G&G

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DIAMOND

Diamond-bearing eclogite xenoliths from the Ardo So Ver dykes. Specimens of gem diamond crystals in rock matrix are almost never found due to the rigorous processing that occurs during diamond mining. Occasionally, a diamond is found in a sample of the kimberlite host rock that brought it to the surface, but finding a diamond in the rock in which it likely crystallized in the earth's mantle is extremely rare. When pieces of the mantle break off and are transported to the surface in a kimberlite magma, they are called *xenoliths* (meaning "foreign rock," because the mantle rocks are not formed from the kimberlite magma itself).

Recently, five small rock samples containing diamond crystals (figure 1) were sent to GIA Research for examination. The samples were submitted by Charles Carmona (Guild Laboratories, Los Angeles) on behalf of owners Jahn Hohne (Ekapa Mining, Kimberley, South Africa) and Vince Gerardis (an occasional trader and collector of unique diamonds and producer of the television series "Game of Thrones"). The specimens were sourced over 25 years ago from a kimberlite fissure mine located 40 miles (65 km) northwest of Kimberley, South Africa. The So Ver mine is located in a group of narrow kimberlite dykes discovered in the 1940s, known as the Ardo dykes, that intruded into Ventersdorp lavas and overlying Karoo shales (M. Field et al., "Kimberlite-hosted diamond deposits of southern Africa: A review," *Ore Geology Reviews*, Vol. 34, 2008, pp. 33–75).

Figure 1. These five diamond-bearing eclogite xenoliths from the Ardo So Ver dykes in South Africa ranged in weight from 2.24 to 12.40 grams, with the largest measuring 2.5 centimeters in length. Photo by Kevin Schumacher.

Mineralogical examination using microscopy and Raman spectroscopy revealed that the rocks were composed primarily of garnet and clinopyroxene and would be classified as eclogite xenoliths (figure 2). In simple terms, eclogites are metamorphic rocks, typically created when basaltic crust from the ocean floor is subducted deep into the earth's mantle where high temperatures and pressures cause chemical reactions that change the basaltic minerals into garnet and clinopyroxene. Eclogites, along with peridotites, are considered the most common mantle host rocks for diamond crystallization. EDXRF chemical analysis of the garnets and clinopyroxenes in these samples showed pyrope mole fractions up to about 49% and jadeite mole fractions up to approximately 31%. These results are consistent with other reported diamond-bearing eclogites (T.F. Fung and S.E. Haggerty, "Petrography and mineral compositions of eclogites from the Koidu Kimberlite Complex, Sierra Leone," *Journal of Geophysical Research*, Vol. 100, 1995, pp. 20451–20473).

Editors' note: Interested contributors should send information and illustrations to Stuart Overlin at soverlin@gia.edu or GIA, The Robert Mouawad Campus, 5345 Armada Drive, Carlsbad, CA 92008.

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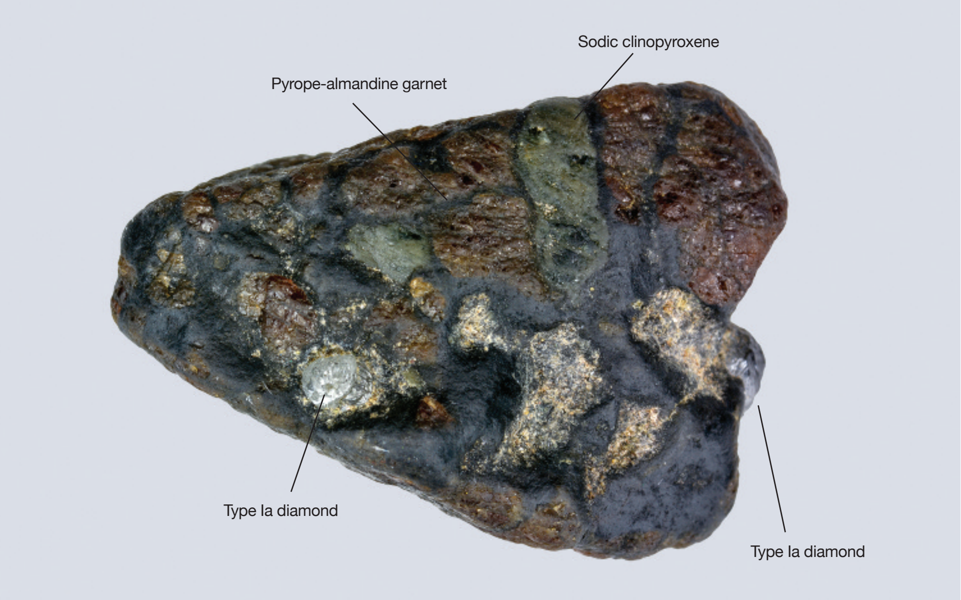

Figure 2. The diamond-bearing xenoliths were composed of pyrope-almandine garnet and sodic clinopyroxene, classifying them as eclogites. Photo by Robison McMurtry.

The diamond crystals in the xenoliths ranged from 1.5 to 4.0 mm in length, and were transparent and near-colorless to pale yellow (figure 3). They occurred as octahedral and combination forms with no visible resorption. No inclusions were visible within the crystals under 10× magnification. FTIR analysis (using an FTIR microscope in reflected light mode) revealed that all of the diamonds were type Ia with abundant nitrogen impurities. Three of the seven diamonds analyzed showed nitrogen impurities dominantly as A-aggregates in concentrations ranging from approximately 420 to 800 ppm.

The data provided here, along with additional ongoing work, will hopefully shed more light on the temperature, pressure, and depth in the earth's mantle where the diamonds crystallized.

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COLORED STONES AND ORGANIC MATERIALS

Cat's-eye calcite from Pakistan. Cat's-eye calcites have been sold at auctions and gem shows for some years, but a gemological description of the material has not been published. Low-quality cat's-eye calcites do exist, such as blue calcites from Mogok, Myanmar, but their chatoyancy is weak. It was very surprising, therefore, to see sharp cha-

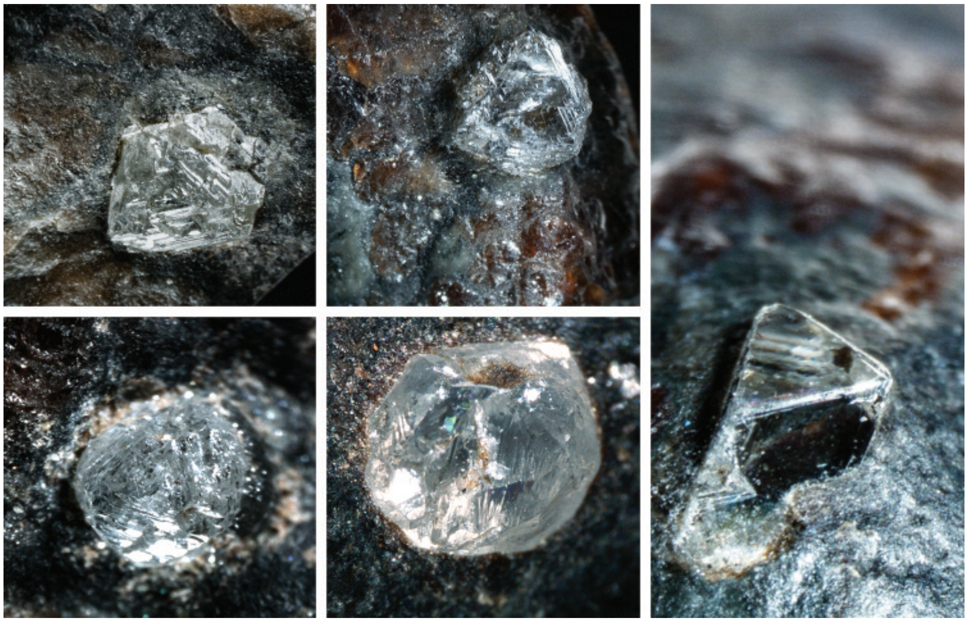

Figure 3. Seven transparent, near-colorless to pale yellow gem diamonds (five shown in these photos) were observed in the eclogite samples, ranging in length from 1.5 to 4.0 mm. Photos by Christopher M. Breeding.

Figure 4. This 57.60 ct calcite from Pakistan shows a cat's-eye. Photo by Jaroslav Hyršl.

toyancy on the beautiful calcite cabochon in figure 4.

The stone, purchased during the Tucson shows in February 2015, came from the Baluchistan province of Pakistan. It weighed 57.60 ct and measured 25.0 × 24.6 × 12.3 mm. It was light green and translucent, without eye-visible inclusions. The spot RI ranged from 1.48 to 1.66, and when rotated the cabochon showed a strong "blink" typical for carbonates. This is significant because the stone resembled chrysoprase; without the rotation, the measured RI in a given position might also approximate that of chrysoprase. There were no lines in the visible spectrum, the stone was inert under UV light, and its specific gravity was 2.72. Viewed in the polariscope, it remained bright, indicating a doubly refractive aggregate. Strong banding (figure 5) was present in the direction of chatoyancy, but the bands were inclined at about 20° angles. The bands were approximately 0.7 mm thick.

Only at 40× magnification did the cause of the chatoyancy become apparent. Numerous tiny needles perpendicular to the chatoyancy were likely evidence of a columnar to needle-like texture. Other than the chatoyancy, this specimen is similar in appearance to the green and orangy yellow calcites from Pakistan that were described in the Fall 2012 GNI section (pp. 217–218). It is the opinion of both the seller and the author that this calcite is from the same locality.

Figure 5. Banding in chatoyant calcite from Pakistan, as seen through the bottom of the cabochon. Photo by Jaroslav Hyršl.

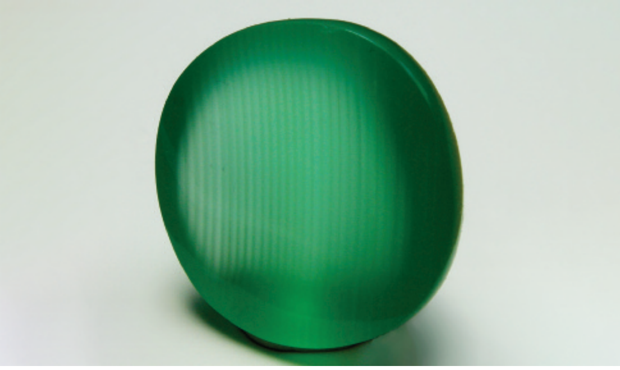

Figure 6. This emerald from Itabira–Nova Era in Minas Gerais weighs approximately 43 ct (approximately 25.30 × 18.10 × 13.75 mm) making it one of the largest Brazilian cat's-eye emeralds examined by the Gübelin Gem Lab. Photo by Janine Meyer.

