G&G Gem News International

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TUCSON 2012

This year's Tucson gem and mineral shows saw brisk sales of high-end untreated colored stones (and mineral specimens) as well as some low-end goods, but sluggish movement of mid-range items. In addition to the more common colored stones, many rarities such as pallasitic peridot (figure 1) and hibonite (figure 2) were seen at the shows. Cultured pearls continued to have a strong presence, and particularly impressive were the relatively new round beaded Chinese freshwater products showing bright metallic luster and a variety of natural colors (figure 3). An unusual historic item seen in Tucson is the benitoite necklace suite shown in figure 4. Several additional notable items present at the shows are described in the following pages and will also be documented in future issues of *G&G*.

The theme of this year's Tucson Gem and Mineral Society show was "Minerals of Arizona" in honor of Arizona's Centennial, and next year's theme will be "Fluorite: Colors of the Rainbow."

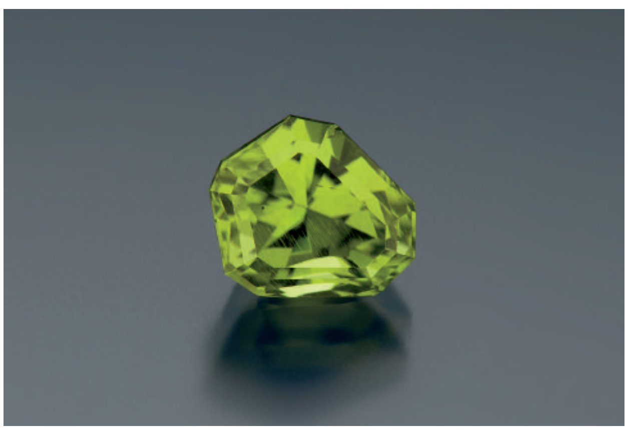

Figure 1. Pallasitic peridot had a strong presence at the 2012 Tucson gem shows. This unusually large and fine example weighs 2.26 ct and is courtesy of Scott Davies, American-Thai Trading, Bangkok. Photo by Robert Weldon.

Figure 2. This exceedingly rare faceted hibonite from Myanmar weighs 0.96 ct and was recently cut from a crystal weighing 0.47 g, which also yielded a 0.26 ct stone. Courtesy of Mark Smith (Thai Lanka Trading, Bangkok); now in the Herbert Obodda collection. Photo by Robert Weldon.

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 will be returned after consideration or publication.

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http://dx.doi.org/10.5471.GEMS.48.1.54.

Figure 3. Beaded Chinese freshwater cultured pearls showing a metallic luster and a variety of natural colors were popular in Tucson this year. Also known as "Edison pearls," the examples shown here are 12.5–13.5 mm in diameter. Courtesy of Jack Lynch (Sea Hunt Pearls, San Francisco); photo by Robert Weldon.

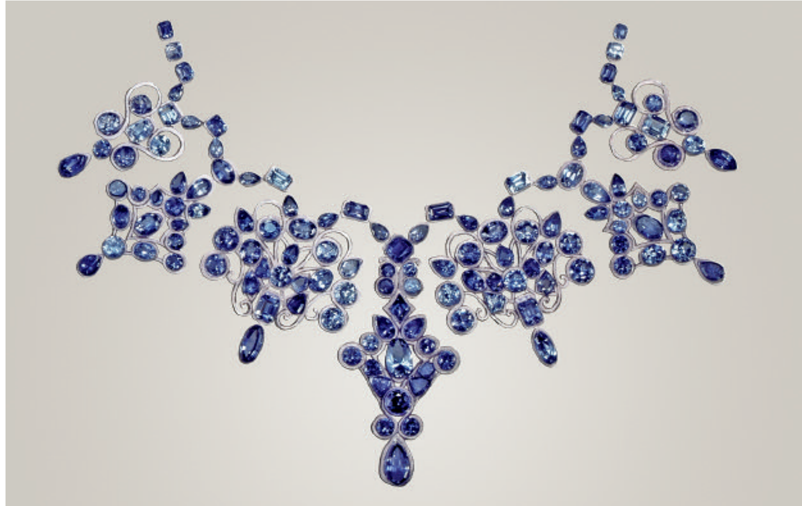

Figure 4. This historic set of 133 benitoites (0.16–3.50 ct) with a total weight of 130.89 carats was faceted from rough material collected by Edward Swoboda and Peter Bancroft in the 1920s and 1930s. The stones are shown on a drawing of a necklace that was designed specifically for this suite. The collection was offered for sale for the first time by Rob Lavinsky (The Arkenstone, Garland, Texas). Courtesy of Bryan Swoboda.

G&G appreciates the assistance of the many friends who shared material and information with us this year, and also thanks the American Gem Trade Association for providing space to photograph these items during the AGTA show.

COLORED STONES AND ORGANIC MATERIALS

Aquamarine from Mavuco, Mozambique. Alluvial deposits at Mavuco in the Alto Ligonha pegmatite district in northern Mozambique are well-known as a source of copper-bearing tourmaline (B. M. Laurs et al., "Copper-bearing [Paraíba-type] tourmaline from Mozambique," Spring 2008 *G&G*, pp. 4–30). During this author's 2008 fieldwork at Mozambique Gems' claim, quartz-rich granitic pegmatites were seen adjacent to the tourmaline mines that were reportedly mined sporadically for aquamarine in the 1980s and 1990s. In November 2011, Mozambique Gems worked this pegmatite area for a two-week period, producing additional aquamarine. This material (e.g., figure 5) was exhibited at the Gem & Jewelry Exchange (GJX) show by mine partner Saint-Clair Fonseca Junior (Mozambique Gems, Nampula, Mozambique, and BC Gemas do Brasil, Governador Valadares, Brazil). He indicated that dynamite was used to blast the hard rock in search of aquamarine, which is frozen in the host quartz rather than being found in gem pockets. They recovered ~300 kg of aquamarine, of which 10 kg contained gem-quality areas. Approximately 500 carats have been faceted in calibrated sizes measuring up to 9 × 7 mm. These untreated gems show a rather saturated pure blue color for their size.

Figure 5. These aquamarines are from Mavuco, Mozambique. The oval center stone weighs 0.94 ct and the others are ~0.4 ct each. Photo by Robert Weldon.

Mr. Fonseca also had several necklace sets composed of faceted and tumbled Cu-bearing tourmaline that was produced from his claim during the past year. Most of this material was unheated, and it displayed a broad range of color similar to the tourmaline documented in the Spring 2008 *G&G* article referenced above.

Brendan M. Laurs

Azurite in granitic rock from Pakistan. At the 2011 and 2012 Tucson gem shows, Warren Boyd (R. T. Boyd Ltd., Ontario, Canada) showed *G&G* an interesting new gem material from the Skardu area in northern Pakistan. This area is famous for producing well-crystallized specimens of tourmaline, aquamarine, topaz, and garnet. In 2010, local prospectors discovered the new gem material in a remote valley. Now marketed as Raindrop Azurite, this unusual rock contains distinctive blue spots that make for attractive specimens, cabochons, and *objets d'art* (e.g., figure 6).

Mr. Boyd reported that the material is mined using simple hand tools, and the pieces are transported on foot or using pack animals to the closest road. So far ~4,000 kg of rough has been stockpiled, and nearly 600 pieces have been cut and polished in Shenzhen and Bangkok. He reported that the material is not treated in any way.

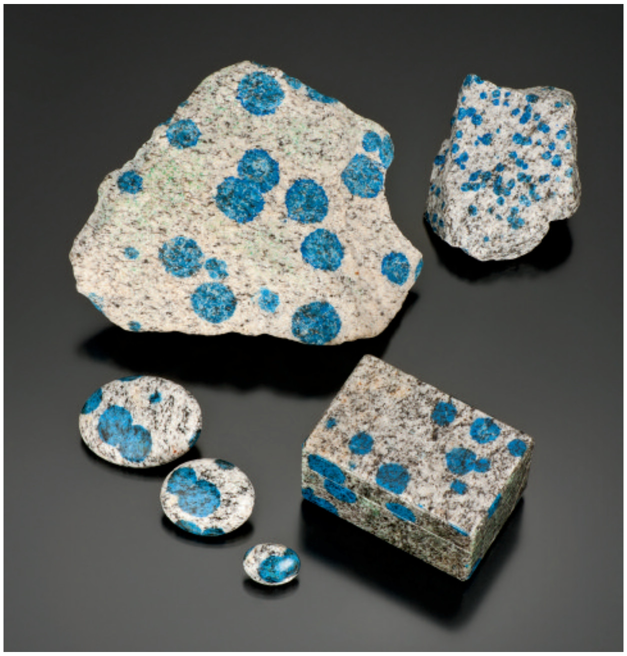

Figure 6. Raindrop Azurite is an azurite-bearing granitic rock from northern Pakistan. Shown here are two pieces of rough (404 and 87 g), cabochons (8.80–61.55 ct), and a box (6 × 4 × 3 cm) made by Silverhorn of Santa Barbara, California. Photo by Robert Weldon.

Raman analysis by Garry Du Toit at GIA in Bangkok confirmed that the blue spots consist of azurite, which occur in a matrix of sodic plagioclase, quartz, and muscovite.

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Cat's-eye emerald from the Belmont mine, Brazil. Chatoyant emerald has been known for decades (e.g., Fall 1982 Lab Notes, p. 169) but remains rather uncommon. During the 1990s, several stones were produced from the Santa Terezinha de Goiás emerald mines in Brazil (Gem News, Spring 1992, p. 60, and Spring 1995, pp. 60–61). Now small amounts of cat's-eye emeralds are coming from another source in Brazil, the Belmont mine.

