GEM NEWS

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DIAMONDS

Claim-staking rush in Canada. One of the biggest claim-staking rushes ever seen in Canada was triggered in late 1991 by the discovery of 81 small diamonds in a 59-kg kimberlite sample from the Lac de Gras area, about 350 km northeast of Yellowknife in the Northwest Territories. As of April 1992, an estimated 3.6 million hectares had been staked with at least 16 companies involved, including De Beers's Canadian exploration subsidiary, Monopros Ltd. Before the Lac de Gras discovery, diamond prospecting in Canada had focused on central Saskatchewan, where drilling in 1989 identified a number of kimberlites. Since then, 160 diamonds larger than 2 mm in diameter have been recovered from 15 kimberlites, but the projected yield is still too low for commercial mining. The Northwest Territories discovery, however, appears much more promising. The kimberlite from which the 81 diamonds were recovered is believed to have a surface area of about 20 hectares, which compares in size to some South African pipes. The discovery was made after more than 10 years of exploration, during which diamond indicator minerals were traced systematically in heavily glaciated terrain. (*Mining Journal*, April 10, 1992, p. 255)

International Diamond Technical Symposium in Israel. In October 1991, some 500 of the world's leading diamond manufacturers gathered in Tel Aviv to share ideas and information on advances in manufacturing technology. Cosponsored by the Central Selling Organisation and the Israel Diamond Institute, this meeting provided attendees from 23 countries an opportunity to better comprehend the truly global character of the diamond market and the unique contributions of each diamond-cutting center.

Presentations by industry experts covered a range of topics: market forces, cutting technology (sawing, bruting, polishing), laser technology, environmental concerns, safety, new cutting styles, and employee training. Dr. James E. Shigley of GIA Research gave a presentation on the gemological aspects of identifying natural, enhanced, and synthetic gem diamonds.

In addition to these presentations, 28 companies exhibited the latest diamond-cutting equipment. The first technical evaluation of automatic diamond-cutting equipment featured systems from developers in six countries. These new systems are variously composed of automatic bruting machines, computerized centering instruments, and girdle-polishing machines, as well as additional equipment, all of which may be used separately or combined for full automation.

Uri Schwartz, chairman of the Technical Israel Committee of the Israel Diamond Institute, addressed the problems of converting from manual to automated diamond processing. He advised diamantaires to consider two fundamentals: (1) the "production basket"—the variety of stones processed by the factory, and (2) the "critical mass"—the minimum quantity of machinery required on the basis of machine capacity and the types of stones to be processed.

Prospecting reveals kimberlite pipes in Ukraine. Two diamondiferous kimberlite pipes have been discovered in the Donetsk region of the Ukraine. The successful search, made by specialists from the Azov prospecting expedition, was prompted by a recent find in the Arkhangelsk region in northern Russia. This earlier discovery led the prospectors to believe that additional pipes might be found in this more southern region of the former Soviet Union. (*Diamond Intelligence Briefs*, February 20, 1992, p. 861)

Small industrials in Uzbekistan. Industrial-quality diamonds, reportedly up to 2 mm in diameter, have been discovered near Tashkent in the Tyan Shan mountains of Uzbekistan. Diamondiferous kimberlites have also been found in the same area. (*Mining Journal*, April 24, 1992, p. 296)

De Beers and the Republic of Sakha sign sales agreement. De Beers Centenary AG recently signed a sales agreement with the Republic of Sakha (formerly Yakutia). According to De Beers, Sakha will now market its rough gem-quality diamonds exclusively through De Beers's Central Selling Organisation (CSO).

The agreement followed a December 1991 decree by Russian President Boris Yeltsin that gave Sakha the right to retain 10% of its rough gem diamond production for independent sale. In the past, all of Sakha's production was sold to the central diamond authorities in Moscow (formerly Glavalmazzoloto, now Rossalmazzoloto), which marketed Russia's rough gem-quality diamonds through the CSO. The Russian diamond authorities will continue to handle

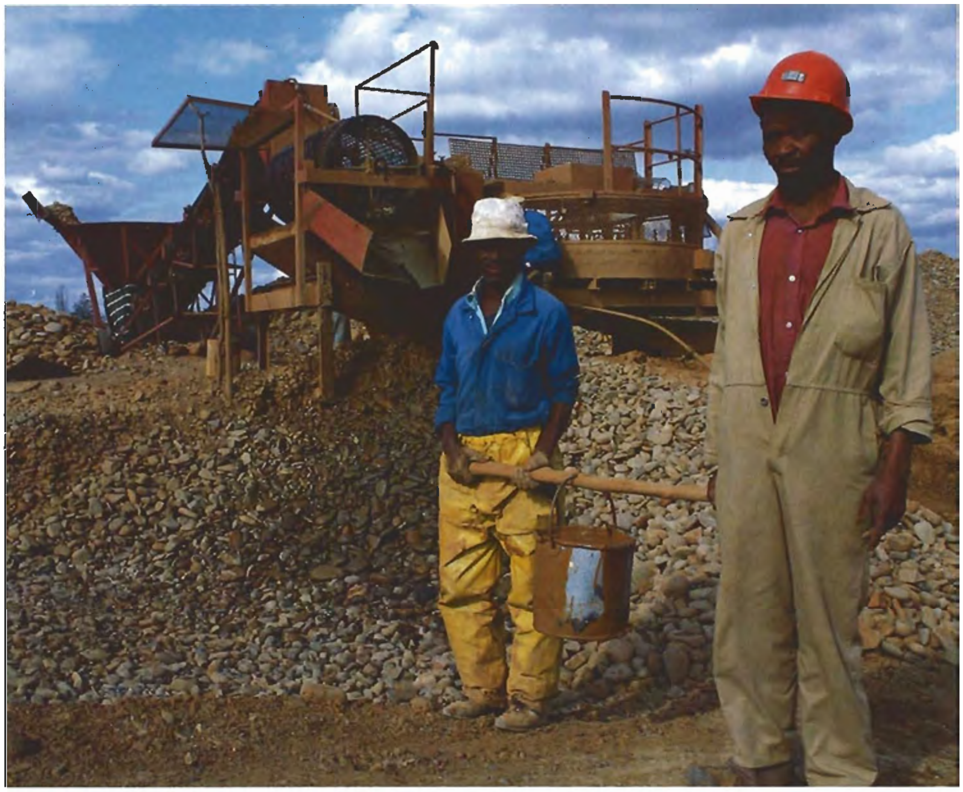


Figure 1. At this small diamond mine in South Africa, the concentrate is carried by bucket from the original recovery plant to a nearby sorting shed. Photo by Robert E. Kane.

