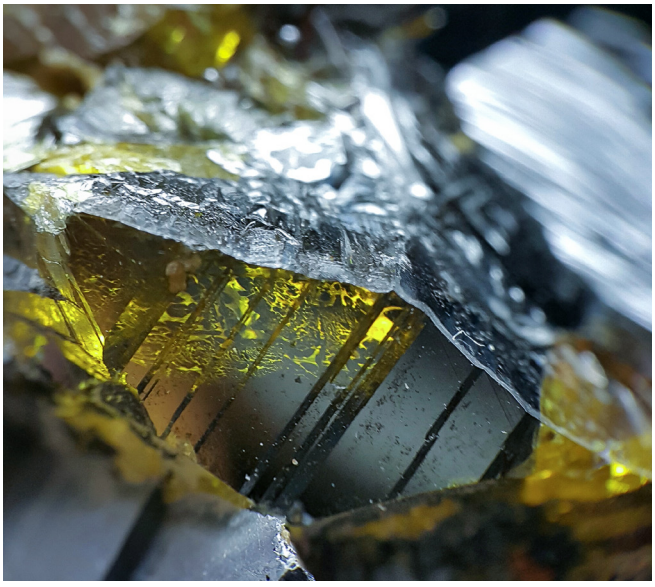


Quartz with Chlorite and Pyrite from Bulgaria
(Photo by Nina Gold)



Galena with Chalcopyrite (Bulgaria, Madan, Gudurska Mine)
(Photo by Nina Gold)

Calcite with Pyrite from Bulgaria
(Photo by Nina Gold)



Sphalerite crystal (Bulgaria, Madan, 9th September Mine)
(Photo by Nina Gold)

Gemmologically Interesting Minerals And Their Origins In Bulgaria

Name	Chemical Composition	Deposits
Actinolite	$Ca_2(Mg,Fe)_5Si_8O_{22}(OH)_2$	Southwest of the village of Avren, Krumovgrad region, Talkovo pole locality, Kamilski dol village (Ivaylovgrad region)
Adular	$K(AlSi_3O_8)$	Nova Mahala village (Parardzishko region)
Agate	SiO_2	Kardzhali, Haskovo, Madzharovo, Shumen, Pernik, Breznik, Vitosha, Vladaya village
Albite	$NaAlSi3O_8$	North of the village of Ardino, Sheitan Kyupryu locality, Dobromirtsi village, Krumovgrad region, Hlyabovo village (Topolovgrad region), Kanarata locality
Almandine	$Fe^{2+}{}_3Al_2(SiO_4)_3$	The region between the villages of Gorni and Dolni Okol, south of Topolovgrad along the Yavuzdere River, south of the village of Dervishka Mogila, Chepelare, south of the village of Ardino, south of the village of Kamilski Dol, southwest of the village of Avren, the region on the peak of Malak Musala in Rila
Amethyst	SiO_2	South of the village of Vladaya, above the village of Marchaevo, north of the village of Teshevo, the town of Madzharovo, the town of Malko Tarnovo, the Kardzhali region, the village of Ahryane, the village of Latinka, the village of Ardino, the village of Zvezdel, the region between the rivers Varbitsa and Krumovitsa river
Analcym	$Na(AlSi_2O_6)H_2O$	The town of Madjarovo, west of the village of Tursko Pole, the village of Gorni Glavanak, the village of Barantsi (Krumovgad region)
Andalusite	Al_2SiO_5	Ardino, Sheitan Kupru locality, Chepelare village, Zhitoshevsko dere, Oman village in Strandzha, Litakovo village (Botevgrad region)
Andradite	$Ca_3Fe_2Si_3O_{12}$	North and northeast of Chepelare, village of Kamilski dol (Ivaylovgrad region), town of Malko Tarnovo
Apatite	$Ca(F,Cl)Ca_4(PO4)_3$	Northeast of the town of Ihtiman, on the road to the village of Poibrene, Panagyurishte, Burgas, Sarneshko Kladenche locality, Atia quarry, Vitosha, Samokov region, Kalkovo village, Topolovgrad region, Hlyabovo village, Kanarata locality
Apophilitis	$(K,Na)Ca_4Si_8O_{20}F{\cdot}8H_2O$	Malko Tarnovo region, Propada locality, Vitosha village, Vladaya village, Baratsi village (Krumovgrad region)
Aquamarine	$BeAl_2(SiO_3)_6$	The region of Chepelare, Botushevo, the region of Vishteritsa, south of Velingrad, Srebriva Cheshma locality, the mouth of the river Vishteritsa, the region of Ardino, the village of Ahryane, the village of Latinka, the village of Vishnevo, Northwestern Rila, the region between Urdini lakes, The Seven Rila Lakes and Malyovitsa, Teshevo region, Gaitaninovo
Augelite	$(Ca,Na)(Mg,Fe,Al,Ti)(Si,Al)2O_6$	The area between Yambol and Burgas, the village of Kiten and the village of Lozenets
Aventurine	SiO_2	The village of Kremikovtsi
Azurite	$Cu_3(OH)_2(CO_3)_2$	Plakalnitsa, Lakatnik, Venetsa, Elshitsa, Burgas copper mines
Bronzite	$(Mg,Fe)_2(Si_2O_6)$	Rhodopes, southeast of the village. Brestovitsa, Sofia region, the village of Pasarel, the village of German
Brookite	TiO_2	Vitosha, the village of Kladnitsa, the village of Rudartsi
Carnelian	SiO_2	South of Kardzhali, Momchilgrad, Primorsko
Chalcedony	SiO_2	Kardzhali region
Chrysocolla	$(Cu,Al)_2H_2Si2O_5(OH)_4.n(H_2O)$	Ellatsite (Etropole region), Elshitsa (Panagyurishte region), Svetiiliyski hills (Novozagorsko region), Ustrem (Topolovgrad region)
Citrine	SiO_2	Madjarovo
Cordierite	$Mg_2Al_4Si_5O_{18}$	Ardino village, Sheitan Kyupru town
Diaspore	AlO(OH)	Haskovo region, Spahievo village

