# 2004
# LAB NOTES

EDITORS
Thomas M. Moses, Ilene Reinitz,
Shane F. McClure, and Mary L. Johnson
***GIA Gem Laboratory***

CONTRIBUTING EDITORS
G. Robert Crowningshield
***GIA Gem Laboratory, East Coast***
Karin N. Hurwit, John I. Koivula, and
Cheryl Y. Wentzell
***GIA Gem Laboratory, West Coast***

## Feathers in COPAL

Like its much older relative amber, gem-quality copal can be quite interesting when it contains unusual or photogenic inclusions, because of its excellent preservative nature and typically high degree of transparency. Recently, gem and mineral dealer Russell E. Behnke of Meriden, Connecticut, sent the West Coast laboratory a 41.59 ct freeform polished mass of fossil resin that measured approximately 44.66 × 32.25 × 9.80 mm. The specimen had been mined, shaped, and polished in Boyacá, Colombia. Mr. Behnke wanted to know if it would be considered amber or the more recent fossil resin, copal. Both amber and copal have been reported from Colombia (see Summer 1993 Gem News, pp. 135–136).

The light brownish yellow sample was transparent to translucent due to the presence of inclusions (figure 1). The refractive index was 1.54, and the specific gravity (determined hydrostatically) was 1.03. While the S.G. was slightly low for a fossil resin, this was not too surprising considering the numerous gas bubbles the piece contained.

As expected for either amber or copal, no absorption spectrum was observed with a desk-model prism spectroscope. When the piece was exposed to long-wave UV radiation, we saw a moderate slightly chalky yellow fluorescence, while exposure to short-wave UV produced only a very weak yellow reaction.

In addition to the gas bubbles and insects typically seen in such material, magnification revealed a significant number of two-phase (liquid and gas) inclusions, some of which had moving gas phases. However, the most interesting inclusion, which was clearly visible even without magnification, was the upper portion of a bird's flight feather (again, see figure 1). Close examination with a gemological microscope and polarized light showed the details of the well-preserved feather as well as the presence of significant strain (figure 2).

In addition to the large flight feather, two tiny feather fragments (figure 3) were also observed. As with most inclusions, these were clearly visible only through the microscope.

Using magnification, we placed a tiny droplet of acetone on the edge of the specimen and allowed it to evaporate. The acetone produced a miniscule dull spot, and this spot proved to be sticky when it was lightly rubbed with the torn edge of a facial tissue. Such a reaction is indicative of copal,

*Figure 1. This 41.59 ct freeform polished mass of copal resin from Boyacá, Colombia, contains bird feathers as inclusions.*

*Editor's note: The initials at the end of each item identify the editor(s) or contributing editor(s) who provided that item. Full names are given for other GIA Gem Laboratory contributors.*

Gems & Gemology, Vol. 40, No.1, pp. 58–65

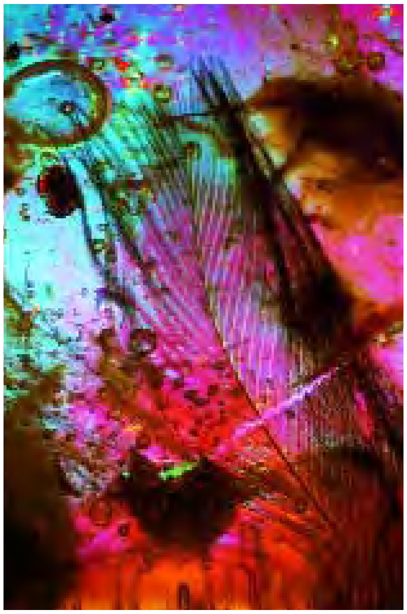


*Figure 2. Feathers occur only rarely as inclusions in natural fossil resins. This flight feather is well preserved in its copal resin host. The use of crossed polarizers reveals the significant strain in this specimen. Magnified 2×.*

*Figure 3. Two tiny feather fragments were also discovered in the Colombian copal. Magnified 10×.*

since amber does not soften and get sticky in response to acetone. Therefore, through this microchemical confirmatory test, we established that this fossil resin was copal rather than amber.

*John I. Koivula and Maha Tannous*

---

### Rare Type IIa Pink DIAMOND, with Green Radiation Stains

The color of some diamonds can be attributed to exposure to natural radiation. Green and brown radiation stains are occasionally observed on rough diamond surfaces or within fractures, but generally they do not contribute to the bodycolor of the diamond. Most of the diamonds in which such stains are seen are yellow, brown, or green. Rarely, brown radiation stains have been observed in blue type IIb diamonds (Fall 1991 Lab Notes, pp. 174–175).