Sakha's rough diamond production and will sort the diamonds in Moscow on Sakha's behalf.

In July 1990, De Beers Centenary and Rossalmazzoloto signed a five-year exclusive sales contract for Russia's rough-gem diamond production. The agreement between Sakha and De Beers Centenary will run concurrently with this contract.

With such important mines as Udachnaya, Mir, and Jubilee, Sakha (now an autonomous republic within the Russian Federation) is responsible for 99.8% of the Federation's total diamond production. This makes Sakha one of the world's largest producers of gem-quality diamonds.

Visit to a small diamond-mining operation in South Africa. While on a trip to South Africa in late 1991, Robert E. Kane of the GIA Gem Trade Laboratory visited the Longlands area, approximately 50 km west of Kimberley. The first alluvial diamond deposits in South Africa were discovered here in 1869, along the Vaal River. There are still many small independent mining operations in the area, with both miners and buyers licensed by the government.

Mr. Kane visited the mine owned and operated by Danie Van Wyk, who has 18 years of experience in the Longlands area. At the time of the visit, Mr. Van Wyk had been working his present site for two years. The operation is rather sophisticated for a small-scale mine, employing heavy equipment and a portable recovery plant operated by three employees.

Recovery begins with a front-end loader that picks up the diamond-bearing gravels and carries them a short distance to the recovery plant, where they are dumped into a vibrating hopper that feeds a conveyor belt. Large rocks are removed by hand, while smaller rocks are sorted by a rotating cylindrical sizing screen. The remaining gravels are then fed into a rotating pan to which water is added, and the less-dense material is siphoned off the top. The heavier material collects in the bottom of the pan, where a drain is then opened to fill buckets with the muddy concentrate.

The concentrate is carried in a bucket (figure 1) to a nearby sorting shed that contains three circular metal pans, each with a different size screen mesh (approximately 3, 7, and 12 mm), stacked vertically and separated by sheet-metal cones. This stack is placed in a large, water-filled metal drum, the gravel mixture poured into the top, and the assembled screens agitated. This separates the heavier material into three size categories and allows waste to collect at the bottom.

The pans are next gravitated separately to concentrate the heavier material (including, hopefully, diamonds) in the bottom center of the pan. Under Mr. Van Wyk's supervision, each pan is then overturned onto a sorting table and any diamonds are removed by hand. Mr. Van Wyk reported that he recovers only colorless to yellow diamonds at his operation and that he had found three good-size crystals—9, 12, and 16 ct—the previous week.

De Beers signs prospecting agreement with Tanzania. A diamond-prospecting and mining agreement has been signed by De Beers's subsidiary Wilcroft Co. Ltd. of Bermuda, Tanex Ltd. (a locally incorporated subsidiary of Wilcroft), and the Tanzanian Ministry of Water, Energy and Minerals. The agreement covers reconnaissance, prospecting, and mining operations in a 22,310-km area of the regions of Mwanza, Shinyanga, and Tabora.

Diamond exploration, including airborne geophysics, has indicated that there may be as many as 300 kimberlite pipes in Tanzania. Under the agreement, Tanex initially will receive a one-year reconnaissance license to identify targets for detailed exploration. (*Mining Magazine*, March 1992, p. 178)

Zaire produced fewer diamonds. Production at the MIBA mine in Zaire dropped from 9.5 million carats in 1990 to 6.8 million carats in 1991. A recent report indicates that January 1992 production was 240,000 ct, down significantly from the projected monthly average of 600,000 ct. The decrease has been attributed to problems that include transportation, supplies, and even obtaining food for employees. (*Diamond Intelligence Briefs*, March 31, 1992, p. 870)

Zaire tightens trade regulations. The Zaire government has ordered all foreign nationals out of its diamond-mining areas and tightened trading regulations in an effort to curb smuggling. A government announcement televised in late February stated that all licenses to purchase diamonds from small, private diggers had been cancelled and that new applications must be submitted. Each licensee may employ no more than 10 buyers, all of whom must be citizens of Zaire, although exemptions can be obtained for significant additional fees. Security measures include tightened surveillance in mining areas and stricter border security. (*Mining Journal*, March 20, 1992, p. 202)

COLORED STONES

Exotic "jewel" beetles. We have previously reported on the occasional use of colorful, iridescent beetle exoskeletons in jewelry (Gem Trade Lab Notes, Fall 1989, and Gem News, Summer 1991). Although somewhat brittle and therefore unsuitable for items such as rings, these unique organic "gems" can be used in brooches and pins, where damage is less likely to occur.

There are over 297,000 different species of *Coleoptera* (beetles) known, but we had previously encountered only brightly colored green beetles in jewelry. However, at a recent science career day held at Chapman College in Orange County, California, one of the Gem News editors viewed an exceptional insect collection, several cases of which were labeled "exotic jewel beetles." These beetles displayed iridescent colors of the entire visible-light spectrum (figure 2). According to the owner, Mr. Les Stockton of Stockton Enterprises, Santa Monica, California, the 107 different beetle species illustrated came from 27 countries, including most of the countries in Central and South America, as well as Madagascar, Malaysia, New Guinea, and Spain. The largest beetle (genus *Megaloxantha*, species *bicolor*), from the Philippines, is more than 3 in. (7.5 cm) long. Most of these "jewel" beetles have found use as personal adornments in the countries in which they are found.

Cat's-eye golden beryl. Elongated, tubular inclusions running parallel to the c-axis are fairly common in beryls, especially in the near-colorless to light-blue aquamarines from Brazil and Zimbabwe. When these inclusions are plentiful, a chatoyant stone may be fashioned from such material.