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Large cat's-eye emerald from Brazil. Gübelin Gem Laboratories (GGL) in Hong Kong and Lucerne recently had the opportunity to examine a translucent emerald, weighing approximately 43 ct, that exhibited a pronounced and well-centered chatoyancy (figure 6). The stone had a spot RI of 1.57 and a hydrostatic SG of 2.73, and it was inert under long- and short-wave UV radiation. Microscopic observation in reflected and transmitted light presented a series of dense elongated, rectangular, and square multiphase inclusions (figure 7).

The UV-Vis absorption spectra showed the characteristic Cr^{3+}- as well as Fe^{2+}- and Fe^{3+}- related bands. In the FTIR absorption spectra, type I and type II water molecules were observed. An intense band at around 2360 cm^{-1} indicated the presence of CO_2, most likely in the multiphase inclusions. Trace-element analysis of the sample with laser ablation–inductively coupled plasma–mass spectrometry (LA-ICP-MS) showed contents consistent with schist- and pegmatite-related emeralds. It also showed lower Li, Cs, and Rb than in emeralds related to highly evolved pegmatites, such as those from Sandawana (Zimbabwe) and Kafubu (Zambia); see J.C. Zwaan et al., "Emeralds from the Fazenda Bonfim region, Rio Grande do Norte, Brazil," Spring 2012 *G&G*, pp. 2–17. The stone's composition was consistent with emeralds from Itabira–Nova Era, Minas Gerais, based on GGL's reference collection and the published literature on the pegmatites of the area (C. Preinfalk et al., "The pegmatites of the Nova Era–Itabira–Ferros pegmatite district and the emerald mineralisation of Capoeirana and Belmont (Minas Gerais, Brazil): geochemistry and Rb-Sr dating," *Journal of South American Sciences*, Vol. 14, No. 8, 2002,

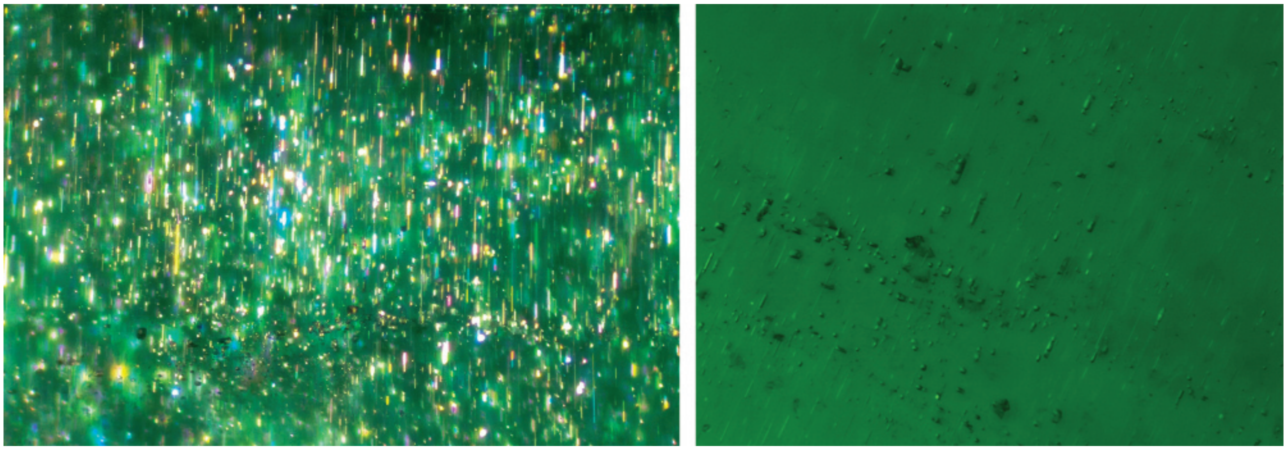

Figure 7. Multiphase inclusions of different shapes and sizes, seen in reflected light (left) and brightfield illumination (right), gave rise to the cat's-eye effect in the Brazilian emerald. Photomicrographs by Wenxing Xu (left) and Stefanos Karampelas (right). Image width 2 mm (left) and 1.2 mm (right).

pp. 867–887). This exceptional stone is one of the largest Brazilian cat's-eye emeralds examined by GGL to date.

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Nonbead-cultured pearls from *Strombus gigas*. Among the saltwater porcelaneous (non-nacreous) pearls, those of *Strombus gigas* gastropods are probably the best known among jewelers and collectors because of their vivid to pastel colors ranging from pink to white to brownish. Also known as "pink pearl," "conch pearl," or "Queen conch pearl," this material was used extensively in Art Deco jewelry, and many designers are now incorporating them into modern pieces. Various articles and books have described the extraordinary beauty, use and related traditions, and early attempts at cultivation of pink pearls (see E. Fritsch and E. Misiorowski, "The history and gemology of the queen conch 'pearls'," Winter 1987 *G&G*, pp. 208–231). The typical structure responsible for the sought-after "flame pattern" was detailed extensively a decade ago (S. Kamat et al., "Structural basis for the fracture toughness of the shell of the conch *Strombus gigas*," *Nature*, Vol. 405, No. 6790, 2000, pp. 1036–1040; H. Hänni, "Explaining the flame structure of non-nacreous pearls," *The Australian Gemmologist*, Vol. 24, No. 4, 2010, pp. 85–88). Found in the Caribbean region, where *Strombus gigas* live and are fished for meat, the pearls had no documented cultured counterpart until the work of Hector Acosta-Salmon and Megan Davis at Florida Atlantic University in 2009.

The Laboratoire Français de Gemmologie (LFG) recently had the opportunity to analyze a parcel of eight samples, presented as cultured conch pearls, from a new farm based in Honduras (figure 8). The colors ranged from white and pinkish white to yellowish orange. The shapes varied from oval to baroque, and weights ranged from 0.21 ct (2.7–3.4 × 4.1 mm) to 3.13 ct (6.5–7.6 × 9.3 mm). Their luster was porcelaneous, and the surface was very smooth and homogenous with no defects. Almost all the samples possessed a typical but subtle flame pattern (figure 9).

Figure 8. These two nonbead-cultured pearls (1.40 and 2.22 ct) from a parcel of eight specimens produced by Strombus gigas *show a light pink and yellowish orange color with a discreet flame pattern. Photo by Olivier Segura.*

Figure 9. These six nonbead-cultured pearls from Strombus gigas *range from 0.21 to 3.13 ct. Inset: Detail of a 0.47 ct pearl, showing a typical thin flame pattern. Photo by Olivier Segura.*

Initial examination revealed no indication of the culturing process, but X-radiography analysis left no doubt about the material's origin. The samples' inner structures revealed a darker central zone, suggesting a less dense material, typical of the graft remainder of the nonbead culture process (figure 10, left). This kind of pattern is not found in the natural conch pearls we have examined in the laboratory (figure 10, right).

According to the farm owners, queen conch pearl culture is undergoing intensive development, and the quality—size, flame pattern, and color—improves with each harvest. While current laboratory techniques are adequate to unambiguously identify nonbead cultured pearls from *Strombus gigas*, the LFG has established a close working relationship with the pearl farm, paying close attention to possible developments in their distinctive inner structures.

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Emmanuel Fritsch

Purple scapolite. Two brownish purple faceted specimens (figure 11) were submitted for identification at the Gem Testing Laboratory, Jaipur, India. The 2.95 ct mixed cushion measured 9.95 × 8.05 × 5.88 mm, while the 1.58 ct mixed oval measured 9.07 × 7.08 × 4.46 mm. Both were relatively clean to the unaided eye. Based on their color, theywere thought to be spinel, but testing soon proved otherwise. Testing yielded the following gemological properties: optic figure—uniaxial; RI—1.549–1.559; birefringence—0.010; and hydrostatic SG—2.63. The material fluoresced a weak orangy red under short-wave UV and was inert under long-wave UV. An absorption band was observed in the yellow-green region using a desk-model spectroscope. In addition, both samples displayed strong dichroism (figure 12) with deep saturated and pale purple colors along the "o" and "e" rays, respectively; this also influenced their face-up color. Under magnification, growth zones and two-directional cleavage planes intersecting at almost 90° were visible. The cleavage planes also contained some fine dendritic films; additionally, the oval specimen had an unidentified brown crystal.

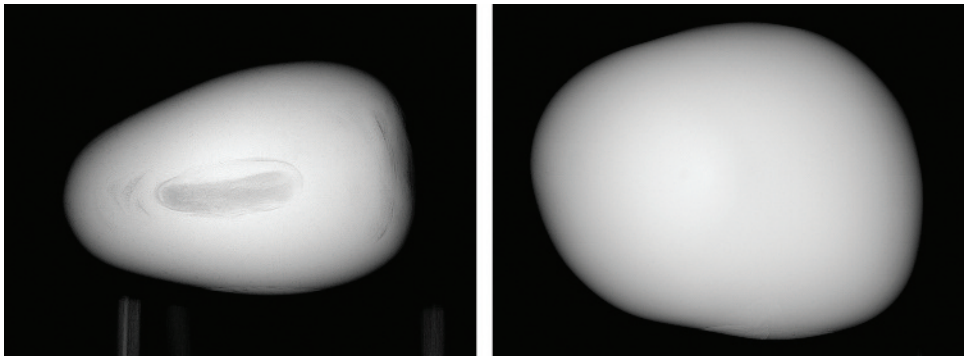

Figure 10. Left: An X-ray of the pearl seen in the figure 9 inset. It shows clear evidence of a nonbead culturing process. Right: An X-ray of a natural conch pearl. Images by Olivier Segura.

Figure 11. These two brownish purple specimens, a 1.58 ct oval and a 2.95 ct cushion, were identified through gemological testing as scapolite. Photo by Gagan Choudhary.

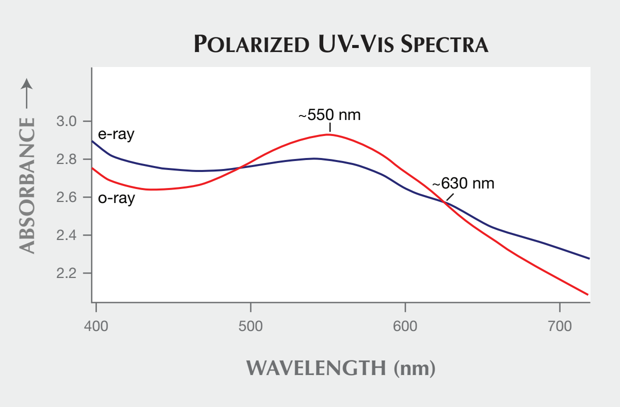

Figure 13. Polarized UV-Vis spectra of the cushion-cut scapolite (shown here in the cushion) displayed Fe-related absorption at approximately 550 nm, which is responsible for the purple color of these specimens.

