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COLORED STONES AND ORGANIC MATERIALS

Using cucumbers to unearth dendritic agates in central India. Even though fashioned chalcedony from central India has been used in jewelry for over three centuries—at least since the reign of Maharaja Chhatrasal in the 1600s—relatively few examples of the superb dendritic agates produced there have been seen in the West. Tarun Adlakha, of Indus Valley Commerce, Ghaziabad, India, recently exhibited a large collection of them in the United States at the 2008 Tucson Gem and Mineral Show.

According to Mr. Adlakha, these agates (e.g., figures 1 and 2) are mined in Madhya Pradesh Province on the fringes of the Deccan Traps (thick basalt flows). These flows erupted at the end of the Cretaceous period, approximately 65 million years ago, forming one of the world's largest volcanic regions. Some agates are mined along tributaries of the Narmada River, but the vast majority are recovered some distance away, from gray-green volcanic ash deposits, at depths of 12–25 m. Mr. Adlakha noted that the Narmada River agates are found as waterworn pebbles and rocks that yield mostly transparent and finely imprinted dendritic gems, whereas the distal sources produce material that is largely translucent. The production includes colorless, orange, red, yellow and, rarely, purple material.

Editor's note: Interested contributors should send information and illustrations to Brendan Laurs at blaurs@gia.edu or GIA, The Robert Mouawad Campus, 5345 Armada Drive, Carlsbad, CA 92008. Original photos can be returned after consideration or publication.

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Miners work the riverbed twice a year during the region's dry seasons. One unusual approach taken by local miners is to plant cucumbers and other deep-rooting vines in the riverbed, where the fast-growing roots reportedly loosen the soft alluvium, causing many nodules to rise to the surface. These are then easily collected for cutting.

Indus Valley Commerce fashions about 10,000 cabochons per year at their shops in Banda, Uttar Pradesh. Mr. Adlakha describes this production as "prime grades"; about 10% are considered "exceptional," but only a small amount, 5% or less, are dendritic. The most experienced and skillful cutters are used to fashion the rare dendritic pieces, because producing fine finished stones from this

Figure 1. This dendritic agate cabochon from central India measures 6.2 × 4.7 cm. The fern-like inclusions are composed of manganese and/or iron oxides trapped between layers of the agate. Photo by R. Weldon.

Figure 2. This shield-shape dendritic agate measures 6.1 × 5.2 cm. Photo by R. Weldon.

material is a specialized skill, particularly for large cabochons (e.g., 18–25 cm). Because the dendrites are only a few microns thick, the margin of error is extremely small; thus, the cabochons are cut by hand rather than with a saw. As a result, it can take a cutter several days to fashion a single stone. The finished cabs are typically 2–5 mm thick.

For more information on these agates, see M. C. Venuti and M. Pantò, "Il mistero delle dendriti indiane [The mystery of the Indian dendrites]," *Rivista Gemmologica Italiana*, Vol. 2, No. 3, 2007, pp. 181–191.

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Fluorite impersonating blue color-change garnet. Garnet comes in almost every color, but collectors continue the quest for stones showing a blue hue. This goal seemed within reach in the late 1990s, with the discovery of "blue" color-change pyrope-spessartine from Bekily, Madagascar. These stones commonly appear blue-green in daylight and purple in incandescent light (see K. Schmetzer and H.-J. Bernhardt, "Garnets from Madagascar with a color change of blue-green to purple," Winter 1999 *Gems & Gemology*, pp. 196–201). Yet only a few euhedral garnet crystals have been reported from Bekily (see Summer 2003 Gem News International [GNI], p. 156); most are irregularly formed fragments.

Therefore, one of us (JH) was quite excited about the prospect of documenting a relatively large (1.1 × 1.0 × 0.9 cm) well-formed crystal thought to be blue garnet from Madagascar. The gem-quality sample was seen at the 2008 Tucson gem shows, and kindly loaned by Jasun and Mandy McAvoy (Asbury Park, New Jersey). Its crystal form was similar to the previously published specimens of pyrope-spessartine from Madagascar, and it displayed a color change from violetish blue to purplish pink (figure 3).

Although the crystal's morphology, isotropic optic character, and color-change behavior were consistent with those of garnet, Raman analysis at the GIA Laboratory proved that it was actually fluorite. This was quite a surprise to all who were involved with this specimen, which apparently had never been tested. In hindsight, the crystal appeared remarkably similar—in its modified cubic crystal form as well as its color—to some of the color-change Ethiopian fluorites documented in the Summer 2007 GNI section (pp. 168–169).

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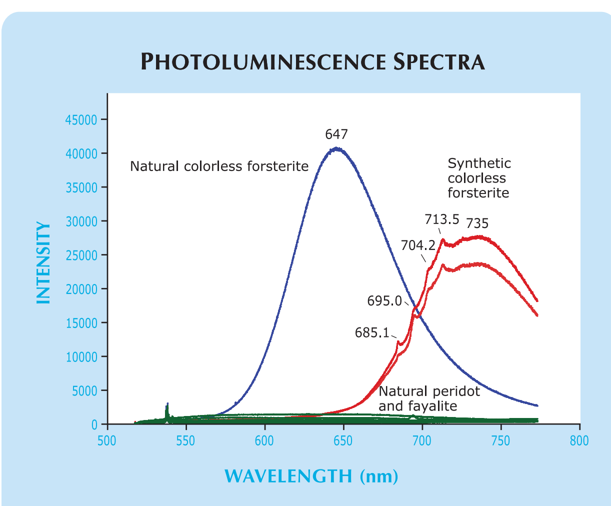
Colorless forsterite from Mogok, Myanmar. During the BaselWorld show in April 2008, the SSEF Swiss Gemmological Institute received a colorless 2.48 ct stone (figure 4, left) for testing. According to Mark Smith (Thai Lanka Trading Ltd., Bangkok), it was cut from rough found

Figure 3. Resembling color-change garnet from Bekily, Madagascar, this ~1 cm fluorite is violetish blue in daylight (left) and purplish pink in incandescent light (right). Photos by Robert Weldon.

Figure 4. The 2.48 ct colorless forsterite on the left is reportedly from the Dattaw mining area near Mogok, Myanmar. A 4.77 ct synthetic forsterite is shown on the right. Photo by H. A. Hänni, © SSEF.

in the Dattaw mining area of Mogok, Myanmar. Originally the stone was sold as humite, a hydrous magnesium silicate, but its refractive indices (1.638–1.677), birefringence (0.039), and hydrostatic SG (3.27) did not quite match. With Raman spectroscopy, the specimen was readily identified as forsterite, a member of the olivine group. (The olivine group consists mainly of two end-members, forsterite [a Mg silicate] and fayalite [an Fe silicate]. The most common gem variety from this group, *peridot*, is a Mg-rich olivine that contains some Fe—typically 5–15 wt.% FeO—resulting in a yellowish green to dark green color.) After BaselWorld, we began seeing more of this material from Myanmar (figure 5), most of which was largely free of inclusions and colorless to slightly yellow. As these contributors had previously seen only synthetic colorless forsterite (e.g., figure 4, right), a detailed study was under-

Figure 6. Whereas the peridot/fayalite samples showed no photoluminescence, the natural and synthetic colorless forsterites had distinct PL bands at different positions.



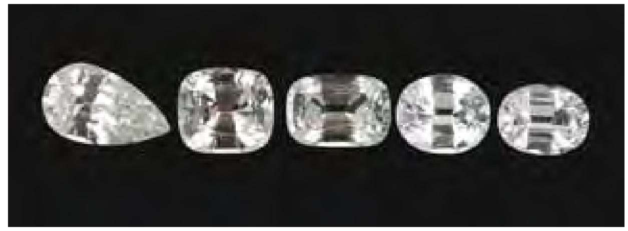


Figure 5. These nearly inclusion-free colorless forsterites from Myanmar range from 1 to 2 ct. Photo by Mark Smith, © Thai Lanka Trading Ltd.

taken to confirm the natural origin of these stones.

Energy-dispersive X-ray fluorescence (EDXRF) analysis of the 2.48 ct stone revealed a minor amount of iron (0.1 wt.% FeO) and traces of Cr, whereas two colorless synthetic samples had only Mg and Si as main constituents and no Fe. The natural specimen showed a moderate red fluorescence to long-wave UV radiation, presumably related to its Cr content, whereas both synthetic samples fluoresced a weak chalky yellow. The reaction to short-wave UV was moderate yellow for the natural forsterite and weak yellow for both synthetic samples. Photoluminescence (PL) spectra excited with a 514 nm argon laser showed a broad luminescence band centered at 647 nm for the natural forsterite, while the two synthetic samples showed a band centered at 735 nm coupled with a series of small luminescence peaks at 685.1, 695.0, 704.2, and 713.5 nm; in contrast, five samples of natural peridot and fayalite (yellowish green to dark green and greenish brown) showed no photoluminescence (figure 6).

Using a microscope, we observed numerous hollow tubes and cavities (figure 7, left) in the synthetic samples. In contrast, the natural specimens showed partially healed fissures with fluid inclusions, as well as colorless idiomorphic (rhombic) crystal inclusions. These inclusions were identified by Raman spectroscopy as dolomite (figure 7, right), which fits well with the forsterite's reported origin in a marble deposit in the Dattaw area. The Mogok region is also known as a source for yellowish green to green peridot. The peridot is mined from the Pyanunggaung Mountains, in talc veins associated with ultramafic (Mg- and Fe-rich) rock (R. C. Kammerling et al., "Myanmar and its gems—an update," *Journal of Gemmology*, Vol. 24, No. 1, 1994, pp. 3–40).

