



EDITOR

Brendan M. Laurs (blaurs@gia.edu)

CONTRIBUTING EDITORS

Emmanuel Fritsch, *IMN, University of Nantes, France* (fritsch@cnrs-imm.fr)

Henry A. Hänni, *SSEF, Basel, Switzerland* (gemlab@ssef.ch)

Kenneth V. G. Scarratt, *AGTA Gemological Testing Center, New York* (kscarratt@email.msn.com)

Karl Schmetzer, *Petershausen, Germany* (schmetzerkarl@hotmail.com)

James E. Shigley, *GIA Research, Carlsbad, California* (jshigley@gia.edu)

Christopher P. Smith, *GIA Gem Laboratory, New York* (chris.smith@gia.edu)

COLORED STONES AND ORGANIC MATERIALS

Amethyst from California. Some notable gem-quality amethyst was found in February 2003 in eastern San Bernardino County, California. Amethyst mineralization has been known in this area for several years (see J. P. Calzia et al., "Mineral resources of the Kingston Range Wilderness Study Area, San Bernardino County, California," *U.S. Geological Survey Bulletin 1709-D*, 1987). The crystals were recovered from the Purple Lily prospect by John Miatech of Sebastopol, California. According to Mr. Miatech, the production consisted of

more than 500 loose crystals (up to approximately 9 cm long and 1 cm wide) and small clusters, as well as a large matrix specimen covered with dozens of amethyst crystals. This 43 kg specimen (46 × 67 cm) will be displayed at GIA in Carlsbad until June 2005.

So far, 16 stones have been faceted (0.87–6.44 ct; see, e.g., figure 1) and five crystal "points" have been polished. The cut stones were generally free of inclusions, and commonly showed angular color zoning in rhombohedral directions when viewed in certain orientations. A few of the samples contained primary (figure 2) or secondary fluid inclusions.

Mr. Miatech indicated that the amethyst was produced from a single cavity that measured approximately 0.5 × 1.1 × 1.5 m. The cavity was discovered via systematic prospecting using a satellite ground positioning system instrument to map amethyst-bearing fault zones (trending northwest to southeast) and joints that cross-cut the granitic host rock. Amethyst was also found within local areas of light-colored granite, where the crystals formed in miarolitic cavities. Due to access problems and the rugged terrain, all of the mining done so far has been with hand tools only. Future production of amethyst from this area will likely remain limited. *BML*

Figure 1. These amethysts (2.44–6.44 ct) were cut from material recovered in eastern San Bernardino County, California. Courtesy of John Miatech; photo by Maha Tannous.



Editor's note: The initials at the end of each item identify the editor or contributing editor who provided it. Full names and affiliations are given for other contributors.

Interested contributors should send information and illustrations to Brendan Laurs at blaurs@gia.edu (e-mail), 760-603-4595 (fax), or GIA, 5345 Armada Drive, Carlsbad, CA 92008. Original photos will be returned after consideration or publication.

GEMS & GEMOLOGY, Vol. 40, No. 2, pp. 170–181

© 2004 Gemological Institute of America

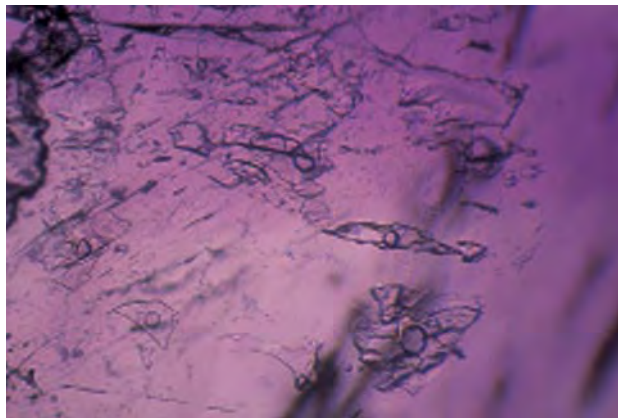


Figure 2. Primary two-phase fluid inclusions of various shapes were present in a few of the California amethyst samples examined. Photomicrograph by John I. Koivula; magnified 20 \times .

Green petrified wood from Arizona. At the 2004 AGTA show in Tucson, this contributor purchased a 17.81 ct sample of green petrified wood. According to the dealer, William Heher of Rare Earth Mining Co. (Trumbull, Connecticut), this rare material originates from Holbrook, Arizona. He also reported that this green petrified wood was discovered in 1991, but it has only recently become available in limited quantities. A small selection of rough and partially polished pieces were available; in the latter, one side was polished while the other retained the original form of the wood (figure 3).

The following gemological properties were obtained on the sample: color—mottled bluish green and white; diaphaneity—translucent to opaque; R.I.—1.55; S.G.—2.49, determined hydrostatically; Chelsea filter reaction—deep red; fluorescence—inert to both long- and short-wave UV radiation; transmission luminescence—moderate red; and lines in the red end of the spectrum were visible with the desk-model spectroscope. Microscopic examination revealed uneven parallel banding along its length with a

somewhat cellular structure seen down the end, in addition to some fractures and cavities.

Raman analysis verified that the material was quartz, as expected for petrified wood. EDXRF spectroscopy performed by GIA Gem Laboratory senior research associate Sam Muhlmeister revealed silicon as a major constituent along with trace amounts of Cr, Ca, Ti, V, Fe, and Sr. Mr. Heher reported that this material is colored by chromium; this is supported by the Chelsea filter reaction, transmission luminescence, visible spectrum, and energy-dispersive X-ray fluorescence (EDXRF) analysis.

It may prove difficult for a novice gemologist to identify this material specifically as petrified wood if the wood-like “skin” has been removed. But the color, along with its subtle structure and gemological properties, should be enough to make a correct identification.