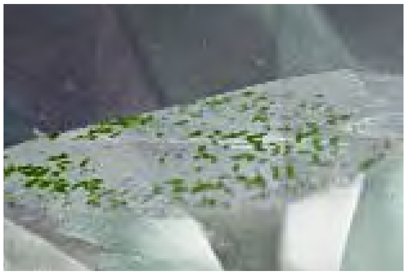
Recently, we examined a large pink diamond with green radiation stains located mainly within fractures. While much of the formation of radiation stains is not completely understood, this observation indicates that natural irradiation can and does occur with all types of diamond, regardless of color and nitrogen/boron concentrations.

The 20.24 ct pear-shaped brilliant cut (31.62 × 17.73 × 3.70 mm) in figure 4 was color graded Faint pink. It fluoresced weak blue to both long- and short-wave UV radiation. No phosphorescence was observed. This stone had very few internal characteristics, but many fractures were present around the girdle. Though most were very shallow, a few larger ones penetrated as deep as 4 mm. Many small green radiation stains were visible along these fractures (figure 5). It is believed that these stains are caused by radioactive isotopes transported in fluids that enter surface-reaching fissures in the rough diamond (see, e.g., A.T. Collins, "Colour centres in diamond," *Journal of Gemmology*, Vol. 18, No. 1, 1982, pp. 37–75).

The stains in this diamond generally had well-defined boundaries. The radiation was not strong enough to affect the bodycolor of even this weakly colored pink stone, which was caused by a broad absorption around 550 nm. Spectroscopic analysis confirmed that this stone was type IIa, with extremely low concentrations of some point defects common in type IIa diamonds. While the combination of pink color and green radiation stains is rare, it represents proof that this stone was not HPHT treated. HPHT processing can create pink dia-

*Figure 4. This Faint pink 20.24 ct pear-shaped brilliant revealed many green radiation stains when examined with magnification. This is a rare feature in pink type IIa diamond, and it indicates that natural irradiation can occur in diamonds of all types.*

*Figure 5. The green radiation stains in this faint pink diamond generally have well-defined boundaries. Length of this image is about 4 mm.*



monds from brown ones, but the heat necessary to change the color of a type IIa diamond would also change the color of the radiation stains. Depending on the temperature used, the green stains could turn brown or perhaps even disappear entirely.

*Wuyi Wang and Thomas Gelb*

### Two Yellow SYNTHETIC DIAMONDS

From the time they were first produced, synthetic diamonds have been a source of concern for the gem and jewelry industry. With the release into the market of gem-quality synthetic diamonds by Gemesis Corp. and other manufacturers, these concerns have grown considerably. In the Winter 2002 issue of *Gems & Gemology* (pp. 301–309), J. E. Shigley et al. described Gemesis yellow synthetic diamonds and the clues for their detection. Although identification may require advanced spectroscopic or luminescence equipment that is only available in a well-equipped gemological laboratory, in many cases the trained gemologist can make the separation based on standard gemological clues, such as metallic inclusions and color zoning. Such was the case with two yellow brilliants that were submitted to the East Coast laboratory for grading.

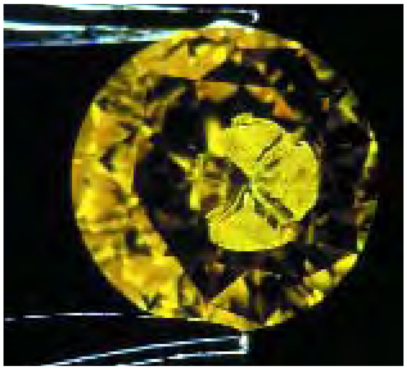


*Figure 6. The rounded edges on this large inclusion in the table of a 0.99 ct yellow round brilliant are indicative of synthetic origin.*

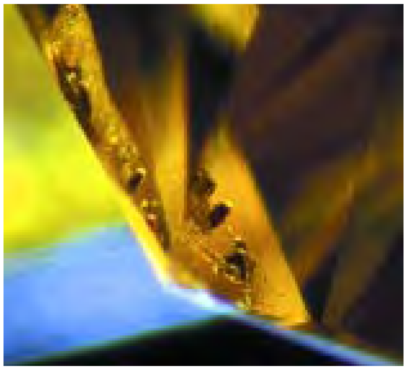


*Figure 7. The rounded form and protrusions of this surface-reaching inclusion, seen touching the crown of a 1.41 ct yellow square modified brilliant, are similar to those that have been reported in commercial synthetic diamonds. Magnified 63×.*