These gemological properties were consistent with scapolite. Raman spectroscopy confirmed this, showing the characteristic peaks for scapolite at approximately 260, 296, 359, 418, 455, 534, 771, 993, and 1093 cm^{-1}. The Raman spectra suggested the specimens belonged to the marialite end of the meionite-marialite solid solution series of the scapolite group (see rruff.info); this was supported by their RI and SG values (R. Webster, *Gems: Their Sources, Descriptions and Identification*, 5th ed., rev. by P.G. Read, Butterworth-Heinemann, Oxford, UK). Polarized absorption spectra (figure 13) revealed a broad absorption centered at approximately 550 nm in both specimens. The intensity of this absorption was stronger in the o-ray direction, while a weak hump at about 630 nm was also present in the e-ray direction. Such absorption bands, associated with Fe^{3+} ions and producing purple coloration, have been reported in sugilite (Spring 1995 GNI, pp. 66–67); however, additional Fe^{3+} features at approximately 350–365 and 410–420 nm were absent in both the "e" and "o" rays of those specimens. Qualitative EDXRF analysis revealed the presence of Al, Si, K, Ca, Fe, Br, and Sr. Mn is a common impurity resulting in purple coloration of stones such as kunzite or some sugilites, but it was not detected in these specimens. On the basis of absorption spectra and elemental analysis, the purple color of these scapolites appears to be caused exclusively by an Fe impurity.

Purple scapolite is known from many localities such as Myanmar, Tanzania, and Tajikistan, but the client did not know the source of these stones. Although we have seen many purple to violet scapolites in the past, these specimens were different because of their brown color component, reminiscent of spinel.

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SYNTHETICS AND SIMULANTS

Synthetic sapphire with diffusion-induced color and star. The Dubai Central Laboratory recently examined an asteriated blue oval cabochon that weighed 24.58 ct and measured 17.37 × 14.61 × 9.59 mm. The client submitted the sample for an identification report and origin determination.

The cabochon appeared to be completely transparent, evenly colored, and clean. Fiber-optic lighting revealed two sharp, six-rayed white stars with long, straight arms of

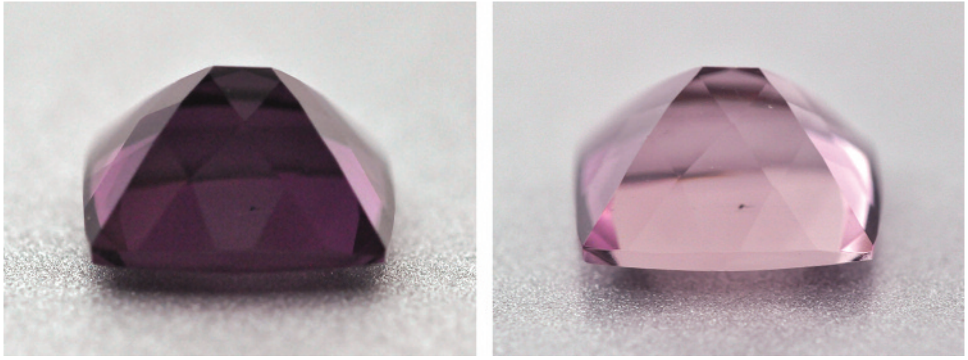


Figure 12. The scapolite specimens displayed intense dichroism (shown here in the cushion), with a deep saturated purple along the o-ray (left) and pale purple along the e-ray (right). Photos by Gagan Choudhary.

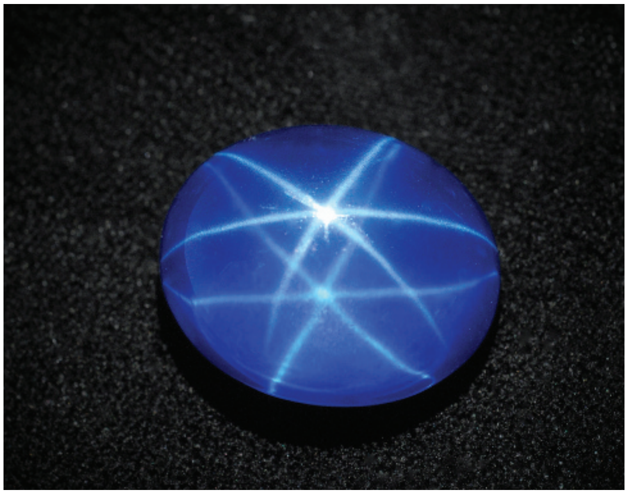


Figure 14. This 24.58 ct star cabochon was a colorless synthetic sapphire whose color and star had been induced by diffusion treatment. Photo by Sutas Singbamroong.

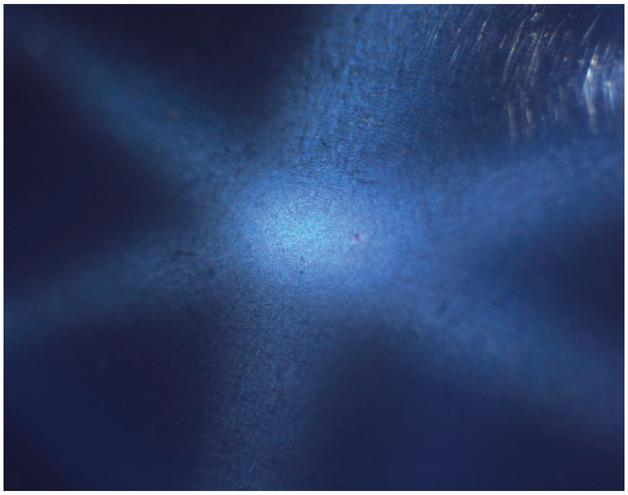
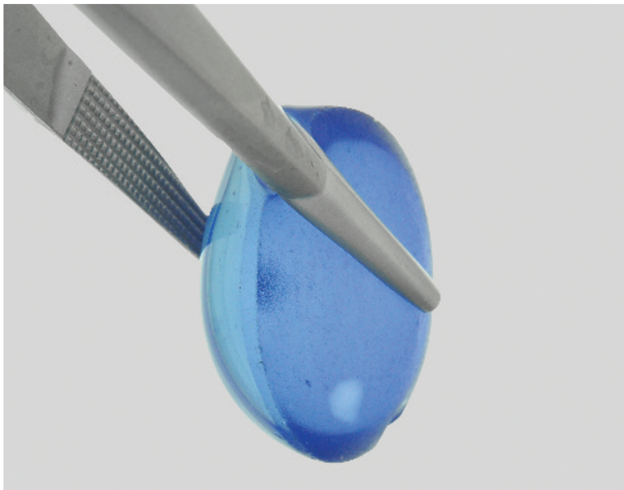


Figure 16. Very fine oriented needle-like inclusions causing the star were confined to a shallow layer below the surface. Photomicrograph by Sutas Singbamroong, magnified 25×.

equal length. The stars seemed to float over the dome surface with internal reflection from the base, very similar to those typically seen in synthetic star sapphires (figure 14).

Standard gemological testing established the following properties: spot RI—1.76; pleochroism—distinct light green and bluish violet (viewed parallel to the girdle); hydrostatic SG—3.98; and fluorescence—inert to both long- and short-wave UV radiation. No characteristic absorption spectrum was seen with a desk-model spectroscope; a faint absorption band was observed at about 560 nm. These properties were consistent with sapphire, though the sample did not show the Fe line at 450 nm commonly seen in natural blue sapphire. Observation of the cabochon immersed in water with diffused transmitted light revealed shallow coloration and a colorless circular area of repolishing (figure 15). This suggested that the specimen owed its color to a diffusion process. The melted appearance of the cabochon's base confirmed that it had been subjected to the heat required for diffusion treatment. Microscopic examination showed only a few small melted fingerprint-like inclusions near the surface, and very fine oriented needle-like inclusions confined to a shallow layer below the surface (figure 16). No curved color banding or angular color zoning was present. Higher magnification indicated that the oriented needles were approximately 5–25 microns long. Further examination with immersion in methylene iodide between crossed polarizers, viewing parallel to the optic axis direction, uncovered the distinct Plato lines strongly indicative of Verneuil synthetic origin.

Figure 15. Immersed in water and viewed with diffused transmitted light, the star cabochon showed shallow coloration with a colorless circular area of repolishing. This feature, along with the melted appearance of the base, indicated that the color and asterism had been produced by a diffusion process. Photo by Sutas Singbamroong.



EDXRF chemical analysis revealed traces of Ti, Fe, and V; no Ga, Cr, or other trace elements were detected. Unoriented UV-Vis-NIR absorption spectroscopy showed two broad bands, one centered at about 330 nm due to Fe^{3+} ions, and one with maxima at about 565 nm due to Fe^{2+}-Ti^{4+} intervalence charge transfer (figure 17). No Fe^{3+}-related sharp bands at approximately 375, 390, and 450 nm were seen.

This combination of properties and features indicated that colorless synthetic sapphire was used as a starting material, and both the color and the asterism were produced by a diffusion process.

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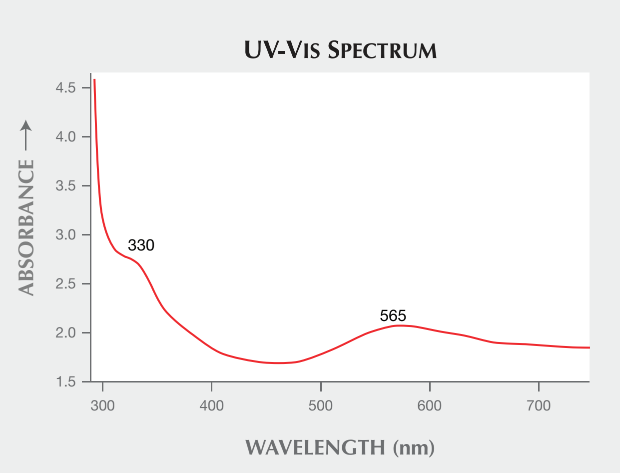


Figure 17. An unoriented UV-Vis-NIR spectrum of the diffusion-induced star synthetic sapphire exhibited two broad bands centered at about 330 and 565 nm, the latter of which is typically responsible for sapphire color.

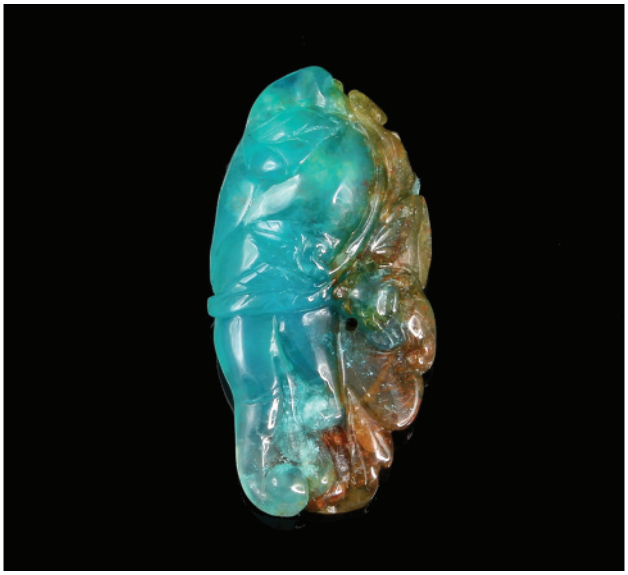


Figure 18. The eye-catching carving weighing 18.43 ct and measuring 31.7 × 15.7 × 7.6 mm, submitted for identification as blue chalcedony. Photo by Larry Tai-An Lai.

