

Bellerophon | Gemlab

« Le Spectre de L'Océan »

Gemmological Report No. 2020SAMPLE

Privilege No. 00

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CONTENTS


Preface	7
Introduction.....	9
Examination Results.....	10
Gemmological Report	12
SAPPHIRE.....	14
HISTORY & LEGEND.....	16
GEOLOGICAL-GENETIC CONSIDERATIONS.....	18
CEYLON.....	20
CORNFLOWER.....	22
ANALYTICAL PROPERTIES.....	24
INTERNAL FEATURES.....	29
SHAPE & CUT	32
Bellerophon Gemlab.....	34

- PREFACE

Coloured gemstone

The first objects that we picked up and said this has value for no other reason, it is not a food, not a fuel, not a medicine, it has value purely because of its beauty, these were Coloured Gems”

INTRODUCTION

emstone has fascinated the human mind since the dawn of time. They have inspired myths, curses, and have been worn by the greatest kings and emperors who often owned the finest gems.

All the gemstones we so greatly treasure and admire come from various depths and locations in the earth's crust.

People have treasured gems for many reasons throughout history. Some of these reasons include the use of gems as beautiful decorative ornaments, religious symbols, good-luck charms, and medicinal purposes. Mainly however, gemstones have been used to display wealth, status, and power.

The Egyptians and later the Romans were among the first to celebrate the power of gemstones. For example, Cleopatra was known for her love of emeralds, which were believed to possess powers of clairvoyance and to defeat spells and enchantments.

T. Rozet

EXAMINATION RESULTS

A Magnificent Sapphire

- “These gems have life in them: their colors speak,
say what words fail of”

- George Eliot

Bellerophon Gemlab examined the natural sapphire on the 11 November 2020. As stated in the Report No. SAMPLE this magnificent gemstone possesses extraordinary characteristics and deserves special mention and appreciation.

The described transparent sapphire is cut and shaped as a pear, modified brilliant crown, and modified step pavilion. It exhibits an important size and weight of 88.888 carats combined with a highly attractive Cornflower colour.

The few microscopic internal features found during the examination and a combination of well-balanced trace elements in the gemstone are hallmarks of Sapphire from the reputed land of Ceylon (Sri Lanka).

Analytical testing revealed that this Sapphire has been spared thermal enhancement and clarity modification, making its clarity and colour entirely natural.

A natural Sapphire of this size and quality is extremely rare and as such it is a privilege to possess it.

BY MARTIAL CURTI CEO & FOUNDER



Report No. 2020SAMPLE

IMAGE IS APPROXIMATE IN SIZE AND COLOUR



Bellerophon | Gemlab

PRIVILEGE GEMMOLOGICAL REPORT

Report Number:	R-2020SAMPLE
Date:	01 January 2020
Weight:	88.888 carats
Measurements:	34.68 x 21.23 x 11.61 mm
Shape:	Pear
Identification:	Natural Sapphire
Colour:	Vivid Blue "Cornflower"
Comment:	No indication of any treatment
Origin:	Ceylon (Sri Lanka)

M.P.H. Curti

Dr. D. Schwarz

SAPPHIRE

Al_2O_3 + Ti, Fe, Cr, V ...

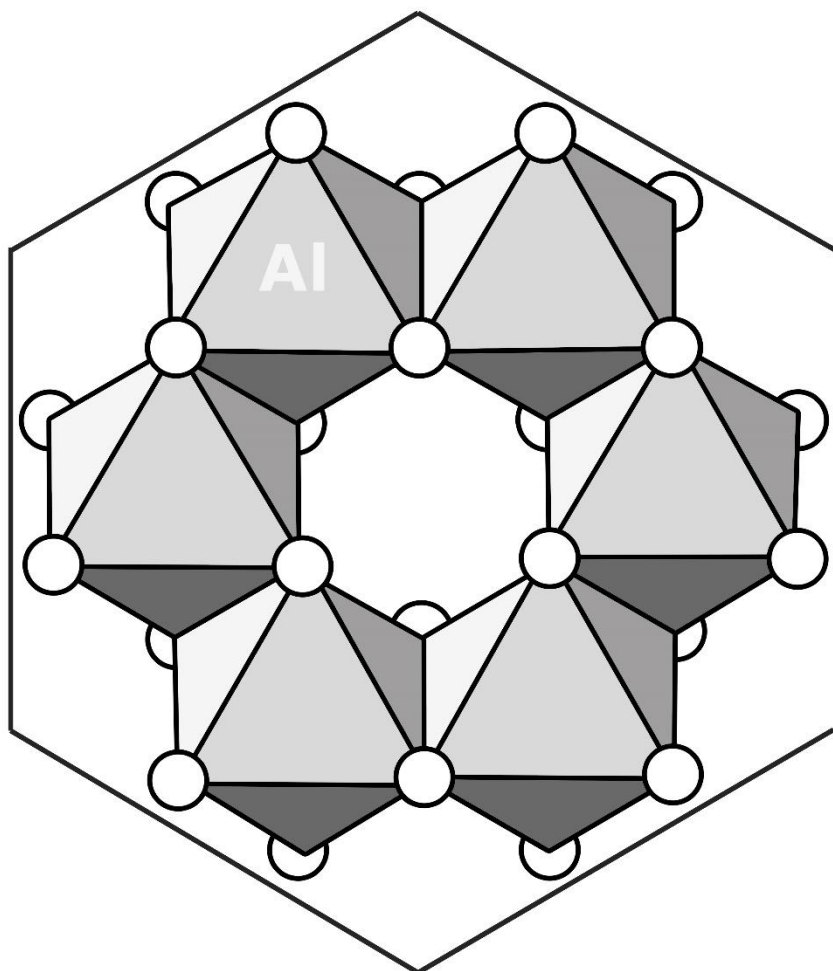
-“A transparent gem variety of corundum other than red (aluminium oxide).”

