GEM N·E·W·S

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THE 25TH INTERNATIONAL GEMMOLOGICAL CONFERENCE

New synthetics and gem localities, gem treatments, important jewelry collections, and advanced gem-testing methods were among the topics of over 30 presentations at this October's 25th International Gemmological Conference (IGC), held in Rayong, Thailand.

Official delegates from Australia, Belgium, Brazil, Canada, France, Germany, Hong Kong, India, Israel, Italy, Japan, the Netherlands, Singapore, Spain, Sri Lanka, Switzerland, Thailand, the United Kingdom, and the United States attended the conference, which was organized through the Asian Institute of Gemological Sciences, in Bangkok, by AIGS Director Kenneth Scarratt.

Each biennial conference takes place in a different country; every other one is held in Europe. The first IGC, organized by Professor K. Schlossmacher and Dr. E. J. Gübelin, took place in 1952 in Locarno, Switzerland. Since its inception, the purpose of this invitation-only event has been the exchange of information among laboratory gemologists and others engaged in the science of gemology.

The following entries are synopses of some of the presentations given at this year's IGC. Also included are reports on field trips taken in conjunction with the conference.

DIAMONDS

Fluid inclusions in diamonds. How some properties of fluid inclusions in diamonds are measured—and the types of fluid inclusions that have been seen—were explored in a talk by Dr. Oded Navon, senior lecturer at The Hebrew University, Jerusalem, Israel.

All the inclusions described were submicron in size and were found in regions of the studied diamonds that have a fibrous texture, including the outer shells of coated diamonds (figure 1). The internal structures of these inclusions were magnified by means of a transmission electron microscope (TEM), infrared spectroscopy was used to identify their individual constituents, and electron microprobe analysis was conducted to measure the average chemistry for each inclusion.

Thirteen diamonds from Botswana were found to contain inclusions of carbonates, apatite, a mica mineral, quartz, and a low-atomic-number noncrystalline phase (a hydrous fluid). All are probably daughter phases of the trapped potassium-rich parent melt. The internal pressures of the inclusions could be deduced from the shift in quartz (infrared) absorption bands from their positions at room temperature and pressure; the diamonds probably equilibrated at 40–70 kbar pressure (120–200 km depth) and retained pressures of 15–20 kbar in their inclusions.

Similar inclusions were found by Dr. Navon and his student, Marcus Schrauder, in fibrous diamonds from Zaire, India, Yakutia, and Sierra Leone. All were associated with the eclogitic paragenesis of diamonds. The researchers also found fluid inclusions in white cloud-like formations in some octahedral peridotitic diamonds from Yakutia. These inclusions also contained water and carbonates, but the solutes differed in composition.

Drs. Navon and Schrauder also discovered another type of fluid-bearing diamond, which contains solid carbon dioxide (CO_2; probably derived from carbonates). This type of diamond probably equilibrated at 70–80 kbar pressure (200–250 km depth), and still retained a pressure of about 50 kbar in the inclusions. CO_2-rich diamonds have been found in Yakutia and, recently, in the Sloan kimberlite on the Colorado-Wyoming border.

Some historical trends in the diamond industry. Dr. A. A. Levinson, of the University of Calgary, Alberta, Canada, reviewed historical trends—and changes in trends—in the diamond industry over the last century. Topics included changes resulting from major new discoveries (such as Russia, Botswana, and Australia); changes in the percentage

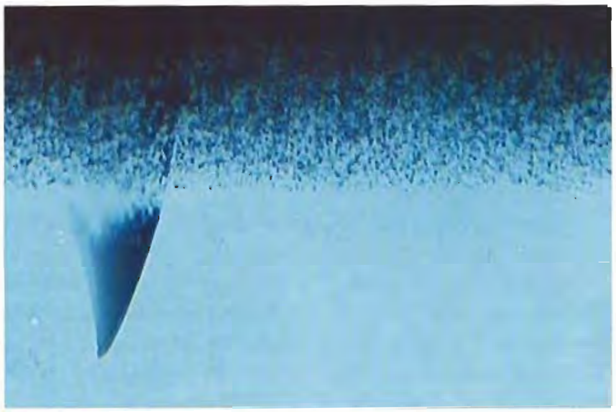


Figure 1. The edge of a densely packed cloud of tiny fluid inclusions is visible in this diamond at high magnification (400×). Photomicrograph courtesy of Oded Navon.

of production directly controlled by De Beers; economic and political factors affecting diamond production (including periods in which production virtually ceased in some mining areas); the importance of specific consumer countries (such as the United States and Japan); changes in jewelry consumption patterns (for instance, the increasing importance of jewelry other than the diamond engagement ring); the effect of low-cost Indian cutting on the retail diamond jewelry industry; and the move to develop new retail markets for gem diamonds, particularly in Asia.

An important upcoming change can be anticipated as a result of the potential development of diamond deposits in Canada's Northwest Territories. In about four years, an estimated two-to-three million carats (Mct) of diamonds—about 25% of which are gem—annually should be available to the rough diamond market, which currently consumes a total of about 100 Mct of diamonds per year, of which about 50 Mct are cuttable. These Canadian diamonds will come from several kimberlite pipes discovered since 1991 and owned by BHP (Australia) and Dia Met (Canada). Although details about the quality and size distribution of the diamonds have not been formally released, it is generally accepted that the gems "are considered to be of high quality, comparable to the best stones in the top ten pipes in the world" (Dia Met 1994 *Annual Report*, p. 5). The question then arises as to what, if any, effect this quantity of apparently high-quality gem diamonds will have on the diamond industry.

COLORED STONES AND ORGANIC GEM MATERIALS

New and unusual inclusions in amber and other gems. Gem News co-editor John I. Koivula described 16 new and unusual inclusions that he had recently examined. One item described, found in a 6.28 ct amber cabochon from the Dominican Republic (figure 2), was an anther (the pollen-bearing part of a flower stamen) from the extinct tree *Hymenaea protera* of the *Leguminoseae* family, which produced the resin that fossilized to form much of the amber from this region. Magnification revealed a small insect (*Thysanoptera*, or thrip) that was trapped in the anther's pollen slit along with numerous tiny pollen grains (figure 3).

Also described was a collection of iolite pebbles (from Sri Lanka and Madras, India, gathered over 25 years) that contained blue-green inclusions of sapphirine. Mr. Koivula also illustrated a very rare, transparent blue inclusion in a diamond, which he speculated might be kyanite. Also shown was an inclusion pattern resembling ink droplets against a swirled yellow background. The host was a very pale yellow hessonite from a new locality for this gem: Tissamaharama, Sri Lanka. The inclusions are actually blue-green spinel octahedra that, because their refractive index is similar to that of the host, show very low relief.

Green beryl and emerald from Central Nigeria. Dr. Charles Arps and Hanco Zwaan, from the National Museum of Natural History and the Netherlands Gemmological Laboratory in Leiden, examined 170 pieces of rough and about 20 cut stones from two areas of central Nigeria: one east of Gwantu (southeastern Kaduna State), and the other northwest of Nassarawa Eggon (Plateau State). They investigated these nearly 200 beryls with regard to crystal habit, growth features and inclusions, physical constants, color, and chemical composition.

