

Gem Trade LAB NOTES

EDITOR

C. W. Fryer
GIA, Santa Monica

CONTRIBUTING EDITORS

Robert Crowningshield
Gem Trade Laboratory, New York

Karin N. Hurwit
Gem Trade Laboratory, Los Angeles

Robert E. Kane
Gem Trade Laboratory, Los Angeles

BERYL, Bicolor

Recently sent to the Los Angeles laboratory for identification was an interesting 9.66-ct bicolored (light blue and colorless) modified emerald-cut stone (figure 1). Subsequent testing revealed that this stone was beryl. The following properties were observed: refractive indices of 1.563–1.570, no reaction to long- or short-wave ultraviolet radiation, and a broad absorption band of moderate strength centered at 427 nm in the visible spectrum of the blue portion of the stone. This spectral absorption is typical of many aquamarines. There was no absorption spectrum for the colorless section. Examination with the microscope revealed inclusions that are typical of beryl. Very prominent, distinct, angular and straight parallel growth features were confined to the blue portion.

This is the first time that we have seen a faceted bicolored beryl consisting of aquamarine and goshenite. We have, however, seen similar color zoning in beryl crystals, particularly those from Nigeria. In the Nigerian crystals that we examined, light green and colorless color zoning was more common than was light blue and colorless, perhaps because these crystals had not yet been heat treated.

RK

Editor's Note: The initials at the end of each item identify the contributing editor who provided that item.

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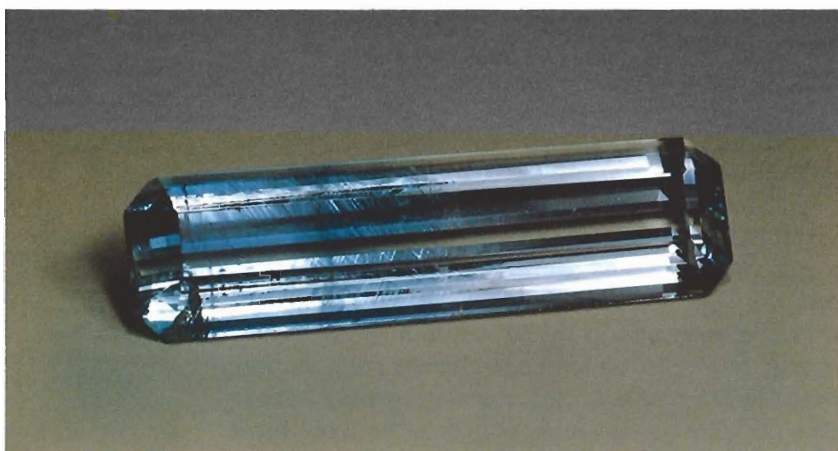


Figure 1. This 9.66-ct bicolored beryl consists of both aquamarine and goshenite.

DIAMOND

Heat-Induced Color Change in Diamond

One of our clients often shares with the New York laboratory unusual diamond specimens from his family's mining operation in Guyana. Many of the rough diamond crystals that they mine have a green "skin" caused by natural irradiation staining.

Recently, our client donated a parcel of four diamond crystals. All except the largest piece (1.12 ct) were greenish in color. Our client explained that the largest crystal was green when mined, but it turned yellow-brown when it was sawed by a laser. Figure 2 shows the now yellow-brown lasered crystal next to another crystal which approximates the original color. Note the "step-like" laser saw marks on the

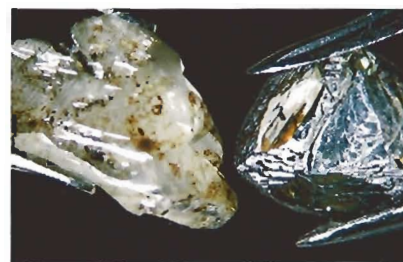


Figure 2. The diamond on the left turned yellow-brown during laser sawing. It was originally green like the stone on the right. Magnified 15x.

yellow-brown stone. When a green-skinned diamond is heated, the green areas will often change to brown or yellow, just as green diamonds are changed from dark green to yellow or brown by heat treatment. In this case, the heat of the laser

(1200°–1300°C) was enough to effect this color change. RC

Diamond With Natural Internal Irradiation Stain

Green and brown surface irradiation stains have traditionally been used to identify natural color in green diamonds. These characteristic stains are a result of natural irradiation within the earth. Occasionally, a near-colorless or very light yellow diamond may also have some natural irradiation stains. Theoretically, such a stone could be artificially irradiated to produce a green color. Consequently, these stains are not proof of natural origin of color, but only an indication. Unfortunately, not all artificially treated diamonds exhibit the 592 nm (5920 Å) absorption line that, when present, has been considered characteristic of artificially irradiated diamonds.

