GÜBELIN

GEMMOLOGICAL PROFILE

14.66 CT

KASHMIRI SAPPHIRE

COMPLEMENTING
GEMMOLOGICAL REPORT

No. Specimen 3

ABOUT THIS DOCUMENT

This Gemmological Profile is complementing a Gemmological Report issued by the Gübelin Gem Lab. The Gemmological Profile has been issued upon request of a client, on the basis of data collected for the described stone at the time of the analysis as stated on the Gübelin Gem Lab Gemmological Report. The Gemmological Profile is only valid if presented together with the original Gübelin Gem Lab Gemmological Report.

Gemmological Profiles provide a more detailed description of a gemstone than the concentrated wording used in Gübelin Gem Lab Gemmological Reports. While Gemmological Reports primarily address the professional traders, Gemmological Profiles attempt to cater the needs of the jeweller and the layperson, who might be interested in getting explanations and background information about gems in general and their gemstone in specific. Gemmological Profiles are issued on request and are available for a broad range of gemstone qualities. Hence, the existence of a Gemmological Profile does not imply any level of quality or rarity of the gemstone it describes. The language used in Gemmological Profiles is more extensive and informal. Statements about certain quality traits of the stone in the Gemmological Profile might be more detailed and go beyond the sober scientific language deployed in the Gemmological Report. In contrast to the Gemmological Report, whose content is based exclusively on data that Gübelin staff has collected directly from the stone, the Gemmological Profile considers and contains also external, possibly uncorroborated data and information.

We refer to the information stated in the Notes and Limitations section on the backside of the Gübelin Gem Lab Gemmological Report and the General Terms & Conditions.

See also gubelingemlab.com.

CONTENT

INTRODUCTION

Gemstones are true products of nature, grown millions of years ago in the earth's crust, brought up to the surface by geological processes, and eventually found by man who brings out its colour and brilliance by cutting and polishing.

The gemmologist's eye looks beyond the sparkling outer appearance of the stones, attempting to understand how they have formed. Minute crystals, fluid inclusions and subtle growth features trapped in their interior are witnesses of their formation millions of years ago and in tens or even hundreds of kilometres depths in the earth. This inner life allows us to detect their identity, authenticity and even their geographic origin.

This Gemmological Profile complements the Gübelin Gem Lab Gemmological Report No. SPECIMEN 3, contained in the inside cover page of this booklet. In this Profile, we present our insights and findings for the 14.66 ct Kashmiri sapphire, disclosing some of its microscopic, chemical and structural characteristics and providing valuable information about its genesis and origin.

We intend to share with you the story that your gemstone tells us on its very individual history and personality.

On 27 May 2018, the Gübelin Gem Lab in Lucerne has been entrusted with testing the 14.66 ct gemstone presented here. The careful assessment and detailed analytical studies performed on this gemstone revealed the results provided in the Gemmological Report No. SPECIMEN 3 and are described in more detail in this Gemmological Profile.

HISTORY & SYMBOLISM OF SAPPHIRE

The word ‘sapphire’ is thought to be derived from the Latin ‘sappirus’, itself coming from the ancient Greek ‘σαπφειρος’ or ‘sappheiros’, meaning ‘dark blue stone’. Other sources point towards a Sanskrit origin ‘sauriratna’ (‘beloved of Saturn’), and even associations with the gem-producing island of Saphirine in the Arabian Sea have been made. The ultimate root is most likely Semitic, with the Hebrew word ‘saffir’, meaning ‘most beautiful’, or ‘perfect’ [ACA].

Many mystical connections and magical properties have been ascribed to sapphire. The Greeks associated sapphire with prophetic qualities, while Buddhists regard it as bringing spiritual light. In India and Arabia it was worn as a protective amulet against the Evil Eye, plague and pestilence, to name just a few healing and spiritual qualities.

The sapphire has often been given a noble, eminent, even heavenly position. An early celestial association was the Persian belief that the world was founded upon a sapphire whose colour was the cause of the blue of the sky, while the ten commandments given to Moses were supposedly engraved upon tablets of sapphire [ACA]. By the Middle Ages, the colours of blue and purple had become representative of royal and religious power, and bishops, princes and kings adopted sapphire as the ideal symbol of their earthly and heavenly power, but also as a sign of purity and to protect them from unclean thoughts.

Sapphire owes its appreciation to its deep, often fathomless blue colour, gazing into it creating a sensation of diving into a clear lake or rising up into the blue sky. It is this pure, saturated blue hue that instils a sensation of endlessness.