The crystals were recovered by primitive open-cast mining techniques from fissure fillings and pegmatitic stringers and veins occurring in the strongly weathered granitoid basement rock, which consists of migmatites, amphibolites, and various gneisses and schists. In many places in central Nigeria, these Precambrian rocks are cut by Late Precambrian granite intrusions (Older Granite) and granites of Cretaceous age (Younger Granite complexes). The widespread occurrence of ores (tin) and other minerals (such as topaz, aquamarine, and tourmaline) is associated with the emplacement of these granite complexes (mainly the Younger).

Green beryl and emerald in the Gwantu and Nassarawa Eggon deposits are very likely the crystallization products of beryllium-, chromium-, and vanadium-bearing hydrothermal or pegmatitic solutions that impregnated the basement rocks near the Younger Granites. Evidently, the presence of chromium and vanadium ions in the salty brines is explained by the fact that the fluids passed through Cr- and V-bearing mafic/ultramafic "greenstones" present in the basement rock.

Many of the rough beryls studied were relatively long and slender hexagonal prisms with strongly etched crystal faces. Some crystals were irregular or broken at both ends, but others had well-developed pyramidal and pinacoidal terminal faces. The nature of the zoning, together with two- and three-phase inclusions, clearly pointed to crystallization in a hydrothermal or pegmatitic environment. No inclusions that would indicate growth of the emeralds in the mafic/ultramafic rocks themselves were encountered.

Most of the samples ranged from near-colorless and pale green to medium-dark bluish green. They displayed marked color zoning both parallel and perpendicular to the c-axis. Strong zoning parallel to the *c*-axis, characterized by a relatively narrow colorless flawed rim and a transparent (yellow- or bluish) green core, is typical for the Nigerian beryl crystals. Twelve faceted stones (1.84 to 28.66 ct) had specific gravities between 2.672 and 2.686, and refractive indices of 1.560 to 1.567 (extraordinary ray) and 1.565 to 1.572 (ordinary ray). UV-visible absorption spectra of the samples showed two different patterns: (pale) green beryls displayed a stronger presence of iron relative to chromium, whereas chromium was more pronounced in the medium-dark stones. These results indicated that good-color emeralds also occur in the Gwantu and Nassarawa Eggon deposits. Chemical analyses of pale green emerald indicated that, besides chromium and iron, vanadium is present as a coloring agent. The calcium, sodium, and potassium contents are very low compared to emeralds from other deposits.

Red beryls from Utah. Dr. Frederick Pough, of Reno, Nevada, gave an overview of red beryls from Utah's Wah Wah Mountains. The red beryls are found just to the south and west of the Thomas Mountains in Utah, one of the many north-south-trending mountain ranges that comprise the Basin and Range geologic province of the western United States.

The red beryls in the Wah Wah Mountains are concentrated in seams in white rhyolite. They apparently grew in both directions from a central seed plate: Usually crystals appear to have a break through the middle of the stone, with the two parts not perfectly aligned. Inclusions are plentiful in the cut stones, which usually weigh less than 1 ct; the largest stone faceted to date is about 7 ct.

Since this is a single-source gemstone (mined only in the Wah Wah Mountains) that is a variety of a well-recognized gem material (unlike tanzanite at its first introduction), Dr. Pough thinks that the marketing economics look good. He thanked Rex Harris, the miner of the material, for his generous cooperation.

Gem localities in China. Professor Akira Chikayama, of the A. Chikayama Gem Laboratory in Tokyo, Japan, presented an update on gem localities in China, based on his extensive travels there.

Diamonds are found at Wafangdian in Liaoning Province, Mengyin in Shandong Province, and Yuanjiang in Hunan Province; rubies at Yuanyang and Yuanjiang in Yunnan Province; sapphire at Changle in Shandong Province and Wenchang on Hainan Dao Island; emeralds at Yuanyang and Wenshan, Yunnan Province; and aquamarines also at Yuanyang, Yunnan Province, and at Altay, in Xinjiang Uygur Autonomous Region. (Altay also produces almandine garnets, topaz, tourmaline, zircon, amazonite, and rose quartz.)

Peridot is found at Zhangjiakou, Hebei Province, and at Beishishan, Jilin Province. Gem materials found elsewhere in China include: topaz, tourmaline, zircon, garnets (pyrope, almandine, and grossular), nephrite, fluorite, quartz varieties (rock crystal, amethyst, rose quartz, tiger's-eye, green jasper, and green, white, and blue quartzite), rhodonite, turquoise, malachite, amazonite, serpentine, pyrophyllite (some with cinnabar inclusions), lepidolite, dolomite, saussurite, "chrysanthemum stone," and ore minerals (hemimorphite, smithsonite, and cinnabar).

Colored stones seen by CISGEM Laboratory. Dr. Margherita Superchi presented examples of identification problems recently seen by herself and co-workers at the CISGEM Laboratory (Chamber of Commerce, Milan, Italy).

Certain pink freshwater pearls and red coral were shown to have natural (for the pearls) and stain-induced (for the coral) colors based on the presence or absence of Raman spectral peaks for carotenoids, which cause the pink and red colors in some organic materials.

Figure 2. This 6.28 ct cabochon of Dominican amber contains an anther from the extinct tree Hymenaea protera. *Photo by Maha DeMaggio.*

*Figure 3. A closer look at the anther shown in figure 2 reveals a tiny insect (*Thysanoptera*) trapped in the pollen slit. Photomicrograph by John I. Koivula; magnified 15×.*

A new rock, promoted as violet jade, does contain jadeite. A Russian hydrothermal synthetic emerald (containing Ni and Cu, but not V) that lacked a flame structure was identified on the basis of its FTIR spectrum. Light-yellow glass "grown" on a white ceramic "rock" contained high levels of Zn and As (it had an R.I. of 1.48 and several sizes of included gas bubbles). Last, a hardened epoxy resin in a natural emerald could be distinguished from several other natural and synthetic resins, including unhardened epoxy resin, based on its Raman spectrum.

New gem deposits in Shan State, Myanmar. Northeastern Myanmar is famous for its corundum deposits, including both the Mogok Stone Tract and the Mong Hsu area in Shan State. While visiting that state's capital, Taunggyi, one of the editors (RCK) learned of another promising corundum deposit from U Tin Hlaing, professor of geology at Taunggyi University. Professor Hlaing reported that the deposit is located about 100 km (62 miles) northeast of Taunggyi. It is reached by walking some 9 km (6 miles) northwest from the town of Lai Hka, which takes about one-and-a-half hours. The corundum—primarily pink sapphires—is found with pink-to-red spinels in a marble horizon in about the center of a metamorphic belt running roughly 130 km north-south by 1.5 km (about one mile) wide. Sapphires are also found in associated alluvial deposits. Professor Hlaing believes that corundum may have been found in the area as early as 1989, but it was not recognized as a new deposit because the stones were mixed in with Mong Hsu material in the Taunggyi gem market.

Recently, garnets have been found at Mong Kung, about 35 km (22 miles) north-northwest of Lai Hka, at the eastern edge of the metamorphic belt. Both ruby and spinel have been found in an area between the towns of Lang Hko and Mawk Mai, approximately 28 km east-southeast of Taunggyi.