Sapphire - a member of the corundum family - is an aluminate oxide that crystallises in the hexagonal crystal system forming tabular and bipyramidal crystals.

The colour range of sapphire varieties is determined in part by foreign elements that are built into the lattice. The most important of these are titanium, iron, chromium, and vanadium. Their presence is highly variable and can reach several weight percentages.

Sapphire is the second-hardest natural gemstone and lies at 9.0 on the Mohs scale of mineral hardness, between Diamond (10) and Topaz (8).

Sapphire is one of the two gem-varieties of corundum, the other being ruby (defined as corundum in a shade of red). Although blue is the best-known sapphire colour, they occur in many colours, including grey and black, and they can be colourless.



Corundum crystal structure.

HISTORY & LEGEND

The word “sapphire” can be derived from many etymologies. The oldest one being most likely Semitic, with the word “*saffir*” meaning “the most beautiful”, or from the Greek word “*sapfeiros*”, which probably referred to lapis lazuli.

In ancient Greece and Rome, kings and queens were convinced that sapphires protected their owners from envy and harm. During the Middle Ages, the clergy wore blue sapphires to symbolize Heaven, and ordinary folks thought the gem attracted heavenly blessings. In other times and places, people instilled sapphires with the power to guard chastity, make peace between enemies, influence spirits, and reveal the secrets of oracles.

Traditionally, sapphire symbolizes nobility, truth, sincerity, and faithfulness. It has decorated the robes of royalty and clergy members for centuries

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GEOLOGICAL-GENETIC CONSIDERATIONS

-“The beginning is the most important part of the work”

_Plato

Sapphires are mined from alluvial deposits or from primary underground workings. Sapphires from different geographic locations may have different appearances or chemical-impurity concentrations and tend to contain different types of microscopic inclusions.

Because of this, sapphires can be divided into three broad categories: classic metamorphic, non-classic metamorphic or magmatic, and classic magmatic

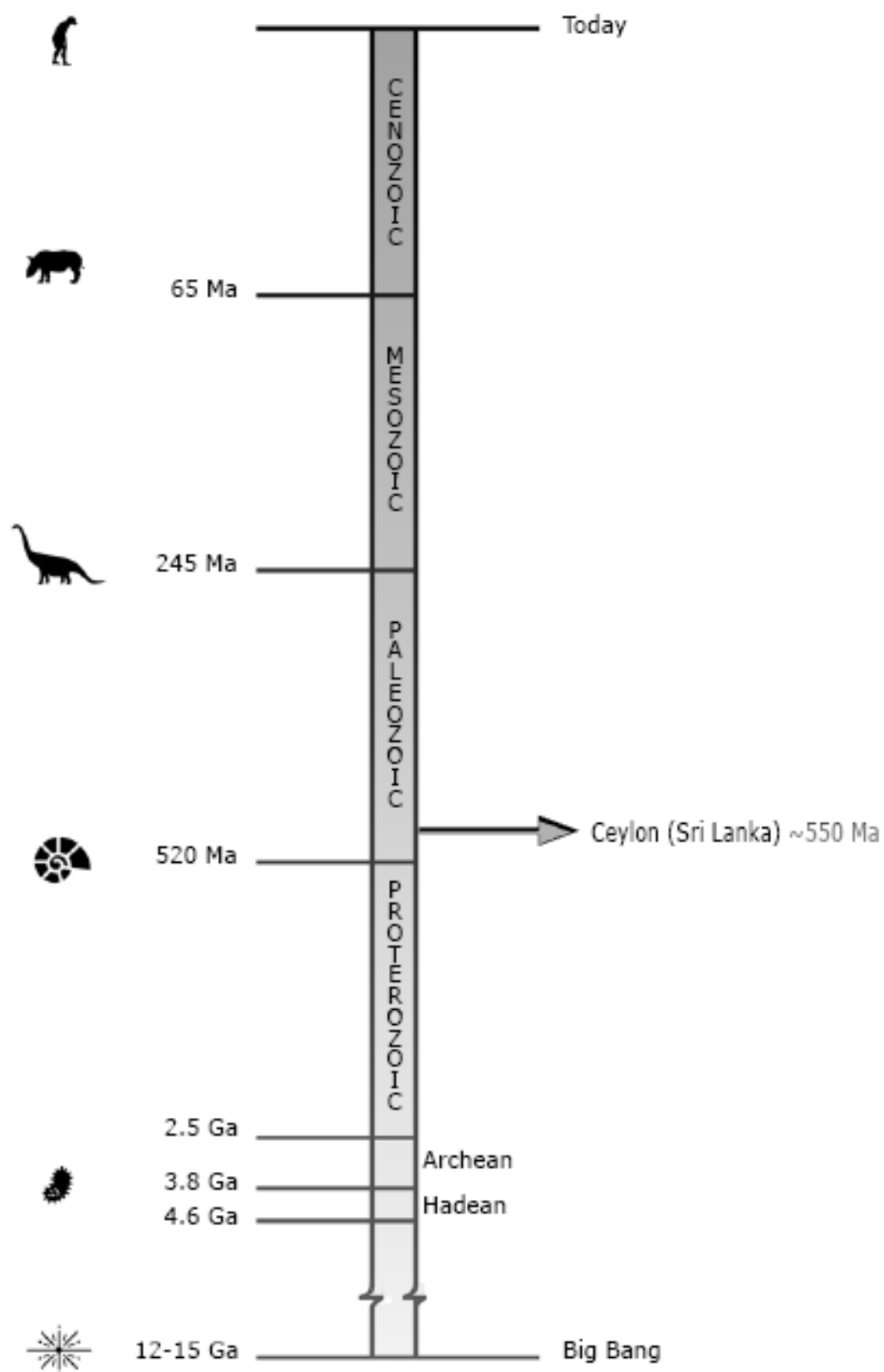
Corundum are rarely mined from the rocks in which they form. Mining small gems from hard rock is possible, but it is awfully expensive, and many of the gems are broken during the mining process. Fortunately, corundum is extremely hard and resistant to weathering.