ACA This abbreviation refers to specific contents of the Coloured Gemstone Professional classes provided by Gübelin Academy. For more detailed information visit gubelinacademy.com

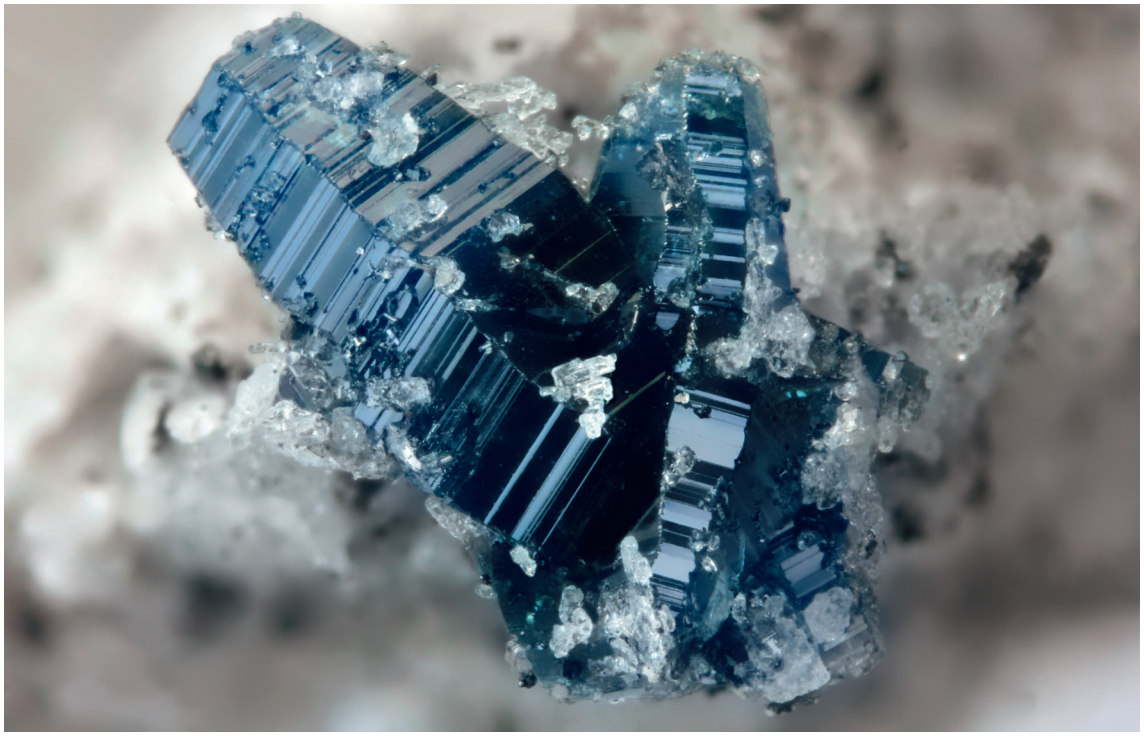
DESCRIPTION

Weight

Sapphires are minerals formed deep in the earth, under specific geologic conditions of high pressures and temperatures. A delicate balance of the right chemical elements is required to supply the growing crystal with the ingredients that finally lend it an appealing blue colour. Crystal growth is usually a slow process extending over several tens of thousands years at least, and rarely the required availability and balance of the just right chemical constituents is maintained throughout the growth of a sapphire. Skilful cutting is needed to bring out the best part of the rough crystal, reducing the weight of the gemstone typically to less than 50 percent [ACA]. Weighing 14.66 ct, the Kashmiri sapphire presented here is an extremely large specimen. While sapphire crystals occasionally do grow in large sizes, most sapphires expose significant zoning or other inhomogeneities of the colour, affecting their visual appearance. Large, unheated specimens of sapphire displaying an attractive colour such as shown in this 14.66 ct sapphire, are considered rare.

Shape & Cut

The final shape and cut of the gemstone is the result of a highly complex decision taken by the cutter, and mainly defined by the shape and the quality of the rough crystal. The cutter tries to find a balance between maximising the colour, brilliance and transparency, while retaining as much weight of the crystal as possible. Special attention is given to the appearance of the colour, the key property in all coloured gemstones [ACA]. Sapphires grow in an oriented manner, resulting in differences of colour - sometimes subtle, sometimes distinct - when viewed from different directions. This effect, called pleochroism [ACA], is carefully considered by the cutter, and plays a pivotal role in getting the best out of



a piece of rough crystal. These considerations were also applied on the present crystal. It was fashioned into a cushion shape, using a cutting style that combines features of both the brilliant cut and the step cut. The dimensions of the gemstone 16.14 mm in length, 12.64 mm in width and 8.27 mm in depth.