At the GJX show, Marcelo Ribeiro Fernandes (Belmont, Itabira, Brazil) showed this contributor several attractive cat's-eye emeralds (e.g., figure 7) that were cut from material recovered since January 2010. Mr. Ribeiro indicated that rough material from his mine is now being examined by a specialist to identify the chatoyant material. He estimated that 100 g annually are separated out for cutting ~100 cat's-eye emeralds per year. Although cabochons ranging from 1 to 30 ct can be cut, Mr. Ribeiro indicated that 5 ct stones are most popular.

This is the first time that chatoyant emeralds have been specifically being targeted at Belmont during the rough sorting process, and the initiative is expected to increase the availability of this rare material in the future.

Brendan M. Laurs

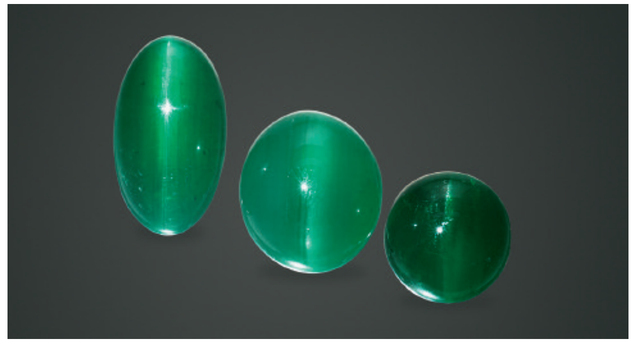

Figure 7. Cat's-eye emeralds such as these (16.75–29.14 ct) are now being cut from rough material that is carefully screened for chatoyancy at the Belmont mine in Brazil. Photo by Robert Weldon.

New production of purple common opal from Mexico. During the Tucson gem shows, Tom Elliot of Opal Royale (Bozeman, Montana) showed this author some purple Mexican opal colored by fluorite inclusions. While this material has been known for some time (E. Fritsch et al., "Mexican gem opals—Nano and micro structure, origin of colour, and comparison with other common opals of gemological significance," *Australian Gemmologist*, Vol. 21, No. 6, 2002, pp. 230–233), recent mining has made significant quantities of rough available to the market. The material was sold under the trade name "Opal Royale" and comes from central Mexico. Similar Mexican purple opal was also being sold in Tucson under the trade name "Morado Opal" and more generically as "Mexican purple opal."

According to Mr. Elliot, there are two basic varieties. A mottled purple and white to light gray variety typically occurs in veins, while a more uniformly colored darker purple version is generally found in nodules, with a chalcedony skin. Samples of both varieties (figure 8) were subsequently studied at GIA's Carlsbad laboratory. One cabochon of each type was examined

Figure 8. These samples of purple common opal are colored by fluorite inclusions. The rough pieces, which weigh 116 and 130 g, are shown with 13.98 and 15.24 ct cabochons. Photo by C. D. Mengason.

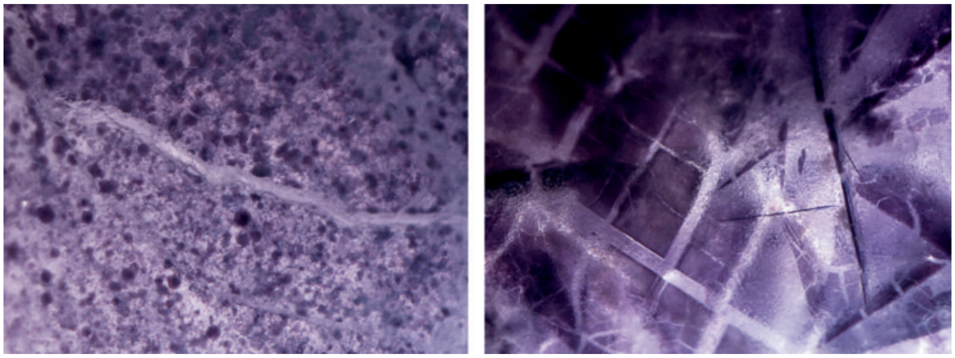

Figure 9. Microscopic examination reveals small rounded masses of purple fluorite in the Mexican opal, along with veins of chalcedony (left, magnified 60×). Brecciated planes of purple fluorite were also seen (right, magnified 40×). Photomicrographs by N. Renfro.

using standard gemological testing methods. Both gave a spot RI measurement of 1.44 and a hydrostatic SG of 2.18. The samples showed a very weak green reaction to long-wave UV exposure and a very strong green reaction to short-wave UV radiation, indications that they likely contained traces of uranium. Microscopic examination revealed small, dense irregular crystals and brecciated planes of purple material (figure 9) that was confirmed as fluorite by Raman analysis. The fluorite inclusions were much more clearly defined in the darker sample. Quartz was also detected in both cabochons.

Buyers should not confuse this non-phenomenal or common opal naturally colored purple by fluorite inclusions with dyed purple hydrophane opal exhibiting play-of-color (N. Renfro and S. F. McClure, "Dyed purple hydrophane opal," Winter 2011 *G&G*, pp. 260–270).

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Rare stones used in jewelry: smithsonite, cobaltite, pyrrhotite, nickeline, and Nuummite. Rare gems have long enjoyed popularity with collectors, but this year's Tucson shows saw several of these materials being purchased specifically for jewelry use (figure 10). At the GJX show, Mauro Pantò (The Beauty in the Rocks, Perugia, Italy) reported selling several varieties to jewelry manufacturers.

Yellow **smithsonite** ($ZnCO_3$), once mined in Sardinia, is no longer available since the closing of the Masua and Monteponi mines more than 40 years ago. The best-quality material is translucent and shows an even deep yellow color. Mr. Pantò has cut ~1,000 carats in standard and fancy shapes that mostly weighed 1–10 ct. He said it is difficult to obtain good-quality material; his entire inventory has come from old collections.

Cobaltite (CoAsS) from the Canadian town of Cobalt, Ontario, is an ore of cobalt with an appealing silver metallic luster. A few hundred carats were available in fancy shapes, with typical weights of 8–15 ct.

Although not particularly rare in nature, **pyrrhotite** (an iron sulfide) is seldom faceted, perhaps because of its low hardness (Mohs 3½–4½). Mr. Pantò had a few hundred carats of pyrrhotite from Mexico ranging from 3 to 10 ct.

The **nickeline** (NiAs) that Mr. Pantò obtained is from Cobalt, Canada. He said it must be mounted with great care, so only a few stones have been used in jewelry so far. Also known as niccolite in Europe, it was initially called *Kupfernickel*, or copper nickel, because the German miners who first saw the copper-red metallic mineral were convinced it was a rich ore of copper.

Nuummite (iridescent orthoamphibole) is normally seen in the market as tumbled stones or cabochons. This was the first time Mr. Pantò had offered faceted Nuummite, which came from the classic Greenland deposits (e.g., P. W. Uitterdijk Appel and A. Jensen, "A new gem material from Greenland: Iridescent orthoamphibole," Spring 1987 *G&G*, pp. 36–42). Similar faceted Nuummite is also known from Mauritania (see Fall 2011 Gem News International [GNI], pp. 242–243). Mr. Pantò had cut a few hundred carats in the 3–6 ct range.

Jan Iverson

Rosalinda: A new ornamental scapolite rock from Peru. White ornamental rock with red spots is known in two varieties: "chicken-blood stone" from China, and "myrickite" from northern California and elsewhere. The former material is a

Figure 10. Rare stones purchased by jewelry manufacturers in Tucson included, from left to right: yellow smithsonite (8.55 ct), cobaltite (13.36 ct), pyrrhotite (9.43 ct), nickeline (18.87 ct), and Nuummite (5.93 ct). Photo by Robert Weldon.

mixture of clay and quartz that is colored by cinnabar (e.g., W. Fuquan and G. Jingfeng, "Chicken-blood stone from China," Fall 1989 *G&G*, pp. 168–170), while the latter consists of silicified cinnabar-bearing rock. A new ornamental rock from Peru, known as Rosalinda, has a similar appearance but quite a different composition.

The first specimens were produced in September 2011 from an unnamed mountain (figure 11) close to the archaeological site of Tambo Colorado, an Inca fortification situated about 40 km east of Pisco, along the main road from the coast to Ayacucho. The outcrop covers an area of about 20 × 10 m, with substantial reserves; boulders approaching 50 cm wide have been recovered. The rock is white, with irregularly shaped pink to red spots that are usually several millimeters wide, though in rare cases they can measure several centimeters across.

XRD analysis of the white matrix mineral identified it as marialite, an Na- and Cl-rich member of the scapolite group. The scapolite is typically fine grained, occasionally forming long needles dispersed in white calcite. The red spots, also identified by XRD, are a member of the epidote-piemontite series, most likely Mn-rich epidote. Viewed with a loupe, some specimens also showed small (up to 1 mm) yellow grains of grossular.

Gemological examination of seven cabochons revealed the following properties: RI of the scapolite—1.54, SG of the rock—2.50–2.59, and Mohs hardness—6. The UV fluorescence shown by the scapolite is distinctive, and is quite useful for separating the material from similar-appearing rocks: It fluoresces orange to red (short-wave) or white (long-wave). Pure red Mn-rich epidote from the same locality showed: RI— >1.78, SG—3.15–3.20, Mohs hardness—5–6, and no reaction to UV radiation.

By the end of 2011, more than 20 tonnes of the rock had been prepared for export. The material can be used for cabochons, beads, and especially carvings (figure 12), some of which are quite large. At the 2012 Tucson shows it was marketed at the Hotel Tucson City Center as Rosalinda by Ramos Minerals, a Lima-based trading company. They had several hundred cabochons in various calibrated sizes; additional material is being polished in Lima.

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Figure 11. A mountainside near Tambo Colorado, Peru, is the source of the new ornamental stone known as Rosalinda. Photo by J. Hyršl.

Figure 12. The samples of Rosalinda on the left include cabochons up to 4 cm long and beads up to 8 mm in diameter. The Rosalinda elephant carving on the right measures 20 cm across. Courtesy of Ramos Minerals; photos by J. Hyršl.