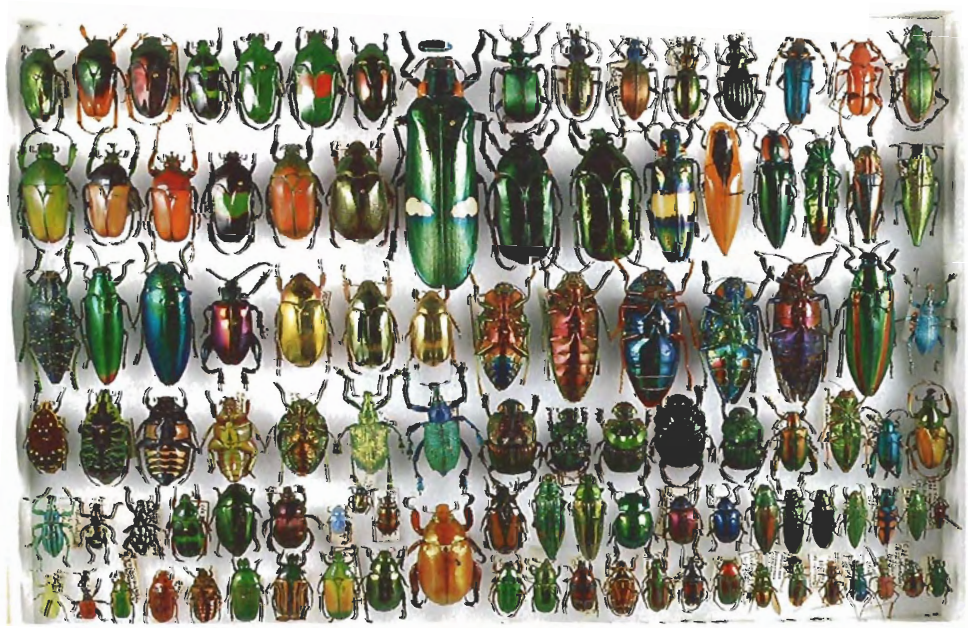


Figure 2. This collection of exotic "jewel" beetles represents 107 different species from 27 countries. The largest beetle shown here is more than 3 in. (7.5 cm) long. Photo by Maha Smith.

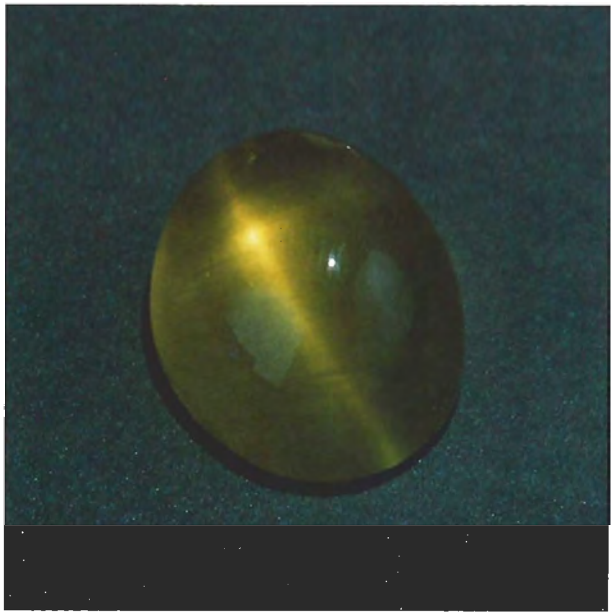
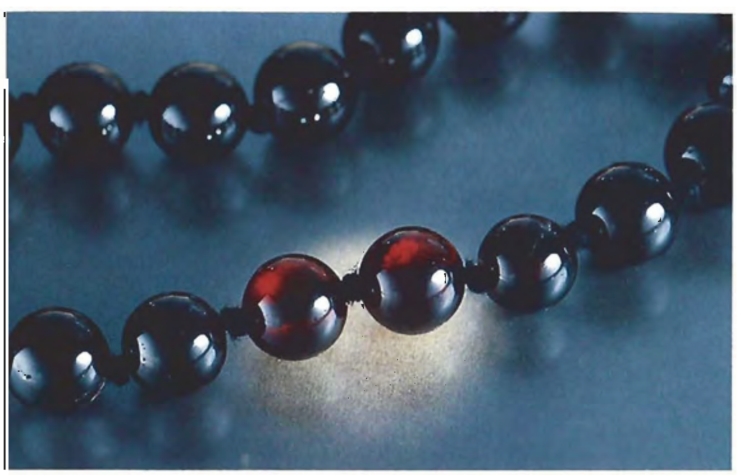


Figure 3. This 7.24-ct chatoyant "golden" beryl may owe its color to artificial irradiation. Photo by Maha Smith.

It is also known that a yellow, or "golden," color can be induced in beryl through irradiation. Although we have regularly seen faceted gems in this color, this year at one of the Tucson shows we came across a dealer with several hundred carats of cat's-eye beryl cabochons, some of which we suspect may owe their color to irradiation. Approximately half of the stones were light-blue aquamarines; the other half, like that pictured in figure 3, were a medium to medium-dark yellow.

Figure 4. The Sinai Peninsula of Egypt is the reported source of the almandine garnet beads (12.3–13.0 mm in diameter) in this necklace. Photo by Maha Smith.



Garnets from Egypt. While on a trip to Egypt in late 1991, one of the Gem News editors (RCK) saw some of the gem-set antiquities displayed in the Egyptian Museum Cairo. Among the gems in the Greco-Roman jewelry were some very dark brownish red stones that resembled almandine garnet. In one room of the museum, a chart listing the gem materials used by the ancient Egyptians included garnet, although neither species nor variety was given.

Later in the trip, at Luxor, the editor visited a gem dealer who displayed a necklace of dark brownish red beads represented as garnets recovered from the south-central area of the Sinai Peninsula, "two mountains over from Gebel Musa" (Mt. Sinai). According to the merchant, his father obtained garnets at the mine site several years before, but the exact location was no longer known. John D. Rouse, in his book, *Garnet*, cited Pliny's report of Egypt as an early source of "carbuncles," a gem name now thought to have referred to garnets. While Pliny mentioned the Thebes (not the Sinai) area as the source, Rouse speculated that this might have been a trading station rather than the mining area.

The necklace was acquired for gemological examination. The 36 off-round beads range in diameter from approximately 12.3 to 13.0 mm. In reflected light, they appear brown and almost opaque; when examined with transmitted light, however, they are brownish red and transparent (figure 4). Magnification revealed dark solid inclusions with irregular outlines and stained fractures.