Colour & transparency

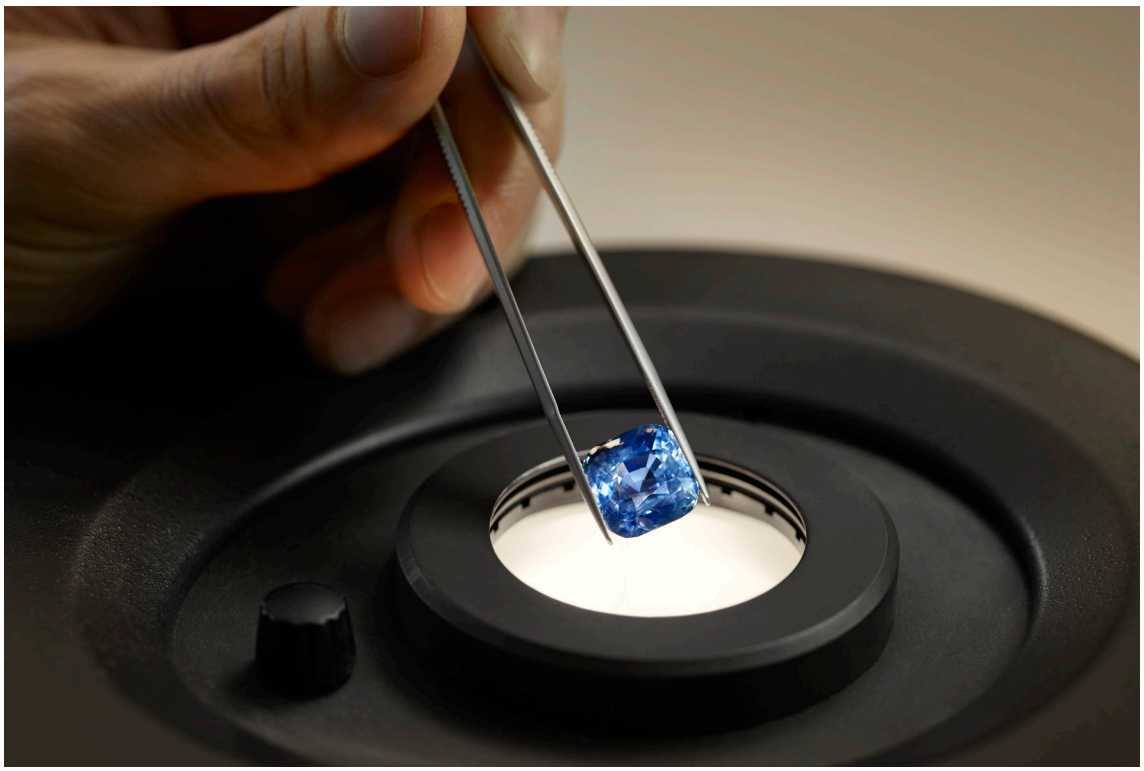
The single most important criterion of a gemstone's quality is its colour. Sapphires cover a broad range of different shades and nuances of blue, often with a subtle contribution of a secondary colour such as purple, exhibiting a variety of saturation and tones. While all combinations have their own charm and legitimacy, a pure, saturated blue colour is the most coveted. The colour of the present gem is exceptional, characterised by an intense saturated blue colour, free of any secondary hue. As a rule of thumb, the transparency of gemstones usually follows the same logic as in diamonds: the cleaner – i.e. showing no or few internal features only – the better. Tiny, usually microscopically small inclusions are a common and welcome feature in coloured gemstones. Ideally, however they do not affect the transparency of the stone. Fine Kashmiri sapphires such as the stone described here display a blue colour that is both deeply saturated and bright at the same time, paired with an incomparable softness: a gentle, diffused light that glows throughout the crystal.

This unusual combination of properties was described by the late Dr. Eduard Gübelin as follows: 'Soft and velvety, scintillating yet bland at the same time; it is a clear, deep blue, enhanced by a gentle admixture of kingly purple.' Although the inclusions causing the velvety – also referred to as 'milky' or 'sleepy' – aspect of Kashmiri sapphires have not been indisputably identified, it is assumed that they are the finest acicular rutile (crystalline TiO_2) particles, the same mineral causing 'silk' in Burmese and Sri Lankan gems. In Kashmiri stones, however, their appearance is non-iridescent, finer, more wispy than needle-like, at times arranged in clouds, dust bands or blocks, yielding a milky turbulence

that gently scatters the light and results in that coveted soft and velvety sheen. This unique blend of the most desirable bright blue with a gentle smoothness in sapphires from Kashmir has upheld their legendary reputation, keeping them at the very top of the sapphire league [ACA]. The finest Kashmiri sapphires such as the present 14.66 ct sapphire are universally accepted to be not only some of the rarest coloured gemstones, but also the most exquisitely beautiful.