On examination with a microscope, both were immediately suspected of being synthetic. The first, a 0.99 ct round brilliant, had a very unusual inclusion under the center of the table (figure 6). When viewed from various angles, this pyramid-shaped inclusion was seen to be very dark gray to black with rounded edges—in contrast to the pyramidal or octahedral inclusions that may be seen in natural diamonds, which typically are transparent or white with flat surfaces and sharp edges. On the basis of its appearance, we concluded that this somewhat globular inclusion was a remnant of metallic flux, which is not uncommon in synthetic diamonds grown by a high pressure/high temperature process. During this growth process, the carbon source is dissolved in a molten metal, or flux, typically composed of iron, nickel, and cobalt. This flux facilitates the movement of carbon atoms toward a host seed crystal, where they are deposited to form a larger crystal. Sometimes pieces of the molten material are trapped inside the growing synthetic diamond as inclusions, taking on diamond's octahedral crystal form while still exhibiting the melted appearance and rounded edges that are characteristic of a metallic flux.

*Figure 8. The presence of metallic inclusions caused this 1.41 ct synthetic diamond to be attracted by a magnet, from which it is suspended here. Magnetic inclusions are very rare in natural yellow diamonds.*

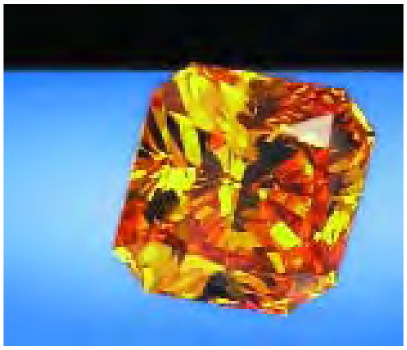
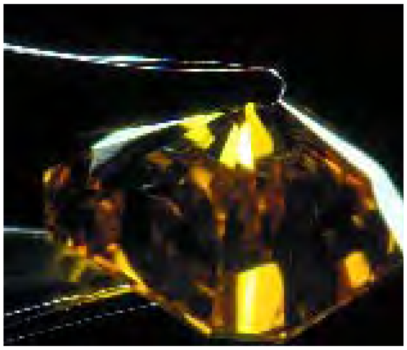


*Figure 9. Color zoning, such as that visible through the pavilion of this 1.41 ct yellow square modified brilliant, is a good indication of synthetic origin. Magnified 10×.*



The second sample, a 1.41 ct square modified brilliant, also had a black inclusion. In this instance, the inclusion reached the crown surface, and had been partially polished away. The remnant visible at the surface did not look so unusual, but the internal portion was globular in appearance, with rounded, elongated protrusions penetrating a short distance into the diamond (figure 7). Again, such rounded black opaque inclusions are indicative of synthetic origin. As a further test, a strong magnet was used to verify that the inclusion was indeed metallic, as all three of the elements typically used in the flux are usually magnetic (figure 8). Further observation of this synthetic diamond revealed color zoning (figure 9) and a cloud of minute pinpoint inclusions. Both of these characteristics are typical of synthetic diamonds. We confirmed the synthetic origin of these two samples with the De Beers DiamondView luminescence imaging system.