Spot refractive indices of 13 beads revealed readings over the limit (1.80+) of the conventional refractometer. Examination with desk-model spectroscopes (both prism and diffraction-grating types) revealed absorption features like those associated with almandine and spessartine garnets. EDXRF analysis, carried out by GIA Research, confirmed the presence of iron and manganese. On the basis of these data, we identified the garnets as almandine-spessartine.

Large jadeite boulder. During a trip to Myanmar (formerly Burma) in March 1992, one of the editors (RCK) and GIA-GTL's Bob Kane saw what was described by local officials as the largest jadeite boulder ever recovered from the Mogaung area of upper Myanmar (figure 5). The boulder was discovered on July 19, 1982, at the Khy-Siu mine, Kan Mine township, Kachin State, and transported to Yangon (formerly Rangoon) one year later. The boulder is approximately 4 m long × 2 m wide × 2.25 m high, and has a circumference of 8.75 m. It weighs approximately 33 metric tons. This impressive specimen is displayed in front of the Myanmar Gems Enterprise headquarters at Yangon.

Gemstones from Laos. Myanmar and Thailand have long been known as important sources of colored stones; over the past few years, Vietnam has gained considerable recognition

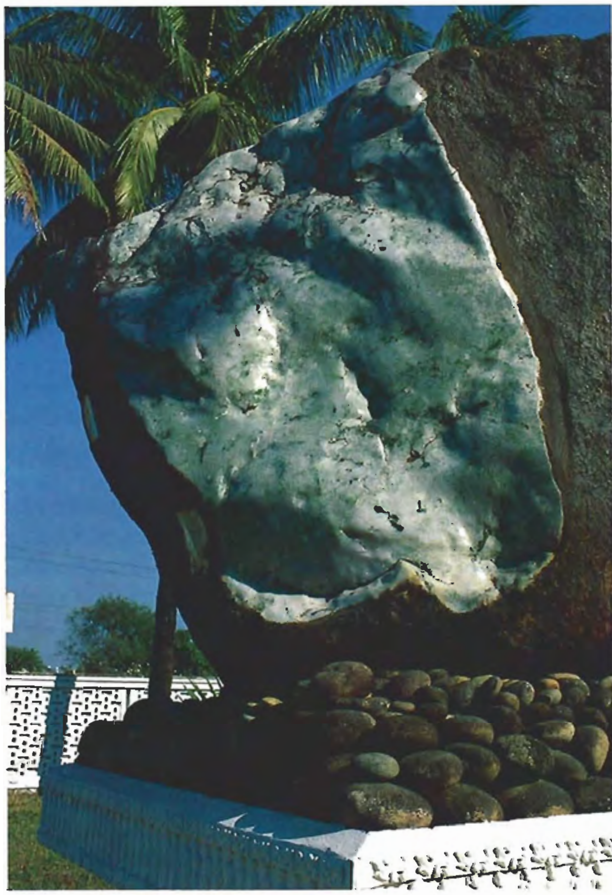


Figure 5. At approximately 33 metric tons, this is reportedly the largest jadeite boulder ever mined in Myanmar (Burma). Photo by Robert E. Kane.

for the fine-quality rubies and fancy sapphires found there. A recent mining summary report indicates that another southeast Asian nation—Laos—may also hold important gemstone potential.

According to *Mining Magazine*, both gem- and industrial-quality sapphires are currently being mined in Laos by a state mining enterprise, as well as by groups of individuals at Ban Houeixai in the country's northwest. There is speculation that additional potential exists on the Bolovens Plateau.

In addition, amethyst is presently mined from vugs and veins in rhyolites in Champasak Province. Zircon and topaz have been noted in this province as well, in alluvial deposits similar to those of the zircon-producing Kantharalak area of neighboring Thailand. Beryl has been identified in pegmatites running northwest along a strike from a known beryl-rich zone in northern Vietnam. (*Mining Magazine*, March 1992, p. 147)

Attractive meteorite jewelry. A report on an extraterrestrial form of olivine (peridot) recovered from pallasitic meteorites was published in the Spring 1992 issue of *Gems & Gemology*. This is not, however, the only "gem" material from a non-earthly source.

At the Tucson gem shows this past February, the editors came across a type of meteorite being set in jewelry (figure 6). According to Mark Castagnoli, president of Canadian Placer Gold Ltd. and the vendor of this material, this "Gibeon class" iron-nickel meteorite was recovered in Namibia. The fine octahedrite crystal structure, or "Widmanstatten" lines (a check-type intergrowth pattern) it displays, is characteristic of this particular material. Mr. Castagnoli informed us that the fashioned material, including the samples we examined, are usually etched with dilute nitric acid to expose the crystal structure.

Black mabe "pearls" and simulants (from nautilus shell). Mabe "pearls" are one of the more interesting assembled gem materials. First, blister pearls are cultured around hemispherical beads placed against the shell; they are then cut from the shell and the bead removed. A smaller spherical bead is inserted into the cavity along with a wax filler. Finally, a section of mother-of-pearl shell is added to form a slightly convex base. Perhaps the most unusual mabe assembled cultured blister pearls are the black mabes that are produced in the South Seas (figure 7).

At the February 1992 Tucson gem shows, we saw some assemblages made from iridescent shell that reminded us of mabe pearls (figure 8). One type, marketed as "Osmeña pearls" by Denis Brand of Gardena, California, was made from the curved innermost shell section of the chambered nautilus. The exposed, strongly iridescent layer of shell (the outermost white-and-brown layer has been polished away) has a delicate grayish blue body color. The larger shell portion is capped at the base with a very thin, flat section of shell, through which it could be seen that the

Figure 6. These 18-K gold cuff links are inlaid with "Gibeon class" iron-nickel meteorite from Namibia. Photo by Maha Smith.

