carats, depending on grade variations within the pipe. The largest rough diamond recovered to date weighed 84 ct.

According to the Sierra Leone government's Gold and Diamond Department, there has been an increase in the annual legal export of diamonds since 2000. Official figures for 2001 were approximately 222,520 carats; by 2004, reported exports had increased to nearly 691,760 carats (figures for 2005 dropped slightly to 668,700 carats). Interestingly, the value per carat has risen dramatically. In 2001, the overall value was \$116.94/ct; by 2005 it reached \$212.26/ct. According to Frank Karefa-Smart, diamond business advisor to the IDMP, this improvement in value and total exports is due to the fact that higher-quality diamonds that were once smuggled out of the country are now exported legally.

The possession of rough diamonds is strictly controlled, and three different types of licenses are required for their handling. A mining license allows miners to dig for diamonds but not to buy them from other miners. A dealer's license is for those who buy from the miners, but it is not sufficient to export the stones; this requires an export license, which costs Sierra Leoneans US\$40,000 a year. Foreigners who purchase diamonds in Sierra Leone can export them using a local exporter's license for a fee of about 1.5% of the government-declared value.

Diamonds are evaluated for export at the Gold and Diamond Department, which assesses a 3% export tax (based on the value of the rough diamonds on the international market). The stones are then packaged and the paperwork completed according to the Kimberley Process.

Peace has been restored in Sierra Leone, and the Kimberley Process seems to have been effective in bringing Sierra Leone's diamonds into legal channels. However, further development at the mining level is an important next step in maximizing the economic benefit for the people who need it most.

Ric Taylor (rtaylor@gia.edu)
GIA Education, Carlsbad

Jewelry repair damages a diamond. The SSEF Swiss Gemmological Institute recently received a mounted yellow pear-shaped diamond with a small chip on the crown (figure 5) and an associated black inclusion that was visible with a gemological microscope. It was accompanied by a grading report that did not mention the chip or inclusion, and stated the clarity as VS_1. The inconsistency of this clarity grade with such an obvious chip/inclusion suggested that these features were created after the diamond was graded. The chip was about 1.0 × 0.5 × 0.3 mm and had the appearance of a cleaved depression. An SEM image (figure 6) showed a stepped crater, with the black spot at its deepest point. The client asked us to identify the black inclusion and determine the cause of the apparent damage. This was the first time we had encountered such a feature.

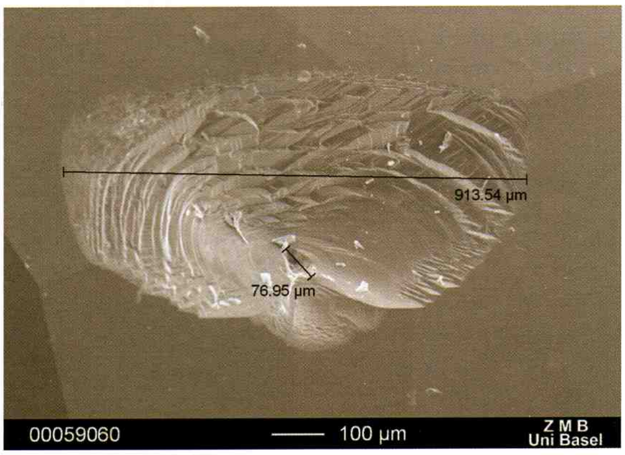
Chemical analysis performed during the SEM investigation (using a detector for light elements) showed that only carbon was present in the black inclusion, and a

Figure 5. The chip (see arrow) on the crown of this yellow pear-shaped diamond appears to have been created by a misdirected shot from a laser soldering gun. A prong in the setting showed evidence of recent repair by laser soldering. A dark spot at the bottom of the pit was identified as graphite. Photo by H. A. Hänni; © SSEF.

Raman spectrum confirmed the presence of graphite. The association of graphite with such a crater could be explained by a pinpoint source of intense heat, causing a transformation from diamond to graphite. This would have resulted in a volume increase of ~1.6× (the density of diamond being 3.52 g/cm^3 vs. 2.16 g/cm^3 for graphite), creating sufficient expansion to cause the chip.