Identity & Authenticity

One most fundamental information any gem lab report has to provide is the identity of the stone. Sapphire is defined as crystalline aluminium oxide, Al_2O_3, called corundum, with traces of the chemical elements iron and titanium. In gems, such trace elements are most commonly the agents responsible for adding colour. Despite their small contribution to the overall chemical composition of the gemstone, trace elements play a key role in determining whether a mineral is just a standard stone or a rare and coveted gemstone. Merely by replacing a few aluminium ions in the atomic structure of corundum with iron and titanium, common, colourless corundum gets turned into a sapphire of an attractive blue colour [ACA]. With a hardness of 9 on the Mohs scale, corundum is one of the world's hardest minerals. This property, paired with toughness and durability, make ruby and sapphire quite forgiving gemstones, keeping their beauty for many generations. Different types of minerals and other materials might be used to fake sapphire, i.e. act as so-called simulants. Clearly, the value of a simulant is a fraction only of the true sapphire. As sapphire can also be grown synthetically, the authenticity needs be addressed; is the sapphire indeed of natural provenance, i.e. grown millions of years ago in the depth of the earth, or is it a synthetic sapphire, i.e. a man-made crystal? Synthetic sapphires are known for more than a hundred years, and possess chemical and physical properties almost identical to



natural sapphires. But the production and hence the supply of synthetic sapphires is virtually unlimited, which reduces their value dramatically compared to a pristine, naturally grown sapphire. hundred years, and possess chemical and physical properties almost identical to natural sapphires. But the production and hence the supply of synthetic sapphires is virtually unlimited, which reduces their value dramatically compared to a pristine, naturally grown sapphire. The 14.66 ct faceted gemstone has proven to be of the blue variety of natural corundum, called sapphire.

Overall quality assessment

The 14.66 ct sapphire described in Gübelin Gem Lab Gemmological Report No. SPECIMEN 3 is of exceptional visual quality. Only a minute share of the sapphires coming out of a mine combine the quality attributes with a weight of 14.66 ct, making this sapphire a true rarity. At its own discretion, the Gübelin Gem Lab is awarding gemstones of exceptional beauty and rarity with an Appendix, an additional document accompanying the Gemmological Report. A combination of outstanding characteristics – a richly saturated and homogeneous colour, a high degree of transparency, the absence of treatment and its large size – qualifies this gemstone to get awarded with an Appendix, a distinction granted to a few, exceptional gems only. Such a combination of quality traits is very rare in natural, untreated Kashmiri sapphires of this size.

ORIGIN

Throughout history, gemstones – in particular rubies, sapphires and emeralds – have been associated with specific countries and mining localities by virtue of their outstanding beauty and quality. However, the outward splendour of a gemstone is not all that contributes to the prominence of a particular source.

The history and notoriety – often tumultuous – with which many exceptional gemstones are associated, have contributed greatly to the reputation of a few specific gem deposits.

The geographic origin of the present 14.66 ct sapphire has been determined to be Kashmir. Located at the northern tip of India, amidst the Himalayan mountains between Pakistan and China, in the Padar region of Kashmir, lies a remote valley. Near the tiny village of Sumjam, and at an elevation of 4,500 m, the small Kudi Valley is home to one of the greatest gemstone finds in the world: the sapphires of Kashmir.

Although the exact date of the discovery of the Kashmiri deposit is unknown, near contemporary accounts date the landslide, which first uncovered the deposit, to some point between the years 1879 and 1882.

The high elevation of 4,500 m above sea level restricted the mining operation to a maximum of ten weeks per year. Nevertheless, the initial deposit - also referred to as the ‘Old Mine’ - was practically exhausted by 1887 already. Although a nearby ‘New Mine’ deposit was later discovered and worked, this, and any later sporadic twentieth century finds, was hardly comparable to the quality or size of this original material.

This emphasizes the short-lived lifespan of the Kashmiri mines. Except sporadic, and largely uncoordinated, attempts in the following hundred years, production was all but exhausted on a commercial level by the early decades of the twentieth century.

Such a limited history only reaffirms the legendary reputation of sapphires from Kashmir. Not only some of the most beautiful and highly valued wonders of nature, but also some of the most scarcely mined gemstones, true Kashmiri sapphires rank amongst the rarest gems on earth.

Determination of origin

The geographic origin of this 14.66 ct sapphire has been determined by comparing its gemmological properties with those of sapphires from the reference collection of the Gübelin Gem Lab. With more than 27,000 stones, it is probably the world's most complete collection of gemstones gathered from all commercially relevant mines worldwide.

The collection has been started in the 1930s and is maintained up to this day. It hence also encompasses mines which are exhausted or closed decades ago. This unique reference collection, combined with the most sophisticated analytical techniques, allows the scientists of the Gübelin Gem Lab to determine the origin of almost all sapphires, solely based on the observations and data they collect on the stone.

If the pattern of properties gathered from the unknown stone matches the one from the reference stones, i.e. of secured provenance, an origin can be determined. However, this is sometimes not a straightforward process, as the properties of sapphires from different deposits might overlap. Although today they might lie thousands of kilometres apart, their geologic setting might be similar, or the host rocks were even adjacent to each other millions of years ago when the gem grew.