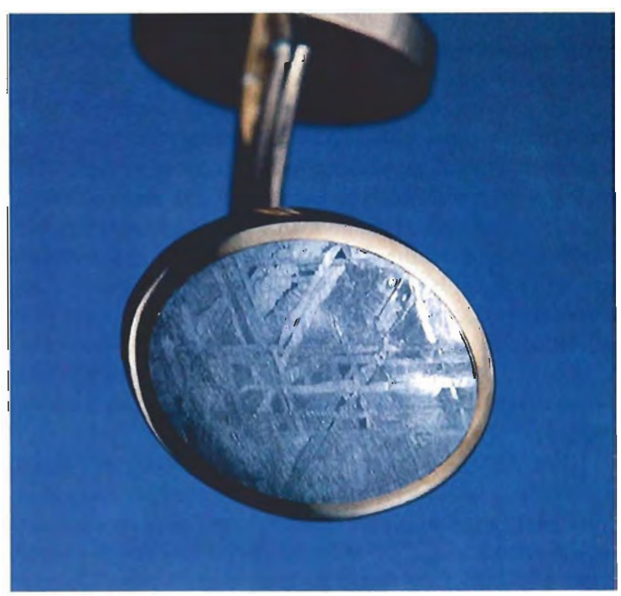


Figure 7. The fine black mabe assembled cultured blister pearls in these earrings measure approximately 14.6 × 12.8 mm; they are recent products of the Polynesian pearl culturing industry. Courtesy of Seung Hae Moon; photo by Maha Smith.

inner cavities were empty; that is, no wax or other filling material had been used. We saw similar assemblages, with creamy white body colors and strong iridescence, made from the curved turbo shell (again, the outer layer of shell had been polished away). "Osmenia pearls" were quite common several years ago; it is interesting to find them reappearing in the market.

Rare gemstones from Quebec. In October 1991, one of the editors (EF) visited the Mont St. Hilaire quarry near Montreal, Quebec. He was accompanied by Guy Langelier and Gilles Haineault, both of whom facet rare gems from this world-famous locality and provided information on the unusual gem species mined from Mont St. Hilaire.

Brownish red villiaumite sometimes exhibits two or three tones within a single gem and was seen in sizes up to about 5 ct, with larger pieces generally being quite dark. This material is very difficult to fashion, as it is water-soluble.

Carletonite, a mineral with a very saturated "royal" blue color, is also difficult to facet. It is relatively soft (Mohs hardness 4), cleavable, and strongly pleochroic. This pleochroism makes it necessary to orient the optic axis perpendicular to the table facet for good face-up color, although such orientation generally results in rather low weight retention. The largest faceted carletonite seen by Mr. Haineault is 1.48 ct.

Hackmanite, a variety of sodalite, is probably one of the most sought-after gems from this locality. Normally near colorless to light yellow, it typically turns pink on exposure to U.V. radiation, then fades within a few minutes (see pages 112-113 of the Summer 1989 Gem News). There is some variability in this reaction, however: Some stones barely change color on U.V. exposure, while others turn a deep pink that remains for some time after exposure to daylight. Mr. Haineault reports that the largest faceted hackmanite he has seen to date is a light yellow 15.33-ct shield cut.

Colorless natrolite crystals vary from completely transparent to somewhat hazy. Some larger crystals might yield faceted stones as large as 10 or 15 ct, although most stones cut to date have been under 5 ct.

Also seen were sphalerite gems, including a 55.62-ct oval of yellowish green ("olive") color. Some smaller, paler faceted stones resemble some yellowish green diamonds.

Among the other transparent faceted collector gems seen were colorless catapleiites, orange serandites, slightly violet albites, and colorless pectolites, all in sizes up to about 1 ct. Facet-quality burbankite, shortite, and cryolite are also found at Mont St. Hilaire. Finally, Mr. Langelier showed a rare 1-ct faceted, colorless vesuvianite from the Jeffrey mine.

Tajikistan to develop gem resources. Tajikistan, a former Soviet republic and now an independent central Asian state, is showing interest in developing its significant natural resources. The government has taken steps to encourage foreign investment in a number of basic industries, including mining, and is seeking outside help to identify commercially viable deposits. For the first time in decades, exploration by foreign firms is possible.

Gems and ornamental stones are among the resources receiving particular attention. A quarry near Pendjikent, in the far west of the republic, has been producing blocks of white marble since 1991 and is expected to yield material comparable to that from Carrara, Italy. Pink spinel is also being mined, as the Pamir Mountains lie in Tajikistan.

Figure 8. These shell assemblages, consisting of nautilus shell (the two on the left) and turbo shell (the two on the right), are somewhat reminiscent of mabe "pearls." The largest measures 28.50 × 17.22 × 9.84 mm. Photo by Maha Smith.


Figure 9. Application of a colorless, transparent acrylic spray to the otherwise dull surface of this 23.29-ct lapis lazuli cabochon (left, before treatment) caused a significant apparent improvement in its luster (right). Photos by Maha Smith.

Amethyst is being recovered near the city of Garm in the west-central region. Reportedly, significant mining of garnets has taken place, and ruby has been found that will soon reach world markets. Lapis lazuli, described as comparable to the finer grades from Afghanistan, has also been located in the Pamir Mountains, very close to the republic's border with Afghanistan. (*Mining Magazine*, January 1992, pp. 6-9)

ENHANCEMENTS

Acrylic coating of gem materials. It is well known that various surface coatings are used on gems to improve the apparent quality of their polish. Wax and paraffin are two substances reportedly used frequently, but plastic coatings have also been used on a number of gem materials (see, e.g., the entries on plastic-treated ammonite and enhanced Paua shell in Gem News, Spring 1991).

It was, therefore, with interest that the editors read a brief entry in a lapidary magazine in which the writer recommended two brands of aerosol sprays for enhancing the surface appearance of gems. One—a transparent, colorless acrylic spray—was subsequently purchased for experimentation.

One fashioned sample of lapis lazuli and one of jadeite (both with dull, worn surfaces) were chosen for the investigation. Each was given four separate light coatings with the acrylic spray, which resulted in significant improvement in apparent luster (figure 9).

When examined with magnification, the treated specimens appeared to have a somewhat unnatural, glassy appearance. Also noted was a slight concentration of the coating in surface irregularities, for example, in areas of undercutting and in carved recesses. The coating was easily scraped off the stones with a razor blade, and material so removed melted readily when tested with a thermal reaction tester. An acetone-dipped cotton swab rubbed across the base of one treated stone readily attacked and removed the coating, revealing the dull gemstone surface beneath.