A 2.40-ct very light yellow pear-shaped diamond was submitted to the New York laboratory for a damage report. During the initial examination we noted a natural brown irradiation stain on the girdle. While examining the flaw in question (an inherent fracture) we noticed a natural irradiation stain within the stone on one of the planar surfaces of the fracture (figure 3). This is the first time the laboratory has seen an irradiation stain inside a diamond. It was located at a depth of approximately

Figure 3. Internal irradiation stain on a fracture in a diamond. Magnified 20×

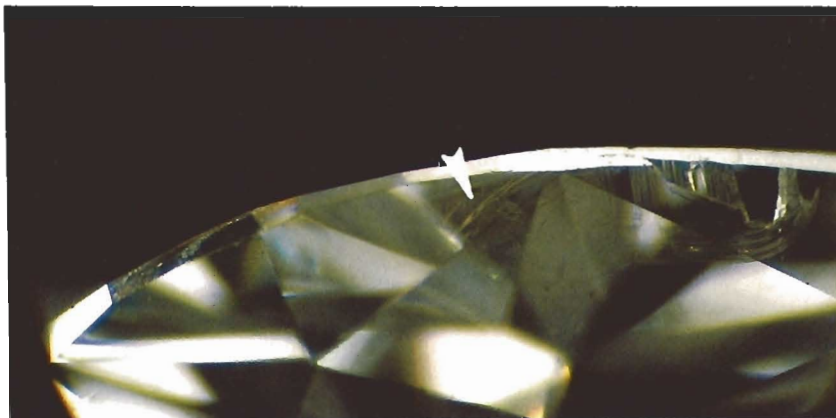


Figure 4. The two parts (4.72 ct and 2.41 ct, respectively) of a piggyback diamond.

1 mm. We can only speculate as to the cause of the interior staining. Perhaps a radioactive liquid infiltrated the fracture at one time. RC

Piggyback Diamond

A Maryland jeweler recently encountered a very unusual diamond



Figure 5. The piggyback diamond illustrated in figure 4 is shown here assembled as it would be in the mounting.

ring. The ring was set with approximately 15 pear-shaped diamonds of about one carat each. In the center was what appeared to be a large, approximately 9 to 9.5-ct, yellow pear-shaped stone. However, on closer examination the stone was found to actually be two diamonds mounted one directly below the other and held in place by the mounting; no cement was used to hold the two stones together. The center "stone" was removed from the mounting and sent to GIA to photograph and examine. The top section, a thin pear-shaped window diamond with no pavilion, weighed 4.72 ct and measured approximately 17.50 × 12.55 × 2.46 mm deep. The bottom "pavilion" portion was a complete pear-shaped brilliant that weighed 2.41 ct and measured approximately 12.50 × 7.23 × 4.48 mm deep. The two separate components are shown in figure 4. This type of deceptive assemblage, known as a piggyback diamond, is seen only occasionally in the trade, and few jewelers are even aware that such items exist. As illustrated in figure 5, when assembled this stone looks remarkably good. It is generally good practice to be suspicious if a large diamond is mounted in such a way that only the culet area and crown are visible. John I. Koivula



Figure 6. This cubic zirconia was cut to simulate a 10-ct fancy yellow octagonal modified brilliant-cut diamond.

FANCY DIAMOND SIMULANT, Yellow Cubic Zirconia

Over the past few years we have noticed an unusual interest on the part of diamond dealers and cutters in large, off-color, light yellow, emerald-cut diamonds. We eventually learned that these stones were being recut as octagonal modified brilliants. The light yellow could become fancy light yellow or even fancy yellow because the new cuts intensify and deepen the apparent color.