Name	Chemical Composition	Deposits
Emerald (Beryl)	$BeAl_2(SiO_3)_6$	Rila, Urdini Lakes locality, Central Rhodopes, northeast of the village of Yugovo
Epidote	$Ca_2(Fe,Al)_3(SiO_4)_3(OH)$	Nova mahala village (Peshtersko region), Kanata locality, Malko Tarnovo town, Kamilski dol village (Ivaylovgrad region)
Fluorite	CaF_2	Smolyan, Mihalkovo, the southern slopes of the Malashevska mountain, Slavyanka, Palace, Central Rhodopes, Yugovo, Sakar, Ustrem
Grossular Garnet	$Ca_3Al_2(SiO_4)_3$	The area of Zheleznitsa and the village of Yarlovo, Rila, Beliya Uluk locality, The Seven Rila Lakes
Heliodor	$Be_3Al_2(SiO_3)_6$	Vishteritsa locality, Ardinsko region, Vishnevo village
Hematite	Fe_2O_3	Kremikovtzi
Jasper	SiO_2	Kardzhali, Momchilgrad, Haskovo, Madzharovo
Kyanite	Al_2SiO_5	Chepelare, Gorkata Peak (Krichim region), Dervishka Mogila village, Sakar
Magnetite	Fe_3O_4	Martinovo village (Chiprovtsi region), Shipka Balkan, Shiroka Polyana locality, Krumovo village (Yambol region), Haskovo region
Malachite	$Cu_2(OH)_2CO_3$	Ellatsite, Kremikovtzi
Opal	$SiO_2.nH_2O$	Haskovo, Mineralni Bani, Tatarevo, Kardzhali, Bezvodno, Komuniga, Momchilgrad, north and northwest of Nanovitsa
Pink Quartz	SiO_2	Plana, village of Dolni Okol
Prehnite	$Ca_2Al_2Si_3O_{10}(OH)_2$	Above the village of Gorni Lozen
Pyrite	FeS_2	Shumen region, Markovo village, Kyulevcha village, Zli dol village (Svogen region), Bardo village (Vakarelsko region), Panagyurishte ore region, Burgas copper mines, Lakin ore region, Govedarnika locality, Madan region, Sharenka locality and Gradishte locality
Quartz (Rock Crystal)	SiO_2	Rhodopes, village of Ahryane, village of Gaitaninovo
Rhodochrosite	$MnCo_3$	Madan, Lucky, Osogovo, Obrochishte, Madjarovo, Kremikovtsi
Rhodonite	$(Mn,Fe,Mg,Ca)SiO_3$	Enyovche, Lucky, Central Rhodopes
Rodingite	$Ca_3Al_2[SiO_4]_3$	Golyamo Kamenyane village, Dobromirtsi village, Guvedjika locality
Ruby (Corundum)	Al_2O_3	Kardzhali, town of Djebel, locality of Mishevsko, village of Byal izvor, village of Padina
Rutile	TiO_2	Kazanlak, south of Pirdop, Haskovo region, south of the village of Krepost, east of Krumograd
Sarder	SiO_2	Momchilgrad, Krumovgrad
Smithsonite	$ZnCO_3$	Sedmochislenitsi, Western Stara Planina, Rhodopes, Ribnitsa, Madzharovo
Smoky Quartz	SiO_2	Gaitaninovo, Ardino, Ahryane, Latinka, Vitosha, the area between Marchaevo and Rudartsi, Plana
Sphalerite	ZnS	Lakin ore region, Madjarovo, Osogovo village, Madan region, Nedelin ore region
Spessartine Garnet	$Mn_3^{2+}Al_2(SiO_4)_3$	Strelcha village, Smilovene locality, Kardzhali region, Latinka village
Spinel	$MgAl_2O_4$	Pirin, Byala Reka locality
Staurolite	$(Fe,Mg)_2(Al,Fe)_9Si_4O_{20}(O,OH)_2$	Sakar, south of Topolovgrad, the village of Dervishka Mogila
Thomsonite	$NaCaAlF_6 \cdot H_2O$	Burgas, Poda, Pavliken, Butovo village
Titanite	Fe_3O_4	Vitosha, village of Hlyabovo (Topolovgrad region)