Aside from their beauty, these new colorless forsterites may also prove enlightening to gemology students, as they clearly demonstrate the concept of isomorphous mixing within the olivine group. Between the forsterite and fayalite end-members are intermediate compostions with various amounts of iron replacing Mg on the same structural site (an isomorphous solid solution). The color is directly related to the iron concentration, ranging from colorless forsterite through yellowish green to dark green peridot, to dark brown fayalite (figure 8). As plotted in figure 9 (using the samples shown in figure 8, in addition to two samples of colorless synthetic forsterite), the greater substitution of Mg by Fe also leads to a marked increase in the RI and SG of the members of this solid solution. Similar observations

Figure 7. As shown on the left, abundant hollow tubes and cavities were seen in the synthetic forsterites (photomicrograph by H. A. Hänni, magnified 20×; © SSEF). On the right, this forsterite from Myanmar contains a somewhat regular pattern of fluid inclusions in a healed fissure, as well as rhombic dolomite inclusions (photomicrograph by M. S. Krzemnicki, magnified 35×; © SSEF).

are well known for other mineral groups with extensive chemical mixing, such as feldspars and garnets.

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Colorless forsterite from Tajikistan. In addition to the gem-quality colorless forsterite from Myanmar now circulating in the trade (see the preceding GNI entry), colorless forsterite from Tajikistan recently became available. According to gem dealer Farooq Hashmi (Intimate Gems, Jamaica, New York), small quantities of this material have been produced from the Kukh-i-Lal skarn-type gem deposit in the southwestern Pamir Mountains, where it is found in association with clinohumite and spinel. Mr. Hashmi noticed a few of the colorless pieces of rough mixed with a 3+ kg parcel of clinohumite that he obtained in mid-2008. He cut a 3.54 ct gem from one of these pieces, and loaned it to GIA for examination.

Gemological characterization of this colorless pear-shaped brilliant (figure 10) yielded RIs of 1.637–1.669 (birefringence 0.032), a biaxial optic figure, and a hydrostatic SG of 3.26. It fluoresced weak orangy pink to short-wave UV radiation and weak red to long-wave UV. In addition to major amounts of Mg and Si, EDXRF spectroscopy revealed traces of Ca, Mn, and Fe. These properties are generally consistent with those reported for natural colorless forsterite (Spring 1999 Lab Notes, pp. 49–51; and K. Nassau, "Synthetic forsterite and synthetic peridot," Summer 1994 *Gems & Gemology*, pp. 102–108). The elements detected by EDXRF were confirmed with laser ablation–inductively coupled plasma–mass spectroscopy (LA-ICP-MS; calibrated with NIST glass standards), which

Figure 8. The 2.48 ct colorless forsterite is shown on the left, along with four peridot specimens and a fayalite. All members of the olivine group, these samples demonstrate the effect of increasing Fe concentration, from left to right. Data from these samples were used for figures 6 and 9. Photo by M. S. Krzemnicki, © SSEF.

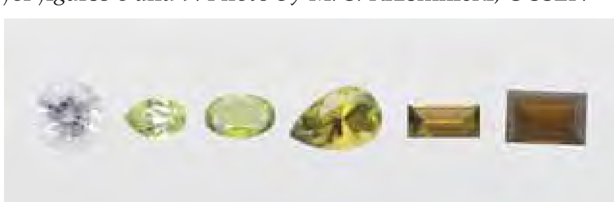

*Figure 9. The SG and RI values of the olivine group (forsterite-fayalite) increase with Fe concentration, as shown here for the samples examined in this study. Similar relationships were illustrated by W. A. Deer et al. (*Rock-Forming Minerals—Orthosilicates*, Vol. 1A, 2nd ed., Longman, London, 1982, p. 184). The arrows show the points corresponding to the two synthetic forsterite samples; the other points correspond to the samples shown in figure 8.*

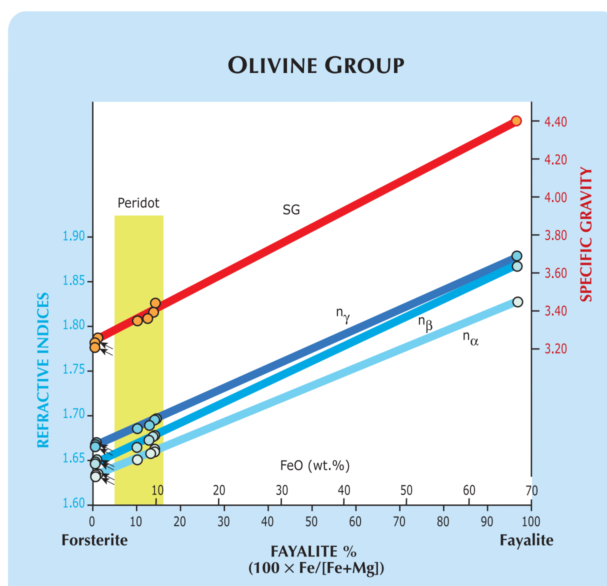

Figure 10. This colorless 3.54 ct forsterite reportedly came from Kukh-i-Lal, in the Pamir Mountains of Tajikistan. Photo by Robert Weldon.

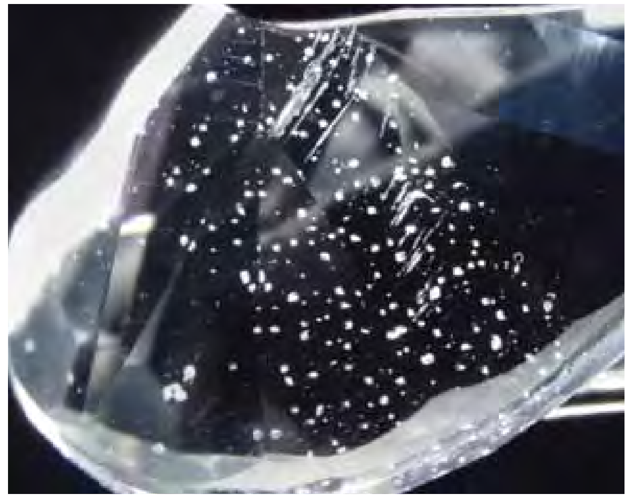

Figure 11. The forsterite contains a "fingerprint" composed of euhedral-to-subhedral inclusions. The linear features superimposed over the fingerprint are scratches. Photomicrograph by D. M. Kondo; field of view 7.2 mm.

showed average concentrations of 43.7 wt.% MgO and 0.34 wt.% FeO. As Mg is strongly dominant over Fe, the stone's composition lies near the forsterite end of the forsterite-fayalite series.

Microscopic examination showed a "fingerprint" composed of euhedral-to-subhedral inclusions (figure 11). With higher magnification and diffused lighting, these inclusions were observed to contain a white, fine-grained solid and—in some cases—a dark opaque crystal with a hexagonal outline (figure 12).

UV-Vis spectroscopy revealed weak absorption features at 451, 473, and 491 nm. Raman spectra taken with 488 and 514 nm laser excitation matched the forsterite and peridot spectra from our database. A 514 nm Raman scan was also taken up to 6000 cm^{-1} to investigate the fluorescence behavior. This showed a broad band with the maximum at approximately 4000 cm^{-1}, which is essentially equivalent to the fluorescent band reported for Burmese forsterite in the preceding GNI entry.

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Natural impregnation of a rock by copper minerals. Rough stone buyer Werner Spaltenstein recently sent a blue-green rock (figure 13) to the SSEF Swiss Gemmological Institute for identification. The material was purchased in Tanzania, but its original locality is unknown. The blue portions resembled lapis lazuli, while the green patches looked like chrysocolla. This contributor had two cabochons polished to evaluate its suitability as an ornamental stone (again, see figure 13).

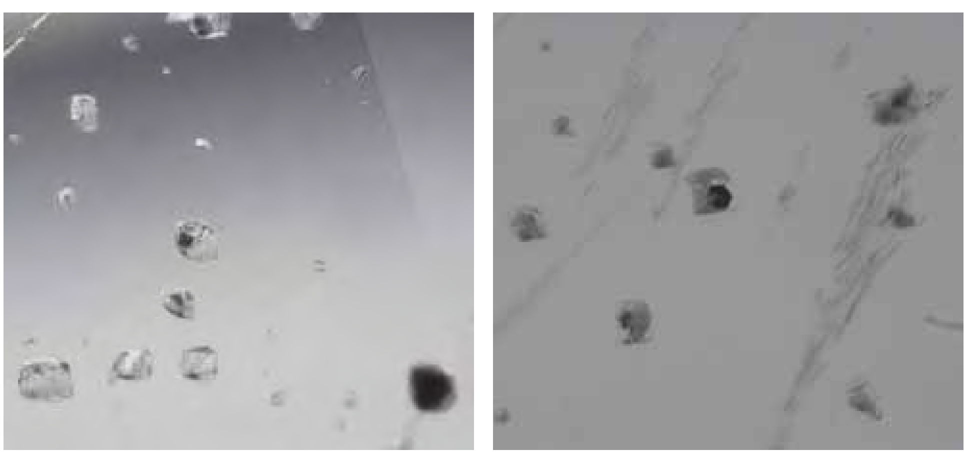

Figure 12. At higher magnification in diffused light, the inclusions forming the fingerprint in figure 11 were seen to consist of white solid phases (possibly within a liquid) and black particles. A hexagonal outline is evident for the black inclusion in the center of the right-hand photo. Photomicrographs by D. M. Kondo; fields of view 1.0 mm.