Figure 13. These rare vlasovites (0.42 and 0.53 ct) are from Sheffield Lake in southwestern Quebec. Photo by Robert Weldon.

Vlasovite from Quebec. At the GJX show, Bradley Wilson (Coast to Coast Rare Stones International, Kingston, Ontario) exhibited nearly three dozen faceted samples of the rare mineral vlasovite ($Na_2ZrSi_4O_{11}$; figure 13). The brownish yellow gem material was mined in September 2008 at Sheffield Lake, near Témiscaming in Quebec, Canada, where it occurred with the more abundant mineral eudialyte. The rough had a uniform color and was transparent in small pieces. More than half of the cut samples he displayed were between 0.10 and 0.30 ct, and the largest stone was 0.53 ct. Although faceted vlasovite has occasionally been available to rare stone collectors, Mr. Wilson's stock at this year's Tucson show was significantly larger than has been seen in the past.

Discovered in 1961 in northern Russia, vlasovite has been found periodically at the Sheffield Lake locality. A 0.27 ct sample from the nearby Kipawa River in southwestern Quebec was reported in the Winter 1993 Gem News section (pp. 287–288).

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SYNTHETICS AND SIMULANTS

"Sterling Opal" debuts. At the Pueblo Gem & Mineral Show, Sterling Foutz (Sterling Opal, Tempe, Arizona) had a wide selection of a new impregnated synthetic opal. The material was developed by James E. Zachery, an electrical engineer who also created the process for Zachery-treated turquoise (see Spring 1999 *G&G*, pp. 4–16). The gem-quality synthetic opal was developed by accident, during the course of 22 years of research on producing nanoparticles for medical applications. The process yields opalescent layers that are then stabilized by impregnation with a specially developed resin that has the same RI as the synthetic opal. Marketed as "Sterling Opal," the material was introduced in nine varieties showing various play-of-color patterns and in bodycolors ranging from white to medium blue (e.g., figure 14).

Mr. Foutz said the product has a hardness similar to that of Zachery-treated turquoise (Mohs 4–5), and he currently manufactures about 18 kg per week. The rough material is fabricated in 2 × 2 in. (5 × 5 cm) tiles that weigh approximately 20–30 g each. The tiles are sliced in half along their thinnest direction, and the sawn surface of each half is polished in a variety of shapes. These tiles were offered in Tucson, along with about 3,000 cabochons cut from 2–3 kg of the rough material. Most of the cabochons ranged from 7 × 5 mm to 25 × 18 mm (ovals) and 10–25 mm (squares). Also available were a few doublets with black backings to accentuate the play-of-color, as well as cabochons of "Picasso opal" featuring a mosaic of tiny synthetic opal pieces set in an epoxy "matrix." Some of these mosaic cabochons had been heated to give the "matrix" a dark color.

Preliminary gem testing of a polished slab and a cabochon of "Sterling Opal" (not doublets or the Picasso variety) at GIA gave RI readings of 1.465 and 1.467, and hydrostatic SG values of 1.72 and 1.74, respectively. These values are within the range of those expected for impregnated opal—natural or synthetic—so care must be taken to correctly identify this material. More information will be reported in a future *G&G* article.

Brendan M. Laurs

Shane F. McClure
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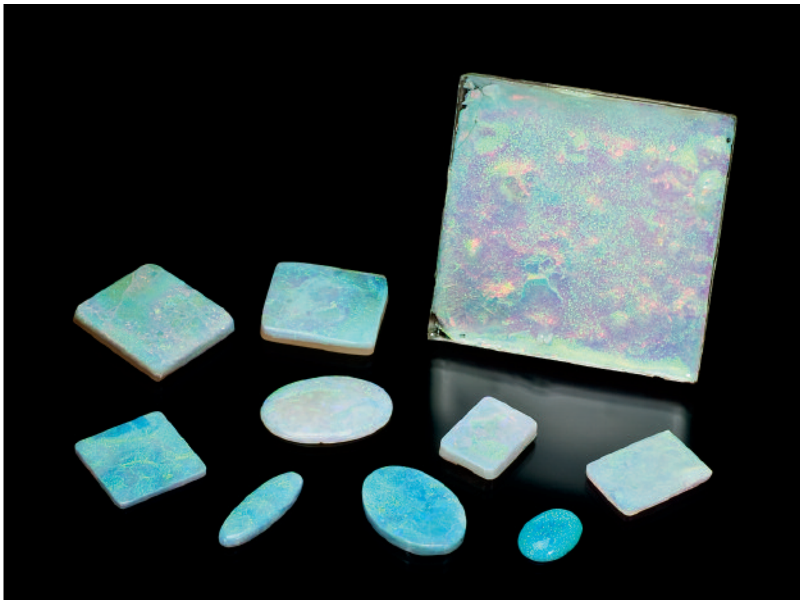
Bicolored tourmaline imitation. As the popularity of bicolored tourmaline has grown over the last few years, its price has risen accordingly. It is hardly surprising, then, that someone would develop an inexpensive imitation of this material.

Figure 14. "Sterling Opal" features various play-of-color patterns, with a white to medium blue bodycolor. The cabochons shown here range from 1.95 to 17.55 ct, and the rough piece (upper right) weighs 22.1 g. Photo by Jeff Scovil.



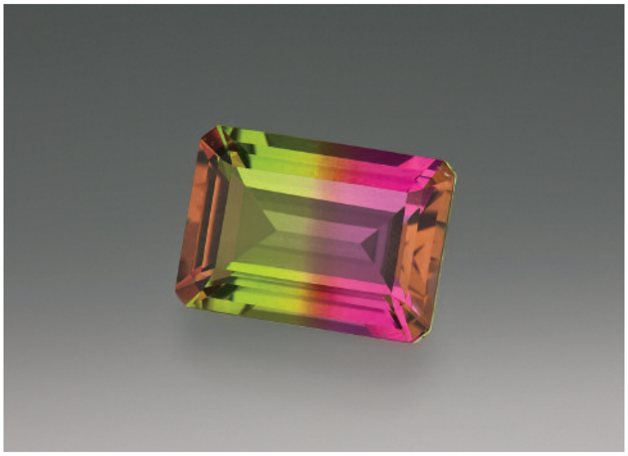


Figure 15. This triplet (6.97 ct) consists of crown and pavilion layers made of colorless quartz that are joined together with a red and green cement layer. Photo by Robert Weldon.

Rajneesh Bhandari (Rhea Industries, Jaipur, India) showed this contributor a new bicolored tourmaline simulant (figure 15). The imitations were offered for sale at the GJX show by RMC of Bangkok and Hong Kong. By the end of the show, they had sold out of all their merchandise on hand.

Mr. Bhandari indicated that the triplets consisted of colorless quartz crown and pavilion layers that were joined together with a red and green cement layer.

One sample was obtained by this contributor for examination. The emerald cut displayed a low-saturation brownish pink color at its extreme ends, likely caused by reflections combining the pink and green colors but somewhat imitative of pleochroism. Immersion in water showed colorless crown and pavilion sections, which both had the RI values and optic character of quartz. No inclusions were seen in the quartz with up to 63× magnification. The cement layer was clearly visible along the girdle (though not as obvious as in many synthetic spinel triplets). The cement layer was thinner than most, and with the microscope it appeared cloudy and contained several gas bubbles. The demarcation zone between the red and green areas was nearly centered and showed a smooth but sharp transition, as commonly seen high-quality bicolored tourmalines.

Viewed face-up with the unaided eye, these new triplets make a surprisingly convincing imitation of bicolored tourmaline.

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CONFERENCE REPORTS

U.S. Faceters Guild seminars. The U.S. Faceters Guild seminars were held February 3 at the Old Pueblo Lapidary Club in Tucson. In "Heat Treating Your Gems," **Lisa Elser** (Lisa Elser Custom Cut Gems, Vancouver, Canada) discussed heating gems such as aquamarine, amethyst, zircon, topaz, tourmaline, and tanzanite using a small programmable burnout oven or butane torch. She suggested sawing off a small piece of rough or choosing a poor-quality stone for experimentation. In an oven, the test stone is covered with investment powder (used in lost wax casting) and then slowly heated no more than 100ºC/hour, with incremental adjustments of 25ºC or less. The gem remains at the desired temperature for 60–90 minutes and is then allowed to cool to room temperature before removal. Because heating carries the risk of damage, Ms. Elser emphasized that she only attempts this treatment when a stone is unsalable and there is a good chance for substantial improvement. By keeping careful notes on stones from different lots, she found that material from the same lot often can be treated identically to yield similar color improvements, while similar material from different lots (and possibly different locations or digs) may require slight temperature adjustments. Her tests demonstrate that small dealers do not need expensive ovens to improve the color of certain gems (e.g., figure 16).

In a session titled "Training in Afghanistan," **Jim Rentfrow** (Green Gem Foundation, Berkeley, California) described efforts by the USAID-funded Afghanistan Small and Medium Enterprise Development program to foster private-sector

Figure 16. A 3.65 ct Nigerian tourmaline is shown before and after heat treatment. Photo by C. Tom Schlegel.

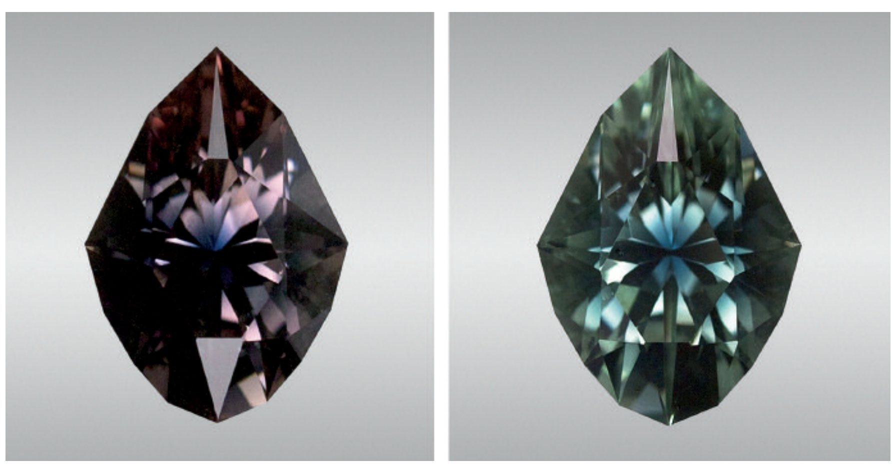

Figure 17. An Afghan woman in Kabul facets with a modern Ultra Tec machine. Photo by Jim Rentfrow.