In many areas, natural weathering and erosion have liberated the stones from their host rock and carried them into streams over long periods of geologic time.

Today, the gems are mined from these stream sediments. Their high specific gravity relative to other sediment particles often causes currents to concentrate them in small placer deposits. Most rubies and sapphires are produced by washing the gravels of these stream deposits. This work is often done by hand because the deposits are small and irregular in shape and character.

Estimation age for Sapphire mineralisation in East Gondwana.

Based on U/Pb dating of Monazites & Zircons(Miller & al 1996)(Holzl & al 1994).



200 MILLION YEARS AGO



TODAY



Sri Lanka was affectionately known as “Ratna-Dweepa” which means Gem Island. The name reflects its natural wealth. Many Sri Lankan Kings have sent gems and pearls to foreign countries seeking to establish trade and relationships. In 250BC the King at the time reported to

have gifted three varied kind of gems and eight types of pearls to the Indian Emperor.

Sri Lanka not only produced gemstones of remarkable variety, the mining, cutting, and polishing industry dates back to centuries. Almost all the stones that are found in Sri Lanka since the periods of the kingships are cut and polished before exported.

The Pan-African orogeny was a series of major Neoproterozoic orogenic events which are related to the formation of the supercontinents Gondwana and Pannotia about 600 million years ago. Gemstones deposits like Sri Lanka, East Africa, India, and Madagascar, are linked to the collision between eastern and western Gondwana. (Kröner 1984).

Sri Lanka, geologically speaking is an extremely old country. Ninety percent of the rocks of the island are of Precambrian age, 560 million to 2,400 million years ago. It has been estimated that nearly 25% of the total land area of Sri Lanka is potentially gem-bearing, making Sri Lanka one of the countries with the highest density of gem deposits compared to its landmass.



CORNFLOWER

SAPPHIRE

- *A*ll gemstones are gifts of nature,
but only the best display Cornflower colour.



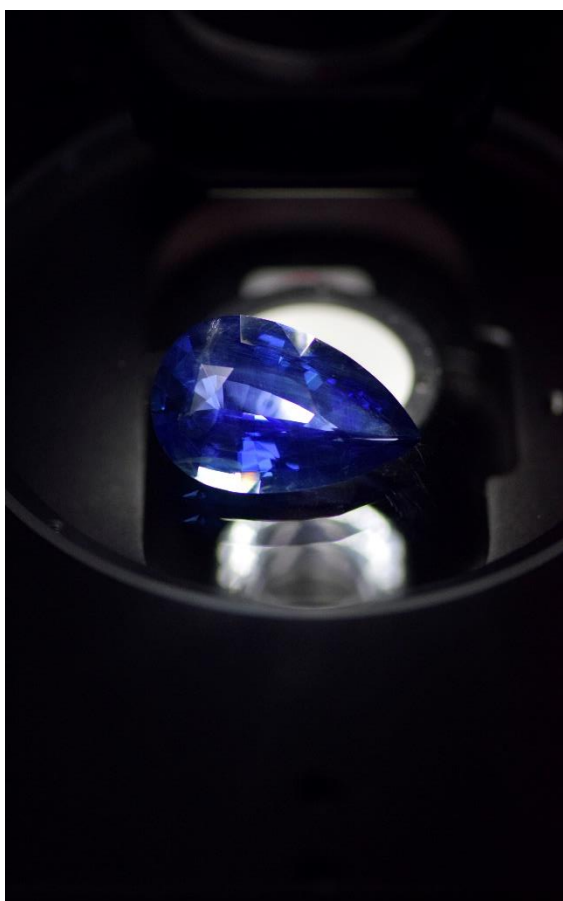
Colour has the greatest influence on a sapphire's value, and preferred sapphires have strong to vivid colour saturation. The most valued blue sapphires are velvety blue to violetish blue, in medium to medium-dark tones. The best combination of clarity and colour are known in the trade as "Cornflower". Sapphires with these qualities command the highest prices per carat. The name "Cornflower" come from the delicate velvet blue of a cornflower plant. When used for Gemstone "Cornflower" defines only the best Vivid saturation Blue



ANALYTICAL PROPERTIES

I am among those who think that science has great beauty”

_ Marie Curie



The testing of a coloured gemstone at Bellerophon laboratory involves the full range of analytical methods. Some are traditional such as measuring the refractive index and specific gravity. Others involve state-of-the-art testing such as spectroscopy and laser induced break down spectroscopy. Together, the combined techniques give a deep understanding of the gemstone properties.