*Vincent Cracco and Joshua Sheby*

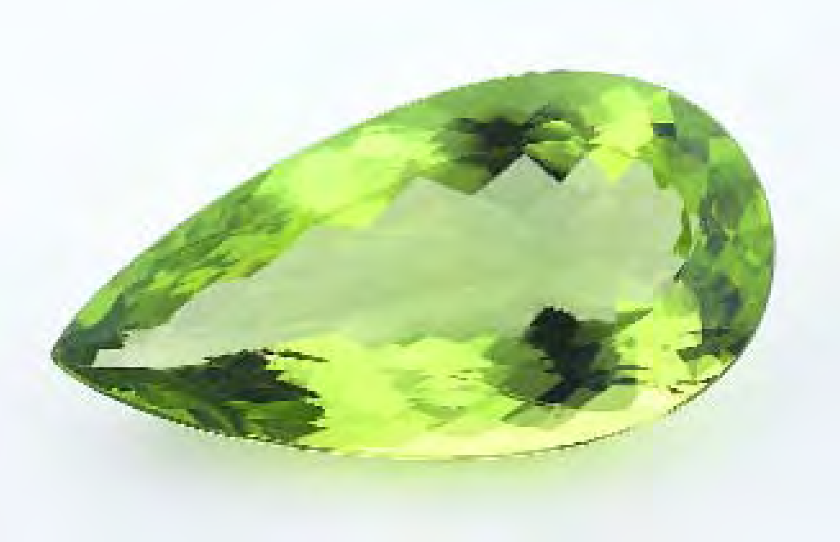


*Figure 10. This 78.35 ct herderite (43.45 × 22.56 × 13.52 mm), reportedly from Minas Gerais, Brazil, is one of six large herderites examined by GIA since 1996.*

## HERDERITE Update

Herderite–hydroxyl-herderite [$CaBePO_4(F,OH)$] is a phosphate mineral series that can form excellent crystal specimens and, when sufficiently transparent, be faceted into attractive stones (with a Mohs hardness of 5–5½). In the Fall 1996 Lab Notes (p. 208), the West Coast laboratory reported on an "extraordinarily large" 38.91 ct herderite. With only one other confirmed example of gem herderite found in the literature (P. J. Dunn and W. Wight, "Green gem herderite from Brazil," *Journal of Gemmology*, Vol. 15, No. 1, 1976, pp. 27–28), this member of the series historically has been considered quite rare. Since 1996, however, we have identified another five specimens of this gem material, ranging from 12.28 to 161.09 ct. The most recent was in November 2003, when Solari and Huntington Jewelers of Park Ridge, Illinois, submitted the 78.35 ct herderite, shown in figure 10. The largest of the six stones, which measured 57.9 × 27.4 × 17.1 mm, was submitted in May 2002 by the Gemological Center in Belo Horizonte, Minas Gerais, Brazil. Given the rarity of this material, these samples provided a unique opportunity to study the properties of gem-quality herderite.

All six herderites, which were either pear shapes or emerald cuts, were yellowish green and had similar gemological properties. Magnification revealed strong doubling (due to birefringence that ranged from 0.029 to 0.031) and only a few internal features: pinpoint or needle-like inclusions that were isolated or in small clusters, as well as small two-phase inclusions, fractures, and coarse needles or growth tubes.

The R.I. values were consistent in five of the six samples, with $\alpha$ = 1.580 and $\gamma$ ranging from 1.609 to 1.611. One sample had slightly lower values: $\alpha$ =1.578 and $\gamma$ = 1.607–1.608. Specific gravity was very constant for all samples, at approximately 3.04. Each stone showed a line at 580 or 585 nm in the desk-model spectroscope. Pleochroic colors were recorded for four of the samples, the most common combination being yellow and yellowish green, with some reports of greenish yellow, green, or brownish green components.

Herderite displays a characteristic luminescence to X-rays; this property was checked on two of the samples, and both luminesced strong orange or yellow-orange with prolonged phosphorescence. A property not found in the literature was the unusual luminescence to transmitted light from a strong light source such as that of a fiber-optic light: weak to medium violet in three stones; the luminescence was very weak blue in the fourth stone tested for this feature.

With all other properties being remarkably similar, it is interesting to note that the UV flourescence varied considerably from stone to stone. The long-wave UV fluorescence ranged in intensity from inert to weak; of the five samples that did fluoresce, three displayed blue luminescence, one green-blue, and one violet. Moderate chalkiness was recorded in two instances. The short-wave UV fluorescence ranged from faint to weak, in the following colors: yellow, yellowish green, blue, greenish blue, green-blue, and violet. Weak to strong chalkiness was recorded for the same two samples as above.

Energy-dispersive X-ray fluorescence (EDXRF) analyses performed on four of the samples revealed Ca and P as major constituents in all, with

Mn, Pb, Sr, and Y as minor or trace elements. Fe was a trace or possible trace element in two of the samples.