Elizabeth P. Quinn (equinn@gia.edu)
GIA Gem Laboratory, Carlsbad

A unique quartz sculpture from Peru. Quartz has the highest number of identified inclusions of any gem mineral; thus far, more than 150 minerals have been found in quartz (J. Hyrsl and G. Niedermayr, *Geheimnisvolle Welt: Einschlüsse im Quarz/Magic World: Inclusions in Quartz*, Bode Verlag, Haltern, Germany, 2003). Often, attractive inclusions can be employed to special effect in sculpted quartz *objets d'art*; perhaps the most popular example is golden rutile (variety sagenite) in rutilated quartz.

An interesting rock crystal sculpture showing creative use of an inclusion was purchased by this contributor in Lima, Peru, in January 2004. Carved in the shape of an owl with eyes of Indian ruby and a bill of Peruvian pink opal, it was 18 cm tall (figure 4). According to the seller, the sculpture was carved in Lima from a single quartz crystal mined at Pampa Blanca, near Pisco. This Peruvian locality hosts one of the world’s most productive deposits of quartz crystals twinned according to the Japan law.

Figure 3. The unpolished side (left) of this 17.81 ct piece of bluish green petrified wood from Arizona retains the structure of the original wood. The polished side (right) displays only a subtle wood grain pattern. Photos by Maha Tannous.





Figure 4. This rock crystal carving in the shape of an owl (18 cm tall) contains a cleverly situated pyrite inclusion, which is visible as the owl's "brain." Photo by J. Hyrsl.

The original crystal was frosted on the surface, making it impossible to view the interior, but a surprise was revealed as the carving progressed. The crystal contained a perfect lustrous pyrite octahedron 1.3 cm across, which through the skill of the artist was positioned within the owl's head to form a well-visible "brain" (again, see figure 4).

Pyrite inclusions of this size are very rare, and almost all of them are found in quartz from Brazil (usually as pyrite octahedrons) and from the Yuzhnyi deposit in the Ural Mountains of Russia. The combination of such an attractive inclusion with this unusual setting makes this sculpture quite unique.

*Jaroslav Hyrsl
Kolin, Czech Republic
hyrsl@kuryr.cz*

Scapolite from Mozambique. At the Tucson gem shows last February, Geofil Ltda. (Cascais, Portugal) had some rough and cut examples of scapolite from a new find in Mozambique. According to Sebastian and Pepe Rodriguez of Geofil, the scapolite was discovered in Nampula Province in October–November 2003. Approximately 2–3 kg of gem-quality rough was recovered, and stones up to 240 ct have been faceted; specimen-quality crystals also formed a significant portion of this production (figure 5).

The geology and mineralogy of the Mozambique scapolite deposits have been examined by one of us (CLG). The best occurrences are known from the northern part of the country, near the border between the Nampula and Zambézia Provinces, in the Malema District. The deposits formed along tectonic boundaries between granulite terranes and greenstone-facies metamorphic rocks, in relatively narrow areas up to several kilometers in length. The scapolite crystals occur in metasomatic stratiform bodies and intrusive veins near the contacts between granite or orthogneiss and compositionally contrasting rocks. These skarn-like rocks and desilicated pegmatites appear to be related to chemical interactions between residual granitic fluids and mafic metavolcanic-to-metacarbonate rocks. The scapolite crystals form in cavities within the coarse-grained veins, together with numerous associated minerals. The main inclusions seen in scapolite crystals are Mn-oxides, lepidocrocite, graphite, and rutile.

Figure 5. Large, transparent crystals of scapolite were recovered from Mozambique's Nampula Province in late 2003. The crystal shown here is 6.2 cm tall, and the oval brilliant weighs 180 ct. Photo © Jeff Scovil.



Since gem scapolite is somewhat resistant to weathering, the most productive deposits are eluvial. Gem-quality cordierite, aquamarine, and spessartine-almandine also are occasionally recovered from the eluvial diggings. To date, the mines have been worked by only a few local people. Recently, a well-organized Mozambique mining company has engaged in an ambitious exploration program in this area, in conjunction with geological research conducted by one of these contributors (CLG).

Gemological properties were obtained by one of us (EPQ) on a partially polished very light yellow-brown striated crystal (figure 6) that was donated to GIA by Geofil Ltda.: R.I.—1.548–1.560 (yielding a birefringence of 0.012); S.G., measured hydrostatically—2.64; fluorescence—weak pink to long-wave UV radiation, and weak red to short-wave UV; and no absorption features when examined with a desk-model spectroscope. Microscopic examination revealed a few inclusions consisting of light or dark opaque crystals with minute tension fractures; most had dislocation bundles extending toward the nearest prism face (figure 7). When the sample was viewed parallel to the c-axis, angular growth lines were evident, particularly near the edges. The properties of this stone are consistent with those listed for scapolite in general by R. Webster (*Gems*, 5th ed., revised by P. G. Read, Butterworth-Heinemann, Oxford, England, 1994, pp. 366–368). Furthermore, the R.I. and birefringence values indicate that this scapolite has a composition close to the marialite end member (see W. A. Deer et al., *Rock-forming Minerals, Vol. 4, Framework Silicates*, Longman Group, London, 1963, pp. 321–337).

Electron-microprobe analyses of two additional scapolite samples (pale yellow and brownish yellow) from this

Figure 6. Gemological properties were measured on this partially polished crystal section of scapolite from Nampula Province (6.8 grams). GIA Collection no. 30603; photo by Maha Tannous.