It now appears that this technique has been used on diamond simulants as well. A client recently submitted to the New York laboratory a ring set with what she thought was a 10-ct fancy yellow octagonal modified brilliant-cut diamond (figure 6). However, routine testing proved the stone to be yellow cubic zirconia. This is the first time we have seen cubic zirconia cut to imitate a fancy yellow octagonal modified brilliant. Figure 7 shows two of the facet arrangements seen on this style of cut. RC

Melted GARNET-and-GLASS Doublet

It is quite probable that the 1.69-ct garnet-and-glass doublet recently examined in the New York lab [fig-

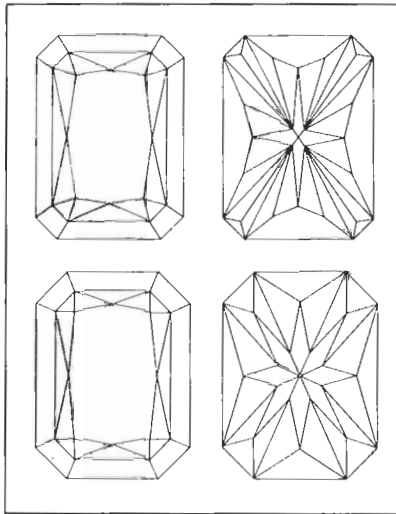


Figure 7. Facet diagrams of two different octagonal modified brilliant cuts.

ure 8) was mistaken for a natural gemstone and left in its setting during repair work, even though the repair work required heat. The red glass, which constitutes the main portion of the doublet, is obviously distorted and has even melted over the edges of the thin garnet crown. Certain types of glass often have a

very low melting point, and the glass in this particular doublet even melts easily when touched with the thermal reaction tester. Also note where the hot prongs of the setting left indentations along the girdle of the glass. RC

Carved JET

Figure 9 shows an opaque black carved urn measuring approximately 12.1 × 6.3 × 31.8 cm (4¾ × 2½ × 12½ in.) high that we received in the Los Angeles lab for examination. Our client questioned whether the material was in fact "black amber." This term is sometimes used in the trade for jet, a form of fossilized wood altered to brown coal. The carving had a waxy luster, was fairly soft, and was easily scratched with a pin. Although it had a poor polish, we were able to obtain a vague refractive index reading of 1.59, considerably lower than the 1.66 figure that is usually listed in the gemological literature for jet.

When the piece was exposed to ultraviolet radiation, both long and short wave, a faint orangy fluores-

Figure 8. Heat-damaged 1.69-ct garnet-and-glass doublet. Magnified 20×.

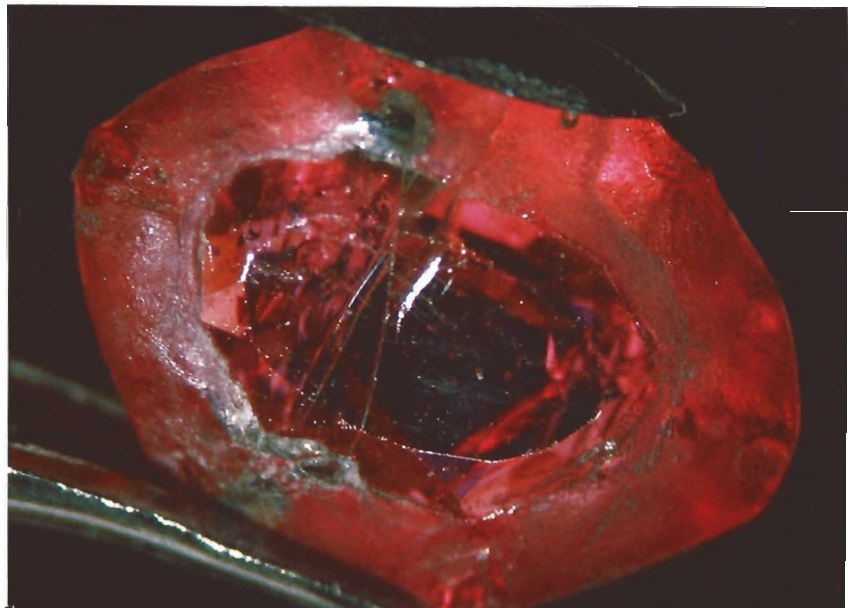




Figure 9. This carved urn, $12.1 \times 6.3 \times 31.8$ cm, is believed to be jet in spite of its low refractive index.