The end-member species of herderite–hydroxyl-herderite are differentiated by mineralogists according to the ratio of fluorine to hydroxyl in the formula. Although these components are not detectable by routine analytical techniques found in most gemological laboratories, it is possible to estimate the composition of the herderite series by measuring the refractive indices, since the R.I. values systematically decrease with increasing fluorine content (see P. B. Leavens et al., "Compositional and refractive index variations of the herderite–hydroxyl-herderite series," *American Mineralogist*, Vol. 63, No. 4, 1978, pp. 913–917). The fluorine content of the previously confirmed gem-quality herderite was determined to be greater than its hydroxyl content (Dunn and Wight, 1976). Since the gemological properties of the six specimens we examined were consistent with this 5.90 ct Brazilian sample (R.I.'s of $\alpha$ = 1.581 and $\gamma$ = 1.610, with just a slightly lower S.G. value—3.02 vs. 3.04), it can be concluded that the additional specimens also fall within the fluorine-rich herderite side of the series, and may be the only other examples of rare and fine gem-quality herderite reported in literature.

Although Dunn and Wight (1976) did not provide any additional information on the locality of their herderite sample, two of the most significant deposits of large, well-formed crystals of hydroxyl-herderite in Brazil are the Virgem da Lapa and Golconda mines in Minas Gerais (P. J. Dunn et al., "Hydroxyl-herderite from Brazil and a guide to species nomenclature for the herderite/hydroxyl-herderite series," *Mineralogical Record*, Vol. 10, No. 1, 1979, pp. 5–11). The owner of the 161.09 ct herderite reported that it was from Ouro Verde, Minas Gerais; the herderite shown in figure 10 is also reportedly from Minas Gerais, although the specific locality is unknown. At the time of this writing, no source information about the other samples examined at GIA was available. Given the number of large herderites submitted to the laboratory since 1996, it would be interesting to know whether the other stones also originated from Minas Gerais, perhaps from the same deposit as the largest herderite reported here.

*CYW*

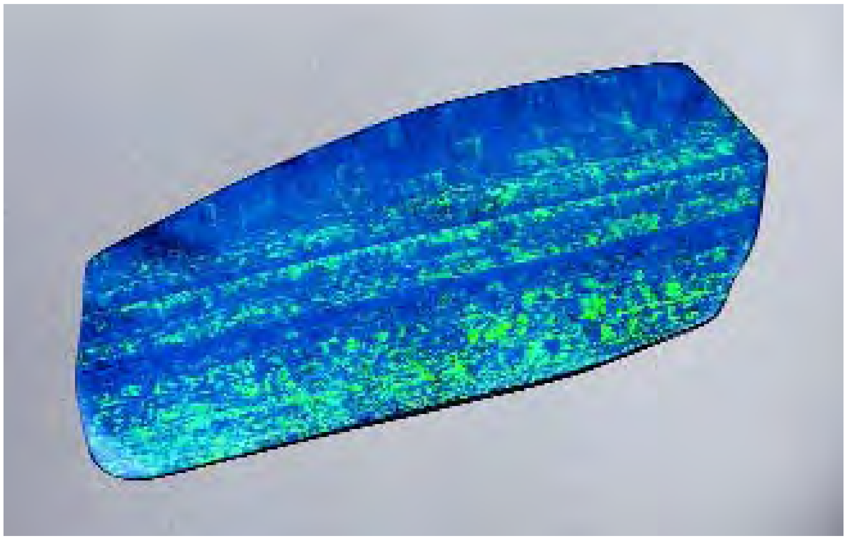


*Figure 11. This 798.39 ct specimen was the largest opal doublet of such high quality ever seen in the laboratory.*

## Large OPAL Doublet

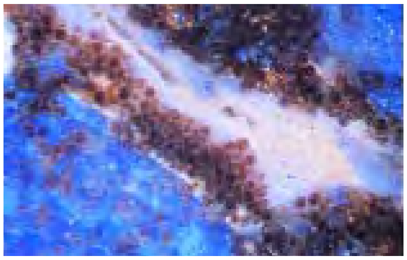
Recently, the West Coast laboratory had the opportunity to examine a large freeform opal doublet that was submitted by Christensen & Co. of South Australia. The doublet weighed 798.39 ct and measured ~139.0 × 57.5 × 13.5 mm (figure 11). Because of its size (none of the staff could recall seeing a larger one of such quality), we had to exercise extra special care in our examination.

The top portion of the doublet consisted of a thin transparent-to-semitransparent layer that showed play-of-color. The bottom portion consisted of a thicker translucent-to-opaque mottled brown-and-white layer that also displayed some play-of-color. These two layers were joined by a black cement. Both top and bottom portions were reportedly from Andamooka, South Australia.