Hence, despite skilful assessment and evaluation of carefully collected analytical data, the determination of the origin is not feasible for any stone. The trustworthiness of the final opinion is - among other factors - defined and limited by the completeness and quality of the lab's knowledge database and reference collection. This is why the Gübelin Gem Lab continuously invests a significant share of its revenues in research and development, both in-house as well as in joint projects with universities and other external scientific research institutions[1].

[1] The annual 'Dr. Eduard Gübelin Research Scholarship' is another key engagement of Gübelin to contribute to the advancement of gemmological knowledge. For more information visit www.gubelingemlab.com/scholarship.

GEOLOGY & AGE

The growth of sapphires in Kashmir is the consequence of a major geologic event, when the Indian subcontinent drifted towards the Eurasian plate and eventually collided into it, a process that started some 64 million years ago and is ongoing to this day. This collision resulted in a thickening of the earth's crust - forming the Himalayan mountain range - and triggered the formation of sapphires along that plate boundary, reaching from the Western Himalaya into Burma and Thailand [ACA]. By applying radiometric dating techniques, we know that Kashmiri sapphires, such as the 14.66 ct sapphire presented here, formed about 25 million years ago in a depth of around 10 kilometres in the earth, at temperatures between 500 to 700 degrees Celsius.

Major sapphire deposits

TREATMENT

Heating has been applied for centuries, and even millennia, to improve both the colour and clarity in corundum. References in Pliny show a diverse knowledge of various mineral treatments in the Roman period, and explicit literary references to the heat treatment of sapphire are found in early mediaeval Arabian and Renaissance European texts [ACA].

Generally, heat treatment offers a way of turning sapphires of less desired quality into highly attractive gems. Treatment is thus an important way of overcoming the enduring undersupply of aesthetically appealing gemstones. However, each treatment must be properly and accurately disclosed, as the presence and the type of treatment influences the value of a sapphire significantly. The resulting small number of natural, unheated sapphires of good colour and transparency, compared with their heated and otherwise treated counterparts, underlines their rarity. The sapphire presented here is one such rare example of unheated sapphire.

WITHIN SAPPHIRE

Careful study of the internal features and properties gives valuable insights into the identity, authenticity and sometimes the origin of a gemstone. All these characteristics are the result of the individual history of this specific gemstone, providing a patchy and fragmented - but very personal - diary from its growth in the inner of the earth, its uplift to the surface, to the mining and finally the processing by man.

The growth of the crystal is controlled by the geological setting in which the mineral formed, the pressure and temperature conditions and the specific chemical environment prevailing at that time. To unravel these secrets from this 14.66 ct sapphire, the scientists at the Gübelin Gem Lab have scrutinised its microscopic features, analysed its detailed chemical composition and its physical-structural properties.

Microscopic features
In combination with the magnifying aid of a microscope, the experienced human eye provides an extremely sensitive, powerful and versatile analytical tool. The determination and description of the microscopic characteristics found in a gem - ranging from tiny crystals, fluid inclusions and particles to growth features and minute fissures - provide a comprehensive qualitative survey indispensable for any gemmological conclusion.

Some of the internal features recorded in this sapphire include stacked dust bands and blocks, dust tracks, corroded zircon crystals crossing each other, and black, opaque, cube-shaped crystals with stress fissures.

These inclusions are regularly observed in Kashmiri sapphires, and are potentially helpful indicators to determine their authenticity and origin[2]. Further to these characteristic inclusions, delicate stringers and flakes are also present in this 14.66 ct sapphire.

2 For more information about the inclusions in gemstones contact the Gübelin Academy or consult 'Photoatlas of Inclusions in Gemstones' (see chapter 'Addendum')

Individual text... as seen in this 14.66 ct Kashmiri sapphire.

Chemical features

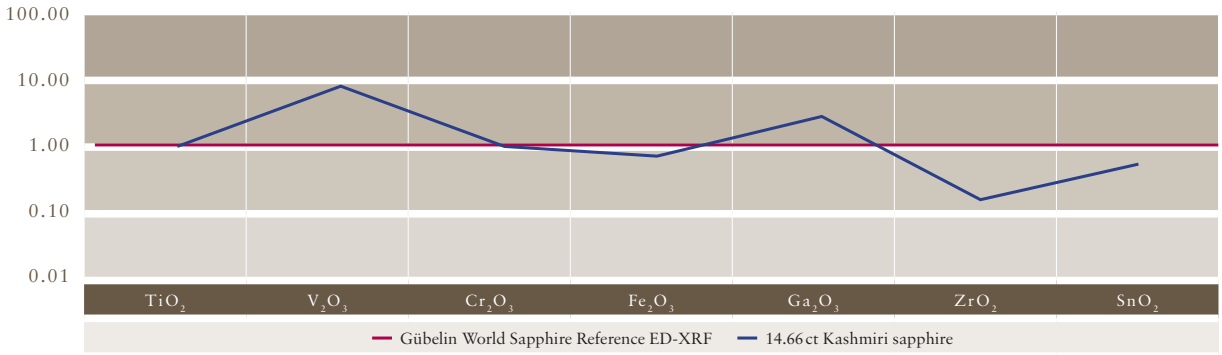
In addition to microscopic features, a number of technologically advanced analytical methods are deployed to allow for a secure determination of a gemstone's authenticity and – with limitations – its origin. These more sophisticated methods can be grouped into spectroscopic and chemical methods. Both types give hints to the type of rock in which the gem formed, and might also reflect alterations imposed by a possible treatment process.