Name	Chemical Composition	Deposits
Tourmaline	$(Na, Ca)(Li,Mg,Fe,Al)_9B_3Si_6(O,OH)_{31}$	Vitosha, Lipata quarry, Byalata Kuria locality, Samokov region, Markova trapeza locality, Planski pluton, Ihtiman region, south of Pirdop, Sarnena Sredna gora, south of the village of Turia (Kazanlak region), north of the village of Malko Dryanovo (Chirpan region), Burgas region , Atia, Sakar mountain, Central Rhodopes, south of Asenovgrad, near Lukovitsa and Chaya rivers, Zabardo village (Smolyan region), Byala Cherkva village (Plovdiv region), Persenk mine, Mihalkovo village, Eastern Rhodopes, m. Satan Kyupru (Ardinsko)
Thulite	$(Ca,Mn)_2Al_3(SiO_4)(Si_2O_7)O(OH)$	Rila, m. Petlite
Turquoise	$CuAl_6(PO_4)_4OH_{8\cdot5}H_2O$	Spahievsko ore field (Haskovo region)
Vesuvianite	$Ca_{10}(Mg, Fe)_2Al_4(SiO_4)_5(Si_2O_7)_2(OH,F)_4$	Rila, White Gutter, east of the Rila Monastery, below Petlite Peak, the area of Urdini Lakes, the area of the Seven Rila Lakes, Mermero, the road to Popova Shipka, Karagyol, Rhodopes, Western Rhodope Batolit

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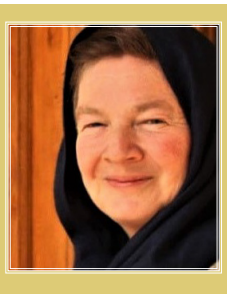
'*Minerals and mineral deposits of Bulgaria*' by Kamen Bogdanov - Associate Professor of Mineralogy SOFIA UNIVERSITY "St. Kl. Ohridski" Faculty of Geology and Geography and Ivan Pojarevski - G.D.Gem President of BULGARIA GEMS Ltd

Touching History

On 26 January, 1905 during his routine inspection Frederick Wells made an unexpected discovery. So did Wilma van der Giessen!



Gemmology & Serendipity

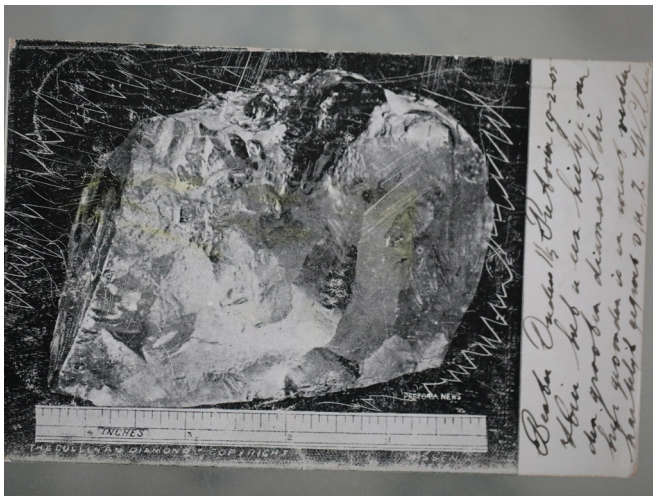
February 20th, 1905 - Post-marked 26 days after it was discovered
(Photo by Wilma van der Giessen)

March 12th, 1905
(Photo by Wilma van der Giessen)

While I was wandering around a gemstone fair in Amsterdam on a wintry Sunday morning, a shoebox with old postcards and stamps with gemstones and minerals on them caught my eye. As a modest collector of such cards and stamps, I began to browse. I could not believe my eyes when I saw the photograph of the famous Cullinan rough diamond on one of the cards. The black and white photo also showed an inch ruler to confirm the size of this huge stone, the largest rough diamond ever discovered at 3,106.75 carats.

The photo was clearly published by a newspaper because under the photo is written Pretoria News and below the inch ruler THE CULLINAN DIAMOND COPYRIGHT.

I realized that I had a historical treasure in my hands. The postcard is over a hundred years old, which means that it has survived two world wars, 1914-1918 & 1940-1945.