Figure 18. The dials in these watches are fashioned from the Muonionalusta meteorite. Inclusions of troilite are visible at the 10 and 12 o'clock positions of the men's stainless steel watch on the left, and at the nine and 12 o'clock positions of the women's titanium watch on the right. Photo by Robert Weldon.

growth. Over the past two years in Kabul, he worked with cutters on Chicken Street to increase their capacity. When he first arrived, only one local cutter used modern techniques and earned $25 per stone. The rest used primitive methods and lower standards, earning $4–$8 per stone. Mr. Rentfrow showed the cutters how to use modern machines (figure 17) and implement proper polishing techniques to remove windows from stones, improve meet points, and read modern facet diagrams. He also taught them accounting principles, provided basic business coaching, and helped them network with local business owners.

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MISCELLANEOUS

Meteorite watches. At the GJX show, Robert and Patricia Van Wagoner (Beija-flor Wholesale, Haiku, Hawaii) exhibited an interesting selection of watches by Larimar Conlight of Denzlingen, Germany. The dials were made from a Swedish meteorite known as Muonionalusta (figure 18). It was discovered in 1906 in the Norrbotten region, north of the Arctic Circle (67°48′N, 23°07′E). Legend has it that two children were tending cattle and kicking stones when one of them struck a heavy rusty object, which they took to their village. In 1910 it was identified as an iron meteorite by Prof. A. G. Högbom, who named it after the municipality of Muonio.

Muonionalusta is composed of a nickel-iron alloy and classified as an octahedrite. After acid etching, slices of the meteorite display a spectacular crystalline texture (Widmanstätten pattern). Inclusions of troilite (FeS) are present in some of the watch dials, and Mr. Van Wagoner indicated that they are sealed under vacuum to prevent the troilite inclusions from oxidizing.

Mr. Van Wagoner also had watches with dials made from the Seymchan meteorite (also an octahedrite) that was found in the Magadan region of Russia in 1967.

Jan Iverson

GNI REGULAR FEATURES

DIAMONDS

Diamond mining to resume at Birim River, Ghana. For decades Ghana's Birim River (figure 19) has been a significant world diamond source since its discovery in 1924. The deposits have yielded as much as 3 million carats yearly, though more than 80% of the output is industrial quality or weighs <0.20 ct (figure 20). During the 1980s, however, production went into steep decline. After intermittent activity, Ghana Consolidated Diamonds discontinued operations in 2007, after running at a loss for a number of years. Now a Ghanaian consortium is working to revive the Birim River deposits.

Figure 19. Workers wash gravel in search of diamonds along the Birim River in Ghana. Photo by R. Shor.

Figure 20. Independent miners sell their Birim River diamonds in the nearby town of Akwatia. Photo by R. Shor.

The new consortium, Great Consolidated Diamonds of Ghana (GCD), has begun rehabilitating old mining equipment and plans to resume operations by September 2012.

Production will initially focus on 20 million cubic meters of tailings spread over 17,100 hectares. A sampling program has indicated an average grade of 0.20 carats per cubic meter, with trace amounts of gold. The company has two other concessions in the area totaling 75,000 hectares. A 1985 survey estimated reserves in the two concessions at 14 million carats. The company estimates that production could reach 1 million carats yearly. Company officials offered no timeline because they are still assessing the extent of rehabilitation necessary to resume activity. Several of the processing plants built in the 1920s are in serious disrepair, and most of the mechanized equipment was sold off in 2007 when mining ceased.

Some areas within the concessions are being dug by hand. The miners sell their goods to local dealers in the nearby town of Akwatia (figure 21). According to Kimberley Process statistics, Ghana exported 333,827 carats of diamonds in 2010, valued at $11.9 million. The vast majority of these were from Birim River diggings. In 2007, the last year of formal mining, Ghana exported 643,289 carats of rough, valued at $16.5 million.

GCD has promised to protect the livelihoods of the artisanal miners who have moved into the area, many of them former employees of the previous operator. The company has also pledged to reclaim mined-out areas to allow small-scale farming.

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Figure 21. Diamonds from the Birim River deposits are typically small (<0.20 ct). Photo by R. Shor.

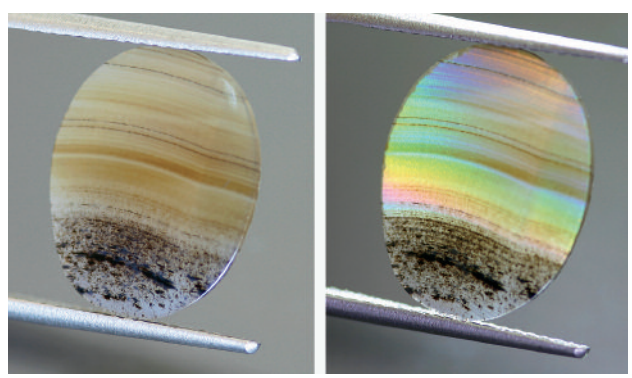
COLORED STONES AND ORGANIC MATERIALS

Iris agate from Montana. At the 2012 gem and mineral shows in Quartzsite, Arizona, Brad Payne (The Gem Trader, Cave Creek, Arizona) encountered a large stock of iris agate from eastern Montana. Iris agate from Montana has been known for decades (e.g., F. T. Jones, "Iris agate," *American Mineralogist*, Vol. 37, 1952, pp. 578–587), but is only rarely seen on the market. The approximately 500 slices ranged from ~1 to 18 cm long, and most of them were slightly domed for cabochon use. Mr. Payne was told the material is collected seasonally along the banks and sandbars of the Yellowstone River, and that this selection represented a single production lot—at least a decade's worth of collecting, which took four years to slice and polish.

The thin slices mostly had a banded light orangy brown bodycolor, and showed an attractive rainbow effect when illuminated with oblique transmitted light (figure 22). However, the iridescence will not be seen if the piece is too thick or not cut in the proper orientation relative to the bands. Many of the larger pieces were cut so thin that they had broken at some point and been repaired with epoxy. In addition to size considerations, iris agate's quality is judged by the amount of iridescence displayed, which Mr. Payne reported was quite variable across the specimens.

Stuart D. Overlin

Figure 22. This 2.65 ct (16.31 × 12.60 × 1.21 mm) iris agate from eastern Montana is shown in reflected light (left) and oblique transmitted light (right). Photos by Brad Payne.



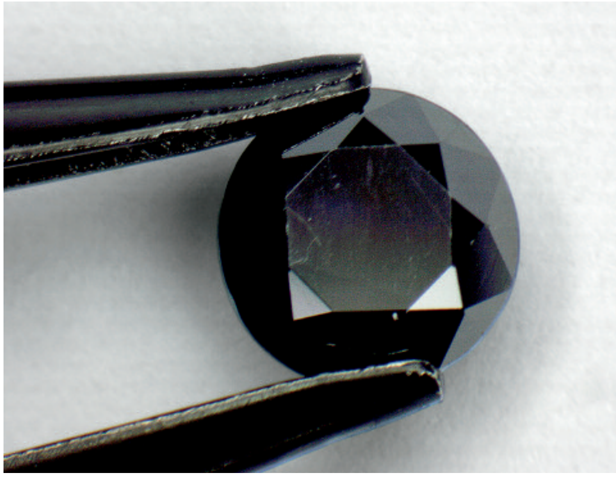
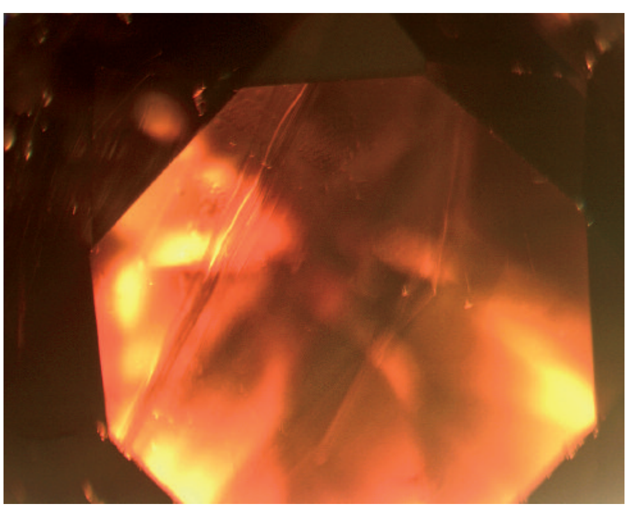


Figure 23. This 2.03 ct semitranslucent black stone is a cassiterite. Photo by I. Gaievskyi.

Black cassiterite. Black gemstones tend to be rarely encountered and are often somewhat difficult to identify. The State Gemological Centre of Ukraine recently examined a black 2.03 ct round brilliant (figure 23). The semitranslucent stone had an adamantine luster, and with strong fiber-optic illumination the stone appeared yellowish brown. It had a very high SG of 7, refractive indices that were above the limit of a standard refractometer, and was inert to both long- and short-wave UV radiation. The sample's observed pleochroism was weak, and its anisotropic optic character was evident from the doubling of facets when viewed through an immersion microscope with a polariscope. Unusual flow lines were also seen with the microscope (figure 24).