Sophisticated analytical techniques[3] measure the concentration of chemical elements in gems. Aside from the main and minor elements, gemstones also contain other elements present in even smaller concentrations of a few parts per million. These trace elements typically do not have any significant influence on the appearance of the gemstone, but they shed light on the environment in which it grew thousands, millions or even billions of years ago. The type and amount of these elements in a gemstone are often indicative of a specific location and are used by gem labs to determine its country of origin.

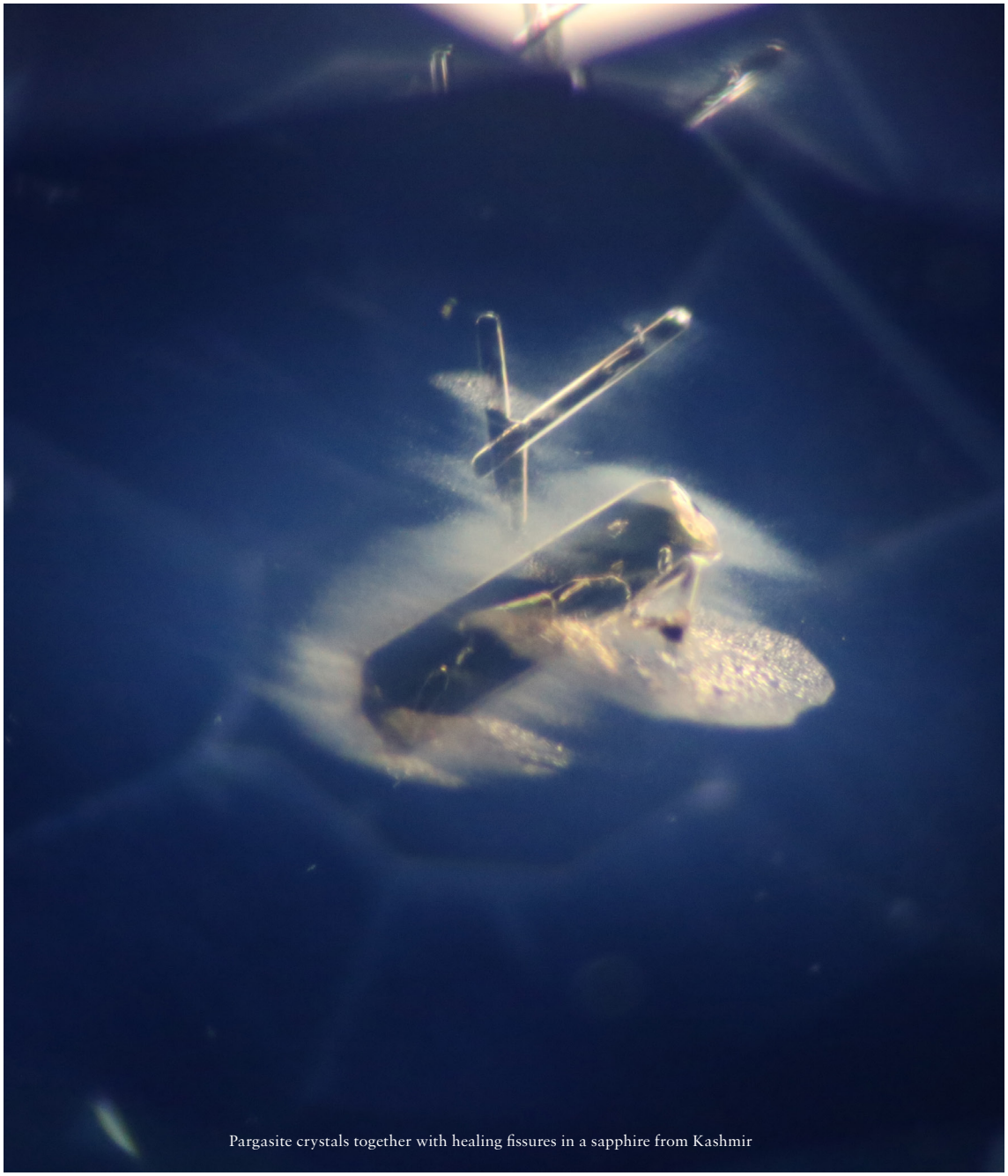
The trace element concentrations of this 14.66 ct sapphire vary slightly to the Gübelin World Sapphire Reference[4], as shown in the trace element diagram. The chemical fingerprint measured in the present gemstone displays the characteristic deviations we expect for a sapphire from Kashmir. This chemical fingerprint is individual and unique for this 14.66 ct sapphire, exactly like the genetic DNA is individual and unique for a specific creature.