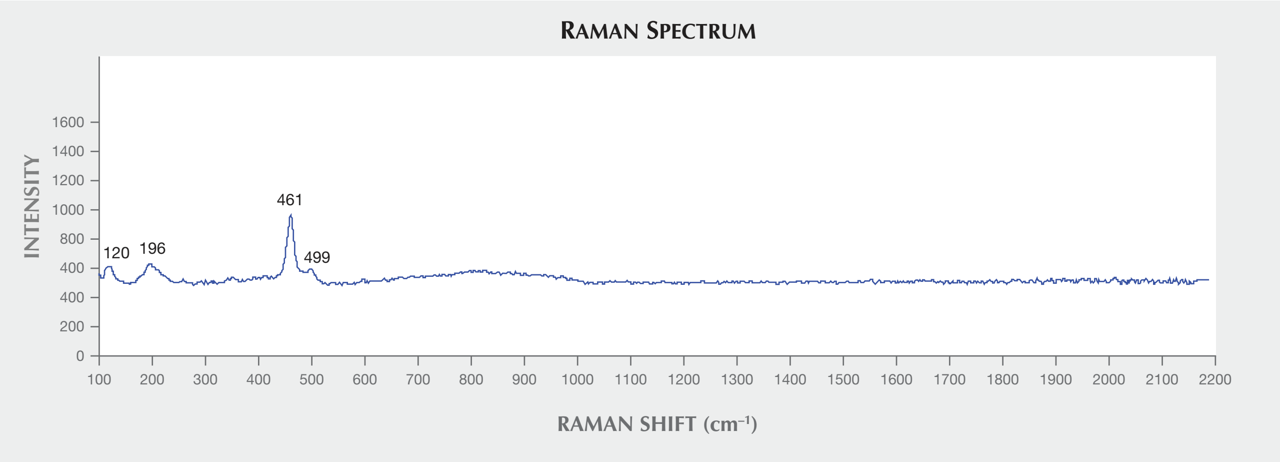
TREATMENTS

Blue chalcedony partially filled with epoxy resin. Blue chalcedony is one of Taiwan's most famous stones; there, high-quality blue chalcedony is sometimes prized as much as jadeite jade. Compared with production from sources such as the United States, Indonesia, Peru, Mexico, and Chile, chalcedony from DuLan Mountain in Taitung, in southeast Taiwan, reveals fine texture and a saturated blue color. Locals and tourists collect the stone as it symbolizes the national spirit, and its value seems to rise year after year.

Local merchants often sell blue chalcedony under the name "Taiwanese blue sapphire," leading to confusion among consumers who believe they are purchasing sapphire. Imitations and treatments are also of concern in the market, with blue opal the most likely imitation to confuse would-be purchasers at first glance. Dyed quartzite and dyed chalcedony also rank among the more common imitations encountered.

The Lai Tai-An Gem Lab in Taipei recently received for identification an 18.43 ct carving measuring 31.7 × 15.7 × 7.6 mm (figure 18). The client claimed the uneven blue and brown translucent item was blue chalcedony. The spot RI of 1.53, SG of 2.55, and FTIR results were consistent with published values for blue chalcedony. Raman peaks at 120, 196, 461, and 499 cm^{-1} (figure 19) confirmed the identity but displayed additional peaks not related to blue chal-

Figure 19. Raman peaks at 120, 196, 461, and 499 cm^{-1} matched the pattern expected for blue chalcedony.



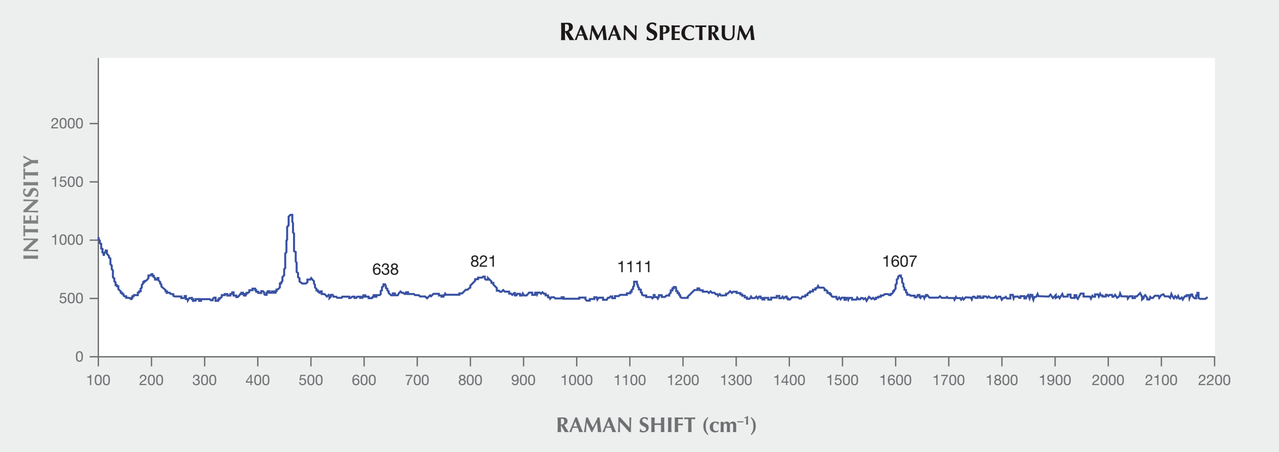


Figure 20. The blue chalcedony's Raman peaks at 638, 821, 1111, and 1607 cm^{-1} matched those expected for epoxy resin.

cedony (figure 20). Examination with a gemological microscope at 40× magnification, which was increased in increments up to 60×, revealed a structure consistent with blue chalcedony but also explained the source of the suspicious Raman peaks: numerous clear bubbles of different sizes at the border of the blue- and brown-colored areas, as seen in figures 21 and 22. The evidence pointed to an epoxy resin as the foreign material; a moderate blue reaction under long-wave UV seemed to confirm a partially filled portion on the carving. Additional Raman analysis on the area in question showed peaks at 638, 821, 1111, and 1607 cm^{-1} (again, see figure 20), as expected for epoxy resin.

In our experience, blue chalcedony is seldom treated, and such treatment is usually applied to repair or conceal cavities or fractures. Even when a filling is only partial, as in this example, traders should disclose any treatments to their clients.

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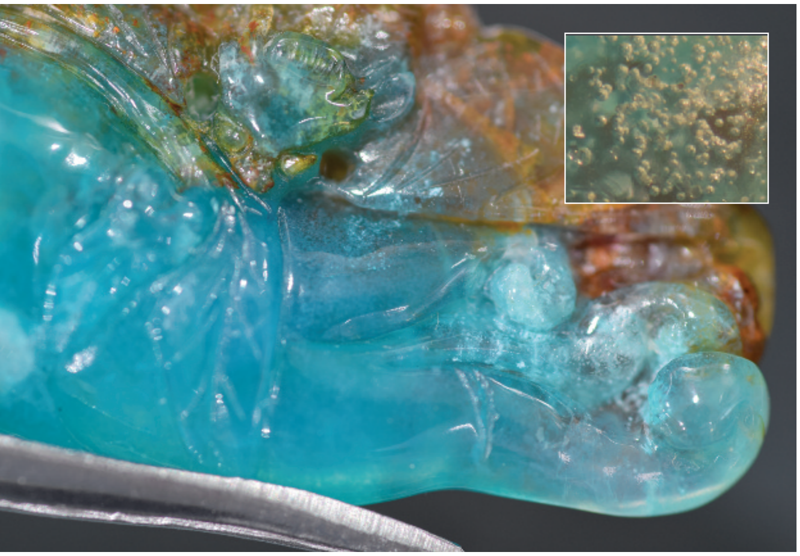
Figure 21. Numerous transparent bubbles of different sizes were visible within a treated portion of the blue chalcedony carving at the border of the blue and brown areas. Photo by Larry Tai-An Lai; inset magnified 60×.



An unusual filled ruby. A 12.12 ct corner-cut rectangular red stone (figure 23) was submitted to the Laboratoire Français de Gemmologie (LFG) for analysis. The sample's refractive index, specific gravity, and Raman spectrum confirmed its identity as a ruby. It fluoresced a medium to strong red in long-wave UV radiation, and a weaker red in short-wave UV. Under magnification, it showed fairly dense accumulations of long needles, some of them rather flat and most of them iridescent (figure 24). Many parallel twin lamellae crossed the gem (figure 25). There was no indication of thermal enhancement. The inclusions and chemical composition were consistent with ruby from Myanmar.

Figure 22. The epoxy resin area as seen through a gemological microscope. Photo by Larry Tai-An Lai; magnified 40×.

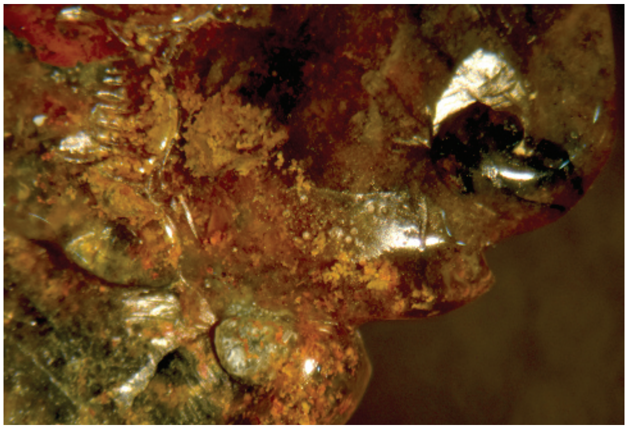


Figure 23. This 12.12 ct red stone showed features typically associated with a natural ruby. Photo by A. Droux/LFG.