We obtained a typical opal R.I. of 1.46 from both the top and bottom layers, and an additional R.I. of 1.55 from some spots on the backing. The opal portions of both layers fluoresced a medium blue-white to long-wave ultraviolet radiation, with a weak blue-white reaction to short-wave UV. Both also displayed phosphorescence of the same color and relative strength to long- and short-wave UV.

Microscopic examination revealed

*Figure 12. At 10× magnification, the unusual circular structure of the oolitic opal backing was readily apparent.*



that the top layer was indeed natural opal, while the backing material consisted partly of natural oolitic opal, which is characterized by an unusual circular structure (figure 12; see also Summer 1982 Lab Notes, pp. 104–105). Magnification, along with the 1.55 R.I., indicated that there were also areas of quartz, probably chalcedony, in the backing material (see Spring 1986 Lab Notes, p. 50).

It was obvious that great care had been taken to create such a piece. The opal top was fairly thin for its size and was not perfectly flat. It had been carved to follow the natural contours of the vein in which it formed, and the backing mimicked the contours of the top layer almost perfectly.

*Elizabeth P. Quinn*

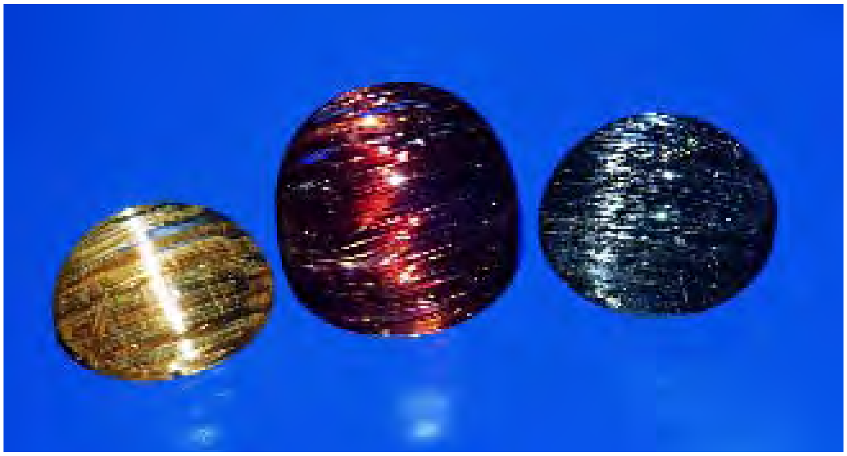


*Figure 13. These rutilated quartz cabochons (10.46–24.22 ct) show three different colors of chatoyancy.*

### Three Rutilated QUARTZ Cat's-Eyes

Rutilated quartz is a popular gem material. In lower qualities, it can be found in abundance at gem and mineral shows, while good examples showing desirable features such as chatoyancy or starburst patterns of rutile are prized by collectors and jewelry designers. Three chatoyant rutilated quartz cabochons recently examined in the West Coast laboratory were particularly interesting because of the different colors presented in their eyes.

As illustrated in figure 13, the reflective chatoyant colors shown by these cabochons were "silvery" gray, "golden" yellow, and "coppery" red. The 13.70 ct silvery chatoyant stone measured 14.47–14.96 × 8.91 mm, while the 10.46 ct yellow cat's-eye measured 13.80–14.03 × 7.59 mm. Both stones were cut from Brazilian quartz by Falk Burger of Los Alamos, New Mexico. The silvery chatoyant cab was fashioned from material that has recently been sold as "platinum quartz" (see Winter 2003 Gem News International, p. 334).

The 24.22 ct cabochon showing red chatoyancy (14.98–15.64 × 12.51 mm) was cut by Kevin Lane Smith of Tucson, Arizona, from rutilated quartz said to have come from Madagascar. Rutile of this color is known to come from other sources as well, including Brazil and North Carolina.

With magnification, the lengthwise striations and tetragonal cross section typical of rutile were visible on the inclusions, as was rutile's high luster compared to the surrounding quartz. Raman analysis confirmed that the chatoyancy-causing inclusions in all three gems were rutile.

While rutilated quartz showing a golden yellow color is relatively common, the silvery gray and coppery red colors are considerably more unusual. The presence of sufficient acicular rutile inclusions in parallel alignment and of a diameter suitable to produce chatoyancy in highly transparent quartz is even rarer in any color of rutile, but particularly so in gray and red.