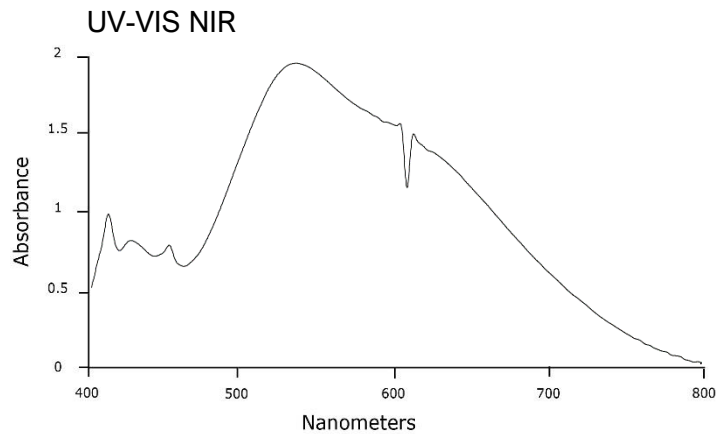
The present gemstone was studied with all available instrumentation by a team of experienced gemmologists. Their combined observation and data interpretation are detailed in the following pages.

From these data: the chemical fingerprinting, and the spectral fingerprinting in the UV-vis-NIR region and the vibrational fingerprinting (Raman and FTIR range), are the most valuable characteristics for the “gemmological interpretation” of gemstone. The chemical fingerprinting is made using E.D.X.R.F (energy dispersive X-ray fluorescence) and L.I.B.S. (laser induced breakdown plasma spectrometry).

Spectral fingerprinting – UV-vis-NIR

Absorption spectra reveal which portions of light are absorbed by the gemstone and which are contained in the transmitted light. It is the type and quantity of foreign elements that determine how much and which light wavelengths are absorbed.

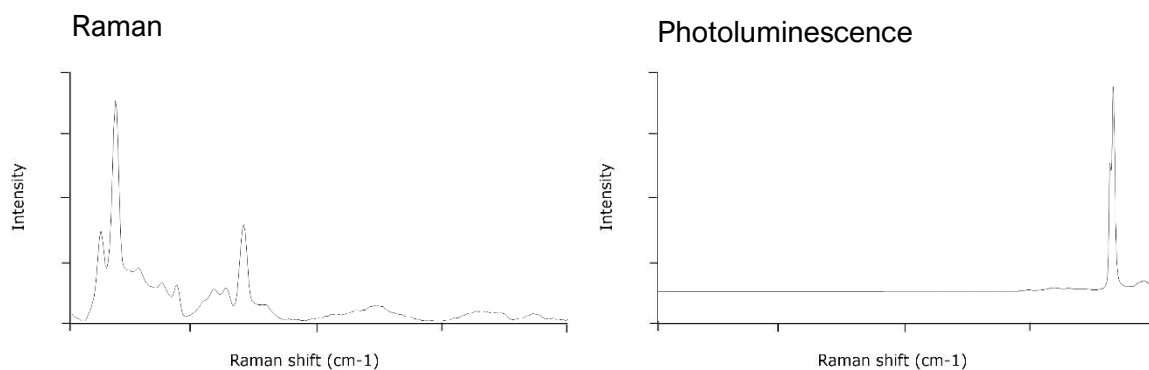
Ultraviolet Visible Near Infrared absorption spectroscopy is a complementary technique to EDXRF for examining chemistry because trace element chemistry controls colour in the gemstone providing information about the colour inducing element it contains.



Raman Spectroscopy

Raman spectroscopy is a non-destructive vibrational spectroscopy. A typical Raman instrument consists of a classical microscope with either, transmitted or reflected light, a low-power laser excitation source, the spectrometer for high resolution light analysis and an appropriate computer for data collection and analysis.

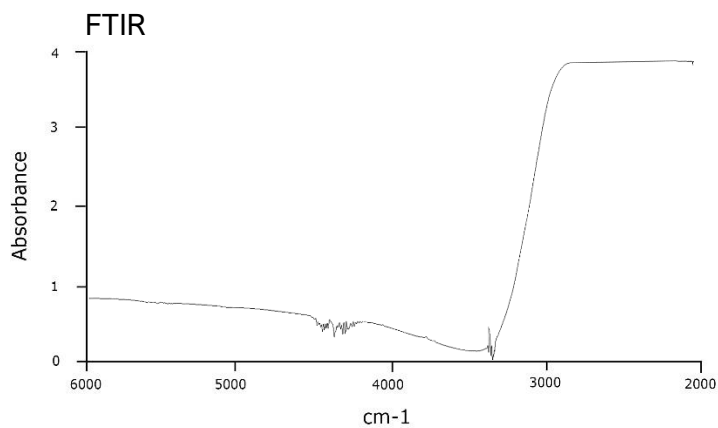
Raman spectrometers are useful for rapidly identifying gemstones since most materials produce characteristic Raman spectra. Most Raman spectrometers can measure photoluminescence as well as Raman scattering.



Infrared spectroscopy

In the infrared, spectral features generally arise from vibrations of molecular and structural components of the crystal. For example, carbon in diamond and water when present in a gemstone, have characteristic signals in the infrared.

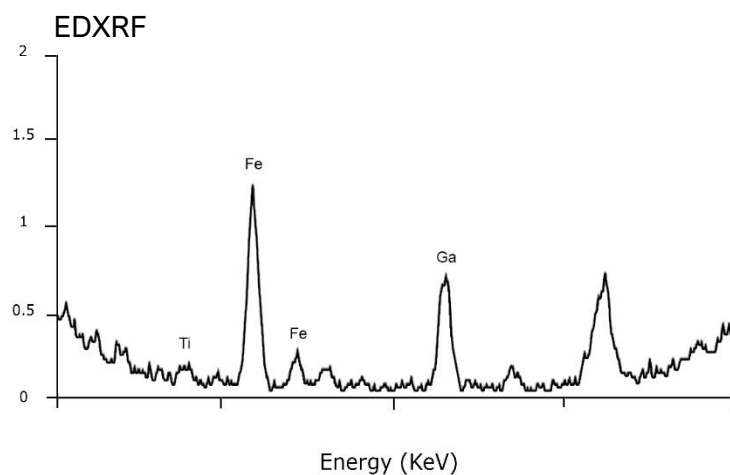
Infrared spectra can be used to help separate one gem material from another or to detect certain types of treatments. The infrared region of the electromagnetic spectrum is the energy range just beyond the red end of the visible spectrum. The unit by which infrared energy is usually measured is the wavenumber (number of waves per centimetre), which is expressed in reciprocal centimetres (cm^{-1}) (Stockton, 1987).