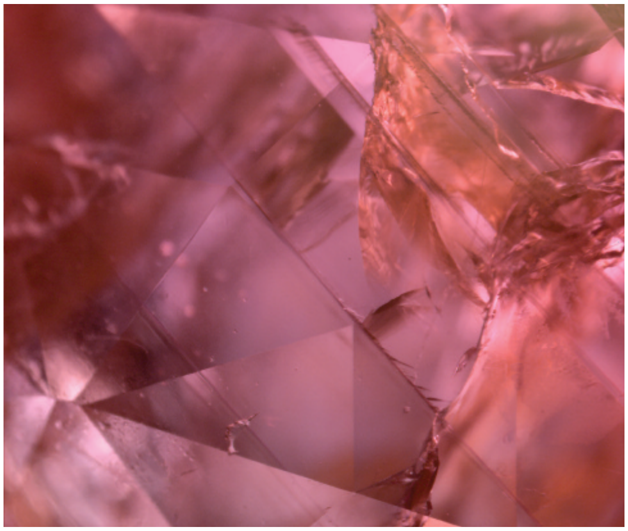
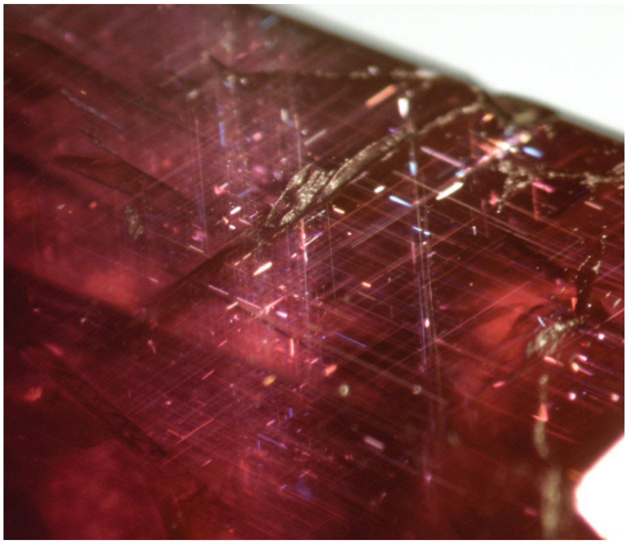


Figure 25. Contrasted twin lamellae in this ruby are similar to those often observed in material from Myanmar. Photomicrograph by A. Droux/LFG; magnified 60×.

Many fractures were apparent, with smaller ones following the twin lamellae. Examining the surface of the fissure, it became apparent that some material was present inside the fractures, and in some locations had left a whitish trace in the fracture close to the surface. Deeper within the fractures there were flat bubbles and networks of cracks similar to those seen in drying mud, with a somewhat dendritic aspect.

Figure 24. Dense accumulations of iridescent needles were visible within the red stone. Photomicrograph by A. Droux/LFG; magnified 50×.



These same patterns were observed with the drying of oil in emerald (H. Hänni, "Gemmology, an oil well in your garden?" *Schweizer Uhren & Schmuck Journal*, No. 3, 1988, pp. 461–464; H. Hänni et al., "How to identify fillings in emeralds using Raman spectroscopy," *Jewellery News Asia*, No. 145, 1996, pp. 154–156). Under the heat of the optical fiber used for observation, some droplets formed at the outcrop of the fissure, indicating that the material was either liquid or had a melting point just above room temperature, suggesting that the filler could be either oil or wax.

Exposure to the ultra-short UV wavelength of the DiamondView revealed the filling material inside the fractures (figure 26). Infrared absorption confirmed the presence of an organic material in the fractures (figure 27). "Oil" peaks at about 2852, 2925, and 2955 cm^{-1} were at positions nearly identical to those observed for oil-impregnated emerald (P. Zecchini and P. Maitrallet, "Que peut apporter la spectrographie infrarouge dans l'étude des émeraudes?" In D. Giard, Ed., *L'émeraude: Connaissances Actuelles et Prospectives*, Association Française de Gemmologie, Paris, 1998, pp. 81–96; M. Johnson et al., "On the identification of various emerald filling substances," Summer 1999 *G&G*, 82–107). The peaks were accompanied by sharp features around 3600–3700 cm^{-1}, attributed to kaolinite group minerals (A. Beran and G. Rossman, "OH in naturally occurring corundum," *European Journal of Mineralogy*, Vol. 18, 2006, pp. 441–447). The band at 2463 cm^{-1} was produced by CO_2.

On the basis of microscopic observation and infrared spectroscopy, we concluded that the ruby showed moderate indications of clarity enhancement—with oil, in this case. Although glass-filled rubies are common on the market today, oiled corundum is much rarer. This oiled

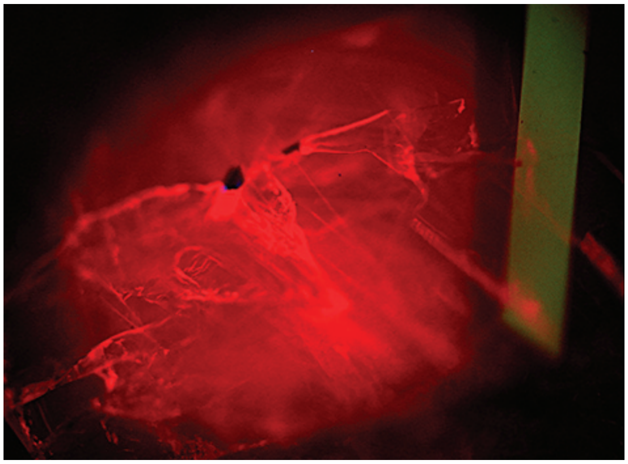


Figure 26. DiamondView imaging of the ruby showed the filling of fractures. Image by A. Droux/LFG.

ruby was also unusual for its size and evidently Burmese origin.

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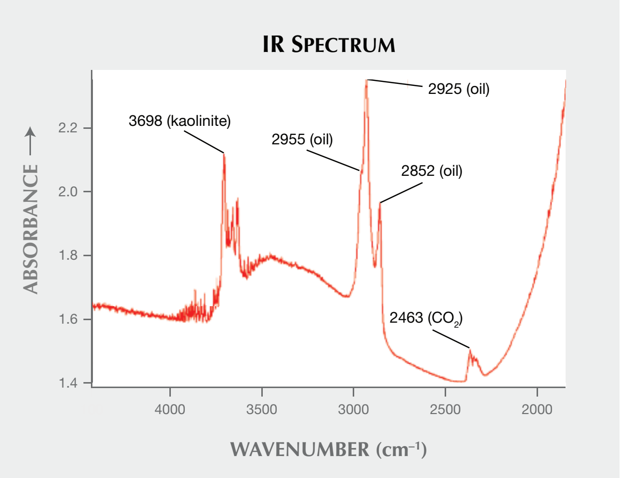
Emmanuel Fritsch

Unusual combination of inclusions in synthetic star sapphire. Recently, an 8.975 ct blue oval cabochon exhibiting asterism (figure 28) was submitted to the Indian Gemological Institute – Gem Testing Laboratory in Delhi for identification. Standard gemological testing revealed a spot RI of 1.76 and hydrostatic SG of 4.00. These properties were consistent with sapphire.

Microscopic examination at 25× magnification showed three-directional "needles" intersecting at 60°/120° angles (figure 29). Under 60× magnification, the three-directional needles appeared as a series of dots. The expected solid rutile needles were not resolved at the magnification used. These three-directional needles were further surrounded by a coarse hexagonal boundary (again, see figure 29) made up of gas bubbles (figure 30, left). The presence of the hexagonal boundary initially led to an impression of natural origin, but the presence of gas bubbles and chalky blue fluorescence under SWUV confirmed a synthetic origin. These three-directional needles (series of dots intersecting at 60°/120° angles) with possibly unresolved rutile needles are responsible for the six-rayed asterism. When the stone was checked in the DiamondView, it showed a dark blue ring around the gas bubbles (figure 30, right). This was the first time this author had seen such a reaction to gas bubbles in a synthetic material in the DiamondView.

Figure 27. Infrared spectrum of the ruby showing the same absorptions as for the filling of some emeralds.



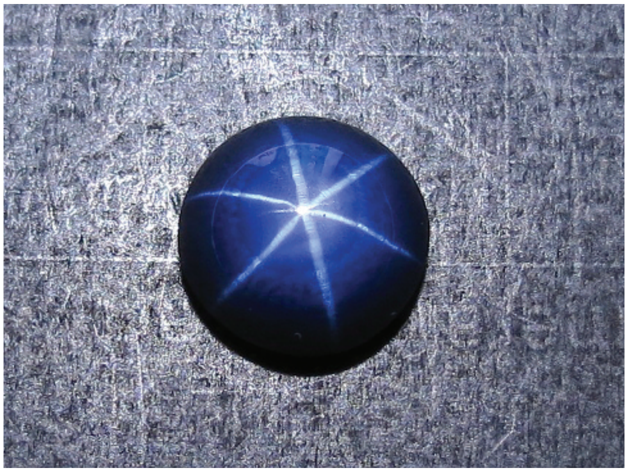
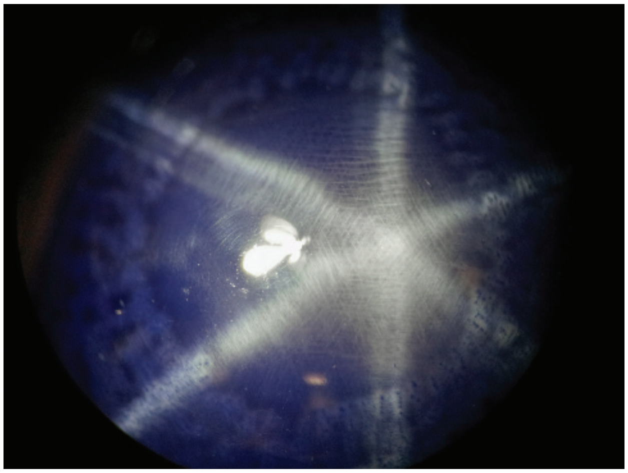


Figure 28. This 8.975 ct specimen was identified as synthetic star sapphire. Photo by Pragati Verma.

Figure 29. Three-directional needles intersecting at 60°/120° angles. Also notice the coarse hexagonal boundary created by the gas bubbles surrounding the three-directional needles. Photomicrograph by Meenakshi Chauhan; field of view 11.30 mm.