Most of these properties are consistent with cassiterite (M. O'Donoghue, Ed., *Gems*, 6th ed., Butterworth-Heinemann, Oxford, UK, 2006, p. 395). Energy-dispersive X-ray fluorescence (EDXRF) analysis detected major amounts of Sn as well as traces of Fe and Cu, confirming the cassiterite identification.

Figure 24. The cassiterite exhibited unusual flow lines. Photomicrograph by I. Iemelianov; magnified 22×.



Cassiterite is rarely encountered as a gemstone. Faceted light brownish yellow material from Bolivia was described in the Summer 2002 GNI section (pp. 175–176), but this is the first time that we are aware of black cassiterite being faceted. A very dark brown (nearly black) cassiterite cabochon with imitation asterism was described by S. F. McClure and J. I. Koivula ("A new method for imitating asterism," Summer 2001 *G&G*, pp. 124–128).

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Diopside from Kenya. While gem-quality diopside is not uncommon, it is usually seen as a transparent green or opaque black star gem. Given that, it was surprising when a parcel of transparent colorless to yellow gems submitted for examination by Dudley Blauwet (Dudley Blauwet Gems, Louisville, Colorado) proved to be diopside. He reported that the rough material came from Kajiado, Kenya, which is located 63 km south of Nairobi. He obtained 71 grams of rough in June 2009, from which he has cut 146 clean stones weighing 49.36 carats.

Gemological properties of the stones Mr. Blauwet submitted to the GIA (figure 25) were within the expected range for diopside, with average RIs of 1.666–1.696 and biaxial optic figures. The SG of the samples, measured hydrostatically,

Figure 25. This colorless to light yellow diopside (0.58–1.12 ct faceted, 0.50–0.73 g rough) is from Kajiado, Kenya. Photo by Robert Weldon.

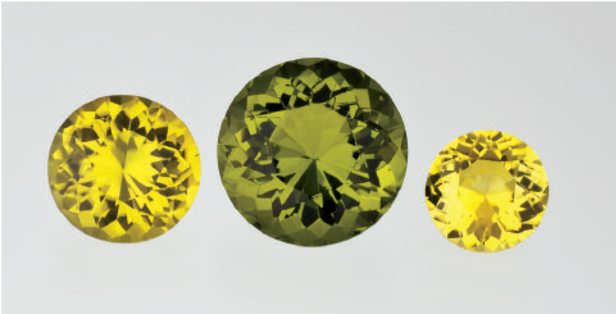

Figure 26. Dark yellow and yellowish green diopside (here, 0.83–2.94 ct) is also known from the Kajiado locality. Photo by Robert Weldon.

was between 3.27 and 3.46. Interestingly, the colorless material fell to the low side of this range, and SG values increased proportionally with the saturation of yellow color. Raman analysis provided confirmation that the stones were diopside.

Microscopic examination revealed numerous small needles and low-relief birefringent crystals (too small and deep in the stones for Raman analysis) but the material appeared fairly clean to the unaided eye. Notably, the colorless samples fluoresced a strong chalky greenish yellow to short-wave UV radiation and were inert to long-wave UV, while the most intensely yellow-colored diopside was inert to both long- and short-wave UV. Therefore, the fluorescence strength of the samples was inversely proportional to their color saturation.

To determine the cause of color, we performed visible spectroscopy and chemical analysis. A yellow sample showed a prominent 450 nm feature along with a weak sideband at 430 nm. The spectrum of a colorless sample was nearly featureless except for a very weak 450 nm feature.

Figure 27. Emeralds are being mined at Mingora, Pakistan, from tunnels such as this one. Photo by A. Lucas.

Chemical analysis revealed significantly more iron in the most saturated yellow diopside (≥2300 ppmw) than in the colorless sample (~600 ppmw). Minor traces of known chromophores Cr (~20 ppmw) and V (~2 ppmw) were also detected in both the colorless and yellow samples, but absorption features associated with them could not be clearly resolved, indicating that these two elements had little impact on the coloration. Instead, Fe^{3+} appears to be responsible for the color (R. G. Burns, *Mineralogical Applications of Crystal Field Theory*, 2nd ed., Cambridge University Press, 1993, p. 225). The difference in chemical composition may explain the diminished short-wave UV fluorescence of the relatively high-iron yellow samples, as iron is well known to quench fluorescence.

At the 2011 and 2012 Tucson gem shows, Jim Walker (Bridges Tsavorite, Tucson, Arizona) also had yellow to yellowish green samples of diopside from the same locality (figure 26). He reported that the material was a byproduct from a blue marble mine that also produces vesuvianite, grossular, and low-quality blue and black spinel. Diopside from this area has been known since 2010 ("Diopside finds niche in gem world," *Jewellery News Asia*, No. 314, October, pp. 38, 40).

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Emerald mining in Mingora, Pakistan. Rarely does a producing gem mine occur within a city, much less in a location where you can almost drive up to the entrance from a city street. That is the case in Mingora, the main municipality in the Swat Valley of Pakistan's Khyber Pakhtunkhwa Province. The Mingora emerald mine, visited by this contributor in October 2011, lies on a hill overlooking the city and the Swat River.

Emerald has been mined at this site since 1958 (see, e.g., E. J. Gübelin, "Gemstones of Pakistan: Emerald, ruby, and spinel," Fall 1982 *G&G*, pp. 123–139). The property covers nearly 74 hectares, 23 of which are believed to be emerald bearing. Mineralization is hosted by talc-carbonate schist, and the miners follow veins of quartz or calcite to find the emeralds. The finer-color material is reportedly associated with calcite veins.

Three operations were being worked concurrently; two of them were ramp-style tunnels (e.g., figure 27), while the third was a 6-m-deep shaft that branched out into underground galleries (figure 28). Personnel entered and exited the shaft on a wooden ladder, and the galleries were supported by timbers. The miners used only pneumatic jackhammers, picks, and shovels, as there were no explosives or mechanized equipment. Generally, one miner in each tunnel would use a jackhammer while the others helped break up the schist with hand tools. The schist was removed from the tunnels by either a windlass or a wheelbarrow, and then taken to a processing area. There, the schist was placed in piles, one for each tunnel. One worker would load the material on a wire screen while another sprayed it with water and a third sifted for emerald rough. The emeralds were placed in a locked box monitored by a guard.

The Mingora mine reportedly produced 2 kg of emerald rough in 2010. In October 2011, however, the mine was producing ~400 g of rough per month (e.g., figure 29). According to the management, the value of the material ranges from 500 to 10,000 Pakistani rupees (US$5.50 to $110) per carat. Approximately 35% of the production is facet-quality, in pieces weighing 0.2–0.6 g. Most of the production is sold to local dealers. Miners currently receive about 10,000 rupees per month, and the payroll also includes a number of security personnel armed with AK-47 rifles.

This contributor also visited several gem and mineral dealers in Mingora. Many of them also sold antiques, jewelry, carpets, handicrafts, and textiles. Although their gem inventory was limited, a wide range of material could be found, including synthetics (ruby and sapphire), imitations (glass and triplets), and treated stones (glass-filled rubies); all were straightforward to identify with a loupe. Emerald rough was available only in lower-quality parcels. As is often the case in mining areas, the asking prices were high.

The people of Swat, including those in the gem trade, were exceedingly friendly and glad to see a foreigner interested in their land and their culture. Many suffered greatly under Taliban rule and during the resulting conflict. They are eager for outsiders to visit this beautiful land, which has been called the "Switzerland of Central Asia."

Andy Lucas

Figure 28. The mine manager at the Mingora emerald deposit climbs down the shaft to inspect production. The hand-powered windlass behind him is used for moving equipment and mined material in and out of the shaft. A pneumatic jackhammer is used to break up the emerald-bearing schist (see inset). Photos by A. Lucas.

Dark yellowish green enstatite from Kenya. Enstatite ($MgSiO_3$) is a normally colorless end member of the pyroxene solid-solution (enstatite-ferrosilite) series. It displays color when additional elements, such as Fe and Cr, substitute for Mg. Gem-quality green specimens are rare, and have been reported from Arizona, East Africa, and Pakistan (G. R. Crowningshield, "Enstenite!" [*sic*], Fall 1965 *G&G*, pp. 334–335; C. M. Stockton and D. V. Manson, "Peridot from Tanzania," Summer 1983 *G&G*, pp. 103–107; Fall 2009 GNI, p. 219). In September 2011, GIA received some dark green gem material, represented as enstatite from Kenya, from gem dealer Dudley Blauwet. He obtained 62 grams of rough from his regular East African supplier, and has cut 66 stones totaling 55 carats. His supplier indicated that the material was mined in late 2010 from Maktau, in the Taita Hills of southern Kenya, near Tsavo National Park. Mr. Blauwet noted that the etched appearance of the crystals was typical of (brown) enstatite from East Africa.

Mr. Blauwet supplied six faceted (0.54–6.75 ct; figure 30) and 14 rough pieces to GIA for examination. They were dark

Figure 29. Emeralds from Mingora typically consist of hexagonal prisms (0.2–0.6 g) that show good color saturation. Photo by A. Lucas.

Figure 30. These enstatites, reportedly from Kenya, range from 0.54 to 6.75 ct. Photo by Robert Weldon.