Cullinan Postcard with inch ruler
(Photo by Wilma van der Giessen)

Addressed to Mr W.H.E. Kreuger
(Photo by Wilma van der Giessen)

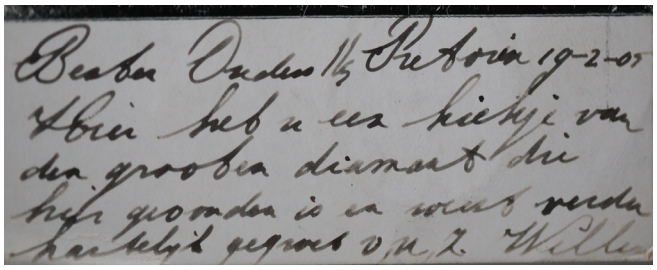


Photo by Wilma van der Giessen

The postcard was written on 19 February 1905 at 11 am and sent to Amsterdam on 20 February 1905 - 25 days after the find on 26 January 1905 in the Premier Mine in South Africa.

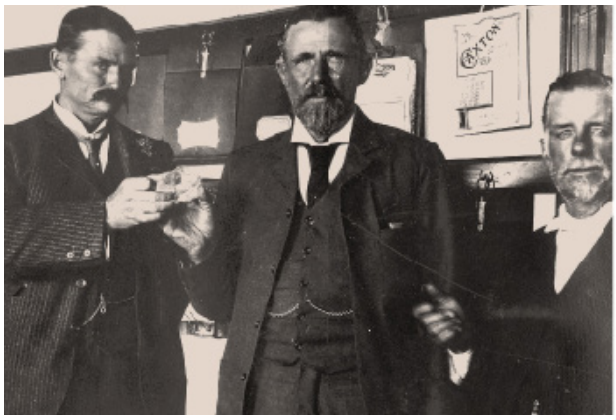
The stamp on the postage stamp depicting King Edward VII proves that the postcard reached Amsterdam on March 12, 1905.

On the front of the postcard next to the photo you can read in Dutch:

"Dear Parents, here is a snapshot of the large diamond that was found here, and further greetings from your son Willem".

The card was sent to Mr W.H.E. Kreuger, Ter Haarstraat 18 in Amsterdam. It is unknown if Willem or his family were diamond professionals.

What happened to this magnificent diamond? Quite a lot!



Sir Thomas Cullinan (Cape Town Diamond Museum)

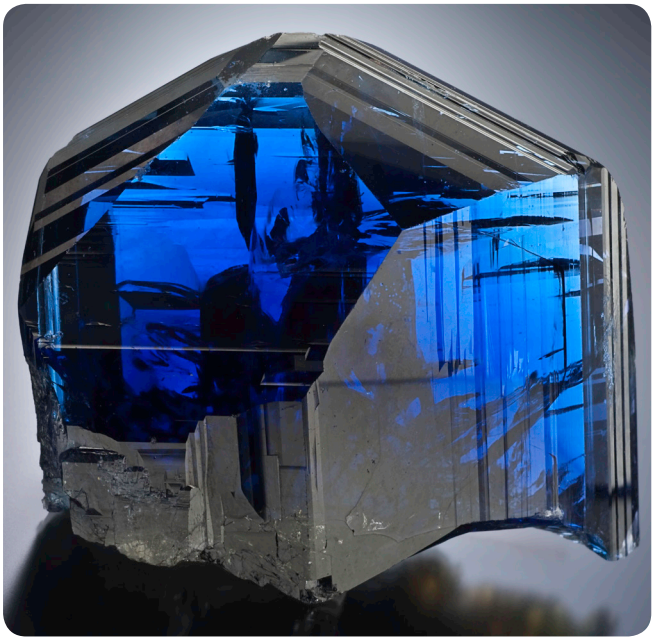
The Premier Mine
(Cape Town Diamond Museum)

S/N	Name	Carat Weight	Shape/Cut	Present Mountings of the diamond
1	Cullinan I	530.20	Pear	Head of the Royal Scepter.
2	Cullinan II	317.40	Cushion	Brow or band of the Imperial State Crown.
3	Cullinan III	94.40	Pear	Finial of Queen Mary's Coronation Crown. Later combined with IV as a pendant brooch
4	Cullinan IV	63.60	Cushion	Originally set in the band of Queen Mary's Coronation Crown. Later combined with III as a pendant brooch
5	Cullinan V	18.80	Pear	Originally mounted in a brooch for Queen Mary, used singly or mounted as the centerpiece of the Delhi Durbar Stomacher. Later mounted on the circlet of her crown as replacement for the Koh-i-Noor.
6	Cullinan VI	11.50	Marquise	Originally mounted in the front cross-patee of Queen Alexandra's regal circlet. Later combined with the Cullinan VIII brooch by Queen Mary to form the Cullinan VI & VIII brooch. Sometimes the Cullinan VI & VIII brooch was linked to the Cullinan V brooch.
7	Cullinan VII	8.80	Marquise	Set as a negligee pendant to the Delhi Durbar emerald and diamond necklace. The shorter pendant incorporated Cullinan VII and the longer pendant a large pear-shaped emerald. Occasionally used as a pendant to the Cullinan VIII brooch, as an alternative to Cullinan VI
8	Cullinan VIII	6.80	Cushion	Mounted as the centerpiece of a radiating platinum mount, with smaller diamonds to form the Cullinan VIII brooch. Later combined with Cullinan VI to form the Cullinan VI & VIII brooch. Sometimes dismantled from the brooch and mounted as part of the Delhi Durbar Stomacher
9	Cullinan IX	4.39	Pear	Mounted in a platinum ring for Queen Mary and later inherited by Queen Elizabeth II. Worn only on a few occasions by both queens.