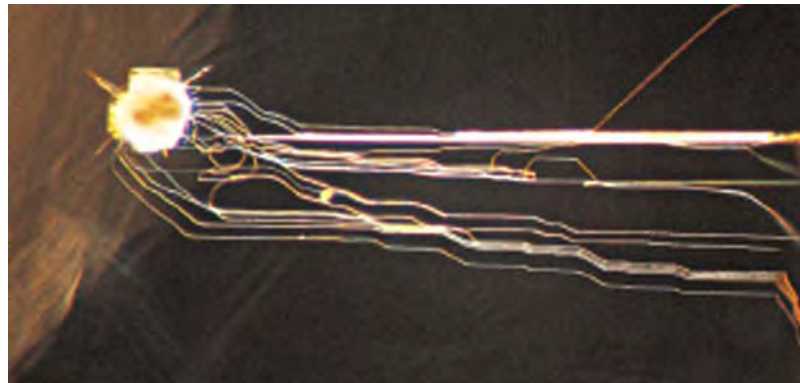


Figure 7. This light-colored inclusion in the Mozambique scapolite shown in figure 6 produced a dislocation bundle that extended toward the surface of the crystal. Subsequent etching from the surface created microscopic channels along the dislocations that are dramatically illustrated here. Photomicrograph by John I. Koivula; magnified 15 \times .

locality were performed by one of us (CLG). The results, in wt. % oxide with the pale yellow sample reported first, were as follows: SiO₂—54.00, 51.12; Al₂O₃—23.31, 24.02; CaO—12.62, 9.12; Na₂O—9.44, 7.82; K₂O—0.10, 0.51; and F—0.10, 0.33. Further chemical analysis and calculations gave Cl—2.21, 2.83; H₂O—0.45, 0.16; and CO₂—1.28, 0.56. In addition, the darker sample contained 0.30 wt. % iron (calculated as Fe₂O₃). The Ca:Na ratio of these two samples (0.84, 0.55) shows that, like the crystal section in figure 6, they have a marialite-dominant composition.

Carlos Leal Gomes (lgomes@dct.uminho.pt)
Universidade do Minho
Braga, Portugal

Elizabeth P. Quinn and John I. Koivula
GIA Gem Laboratory, Carlsbad

BML

Update on tourmaline and other minerals from Warner Springs, California. Since 2001, some notable discoveries of gem tourmaline have occurred at the Cryo-Genie mine in the relatively little-known Warner Springs pegmatite district of San Diego County, California (see *Gem News International*, Winter 2001, pp. 338–339, and Winter 2002, pp. 355–356). Details on the geology and recent production were reported by A. R. Kampf et al. ("Tourmaline discovery at the Cryo-Genie mine, San Diego County, California," *Rocks & Minerals*, Vol. 78, No. 3, 2003, pp. 156–168). In addition, the Mineralogical Society of America's Pegmatite Interest Group Web site (www.minsocam.org/msa/special/pig) has archived periodic updates on the production that were submitted by mine personnel in August–November 2002, and this site also contains a recent article by J. E. Patterson on a geophysical survey of the pegmatite using ground-penetrating radar.

At last February's Tucson gem show, Dana Gochenour



Figure 8. At the Cryo-Genie mine near Warner Springs, California, excavation of the “Beryl pocket” took place from August to November 2003. Most of the contents of this large pocket consisted of broken pieces of pegmatite and fragments of quartz and feldspar (referred to as “pocket rubble”). The inset shows how crystals of pink tourmaline and smoky quartz were carefully excavated from the surrounding sticky brown clay using a chopstick. Photos by Brendan Laurs.

(Gochenour’s Minerals, Tustin, California) had some cut stones and mineral specimens from these finds as well as more recent pockets. This report provides an update on these later developments—particularly the August 2003 discovery of the “Beryl pocket.” This large clay-filled cavity was found on the same trend in the pegmatite as two other significant pockets (described in the previous GNI entries) that are referred to by the miners as the Big Monday and BAT pockets.

The top of the Beryl pocket was initially encountered in the floor of the underground workings, so to provide better access the mining crew drove a new tunnel around



Figure 9. This large beryl crystal (top, approximately 13 cm in diameter) from the Cryo-Genie mine is associated with smoky quartz and bladed aggregates of white cleavelandite feldspar. Courtesy of Gochenour’s Minerals; photo by Brendan Laurs.

the mineralized area to intersect it from below. A smaller cavity found along the way (the New Drift pocket) contained several pink tourmaline crystals up to 15 cm long and 7.5 cm in diameter. Unfortunately, the tourmalines were extensively fractured and came out in numerous fragments. Nevertheless, many of the pieces were facetable, yielding stones up to 4.5 ct of an attractive “pure” pink color with no brown modifier.

The new tunnel reached the bottom portion of the large cavity in late August, and the miners proceeded to work the host pegmatite from around the sides so that large portions of the clay-encrusted pocket contents could be removed (figure 8). On August 29, they found a large specimen consisting of pale greenish blue beryl (approximately 13 cm in diameter), smoky quartz, and cleavelandite feldspar (figure 9). Several additional specimens containing smaller beryl crystals also were recovered. Some of the

Figure 10. The Cryo-Genie beryl (left) fluoresces greenish yellow to short-wave UV radiation (right, with a blue overtone from the lamp). Sample (3.7 cm long) donated by Gochenour’s Minerals; photos by Maha Tannous.





Figure 11. Metallic gray inclusions of pääkkönenite in quartz have been recovered from the Cryo-Genie mine, as shown by this sample (1.8 cm long; GIA Collection no. 30485) donated by Gochenour's Minerals; photo by Maha Tannous. The inset shows one of the inclusions in more detail; photomicrograph by John I. Koivula, magnified 10×.

specimens had small prisms of pink tourmaline that formed inclusions in—and overgrowths on—the beryl; this association of pink tourmaline with blue beryl is quite unusual. Due to its pale color and numerous inclusions, only one sample of the beryl has been faceted so far, into an 8 mm round brilliant.