[3] For more information about the applied analytical methods visit www.gubelingemlab.com

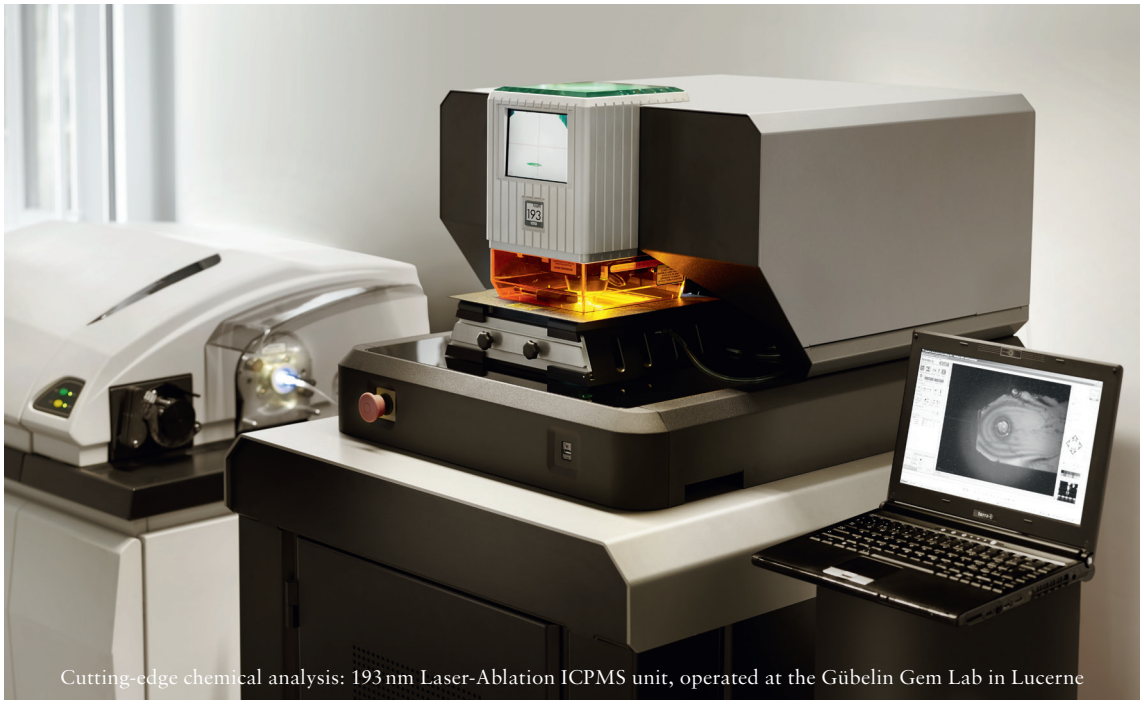
[4] The Gübelin World Reference Sapphire is an empirical trace elemental composition of an assumed sapphire with the averaged and weighted concentration of potentially indicative elements, comprising all commercially relevant deposits worldwide.



Trace element pattern for the 14.66 ct Kashmiri sapphire, gathered by energy dispersive X-ray fluorescence (ED-XRF) spectrometry. The blue line shows the deviations of a selection of trace element concentrations in comparison to the normalised Gübelin World Sapphire Reference, shown in red.



Pargasite crystals together with healing fissures in a sapphire from Kashmir



Cutting-edge chemical analysis: 193 nm Laser-Ablation ICPMS unit, operated at the Gübelin Gem Lab in Lucerne