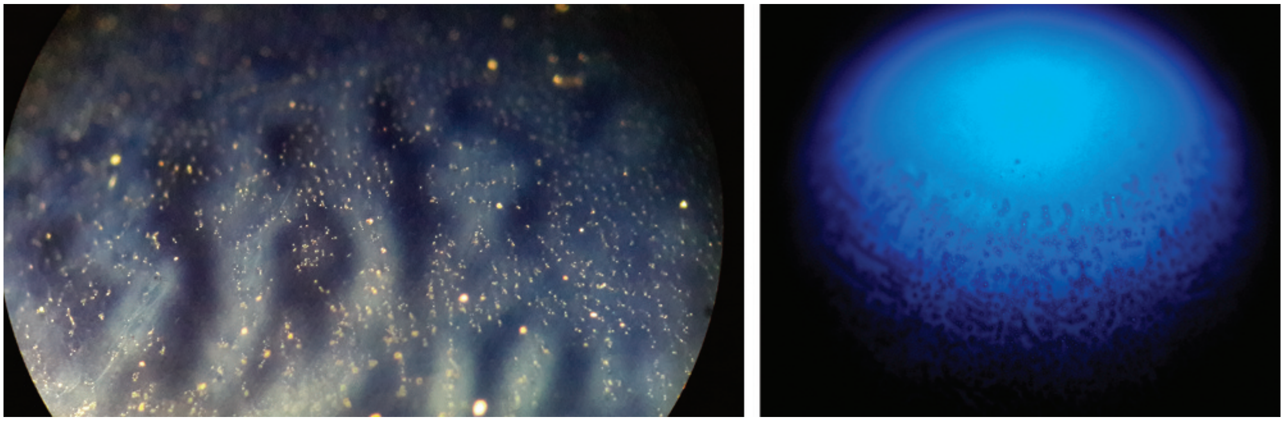
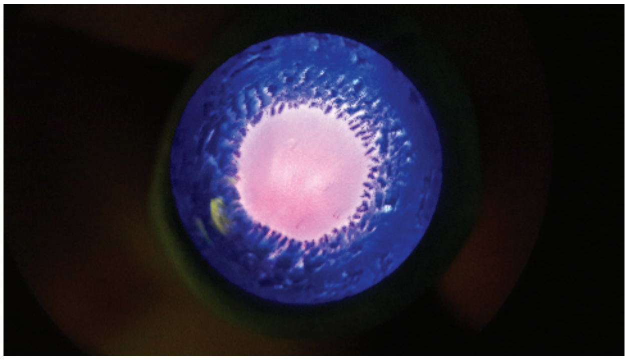


Figure 30. Left: Gas bubbles appearing as whitish dots under 50× magnification. Right: DiamondView imaging of the gas bubbles. Notice the dark blue areas visible around the gas bubbles, which were inert to UV. This may indicate compositional variation where the whitish and dark areas are visible in the left-hand image. Photomicrograph and DiamondView image by Pragati Verma.

The three-directional intersecting needles that give rise to asterism in synthetic sapphire are a by-product of the titanium oxide added in the feed material for crystal growth. As mentioned above, the three-directional needles observed here were actually resolved microscopically as a series of dots, and the expected rutile needles were not observed. After growth, the boule was likely reheated, causing the previously disseminated titanium oxide to precipitate out as needles of rutile (R. Webster, *Gems: Their Sources, Descriptions and Identification*, 5th ed., rev. by P.G. Read, Butterworth-Heinemann, Oxford, UK).

When the sample was viewed in transmitted light, it appeared transparent in the center but translucent from the sides, resembling an eye (figure 31). No gas bubbles were visible in the center of the cabochon, but there were increasingly higher concentrations of gas bubbles toward the edges. Under SWUV, this material showed chalky blue fluorescence confined to the central transparent part. Such hexagonal patterns were previously reported in synthetic sapphire in *G&G* (Summer 2007 GNI, pp. 177–178). While observing any stone, one must not consider a single inclusion or characteristic, such as the hexagonal boundary observed here, as an indicator of natural or synthetic origin. There must be a thorough examination of all inclusions and properties (in this case, gas bubbles and chalky blue fluorescence under SWUV) to conclude the origin of a material.

Figure 31. Under fiber-optic light, the material showed an eye-like pattern, with a pink and transparent center and blue and translucent sides. Also notice the hexagonal boundary made from the gas bubbles. Photomicrograph by Pragati Verma; field of view 22.94 mm.



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MORE FROM TUCSON 2015

Diamond slices. Gem and mineral slices were very popular at this year's Tucson shows, with opaque, translucent, clear, included, rough-edged, and finely shaped slices found in every color and price point. Materials such as fossilized coral, rutilated quartz, lacy agates, labradorite, chalcedony, watermelon tourmaline, sapphire, and diamond were on display. A wide variety of sizes were available as well, with pieces measuring several centimeters in diameter finding their way into dramatic necklaces, while some high-end jewelry and collector pieces used extremely thin and small gem slices.

Notably, the third-place winner in the bridal category of the 2015 AGTA Spectrum Awards was a pair of platinum and diamond earrings designed by Michael Endlich, featuring three pairs of diamond slices in addition to several pavé-set diamonds (figure 32). Endlich finds this gem material unusual, exciting, and subtle. Most of his clients have never seen these slices and are fascinated once they

Figure 32. These AGTA Spectrum Award–winning earrings, designed by Michael Endlich, incorporate three matched pairs of diamond slices totaling 7.07 carats into a platinum setting. Photo courtesy of Michael Endlich.

realize they are looking at diamonds. He goes through thousands of slices to select those he will incorporate into pieces. He particularly likes slices with patterns, such as concentric squares. This material is relatively new to the marketplace, and he first came upon it six years ago. Even though more diamond dealers offer them today, few slices have the distinct patterns Endlich looks for.

At the GJX show, Punya Malpani (Dynamic International, Hong Kong) discussed the diamond slice market with us and shared some particularly eye-catching and rare examples. He noted that the price of these goods has gone up approximately 20× in the past decade, as jewelry designers continue to go beyond traditional faceted gem shapes. There is also a strong collectors' market for this material, as the unique nature of each piece adds to its appeal. In fact, there are very few larger slices of diamond in the marketplace, because the outer "skin" from the rough material was generally discarded before this niche market was identified. Unlike faceted diamonds, inclusions increase the value of slices, especially if they are unusual, striking, and highlight growth patterns.

Figure 33. The three-rayed "trapiche" pattern is found in less than 0.1% of diamond slices, and rarely is it so distinct. The collection of nine slices, including these four samples, took years to assemble. Photo by Jennifer Stone-Sundberg, courtesy of Dynamic International.

Figure 34. These two large colorless diamond slices from the same piece of rough show dramatic patterning. Photo by Duncan Pay, courtesy of Dynamic International.

Diamond slices today are mainly cut by laser and can vary widely in diameter and thickness, though diameters greater than one centimeter are difficult to come by, as rough in that size is much rarer. Many slices are slightly faceted to add some sparkle to the finished piece. Most of the diamond slices maintain the rough outline, as this can add to the appeal, but some are shaped into fanciful and matched sizes such as the "snowflakes" Malpani showed us.

Three-rayed "trapiche" diamond slices are among the most scarce and striking, as they contain a recognizable radiation-symbol pattern (figure 33). These are only found about once in a couple of thousand slices, and even then it is rare to find distinct coloring. The collection shown in the photo took years to assemble.

Malpani's most prized slices are the matched pair of large colorless diamond slices with dramatic white patterning (figure 34). These two pieces, separated from a skin cut of a large piece of rough, date back about 20 years. This is unusual, as such slices were not retained in the past.

It appears that the use of gem slices in jewelry has penetrated the high-end market. Since diamond is clearly a prominent material capitalizing on this gem "cut" with natural appeal, we can expect this trend to continue.

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Large Namibian demantoid garnet. At the GJX show, Stefan Reif (Tsuen Wan, N.T., Hong Kong), showed us an 11.63

ct round brilliant demantoid garnet. It was an exceptional stone of intense vibrant green with a touch of blue (figure 35, second from the left). According to Reif, the original rough weighed approximately 46 ct—about 9 grams—making the yield a little over 25%. This is an exceptionally large gem for Namibia's Green Dragon mine, where the bulk of production is suitable for small calibrated gems.

Namibian demantoid was first discovered in the 1990s (Fall 1997 GNI, pp. 222–223). The current production came from an open-pit, hard rock mine with an annual production between 5,000 and 10,000 carats. According to Reif, the local geology includes marble, pegmatite, and rhyolite. The distribution of demantoid pockets within these rocks is irregular and difficult to predict. Beside the geological challenges, water is scarce, and temperature extremes range from freezing at night to baking desert heat in the daytime.

The Green Dragon mine is renowned for its production of well-proportioned rough. This material is suitable for cutting smaller gems into 2–3 mm sizes in a range of colors from slightly bluish green (top color) through "lemongrass" green to greenish yellows and reddish browns. These are used for precision-cut calibrated and melee-sized goods placed as accent stones in high-end jewelry. Most of the cutting is done in Thailand, and the yield is approximately 10% due to the desire for well-proportioned cut gems. Besides precision-cut demantoid and andradite garnet in calibrated sizes, Reif also cuts to higher tolerances for the watch industry, producing 3 × 2 mm tapered baguettes for watch bezels.

Even in these small sizes, well-cut gems display high luster and very distinct fire, making them an excellent visual alternative to diamond. Rough suitable for gems of 6.0 mm (about 1 ct) is much rarer, but material for larger gems does come up once in a while.

Figure 35. This selection of andradite garnet from Namibia's Green Dragon mine includes an 11.63 ct demantoid round brilliant, an unusually large stone for this source. Photo by Robert Weldon/GIA, courtesy of Green Dragon mine.

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Green nephrite jade attracts buyers in Tucson. The Jade West Group, a leading nephrite jade company in North America for the past 30 years, drew many buyers at their 2015 GJX booth. Prized in Chinese culture for over 5,000 years, nephrite regained its momentum in the domestic Chinese market after the 2008 Beijing Olympics, when it

Figure 36. This photo shows half of the Polar Pride jade boulder discovered at the Polar jade mine in British Columbia. The original boulder weighed 18 tons. Courtesy of Jade West Group.

Figure 37. This strand of 41 nephrite beads is comprised of material from the Polar mine. Photo by Robert Weldon, courtesy of Jade West Group.

was used in the gold, silver, and bronze medals. At the same time, the Chinese government launched a campaign promoting the significance of nephrite jade in the country's history. This reignited the love of nephrite among the Chinese people, and the increasing demand and price drove a new Canadian jade rush in northern British Columbia (BC).

A tectonic belt running from Alaska through BC to Mexico favored the formation of nephrite. Tectonic and lithological contacts are the predominant ore body controls. BC has more than 50 known nephrite deposits, distributed mainly along tectonic inclusions of country rocks, dikes, and mafic rock layers within serpentinites, or along the contact between serpentinite and the wall rocks. This formation is very similar to other green nephrite occurrences all over the world. Nephrite is found both *in situ* and as boulders; the Polar Pride boulder, found in BC's Polar mine, is a well-known example of the latter (figure 36).

Nephrite boulders are the products of erosion from the last ice age. They are usually drilled or sawed to test the quality, and only the good-quality material is transported for sale. While some of today's nephrite is from boulders, primary deposits supply the bulk of BC's production. This is partially due to the lack of high-quality boulders; however, the growing demand and price for nephrite also make it profitable to mine the primary deposits.

According to Kirk Makepeace, president of Jade West Group, the price of jewelry-grade jade from BC (figure 37) experienced at least a tenfold increase from a decade ago. Before 2008, top-quality nephrite from BC sold for about \$20 a kilo; equivalent stones now range from \$200 to \$2,000 a kilo.