Viewed with low magnification, the material gave the initial impression of a color-treated coarse-grained igneous rock because of the numerous fractures and cleavage planes that were filled with a dark blue material (figure 14, left). With the client's permission, we prepared a petrographic thin section from the rock sample to analyze the component minerals and study their textural relationships (figure 14, right). Sodium-rich plagioclase, quartz, and muscovite mica were identified microscopically, and were confirmed via Raman spectroscopy. The blue material filling the fissures was not a dye but rather was identified as azurite; also present were malachite, chrysocolla, and chalcanthite. EDXRF chemical analysis showed Si, Al, Na, and some K and Ca. Copper was clearly present, as was Fe in low concentration.

The gemological properties of the material corresponded to the predominance of sodic plagioclase and quartz: The mean RI was 1.55, and the SG (by hydrostatic weighing of the large piece of rough in figure 13) was 2.69.

This ornamental material apparently formed when a plutonic rock was naturally fractured and impregnated with secondary copper minerals. "Jambolite" has been proposed as a trade name (*jambo* is a popular greeting in Swahili) for this colorful rock.

Henry A. Hänni

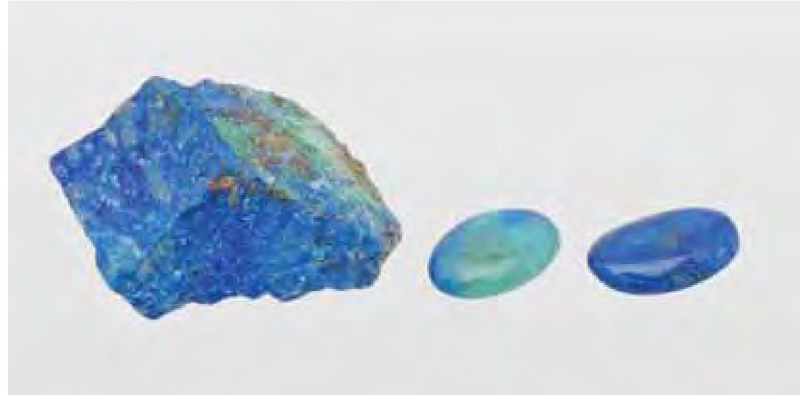

Figure 13. This feldspar-quartz-muscovite rock, sold in Tanzania, is naturally stained by secondary copper minerals. The blue color is due to azurite-filled veins, and the green is derived from malachite and chrysocolla. The cabochons are approximately 20 mm long. Photo by H. A. Hänni, © SSEF.

Update on the John Saul ruby mine, Kenya. In May 2008, this contributor and Dr. James E. Shigley of GIA Research visited the John Saul ruby mine, which is owned and operated by Rockland Kenya Ltd. in the Tsavo West National Park of southern Kenya. Our fieldwork was facilitated by Alice Muthama, director of Muthama Gemstones Ltd. in Nairobi. This report provides an update on underground mining activities and ore processing since the comprehensive Gem News entry on this deposit that was published by J. L. Emmett in the Winter 1999 issue of *Gems & Gemology* (pp. 213–215).

According to general manager Alfonse M'Mwanda and mine geologist/engineer Meshack Otieno, the underground mining began in late 2004, and is taking place in two locations on the property: the Kimbo shaft (in the former Kimbo pit), and the Gitonga shaft (in the former pit containing the Nganga and Miller open cuts; figure 15). The Kimbo shaft reaches a depth of 42 m and contains four levels of horizontal tunnels. It is currently the sole ruby producer, exploiting a mineralized zone that is 0.5–2 m thick. The Gitonga shaft is 21 m deep and contains one level. So far, no commercial ruby production has occurred from these exploratory workings but, according to old literature, good-quality stones were found in surface deposits in this area. Each shaft is joined to a separate ventilation shaft, and

Figure 14. At first glance (left), the rock appeared to contain a blue dye. Closer examination of a petrographic thin section with magnification (right) revealed the presence of azurite in veins crosscutting the feldspar-quartz-muscovite. Photomicrographs by H. A. Hänni, © SSEF; image width 5 mm (left) and image magnified 10× (right).

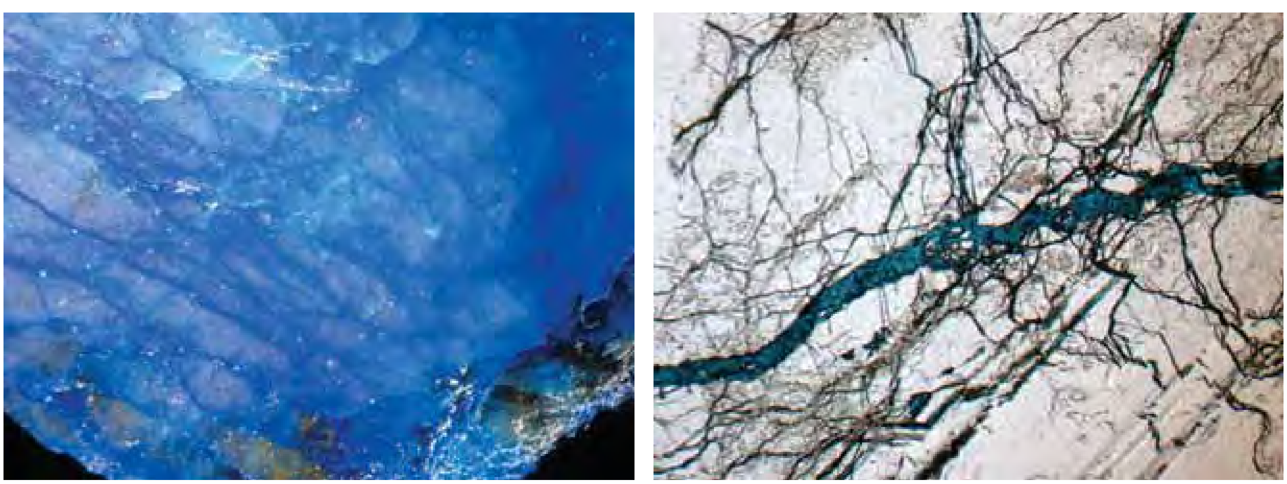

Figure 15. Underground mining at the John Saul ruby mine is taking place in two shafts, located at opposite ends of this large open pit. On the left is the Kimbo shaft, while the Gitonga shaft is visible in the distance to the right. The mine offices and sorting facilities are housed in the blue-green building on the left horizon. Photo by B. M. Laurs.

cranes are used to hoist the miners and the excavated material to the surface (figure 16). Mining is performed with pneumatic drills, and explosives are used only when necessary. The ruby-bearing material is transported underground in wheelbarrows (figure 17) before being loaded into a large container to be brought to the surface (again, see figure 16). The miners typically extend the tunnels 0.5 m day, and work 5½ days per week.

Of the 93 mine employees, 23 are involved with processing the ruby-bearing ore. The ore is stockpiled in a staging area, where it dries prior to being put through a rotating sieve. The fine-sized fraction is stockpiled, while the other material goes to a crusher and is then hand picked for ruby. Any matrix material is removed from the ruby by careful hammering and trimming as necessary with tile nippers (figure 18). The corundum is then sorted into three qualities, and each is sieved into several size fractions.

Since January 2008, the mine has produced approximately 200–500 kg per month of mixed-grade ruby and pink sapphire (excluding low-grade corundum). The rough is washed in hydrofluoric acid and heated in air to 1400°C for 12 hours (to brighten the darker colored material). Most of the rough is sent to Thailand for cutting, although a small amount is polished in Nairobi using Thai cutters.

Figure 16. Cranes are used to remove the excavated material from the shafts, as shown here at the Kimbo pit. A cage that is used for hoisting the miners is visible in the dump truck. Photo by B. M. Laurs.

Figure 17. Ruby-bearing material from the working face of the mine is moved to the haulage shafts in wheelbarrows. Photo by B. M. Laurs.

Figure 18. The corundum is carefully trimmed and sorted on site by Rockland Kenya Ltd. Photo by B. M. Laurs.

The cabochons are sorted into six quality grades, and only a small percentage possess top color and translucency (e.g., figure 19). At the time of our visit there was no facet-quality rough available, but the company anticipates better production as the deposit is explored at deeper levels.

Brendan M. Laurs

Figure 19. The highest-quality ruby cabochons currently being produced at the John Saul mine show good translucency and a bright red color without any modifying tones. These heat-treated stones weigh approximately 1.2 ct each. Photo by B. M. Laurs.

Ruby and other gems from Nanyaseik, Myanmar. The Nanyaseik (also called Namya or Nanyar Zeik) region of northern Myanmar has been known for nearly a decade as a source of fine-quality ruby, spinel, and other gems (see, e.g., H. Htun and G. E. Harlow, "Identifying sources of Burmese rubies," Fall 1999 *Gems & Gemology*, pp. 148–149, and Fall 2001 GNI, pp. 237–238). The mining area is situated about 50 km northwest of the town of Mogaung in Kachin State, at the southern edge of the Hukaung Valley, within an area extending from 25°35′15″ N, 96°31′00″ E to 25°39′30″ N, 96°34′20″ E. The following update on the localities and gem production from the area is derived mainly from field research by one of these contributors (KKW) for his PhD dissertation.

The region is generally flat, with a few hilly areas, and densely forested. Within the area are two major rock units: granite and marble. Within the marble, associated minerals are variable in occurrence and consist of diopside, graphite, phlogopite, forsterite, spinel, and ruby.