Dyed massive beryl and quartz resembling ornamental gems. One of the editors (EF) was recently shown a new, enhanced gem product developed by Dominique Robert of Lausanne, Switzerland. The unnamed material consists of massive beryl with variable amounts of intergrown quartz; this composite is heat treated and then dyed purple to imitate such ornamental gem materials as charoite and sugilite. The heat treatment most likely increases porosity, which in turn permits deep penetration of the dye—to 0.5 mm or more, according to Mr. Robert. This was later confirmed when one of two rough specimens donated to GIA's permanent collection was fashioned into a cabochon (figure 10).

We subsequently learned that Mr. Robert was also producing this material in a "turquoise" blue and "coral" orangy red. All of the material is easy to identify from dye concentrations in fractures.

Figure 10. This cabochon (17.23 ct) and rough specimen (approximately 2.5 cm), which resemble charoite, consist of heat-treated and dyed massive intergrown beryl and quartz; the cabochon is primarily quartz while the unfashioned piece is predominantly beryl. White areas can be seen on the cabochon where the dyed surface layer was removed during fashioning. Photo by Robert Weldon.

Figure 11. This strand of beryl beads (6–7 mm in diameter) has been "color enhanced" by a combination of colored thread and dye concentrations in fractures and along the drill holes. Photo by Maha Smith.

Beryl beads with multiple color enhancements. Beads are commonly color enhanced in a number of ways. One of the simplest methods is to induce dye into fractures that were either pre-existing or intentionally induced by "quench crackling." Another technique is to coat the drill holes of pale beads with dye (e.g., a red dye for pink corundum beads so they will resemble ruby). Similarly, pale beads may be strung on a brightly colored thread.

This year at Tucson, the editors came across inexpensive strands of beads being sold as "aquamarine" that had their apparent color enhanced by both of the above methods (figure 11). Most obvious was the bright, slightly greenish blue thread on which the beads were strung. However, careful examination also revealed the presence of a greenish blue dye concentrated in surface-reaching fractures. We subsequently purchased a strand for investigation. Standard gemological testing on several beads confirmed that they were beryl. Examination of these beads with magnification revealed heavy concentrations of brightly colored dye lining the drill holes.

In an attempt to determine their true color, we soaked several beads for a few days in acetone, followed by a brief cleaning in an ultrasonic unit. After examination with magnification showed that most of the dye was removed from the fractures and drill holes, we restrung the beads on white thread. This revealed that, in addition to improving the apparent depth of color, the combination of dye and colored thread had helped to "homogenize" the color of the strand. The beads appeared much less well matched with the treatments removed, some beads being pale blue aquamarines while others were essentially colorless beryl (i.e., goshenite).

Treatable "concrete" opal. In the Fall 1990 Gem News, the editors reported on an opal material that apparently had been "sugar" treated and then coated with a plastic-like substance. This entry was subsequently expanded and published as an article in the February 1991 issue of *The Australian Gemmologist.*

As a follow-up, the editors were contacted by Paul B. Downing of Majestic Gems & Carvings, Tallahassee, Florida. Mr. Downing informed us that, over the past several years, a material has been found in quantity at Andamooka that is referred to locally as "concrete," or sandstone opal. This matrix opal differs from the traditional Andamooka matrix opal in that the newer material is much softer and more porous. Therefore, although "sugar" treated like the typical Andamooka material (see the excellent report on this method by Grahame Brown, in the Summer 1991 *Gems & Gemology*), it is then "toughened" with a plastic coating (figure 12). The product can be quite attractive, resembling the best Honduras matrix opal, with typical matrix patterns and the obvious black inclusions characteristic of sugar-treated material.

Silver-nitrate-treated matrix opal. A number of enhancements have been used on porous types of opal and opal-bearing rocks to produce a dark background for an otherwise weak play of color. In addition to the "sugar" treatment of Andamooka matrix opal mentioned above, there is also the "smoke treatment" of porous opal from Jalisco, Mexico, and the impregnation with black plastic of porous material from Brazil.

Recently, the editors learned of another treatment that produces a dark background for matrix opal, reminiscent of one used to produce black color in pearls. The "recipe" appeared in the August–December 1991 issue of *The Opal Express* and was provided by the Andria Bree Gem Co. of El Cajon, California. In this process, the stone is treated

Figure 12. This 1.20-ct specimen of "concrete" opal is a porous matrix-type of opal from Andamooka, Australia. The thin black layer represents a quick sugar-acid treatment carried out to determine how well the sample would respond. Specimen courtesy of Paul H. Downing; photo by Maha Smith.

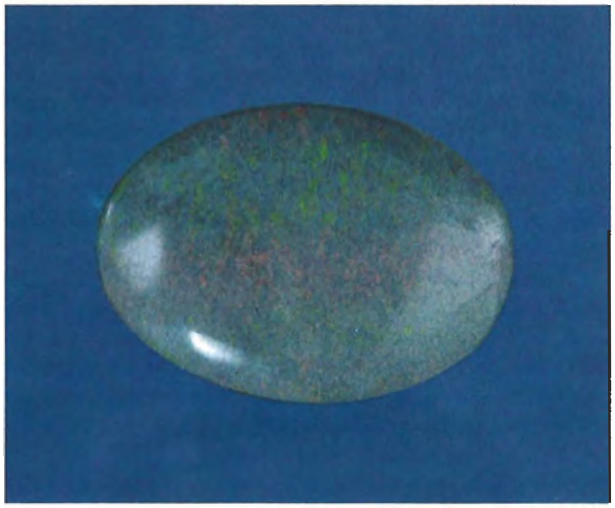


Figure 13. The dark background of this 5.00-ct matrix opal was produced by a silver-nitrate treatment. Photo by Maha Smith.

Figure 14. The 6.34-ct blue Egyptian turquoise cabochon on the right is untreated; the 9.04-ct green turquoise cabochon on the left, also from Egypt, was treated with mineral oil. Photo by Maha Smith.

after cutting but before final polishing. Following drying at low temperature, the matrix opal is gently heated in a silver-nitrate solution for several hours. The stone is then cleaned and heated in a solution of film developer, cleaned again, and given its final polish. An optional step—after the silver nitrate but before using the developer—is to place the stone in direct sunlight.