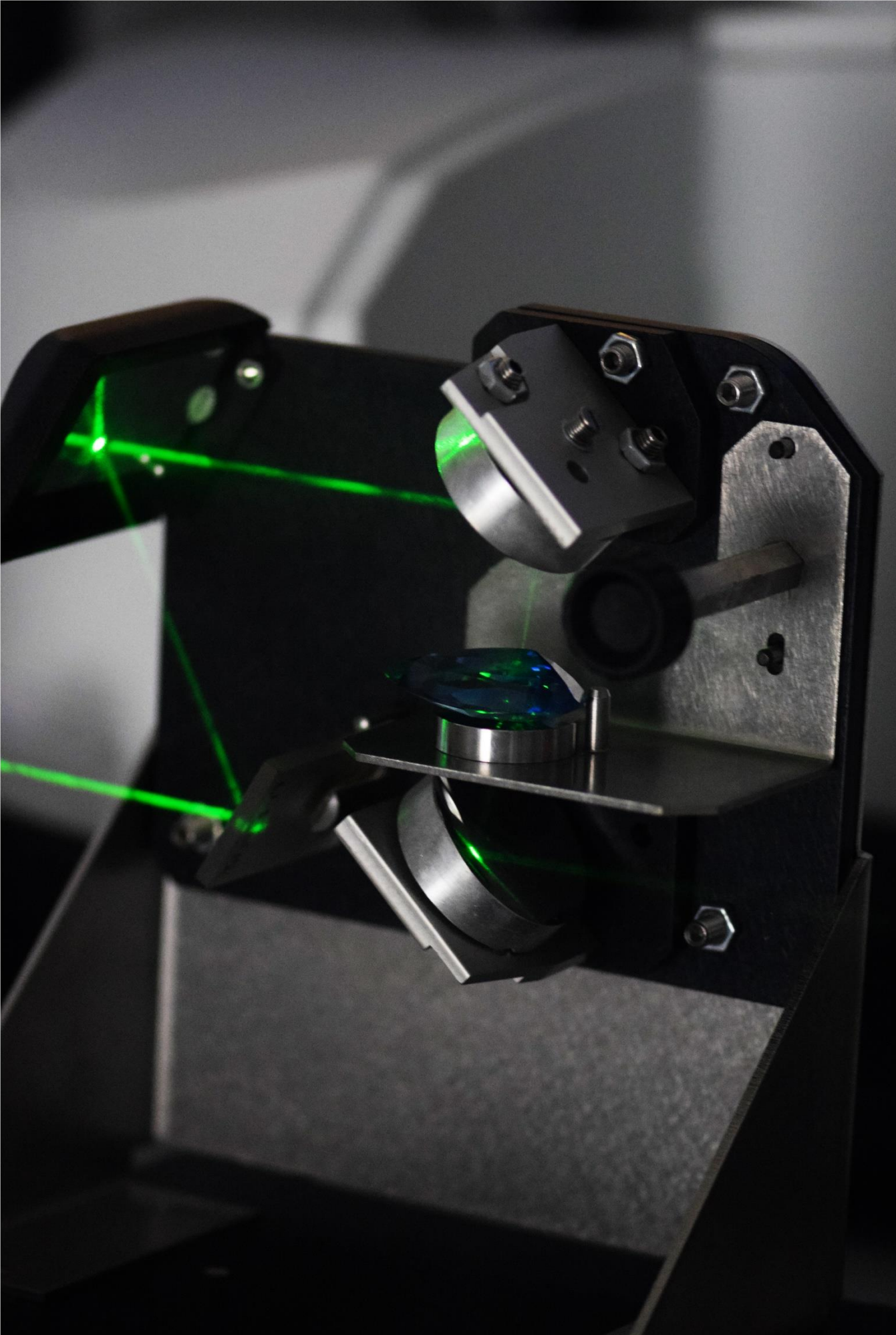


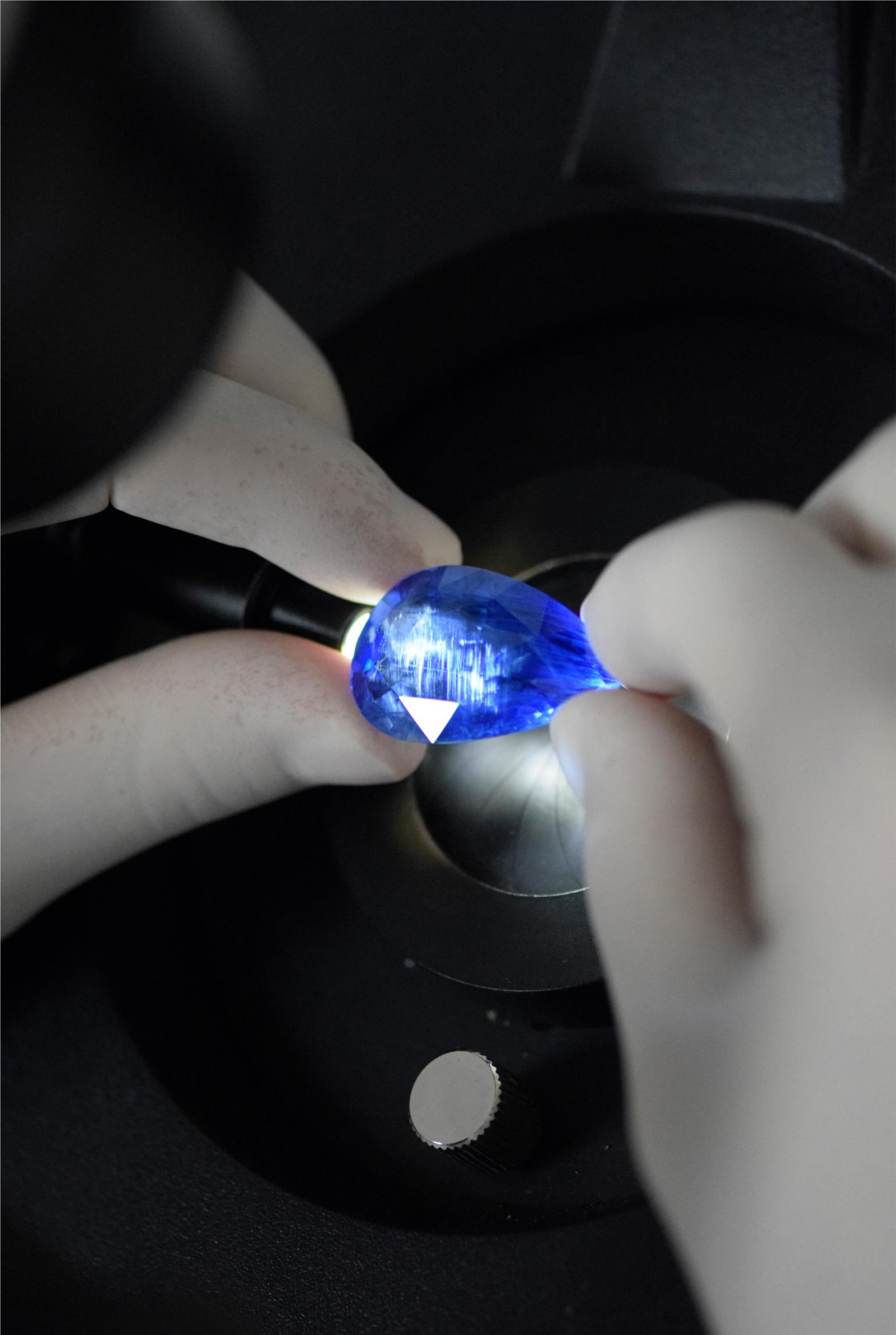
Chemical fingerprinting

The chemical fingerprint of a sapphire reflects the geological-mineralogical environment (composition of mineralizing fluids, host rock composition, temperature, and pressure conditions) at the time of its formation.

It is the contents and the ratios of the relevant elements (e.g. chromium, vanadium, iron, titanium, and gallium) that define the chemical fingerprinting of sapphire from different geographic origins and/or from different geologic-genetic environments.