New emeralds from southern India. A 15-km-long belt of micaceous rocks "near the Idappadi and Konganapuram village of Sankari Taluka" in the Salem district, Tamil Nandu State, India, is the site of a new find of emeralds, according to Dr. Jayshree Panjikar, of the Gemmological Institute of India, Bombay. She and her colleagues examined 16 samples, ranging up to 23.05 ct. They found that these Sankari emerald crystals occur as hexagonal prisms (figure 4), with pyramidal faces and sometimes second-order prism faces.

They determined the following gemological properties: color—saturated green to "pale whitish green"; pleochroism—medium to strong, bright green (parallel to the c-axis) and bluish green (perpendicular to the c-axis); S.G. (hydrostatic)—2.70 to 2.73; R.I.—1.582 to 1.585 (extraordinary ray), 1.588 to 1.591 (ordinary ray); birefringence—0.006; and spectrum with a hand-held type of spectroscope—strong doublet at 680 nm, fine line at 630 nm. With a spectrophotometer, they detected Cr^{3+} peaks at 684, 676.8, 629, and 611 nm; Fe^{3+} peaks at 368.8 and 453 nm; (possibly iron or vanadium) peaks at 504, 530, and 568 nm; and, in darker stones, additional peaks between 400 and 500 nm.

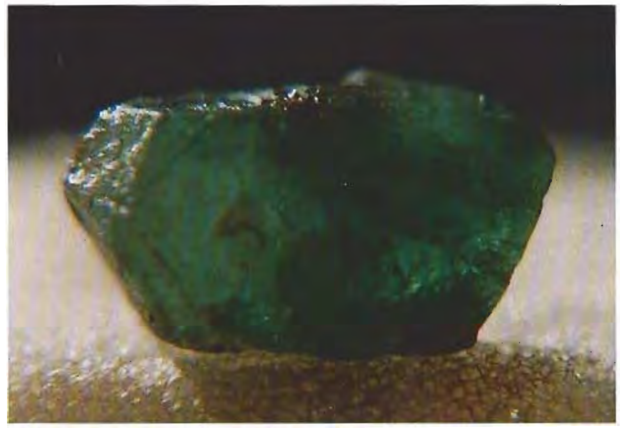


Figure 4. This emerald crystal, approximately 10 mm wide, is typical of the color and shape of emeralds from a new find in southern India. Photo by Jayshree Panjikar.

The dark green stones had slightly different chemistries (determined by atomic absorption spectroscopy) and fluorescence behaviors than their pale green counterparts. One dark green stone contained 0.92 wt.% Cr_2O_3, 0.46 wt.% Fe (as FeO), and 0.02 wt.% V_2O_3. A pale green stone contained 0.56, 0.03, and 0.03 wt.% of these elements, respectively.

Among the inclusions seen in Sankari emeralds were mica (most common), quartz, apatite (figure 5), feldspar, pyrite, included hexagonal beryl crystals (visible in polarized light), spinel, black rounded crystals with tension cracks, large needle-like inclusions (possibly tourmaline or amphibole), and black carbonaceous matter. Two generations of fluid inclusions were seen, with some three-phase inclusions in negative crystals among the first generation. Remarking on the resemblance of these stones to emeralds from Madagascar, Dr. Panjikar suggested that both deposits may have come from the same (Precambrian to early Cambrian) metamorphic belt, split in two with the breakup of the ancient supercontinent Gondwanaland. Because of this, she thinks that there is a possibility of finding large deposits of emeralds and other gemstones in the area.

Natural glass: tektites. Dr. Charles Arps, of the National Museum of Natural History in Leiden, presented an overview of tektites, their occurrences, morphology, properties, identifying characteristics, and uses.

He described tektites as relatively small shiny black to dark brown or green semitransparent natural glass objects, with characteristic but variable shapes, symmetry, and surface morphology. Tektites have been found in four "strewn fields," or regions: Southeast Asia/Australia, Czechia in Central Europe, the Ivory Coast of West Africa, and south-to-southeastern North America. Although several theories have been proposed for the formation of tektites, most geochemical evidence is consistent with their origin as the

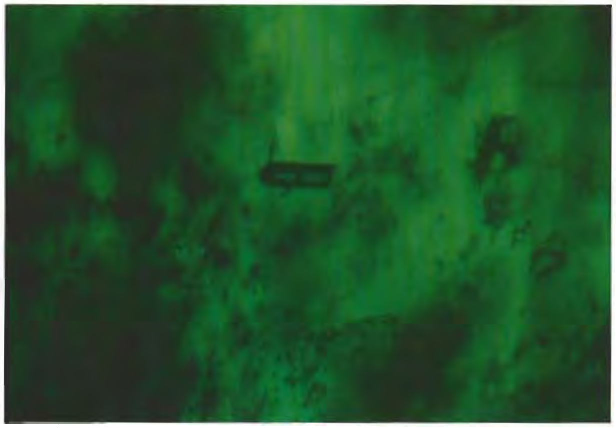


Figure 5. Tiny apatite crystals are among the mineral inclusions found in the new emeralds from southern India. Photomicrograph by Jayshree Panjikar; magnified 50×.

ejected residue of terrestrial rocks that were blasted by meteorite impacts. (In fact, two of the strewn fields are associated with individual craters: Czechia with the Ries impact crater in southern Germany, and Ivory Coast tektites with the Bosumtwi crater in Ghana.) The Australasian tektites are the youngest, 720,000 years old; the Ivory Coast tektites are 1.02 million years (My) old; the moldavites (tektites from Czechia) are 14.7 My old; and the North American tektites are the oldest, at 34.2 My.

Tektites have varietal names based on their shapes as well as on their provenances. For instance, in the northwestern part of the Australasian strewn field, "splash-form" aerodynamic-looking tektites (ovals, dumb-bell shapes, teardrops, buttons) are distinguished from the irregular, chunky, and sometimes very large Muong Nong tektites. Other names include: moldavites (tektites from Czechia); bediasites and georgiaites (tektites from the U.S.); and indochinites, philippinites (or rizalites), billitonites, javanites, and australites from various parts of the Australasian strewn field.

As cut stones, tektites can be difficult to distinguish from manufactured glass. (Moldavites were originally believed to be slag from the Bohemian glass-making industry!) Among the characteristic inclusions of this natural glass are: gas-filled bubbles and vesicles, a strongly contorted swirling internal structure, small grains or curved tails of isotropic "lechatelierite" (pure silica glass), Fe-Ni spherules, and shocked mineral inclusions. R.I.'s fall between 1.48 and 1.53, and S.G.'s are 2.30–2.52. Tektites vary widely in chemistry, with both R.I. and S.G. increasing as the silica content decreases.

Tektites have been used since prehistory as ornamental materials and gems, as tools, and as cultural and religious objects (in Europe, Thailand, and West Africa). In some Australian tribes, they were regarded as magical. However, miners in Indonesia have considered them bad omens in certain alluvial deposits.

Jade market in Mandalay. Although jadeite has been found in a number of countries, including Guatemala and Russia, the major commercial source of this important gem material is Myanmar (Burma). The main mining area in Upper Burma is situated between Hpakan and Tawmaw, near the Uru River. While some jadeite leaves the mining areas via China, most of the rough material travels south to the city of Mandalay.