cence became visible. A thermal reaction test produced an organic odor typical of burning coal. In addition, the material left a brown streak on an unglazed porcelain plate, also indicating that it might be some type of coal. We were satisfied that this was jet, or coal, in spite of the low R.I. KH

Oiled LAPIS LAZULI

An importer of fine lapis lazuli beads that had reportedly originated in Afghanistan was perplexed by an apparent difference in luster among the beads. He suspected that some of them had been oiled to improve their appearance.

After establishing that the 10-mm beads shown in figure 10 were in fact lapis lazuli, the New York laboratory used the thermal reaction tester and magnification to examine the beads for oil or paraffin. All of the beads showed the characteristic evidence of oil being drawn to the surface by the heated probe. Some of the beads had heavy concen-

trations of oil in the drill holes and fine cracks. Oil rather than paraffin was indicated because the liquid did not turn white on cooling as paraffin will. No evidence of blue dye was observed when the beads were examined with the microscope or were checked with an acetone solvent.

Oil or paraffin treatment has been used historically to "set" dye in such stones as jade, lapis lazuli, and tumbled amazonite. Although we are certain that the beads we examined were not dyed, we do not know why oil treatment alone was used, unless it was to cover a poor polish.

RC

PEARLS

Conch "Pearls"

Both the Los Angeles and the New York laboratories had the opportunity to examine a selection of pink calcareous concretions, commonly referred to as conch "pearls," that ranged in weight from 0.67 ct to 5.10 ct. Figure 11 gives some indication of the range of colors and shapes in

which conch pearls occur. The client who submitted them to us stated that the conch pearl that is second from the right in the top row in figure 11 seems to be the classic shape of the better-color ones.

Our client represented the owner of the conch pearls, who is a commercial supplier of conch meat. These particular conch pearls were reportedly found in the waters off the islands of St. Christopher (also known as St. Kitt) and Nevis in the Lesser Antilles of the Caribbean. As to the rarity of these conch pearls, we were informed that in 12 months of shipping over 25,000 lbs. of conch meat, which represents approximately 54,000 conchs, only four large (5–10 ct) and a few dozen smaller "pearls" were found. Our client informed us that the best pink colors are found in the outer parts of the conch near what the divers call the horn, a hook-like muscle that the conch uses to pull itself along. The color and translucency of the "pearl" are poorer the farther back into the animal the "pearl" is formed.

Figure 10. These 10-mm beads of Afghanistan lapis lazuli were found to have been oil treated.





Figure 11. A selection (0.67–5.10 ct) of calcareous concretions known in the trade as "conch pearls."

Opaque brown to yellow conch pearls are also found, but these are usually discarded because of their unappealing appearance.

All of these conch pearls showed the characteristic flame-like structure. Note the two center pieces in the bottom row of figure 11. These represent one pearl that was sawed in half, revealing an interesting cross-sectional coloration and structure.

RK

Imitation $\frac{3}{4}$ Cultured Blister Pearls

It has been said that imitation is the sincerest form of flattery. In the jewelry trade, imitations are usually confined to popular, well-established items, such as diamonds. It was therefore unusual for the New York laboratory to examine an imitation of something relatively new to the pearl market: the $\frac{3}{4}$ cultured blister pearl (figure 12). This type of pearl was previously described in the

Figure 12. A 17-mm imitation $\frac{3}{4}$ cultured blister pearl.



Summer 1981 (p. 104) and Winter 1983 (p. 235) issues of *Gems & Gemology*.

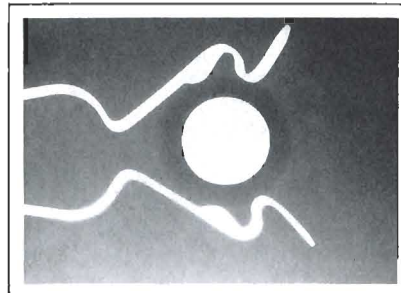
One of our clients bought a large selection of what he thought were variously colored $\frac{3}{4}$ cultured blister pearls in Hong Kong. Upon X-ray testing one of these "pearls," we determined that it was made out of plastic with a solid metallic core to give it weight (figure 13). Figure 14 shows the crazing that occurred on the surface of the plastic when the "pearl" was immersed in safety film cleaner for X-radiography.