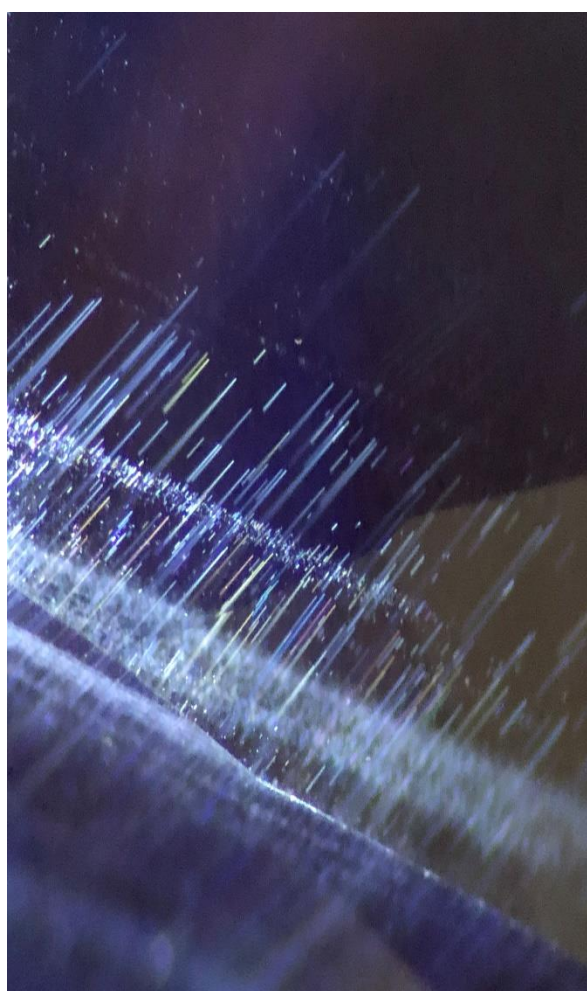






INTERNAL FEATURES

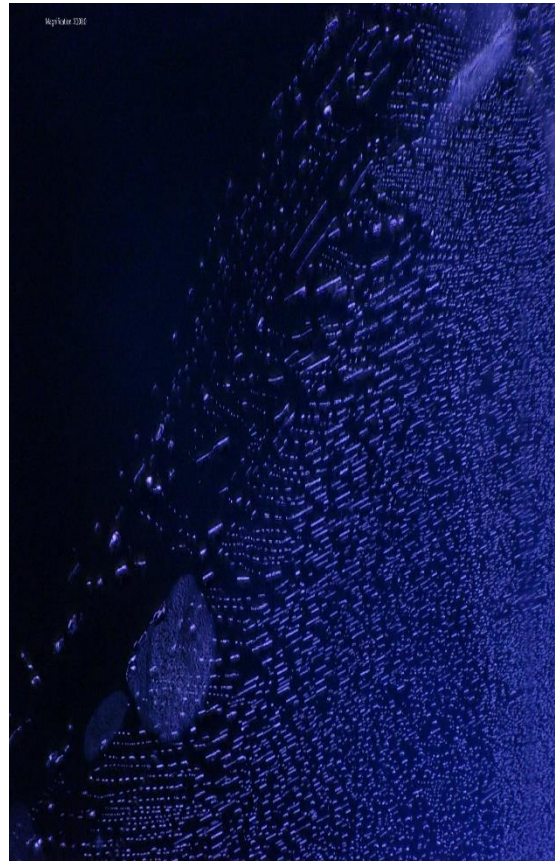
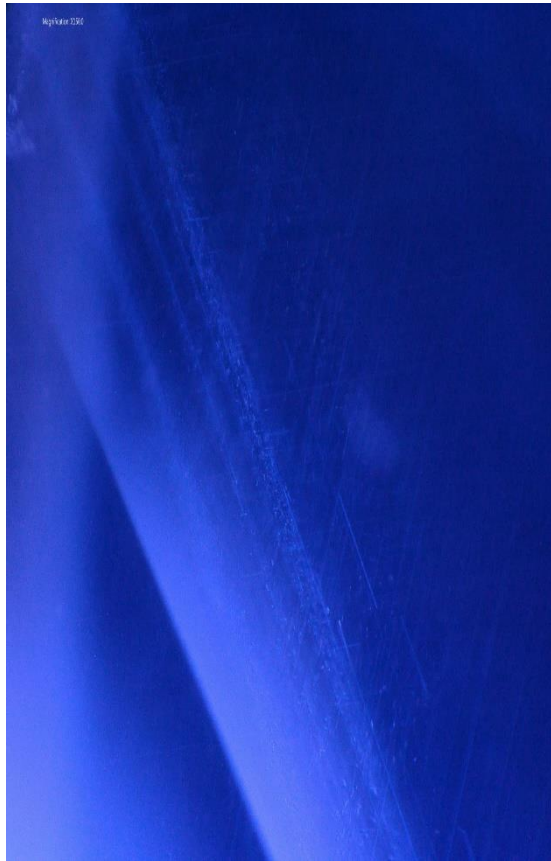
- *E*very gemstone is a reflection of its inner world.



The gemmological microscope is widely considered one of the most useful equipment in a gemmological laboratory. With high quality microscope and multiple illumination techniques, an experienced gemmologist can make detailed observations and highly accurate assessments.

Among the properties used for the characterization of coloured gemstones, the interpretation of the internal features is - in general - still the most common and most important routine examination for the gemmologist at Bellerophon laboratory.