SPICE of Life

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.

Blue Heaven - Tanzanite



Tanzanite Crystal
(Photo Jeff Scovil)

Tanzanite is the exciting gemstone discovery of the 20th century and the most recent addition (2002) to the birthstones for December (along with zircon, turquoise and blue topaz). It is also the gemstone for the 24th wedding anniversary and one thousand times rarer than diamond!

Tanzanite is the trade name for the rare blue violet colour variety of the mineral species zoisite.

Etymology

According to the Maasai tribe (Masai) legend, shepherds witnessed a bolt of lightning in the Merelani Hills, in the Manyara Region. When the smoke cleared, the heat transformed crystals in the ground of the northern Tanzanian region into shimmering blue/violet stones!

The discovery of transparent crystals of blue zoisite in 1967 stimulated interest in this gem. Soon after discovery, laboratory experiments determined that heating could improve the colour of some naturally blue stones (like blue sapphire). They also found that heating could influence positively naturally brown or green zoisite and transform them into marvelous blue zoisite.

Tiffany & Company recognized the potential of this blue-violet wonder of nature and became its main distributor. They started to use the name of the locality of the deposit in the north of Tanzania as its trade name. Besides the fact that the name tanzanite honours its country of origin and the people living in that area, it was and still is a far more communicative and marketable term than zoisite.

Geology

This northern region of Tanzania belongs to the Mozambique Orogenic Belt that formed between one billion and 500 million years ago and consists of highly metamorphosed, mid-crustal gneisses deformed by eastward-dipping thrusts very similar to the thrusts on the southern side of the Himalayas. The deposits run at an angle of 41 degrees to the surface where the deposit line or horizon periodically folds over itself, creating pockets of tanzanite through the incorporation of vanadium.

The mineral zoisite naturally occurs in a range of colours including colourless, gray, yellow, brown, pink, green, blue, and violet.

Localities

Tanzanite of gem quality is only found in the Merelani Hills, in the Manyara Region of Northern Tanzania and near the base of Mount Kilimanjaro and the city of Arusha.
The mining area is extremely small, approximately two kilometres wide by four kilometres in length. The Tanzanian Government divided the area into 4 mining blocks, A, B, C and D. Today, Block A is licensed and operated by Kilimanjaro Mines Ltd., Blocks B and D are allocated to small-scale miners and Block C is operated by the TanzaniteOne Group.

Tanzanite StarBrite ™ 10.22 carats cut by John Dyer (Photo by Lydia Dyer)

Tanzanite Regal Radiant ™ 21.45 carats cut by John Dyer (Photo by Lydia Dyer)

Tanzanite Regal Radiant ™ 2.36cts cut by John Dyer (Photo by David Dyer)

Tanzanite Regal Radiant ™ 1.20cts cut by John Dyer (Photo by David Dyer)

Physical and Optical Properties

Tanzanite is a calcium aluminium silicate and has a chemical composition of $Ca_2Al_2(SiO_4)_3(OH)$ with the addition of vanadium. The crystal structure is orthorhombic.

It is biaxial positive with an R.I. of 1.691-1.700, a specific gravity of 3.35 and a hardness of 6.5 to 7 on the Mohs scale.

While tanzanite can be confused with sapphire and iolite, there are substantial differences between their R.I.'s and S.G's and their magnetic responses (with tanzanite being diamagnetic, sapphire moderately magnetic and iolite strongly magnetic).

When viewed under a Hanneman Tanzanite filter, tanzanite will exhibit a pinkish-orange colour along with its correct dichroic colours. Natural purple sapphire will appear bright red under the Chelsea filter.

Colour

Tanzanite derives its colour from the addition of vanadium during its formation and when heat treated, its resulting blue/ violet colour is the 'trigger' that makes this gemstone a 'marketing' sensation.

CIBJO defines tanzanite as a blue to violet material while the other transparent gem quality zoisites are defined as tanzanite together with their colour prefix, for example green tanzanite.

Specific colour grading rules are available for tanzanite. The most common and desired colours for tanzanite are violetish-blue and bluish-violet.

Pleochroism

Pleochroism is the name for the physical property whereby a mineral exhibits different colours when viewed from different directions. This is best observed using a dichroscope.

Untreated tanzanite is 'trichroic', meaning that it displays three colours, two at a time through the dichroscope). These can include purple, blue, green, brown, or yellow.

Absorption Spectra

Deep coloured tanzanite will show a moderately strong broad absorption band in the orange at 595 nm and weaker bands centred at 528 nm and 455 nm in blue. In comparison, blue sapphire can show a band at 450 nm which might be confusing, however in heat treated tanzanite, this band is barely visible.