In conjunction with the IGC conference, one of the editors (RCK) visited the open-air jade market in Mandalay. He found most activity to be centered on 86th Street, between 38th and 40th Streets. On what was described to the editor as a typical business day, easily 5,000 people, buying and selling goods, packed a 500 m stretch of street and a large nearby courtyard (close to the 40th Street intersection). At the opposite end, near 38th, in an open area adjacent to the Ah Yoe Ooe pagoda, dealers were selling almost exclusively "utility jade." This material, typically used for carving ornamental objects such as figurines and functional objects like bowls, was sold in such forms as small boulders, unpolished slabs, slab fragments (including the peripheries of pieces from which hololith bracelets had already been cut), and lower-quality hololith bracelets (figure 6). Elsewhere along the street, dealers sold low- to high-quality "commercial jade"—gem-quality material suitable for jewelry items and less-valuable gemstones.

The fine-quality "imperial jade" was seen in another jade market, along 34th Street between 85th and 86th Streets. Here, we saw far fewer buyers and sellers, not more than 200 total. Unlike the larger market, nothing was

Figure 6. At one end of the jade market in Mandalay, Myanmar, a woman sells fragments of jadeite slabs and other lower-quality material. Photo by Robert C. Kammerling.

Figure 7. In a small lapidary shop in Mandalay, Myanmar, a worker saws a double ring blank in half to produce ring "preforms." Photo by Robert C. Kammerling.

openly displayed. When approached, dealers would take small stone papers from pockets or from inside their shirts. Almost all the material seen in this market was of very good to excellent quality. Although most were cabochons, one dealer offered gold rings, each set with a single imperial jadeite cabochon.

Jadeite lapidaries in Myanmar. While Myanmar is the major commercial source of jadeite, most is fashioned elsewhere, especially Hong Kong and southern China, as well as various cities in Thailand.

Still, some Myanmar jadeite is cut in the country itself. While in Mandalay, one of the editors (RCK) visited several small shops in what appeared to be essentially a cottage industry. One had a single electric-motor-driven saw, which was being used to cut an approximately 1 kg boulder. The piece had been purchased "mawed," that is, with a single window ground into its surface. The buyer, a master with 30 years of jade buying and cutting experience, had used this window to inspect the interior before purchase. Under the watchful eyes of this master, an assistant cut sections off the boulder. After each cut, the master would examine the remaining block and mark it with a pencil, indicating where the next cut should be made. The cutting revealed that the boulder was about one-third imperial jadeite, with the rest commercial jadeite. From the better portion, the firm estimated that it would recover 20%–25% of the weight in fashioned goods. If their estimate proved accurate, they expected to double their $25,000 investment.

The next shop visited produced blanks for jadeite hololith bracelets (the final shaping and polishing was apparently done elsewhere). Jadeite boulders were first cut into slabs on an electric saw. After that, the hololith blanks were cut out using a drill-press-like machine with two concentric circular blades.

Another shop produced two types of finished items from the central cores remaining after hololith bracelets were cut from jadeite slabs: small hololiths for infants' bracelets and for stringing together to make jadeite curtains, and hololith rings. For the rings, a double-bladed cutting tool was again used to cut three double blanks from each circular blank. Each double blank was then sawn in half, producing two ring "preforms" (figure 7). We were told that the workers shared 2 kyats (about US$0.02) for each preform produced. They produced the ring's final, rounded shape by rotating it on the shaft of a lathe while bringing into contact a fist-sized piece of basalt; for this step, a worker is paid 1.5 kyats (about US$0.015) for each ring. Another worker polished the ring on the lathe, using the outer surface of a piece of bamboo; again, the pay was 1.5 kyats. We were told that one worker responsible for the last two steps could typically produce 50–60 rings a day.

One of the most interesting shops carved jadeite from designs created by an artisan-carver or copied from a previously fashioned piece or from an illustration. As an example of the latter, the editor was shown a photo of a bronze statue of a deity. From this, an acetate template was made with the outlines of the statue. The template was then traced on a sawn "face" that had been placed on a small jadeite boulder (see, e.g., figure 8). All of the artisans at this shop had some art training as well as experience as woodcarvers or in carving softer gem materials such as alabaster. Even with this experience, they had all traveled to China to learn how to work jade.

Tools used to work the jadeite include electric grinding wheels and hand-held drills. All the actual cutting tools had been made in the shop. The coarsest abrasive for the grinding wheels was prepared from Carborundum powder that had been mixed with a hard waxy material secreted by tree-boring insects. The finer-grit abrasive was made from a mixture of this waxy material and ground, petrified wood. For the final polish, a commercial dental polishing compound was used, although the firm was experimenting with a diamond powder purchased from China. Using this equipment, in five days an artisan can fashion one 25 cm–tall image of the Buddha or 10 small pendants. The firm charges from 1,000 to 5,000 kyats (US$10–$50) per cubic

Figure 8. A partially-carved image of the Buddha (left) awaits final carving and polishing. Black ink marks how a sawn jadeite boulder will be carved (right). Photo by Robert C. Kammerling.

inch for carving statues. (The exact amount depends on the intricacy of the design.)

We also visited a shop that produces jadeite cabochons. The cabochons were first rough ground on a vertical grinding wheel, then preformed on a finer-grit wheel. The last step, polishing, was performed with a wide lathe shaft that was covered with bamboo (figure 9). Unlike the other shops visited, the equipment here was powered by foot pedals.

Figure 9. One worker polishes a jadeite cabochon using a wide lathe shaft covered with bamboo (left), while the other worker preforms a cabochon on a grinding wheel. Photo by Robert C. Kammerling.

The last stop was at a firm that produced beads. Workers formed them by hand on a grinding wheel. The beads were then drilled with a bow drill, the cutting tool for which was a rod tipped with a small diamond crystal. The other end of the rod was manipulated by the driller. We were told that it takes about five minutes to completely drill a 6–9 mm bead. Workers were paid 2 kyats (US$0.02) per drilled bead.

Freshwater natural pearls from the Lac St. Jean area, Québec. Francine Payette, a geologist-gemologist from Québec, Canada, examined the structure and composition of three pearls from the pearl mollusk *Margaritifera margaritifera*, which is found in some Québec waterways and in a limited area along the Atlantic Coast. (The natural range distribution of this mollusk extends from Labrador to Pennsylvania, along the East Coast drainage of North America.)

Young *M. margaritifera* live as parasites on brown and spotted trout in Québec rivers. Adults live in the mud and sand on the bottoms of small waterways; they grow shells up to $4 \times 6.5 \times 15$ cm, with brown-to-black exteriors and white (with tints of pink and violet) nacre. There is no commercial pearl fishing in the province, and the cold climate limits harvesting to about four summer months.

Ms. Payette, who performed her analyses at the Laval University Department of Geology in Québec, used cathodoluminescence, X-ray diffraction analysis, scanning electron microscopy, and optical microscopy to study thin-sectioned samples of these pearls. Aragonite was the main mineral component, with minor calcite detected. In the interior of the pearl, the aragonite occurs as long, slender crystals radiating from a central point; in the thin outer layer, the aragonite occurs as tabular crystals (figure 10). The contact zone between these two layers is quite sharp; in the nacreous layer, the tabular aragonite crystals overlap one another, with some disordered layering seen. One non-nacreous concretion showed partial dissolution (diagenesis?) of the exposed square cross-sections at the ends of the radiating aragonite crystals, with small calcite(?) crystals between them. Ms. Payette speculated that the small amounts of calcite may have been responsible for the cathodoluminescence of these pearls, which was more sporadic in the nacre layers. She cautioned that more work is needed, and noted that some Québec pearls were also described by Dr. Emmanuel Fritsch in the Spring 1993 Gem News (p. 58).