The annual production of BC nephrite jade is about 400 tons. Most of the output comes from four active mines; together, they produce about three-quarters of the world's high-quality green nephrite. Of these four, Jade West operates the Polar, Ogden, and Kutcho jade mines. Jade West also deals with material from Wyoming and Siberia. Over the last 10 years, approximately 90% of the company's BC production was exported to mainland China; the remaining 10% was sent to Taiwan, Vietnam, and Thailand.

Figure 38. This Canadian jade fish hook pendant features a piece of nephrite from the Kutcho mine. This is one of the styles Jade West has customized for the North American market. Photo by Robert Weldon/GIA, courtesy of Jade West Group.

Jade West sends almost all of its rough nephrite to Guangdong for carving and jewelry manufacturing, with designs customized for different markets (figure 38). In addition to traditional carvings and jewelry, there is demand from Southeast Asian countries for giant Buddha statues and from Western countries for home decor. This demand leads Mr. Makepeace to be very optimistic about the future of BC nephrite.

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Baroque pearls. Several vendors at this year's Tucson gem shows, including AGTA and GJX, carried baroque pearls in an assortment of colors, sizes, and qualities. A common request from buyers was for pairs in larger sizes. The increased availability of less-expensive, quickly produced freshwater baroque cultured pearls from China in a wide range of sizes has had a noticeable impact on the market, as more designers are experimenting with them and more consumers are seeking them out. At the same time, sizable high-quality baroque pearls from the Philippines and Australia, particularly golden pearls, are becoming harder to

Figure 39. This hummingbird brooch features a 20.0 mm silver pink baroque pearl. It is surrounded by 319 diamonds (2.54 carats total), with a single 0.03 ct ruby eye mounted in 18K white gold. Photo by Robert Weldon/GIA, courtesy of Ron Greenidge and Emiko Pearls International.

Figure 41. This brooch depicting four swallows contains two golden "keshi" cultured pearls from the Philippines and two silver blue Australian South Sea keshi, ranging from 9 to 11 mm. They are surrounded by 211 yellow diamonds totaling 1.70 carats, 170 white diamonds totaling 1.23 carats, and eight ruby eyes totaling 0.28 carats, all set in white and yellow 18K gold. Photo by Robert Weldon/GIA, courtesy of Ron Greenidge and Emiko Pearls International.

find, as noted by AGTA exhibitor Ron Greenidge (Emiko Pearls International, Bellevue, Washington).

Emiko Pearls, founded in 1980, specializes in large and unusual classic and baroque pearls of gem and near-gem quality, namely South Sea, Tahitian, and "keshi" cultured pearls in golden, silver blue, gray, and pink hues. Greenidge showed us several examples of handmade jewelry that maximized the potential of exceptional baroque cultured pearls, particularly "jumbo" baroques in the 20–22 mm range. In response to market conditions, Emiko has transitioned over the past decade from offering loose pearls to almost exclusively producing finished goods.

Figure 40. The whimsical design of this octopus brooch accentuates the 17.3 mm gray baroque Tahitian cultured pearl set in black-plated 18K gold. Also featured are 374 black diamonds totaling 3.78 carats, 26 yellow diamonds totaling 0.33 carats, and 169 white diamonds totaling 1.64 carats. Photo by Robert Weldon/GIA, courtesy of Ron Greenidge and Emiko Pearls International.

Greenidge's love of jewelry, paired with the increasing scarcity of high-quality larger pearls, has led the company to make one-of-a-kind pieces that showcase the uniqueness of individual pearls. Instead of finding pearls to place into existing jewelry, the firm designs jewelry around the pearl. The results are exquisite with whimsical and natural qualities, as seen in their hummingbird and octopus brooches (figures 39 and 40). Each piece is hand-welded from 18K gold, with diamonds and other precious stones added. The pieces, which take several months to create, are sought by clients in Asia and Europe (particularly China, Thailand, and Italy). High-end stores with one or two locations are the primary buyers, as Emiko does not mass-produce any of its designs. The swallow pin in figure 41, complete with forked tails, uses multiple keshi cultured pearls in two tones with matching diamond and gold colors.

As the consumption of pearls, including large baroque cultured material, increases with greater availability of lower-priced goods, expect to see other suppliers of high-quality pearls strive to differentiate themselves as Emiko has done.

Jennifer Stone-Sundberg

Figure 42. The Namya mining area is about 300 km north of Mogok. Namya, Mogok, and Mong Hsu together form a "ruby triangle" in northern Myanmar, as these three locations have produced high-quality ruby. Adapted from R. Hughes, Ruby & Sapphire: A Collector's Guide, *2014, Gem and Jewelry Institute of Thailand, Bangkok, p. 132.*

Figure 43. The 3.32 ct Crimson Prince ruby was cut from a 1.2 gram rough. Both the color and the clarity make this stone extremely rare. Photo by Robert Weldon/GIA, courtesy of Jeffery Bergman.

Crimson Prince ruby from Namya. Mogok, Myanmar is considered the source of the finest rubies on Earth. In 2000, an exciting new ruby discovery was made in Namya, located in the Kachin state approximately 300 km north of Mogok and east of the jade mine at Hpakant (figure 42). While known mostly for its vibrant pink and red spinels, Namya also produces fine rubies, typically of medium saturation. Due to the remarkably similar geology of the two deposits, it is often impossible to separate Mogok rubies from Namya material.

In the spring of 2014, a rough stone with strong red color and unusually fine clarity weighing approximately 1.2 grams was discovered in Namya. The stone was entrusted to a skilled and experienced ruby cutter, who finished it as a 3.32 ct roundish cushion measuring 7.99 mm in diameter (figure 43). The color, clarity, and cutting are so unusual for a ruby that on initial casual observation, most experts have mistaken it for a spinel.

In December 2014, Richard Hughes of Lotus Gemology examined the stone, commenting on its "pigeon's blood" color. Additionally, he remarked that its clarity was "extraordinary," mentioning that only "a light dusting of silk is evenly distributed across the stone" and noting that it was "obvious that the lapidary took great care in its fashioning, befitting a gem of such high value…."

This exceptional ruby deserved a befitting name. Several ideas were put forward; calling it a "King" seemed grandiose, and it was too vividly saturated to be a

Figure 44. Excavators and a washing plant on Gem Mountain process gravel for sapphire recovery. Photo by Warren Boyd.

Figure 45. A trench on Gem Mountain showing the sapphire-rich colluvium on the hilltops between the previously worked gulches. Photo by Keith Barron.

"Princess." In March 2015, the Crimson Prince ruby found a fitting new home at a prestigious *haute joaillerie* on Place Vendôme in Paris.

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PrimaGem, Bangkok

Update on Rock Creek Sapphire deposit. Recently, Montana-based Potentate Mining LLC secured approximately 3,000 acres of sapphire-bearing ground covering the famous Rock Creek district, including the Gem Mountain mine near Philipsburg, Montana. Since the discovery of these sapphire deposits in the 1890s, this is the first time that one company has consolidated such a large land position, encompassing the old alluvial sites as well as the area on the hills in between these old workings (figure 44). Potentate has assembled a team of highly experienced placer miners, geologists, mining engineers, and heavy equipment operators to recover and process the sapphires from this mine.

The Rock Creek deposits occur in debris flow, colluvium, and secondary alluvial deposits (figure 45). Although the bedrock for these deposits has not yet been defined, Potentate plans further geological mapping and geophysical surveys in the near future to uncover these sources.

To date, the rough sapphires recovered from the bulk sampling pits range in size from 0.25 ct to over 20 ct. Approximately 15% of this rough occurs naturally in marketable colors, including pink, orange, orange-pink, lavender, golden yellow, blue-green and green, and fine blue (figure 46). A substantial percentage of the remaining rough responds very well to heat treatment technologies that improve clarity and turn greenish and grayish rough to desirable colors such as blue, orange, yellow, pink, and parti-color.

The high-grade concentration of the sapphires recovered from the various test pits, and the substantial inferred rough sapphire resource on Gem Mountain, indicate that Potentate would be able to provide a long-term, consistent supply of sapphire rough to the global market (figure 47).

Figure 46. A selected assortment of unheated rough sapphires from the Rock Creek deposit, ranging from 0.50 to 17 ct. Photo by Warren Boyd.

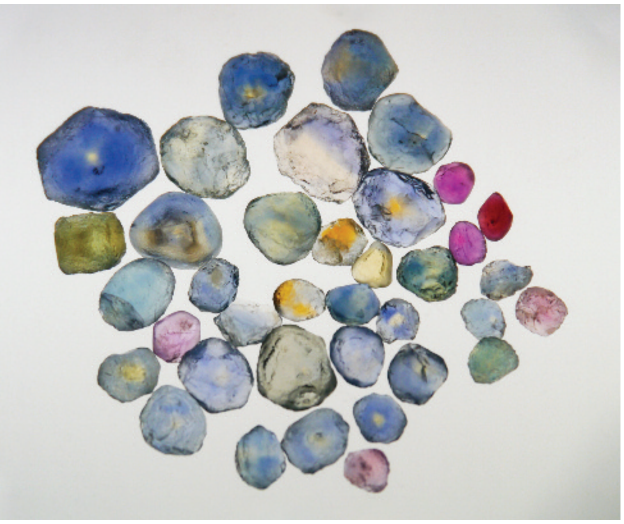

Figure 47. A selection of natural and heat-treated Rock Creek sapphire ranging from 0.50 to 4.70 ct. Photo by Jeff Scovil.

Figure 48. A unique parti-color Brazilian tourmaline necklace with a total weight of 961 carats. Photo by Duncan Pay/GIA, courtesy of Atlas Gemstones, Inc.

Potentate would be the only large-volume source for the Rock Creek sapphires. The company is developing a marketing strategy that would provide sustainable supply chain guarantees to their clients. These clients, including wholesale gemstone cutters, polishers, and fine jewelry retailers, would in turn be able to provide guarantees of origin and the presence (or absence) of any heat treatment to their consumers.

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Keith Barron
Potentate Mining, LLC
Philipsburg, Montana

Unique tourmaline necklace. At the AGTA show, Anna Jankowiak (Atlas Gemstones Inc., Toronto) showed us a unique 961 ct parti-color tourmaline necklace and clasp (figure 48). This piece, which Ms. Jankowiak said she purchased in India, was reportedly cut from a single large, slender Brazilian tourmaline crystal reportedly mined within the last three years. The cutter tried to salvage as much of the material as possible by slicing down the crystal's length. This produced large flattened sections with rounded edges that showed alternating green and pink color zoning down their lengths. The zoning was strong, neat, and "tight." This was in contrast to many of the parti-color tourmaline crystal slices we saw at the show, which were sliced perpendicular to their lengths to show the typical concentric "watermelon" zoning.

Duncan Pay

CONFERENCE REPORTS

Maine pegmatite workshop. The 2015 Maine pegmatite workshop took place at the Poland mining camp, May 29–June 6. As readers know, many important colored gemstones including tourmaline, beryl, topaz, garnet, quartz, and spodumene are mined worldwide from pegmatites, and these rocks are the source for most fine gem crystals. Maine pegmatites have been mined for many decades (some back as far as the 1820s) and are renowned for their fine tourmaline, beryl, and quartz crystals. The workshop's website is at pegworkshop.com.