A sample of beryl from this pocket was studied by Dr. George Rossman (California Institute of Technology, Pasadena), who reported that the pale blue color was caused by iron (as is typical for aquamarine) and the sample contained significant cesium. A most unusual characteristic of this beryl was its fluorescence. Although inert to long-wave UV radiation, the beryl fluoresced a moderate greenish yellow to short-wave UV (figure 10). Luminescence spectroscopy by Shane Elen of the GIA Gem Laboratory showed a predominant broad band in the green-to-yellow spectral

Figure 12. Tourmaline from the recent finds at the Cryo-Genie mine typically has an attractive pink color with no brown modifier. The rectangular tourmaline weighs 9.01 ct, and the stone in the ring is 2.5 ct. Courtesy of Gochenour's Minerals; photo by C. D. Mengason.



region corresponding to the blue fluorescence, with a weaker blue-green component and a small emission band in the green region at 540 nm.

The large pocket (2.9 × 2.3 × 1.2 m) also contained a few significant crystals of pink tourmaline, as well as several matrix specimens of quartz and cleavelandite. The crystals were carefully removed from the sticky clay in the pocket using hand tools and soft digging implements such as chopsticks (see figure 8, inset). Nevertheless, most of the tourmalines had been previously fractured by natural forces, and fell apart when removed from the pocket or during cleaning.

Further mining uncovered additional pockets with pink and dark blue-violet tourmaline, as well as morganite beryl. The largest of these cavities (1.8 × 1.2 × 0.9 m), excavated in March 2004, contained a significant amount of pink tourmaline gem rough.

For inclusion enthusiasts, the Cryo-Genie mine has yielded an unusual mineral—dark gray metallic needles of pääkkönenite (Sb₂AsS₂) in quartz (figure 11). According to Kampf et al. (2003; cited above), prior to being found at the Cryo-Genie mine in two of the recent pockets, this mineral was known from just four other localities worldwide (none of them pegmatites).

As of April 2004, approximately 1,000 carats of pink tourmaline had been faceted in mostly calibrated sizes, consisting of about 500 stones of 0.5 to 5 ct, and another 500 that weighed less than 0.5 ct (mostly 3–6 mm round brilliants). The largest stone cut to date is a 25.25 ct rectangular modified brilliant. In addition, about 100 bluish green melee (3–5 mm) were faceted, and some of the pink tourmaline has been set into attractive gold jewelry (see, e.g., figure 12). BML

INSTRUMENTS AND TECHNIQUES

Recent U.S. patents for diamond fingerprinting methods. Ever since concerns about the use of diamonds to support armed conflicts, terrorism, and other illicit activities arose in the early 2000s, the industry has been in search of methods that would allow the tracking of individual diamonds from source to market (see, e.g., A. A. Levinson and J. E. Shigley, "White House Conference on 'conflict diamonds,'" Spring 2001 Gem News International, pp. 64–66). These typically have included marking techniques and means of recording unique internal properties or chemical characteristics. Given the potential value of a practical and reliable method of diamond "fingerprinting," it is not surprising that various individuals and groups have recently sought patents in this area.

However, of the possible methods discussed at the 2001 White House Conference, U.S. patents have been issued only for those that record internal characteristics via optical examination (see, e.g., S. Redfean, "Optics may hold key to derailing contraband diamond trade," *Optics and Photonics News*, Vol. 13, No. 2, 2002, pp. 20–22), or that mark a diamond using a laser or radioactive isotopes. No

methods appear to have been patented recently in the U.S. for fingerprinting by X-ray topography (see, e.g., R. Diehl and N. Herres, "X-ray fingerprinting routine for cut diamonds," Spring 2004 *Gems & Gemology*, pp. 40–57; the technique discussed in that article has been patented in Germany), by ion implantation (see Winter 2002 Lab Notes, pp. 344–345), or by spectroscopic or chemical analysis of inclusions or coatings. Despite the attention devoted to LA-ICP-MS for diamond fingerprinting (see N. Lubick, "Fingerprinting a diamond's source," *Geotimes*, Vol. 48, No. 12, 2003, pp. 38–39; M. Resano et al., "Possibilities of laser ablation–inductively coupled plasma–mass spectrometry for diamond fingerprinting," *Journal of Analytical Atomic Spectrometry*, Vol. 18, No. 10, 2003, pp. 1238–1242), no such U.S. patents appear to have been issued.

Following is a summary of U.S. patents and patent applications for methods of diamond fingerprinting that have been awarded or published since the White House Conference in January 2001, in chronological order.

Lalit K. Aggarwal of Philadelphia, Pennsylvania, received a patent for an "automated" diamond grading device (L. Aggarwal, *Apparatus and Method for Grading, Testing, and Identifying Gemstones*, U.S. patent 6,239,867, filed December 7, 1999, issued May 29, 2001). The device records several attributes of a diamond within a computer-controlled imaging apparatus. Although intended primarily for the grading of diamonds for clarity, color, and cut, the inventors claim that the device also gathers sufficient infor-

Figure 13. This drawing taken from a recent patent by Aharon Zidon of Givatayim, Israel, demonstrates how a diamond can be marked with a unique pattern by exposure to a radioactive isotope. A mask (lower drawing) is placed between the diamond and a small amount of radium so that as the radium decays, it implants daughter isotopes in the desired pattern.