Careful observation of the setting revealed that one of the prongs on the pendant had recently been repaired by laser soldering. An accidental shot from a laser soldering

Figure 6. This SEM image of the chip in figure 5 shows the stepped shape of the crater walls and a small depression at the base of the pit corresponding to graphite. A phase transformation from diamond to graphite produced by the intense heat of a laser soldering gun would cause a sudden volume expansion, creating the chip. Image © SSEF/ZMB.



gun would have enough energy to cause the phase transition from diamond to graphite. This case shows that great care must be taken to avoid accidentally damaging a gemstone with a laser soldering gun.

HAH

COLORED STONES AND ORGANIC MATERIALS

Green augelite from Peru. Augelite, monoclinic $Al_2(PO_4)(OH)_3$, is a very rare collector's stone. Until now, the best specimens—yellow-green crystals up to 2 cm—came from Rapid Creek, Yukon Territory, Canada, where they formed within fractures in shales. And the only facetable material was from an historic andalusite deposit at the Champion mine, Mono County, California, which was worked during the 1920s and '30s. This site produced colorless crystals typically to 1 cm (exceptionally up to 2.5 cm), but faceted stones usually weighed a maximum of ~1 ct and were quite rare; the largest one known to this contributor is 4.00 ct (Patricia Gray, pers. comm., 2006).

However, a new source of gem-quality augelite appeared in early 2006, when druses of well-formed light green crystals up to 2 cm (exceptionally up to 5 cm) were discovered in a quartz vein at the small Ortega mine in Ancash Department, northern Peru (see T. P. Moore, "What's New in the Mineral World?" June 30 and October 27, 2006 updates at www.minrec.org/whatsnew.asp). Reportedly, two brothers from Lima had reopened an abandoned mine in search of quartz crystals with Japan-law twinning. They were surprised to find very fine augelite at the deposit.

Figure 7. A former quartz mine in northern Peru has produced some fine specimens of augelite; the faceted stones weigh 1.19 ct (left) and 0.94 ct (right). Photo by J. Hyrsl.

The augelite crystals (e.g., figure 7) are usually milky, and only small areas near the surface are facetable. The green color is inhomogeneous, so to get the best color the rough must be carefully oriented for cutting. The faceting process is also complicated by two cleavages (perfect in the {110} direction, good in the {$\bar{2}$10} direction). Gemological properties were measured on three cut stones (0.20–1.19 ct): R.I.—n_α=1.575, n_β=1.576, and n_γ=1.590; birefringence—0.015; and fluorescence—light yellow to short-wave and inert to long-wave UV radiation. In addition, three crystals were used to measure hydrostatic S.G. values of 2.69–2.70; the Mohs hardness was determined as 5.5. These properties are comparable to those reported for augelite by M. O'Donoghue (*Gems*, 6th ed., Butterworth-Heinemann, Oxford, England, 2006, p. 385). The largest cut stone seen by this contributor was 1.19 ct, but larger stones should be produced in the future.

Jaroslav Hyrsl (hyrsl@kuryr.cz)
Prague, Czech Republic

Bicolored beryl from the Erongo Mountains, Namibia. In mid-2006, Jo-Hannes Brunner (Pangolin Trading, Windhoek, Namibia) informed us about a new find of bicolored beryl from Namibia's Erongo Mountains. This area is famous for producing fine specimens of aquamarine, black tourmaline, jeremejevite, and other minerals (see the Fall 2002 GNI section, pp. 264–265 and 266–268; B. Cairncross and U. Barhmann, "Famous mineral localities: The Erongo Mountains, Namibia," *Mineralogical Record*, Vol. 37, No. 5, 2006, pp. 361–470). Only a small amount of the bicolored beryl was recovered, in early 2006, and a few stones have been cut and set into jewelry (figures 8 and 9).

Mr. Brunner donated several pieces of rough and one cut bicolored beryl to GIA for examination. The cut stone (13.68 ct; again, see figure 8) was examined by one of us (KR) and showed the following properties: color—bicolored light greenish blue and yellowish green, with a sharp demarcation between the two colors; R.I.—1.562–1.569 for the blue portion and 1.577–1.584 for the green portion; birefringence—0.007 (both colors); hydrostatic S.G.—2.68; fluo-

Figure 8. This bicolored beryl (13.68 ct) was cut from material recovered in early 2006 from the Erongo Mountains in Namibia. Gift of Jo-Hannes Brunner; GIA Collection no. 36705. Photo by Robert Weldon.