Unusual pearls. Although today's commercially important pearls predominantly come from a small group of nacreous salt- and freshwater bivalves, niche markets do exist for rare pearls, such as gastropod-derived abalone and conch "pearls," and bivalve-derived wing-shell pearls. However, some pearls are rarer still. Dr. Grahame Brown, of ALL-

GEM Services, Albany Creek, Australia, reported on some rare and unusual pearls that he had seen over the last two decades. He described:

• A hammer-oyster (*Malleus albus*) "pearl", which was brownish, pear shaped, and non-nacreous. It had an S.G. of 2.2 and was formed from alternating layers of radiolucent conchiolin and radiopaque calcite.

• A brownish nacreous button pearl discovered in a saltwater (edible) New Zealand Greenshell™ mussel (*Perna canaliculus*).

• A bicolored near-hemispherical button pearl, with striking (and characteristic) orient and luster, from the black-banded wing shell, *Mangavicula macroptera*.

• A porcelaneous clam "pearl" from *Tridacna gigas* of Papua New Guinea origin—a distorted pear-shaped opaque white concretion with an S.G. of 2.80 and no structural characteristics visible with X-radiography.

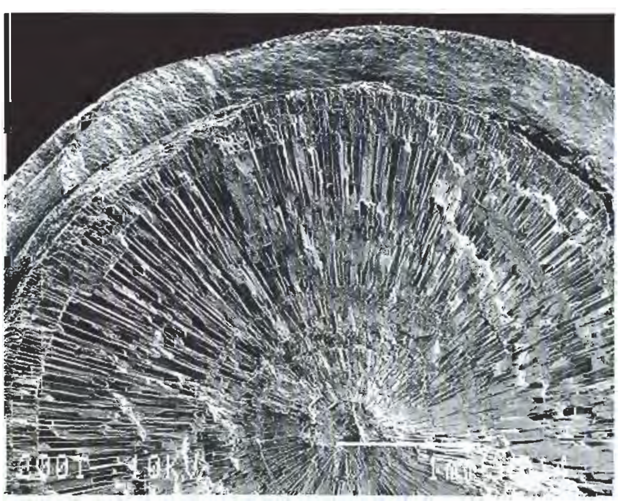
• "Coconut pearls" (figure 11), which are manufactured by Indonesian craftsmen from processed thick shell, and which show characteristic striations with "transillumination."

• Highly iridescent natural abalone pearls and cultured abalone half-pearls, with silvery green to brownish red subsurface colors that continuously shifted as the pearls were moved under indirect overhead illumination.

• An extremely rare *trochus* "pearl" (from *Trochus niloticus*), which displayed a porcelaneous luster but had the typical concentric lamellar structure of a natural pearl.

Dr. Brown also described an early cultured pearl necklace of Australian origin. Evidence suggested that the pearls were cultured in the Australian *P. maxima* during or before the first decade of the 20th century, by the Englishman William Saville-Kent. Mr. Saville-Kent operated a pearl-culturing farm on Albany Island, just to the east of Australia's Cape York, between 1906 and 1908. Dr. Brown proposed that Mr. Nishikawa and Mr. Mise, generally accepted as the first to culture round bead-nucleated pearls successfully, may have learned the technique by observing Mr. Saville-Kent's experiments on or around Thursday Island.

Figure 10. This SEM photomicrograph clearly illustrates the long aragonite crystals radiating from the core, and the outer layer of tabular aragonite crystals, in a natural pearl from the Lac St. Jean area, Québec. Photomicrograph courtesy of the Department of Geology, Laval University, Québec, Canada.



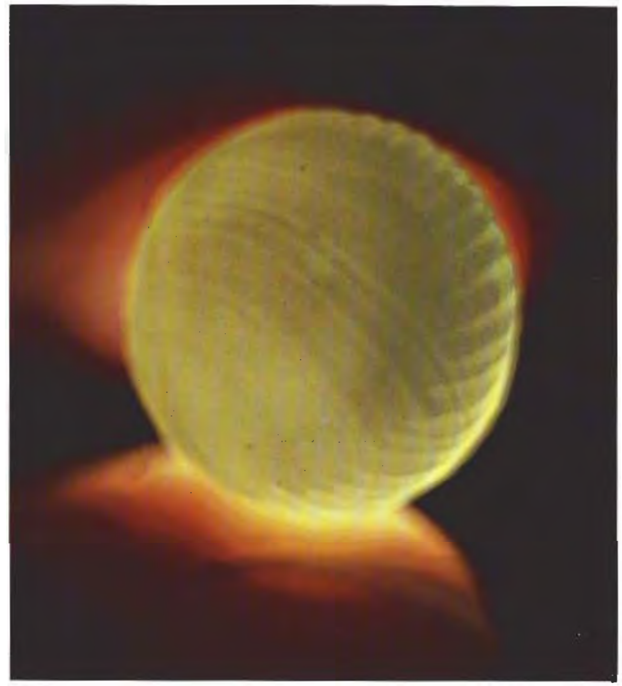


Figure 11. This 13 mm "coconut pearl" was manufactured in Indonèsia from a thick piece of mother-of-pearl shell. Transillumination ("candling") reveals the shell structure and cutting marks. Photo courtesy of Grahame Brown.

Rubies from the Barrington volcanic field, East Australia. Dr. F. L. Sutherland, of the Australian Museum in Sydney, described faceting-quality rubies found in alluvial deposits shed from the Tertiary Barrington basalt shield volcano in eastern Australia. The rubies accompany sapphire, zircon, spinel, and other heavy detrital minerals (figure 12). Crystals show corrosion from transport in a hot fluid; the main mineral inclusions in these crystals are pleonaste (ferroan spinel) and chromian pleonaste. The ruby grades into pink sapphire with a decrease in chromium and iron contents.

The parent rock—found as small mineral aggregates accompanying the gem corundum—contains ruby, sapphire, sapphirine, and spinel, with a reaction-rim of pleonaste spinel (from transportation in a hot melt) sometimes visible. Sapphires that crystallized with the ruby are near-colorless, or are found in pastel shades of yellow, blue, green, or pink. The sapphirine is usually blue to green, with a composition of about $7MgO•9Al_2O_3•3SiO_2$ with some iron substitution. The spinel is opaque pleonaste and chro-

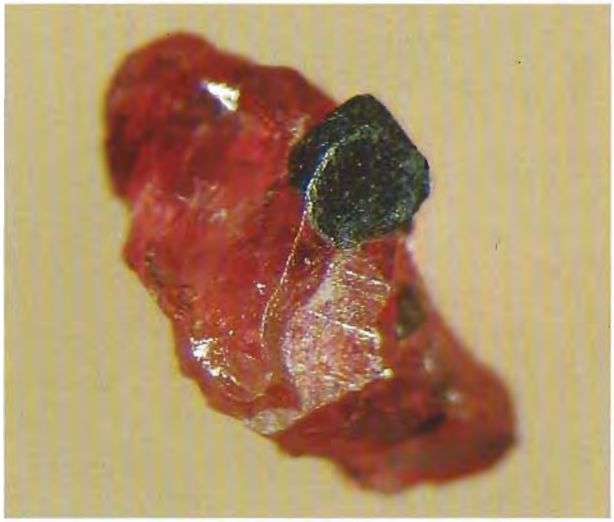


Figure 12. This 3 mm–long ruby grain with attached chromian spinel crystal is from the Barrington volcanic field in eastern Australia. Photo by Gayle Webb; © Australian Museum, Sidney.

mian pleonaste. Sapphirine-spinel thermometry suggests that these aggregates crystallized at about 780°–940°C.