Most of the gem production comes from secondary deposits that are worked by open-pit (*in-bye*) or square-shaft (*le-bin twin*) methods. There are five recognized mining areas within the Nanyaseik region:

- Ma Not Maw: First discovered in 2000, this area (25°37′12″ N, 96°32′45″ E) measures approximately 4 km^2 and experienced a major mining rush that subsequently led to the creation of Ma Not village. The gem-bearing layer (*byone*; 0.6–1.8 m thick) consists of reddish brown clayey soil that locally contains rock fragments. Within it have been found gem-quality ruby, sapphire, yellow-to-green zircon, pale yellowish green and dark green transparent epidote, and colorless topaz.
- Melin Chaung Maw: Situated near Nanyaseik village at 25°36′45″ N, 96°34′19″ E, this area is around 10 km^2 and produces large waterworn opaque rubies and sapphires that are locally called *carbolic*. Reddish brown transparent almandine, brown tourmaline, and zircon are also found. The gem-bearing layer is typically about 3 m thick and consists of clay and clasts of marble and granite.
- Khung Saing Zup Maw: The Khung Saing Zup village is located on the Mogaung-Phakant (Hpakan) road, and the mining area is situated ~100 m from the road. Here is found the largest open-pit mine (240 × 90 m) in the Nanyaseik region. The gem-bearing layer contains quartz, feldspar, mica, calcite, spinel, ruby, and epidote.
- Sabaw Maw: At 25°39′31″ N, 96°32′48″ E, this area lies in the northern part of the Nanyaseik region. Numerous shallow pits have produced quartz, spinel, sapphire, ruby, and pink painite.
- War Bu Maw: This area, located at 25°38′20″ N, 96°32′27″ E, is covered by swampy soil that overlays whitish clayey soil and organic material. Specific information on the gem materials from there is not available.

Nanyaseik rubies come in a variety of hues, including brownish red, orangy red, purplish red, and pinkish red. Colorless, yellow, pink, orange-yellow, "padparadscha," blue, and purplish blue sapphires are also found, though gem-quality blue sapphires are rare. Good-quality Nanyaseik rubies typically range from a few millimeters to one centimeter, while opaque stones up to 10 cm have been found. The crystals are usually somewhat rounded and equant, and may exhibit deep striations and rhombohedral parting. Conspicuous crystalline inclusions and oriented rutile needles have been noted. Trapiche specimens have also been found. Microprobe analyses of eight Nanyaseik rubies at HIAF (Heavy Ion Analytical Facility, CSIRO Exploration and Mining, North Ryde, New South Wales, Australia) revealed traces of V, Ti, Cr, Ga, Fe, Mn, Zr, Co, Cu, Ni, Sr, Y, and Pb. The low Fe content and presence of appreciable V and Cr apparently are responsible for the strong red fluorescence of Nanyaseik ruby.

Figure 20. This 0.56 g sapphire from Winza, Tanzania, is notable for its interesting color distribution. Note the purple-pink zone that is visible near the pinacoidal face, while the rest of the crystal appears colorless or blue of varying depth. Photo by G. Choudhary.

Figure 21. The sapphire crystal in figure 20 displayed numerous tiny hexagonal-to-subhexagonal growth hillocks on the pinacoidal face. Photomicrograph by G. Choudhary; magnified 80×.

Figure 22. The color distribution of the sapphire appeared to be restricted to zones with sharp edges that followed pyramidal directions within the crystal (left and center). The purple-pink areas also displayed alternating zones of lower and higher saturation along with some blue bands, oriented parallel to the pinacoidal face (right). Photomicrographs by G. Choudhary; magnified 35× (left), 45× (center), and 60× (right).

Nanyaseik spinel also shows strong fluorescence, and the crystals are commonly octahedral (sometimes combined with dodecahedral faces). The color is most commonly pink with an orange tint. Additional colors such as greenish blue, bluish green, pale pink, gray, orange, red, and brown have also been recovered. Internal features commonly consist of small translucent crystals, large prismatic crystals, octahedral spinel crystals, and fluid inclusions.

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An interesting zoned sapphire crystal from Winza, Tanzania. Recently discovered rubies from Winza in central Tanzania have gained popularity for their bright red color and transparency (Summer 2008 GNI, pp. 177–180). Sapphires have also been reported from this deposit (V. Pardieu and D. Schwarz, "Field report from Winza," *Rapaport*, Vol. 31, No. 26, 2008, pp. 173–175), but they have not received as much attention.

At the Gem Testing Laboratory in Jaipur, we had an opportunity to characterize a 0.56 g sapphire crystal (figure 20) that was brought to our attention by Shyamala Fernandes of Jaipur. She obtained the crystal from Jacob Hoyer of Italy, who purchased it directly from a Winza miner. The crystal's appearance immediately pointed to sapphire due to its characteristic pyramidal habit, which was terminated by a pinacoidal face; it also exhibited faint horizontal striations along the pyramidal faces, in addition to tiny hexagonal-to-subhexagonal growth hillocks on the pinacoid that were observed only at high magnification (figure 21).

The most interesting feature of the crystal was its color zoning. The area nearest the pinacoid was purple-pink, which gradually shifted to colorless and then blue (again, see figure 20). The latter color increased from light to deep blue to almost black toward the lower end of the crystal, making it appear opaque. When magnified, this color distribution seemed to be restricted to zones with sharp edges that mostly followed pyramidal directions within the crystal (figure 22, left and center). In addition, the purple-pink area displayed zones of alternating saturation along with some blue zones that were oriented parallel to the pinacoidal face (figure 22, right, also illustrated in M. S. Krzemnicki and H. A. Hänni, "New Tanzania mine uncovers source of exceptional rubies," *InColor*, Spring 2008, pp. 46–47).

When the crystal was viewed along the c-axis, we observed a transparent purple-pink core that was surrounded by a dark blue to black rim (figure 23). This effect reminded us of Mong Hsu rubies, where typically the central core is dark blue and the outer rim red; in this crystal, the zoning was reversed. However, we could not determine whether this core was colorless and the purple-pink color was visible because of the zone at the tip of the crystal, or if the core itself was purple-pink.

Figure 23. When the sapphire crystal was viewed along the c-axis, the central core appeared transparent purple-pink and was surrounded by a deep blue to black rim. The apparent pink color might be due to the presence of the pink zones near the pinacoid. Photomicrograph by G. Choudhary; magnified 35×.

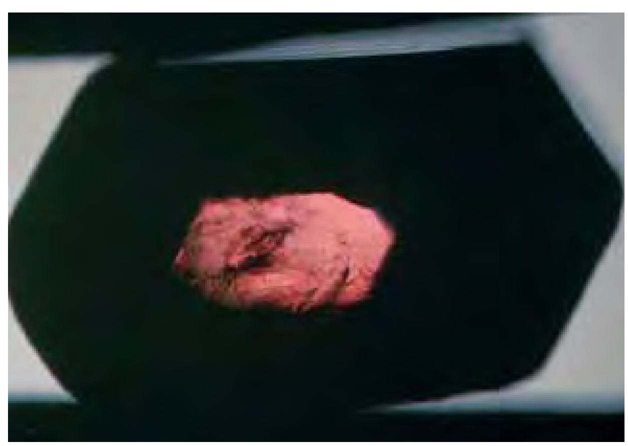

Figure 24. This 2.5 g tourmaline, reported to be from Nigeria, proved to have an interesting internal feature. Photo by G. Choudhary.

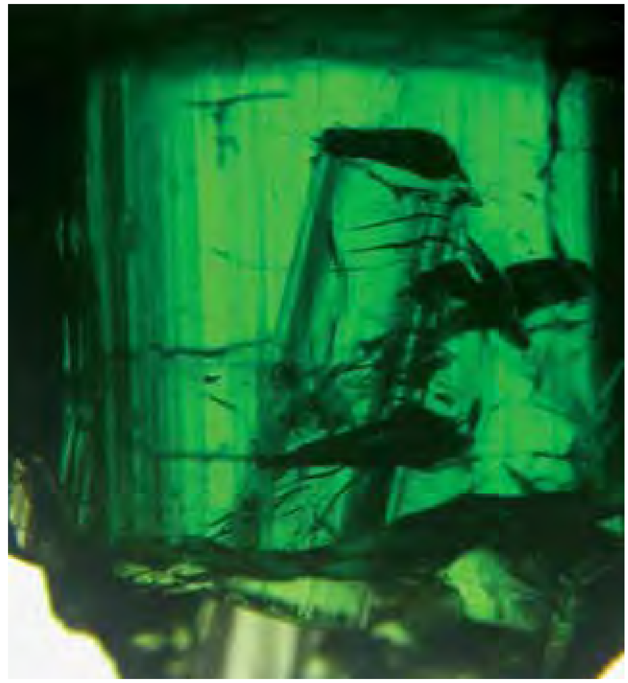

Figure 25. With transmitted light and magnification, the tourmaline in figure 24 was seen to contain an elongated crystal. It displayed weak striations on the prism faces, which were terminated by low-angle pyramidal faces (that appear dark in this image). Photomicrograph by G. Choudhary; magnified 10×.

No mineral or fluid inclusions were seen, possibly due to the dark color of most of the crystal; the color zones described above were observed only where the crystal was relatively transparent.

Since its discovery, the Winza deposit has produced some fine rubies, along with interesting specimens such as this sapphire. With further exploration, a wider range of material may be expected.

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A tourmaline crystal within a crystal. Recently, we had the opportunity to study an unusual 2.5 g tourmaline crystal (figure 24) that contained an intergrowth of a second, smaller tourmaline. This specimen, reportedly from Nigeria, was loaned by Mr. S. K. Ajmera (Poorva's, Jaipur). It was transparent and displayed characteristic tourmaline morphology, including a prismatic habit, a roughly triangular cross section with broken terminations, and striations along the length of the prism. It was bright green when viewed from the sides, but much darker down the c-axis. From its appearance, the crystal was readily identified as tourmaline.