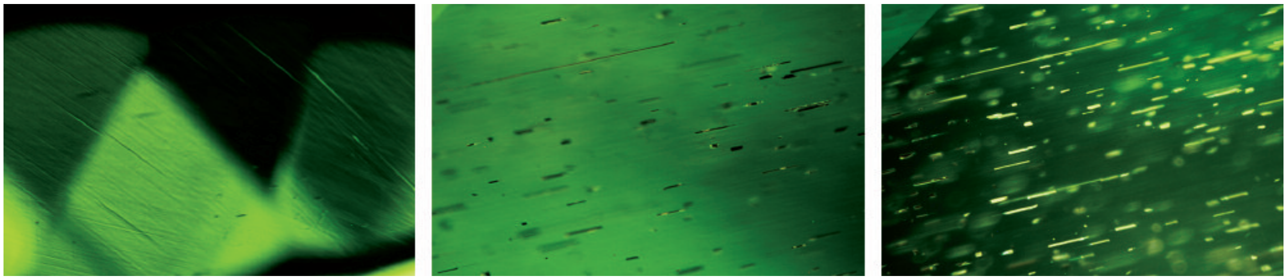
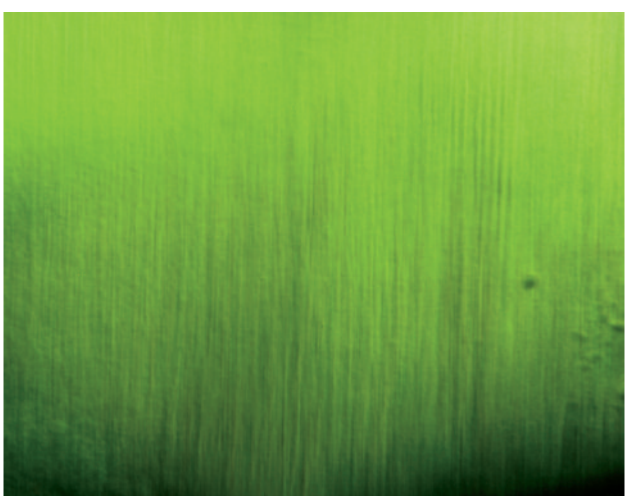


Figure 31. Colorless growth tubes were common in the enstatite (left, magnified 50×). Same samples had growth tubes that were filled with brown needles (center, magnified 105×) that appeared highly reflective in certain directions (right, magnified 85×). Photomicrographs by K. S. Moe.

yellowish green, and showed moderate to strong pleochroism in light to dark yellowish green. The refractive indices were 1.663–1.671 and the SG, determined hydrostatically, was 3.26. Both of these properties are within the range expected for enstatite, and Raman spectroscopy confirmed this identification. All of the samples were inert to both long- and short-wave UV radiation. Microscopic examination revealed numerous parallel, transparent growth tubes (figure 31, left). A few two-phase (solid-gas) and three-phase (solid-liquid-gas) inclusions were found among the growth tubes. Interestingly, many samples had needles trapped inside the growth tubes. The needles were dark brown and appeared highly reflective when viewed in certain directions (figure 31, center and right). Planar color banding (possibly related to polysynthetic twinning) was observed in a few samples (figure 32). One hazy-looking stone did not contain any internal features except for a roiled structure.

Qualitative EDXRF analysis detected Fe, Ca, Cr, Zn, Al, Ni, and Ga, in addition to the main components Mg and Si. A high-resolution visible-NIR spectrum showed a broad transmission window at ~550 nm that was responsible for the samples' yellowish green color. Small broad bands at 506 and 680 were caused by Fe^{2+} and Cr^{3+}, respectively. Infrared spectroscopy showed OH-stretching bands (i.e. hydrous defects) in the 3600–3000 cm^{-1} range.

Figure 32. Planar color banding, possibly related to polysynthetic twinning, was observed in a few enstatite samples. Photomicrograph by K. S. Moe; magnified 72×.



Enstatite has Raman doublet bands at 685–663 cm^{-1} (Si-O-Si stretching) and 1033–1014 cm^{-1} (Si-O stretching) that reflect the proportions of Mg^{2+}, Fe^{2+}, and Ca^{2+} (A. Wang et al., "Characterization and comparison of structural and compositional features of planetary quadrilateral pyroxenes by Raman spectroscopy," *American Mineralogist*, Vol. 86, 2001, pp. 760–806). The samples' relatively high Raman shifts (>660 cm^{-1} for the first doublet) suggested a higher proportion of Mg^{2+} than both Fe^{2+} and Ca^{2+}. Analysis of the Raman spectra—marked by the presence of a 236 cm^{-1} band (slightly shifted to 238 cm^{-1}) and the absence of 431 and 369 cm^{-1} bands—suggests that these samples are the polymorph orthoenstatite (P. Ulmer and R. Stalder, "The Mg(Fe)SiO_3 orthoenstatite-clinoenstatite transitions at high pressures and temperatures determined by Raman-spectroscopy on quenched samples," *American Mineralogist*, Vol. 86, 2001, pp. 1267–1274). Spectra and additional photomicrographs are available in the *G&G* Data Depository at gia.edu/gandg.

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New gem discoveries in Ethiopia. Ethiopia is well known for its opals, particularly those discovered in early 2008 in Wollo Province (see, e.g., B. Rondeau et al., "Play-of-color opal from Wegel Tena, Wollo Province, Ethiopia," Summer 2010 *G&G*, pp. 90–105). Other gems reported from Ethiopia include peridot (Spring 1993 Gem News, p. 59), fluorite (Summer 2007 GNI, pp. 168–169), and pyrope-almandine (Summer 2005 GNI, p. 177).

From late 2010 to early 2012, gem dealer Farooq Hashmi (Intimate Gems, Glen Cove, New York) documented several additional gems during buying trips to this little-explored country. In addition to sapphire and zircon (Fall 2011 GNI, pp. 247–248), he encountered emerald, aquamarine, morganite, tourmaline, apatite, pyrope, and phenakite (figure 33). Emerald and morganite from Ethiopia will be described in future reports, and notes on the other gems are provided here.

The **aquamarine** reportedly is mined from a remote area ~30 km from Shakiso in southern Ethiopia. Granitic pegmatites in this area have been worked by hand tools near the surface,

Figure 33. Several gems have recently been produced from Ethiopia. From top to bottom, these include aquamarine (6.50 and 7.85 ct), tourmaline (3.36 ct), apatite (4.98 ct), pyrope (2.01 ct), and phenakite (0.61 ct). All stones were cut by Hassan Z. Hamza (Noble Gems Enterprises, Dar es Salaam, Tanzania) for this report. Photo by Robert Weldon.

and have also yielded rock crystal, tourmaline, and beryl of various colors besides aquamarine. On Mr. Hashmi's first trip to Ethiopia, several hundred kilograms of blue-to-green aquamarine were available in the capital city of Addis Ababa, although only 5–10 kg were of gem quality. More good-quality rough appeared at the October 2011 Munich mineral show, and Mr. Hashmi learned on his latest trip that nearly 1,000 kg of semi-gem aquamarine had recently been produced. He indicated that multiple mining areas are active; one deposit that he visited consisted of an eroded mountainside with a large exposed pegmatite.

Tourmaline is also apparently being mined from multiple deposits in Ethiopia. Dark blue-to-green material is produced from the pegmatites in the Shakiso area, and Mr. Hashmi also obtained a single piece of lighter bluish green tourmaline (represented to him as sapphire) from an unspecified alluvial deposit. Several kilograms of the Shakiso crystals were available during his initial buying trip in relatively small sizes (<2 g). By 2012, tourmaline output had increased considerably, with new mining areas producing larger clean sizes (up to 10 g) in pink and blue-green colors. Electron microprobe analyses by two of the authors (WBS and AUF) of a 0.91 ct faceted dark blue tourmaline from Mr. Hashmi showed it to be elbaite with 2.30 wt.% MnO and 0.52 wt.% FeO. It had an unusual trace-element composition, containing 0.29 wt.% PbO, 0.07 wt.% ZnO, 0.04 wt.% V_2O_3, and 0.02 wt.% Cr_2O_3.

Greenish yellow **apatite** was available in transparent pieces as large as 20 g during Mr. Hashmi's 2010 trip, and the next year he saw rough parcels totaling several kilograms. According to Seid Abdella (RV Gems, Addis Ababa), the material comes from two localities near Aroresa in the Siddama area of southern Ethiopia.

Orangy red **pyrope** comes from the Borana area of southern Ethiopia. Since late 2010, Mr. Hashmi has encountered ~20 kg of material weighing up to 5–6 g apiece. Similar pyrope-almandine was described in the Summer 2005 GNI entry mentioned above from Hagare Mariam in the southern part of the country.

The source of **phenakite** in Ethiopia was not disclosed by Mr. Hashmi's supplier, who at the time thought the rough material was diamond. The supplier offered several hundred grams of colorless broken fragments ranging up to several grams apiece.

The recent discovery of so many gem materials in Ethiopia suggests interesting possibilities for future finds.

Brendan M. Laurs

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Burmese spessartine. In March 2010, Hussain Rezayee (Rare Gems & Minerals, Beverly Hills, California) informed GIA about a new find of spessartine in Myanmar (Burma). He indicated that small quantities have been inconsistently produced from a gold mining area since early 2010, in clean pieces weighing up to 4 g. The color ranges from bright orange to dark brownish red, and attractive faceted stones weighing 20+ ct have been cut.

Mr. Rezayee loaned a 6.66 ct reddish orange gem for examination (figure 34). The gemological properties of this cushion mixed cut were: RI—over the limits of the standard refractometer; hydrostatic SG—4.22; fluorescence—inert to both long- and short-wave UV radiation; and absorption features consisting of a 440 nm cutoff (due to Mn^{2+}), a weak 520 nm line (Fe^{2+}), and weak bands at 570, 615, and 690 nm (Fe^{2+}) seen

Figure 34. This 6.66 ct reddish orange spessartine is reportedly from Myanmar. Photo by Robert Weldon.

Figure 35. Microscopic observation of the spessartine revealed whitish irregularly shaped corroded inclusions. Photomicrograph by HyeJin Jang-Green; field of view 3.0 mm.

with the desk-model spectroscope. Visible-NIR absorption spectra collected with an Ocean Optics e-scope showed the same features, as well as a very weak absorption at 495 nm (Mn^{2+}). Microscopic examination revealed small fluid "fingerprints," numerous whitish irregularly shaped corroded inclusions (figure 35), and pronounced straight and angular growth zoning.

EDXRF spectroscopy showed major Mn, moderate Fe, and traces of Ca. Based on its absorption spectrum and chemical composition, this reddish orange garnet is spessartine with a significant almandine component.