This suite of associated minerals contrasts with the more common sapphire suites in eastern Australia, which typically contain blue-green growth-zoned sapphire crystals. Such sapphires contain inclusions of rutile (silk) and iron-rich spinel, as compared to the pleonaste inclusions in the Barrington corundum aggregates. The association with sapphirine seen at Barrington also appears in some alluvial ruby fields in Thailand (Rubywell mine). This raises the potential of sapphirine as an indicator for ruby sources.

Figure 13. Two young women sort rough rubies from Mong Hsu at the gem market in Taunggyi, Myanmar. Photo by Robert C. Kammerling.

Ruby market in Taunggyi. For many of the rubies mined in Mong Hsu, the first stop after the mines is the ruby market in Taunggyi (Myanmar). In early November 1995, in conjunction with the IGC conference, one of the editors (RCK) visited this important gem-trading center.

Located near the outskirts of the city, the market is in an enclosed compound reminiscent of (but larger than) that at Luc Yen in northern Vietnam. For the most part, dealers sit at small tables (figure 13), for which they pay 200 kyats (about US$2) a day. Even though business was described as "light" on the day we visited (which followed a holiday), we conservatively estimated that some 2,000 people were in the compound at the height of activity. We were told that 10,000 people typically crowd the market on a more normal work day, but that this is half the number seen the previous year.

This drop in activity apparently does not relate to problems in Mong Hsu: Several people confirmed that there has been no decrease in mining activity, and material continues to move freely to Taunggyi. Rather, the market reportedly has been affected by a drop in the prices paid for Mong Hsu material, because of increased difficulties in getting it out of the country. In the past, material freely crossed from Tachileik, Myanmar, into Mae Sai, in the far north of Thailand (see "Update on Monghsu ruby," Winter 1993 Gem News, pp. 286–287). However, about six months before the editor's visit, the Myanmar government closed this land link. Material now travels a more circuitous, and perhaps less-secure, route from Myanmar into Thailand. We were told that much of the Mong Hsu material was being diverted to the Thai border towns of Mae Hong Song and Mae Sot.

Although rubies dominated the Taunggyi market, we also noted small parcels of blue sapphire (reportedly from Mogok), some non-gem tourmaline, spinels from both Mogok and Mong Hsu, a few pieces of fluorite (both violetish blue and green) from Mogok, commercial-quality jadeite cabochons, and red garnets from the Mong Hsu area. We were also told that some of the higher-quality Mong Hsu material is sent to Mogok, because material of Mogok provenance brings a higher price on the market. Conversely, lower-quality Mogok material is brought to Taunggyi and mixed in with that from Mong Hsu.

As many as one-third of the women in the market wore gem-set jewelry, primarily earrings and large pendants set with many small, faceted rubies (figure 14). When asked the source of their stones, most said that it was Mong Hsu.

Sapphire mining in Laos. Southeast Asia is famous for its corundum deposits: Myanmar has Mogok and Mong Hsu; Thailand has Kanchanaburi and Chanthaburi-Trat; and Cambodia has Pailin. The newest addition to this group of corundum producers is Laos. In a brief report in the December 1994 *ICA Gazette*, a Laotian locality called

Figure 14. This woman, like many of those buying and selling gems in the Taunggyi market, wears ruby-set earrings. Photo by Robert C. Kammerling.

"Huai Sai" was said to produce good-color blue sapphire. More recently, in the August-September 1995 issue of *JewelSiam*, David Squires described a brief visit to a mechanized mining operation near the Laotian border town of Ban Houay Xai.

Also in conjunction with the IGC conference, one of the editors (RCK) visited a mining area not far from Ban Houay Xai. Starting from the city of Chiang Rai in northern Thailand, the editor and a few colleagues drove approximately one-and-a-half hours on a paved two-lane road to reach Chiang Khong, a Thai border town on the Mekong River, roughly 70 air miles (112 km) northeast of Chiang Rai. After arranging for a one-day entry permit to enter Laos, the group crossed the river by long, narrow power boat to Ban Houay Xai, where we rented two "samlors" (motorcycle taxis) for the drive to the mines.

The first site visited was Ban Tong Saeng Chan, which translates as "field with moonlight," about 15 km southeast of Ban Houay Xai. The mining area was a large field that had been pierced by circular shafts about 1.5 m in diameter and 2–3 m (6–9 feet) deep. Miners reached the bottom of the shafts by climbing down bamboo poles. They used short-handled shovels to dig the shafts (and sometimes short tunnels—no more than a meter or so—into the gem-bearing layers). Miners used either the shovels or small metal bowls to extract the gem-bearing lateritic soil (we saw no distinct gravel layer in any of the pits). The extracted material was then placed in a bucket and, in shallow shafts, handed to a co-worker at the surface (figure 15). When the shaft was too deep, the miners hauled the buckets to the surface using a bamboo pole fitted with a hook on one end.

When enough material had been extracted, it was sifted through a large-mesh basket to remove any large rocks and then loaded into a plastic grain sack, which the miner then carried to a small stream some 200–300 m away. Here, the soils were shoveled into wide, shallow woven wicker baskets, like those used in many parts of the world for washing gem-bearing material. Because the stream was very shallow, the miners used shovels to dig depressions in the stream bed deep enough to permit washing. Once the soil had been washed away, the miners would examine the gravels and remove any sapphires found, often while still sitting in the stream (figure 16).

The editor had an opportunity to briefly examine some of the sapphires, both at the washing site and at a local dealer's home. These sapphires ranged from light to dark blue (figure 17), with many noticeably color zoned. The overall impression was that some fine-quality material was coming out of the area. Although most of the rough was small (one carat or less), we saw some stones of several carats.

The sapphire deposit in southern Madagascar. Sapphires from new mining operations near Andranondamtso, Madagascar, were described by Contributing Editor Dr. Henry Hänni, on the basis of work done with colleagues Michael Krzemnicki and Drs. Lore Kiefert, Karl Schmetzer, and Heinz-Jürgen Bernhardt. Andranondamtso is a small village north of Tolanaro (Fort Dauphin).

Figure 15. At a sapphire-mining locality near Ban Houay Xai, Laos, a miner passes a bucket of soil and gravel to a co-worker. Photo by Robert C. Kammerling.

Figure 16. Soil and gravels, recovered from pits like that shown in figure 15, are washed for sapphires in a local stream. Photo by Robert C. Kammerling.