Figure 26. The included crystal displayed an etched surface along the length of its prism faces (left, magnified 80×). When examined at certain angles with fiber-optic light, the pyramidal faces of the included crystal appeared bronzy, revealing complex patterns of etching and/or growth hillocks (center, magnified 65×). Some angular growth features were present just below the pyramidal faces (right, magnified 80×). Photomicrographs by G. Choudhary.

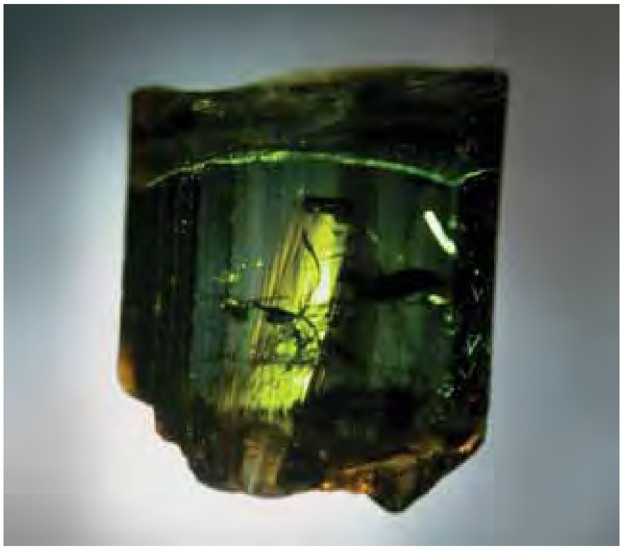

Figure 27. Between crossed polarizers, the included tourmaline remained bright when the host crystal came into an extinction position, indicating different planes of polarization for the two crystals. Photo by G. Choudhary.

Observed with transmitted light, the specimen's unusual feature became evident: It contained an elongated crystal that was inclined to the length of the main crystal (figure 25). With magnification, the prismatic habit of the included crystal was seen to be remarkably well developed. It displayed a pyramidal termination and a triangular cross section (again, see figure 25). Weak striations along the length of the prism also were visible. A small part of the included crystal extended beyond the host crystal, and it displayed a green color similar to that of the host.

At higher magnification, the prism faces of the internal crystal displayed fine etch marks (figure 26, left), which appeared angular (like two sides of a triangle). The pyramidal faces appeared to be coated with a bronzy material, and a complex pattern of triangular etching/growth hillocks was present (figure 26, center). In addition, this crystal displayed some angular growth zoning just below the pyramidal faces (figure 26, right). "Trichites" (hair-like fluid inclusions typically found in tourmalines) were present in both the host and the included crystal.

When observed between crossed polarizers, the specimen clearly showed an anisotropic nature. As expected based on the orientation of the crystal within its host, the internal crystal's polariscope reaction was distinctly different from that of the host crystal (figure 27).

The surface features of the included crystal recorded variations in its growth conditions. We believe it is protogenetic—that is, it formed before the main crystal. After the smaller crystal formed, its prism faces were apparently etched by residual fluids, and it was subsequently overgrown by the host tourmaline crystal.

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Gagan Choudhary

Tourmaline from Muva, Mozambique. In late August 2007, two of these contributors (BML and JCZ) visited a new alluvial tourmaline deposit in northeastern Mozambique, in conjunction with field studies of the Cu-bearing tourmaline mines at Mavuco (see B. M. Laurs et al., "Copper-bearing [Paraíba-type] tourmaline from Mozambique," Spring 2008 *Gems & Gemology*, pp. 4–30). The deposit is located at 15°49′39.9″ S, 39°06′04.4″ E, which is only 13 km northeast of Mavuco.

At the time of our visit, there were approximately 100 miners working the deposit with picks and shovels in a series of shallow pits (figure 28). As at Mavuco, it was necessary to dig through some overburden (1–3 m) before reaching the tourmaline-bearing horizon. The thickness of this horizon could not be determined due to the presence of mud/water in the bottom of the pits. We were told by local miners and traders that about 50 kg of tourmaline were produced each week, as waterworn crystals ranging from near colorless to yellow to green and pink to brown

Figure 28. Miners work the Muva tourmaline deposit with picks and shovels in a series of shallow pits. Photo by J. C. Zwaan.

Figure 29. These pebbles (~0.8–2.9 g) show some of the colors of tourmaline that have been recovered from the Muva deposit. Photo by Kevin Schumacher.

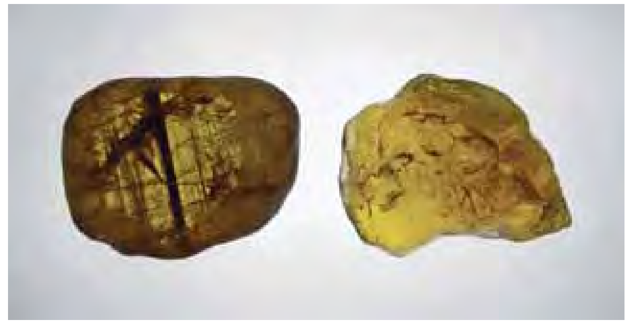

Figure 30. Some of the tourmaline from Muva is greenish yellow to yellow, as shown by these samples (8.66 and 8.59 g), which were gemologically characterized for this report. Photo by J. C. Zwaan.

(e.g., figure 29). Although the miners hoped to find Cu-bearing tourmaline at this deposit, the colors recovered there suggested that none contained Cu; however, the tourmaline had not yet been chemically analyzed.

From a parcel of rough material weighing approximately 1 kg, we selected 21 pieces for further study that encompassed the available range of colors. Flat faces were polished on all pieces, and two of them (both yellow, figure 30) were gemologically characterized using standard techniques at the Netherlands Gemmological Laboratory. The other 19 samples (pale yellow, yellow to yellowish green, and pink) were chemically analyzed by electron microprobe at the University of New Orleans.

The following properties were determined on the two rough samples (8.66 g greenish yellow and 8.59 g yellow, listed in respective order): pleochroism—very strong slightly greenish yellow and dark brown, and weak yellow and very light yellowish green; RI—1.627–1.648 and 1.622–1.643; birefringence—0.021; hydrostatic SG—3.09 and 3.07; fluo-

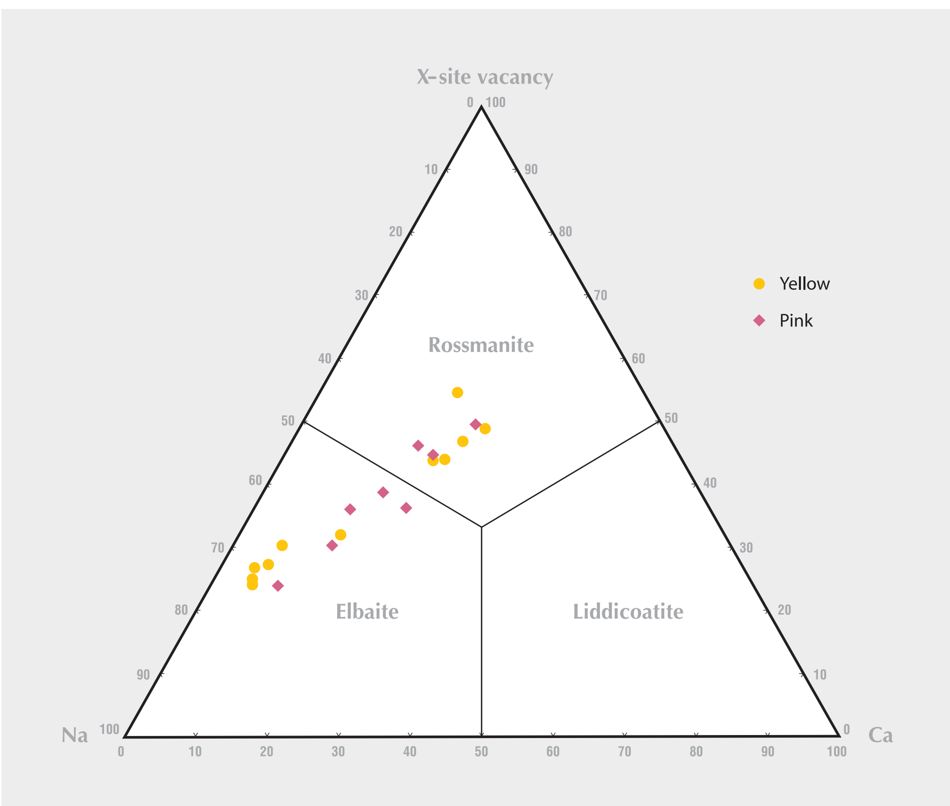

Figure 31. Electron-microprobe analyses of 19 samples of Muva tourmaline showed that they consisted of elbaite and rossmanite, and that there was no correlation between color and tourmaline species.

rescence—inert to long- and short-wave UV radiation; and no distinct features visible with a desk-model spectroscope. Microscopic examination revealed partially healed fissures, forming "trichites" composed of fine, thread-like, or wispy capillaries. Also present were hollow tubes that were mostly narrow and oriented parallel to the c-axis; some thicker tubes were stained reddish brown. The properties listed above are typical for gem tourmaline. EDXRF analyses of these samples showed that they contained high concentrations of Mn, and only trace amounts of Ca, Fe, and Ti.