*John I. Koivula and Maha Tannous*

### SPURRITE

Since there are actually very few naturally colored purple gem minerals, receipt in the West Coast laboratory of four translucent purple beads (see, e.g., figure 14) immediately raised suspicions of dyed quartzite or carbonate. However, when the beads were examined with magnification, they were found to be aggregates that contained numerous naturally colored, distinctly dichroic purple grains, which changed from a rich purple to very light purple or near colorless when the polarizer of the microscope was rotated. This identification was to be a greater challenge than initially expected.

We selected one of the beads (0.43 ct, 4.34–4.39 × 2.90 mm) for testing. With permission from the owner, Stephen Mauldin Stone Co. of Sandia Park, New Mexico, we exposed this bead to a minute amount of 10% HCl solution; it effervesced readily, indicating the presence of a carbonate. The purple grains displayed a higher resistance to the acid, while the interconnecting material was easily etched.

On the refractometer, the sample displayed a birefringence blink from approximately 1.64 (α) to 1.68 (γ). Some areas appeared to have a larger birefringence, while others gave a spot R.I. value close to 1.50; however, these secondary values were indefinite. The average S.G., obtained hydrostatically, was close to 2.96 although values as low as 2.85 were also obtained because of the small size of the bead.

The specimen displayed no visible spectrum and was inert to short-wave UV radiation. The long-wave UV luminescence was a faint "cobalt" blue.

The area of purple grains that was isolated by the acid etching was scraped for X-ray powder diffraction analysis. The resultant pattern matched that for the mineral spurrite, which is an uncommon, usually massive, biaxial negative, monoclinic mineral with the chemical composition $Ca_5(SiO_4)_2(CO_3)$ and a hardness of 5 on the Mohs scale (see, e.g., W. L. Roberts et al., *Encyclopedia of Minerals*, 2nd ed., Van Nostrand Reinhold, New York, 1990, pp. 808–809). To further isolate individual components for testing, the bead was immersed in the dilute HCl solution for several hours. It effervesced readily, and most of the sample dissolved, leaving a white powdery residue. A white substance that remained intact was also scraped for X-ray powder diffraction, yielding a pattern that matched that of a combination of grossular and idocrase.

EDXRF, performed on the bead by senior research associate Sam Muhlmeister prior to its dissolution in acid, revealed Si and Ca as the major elements present, with a trace of Fe. The primary constituents were consistent with spurrite, but the lack of Al suggested that neither grossular nor idocrase was present. Further analysis of numerous areas of this and an accompanying bead found Al in some areas, but not in many others. The relative amounts of Al could not be determined, and Mr. Muhlmeister believed that its variable presence was due to the inhomogeneity of the material.

Raman analysis of the purple grains yielded distinct spectra that contained possible carbonate peaks, but they did not match any reference spectra in the database (which did not include spurrite). The spectra of areas between the purple grains matched those of several carbonates in the database. None of the areas tested yielded any matches for grossular or idocrase.

The R.I. of this sample was consistent with that recorded for the mineral spurrite. The S.G. was slightly below but close to the value of 3.0 reported in the literature. The presence of a carbonate compound, the X-ray powder diffraction pattern, and the chemistry all confirmed that this material indeed consisted largely of spurrite. One of the X-ray diffraction patterns indicated the presence of additional minerals; however, since the identity of these minerals could not be confirmed by either EDXRF or Raman spectroscopy, it was necessary to conclude that the item was a rock consisting of spurrite and additional minerals. Petrographic testing would be necessary to characterize this material further.

In February 2001, the West Coast laboratory received a 7.19 ct partially polished piece of rough material that had similar properties to the aforementioned stones, and had a corresponding conclusion on the report. This entry's author tested (less extensively) another purple aggregate that was purchased as spurrite for the GIA stone collection at the 1997 Tucson gem show; it too had enough of the same properties to indicate that it was indeed spurrite (or at least its dimorphous counterpart, paraspurrite [discussed below]), reportedly from a deposit in the southwestern U.S.

To further compare these materials to each other and to the properties published in the literature for spurrite, cathodoluminescence was observed on two of the four beads as well as on the stone from the GIA collection. The published cathodolu-

*Figure 14. Four purple beads that were reportedly from Guerrero State in southern Mexico proved to be rocks that consist primarily of spurrite plus additional minerals. Shown are two of the beads (0.85 ct total weight) along with a sample (19.02 ct) from GIA's collection, reported to be spurrite from the southwestern U.S.*

minescence of spurrite is green (J. W. Anthony et al., *Handbook of Mineralogy*, Vol. II, *Silica, Silicates*, Part 2, Mineral Data Publishing, Tucson, Arizona, 1995, p. 748); however, the two beads luminesced pinkish orange, and the stone from the GIA collection luminesced orange. Given that the spurrites seen in the lab were aggregates with other minerals, it is possible that the additional components influenced the cathodoluminescence.