The Tranomano Precambrian crystalline schists are embedded between the Anosyenne chain and the Androy volcanics in southern Madagascar. The Tranomano units form the central part of a peneplain; these crystalline schists were subjected to strong (granulite facies) metamorphism, and consist of pyroxenites, garnet gneisses, and pyroxene gneisses. These rocks were folded and a granitic mass intruded, from which pegmatite dikes emanated further into the pyroxenites. Sapphires formed locally in the reaction zones between the pegmatite dikes and the pyroxenite; these deposits take the form of nests and pockets. The sapphire crystals are usually small (5–15 mm across) and are light-to-dark blue in color (figure 18). Crystal shapes observed vary from columnar to pyramidal and distorted tabular shapes; crystal faces identified so far include *c*, *a*, *r*, *n*, *w*, *z*, and a rare scalenohedral form. These faces not only define the surface morphology of the crystals, but they also are frequently encountered within the crystals, where they form growth and color bands. Electron microprobe analyses revealed significant variations in the concentrations of chromophore elements Fe (0.15–0.25 wt.% Fe as Fe_2O_3) and Ti (0.05–0.15 wt.% Ti as TiO_2). The absorption spectrum is similar to that of Sri Lankan and Burmese sapphires, with a weak-to-moderate Fe^{3+} absorption at 450 nm.

Mineral species identified in the (very calcite-rich) associated parent rock include: calcite, feldspars, quartz, diopside, mica, anatase, spinel, apatite, wollastonite, and a mixture of clay minerals. Inclusions found in the sapphires are: apatite, calcite, spinel, diaspore, CO_2, and rutile. These were identified by Raman spectroscopy and SEM-EDS. Rutile needles were not present or were very small. Turbid areas in the crystals may be composed of fine, submicroscopic TiO_2 precipitates. Because many crystals have sectored color zoning and/or turbid areas, sapphires from this locality will probably need heat treatment to be marketable.

Scapolites from new discoveries in Sri Lanka. The gemological properties of scapolites from Sri Lanka were discussed by Pieter C. Zwaan, of Leiden, the Netherlands, and E. Gamini Zoysa, of Mount Lavinia, Sri Lanka. These yellow to near-colorless stones came from eluvial and alluvial deposits near Pohorabawa, a small village in the Eheliyagoda area, and in the Embilipitiya area.

The Eheliyagoda specimens had mean refractive indices of 1.542 (extraordinary ray) and 1.560 (ordinary ray), birefringence of 0.018, specific gravity of 2.632, and composition of $Marialite_{67.5}Meionite_{32.5}$. There are two groups of Embilipitiya scapolites: one with gem properties similar to those from the Ehilayagoda area, and the other with refractive indices of 1.550 (extraordinary ray) and 1.578 (ordinary ray), a birefringence of 0.028, a specific gravity of 2.693, and a composition of $Marialite_{40.5}Meionite_{59.5}$. This second group of scapolites also may contain needle-like inclusions of pyrrhotite.

Scapolites can be distinguished from other yellow Sri Lankan gemstones with similar properties (such as citrine and various feldspars) by their strong orange-yellow to

Figure 17. This handful of sapphire rough, seen at a mining site near Ban Houay Xai, appears to be typical of the sapphires being produced in the area. Photo by Robert C. Kammerling.

"canary" yellow fluorescence to long-wave UV radiation and their much stronger birefringence.

With regard to gemological properties, Eheliyagoda scapolites have much in common with those from Tanzania, whereas most Embilipitiya scapolites are very similar to scapolites from Madagascar. Among the scapolites from other localities that were available for identification was a 2.06 ct violet stone from Pakistan, which had the lowest numerical values for physical properties and the lowest meionite content (composition $Marialite_{92.4}$ $Meionite_{7.6}$) ever observed in the Netherlands Gemmological Laboratory.

Figure 18. These sapphire crystals from southern Madagascar range from light to dark blue. The largest is about 15 mm long. Photo courtesy of Henry A. Hänni, SSEF.

Tanzanites and other zoisites from Merelani, Tanzania. Why do so many colors of zoisite come from such a small area in Tanzania? Why does some zoisite exhibit a color change after heat treatment, while some does not? To answer these questions, Contributing Editor Henry Hänni (aided by Daniel Traber and Dr. N. Barot), analyzed 42 zoisite crystals and chips both chemically and spectroscopically.

Chemical investigations were carried out by microprobe, with special attention given to the chromophores Fe, Ti, Cr, and V. Quantitative results showed low aluminum contents (compared to the ideal zoisite formula). This suggests substitution of the chromophores for Al, either as a simple substitution or coupled with some other substitution. Brown and blue samples typically had a V_2O_3/Cr_2O_3 ratio greater than two; this ratio was less than two for green samples. Light blue crystals with elevated TiO_2 contents showed only a weak response to heat treatment, despite their vanadium content. Manganese and iron were found in very low concentrations only; hence, the authors did not consider these elements to be relevant with regard to the colors of the Merelani zoisites. A green zoisite from Pakistan and a pink zoisite (purchased in India) were tested for comparison purposes, and were found to have significant iron contents.

Violet zoisites owe their color to V^{3+}. The addition of a little Cr^{3+} results in a purer blue. The transition from brown to blue is caused by destruction of the 450 nm absorption band on heat treatment. (Both the brown pleochroic color and the 450 nm absorption band are polarized parallel to the c-axis.) Samples with elevated Ti contents (which are usually light blue) showed weak reactions to heat and kept the 450 nm feature to a certain extent. The authors speculate that the color transition mechanism (with heat treatment) is: $Ti^{3+} + V^{4+}$ converting to $Ti^{4+} + V^{3+}$ as titanium is oxidized with heating; they hope that further investigation will confirm this hypothesis. Finally, they noted that infrared spectroscopy revealed no features that would be diagnostic for heat treatment in zoisite.

SYNTHETICS AND SIMULANTS

Russian flux-grown synthetic alexandrites. One of the contributing editors, Dr. Karl Schmetzer, examined about 200 crystals of flux-grown synthetic alexandrite obtained from Novosibirsk and Bangkok. About 90% of the crystals showed cyclic twinning; the balance were untwinned single crystals. Dr. Schmetzer identified as external crystal faces (dominant faces underlined here for emphasis) pinacoids *a* (100), *b* (010), and *c* (001); rhombic prisms *s* (120), *k* (021), *x* (101), and *m* (110); and one rhombic dipyramid *o* (111). X-ray fluorescence spectroscopy revealed minor-to-trace amounts of Cr, Fe, V (in some samples), Ge, Bi, and Mo. Cr, V, and Fe are chromophores. Bi and Mo were already known to be components of the flux material used in Russia for the growth of synthetic alexandrites, but the presence of germanium, sometimes greater than 1 wt.% GeO_2, was surprising.

The crystals showed growth zoning parallel to the four dominant *a*, *x*, *k*, and *o* faces (figure 19), which was also seen as zoning of Cr, Fe, Ge, and V (again, in some samples) with the electron microprobe. About 10% of the samples revealed an intense red (in incandescent light) core, with a lighter red rim, and a rounded, still more intense red boundary between the two. Chromium content ranged up to 4 wt.% Cr_2O_3 in the boundary area, which indicates a two-stage growth process for some of the synthetic alexandrites.

GGG as a corundum fake. Over the past few years, reports have appeared here and elsewhere about the danger of inadvertently purchasing synthetic rubies that have been fashioned to resemble waterworn natural rubies from Vietnam (see, for example, Winter 1991 Gem News, p. 260). We have also heard of an imitation Mong Hsu ruby that is produced by inserting a blue, wax-like substance into a cavity in synthetic ruby; the wax superficially resembles the blue central zone typical of material from that locality.