Electron-microprobe analyses of the 19 samples showed that 11 were elbaite and eight were rossmanite. Some representative average analyses are available in the *G&G* Data Depository (see www.gia.edu/gemsandgemology). There was no correlation between color and tourmaline species (figure 31). No Cu was detected in any of the samples. The yellow to yellowish green samples contained significantly more Mn (3.99–7.44 wt.% MnO) than the pink samples (0.14–2.51 wt.% MnO), as well as slightly higher concentrations of Ti. The compositional data for the yellow to yellowish green samples was quite similar to those reported for tourmaline of similar colors from the Canary mining area in Zambia (see B. M. Laurs et al., "Yellow Mn-rich tourmaline from the Canary mining area, Zambia," Winter 2007 *Gems & Gemology*, pp. 314–331), except that some of the Mozambique stones contained much higher Ca, as well as slightly higher Fe and lower Na.

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Figure 32. Pakistan is the source of this 31.9-mm-long aquamarine that contains a cloudy tornado-shaped concentration of fluid inclusions, as well as some interesting mineral inclusions. GIA Collection no. 37700; photo by Robert Weldon.

INCLUSIONS IN GEMS

Two unusual aquamarines. Two very unusual aquamarine specimens were recently brought to our attention by Dudley Blauwet (Dudley Blauwet Gems, Louisville, Colorado) and Jack Lowell (Colorado Gem and Mineral Co., Tempe, Arizona). The beryl crystal from Mr. Blauwet came from the Biensapi aquamarine pegmatite in the Braldu Valley in Baltistan, Pakistan, and he donated it to GIA because it contained some interesting inclusions. As shown in figure 32, this 31.9-mm-long crystal had a transparent termination and a cloudy lower portion with a tornado-like shape composed of numerous veils of minute fluid inclusions. The mineral inclusions in this aquamarine were also interesting. In addition to some obvious white feldspar crystals, a few small brownish green crystals were also visible (figure 33), although they were too deep in the host to allow analysis beyond what could be surmised through magnification. In this contributor's experience, the only brownish green crystals so far identified in Pakistani beryls have been monazite.

Figure 33. Although it was too deep in the Pakistan aquamarine to be analyzed, this 0.45 mm brownish green crystal inclusion surrounded by a tension halo appeared to be monazite. Photomicrograph by J. I. Koivula.

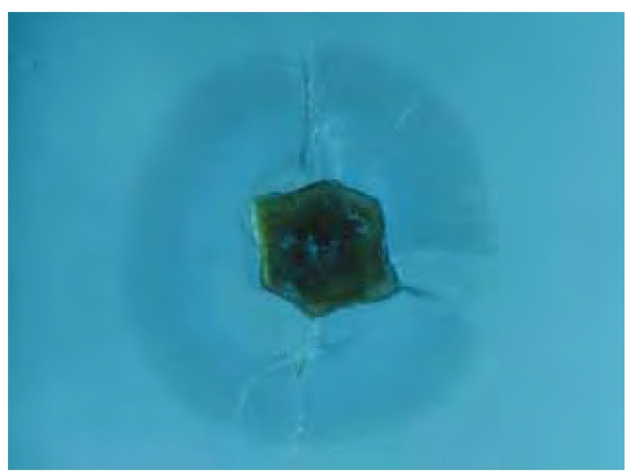

Figure 34. Some of the crystals in this 52.17-mm-wide aquamarine cluster from Namibia displayed an unusual trapiche structure on their terminations. Photo by Robert Weldon.

Figure 35. Looking down the c-axis, the hexagonal symmetry of the trapiche structure in this 5.87-mm-wide termination in the Namibian aquamarine cluster is clearly visible. Photomicrograph by J. I. Koivula.

The specimen from Mr. Lowell reportedly came from the Erongo Mountains in Namibia. It measured 52.17 mm wide and was composed of a cluster of transparent-to-translucent greenish blue aquamarine crystals that were partially coated with a thin layer of pocket clay. The most interesting feature, which is clearly visible in both figure 34 and the photomicrograph in figure 35, was the distinctive trapiche structure apparent on several terminations. We have never before encountered such an obvious example of a trapiche pattern in aquamarine.

A 2006 issue of the *Mineralogical Record* (Vol. 37, No. 5) was dedicated to the minerals from the Erongo Mountains in Namibia, and though aquamarine was featured on the cover and thoroughly discussed and illustrated in the text, no mention was made of trapiche features and no photographs of this type of aquamarine were included. Although this appears to be a very unusual specimen, the fact that such material exists opens the possibility of trapiche aquamarine appearing in the gem market.

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An interesting rose quartz from Madagascar. In October 2007, Fabrice Danet (Style Gems, Antsirabe, Madagascar) informed us about a new find of rose quartz from Madagascar that contained some unusual inclusions. He first saw the material in April 2007, when a local dealer offered him a few kilograms of rather small pieces said to be morganite. About half the rough contained noticeable green inclusions, and Mr. Danet subsequently purchased 2 kg. In June 2008, he obtained 10 kg from a 100 kg parcel consisting mostly of small pieces. This time it was offered as rose quartz by a man who actually mined the material. He reported that it came from several small pits in a weathered pegmatite that contained beryl, black tourmaline, mica, clay, and areas of rose quartz. According to the miner and several local dealers, the deposit is located in the Ihosy area of southern Madagascar.

So far, Mr. Danet has cut about 200 stones, the largest of which weighs 27 ct. On examining the material with a loupe, he noticed that the green inclusions had a shape and color that were typical of diopside. Also present were orange hessonite-like inclusions and some very thin needles.

Figure 36. This 3.83 ct rose quartz from southern Madagascar contains an inclusion suite that has not previously been documented in such material from any locality. GIA Collection no. 37702; photo by Robert Weldon.

Figure 37. The green inclusions in this rose quartz from Madagascar proved to be diopside, and the orange crystalline masses were identified as grossular. Also present are some needles of epidote. Photomicrograph by J. I. Koivula; field of view 2.7 mm.

Figure 38. This 3.63 ct step cut, which was identified as scapolite, contains conspicuous randomly oriented inclusions that appear black to the unaided eye. GIA Collection no. 37701; photo by Robert Weldon.

Mr. Danet donated to GIA a light pink 3.83 ct oval brilliant cut (figure 36) and three pieces of rough that contained obvious dark green and bright orange transparent-to-translucent inclusions. The faceted gem was confirmed as rose quartz by standard gemological testing. It contained a relatively large green inclusion adjacent to an orange inclusion (figure 37) that were both visible through the table facet and made excellent targets for Raman microanalysis. As suggested by Mr. Danet, the green inclusions were indeed diopside and the orange crystals were grossular. While we have encountered garnets before as inclusions in rose quartz (from Sri Lanka), this is the first time this combination of inclusions has been observed in rose quartz from any locality. As an added bonus, the very small blade-like to acicular inclusions in the stone were identified as epidote.

John I. Koivula and Karen M. Chadwick
GIA Laboratory, Carlsbad

Scapolite with diopside inclusions. In September 2007, Fabrice Danet obtained some yellow gem rough containing abundant stringers of dark inclusions that he was told came from the Amboasary region of Madagascar. The material was reportedly associated with mica, apatite, and large prisms (up to 50 cm) of yellow scapolite that were typically opaque. He obtained about 200 g of the inclusion-bearing material from a 5 kg parcel, and so far he has cut 16 stones ranging up to 7 ct. Mr. Danet donated to GIA a very light yellow 3.63 ct rectangular step cut (figure 38) and a few pieces of the rough material. Its overall appearance suggested that it might be heliodor, which is well known from Madagascar, but the inclusions were not typical of this beryl.

Standard gemological testing identified the faceted stone as scapolite. To the unaided eye, the inclusions appeared black and seemed randomly oriented. With magnification, their habits ranged from long rods to nearly spherical bulbous masses that did not have visible crystal faces (figure 39). They were actually dark green in color, and even with magnification they had no apparent crystallographic orientation or relation to their host. Raman microspectroscopy identified them as diopside. In addition, a few extremely small light orange fuzzy-looking inclusions in association with the much more prominent diopside inclusions were identified as barite. The stone also contained some ultra-fine hair-like fibers that were too thin to identify by Raman analysis.

John I. Koivula and Karen M. Chadwick

Spodumene from Afghanistan with unusual inclusions. As a pegmatitic gem mineral, spodumene may occasionally display interesting inclusions that reflect its geologic character and the conditions of its growth and post-growth dissolution. This contributor recently examined two spodumene crystals that hosted some noteworthy features.

Figure 39. With magnification, it was evident that the inclusions in the scapolite were dark green; Raman analysis identified them as diopside. Photomicrograph by J. I. Koivula; field of view 3.3 mm.

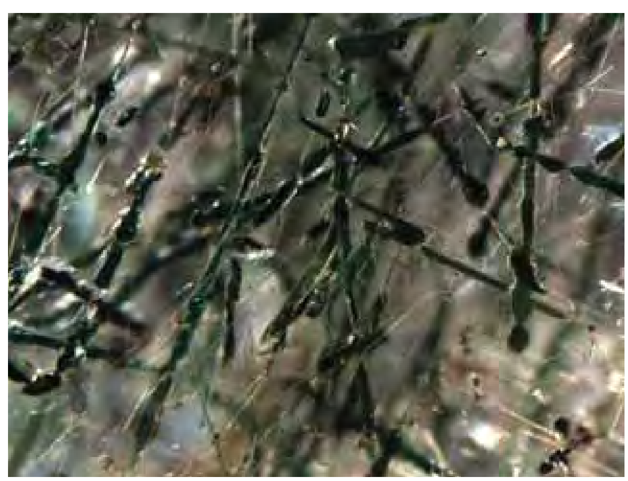

Figure 40. This 25.0-mm-long crystal of spodumene extends from a matrix of K-feldspar, creating an aesthetic mineral specimen that is reportedly from Afghanistan. GIA Collection no. 37699; photo by Robert Weldon.