Inclusions

Tanzanite is classified as a 'Type 1' gemstone meaning that generally they are found with no eye visible inclusions. Lower commercial grade qualities may have fractures that are visible to the eye. Stones that contain parallel fibres or channels are often cut en-cabochon producing chatoyancy (cat's eye effect).

Cutting

As an extension to the Mining Act, the Tanzanian Government passed a law banning the export of rough tanzanite over one gram. The reasoning for this was to increase investment at home in cutting and polishing and bring back more revenue to Tanzania. Prior to the law being passed, most of the rough tanzanite was exported to countries such as India, where the processing was done. These processing countries earned most of the revenue from the sale of tanzanite, whilst Tanzania earned only a small percentage. The legislative changes were designed to encourage the growth of processing facilities in East Africa and give a boost to miners. Mining provides direct employment for around 14,000 workers in Tanzania at present.

All kinds of facet-based cutting styles or shapes are used including the cabochon cut for stones that are less transparent. The world's largest tanzanite weights 16,839 carats.

One property that makes tanzanite challenging for gem cutters is its perfect prismatic cleavage.

Fluorescence

Tanzanite does not exhibit any characteristic fluorescence under UV light or X-Rays.

Treatments and Enhancements

Tanzanite is routinely heat treated to transform it into the exquisite blue to violet blue colour which is typically seen in the trade. When heated to 410 degrees Celsius the blue colour becomes more saturated. At 500 degrees Celsius, the brownish-yellow colour component can disappear. The resulting colour is permanent.

Spectroscopic analysis of heat-treated stones show that during this process the absorption band associated with the brown colour component is removed while the bands commonly assigned to V^{3+} are largely unchanged. Research conducted by Dr. Karl Schmetzer further concluded that the missing absorption band could not be restored after exposing the treated stones to radiation. This supported the theory that the colour transformation did not involve

an ordinary colour centre as commonly observed in numerous other minerals (i.e. certain quartz and yellow beryl). Although this change of colour is not completely understood, a combination of absorption spectroscopy and EPR examination shows the presence of both V^{3+} and V^{4+} in untreated stones whereas only V^{3+} is present after they have been heated. While another trace element may be involved, there does appear to be some connection between the removal of the yellowish-brown colour component and V^{4+}.

Tanzanite can also be oiled (Lotus Gemology) and in some cases, low quality material is coated with a 'cobalt coating' (AnchorCert), which can improve the apparent colour of the tanzanite by as much as two grades – i.e. from A or AA to AAA or AAAA. Like all coated gemstones, this treatment is not stable and can be removed if a stone is repolished.

Synthesis and Simulants

Tanzanite is currently not produced synthetically but is often imitated by lab-created forsterite (a mineral in the olivine solid solution series) coranite (a synthetic blue corundum), tanavyte (a purple yttrium aluminium garnet), nanosital (a man-made glass-ceramic made in many different colours) and cubic zirconia.

Cleaning and Care

Tanzanite is stable to light and chemicals with the exception of hydrochloric and hydrofluoric acid.

Ultrasonic and steam cleaners should never be used to clean tanzanite. The preferred method of cleaning involves the use of warm, soapy water.

Like other gemstones, such as emerald, opal and pearl, tanzanite is a stone that requires a little extra TLC (tender loving care)!

Conclusion

Why tanzanite? Well, the answer is quite simple. Unlike other gemstones, it only comes from one locality in the world, is relatively rare and yet compared to blue sapphire is far more affordable. As you can see from the pricing chart below, tanzanite will give you the 'look' of a blue sapphire without breaking the bank!

In 1968, Henry B. Platt, great grandson of Louis Comfort Tiffany and later president and chairman of Tiffany & Co. in New York, saw the potential in tanzanite and he was certainly right!

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Tanzanite Values & Comparative Price Guide

Tanzanite				
Weight	**Commercial**	**Good**	**Fine**	**Extra Fine**
1.00 - 1.99ct	Base	+100%	+163%	+200%
2.00 - 2.99ct	+33%	+117%	+200%	+233%
3.00 - 4.99ct	+100%	+133%	+217%	+267%
Comparison between Tanzanite and Blue Sapphire (Treated, Non-Origin)				
Gemstone	**Commercial**	**Good**	**Fine**	**Extra Fine**
Tanzanite	Base	Base	Base	Base
Blue Sapphire	+93%	+200%	+389%	+580%

For comparative purposes (Tanzanite & Blue Sapphire), a two-carat tanzanite has been used as the baseline (Reference - GemGuide)

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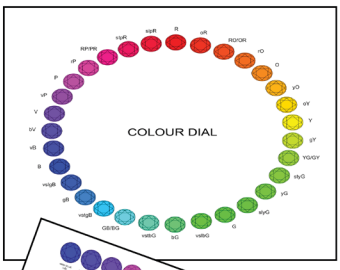

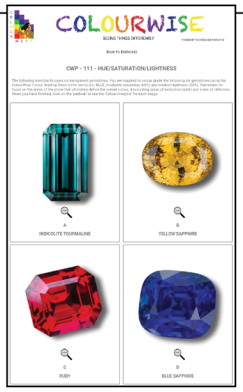

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Meet the Team

Geoffrey Dominy (World Gem Foundation) 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 fifty-three countries, is used by fourteen schools, colleges, universities and gemmological organizations as their recommended textbook and now features photographic contributions by other award winning photographers including Jeff Scovil.