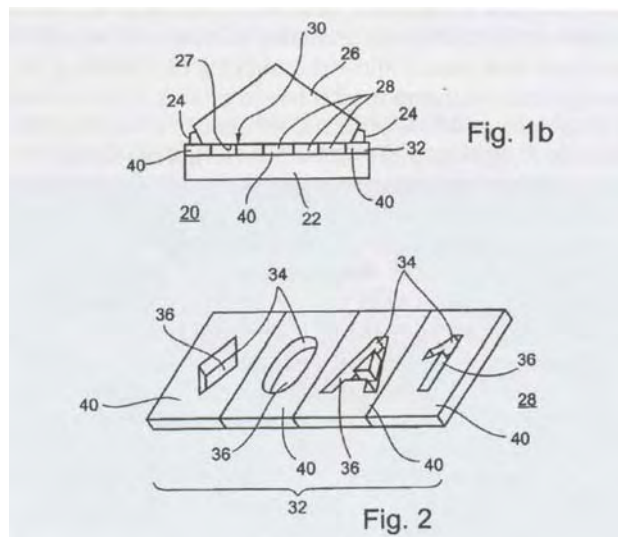


Figure 14. This confocal microscope system is being used to fingerprint a diamond by recording the relative positions of its inclusions. The blue light in the center is a sample diamond being illuminated by the microscope's laser. Courtesy of University of British Columbia Bioimaging Facility.

mation to fingerprint a specific gemstone based on its internal and external characteristics. The grading device, known as ImaGem, is expected to be marketed in 2004 by ImaGem Inc., also of Philadelphia, and has been the subject of several articles in the trade press (see, e.g., V. Gomelsky, "New instrument automates diamond grading," *National Jeweler*, Vol. 98, No. 2, 2004, p. 32; I. Solotaroff, "A new diamond age," *Modern Jeweler*, Vol. 102, No. 10, pp. 48–56). Once a diamond has been scanned by the ImaGem device, another instrument, known as VeriGem, can be used to identify it later by matching it to stored information. Grading a diamond with ImaGem takes about five minutes; identification with VeriGem takes approximately 20 seconds. VeriGem is currently being beta tested; ImaGem plans to release it in 2005.

Aharon Zidon of Givatayim, Israel, has received a patent for a method of marking diamonds (and other objects) with radioactive isotopes in a specific pattern (A. Zidon, *Apparatus for and Method for Marking Objects, Objects Marked Thereby and Apparatus and Method of Reading Marked Objects*, U.S. patent 6,616,051, filed June

28, 2000, issued September 9, 2003). The pattern is applied by masking the diamond in front of a small quantity of radium such that, as it releases radioactive "daughter" isotopes (radon, lead, bismuth, and polonium) through radioactive decay, these are implanted in a precise pattern in the diamond (figure 13). The pattern is invisible except to the proper type of radiation detector, and the amount of radioactive material implanted is designed to be below regulatory limits for release of radioactivity.

A team from Lazare Kaplan International, New York, has received a patent on a new method of laser inscribing gemstones (G. R. Kaplan et al., *Microinscribed Gemstone*, U.S. patent 6,684,663, filed September 6, 2002, issued February 3, 2004). This is a patent from a "divisional application" of an earlier application for a similar method, now patented as well (an inventor files a divisional application when the patent examiner finds that the original application describes more than one invention; the divisional application extracts the extra invention into a new application). This patent describes several methods of encrypting and authenticating laser inscriptions that could be useful for diamond fingerprinting.

Recently, Malcolm Warwick of Vancouver, Canada, submitted a patent application for a method that uses confocal laser interferometry to determine the relative positions of inclusions in a diamond (M. R. Warwick, *Method and Apparatus for Identifying Gemstones*, U.S. patent application 20030223054, filed May 29, 2002, published December 4, 2003). With this method, shown in figure 14, the diamond is scanned by a laser beam and the position and orientation of inclusions are recorded in a unique profile, which can be encoded in a laser inscription on the stone's girdle (another pending patent, not yet published, covers the coding method). The process is currently being developed by Canadian Gem ID Systems, with assistance from Sirius Diamonds and the use of technical staff and facilities at the University of British Columbia, all in Vancouver.

For those interested in searching the U.S. Patent and Trademark Database (www.uspto.gov/patft/index) for future patents on this subject, some classifications that may include fingerprinting methods are given in table 1.

Thomas W. Overton (toverton@gia.edu)
GIA, Carlsbad

TABLE 1. U.S. patent classes that may include diamond fingerprinting methods.

Fingerprinting method	Patent class
Laser inscription	63/32
Implantation of radioisotopes	235/487, 235/491
ICP-MS	250/281–282, 250/288
Ion implantation	315/111.81
Optical examination	356/30
X-ray topography	378/74

SYNTHETICS AND SIMULANTS

Colored cubic zirconia Buddha carvings. For the past few years, several types of near-colorless, yellow, and orange-to-red Buddha statues have been offered to tourists in Thailand as amber carvings (see, e.g., figure 15). Four of these statues (ranging from about 2.5 to 7 cm tall) were loaned to this contributor for examination. The carvings had rounded corners that suggested a worn appearance, as well as areas that appeared to show relics of gold foil. The indentations and depressions contained an unidentified dust-like brown material. All of these factors helped make the carvings look antique and authentic.

Although they were too large for measuring hydrostatic S.G. values with the equipment available, their heft indicated that they were probably all made of the same material, which was far too dense for amber. A detailed examination with magnification revealed no inclusions, high transparency, and homogeneous color, properties that are unlikely to be found at the same time in amber.

However, these properties were consistent with cubic zirconia. To verify this hypothesis, we analyzed two carvings (one yellow and one red) using a PGT energy-dispersive detector coupled with a Jeol 5800 scanning electron microscope in the low vacuum mode. The main elements present in both statuettes were Zr and Y, with smaller amounts of Hf, which confirmed that the material was yttrium-stabilized cubic zirconia. The red sample also contained K, Ca, and Mn.