Tom and Phyllis Malicki of Benecia, California—opal enthusiasts who have first-hand experience with this treatment—provided the editors with a 5.00-ct oval cabochon of silver-nitrate-treated matrix opal (figure 13) and an untreated 9.53-ct specimen for comparison. The treated sample displays a medium-dark-gray background color that enhances the play of color. Magnification revealed dark, irregular specks reminiscent of sugar-treated material.

In an experiment conducted by the Gem News editors, an irregular piece of Andamooka matrix opal (provided by Paul Downing) was sawn in half; one section was retained as a control, while the other was treated in the silver-nitrate solution. The treatment produced a dark background color, as expected. Both treated and untreated sections were then examined using EDXRF, which revealed the presence of silver in the treated section and none in the untreated piece.

Modern-day turquoise oiling. The so-called "oiling" of emeralds is often justified by its supposedly ancient origins. Some in the international gem trade have even questioned the need to disclose the treatment on the same grounds of venerability.

In articles appearing in the July 1991 *Journal of Gemmology* and the October 1991 *Modern Jeweler*, however, Dr. Kurt Nassau reexamined the alleged antiquity of the treatment. He concluded that emerald oiling is probably less than 100 years old. Instead, it appears that the "oiling" mentioned in early texts involved the treatment of other gems to induce or improve a desired green color, for example, to turn blue turquoise green or improve the appearance of chalky malachite.

In Luxor, Egypt, in late 1991, one of the Gem News editors (RCK) learned of a modern-day turquoise treatment that appears to further justify Dr. Nassau's hypothesis. While looking through parcels of Egyptian turquoise at a Luxor gem shop, the editor was told that the predominantly blue material was preferred by many tourists, but that the local populace had a definite, long-standing preference for green material. The vendor then produced a plastic jar containing a viscous, colorless liquid and what appeared to be several hundred carats of turquoise cabochons.

The vendor described his turquoise treatment: First, mineral oil is boiled for approximately one hour and then allowed to return to room temperature. The turquoise to be treated—already fashioned—is placed in the "prepared" mineral oil and examined every day or so until the desired color change has occurred (normally one to two weeks). Finally, the stones are cleaned with denatured alcohol prior to sale. Figure 14 shows samples of Egyptian turquoise both before and after a one-week treatment.

SYNTHETICS AND SIMULANTS

Assembled imitation emerald crystal. The Summer 1989 Gem News column contained an entry on a clever imitation emerald crystal obtained in Brazil. The specimen was apparently produced by sawing in half a light-toned beryl crystal, coring out the two halves, filling the sections with a viscous green fluid, and reassembling them.

Recently, Thomas Chatham of Chatham Created Gems, San Francisco, California, loaned the editors the components of a similar imitation that had been disassembled. This particular simulant had been purchased in Bogotá, Colombia, by a Japanese buyer in 1991. The ruse was discovered when a cutter began to saw through the "crystal" near one of the terminations, causing a green fluid to leak from the stone.

This latest deceptive specimen consisted of a hollowed-out hexagonal prism that, even with the filling

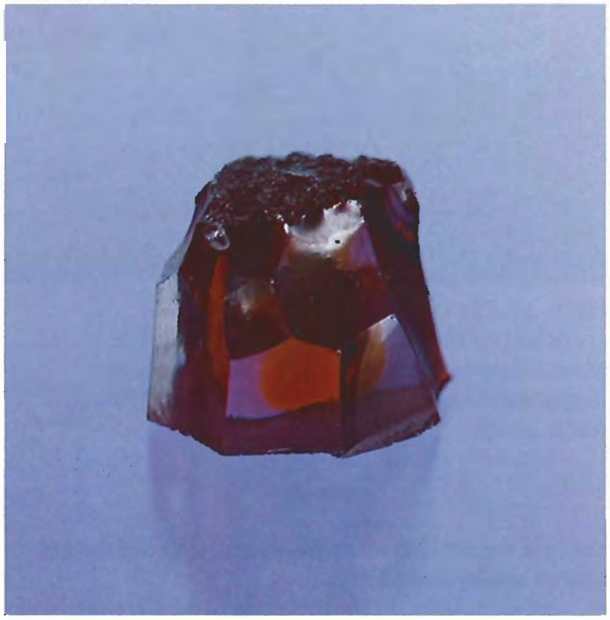


Figure 15. This 230.10-ct CZ displays interesting color zoning due to a combination of the dopants and growth conditions used. Photo by Maha Smith.

removed, appears medium-dark green. Examination under magnification, however, revealed the color to be due, at least partly, to a colored coating adhering to much of the internal cored surfaces; areas where the coating is absent appear nearly colorless. A second component of the assemblage is what appears to be a waterworn, elongated subhedral crystal, composed of (or coated with) a green substance. This component had been inserted in the hollowed-out cavity of the hexagonal prism. Although it could not be conclusively identified, its extremely low heft and very soft nature suggest a plastic.

The third component, the cap, is an assemblage of its own, consisting of a squat, soft, gray metal (lead?) plug covered with what appears to be a mixture of ground mineral matter in a polymer (?) groundmass that melted when the tip of a thermal reaction tester ("hot point") was applied gently.

Mr. Chatham informed us that this and other such deceptions are rumored to be produced in a "factory" in Bogotá. Among the other frauds reportedly produced there and seen by the editors are the glass imitation tourmaline crystal described below and two small hexagonal prisms with green surface coatings.

Update on nontransparent CZ. The Winter 1991 issue of *Gems & Gemology* included a report on nontransparent cubic zirconia from Russia. One gemological property not included in the report was refractive-index values, as conventional refractometers do not read above approximately 1.80.

Subsequently, the editors were contacted by Cornelius S. Hurlbut, Professor Emeritus of Mineralogy at Harvard University. Professor Hurlbut has been developing his own Brewster-angle refractometers and was interested in testing samples of the nontransparent CZs with his latest instrument. Samples used in the original study were therefore sent to him for testing.

Professor Hurlbut has since provided us with R.I. values for these Russian-produced materials: black, 2.140; pink, 2.160; and white, 2.165. Although readings on the latter two were taken on the slightly curved surfaces of cabochons, very consistent readings were obtained through approximately 50 tests on each type.