Figure 41. Isotropic, transparent, and yellowish brown, these tetrahedral and modified octahedral inclusions in the spodumene in figure 40 resemble a mineral in the pyrochlore group, possibly pyrochlore itself. Photomicrograph by J. I. Koivula; field of view 2.6 mm.

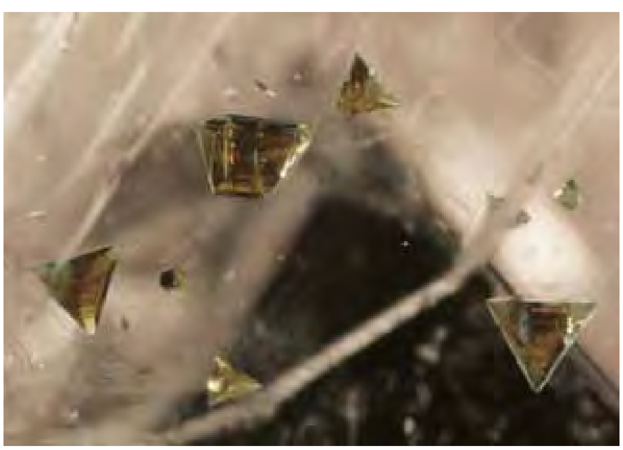

Figure 42. Also reportedly from Afghanistan, this 71.2-mm-long spodumene crystal has an etched spiral dislocation pattern extending through its entire length. Photo by Robert Weldon.

One of these specimens was donated by Dudley Blauwet. This pale yellow spodumene reportedly was mined from Kala, Darre Pech, Kunar Province, Afghanistan. As pictured in figure 40, the 25.0-mm-long transparent spodumene crystal extended from a matrix of K-feldspar and was very aesthetic. Scattered mineral inclusions were present near the base of the spodumene, but because of their positioning they could not be analyzed by Raman spectroscopy. Microscopic examination proved that the inclusions were isotropic and that they had a refractive index that was reasonably higher than their host. Their transparency and yellowish brown color, together with their tetrahedral to modified octahedral habit (figure 41), reminded us of inclusions we had encountered before in a beryl from Pakistan (E. J. Gübelin

Figure 43. The spiral dislocation pattern appeared to be epigenetically filled with off-white to reddish brown debris that was probably a mixture of clay minerals and iron oxides. Photomicrograph by J. I. Koivula; field of view 9.7 mm tall.

and J. I. Koivula, *Photoatlas of Inclusions in Gemstones*, Vol. 2, Opinio Publishers, Basel, 2005, p. 177). Those inclusions were conclusively identified by X-ray diffraction as pyrochlore, so the possibility exists that the inclusions in this specimen might also be pyrochlore or some other pegmatitic member of the pyrochlore mineral group.

The other spodumene, also reportedly from Afghanistan, was pale pink and measured 71.2 mm long (figure 42). It was sent to us for study by Jack Lowell because it had what appeared to be an etched spiral dislocation pattern extending through its entire length. The dislocation pattern was clearly visible even without magnification, and in some viewing directions it looked a bit like numerous tiny birds perched on a wire. Viewed with magnification through the natural surface, the etched dislocation had more of a fern-like or blade-like spiral pattern to it, with several relatively evenly spaced "petals" or curved "fan blades" extending from the edges along the length (figure 43). The whole of the dislocation also appeared to be filled with chalky-looking off-white to reddish brown epigenetic debris that was probably a mixture of clay minerals and iron oxides, which are commonly encountered as post-growth deposits in such features.

John I. Koivula

SYNTHETICS AND SIMULANTS

Two interesting synthetic rubies. Most synthetic rubies and sapphires are grown by flame-fusion (Verneuil), flux, or hydrothermal processes. Of these, Verneuil synthetics are the most common due to their low production cost. The Verneuil products are easily identifiable by internal features such as gas bubbles of various shapes and types, curved growth features (lines and color bands), and Plato lines.

However, some Verneuil synthetic rubies and sapphires display inclusion features that closely resemble those seen in their natural counterparts (e.g., Summer 2007 GNI, pp. 177–178). Recently, the Gem Testing Laboratory of Jaipur, India, encountered two synthetic rubies that were interesting because of their natural appearance. The rubies were purple-red mixed-cut ovals weighing 3.50 and 2.97 ct (figure 44). Upon initial observation, both specimens appeared to be ruby, which was supported by their RI and SG values.

When the 3.50 ct sample was observed carefully at low magnification, it appeared to be divided into two sections, one translucent and the other transparent (figure 45). These sections were separated by a distinct, slightly curved plane running throughout the specimen. The transparent portion displayed a cloud of fine "pinpoints" in a radiating pattern; this cloud was further surrounded by a circular zone (again, see figure 45). The circular zone was visible to the unaided

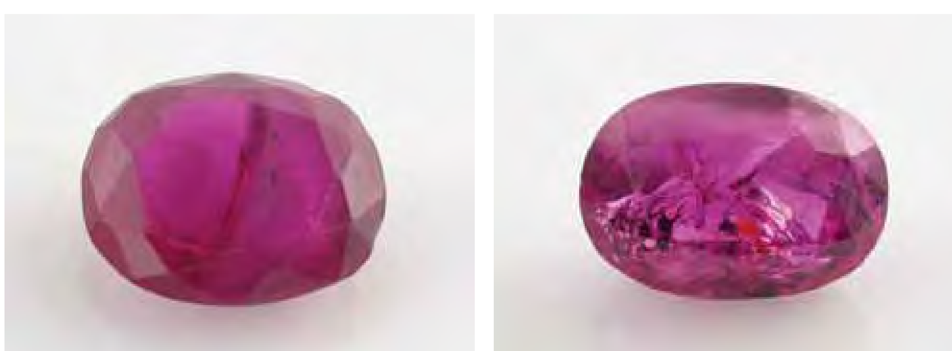

Figure 44. These 3.50 ct (left) and 2.97 ct (right) synthetic rubies, which were represented as natural, displayed interesting features. Note the distinct curved plane at the center of the 3.50 ct sample, dividing it into two parts, while the 2.97 ct gem displays surface breaks and a milky zone. Photos by G. Choudhary.

Figure 45. The transparent portion of the 3.50 ct sample displays a cloud of pinpoints in a radiating pattern, surrounded by a circular zone that confirms the ruby is synthetic. Photomicrograph by G. Choudhary; magnified 10×.

eye, and identified the sample as a flame-fusion synthetic. The translucent portion contained a dense concentration of globular and tubular inclusions (figures 46 and 47). When viewed in certain orientations, the inclusions were seen to be concentrated in parallel planes intersecting one another at angles that appeared to be 60°/120° (figure 46, right). The intersections of these planes formed rhomboid shapes that were very similar to those formed by the intersection of rhombohedral twin planes in natural corundum. It can be assumed that such features formed along the rhombohedral planes due to disturbances during the growth process. The translucent portion also contained a few blue pinpoints (again, see figure 47). Such blue-colored pinpoints have been noted previously in Verneuil synthetic corundum (ruby, as well as sapphire) by this contributor. The fact that the two portions of the sample displayed such distinct inclusion features seemed to indicate a composite stone, but this possibility was ruled out by the absence of a junction plane or flattened/trapped gas bubbles (again, see figures 45 and 46, left).

The 2.97 ct specimen had obvious surface breaks containing eye-visible orange stains, and also a milky zone toward one end. These features are common in natural rubies that have iron staining and host milky zones consisting of rutile silk or discs. When magnified, the surface breaks displayed distinct orange patches, with some flow-like patterns that indicated impregnation by a colored substance (figure 48, left). The milky zones had curved edges and were composed of fine gas bubbles (figure 48, right), which pointed to synthetic ruby. In addition, fine curved growth lines and scattered spherical and elongated gas bubbles were seen, as expected in Verneuil synthetics. In general, the substance used to fill fissures in gems is either colorless or is colored to match the stone's bodycolor. In this specimen, the use of a different-colored substance provided obvious evidence that it had been filled.

Gagan Choudhary

MISCELLANEOUS

Update on U.S.-Myanmar import restrictions. On July 29, 2008, U.S. President George W. Bush signed into law the Tom Lantos Block Burmese JADE (Junta's Anti-Democratic Efforts) Act of 2008. A supplement to the Burmese Freedom and Democracy Act of 2003, the new JADE Act significantly strengthens restrictions on the import of Burmese ruby and jadeite into the United States.