In 2018, Geoff released a 5th Anniversary Printed Edition (Two Volumes) and on December 14th, 2019, released his first book in Spanish 'Gemología Para Todos' (the first 14 chapters of the Handbook of Gemmology).

He currently lives in Palma, Mallorca, Spain and in addition to lecturing and promoting his books, is the founder of the World Gem Foundation and creator of ColourWise.

Leone Langeslag (Dutch Gem Academy) 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) 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.

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

He received his FGA & DGA (Gem Diamond Diploma) through Gem-A in 2011, his BA in History from the Mälardalens University in 2000 and studied geology and gemmology at Luleå Technical University (2005 - 2007), cultural and industrial history at the Uppsala University (1998 - 2000), and archival science at Karlstads University (1998 - 1999). Jan also took his Accredited Jewelry Professional - AJP (Gemological Institute of America 2011), Introduction to Watches (International School of Gemology 2012), Jewellers Education Foundation - Graduate Sales Associate (American Gem Society 2011), Blacksmithing (Säterglántan 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.

Gérard Raphaël Quintin (South American Gem Academy) 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.

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.

Marie-Hélène Corbin (Gem Academy of Canada & Gem Academy of Belgium) is an FGA gemmologist and accredited Senior Gemmologist through the AGA.

Following a busy career in real estate, she wanted to change her professional path and became interested in gemmology. This discovery of gemstones turned into a passion. Marie-Hélène studied at the EGM and successfully passed her Gemmology Diploma.

Guided by the desire to pass on her love for gems, she became the new Director of EGM in 2016, with a strong desire to modernize the school. As a teacher, she instills in her students the desire to learn more about the world of gemstones.

This passion for gems does not stop there, and Marie-Hélène created Quebec's first independent gem identification laboratory, Lelièvre Laboratoire de Gemmologie (LLG) in 2018. In order to offer the most complete service to her clients, she created the Gems and Jewelry Appraisal Center in 2019, also in Montreal.

Kyalo Kiilu (East African Gem Academy) 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 East African Gem Academy with a strong desire and ambition to share his knowledge of gemstones with his fellow East Africans, 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 (South Central African Gem Academy) 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) 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.

Barickeh Charles Kholifa Koroma (West African Gem Academy) is a freelance gemmologist, diamond grader/ valuer, a member of the Gemmological Association of Great Britain and a member of the Scottish Gemmological Association. He was born in Liberia to Sierra Leonean parents and raised in the mineral rich country of Sierra Leone where he survived a devastating brutal civil war which lasted for almost 12 years.

He relocated to the United Kingdom in 2004 and received help on how to cope with Post Traumatic Stress Disorder (PTSD), which now proves pivotal in his approach to life.

He attended the coveted School of Jewellery, Birmingham City University (BCU) where he studied a diploma in diamonds (Gem-A) and a BSc (Hons) in Gemmology and Jewellery Studies. He graduated with a first-class degree in 2018 and was awarded the prestigious Scottish Gemmological Association Prize for Gemmology. He then moved back to Sierra Leone to pursue his dreams. His greatest achievement so far is working as a student mentor during his time at the university, he was able to give advice and guidance to some students that were struggling to cope with the demands of higher education and being away from home.

Like Kyalo, he comes to the World Gem Foundation and specifically the West African Gem Academy with a strong desire and ambition to share his knowledge of gemstones with his fellow West Africans, 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 Sierra Leone.

Dr. Laurent Massi (French-Swiss Gem Academy) completed his PhD studies on 'Atomic-scale Defects in Brown and Hydrogen-rich Diamonds' at the Department of Physics at Nantes University in France under the direction of Professor Emmanuel Fritsch. During his studies he also taught gemology in Paris at the French National Gemological Institute. Dr. Massi subsequently taught gemology and gave presentations at conferences in numerous countries all around the world. During his career he has also had the opportunity to publish a variety of scientific and educational articles on color-change corundum, hydrogen- and CO2-related optical centers in diamond, chameleon diamonds, clinohumite, color-change bastnäsite and on a new gem mineral: hibonite, one of the rarest gems on Earth.

Dr. Massi was the Director of the Asian Institute of Gemological Sciences (AIGS) Gem Laboratory and Gem School based in Bangkok - Thailand. He subsequently completed his Graduate Gemologist (GG) studies at the Gemological Institute of America (GIA) headquarters in Carlsbad, USA and then became the Director of the new GIA Thailand Campus located in Bangkok - Thailand.