RC

RUBY, with Unusual Inclusions

Some time ago, the Los Angeles laboratory was asked to identify an attractive purplish red oval mixed-cut stone that weighed slightly over one

Figure 13. This X-radiograph of the imitation pearl shown in figure 12 reveals a metal core and a plastic surface.



carat. Standard gemological tests identified the stone as a ruby which was inert to short-wave ultraviolet radiation but fluoresced a weak red to long-wave ultraviolet radiation. When the stone was viewed with magnification, some of the inclusions were quite puzzling. Very fine "silk"-like inclusions were arranged in layers that fanned out into veils. These inclusions resembled the wispy veil-like inclusions that sometimes occur in Czochralski synthetic stones. We also noticed two parallel twinning planes and a small iron stain in one corner of the stone which indicated natural origin. Since our findings were not conclusive, we asked the GIA Research Department to analyze this ruby by means of X-ray fluorescence to determine the trace elements that would indicate natural or synthetic origin. The trace elements that were found in this ruby were mainly chromium, iron, and gallium; no elements that would suggest a synthetic origin were found. On the basis of these tests, we concluded that this stone was indeed a natural ruby that happened to have very unusual inclusions that mimicked those sometimes seen in some synthetics.

KH

SPINEL, Color Change

In the Winter 1984 issue of *Gems & Gemology*, we reported on an attrac-

Figure 14. The surface of the imitation pearl shown in figures 12 and 13 was crazed when the bead was immersed in safety film cleaner. Magnified 10 $\times$.



tive natural spinel that exhibited a color change from pinkish purple when viewed with fluorescent illumination to purplish pink under incandescent light. One of the interesting features of this stone was the moderate chalky yellowish green fluorescence it exhibited when exposed to long-wave ultraviolet radiation. The Los Angeles lab recently had the opportunity to examine another interesting natural spinel. This spinel showed a weak color change, more of a tonal change really, from light grayish purple to medium grayish purple. This stone also exhibited a chalky yellowish green fluorescence (very weak) when exposed to long-wave ultraviolet radiation. It was inert to short-wave ultraviolet radiation, as was the previously mentioned color-change spinel.

RK

Synthetic SPINEL, Color Change

Of the many types of synthetic spinel, the color-change or "alexandrite-like" variety is the one least often encountered in the laboratory. The Los Angeles laboratory recently examined a synthetic color-change spinel with a "rather believable" color change from dark bluish green when viewed with fluorescent illumination to dark brownish green under incandescent lighting. This is in contrast to the unrealistic color change exhibited by the very commonly encountered synthetic color-change sapphire. Despite the realistic color change, this type of synthetic spinel can be readily identified with standard gemological tests.

RK

Synthetic ZINCITE

In New York, we recently examined a 4.05-ct transparent yellow round brilliant. At first glance, we thought it might be a synthetic rutile or the unusual tetragonal cubic zirconia. When the stone was tested, the R.I.



Figure 15. New hydrothermal synthetic zincite on the left, accidental synthetic zincite furnace products on the right.

proved to be over the limits of the refractometer, the polariscope revealed a uniaxial optic figure, the specific gravity was 5.70, and a hardness of approximately 4–4½ was determined. There was no diagnostic spectrum. At the request of our client, a sample of the rough was sent to

the Applied Gemology Division of the Research Department at GIA, where X-ray diffraction analysis proved the material to be synthetic zincite.

The client indicated that this material is the by-product of an industrial process used in Poland. However, its softness precludes its use in jewelry. A rare, vivid red zincite does occur in nature; it is prized by collectors both as rough material and when faceted.

Synthetic zincite has been produced experimentally by at least two methods, hydrothermal and vapor growth. Figure 15 (left) shows a new hydrothermal specimen that weighs 20.2 grams and measures 33 mm long. The larger of the two accidental products on the right is a 5.3-gram piece from a furnace fragment that originally weighed 171 grams. The assorted colors of the hydrothermally grown synthetic zincite shown in figure 16 are the result of various impurities. Figure 17 shows examples of synthetic zincite grown by the vapor growth method.