The 2003 Act imposed an import ban on all Burmese products, including Burmese gem materials, into the U.S. However, because of World Trade Organization Rules of Origin, Burmese gems that underwent a substantial transformation (e.g., cutting and polishing) outside Myanmar were not considered products of Myanmar and were not covered by the import ban (see, e.g., Spring 2005 GNI, p. 71). The 2008 JADE Act closes this loophole for ruby and jadeite. As of September 29, 2008, it is illegal to import into the United States:

- Jadeite mined or extracted from Myanmar
- Rubies mined or extracted from Myanmar
- Any articles of jewelry containing jadeite or rubies mined or extracted from Myanmar

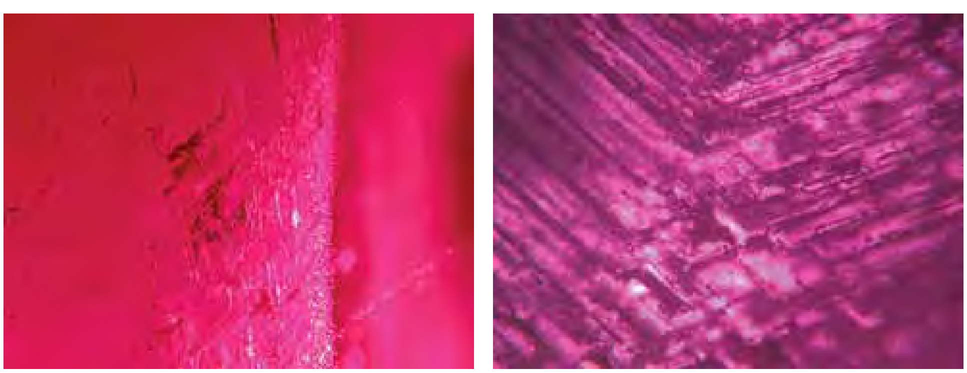

Figure 46. Part of the 3.50 ct synthetic ruby contains abundant inclusions that in places intersect at ~60°/120°. In the left image, no junction plane or trapped gas bubbles are present between the translucent and transparent areas, ruling out a composite gem. Photomicrographs by G. Choudhary; magnified 30× (left) and 65× (right).

Figure 47. Some of the globular and tubular inclusions in the 3.50 ct synthetic ruby were not arranged in intersecting planes, as shown here. Also note the scattered blue pinpoints. Photomicrograph by G. Choudhary; magnified 80×.

For both gem materials, the rules apply regardless of whether the gem is rough or fashioned. It is important to remember that the 2003 restrictions remain in effect, so it is still illegal to import other rough Burmese gem materials and all finished gemstones that are cut and polished in Myanmar.

An important element of this law is that importers of non-Burmese ruby and jadeite will be required to demonstrate the origin of their gemstones, and they must retain all information relating to the purchase, manufacture, and shipment of such goods for a period of not less than five years from the date of entry into the U.S. The only way these requirements can be waived is if the exporting country has itself implemented a similar set of restrictions to prevent the importation of Burmese gemstones into that country. The exact implementation of the law will be determined through the development of regulations, which are still being drafted.

The full text of the 2008 JADE Act is available at www.govtrack.us/congress/billtext.xpd?bill=h110-3890.

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ANNOUNCEMENTS

***Gems & Gemology* wins two major awards.** On July 29, the American Gem Society presented Russell Shor with its annual Richard T. Liddicoat Journalism Award for Industry/Trade Reporting for his Fall 2007 *G&G* article "From Single Source to Global Free Market: The Transformation of the Cultured Pearl Industry." This marked the fifth prize for a *G&G* article since the Liddicoat Awards' inception in 2003.

G&G also received recognition for the quality of its printing, placing first in the 2008 Gold Ink Awards competition, in the category of Scientific and Technical Journals. Cosponsored by *Print Media* and *Printing Impressions* magazines, the Gold Ink Awards are recognized as the nation's most prestigious print competition. They are based on print quality, technical difficulty, and overall visual effect.

This brings to 29 the number of awards *Gems & Gemology* has won for editorial and printing excellence since moving to a larger format in 1981.

Conferences

Gem-A Centenary Conference and 2nd Annual European Gemmological Symposium. The Gemmological Association of Great Britain (Gem-A) will hold its annual conference October 25–26 in London. In conjunction with its centennial celebration, Gem-A will also be hosting this year's European Gemmological Symposium at the same time. Day one will highlight the history of gemology and the jewelry trade, and day two will discuss practical tips and new technologies for the modern gemologist. Visit www.gem-a.info/news--events/the-gem-a-conference.aspx.

Gems in objects of cultural heritage. An international conference titled *Geoarchaeology and Archaeomineralogy: Impact of Earth Sciences in the Study of Material Culture*

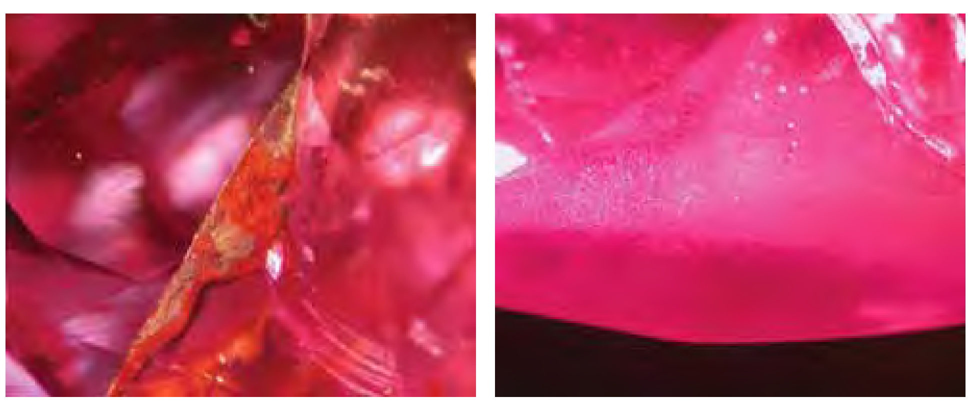

Figure 48. Surface breaks in the 2.97 ct synthetic ruby contain orange patches with flow-like patterns that indicate impregnation by a colored substance (left). Also note the fine curved growth lines, characteristic of a melt-grown synthetic, as is the curved milky zone on the right. Photomicrographs by G. Choudhary; magnified 80× (left) and 60× (right).

will take place in Sofia, Bulgaria, October 29–30, 2008. One of the conference topics will be "Archaeomineralogy and Gemmology." A field trip will focus on the "Role of Bulgaria in the History of World's Jewellery Art." Visit http://mgu.bg/docs/CircularEN.doc.

GIT 2008. The Gem and Jewelry Institute of Thailand will host the *2nd International Gem & Jewelry Conference* December 11–14 in Bangkok. The program will feature a two-day technical session, with oral and poster presentations, followed by a two-day excursion to the Kanchanaburi sapphire deposits. Visit www.git.or.th/conference/index.html.

IDCC-2. The *2nd International Diamond Cut Conference* will take place in Lausanne, Switzerland, March 22–25, 2009, just before the BaselWorld 2009 Watch and Jewellery Fair. A diamond cut exhibition will be offered at the fair. Visit http://idcc2.octonus.com.

MAEGS 16. Gemology will be one of the topics covered at the *Meeting of Association of European Geological Societies*, July 9–13, 2009, in Cluj-Napoca, Romania. Visit http://bioge.ubbcluj.ro/maegs16.

Gemological Research Conference. GIA will host its second Gemological Research Conference August 21–23, 2009, in San Diego, California. The program will feature oral and poster presentations and panel discussions in two parallel tracks (gemology and jewelry/business issues), as well as a photography competition and field trips to the gem pegmatites in San Diego County. Visit http://grc2009.gia.edu.

4th International Symposium on Granitic Pegmatites. Held in Recife, Brazil, August 30–September 6, 2009, this conference will explore the latest scientific advances in the study of granitic pegmatites. Field trips will include the Eastern Brazilian Pegmatite Province (Minas Gerais) and the Borborema Pegmatite Province (northeastern Brazil). Visit www.ufpe.br/geologia/peg2009brazil.

Exhibits

Exhibits at the GIA Museum. Through December 2008, "Facets of GIA" will explain the various gemological services that GIA provides, including diamond grading, gem identification, education, and public outreach. Also, on display in the Rosy Blue Student Commons are photo-essays by Robert Weldon, manager of photography and visual communications at the GIA Library, and *G&G* editor Brendan Laurs, depicting emerald mines in Colombia and the Paraíba-type tourmaline deposit in Mozambique, respectively (for more on the latter, see the article in the Spring 2008 issue of *G&G*). Advance reservations are required; to schedule a tour, call 760-603-4116 or e-mail museum@gia.edu.

The Aurora Collection at The Vault. "The Vault," a new permanent collection of rare gemstones and mineral specimens, is now open at the Natural History Museum in London. On temporary display is the Aurora Collection, currently comprising 296 naturally colored diamonds (267.45 carats total weight) assembled by collectors Alan Bronstein and Harry Rodman. Also on display is the 47.69 ct Star of Africa, which helped launch the 1869 diamond rush in South Africa, and the 1,385.95 ct Devonshire emerald crystal. Visit www.nhm.ac.uk/galleries/green-zone/vault.

Gold in the Americas. Now on display at the Musée de la Civilisation in Quebec City, Quebec, this exhibition will review the importance of gold to the cultures of North and South America, both ancient and modern. The 250 items on display will include gold objects and mineral specimens, as well as paintings, sculptures, and ethnographic objects. Visit www.mcq.org/or.

Portuguese and Brazilian jewelry. An exhibition of Portuguese and Brazilian jewelry is on display at the Royal Palace of Ajuda in Lisbon until November 30. The exhibit marks the 200th anniversary of the Portuguese royal court's arrival in Brazil, as they fled from Napoleon's troops. The curators chose 24 Portuguese and 24 Brazilian jewelry artists to work in pairs and create pieces based on the period. Brazilian diamonds and gold are featured, as well as colored stones from the Brazilian state of Minas Gerais.

Nature of Diamonds at the ROM. The Nature of Diamonds exhibit is on display at the Royal Ontario Museum from October 25, 2008, to March 22, 2009. The award-winning exhibition explores humankind's ongoing fascination with diamond, examining its geologic origins, mining, cultural significance in art, literature, and ornamentation, and numerous technological applications. Visit www.rom.on.ca.

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