With more than 20 years of experience in the Gems & Jewelry industry, Dr. Massi is now the head of both the new international gem academy AGAT (for 'Academy of Applied & Technical Gemology') as well as the co-founder of the French-Swiss Gem Academy (from the World Gem Foundation), both housed in the Majestic building - a former palace from the Belle Epoque - located on the French Riviera, in Nice - France.

Ludovic Durand Oro (French-Swiss Gem Academy) graduated from the Federation for European Education in Gemmology (FEEG) in 2012, has taught at the French Gemological Institute in Paris (France), was the Director of Education of a gem school based in Monaco and in 2019 co-founded the Academy of Applied & Technical Gemology (AGAT gem school) as well as the French-Swiss Gem Academy (FSGA), both based on the French Riviera in Nice, in the south of France.

A true gem enthusiast, he loves to organize gem field trips for his students to gem producing areas around the world while also acquiring top quality gemstones for his private clients.

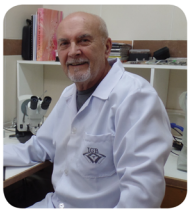
Nina Zolotukhina (Eastern Europe & Russia) studied gemmology at Moscow State University, is an independent gemmologist, now based in Bulgaria, founder of Gemlab Europe Project, researcher, gem expert and author of reviews and articles about gemstones, research methods and gemmological equipment. She is an avid mineral and gemstone collector and photographer of minerals and inclusions (photomicrography).

MEET OUR TEAM OF PROFESSIONALS

Geoffrey M. Dominy
World Gem Foundation
Spanish Gem Academy

Leone Langeslag
Dutch
Gem Academy

Deborah Mazza
British
Gem Academy



Gérard Raphaël Quintin
South American
Gem Academy

Marie-Hélène Corbin
Gem Academy of Canada
Gem Academy of Belgium

Jack Ghazalian
American
Gem Academy

Dr. Laurent Massi
French Swiss
Gem Academy

Ludovic Durand Oro
French Swiss
Gem Academy

Kyalo Kiilu
East African
Gem Academy

Salomon Lutumba
South Central African
Gem Academy

Barickeh Charles Kholifa Koroma
West African
Gem Academy

Nina Zolotukhina
Eastern Europe
& Russia

Lucille Daver
Gem Academy of Canada
Gem Academy of Belgium

Guillaume Benard
Gem Academy of Canada
Gem Academy of Belgium

Dorian Fitchko
Gem Academy of Canada
Gem Academy of Belgium

Alisson Lemaire
Gem Academy of Canada
Gem Academy of Belgium

Amélie Lebrun
Gem Academy of Canada
Gem Academy of Belgium

Caroline Gagnaire
Gem Academy of Canada
Gem Academy of Belgium

Wilma van der Giessen
Gem Academy of Belgium

IF YOU ARE INTERESTED IN JOINING OUR TEAM

WE WOULD LOVE TO CONNECT WITH YOU

Wilma van der Giessen (Belgium) received her first diamond education from Mr. S. Asscher in 1980 and in 1983 graduated at the German DGemG in Idar Oberstein as a diamond professional. At the age of 18, she was introduced to the diamond world in Antwerp where she learned all about rough and polished diamonds. Two years later, in 1985, she received her FGA diploma and in 1991 graduated as a GG at GIA's headquarters in Santa Monica, USA. Traveling is one of her great passions and her teaching space is a true paradise for gemmology students because they have access to a great collection of both natural and synthetic gemstones. Wilma is an avid photographer of gemstone inclusions and nature.

Academy Directory

Academy Name	Website Portal	E-mail Addresses
World Gem Foundation	www.worldgemfoundation.com	information@worldgemfoundation.com
American	www.worldgemfoundation.com/aga	aga@worldgemfoundation.com
Belgian	www.worldgemfoundation.com/gab	infogembelgium@egmtl.com wilma@worldgemfoundation.com
British	www.worldgemfoundation.com/bga	bga@worldgemfoundation.com
Canadian	www.worldgemfoundation.com/gac	infogemcanada@egmtl.com
Caribbean	www.worldgemfoundation.com/cbga	cbga@worldgemfoundation.com
Central American	www.worldgemfoundation.com/caga	caga@worldgemfoundation.comm
Dutch	www.worldgemfoundation.com/dga	dga@worldgemfoundation.com
Eastern Europe / Russia	www.worldgemfoundation.com/eega	ninagold@worldgemfoundation.com
French-Swiss	www.worldgemfoundation.com/fsga	fsga@agat-gemology.com
East African	www.worldgemfoundation.com/eaga	eaga@worldgemfoundation.com
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Scandinavian	www.worldgemfoundation.com/scga	scga@worldgemfoundation.com
South American	www.worldgemfoundation.com/saga	saga@worldgemfoundation.com
South Central African	www.worldgemfoundation.com/scaga	scaga@worldgemfoundation.com
Spanish	www.worldgemfoundation.com/sga	sga@worldgemfoundation.com
West African	www.worldgemfoundation.com/waga	waga@worldgemfoundation.com

Australian Opal Centre

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

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