Although such CZ Buddha carvings are not new (see Winter 1993 Lab Notes, p. 278), their representation as amber was previously unknown to this contributor.

EF

Figure 15. Buddha statues such as this one (2.5 cm tall) are being sold as amber carvings in Thailand. However, they are manufactured from cubic zirconia. Photo by Anne-Claude Couturier.





Figure 16. This strand of imitation pearls, sold as “shell pearls,” proved to be *Tridacna* clam shell beads with a lacquer coating. Photo by H. A. Hänni, © SSEF.

“Shell pearls” with *Tridacna* clam shell beads. Recently, a client donated a strand of approximately 8-mm-diameter white “shell pearls” (figure 16), so that these imitation pearls could be characterized at the SSEF Swiss Gem-mological Institute. “Shell pearls” typically are composed of a shell bead that is coated to resemble pearls (see, e.g., Summer 2001 Lab Notes, pp. 135–136).

Examination of the drill holes of the “shell pearls” revealed a silvery coating and a transparent top layer with radiating microcracks (figure 17). When the coating was peeled away, it was evident that the beads were composed of very white shell material showing coarse layers (figure 18). Identification of the bead material as aragonite was made by Raman analysis (peaks at 1085, 705, 207, and 153 cm^{-1}); the S.G. was measured hydrostatically as 2.83. At 10 \times magnification, a fine flame structure was visible (again, see figure 18). This structure differs from that of shell beads traditionally used as cultured pearl nuclei, such as those from North American freshwater mussels. However, the beads were very similar to shell material of the *Tridacna* giant clam. Scanning electron microscopy of a reference sample of *Tridacna* shell revealed an array of aragonite tiles, similar to those seen in conch shell. This fibrous structure makes the substance relatively tough and solid, a necessity for the build-up of shell material in the larger mollusks. The similarity in the microstructure to that of the beads in the imitation pearls provided additional evidence that these beads were made from *Tridacna* shell.

Tridacna shell beads reportedly have been used as nuclei in Australian cultured pearls (see Summer 2002 Gem News International, p. 179), and we also have heard rumors about their use in black Tahitian cultured pearls and Chinese Akoya cultured pearls. Since *Tridacna* clams can grow quite large, they could be a good source of white shell material for large beads. However, they are already scarce in some areas due to overharvesting, and therefore wild *Tridacna* clams should not be harvested for shell

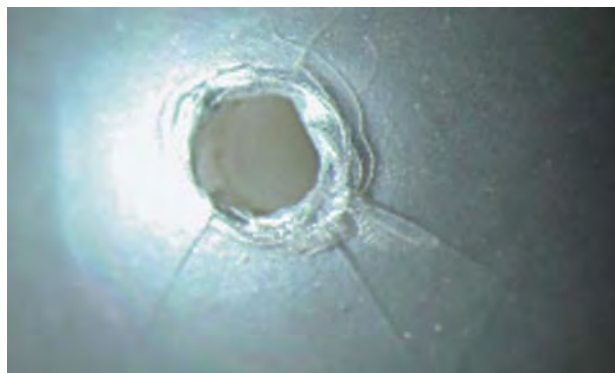


Figure 17. Around the drill hole of one of the “shell pearls,” the silvery coating and a transparent top layer (with cracks) are visible. Typical for a pearl imitation are the folded layers around the hole. Photomicrograph by H. A. Hänni, © SSEF.

beads. Since the source of the beads used for imitation pearls is not important as long as the material approximates the weight of genuine pearls, it is really unnecessary to use *Tridacna* shell when common marble could provide usable beads with far less impact on the environment.

Regardless of the material used for the beads, we feel that the trade name “Shell Pearls” is incorrect and misleading for these imitation pearls. HAH

Fake tanzanite mineral specimens. As the demand increases for gem and mineral specimens, miners are often saving attractive crystals and matrix specimens, hoping for the premium that collectors might pay. However, the number of salable items is limited, because few specimens survive the rigors of blasting and transportation from remote source areas. This constricted supply, coupled with increasing demand, has fostered a thriving business in repaired specimens and also assembled fakes.

Figure 18. The “shell pearls” contained beads that consisted of coarse layers (right side) and, in some areas, showed a flame structure (left side). These features are typical of non-nacreous shell material. Photomicrograph by H. A. Hänni, © SSEF.



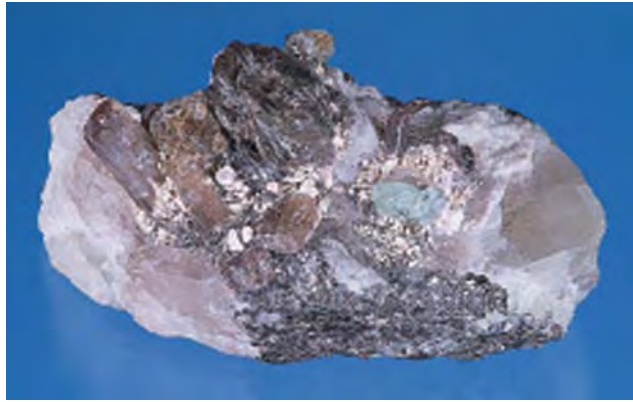


Figure 19. This cleverly assembled imitation of a tanzanite mineral specimen ($5.5 \times 3.0 \times 1.0$ cm) contains pieces of grayish purple tanzanite, light green diopside, and smoky quartz glued onto a matrix of calcite and graphite (left). With exposure to long-wave UV radiation (right), the glue mixture fluoresced bright white (the orangy pink areas are calcite). Photos by Maha Tannous.