Spectroscopic features

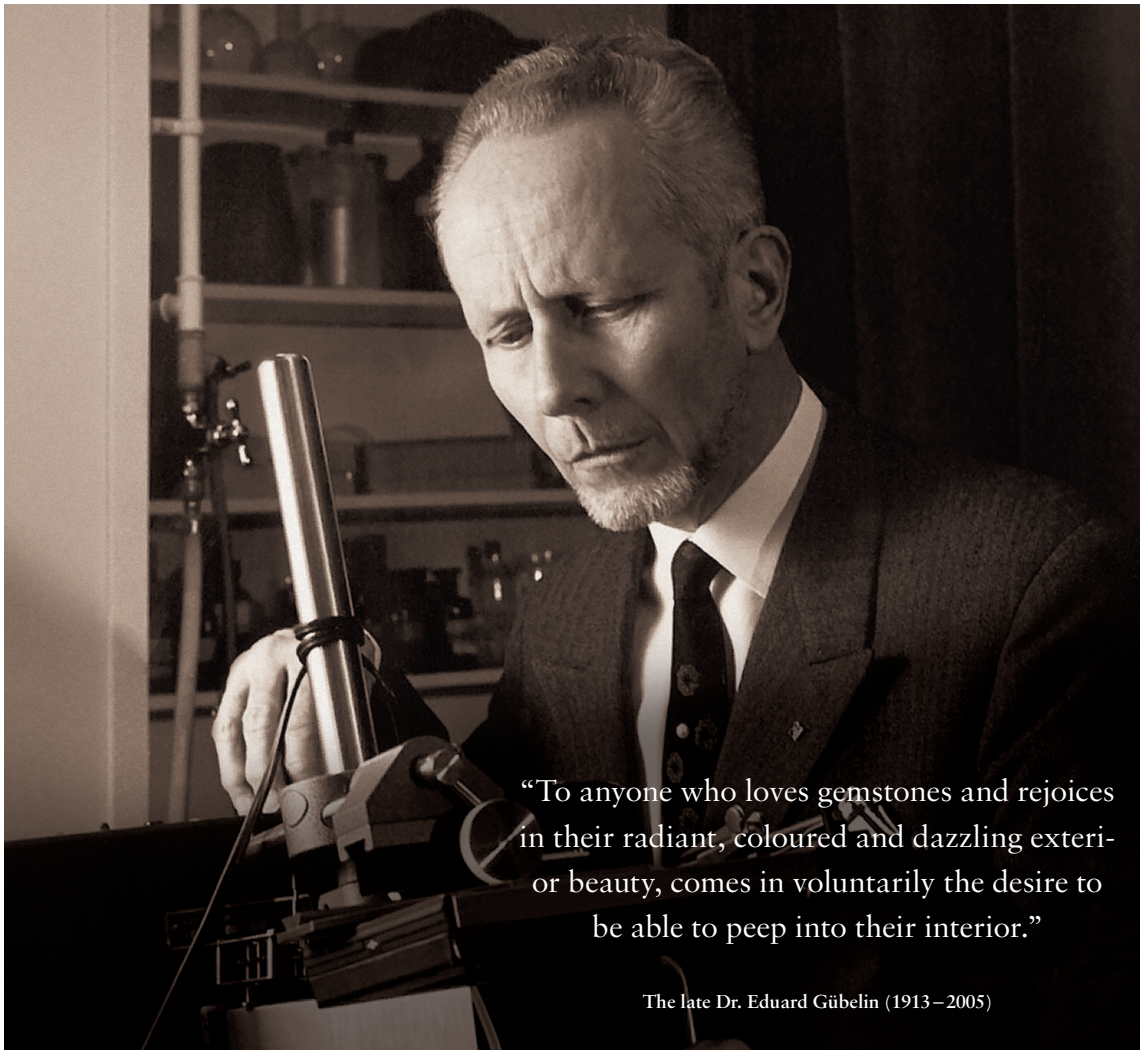
Different methods of spectrometry are applied to help determining possible treatments and the origin of a gemstone. These analytical techniques apply electromagnetic radiation that interacts with the gemstone, providing information about its chemical and structural constituents (i.e. elements, molecules, crystallographic properties) through the characteristic absorbance of visible, infrared and/or ultraviolet light.

Spectroscopy applying ultraviolet to visible light can provide clues on the geological environment in which sapphire formed in the earth's crust.

The present 14.66 ct sapphire shows spectroscopic features typical for sapphires formed in rocks that crystallised during a major geologic event referred to as regional metamorphism.

ABOUT GÜBELIN GEM LAB

The roots of the Gübelin Gem Lab go back to the 1920s. The laboratory's standard of excellence and tireless devotion to the science of gemmology, pioneered by the late Dr. Eduard Gübelin, soon came to be rewarded with international esteem and recognition. Today, the team of the Gübelin Gem Lab is composed of highly trained and experienced professionals who share a passion for the treasures released by the earth and entrusted to our hands by our clients. We combine state-of-the-art analytical techniques, expertise and extensive practical skills when it comes to interpreting gemmological and geological data and rendering a professional opinion on diamonds, coloured stones and pearls. We are committed to maintain the integrity and reliable service that our clients have come to expect from the Gübelin Gem Lab.



ADDENDUM

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Gübelin Academy

Gübelin Academy was established in 2013 to offer unique, fast-track training into the wonderful world of coloured gems. Designed for professionals as well as enthusiasts and connoisseurs, courses cover the basics as well as the advanced history, gemmology and psychology behind the most precious and colourful commodities in the world.

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