While in Taunggyi, Editor R. C. Kammerling learned of another deception being used on local jewelers: Large pieces of purple GGG are fashioned to resemble corundum crystals and misrepresented as material from a "new" deposit. One such imitation, shown by U. Tin Hlaing (who had identified the specimen as GGG), had a rough-ground surface with fairly convincing parallel striations on the

Figure 19. This Russian flux-grown synthetic alexandrite shows a characteristic growth pattern consisting of two a (100) pinacoids (left and right) and two o (111) rhombic dipyramids (top). Photomicrograph (immersion, incandescent light) courtesy of Karl Schmetzer; magnified 40×.

crystal "faces" (figure 20). Because of the rough surfaces, it was difficult to examine the interior of the piece, even with strong transmitted light. However, its deep purple color was very evident. Unwary jewelers, seeing this transmitted purple color, might mistake it for a mixing of colors from the red periphery and blue core of a Mong Hsu-like crystal.

INSTRUMENTATION

The lapidary as a gemological resource. Michael Gray, of Graystone Enterprises, Missoula, Montana, pointed out that lapidaries—the people who fashion gem rough into cut stones—can be an invaluable source of gemological information, especially with regard to new materials, and locality and treatment information. For instance, the fact that benitoite was too soft to be sapphire provided the first clue that it was a new mineral. In Mr. Gray's experience, heat-treated corundums do not respond to cutting and polishing in the same way that untreated stones do, and bicolored tourmalines from different localities behave differently during faceting.

Nuclear microscopy of rubies. Mr. Tay Thye Sun, of the Far East Gemological Laboratory, Singapore, described the use of a nuclear microscope to determine trace-element contents in rubies. In this research, carried out in collaboration with the National University of Singapore Nuclear Microscopy Group, a focused beam of high-energy protons is raster-scanned across the sample's surface; X-rays (Particle Induced X-ray Emission, or PIXE) and backscattered protons (Backscattering Spectrometry, or BS) are collected from regions as small as 1 micron. Depths of around 30 microns are probed. The method allows the determination of trace-element concentrations at the 1 ppm level from homogeneous regions near the stone's surface, where no inclusions or surface contaminations are present.

In addition to the six rough samples from Mong Hsu and four cut stones from Thailand that had been studied in detail, Dr. Tay presented preliminary results for 105 rubies from various Myanmar localities. The Thai stones had higher Fe contents than the Mong Hsu rubies, but the Mong Hsu stones had more V and Ti. The dark Mong Hsu core regions were high in Cr and Ti.

Raman spectrometers. Interest in Raman spectroscopy as a gemological technique continues to grow because of its usefulness as a nondestructive technique to identify inclusions in gemstones. Dr. Prof. Bernard Lasnier, of the Gemmology Laboratory at the University from Nantes, France, reported that the technology of gemological Raman spectrometers continues to improve; Han A. Talay of the University of Nantes has developed a new unit that is portable (it weighs 15 kg) and can also be used for colorimetric measurements.

Figure 20. This rough "crystal" of purple GGG was misrepresented to a jeweler in Taunggyi, Myanmar, as a corundum gem from a new locality. Photo by Robert C. Kammerling.

Dr. Jamie Nelson, of London, England, provided a very lucid description of how the Raman effect works, and reported that he is developing a catalog of Raman spectra of gemstones and their inclusions, which currently contains 150 entries. (For an existing catalog of 80 Raman spectra of gems and their inclusions, see the 1992 special Raman spectroscopy issue of *Revue de Gemmologie* [abstracted by E. Fritsch in the Fall 1993 *Gems & Gemology*, p. 224]. A more extensive catalog—with more than 600 mineralogical standards—is currently in press in Nantes.) Garry du Toit, of the Asian Institute of Gemological Sciences in Bangkok, showed several Raman spectra of inclusions in gems, including calcite in a Burma ruby that had been heat treated to an extreme degree and the emerald fillers cedarwood oil, Opticon, and a "different type of resin" used in Bangkok, which is activated by UV radiation.

In a panel discussion following these presentations, some limitations of the Raman technique were pointed out. Inclusions must be fairly close to the surface of the gem being studied; and, in highly fluorescent stones, luminescence can totally swamp the Raman signal (unless multiple lasers, or other methodological changes, are used).

Brewster angle refractometer. Dr. Roger Harding, of the Gemmological Association and Gem Testing Laboratory of Great Britain, described an instrument that works by measuring the angle at which the light reflecting off the surface of a gemstone is most highly polarized (the Brewster angle). A laser serves as the high-intensity monochromatic light source; however, as the lasers employed to date emit light in the red end of the spectrum (632.8 or 670 nm), and not at the 589 nm sodium D line, the measurements must be converted (that is, the dispersion must be known) in order to compare results with conventional refractometers. Thus, a table of Brewster angles (at 670 nm) is more convenient for recording and comparing data. With this instrument, the Brewster angles of diamond and CZ can be distinguished, and no optical coupling fluid (such as R.I. liquid) is needed.

MISCELLANEOUS

Gems in ancient jewelry. Jewelry from a 4th century B.C. sepulcher was the topic of a talk given by Jean-Paul Poirot, of the Service Public du Controle des Diamants, Perles Fines et Pierres Précieuses, Paris. The sepulcher was of the Achemenid period in Susa (modern Iran).

The gems in three beaded necklaces, two buttons, two ear pendants, one torque, and two bracelets were identified. Drilled beads from one single- and one four-strand necklace included: quartz (rock crystal, amethyst, smoky quartz); cryptocrystalline quartz (including carnelian, sardonyx, onyx, brown banded agate, red and yellow jasper, and other chalcedony) and siliceous rocks; hematite and ferruginous rock; feldspar porphyries with black body colors; and limestone, mother-of-pearl, amazonite, turquoise, malachite, serpentine, lapis lazuli, gold beads, and "artificial products" (sintered glassy frits with bluish white body colors).

Figure 21. Gems & Gemology *Editor Alice Keller accepts the trophy for best scientific/educational feature article from ASAE President R. William Taylor.*

The necklace with cloisonné beads, and all the other pieces, contained cloisonné inset with lapis lazuli, carnelian, agate, and turquoise. In one piece, amazonite was used to imitate turquoise in an inconspicuous place. All the pieces showed signs of wear and weathering, such as stones missing from the enamel work and the alteration of some lapis lazuli caused by pyrite decomposition. They also showed that culture's appreciation of turquoise and lapis lazuli, and the influence of neighboring civilizations.

ANNOUNCEMENTS

***Gems & Gemology* wins again.** For the fourth consecutive year, *Gems & Gemology* won an award in the prestigious American Society of Association Executives (ASAE) Gold Circle competition. For 1995, the journal received a first-place trophy in the category "Feature Writing, Scientific/Educational" for the article "An Update on Filled Diamonds: Identification and Durability," by R. C. Kammerling, S. F. McClure, M. L. Johnson, J. I. Koivula, T. M. Moses, E. Fritsch, and J. E. Shigley (which appeared in the Fall 1994 issue and was the recipient of *Gems & Gemology's* own "Most Valuable Article" award). *Gems & Gemology* also placed second overall in the "Journals" category. Editor Alice Keller traveled to Chicago in early December to receive the trophy on behalf of the journal (figure 21).