Editor's note: Consistent with its mission, GIA has a vital role in conducting research, characterizing gems, and gaining knowledge that leads to the determination of gemstone origins. The sample studied in this report is not subject to the Tom Lantos Block Burmese JADE Act of 2008, and its import was in accordance with U.S. law.

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SYNTHETICS AND SIMULANTS

Enameled jewels in the Chinese market. With the jewelry market booming in China, a variety of new materials are being used in jewelry, including enamels, ceramics, plastics, and composites. Enamels consist mainly of mixtures of quartz, feldspar, borax, and fluorite. Traditional enameled copper jewelry, called *jingtailan* (cloisonné), dates back hundreds of years. These relatively inexpensive ornaments are popular for their beautiful color and luster.

TABLE 1. Chemical composition of the Chinese enamels.[a]

Sample no.	Color	Elements
1	Green	Si, K, **Cr,** Cu, **Pb**, Sb
2	Blue	Si, K, Ti, Mn, Cu, **Pb**
3	Black	Si, K, Mn, Fe, Cu, **Pb**

[a] Potentially hazardous elements are shown in bold font.

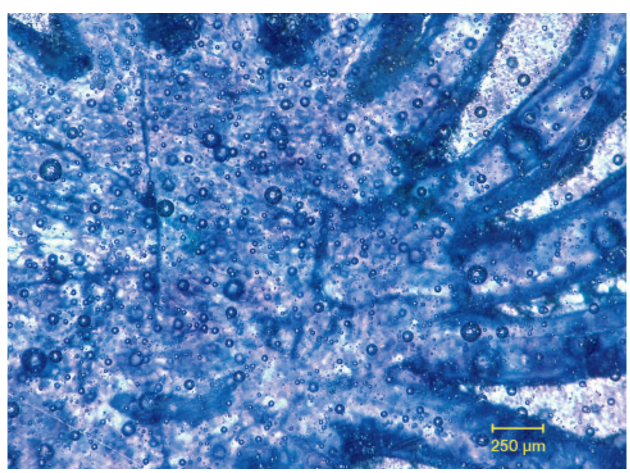
Figure 36. These pieces of enameled silver (1.7 cm in diameter) contained potentially hazardous traces of Pb (as well as Cr in the green sample). Photo by Y. Zhang.

In December 2011, the National Gemstone Testing Center (NGTC) lab received a donation for research of three pieces of enameled silver (figure 36) that were reportedly representative of new material for use in fashion jewelry. The pieces measured 1.7 cm in diameter and weighed 2.02–2.18 g. The enamels were blue, green, and black, and had spot RIs ranging from 1.57 to 1.58. Microscopic examination revealed numerous air bubbles in the enamel portions (e.g., figure 37). The bubbles were typically round and ranged from a few microns to ~200 microns in diameter.

To investigate the internal structure of the enamels, one of them (black sample) was broken apart. The piece was found to consist of three parts (figure 38): a top enamel layer (0.5–1 mm), the central silver layer (0.3–1 mm), and a bottom enamel layer (0.05–0.1 mm).

EDXRF chemical analysis of the enamels (table 1) showed major amounts of Si and K in all three samples. The minor elements varied depending on the enamel's color. It should be noted that the toxic element Pb was detected in all three

Figure 37. Magnification of the enamels revealed an abundance of air bubbles. Photomicrograph by Y. Zhang.



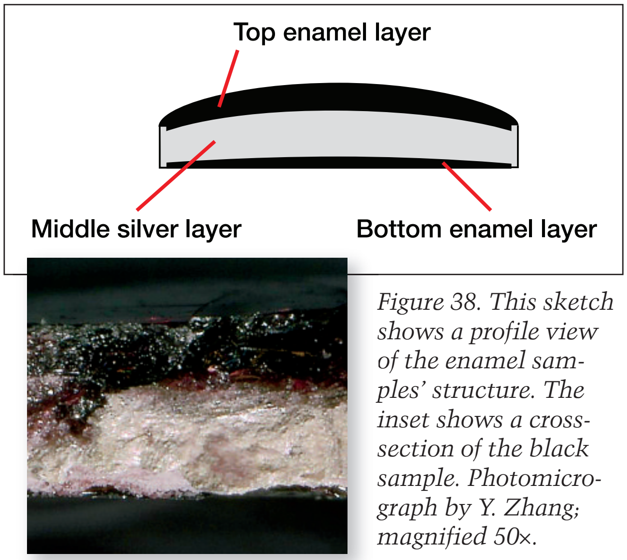


Figure 38. This sketch shows a profile view of the enamel samples' structure. The inset shows a cross-section of the black sample. Photomicrograph by Y. Zhang; magnified 50×.

samples, and the green piece also contained Cr. Both elements were present in amounts that exceeded their allowed concentrations of 0.1% defined by the Chinese national standard (Jewellery - Fineness of Precious Metal Alloys and Designation, GB 11887-2008, November 1, 2009, 12 pp.). The presence of Pb and Cr in this jewelry could be hazardous to the wearer's health, so testing the safety of such enamels is paramount.

As the Chinese jewelry market grows and new materials are used in jewelry, NGTC will continue to monitor these developments and protect consumers.

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Geikielite from Sri Lanka with fake star effect. While on a buying trip to Ratnapura, Sri Lanka, in October 2010, one of these contributors (TP) purchased what was represented as a rutile cabochon with an artificial 11-ray star (figure 39). The process of engraving or scratching cabochons to produce asterism has already been well documented (S. F. McClure and J. I. Koivula, "A new method for imitating asterism," Summer 2001 *G&G*, pp. 124–128; K. Schmetzer and M. P. Steinbach, "Fake asterism—two examples," *Journal of Gemmology*, Vol. 28, No. 1, 2002, pp. 41–42). However this stone appeared fully opaque under strong fiber-optic light, which is unusual for rutile. Also, its specific gravity (4.12) and strong attraction to a neodymium magnet were not consistent with rutile, so we decided to investigate further.

Chemical analysis by energy-dispersive spectroscopy on a JEOL 5800LV scanning electron microscope gave the following composition (in element %): Ti = 18.97, Mg = 15.09, Fe = 6.46, and O = 59.49. This composition is consistent with ferroan geikielite, the Mg-rich member of the ilmenite group, with 70% geikielite and 30% ilmenite *sensu stricto*. Geikielite was first discovered in the Ratnapura area in 1892, so it is no wonder that this interesting piece was sold in Sri Lanka, with the added curiosity of a fake star. To the best of our knowledge, this is the first occurrence of geikielite as a gem.

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TREATMENTS

A dyed blue opal with play-of-color. Since the discovery of opal from Ethiopia's Wollo Province in 2008, large quantities of this material have entered the marketplace, at a much lower price than the Australian counterpart. Until September 2011, most were white or light yellow, with strong play-of-color. Due to the abundance of this material, gem laboratories have expected to see treated versions in a variety of colors.

The Gem Testing Laboratory of Jaipur, India, recently received an unusual blue opal for identification (figure 40). The sample weighed 0.45 ct and measured 7.00 × 5.08 × 1.84 mm. It appeared to be opal, but its unusual color and striking play-of-color raised doubt regarding its authenticity. Microscopic observation with fiber-optic lighting revealed a cellular play-of-color (or "digit pattern") with grayish cloudy interstitial areas, features indicative of Wollo opal (see B. Rondeau et al., "Play-of-color opal from Wegel Tena, Wollo Province, Ethiopia," Summer 2010 *G&G*, pp. 90–105).

Although the cellular structure identified this as natural (not synthetic) opal, we doubted that the blue bodycolor was

Figure 39. This 2.21 ct cabochon, represented as rutile with an imitation 11-ray star, proved to be geikielite. Photo by J.-P. Gauthier.

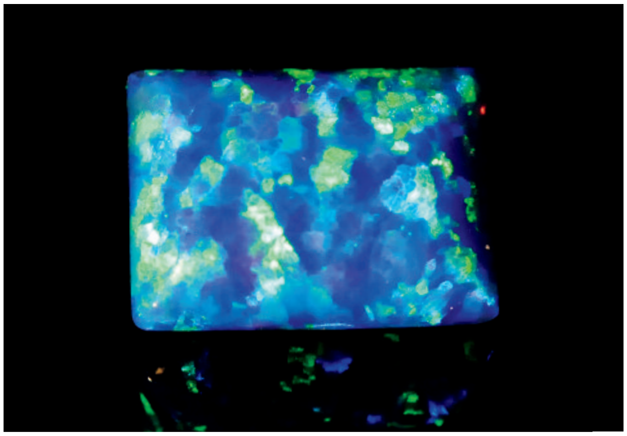

Figure 40. This 0.45 ct blue opal with striking play-of-color proved to be dyed. Besides its color, the sample's gemological properties were consistent with opal from Wollo, Ethiopia. Photo by G. Choudhary.

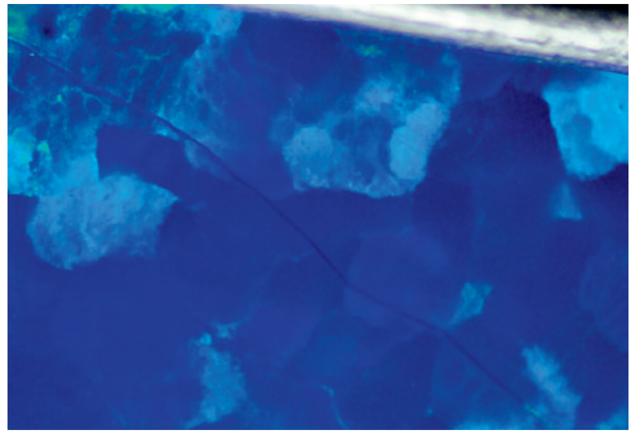

Figure 41. The opal in figure 40 displayed blue color concentrations along a surface break, indicating dye treatment. Photomicrograph by G. Choudhary; magnified 64×.

also natural. Careful gemological testing proved useful in determining the cause of color. The sample had a spot RI of approximately 1.45 and a hydrostatic SG of 1.76; no signs of porosity were seen while taking the SG reading. It displayed strong red UV fluorescence (both long- and short-wave). With the desk-model spectroscope, three distinct bands were seen at ~540, 580, and 650 nm. This absorption pattern, associated with cobalt, is often seen in dyed blue materials. The opal displayed a strong red reaction to the Chelsea filter, confirming the presence of a blue dye.