Bicolored CZ. As a further follow-up to the Winter 1991 *Gems & Gemology* report on nontransparent CZ from Russia, Joseph F. Wenckus, of the Ceres Corp., provided the editors with an interesting 230.10-ct CZ crystal section (figure 15) that has an orange core and a lavender periphery. According to Mr. Wenckus, the unusual bicolored effect is caused by the combination of dopants used—both cerium oxide (CeO_2) and neodymium oxide (Nd_2O_3)—and the conditions under which the crystal was grown—partially oxidizing. Reduced cerium oxide present in the core causes the orange color and masks the weaker color effect of the neodymium. Oxidized cerium oxide in the outer section of the crystal contributes no color, revealing the lavender hue caused by the neodymium dopant. It is possible that attractive color-zoned gems, reminiscent of amethyst-citrine ("ametrine"), could be cut from such a crystal.

Blue spinel from Vietnam as sapphire imitator. A number of incidents have been reported over the past year of synthetic rubies represented as natural rubies from Vietnam. A recent ICA Laboratory Alert, originating from the Hong Kong Gems Laboratory, reported that natural blue spinels from Vietnam have been represented as sapphires from that country. According to the report, the rough stones involved were quite large, in the range of 100–180 carats. Standard gemological testing carried out on one large specimen, first in the rough state and again after cutting, revealed properties consistent with those reported in the literature for spinel.

Glass imitation tourmaline crystal. Many simulants for Paraíba tourmaline—both rough and faceted—have been encountered in the gem trade (see, e.g., Gem News, Winter 1991). Recently, Thomas Chatham of Chatham Created Gems brought to the editors' attention another interesting tourmaline simulant. Purchased by a gem dealer in Bogotá, Colombia, the specimen weighs 49.81 ct and is a grayish blue color very similar to some indicolite tourmaline from Brazil (figure 16). In cross-section this "crystal" has the distinctive three-fold symmetry associated with tourmaline, and roughly parallel "striations" similar to those typical of tourmaline run the length of the specimen. Some of the more deeply recessed of the latter contained a reddish brown, earthy staining.

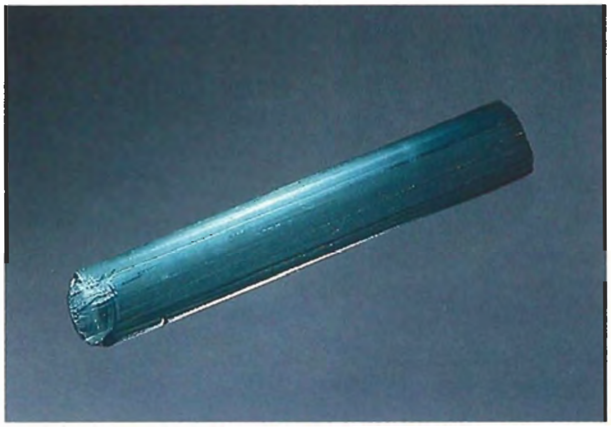


Figure 16. This 49.81-ct imitation of indicolite tourmaline was fabricated from glass. Specimen courtesy of Thomas Chatham. Photo by Maha Smith.

Although the long "crystal faces" have a dull luster that gives them a waterworn appearance, the two ends are vitreous, one consisting of a large conchoidal fracture. Through the latter it was possible with magnification to resolve a single spherical gas bubble. Other properties (spot R.I. 1.52, moderate heft, strong anomalous double refraction) were also consistent with those of glass.

More synthetics sold as natural rubies from Vietnam. In both the *Gems & Gemology* article on Vietnamese rubies (Fall 1991) and a subsequent Gem News entry (Winter 1991), we reported that flame-fusion synthetic rubies have been sold as natural stones in Vietnam.

Since then, other gem laboratories have reported a number of cases of similar deceptions in Vietnam and elsewhere. A March 27, 1992, update to the International Colored Gemstone Association's Laboratory Alert No. 22 contains a report from Dr. Grahame Brown of Allgem Services, Brisbane, Australia, on what outwardly resembled waterworn natural ruby crystals, but proved to be Verneuil synthetics.

In Dr. Brown's experience, as well as that of the Gem News editors and others, immersion can help reveal the curved growth associated with Verneuil synthetic rubies, especially when the exterior of a sample has been abraded to simulate the effects of alluvial transport. With this in mind, gemologists purchasing rough corundum should consider carrying an immersion cell, or other transparent container, to check for these diagnostic features.

Experimental synthetic sodalite from China. In late 1991, Professor Liu of the Institute of Geochemistry of the Academia Sinica in Guangzhou, China, donated to GIA a number of laboratory-grown materials produced in his country. These include synthetic quartzes (amethyst and citrine), flame-fusion synthetic corundums, synthetic cat's-eye alexandrite, synthetic spinel, green YAG, and various colors of CZ.

Perhaps the most interesting specimens, however, were three samples of synthetic sodalite that ranged in weight from 20.38 to 57.39 ct. Professor Liu reported that the samples, which were heavily included and twinned, were produced experimentally, with research ongoing to improve the quality. As grown, the synthetic sodalite is colorless; it is subsequently irradiated to produce an attractive blue color (figure 17).

Figure 17. This 20.38-ct synthetic sodalite crystal was produced in China. Photo by Robert Weldon.

INSTRUMENTATION

Low-cost quartz wedge simulator. Determining whether a gem is uniaxial or biaxial can help distinguish among anisotropic gems with similar refractive indices and birefringence, such as transparent yellow labradorite feldspar and golden beryl. This can be done by plotting refractometer readings or by resolving an interference optic figure between crossed polars. Occasionally, a gemologist will also need to determine whether a gem is positive or negative in optic sign—to separate, for example, quartz (uniaxial positive) from scapolite (uniaxial negative). This, too, is most commonly done by plotting readings from the refractometer, provided there is an appropriate facet to test.

Another method, more familiar to mineralogists than to gemologists, is to use a quartz wedge in conjunction with a polariscope and condensing lens. Unfortunately, quartz wedges are rather costly and difficult to obtain; in practice, few gemologists use them. Hanneman Gemological Instruments of Castro Valley, California, now offers a low-cost alternative. Called the Hanneman-Daly Wavelength Modifier & Quartz Wedge Simulator, this accessory is used in essentially the same manner as a quartz wedge. Those familiar with the quartz wedge should have little difficulty working with the Hanneman product.