The precise description and the identification of rubies inclusions is an important tool in distinguishing between genuine and synthetic ruby as well as in determining the geographic origin of natural ruby. Study and documentation of the inclusion phenomena in the gemmological microscope are essential and an integral part of the testing procedures of a coloured gemstone.



INTERNAL FEATURES MAPPING

SHAPE & CUT

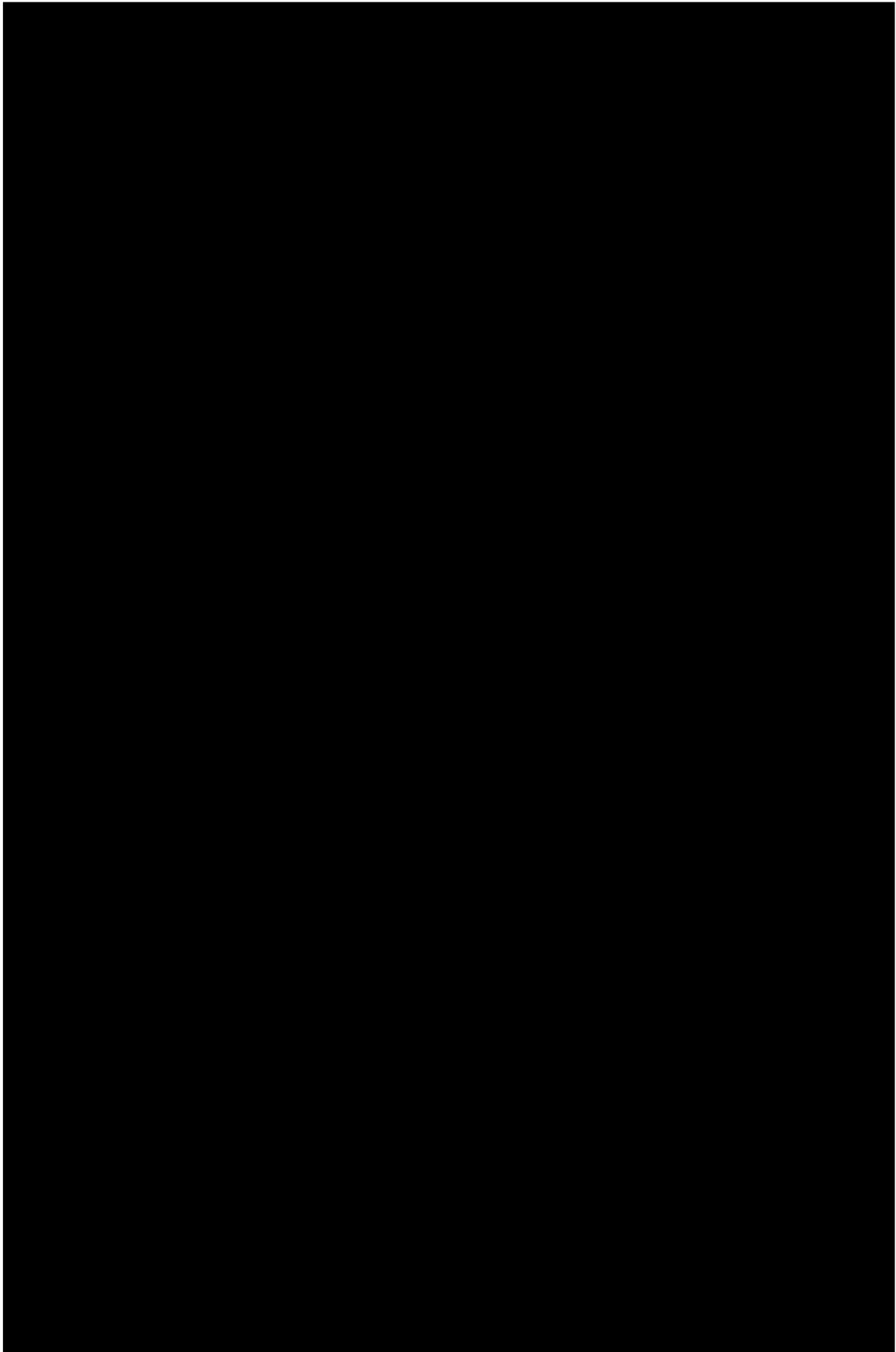
- “The cutting of a gem has to be finished before you can see whether it shines.”