The opal was once again observed with the microscope to locate any signs of color concentrations. This time, we noted a surface break with blue color concentrations along its length (figure 41). On the basis of microscopic observations and gemological properties, the sample was identified as a dyed opal.

A dyed green-blue opal showing play-of-color was recently documented along with dyed purple material that originated from Wollo Province (N. Renfro and S. F. McClure, "Dyed purple hydrophane opal," Winter 2011 *G&G*, pp. 260–270), and treated black Wollo opals also have been reported (see C. Williams and B. Williams, "Smoke treatment in Wollo opal," www.stonegrouplabs.com/SmokeTreatmentinWolloOpal.pdf). We can expect to see other treated colors of Ethiopian opals in the future.

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Gem Testing Laboratory, Jaipur, India

CONFERENCE REPORTS

Mines to Market conference. On November 2–3, 2011, the Gem and Jewelry Export Promotion Council of India hosted the first-ever International Colored Gemstone Mines to Market Conference in Jaipur. **Yianni Melas** (Limassol, Cyprus), who brought together the international group of speakers, served as master of ceremonies. The presentations covered a wide range of topics in the colored stone industry, from the miner to the retail point of sale, and brief summaries of some of them are provided here.

The keynote speaker was **Alberto Milani** (Buccellati, New York), who indicated that the perception among many wealthy consumers in the U.S. and Europe is that the quality of luxury products is declining. He pointed out that the luxury market is rapidly splitting into two tiers, high-end and entry-level. To expand their market, luxury companies must emphasize quality to keep their brand positioned, provide excellent customer service, and keep their message direct and simple.

Ian Harebottle (Gemfields, London) demonstrated how larger gem producers can make significant contributions toward social responsibility and improving the image of the industry. He also stressed that if the supply chain rested solely on artisanal mining, it would be difficult to create a constant supply of colored stones to fuel future growth. **Robert Weldon** (GIA, Carlsbad) gave a multimedia presentation that followed the production of ametrine from the mine to the jewelry marketplace. The methodology developed by mine owner Ramiro Rivero can serve as a sustainability model for small-to-medium scale miners and manufacturers, and includes environmentally friendly mining practices and a working environment that promotes innovation in cutting design and jewelry manufacturing.

Richard Hughes (Sino Resources Mining Corp., Hong Kong) gave a multimedia presentation on ruby and sapphire deposits. He emphasized the romance of the colored stone industry, the exotic sources of these rare gems, and the effort and passion involved in bringing them to the market. **Dr. Federico Pezzotta** (Natural History Museum of Milan, Italy) relayed the importance of Madagascar in supplying the trade with blue sapphires and rubies when other sources had limited production, as well as the nation's abundant potential for producing a wide variety of gem materials in coming decades. **Edward Boehm** (RareSource, Chattanooga, Tennessee) discussed how ruby sources have evolved over the last decade with the depletion of the Mong Hsu deposit and discovery of new localities in Tanzania and Mozambique.

Federico Bärlocher (Yangon, Myanmar) spoke on the past and future of Myanmar's gem deposits, including Mogok ruby, and presented a short video called "Myanmar the Ruby Land." He noted that there are half a million people living in Mogok, "involved only in looking for ruby, sapphire, and spinel, and everyone living only for gems."

Glenn Lehrer (Lehrer Designs, Larkspur, California) described how gem carving takes several times longer than faceting and that the main time consuming factor is the final polish of carved areas, especially channels and other tight areas. **Shaltiel Cohen** (Zamrot, Jerusalem) presented a video of an Israeli cutting system that incorporates the speed of jam-peg cutting with the precision of a vertical mast faceting machine.

Nirupa Bhatt (GIA India, Mumbai) spoke on the importance of education and how the future of the gem industry depends on the training of today. GIA India is working with the Indian industry to develop new education models that cooperate with the industry to reach students and provide the skills they will need to succeed. **This contributor** focused on the disclosure—or in many cases the lack thereof—of major treatments. He advocated that full disclosure be given to the consumer including a clear description of the treatment, how it affects the appearance and durability of the stone, and any special care and cleaning considerations, rather than using simplified trade-oriented terminology.

Steve Bennett (GemsTV, Worcestershire, U.K.) stressed how focus groups and surveys regarding gem-buying preferences often show more about how consumers feel about themselves and their desire to be perceived, rather than how they actually make decisions. **Dr. Chuck Lein** (Stuller, Lafayette, Louisiana), who spoke on being "jeweler to the jewelers," revealed that the average turnover of stock for independent retail jewelers in the U.S. was only 0.7 times annually.

At the close of the conference, GJEPC chairman **Rajiv Jain** made some astute observations on issues the colored stone industry needs to address to grow and prosper. These included developing a mine-to-market strategy similar to that of the diamond trade, securing production of rough material and improving cutting techniques, and increasing colored stones' share in the luxury market.

Andy Lucas

Gem-A Conference 2011. The annual Gem-A Conference took place November 6 in London. Highlights of some of the presentations offering new information are given here.

Brian Jackson (National Museums Scotland, Edinburgh) reviewed optical phenomena in gems. He described how heat—even the low heat from your hand—can cause some fluorites to emit light.

Willy Bieri (GemResearch Swisslab, Bangkok) spoke on distinguishing untreated Tibetan copper-bearing andesine from its diffusion-treated counterpart using advanced analytical methods. Scanning electron microscopy (SEM-EDX) can be used to detect up to 40 different elements and compounds in andesine, including native copper, copper oxides, naturally melted glass, silver, and gold. He also described how isotope testing and laser ablation–inductively coupled plasma–mass spectrometry (LA-ICP-MS) can be used to prove whether the color is natural, diffusion-treated, or of undeterminable origin. Due to expense and potential for damage, Mr. Bieri noted, advanced testing is only practical on random samples from a parcel.

Steve Bennett (Gems TV, Worcestershire, U.K.) pointed out that his company's television shopping network, which offers 90 gems in 540 varieties from 60 countries, far outsells their online retail division. Mr. Bennett affirmed his belief in selling the dream rather than the product, avoiding information overload, and upholding the mystique and folklore of gems and jewelry.

Branko Deljanin (Canadian Gemological Laboratory, Vancouver) overviewed the screening and identification of enhanced and synthetic diamonds in the market today. He discussed advanced testing equipment but added that some additional characteristics should be considered: the morphology of the rough, the detection of diamond type using crossed polarizers, and the fluorescence colors commonly displayed by natural diamonds (blue), HPHT synthetics (green to yellow), and CVD synthetics (brownish orange).

Alan Hart (Natural History Museum, London) spoke on evaluating and recreating the original Koh-i-Noor (Persian for "Mountain of Light") diamond. The motive to recut the diamond can be traced to the poor reception it received at the Great Exhibition in 1851. The gem was described as resembling a dull piece of glass, prompting *Punch* magazine to dub it the "Mountain of Darkness."

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MISCELLANEOUS

Gem news from Myanmar. In mid- to late 2011, this contributor's lab in Taunggyi, Myanmar, received some interesting items for identification. Among these were smooth egg-shaped samples with a waterworn appearance that measured 7–8 cm long. They were typically green (also yellow and red) and contained large gas bubbles, making them easy to identify as glass.

A new deposit of blue kyanite has been found near Zayatkwin village in Thabeikkyin township (Mandalay division). Stones weighing 2–4 ct have been faceted, and they typically contain hollow tube inclusions. Some of the stones have been set into reasonably priced jewelry.

Cabochons of dark blue sapphire weighing 1–2 ct (e.g., figure 42) appeared in the market in 2011 from near Bawma village (north of Kyatpyin in the Mogok area), which recently became known for producing orangy red to purplish red spinel (e.g., Summer 2010 GNI, p. 154). The sapphires contain abundant partially healed fractures, groups of elongate solid crystals, irregular black crystals, twin planes (sometimes with associated white spike-like inclusions), thin films, small rutile needles in a single plane, unidirectional fluid inclusions, and uneven patches of greenish blue color zoning.

Figure 42. These sapphires are from a new find near Bawma village in the Mogok area of Myanmar. The cabochons weigh ~1–2 ct. Photo by U T. Hlaing.

In early 2012 this contributor learned of a new gem mining area in Karen State—in the headwaters of the Bilin River—that is the source of pink to red spinel, dark blue sapphire, and dark brownish red garnet. The rough gems show various amounts of rounding due to alluvial transport, and most pieces weigh ~0.4 g.

The mid-year session of the 2011 Myanma Jade, Gems & Pearl Emporium took place December 24, 2011–January 3, 2012 in Naypyidaw. More than 5,400 merchants attended the government-run sale, nearly a third of them foreigners. The emporium sold 8,290 of the 11,821 jade lots offered, as well as 39 of the 230 gem lots and 212 of the 270 cultured pearl lots. An official who spoke to the *Myanmar Times* quoted total sales of US$903 million, much lower than the $2.9 billion recorded a year ago. Traders attributed the decline to China's 35% tax on gem imports from Myanmar, up from 10% last year, and its raising the minimum deposit on bids from 10,000 euros to 50,000 euros.

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ERRATUM

Figure 10 of the Winter 2011 phosphorescent diamond Lab Note (pp. 310–311) was redrafted incorrectly by *G&G*. A corrected version is shown below, which also includes error bars showing the standard deviation for each average value.