The workshop is conducted by Dr. William "Skip" Simmons, Dr. Karen Webber, and Alexander Falster—all formerly of the University of New Orleans—and Ray Sprague, a local pegmatite miner. Simmons, Weber, and Falster were the core of the university's mineralogy, petrology, and pegmatology ("MP^2") research group. Following the closure of the university's mineralogy department, they relocated to the new Maine Mineral and Gem Museum in Bethel (www.mainemineralgemmuseum.org).

The workshop has taken place annually since 2001. The 2015 workshop had a total of 26 attendees, including six undergraduate mineralogy students from University of New Orleans, one postgraduate mineralogy student from the University of the Basque Country (Bilbao, Spain), a well-known mineral dealer, a variety of mineral collectors, and interested members of the public.

The workshop is structured with morning presentations and lectures, followed by excursions to mines and quarries in the afternoon. Given the breadth of participants (rockhounds from mineral clubs, undergraduate and graduate geology students, mineral dealers, gemologists, and PhD-level researchers), the content varied from introductory to quite complex—and sometimes contentious— topics, such as pegmatite genesis (fractional crystallization from granite vs. anatexis) and crystallization time. In particular, the relationship of pegmatites to tectonic settings was well explored, as was the current consensus on cooling time and the formation of large crystals. Nonetheless, the presenters did an excellent job and encouraged plenty of debate. Some of the best questions came from the mineral collectors in the group, many of whom have visited these quarries repeatedly.

The selection of field excursions (figures 49 and 50) varies from year to year and is dependent on which mines are available or being worked at the time. This year's destinations included the following quarries: Western Mount Apatite, Tamminen, Waisanen, Bennett, Orchard, Havey, Mount Mica, and Emmons. Around noon each day, participants would caravan in a stream of cars to the "quarry du jour." The workshop organizers enjoy excellent relationships with local mine owners, dependent on the good conduct of the attendees.

At each quarry, Simmons or Falster explained pegmatite mineralogy and miners Frank Perham or Ray Sprague outlined current or past mining history at the site. The remainder of the time could be spent mineral collecting, which was a focus for a good portion of the group. Those interested in more depth could talk with members of the MP^2 research group about the exposures, or with Per-

Figure 49. Workshop attendees at the Havey Quarry, which has produced some of the finest Maine elbaite tourmalines. The mine was originally opened in 1902 and worked for feldspar. This view shows the Havey pegmatite body, with three pockets visible. Photo by Duncan Pay/GIA.

ham and Sprague about the practice of mining pegmatites. Indeed, this is the workshop's strong suit: The theory from the morning presentations is applied to real rocks in the afternoon.

Besides the quarries, workshop attendees also visited the new Maine Mineral and Gem Museum in Bethel. There they could see the progress of the exhibits and view the MP^2 research group's laboratory in the basement, which includes an electron microprobe, scanning electron microscope, X-ray diffraction equipment, and other advanced instrumentation.

Following an evening lecture on pegmatite mineralogy complemented by numerous hand specimens, the opening session kicked off with a general introduction to pegmatites, the earth's chemistry, and phase equilibria. Throughout the week, the presentations delivered by Simmons, Webber, and Falster built on the basics to cover the relationship of granites to pegmatites, magmatic differen-

Figure 50. Colorful mineralogy at the Havey quarry. Pink and green tourmaline, clevelandite, lepidolite, and "salmon"-colored feldspar all indicate the presence of a nearby pocket. Photo by Duncan Pay/GIA.

tiation, pegmatite classification, magma genesis, and the influence of tectonic setting. Some of the more complex topics covered included crystallization dynamics, such as the influence of volatiles and fluxes (water, lithium, fluorine, boron, and phosphorous), pegmatite textures, aplites ("line rocks"), pocket formation and indicators, and regional and internal zonation of pegmatites.

Besides these instructional sessions, workshop attendees were also treated to a variety of other presentations, including:

Myles Fetch (Maine Mineral and Gem Museum, Bethel) described the garnet line in Oxford County pegmatites. He explained that the garnet line marks the lower edge of the pegmatite's productive zone. It might swell upward close to a pocket, serving as an important indicator.

Dr. Encar Roda-Robles (University of the Basque Country and a member of the MP^2 pegmatite research group) presented on pegmatites from the Iberian Massif and the central Maine belt, covering the differentiation of granitic melts vs. anatexis. Dr. Roda-Robles also delivered a talk on tourmaline, mica, and garnet as sensitive indicators of pegmatite evolution in the Berry-Havey pegmatite. This last talk was very relevant, as the afternoon's field trip was to this quarry.

Idoia Garante-Olave (University of the Basque Country) delivered a presentation on mineralogy and geochemistry of micas from the Tres Arroyos pegmatite field in Badajoz, Spain.

Frank Perham, a noted Maine pegmatite miner, reminisced on the remarkable Newry tourmaline discovery, which produced an estimated $30 million worth of gem and specimen-grade tourmaline crystals in 1972. Perham also delivered a talk on Maine feldspar mining.

Dr. Skip Simmons presented previous work on the chemistry and a calculation of volume, by mineral, for the Mt. Mica pegmatite. The volume of tourmaline was estimated at >1%.

Jim Nizamoff (a mineralogist with Omya AG and former University of New Orleans research associate) and mineral collector **Don Dallaire** discussed the pegmatite mineralogy of the Conway and Osceola granites from the White Mountains of New Hampshire.

Ray Sprague (pegmatite workshop organizer and miner) presented on the mineralogy of specimens from the Emmons pegmatite in preparation for the all-day visit to that quarry.

Duncan Pay

2015 Sinkankas Symposium. The thirteenth annual Sinkankas Symposium was held April 18 at GIA headquarters in Carlsbad, California. Co-hosted by the Gemological Society of San Diego, GIA, and Pala International, the event drew a capacity crowd eager to learn about opal.

After welcoming remarks from organizer **Roger Merk**, the morning presentations began with an overview by **Dr. Eloïse Gaillou** (Paris School of Mines) on geology, color, and microstructure. **Andrew Cody** (Cody Opal, Melbourne) chronicled the Australian opal market before delving into fossilized specimens. **Dr. Raquel Alonso-Perez** (Mineralogical and Geological Museum, Harvard University, Cambridge, Massachusetts) spoke on the history of the museum and shared photos and data of specimens from its collection. Photographer **Jack Hobart** showed superb images from his extensive database of Mexican opals. **Bill Larson** (Pala International, Fallbrook, California) described his personal collection of Mexican, Australian, Ethiopian, and Brazilian opals, many of which were on display throughout the campus.

The afternoon sessions began with a presentation by **Alan Hart** (Natural History Museum, London) on the museum's opal collection. Noted lapidary **Meg Berry** (Megagem, Fallbrook, California) described various techniques for cutting and carving. Buying guide author **Renée Newman** (International Jewelry Publications, Los Angeles) discussed the jewelry uses of matrix and common opal. **Helen Serras-Herman** (Gem Art Center, Rio Rico, Arizona) followed with additional insight on the many varieties of common opal. **Robert Weldon** (GIA, Carlsbad) discussed the challenges of photographing opal's shifting flashes of color, as well as the instruments and post-production techniques best suited to the task. **Nathan Renfro** (GIA, Carlsbad) looked at the gem's internal features and the wide range of mineral inclusions that create vibrant, colorful scenes. **Dr. George Rossman** (Caltech, Pasadena, California) examined causes of color and offered closing remarks.

Sapphire will be the theme of the 2016 symposium. For more information on the event or to purchase the proceedings volume, visit www.sinkankassymposium.net.

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ERRATA

1. In the Spring 2015 announcement of the Dr. Edward J. Gübelin Most Valuable Article Award winners (p. 31), the first-place article, "Sri Lanka: Expedition to the Island of Jewels," should have been listed as a Fall 2014 rather than Summer 2014 article.
2. In the Spring 2015 Gem News International entry "Fine tsavorite and spinel" (p. 74), the company "Tsavorite USA" should have been listed as "Bridges Tsavorite."
3. Also in the Spring 2015 issue, we published an update on Brazilian copper-bearing tourmaline seen at this year's Tucson gem shows (GNI, pp. 71–72). It now appears that the gemstones represented to GIA as production from the Mineração Terra Branca (MTB) Brazil Paraíba mine in Rio Grande do Norte—and photographed for the entry—were mined instead at the Parazul Mineração mine in neighboring

Paraíba province, in the area where the gem was originally discovered. As soon as this came to our attention, we withdrew the story from the GIA website.

Reports in the Brazilian and international media circulated during May and June 2015 about an ongoing federal investigation into both mines. Several principals from each mine are in custody at the time of writing as part of the operation into alleged laundering of gems from a mining operation lacking the necessary permits (Parazul), through one with the required permissions (MTB). Reports indicate that the investigation commenced in 2009, and continued through the 2015 Tucson show with the cooperation of the U.S. Federal Bureau of Investigation (FBI).

We wish to note that neither the original discoverer of Paraíba tourmaline, Heitor Dimas Barbosa, nor his son Sergio, are part of any investigation or implicated in this affair in any way.

4. Finally, we would like to post a correction to L.T.-T. Huong et al.'s article "A preliminary study on the separation of natural and synthetic emeralds using vibrational spectroscopy" (Winter 2014 *G&G*). In figure 3 (p. 289), the vertical axis legend should read "SiO_2 wt.%." Similarly, in table 1 (p. 291), both silicon and alkalis (Li, Na, K, Rb, and Cs) should be expressed as oxides rather than elements.

In the Materials and Methods section, the authors mentioned different measurement techniques for Si (electron microprobe) and the alkalis (laser ablation–inductively coupled plasma–mass spectrometry, or LA-ICP-MS). As a result, one original measurement was in parts per million (ppm, either parts per million atoms—ppma—or parts per million by weight—ppmw) for the alkalis (LA-ICP-MS) and the other was in wt.% for SiO_2 (electron microprobe). This indicates that a conversion between ppm and wt.% was made but not mentioned in the paper. Our technical editor noted that the wt.% values reported for alkalis in the paper (0.330 to 1.872), which correspond to 670 to 18,720 ppm, were in line with the published literature.

The article's lead author, Dr. Le Thi-Thu Huong, confirmed that all the alkali values published in the paper were converted from ppm to wt.%. We thank Dr. Karl Schmetzer for bringing this to our attention.

For More on Tucson 2015

Explore the emerging trends, unique pieces, and production updates from this year's gem shows. GIA's coverage from Tucson provides an exclusive look at the gem and jewelry industry through video interviews and photo galleries.

Visit www.gia.edu/tucson-2015-show, or scan the QR code on the right.