On a recent buying trip to Tanzania, this contributor was presented with several assemblages that were constructed to resemble naturally occurring mineral specimens. One of these (figure 19) was created by combining many of the minerals that are naturally associated in the Merelani tanzanite deposits. This cleverly assembled imitation measured $5.5 \times 3.0 \times 1.0$ cm, and had three grayish purple tanzanite crystals, a light green diopside crystal, and three smoky quartz fragments mounted on a base consisting of calcite and graphite. The largest tanzanite crystal was dusted with minute pyrite crystals that grew naturally on its surface. All of the crystals were attached to the matrix with a white chalky material mixed with glue. The glue was easily visible using $20\times$ magnification, and fluoresced strongly to long-wave UV radiation (again, see figure 19).

For comparison, figure 20 shows a genuine specimen of tanzanite, with a white calcite matrix, light green diopside, and a small area of graphite. The calcite has grown naturally around the tanzanite crystal, and there was no evidence of any glue or chalky paste mixture with either magnification or exposure to long-wave UV.

Edward Boehm (joebgem@aol.com)
JOEB Enterprises, Solana Beach, California

CONFERENCE REPORTS

ICNDST-9. The 9th International Conference on New Diamond Science and Technology was held March 26–29, 2004, at Waseda University in Tokyo, Japan. The conference brought together an international audience of more than 200 scientists and engineers who study the growth and physical properties of diamond and related carbon materials, as well as the potential uses of these materials for numerous electronic and other high-technology applications. Several presentations focused on topics of gemological interest.

Dr. Alan Collins of King's College, London, discussed the annealing behavior of interstitial-related optical centers in electron-irradiated type Ib synthetic diamonds. He described particular changes in visible and infrared spectral

features after the synthetic diamonds were annealed at up to 500°C . The annealing behavior in nitrogen-containing synthetic diamonds was found to be more complicated

Figure 20. This genuine specimen of tanzanite ($4.0 \times 2.2 \times 1.4$ cm) showed no evidence of glue or paste material, either with magnification or when exposed to long-wave UV radiation. The associated minerals are calcite, diopside, and graphite. Photo by Maha Tannous.





Figure 21. These sapphires (the largest ones weigh 0.59 and 0.19 ct) are from a recently discovered deposit on Baffin Island in northern Canada. Courtesy of True North Gems; photo © Stephen Krasemann.

than previously thought in terms of the optical defects and how they react to heat treatment. **This contributor** discussed the gemological identification of natural, treated, and synthetic diamonds, and highlighted current challenges to this effort, such as the detection of HPHT treatment. At present, the identification of gem diamonds requires not only documentation of visual features and other aspects obtained from conventional gemological testing, but characterization using a variety of spectroscopic techniques as well. **Branko Deljanin** of EGL USA, Vancouver, Canada, discussed the diagnostic features (e.g., luminescence reactions and spectroscopic features recorded with infrared and photoluminescence techniques) of several CVD-grown synthetic diamonds produced by Apollo Diamond in Boston, Massachusetts; a subsequent presentation by **Dr. Robert Linares** of Apollo Diamond reviewed his company's efforts to produce high-quality single-crystal synthetic diamonds by a CVD process. The growth of the ICNDST conference since its inception in 1988 illustrates the greater interest in diamond as a material for use in an expanding range of products. *JES*

GAC-MAC 2004. The 49th annual joint meeting of the Geological Association of Canada and Mineralogical Association of Canada was held May 12–14, 2004, at Brock University in St. Catharines, Ontario. Although focused on the geology of the Lake Erie and Lake Ontario regions, the meeting covered a wide range of other topics. Several presentations in sessions devoted to rare-element deposits and kimberlites may be of interest to gemologists.

Dr. David London of the University of Oklahoma, Norman, discussed how increasing concentrations of “fluxing elements” (Li, F, B, and P), along with rapid crystallization rates, contribute to producing the observed vertical zonation of Na and K in feldspars and other minerals in pegmatites and mineralized granites. **Matthew Taylor** of Masaryk University, Brno, Czech Republic, and coauthors proposed a new theory on the crystallization of granitic pegmatites from sol-gel processes in magmatic melts or fluids. The gel theory provides an alternate explanation for

problematic aspects of pegmatites, such as the suspension of large crystals and the formation of massive quartz cores. **Dr. Petr Černý** of the University of Manitoba, Winnipeg, and coauthors calculated the overall bulk composition of the famous Tanco rare-element pegmatite in southeastern Manitoba. These data support the derivation of this pegmatite and similar ones elsewhere by igneous fractionation from a leucogranitic magma. **Heather Neufeld** of the University of British Columbia (UBC), Vancouver, and colleagues described the geology of the Regal Ridge emerald deposit in the Finlayson Lake District of southeastern Yukon, Canada. Emeralds occur within quartz veins that intrude mid-Paleozoic metavolcanic and metaplutonic rocks. Efforts are currently under way to determine the extent of emerald mineralization at the deposit. **Dr. Lee Groat**, also of UBC, and coauthors described the deposit of green-to-blue beryl at the True Blue property in the Ketzaseagull District, also in the southern Yukon. Beryl crystals up to 5 cm long occur in quartz veins that fill tension gashes in syenite. In a poster presentation, **Andrea Cade** of UBC and coauthors described the geology of the recently discovered occurrence of gem-quality blue sapphire (figure 21) near the community of Kimmirut on Baffin Island in northern Canada. The sapphire (along with other gem minerals such as apatite, spinel, and sphene) is found in a paleo-Proterozoic marble host rock.