RC

Figure 16. The various colors of this hydrothermally grown synthetic zincite are caused by the use of different impurities. The large black specimen is 43 mm long and weighs 52.1 grams.



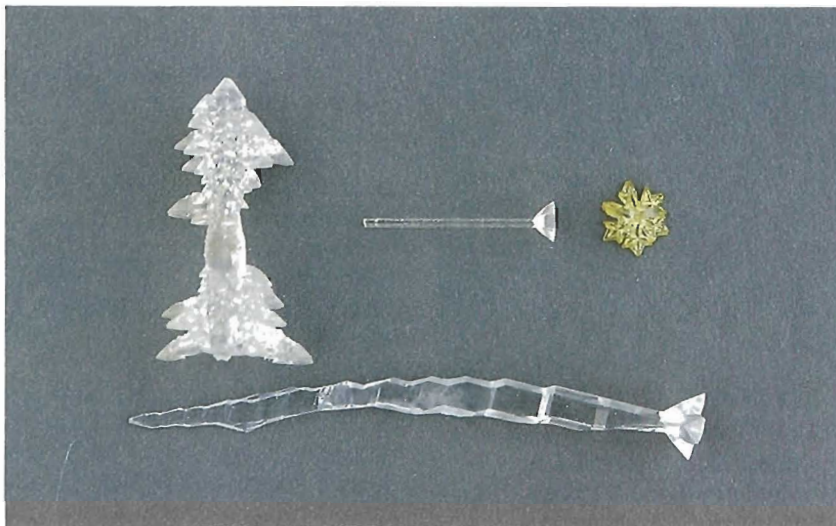


Figure 17. These crystals of synthetic zincite were produced by the vapor growth method. The largest specimen is 45 mm long.

UNCLASSIFIED ODDITY

In the Spring 1983 issue of *Gems & Gemology* (p. 49), we discussed an item under "Unclassified Oddities." We stated that "although we know it is of organic origin, we have no idea what creature created it, or how it was formed." Recently, I received a telephone call from GIA student

Michael Patterson of Florida, who believed that he could identify the item in question, shown here in figure 18. He thinks it is the lens from the eye of a fish that has been boiled. In his experience, when the fish is boiled the lens turns white and becomes quite hard. This seems to be a reasonable explanation, since our ob-



Figure 18. This broken concretion with a bead-like core (13 mm in diameter) may be the lens from a boiled fish eye.

ject was found in a can of fish sold as cat food, which surely would include parts of a fish not normally used for human consumption. The light beige color could be the result of staining from the oils present in the can. Our thanks to Mr. Patterson for taking the time to call us with this explanation. CF

FIGURE CREDITS

Figures 1, 9, and 11 were supplied by Shane McClure. Chuck Fryer took the photos used in figures 4, 5, and 18. Dave Hargett furnished figures 2, 3, 6, 8, 10, and 12-14. Dr. Kurt Nassau very kindly allowed us to use his photographs for figures 15-17.

5TH ANNUAL GEMS & GEMOLOGY MOST VALUABLE ARTICLE AWARD

The Winter issue marks the end of the 1985 *Gems & Gemology* volume year. Once again, we are asking you, our subscribers, to participate in the 5th Annual Most Valuable Article Award. We count on you to give our authors the recognition they deserve for the time and effort invested in their articles. We also need to hear your feelings about *Gems & Gemology* — we value your opinion and want the journal to continue to reflect your needs and interests.

Your ballot is located on the insert card inside this issue. Please choose three articles from 1985 and mark them in order of numerical

preference: (1) first, (2) second, (3) third. Be sure to mark only three articles for the entire year. Additional comments concerning the journal are welcome in the space provided.

After voting, detach the postcard ballot and drop it in the mail (postage is prepaid if mailed in the U.S.). Ballots must be received by March 10, 1985 to be included in the final tally.

The winning articles will be announced in the Spring 1986 issue of *Gems & Gemology*. Cash awards of \$500, \$300, and \$100, respectively, will be given to the authors of the articles that place first, second, and third in the balloting.