Spurrite may be white, gray, purple, or purple-gray, and is the product of low-pressure, high-temperature metamorphism along the contact between carbonate rock, most commonly limestone, and mafic magma. The best-known source localities include northern Mexico and Ireland, but it also occurs in Scotland, the U.S. (Riverside County, California; Luna County, New Mexico; and Lewis and Clark, and Meagher counties, Montana), Turkey, Israel, Japan, New Zealand, Siberia, and elsewhere in Russia (Anthony et al., 1995). The owner of the samples received for testing said they came from Guerrero State in southern Mexico, a location that was not reported in the author's reference literature.

Paraspurrite, a pseudomorph of spurrite, has an identical chemical composition, closely related crystal structure, and similar gemological properties to those of spurrite. It has been found in Inyo County, California (A. A. Colville and P. A. Colville, "Paraspurrite, a new polymorph to spurrite from Inyo Cou nty, California," *American Mineralogist*, Vol. 62, 1977, pp. 1003–1005). The two minerals may be distinguished by measurement of their unit-cell parameters. The X-ray powder diffraction patterns are similar, with paraspurrite exhibiting additional reflections and different line intensities in the pattern. Paraspurrite also has different associated minerals, which may be observed in thin section.

In addition to the samples discussed in this entry, another spurrite was observed by GIA laboratory staff at the 1986 Tucson gem show (Summer 1986 Gem News, pp. 114–115); however, the four beads reported here represent only the second instance that this material has been submitted by a client to the laboratory for identification. *CYW*

### Bicolored Cat's-eye TOURMALINE

Cat's-eye tourmaline and bicolored tourmaline are well known to gemologists. The bicolored gems are usually faceted to display the component colors, or cut as polished slabs as in the case of green and red so-called watermelon tourmaline. Cat's-eyes are always fashioned as cabochons to showcase the reflective nature of the chatoyancy-causing bundles of parallel growth tubes. However, it is unusual to have bicoloration and chatoyancy together in the same stone.

Just such a specimen was recently examined in the West Coast laboratory. The 9.77 ct bicolored cat's-eye tourmaline (16.84 × 11.16 × 5.71 mm) was cut by Falk Burger of Los Alamos, New Mexico. The rough material, which came from Brazil, was bicolored blue and green perpendicular to the length of the crystal.

The cabochon was cut as a cushion shape with one end green and the other blue (figure 15). When it was tilted under a single point source of light, such as a fiber-optic illuminator, a single sharp eye was observed to drift back and forth across the stone, changing from blue to green depending on the portion of the stone in which it was observed. However, as shown in figure 15, when two light sources were used, a green eye and a blue eye could be seen simultaneously.

*Figure 15. This 9.77 ct Brazilian cat's-eye tourmaline shows two different colors of chatoyancy at the same time when illuminated by two separate light sources.*

Magnification revealed that the chatoyancy was caused by reflection from a combination of two micro-features. As expected, numerous fine growth tubes extending lengthwise in the cabochon were in large part responsible for the phenomenon. Also playing a part in the chatoyant effect, however, was a naturally striated unpolished base, which was the rough surface of the original tourmaline crystal.

Over the years, we have seen numerous bicolored tourmalines as well as many cat's-eye tourmalines. This is the first time, however, that we have seen these two varieties of tourmaline used so effectively in combination to create a very unusual gem.

*John I. Koivula and Maha Tannous*

### Erratum: Euclase Specimen

Ms. Claudia Piñeros, the owner of the euclase specimen described in the Spring 2003 Lab Notes (p. 42), has informed us that the specimen was actually found in the course of exploration for emeralds in Pauna, Colombia (not in Brazil as was reported in that entry). *Gems & Gemology* regrets the error.

PHOTO CREDITS
Maha Tannous—1, 11, 13, and 15; John I. Koivula—2, 3, and 12; Wuyi Wang—4 and 5; V. Cracco—6, 7, and 9; Elizabeth Schrader—8; C. D. Mengason—10 and 14.