In the session on kimberlites, **Christian Böhm** and colleagues from the Manitoba Geological Survey, Winnipeg, described current efforts to discover diamondiferous kimberlites in Manitoba. Although no occurrences have been reported to date, a number of geological components essential for such occurrences are present in the province, as are promising results from indicator mineral surveys. **Dale Sutherland** and coauthors from Activation Laboratories, Ancaster, Ontario, described a new exploration method that measures gas hydrocarbon compounds in soils to indicate buried kimberlites. **Shannon Hay** of the University of Alberta, Edmonton, and colleagues reported on the recent discovery of diamond-bearing kimberlite pipes on the Churchill property in the Kivalliq region of Nunavut. Evaluation is currently under way to determine their potential. **Christine Vaillancourt** of the Ontario Geological Survey, Sudbury, and coauthors discussed the discovery of millimeter-size gem diamonds in volcanoclastic breccias from northern Ontario. This is a potentially new type of commercial diamond occurrence, different from Phanerozoic kimberlites and lamproites, and hence it provides a new exploration target for diamonds in Archean greenstone belts. *JES*

ANNOUNCEMENTS

Exhibits

Pearls at the Royal Ontario Museum. “Pearls: A Natural History,” a traveling exhibition tracing the natural and

cultural history of pearls organized by the American Museum of Natural History (New York) in collaboration with the Field Museum (Chicago), will be on display at the Royal Ontario Museum in Toronto from September 18, 2004 to January 9, 2005. Included will be displays on pearl formation and culturing, as well as historical pearl jewelry that once belonged to Queen Victoria and Marie Antoinette. Visit www.rom.on.ca/exhibits/pearls.

Carnegie Gem & Mineral Show. On November 19–21, 2004, at the Carnegie Museum of Natural History in Pittsburgh, Pennsylvania, this show will feature sapphires in special exhibits and invited museum displays. Visit www.carnegiemuseums.org/cmnh/minerals/gemshow.

Conferences

5th European Conference on Mineralogy and Spectroscopy. On September 4–8, 2004, at the University of Vienna, Austria, this meeting will be held in conjunction with the *6th European Mineralogical Union School on Spectroscopic Methods in Mineralogy*, which takes place from August 30 to September 8. Students will gain exposure to optical (UV-Vis-NIR) and luminescence spectroscopy, vibrational spectroscopy (Raman and infrared), Mössbauer spectroscopy, nuclear magnetic resonance spectroscopy (NMR), and X-ray absorption spectroscopy (XANES and EXAFS). Visit www.univie.ac.at/Mineralogie/ECMS2004 and www.univie.ac.at/Mineralogie/EMU_School.

Gems of Pacific continental margins. The International Association on the Genesis of Ore Deposits will host a symposium titled “Gemstone Deposits on Continental Margins” at the Interim IAGOD Conference on Metallogeny of the Pacific Northwest: Tectonics, Magmatism & Metallogeny of Active Continental Margins. The conference will take place September 11–19, 2004, in Vladivostok, Russia. Visit www.fegi.ru/IAGOD.

Diamond 2004. A review of the latest scientific and technological aspects of natural and synthetic diamond (as well as related materials) will take place at the 15th European Conference on Diamond, Diamond-like Materials, Carbon Nanotubes, Nitrides & Silicon Carbide, September 12–17, in Riva del Garda, Italy. Visit www.diamond-conference.com.

ICAM 2004 in Brazil. The 2004 International Congress on Applied Mineralogy will be held in Águas de Lindóia, Brazil, September 19–22, and will include a special session on gem materials. Pre- and post-conference field trips will tour colored stone and diamond deposits in the Ouro Preto and Diamantina areas, as well as agate and amethyst mines in Rio Grande do Sul State. Visit www.icam2004.org.

Hong Kong Jewellery & Watch Fair. Held at the Hong Kong Convention and Exhibition Centre on September 19–22, this show will host GIA GemFest Asia 2004 on September 20. This free educational event, titled “Update on GIA's Diamond Cut Research,” will take place from 9:30 to 11:30 am in Room 301B of the Hong Kong Convention and Exhibition Centre; RSVP to events@gia.edu or giahk@netvigator.com, or call 760-603-4205 in the U.S. or 852-2303-0075 in Hong Kong. The Fair will also host an educational seminar given by the Gemmological Association of Hong Kong on September 21, in addition to several jewelry design competitions. Visit www.jewellerynetasia.com/exhibitions.

Rapaport International Diamond Conference 2004. On October 12, 2004, this conference will take place in New York and feature an insider's look at the international diamond and jewelry industry. Visit www.diamonds.net/conference.

CGA Gemmology Conference 2004. The Canadian Gemmological Association is holding its annual conference at the Terminal City Club in Vancouver on October 22–24. The theme of the conference will be “Seasons over Time.” Visit www.gemconference2004.com.

Pegmatites at GSA. A topical session titled “Granitic Pegmatites: Recent Advances in Mineralogy, Petrology, and Understanding” will be held at the annual meeting of the Geological Society of America in Denver, Colorado, November 7–10, 2004. The meeting will also feature a session covering advanced mineral characterization methods. Visit www.geosociety.org/meetings/2004.

Antwerp Diamond Conference. The 3rd Antwerp Diamond Conference, presented by the Antwerp Diamond High Council (HRD), will take place in Antwerp on November 15–16, 2004. The conference will focus on synthetic diamonds, as well as strategies to promote consumer confidence in natural diamonds. Visit www.hrd.be/newscenter/newscenter/hrd_news/article.aspx?iNewsItemID=47.

ERRATUM

The herderite entry in the Spring 2004 Lab Notes (pp. 61–62) contained an error in one of the references. The reference for Leavens et al. (1978) should have been:

P. B. Leavens et al., “Compositional and refractive index variations of the herderite–hydroxyl–herderite series,” *American Mineralogist*, Vol. 63, No. 9–10, 1978, pp. 913–917.

We thank John S. White for bringing this to our attention.