_Leonard Cohen

Cutting rough sapphire present numerous challenges. The colour of the stone can be uneven so the master cutter must choose an orientation in which the finished stone will have an even face-up colour. Sapphire is pleochroic, meaning its overall colour is changing depending on the crystal axis.

The present gemstone displays a particularly good brilliancy and good proportions. Achieved through skilful cutting of this sapphire.

The degree of lapidary craftsmanship adds value to the nature of this sapphire and contributes to the well-pronounced colour.



Bellerophon | Gemlab

We are an independent gemmological laboratory created for you to serve you in the attempt to comprehend and grasp the truth in this fascinating and multi facets world named "Gemmology".

We prefer to think of ourselves as more than just a gemmological laboratory. We are pioneers in new frontier where higher standards, transparency, and integrity meet.

With our head office in Paris, France and a full state-of-the art laboratory in Bangkok, Thailand, we are actively creating opportunity to further increase quality and set higher standard in our industry.

- Independent gemmological laboratory
- State of the art technology
- Highly qualified gemmologists
- Complete reference collection
- Unique combination of expertise
- Expert system / Artificial intelligence assisted
- Complete transparency

Technology

Bellerophon's R&D department harnessed thanks to successful partnership with leaders in other fields such as Artificial intelligence, Photography, Optics, Luminescence Spectroscopy, IT and Engineering new opportunities to better serve our customer worldwide and create a paragon of excellence.

Our research centre is equipped with state of the art heating furnaces and cutting facility, used for research and development for authentication of enhancement and research on origin determination only.

- Raman spectroscopy
- Photoluminescence spectroscopy (365nm, 532nm & 708nm)
- Ultraviolet visible near infrared spectroscopy
- Fourier transform infrared spectroscopy
- Energy dispersive X-ray fluorescence
- Laser-induced breakdown spectroscopy
- Ultraviolet imaging
- Refractometer
- Geiger counter
- Polariscope
- 3D scan system
- Keyence microscope

Knowledge

Director | **M.P.H Curti**

M.P.H Curti, Graduate Gemmologist is the director of Bellerophon since august 2018. Started his career as a gemstone cutter in Burma (Myanmar). Worked in Mozambique with Gemfields. Later traveling to many gem deposit and gem centers in Asia, Africa, Europe, and America. Assisted with the discovery of a new mineral, worked with GRS, Thailand, and featured in a GIA article about the discovery of a new gem deposit.

Senior Gemmologist | **Dr.D.Schwarz**

Dr.Dietmar Schwarz is the senior chief Gemmologist of Bellerophon since October 2019. Renowned gemmologist and world foremost authority on Emerald, spent more than 20 years as head of research at Gubelin laboratory in Switzerland, author of "Esmeralda" (1987) & "Geographic Origin Determination of Coloured Gemstones" (2012), also a prolific author & co-author of numerous notable gemmological articles.

Gemmologist | **T.Rozet**

T.Rozet, Advanced Training Course from SSEF is the Gemmologist of Bellerophon since September 2018. Successfully finished the intense gemmological program with detailed approach to identifying treatment and origin of ruby, sapphire, and emerald.

Analyst | **M. Buduca**

M.Buduca, join Bellerophon in September 2019. Graduate Gemmologist from the Federation of European Education of Gemmology, in the Institute National de Gemmologie in Paris France. She is also an Accredited Gemmologist from the Asian Institute of Gemmological Science. She is leading the Research and Development department.

Research Associate | **Ferdin Joe J.J, PHD**

F.J.J Joseph, PHD is a lecturer in the Thai-Nichi institute of Technology, specialized in data science, with a P.H.D in computer Science and information System. He provides us with reliable system for data processing and comparative analysis.

Reference Collection

- Comparative analysis on one of the most complete data-base in gemmology.

A reference collection of more than 9000 samples including most gemstones, all known synthetic made, all enhancement ever detected and more than 4000 gem-quality samples for origin determination for Spinel, Chrysoberyl, Opal, Emerald, Ruby & Sapphire. More than 30 countries of origin referenced.

- Identification: +600 minerals recorded
- Treatment: All treatments known for all major gemstone recorded
- Genesis: Collection of all beryl & corundum synthetic
- Origin determination: + 4000 samples for origin