Gem Trade LAB NOTES

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AMETHYST, Unusual Natural Inclusion

Before synthetic amethyst was available on the market, we seldom felt it necessary to examine every amethyst under magnification to observe any inclusions that might be present. However, the advent of the synthetic material has made it necessary to study the inclusions in each stone to determine, if possible, natural or synthetic origin. Figure 1 shows an amethyst that came into the New York lab for identification. The inclusions, which resemble a pie-shaped galaxy of red stars, are goethite, an iron-oxide mineral. While the presence of goethite establishes the natural origin of the stone, this is the first time we have observed this unusual zonal distribution in amethyst. *R.C.*

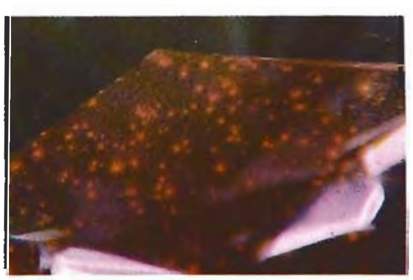


Figure 1. Unusual zonal distribution of goethite inclusions in amethyst. Magnified 30×.

CUMMINGTONITE-GRUNERITE, A Series in the Amphibole Group

Recently submitted to the Los Angeles laboratory for identification was a piece of rough material with one polished face that consisted of an opaque black center section bordered by two opaque yellowish brown areas (figure 2).

Figure 2. This amphibole rock—measuring 36.3 × 23.0 × 21.2 mm—is slated for use as an ornamental stone.

When the specimen was examined with the unaided eye, white inclusions were observed scattered throughout the opaque black material. Testing of the black area with a refractometer revealed vague readings of 1.54 to 1.55 and 1.64 to 1.65, indicating the presence of more than one mineral within that portion of the rock.

A minute amount of powder was scraped from the black portion for X-ray diffraction analysis. The results of the X-ray powder diffraction showed that the black material is a

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

rock consisting of at least three different minerals, one of which is an amphibole, probably in the cummingtonite-grunerite series. There were not enough diffraction lines to identify the other components. Nongemological, probably petrographic, tests would be required to identify the rock type.

This material is reportedly from a deposit in North Carolina. The client who submitted the sample for identification explained that the owner of the specimen had several hundred kilos of this material and planned to market it for use as an ornamental gem, that is, for carvings, cabochons, and inlaid stones in jewelry. The jeweler-gemologist should not be surprised, therefore, if he encounters this material at some future time. *R.K.*

DIAMOND

Coated Diamonds

Longtime readers of *Gems & Gemology* will no doubt recall the important article by Eunice R. Miles on "Diamond Coating Techniques and Methods of Detection," which appeared in the Winter 1962-63 issue. At that time, the practice of coating diamonds had become so insidious and damaging to the trade that in September 1962 the New York state legislature enacted a law prohibiting the use of the technique unless it was fully disclosed to the purchaser.

Since then, the Gem Trade Laboratory has seen only about three or four coated stones a year. In fact, some of the more recent staff members had never even seen or tried to color grade such a stone. Approximately six months ago, however, an unusual number of coated diamonds started to come in to both the Los Angeles and the New York labs.

These stones were not being submitted by appraisers or jewelers who were suspicious of the color, but rather by cutters and brokers. Twenty years ago, graders familiar with coated stones became cautious when the stones looked "wrong" in the color grader. However, using the same "double lighting" recommended originally by Mrs. Miles, very discrete coatings were detected. For the most part the actual colors of the stones before coating have been found to be H or I. With the coating, some might have been graded as high as G if they hadn't had that suspicious grayish appearance. In at least one recent case, the client submitting an uncoated stone that had been found to grade H asked for a color recheck within a week after the report had been issued. When the stone was reexamined, it was found to have a coating that gave it an F to G appearance, but with a grayish cast. Clearly, the laboratory was being used.

For the most part, the coatings seen recently are beautifully applied and could be easily overlooked. Sometimes only a ghostly band on one side of the girdle can be detected. In other cases, the band lies on both the pavilion and the crown side of the girdle, as in figure 3. The coating is so thin that no effort has been made to analyze it. However, its resistant nature suggests that it may be similar to the blue-to-violet hard enamel (flux) reported by Mrs. Miles in 1962. *R.C.*

Dendrite-like Inclusion

The Gem Trade Lab Notes section of the Spring 1984 issue featured a photo of a stepped laser drill hole connecting several inclusions. Figure 4 shows a rare, step-like *natural* dendrite-like inclusion that appears to connect several included crystals in a diamond that was submitted to our New York laboratory for grading. *R.C.*

DIOPSIDE

A few months ago, a gemologist from Sri Lanka asked the Santa Monica lab to help in the identification of a 0.72-ct emerald-cut grayish lavender stone. This stone was highly birefringent, .029, with a refractive index of 1.671–1.700. The optic character was biaxial positive; a biaxial optic figure could even be obtained on the pavilion of the stone near the culet. No absorption lines were visible in the hand spectroscope. The fluorescence was faint chalky greenish white to short-wave ultraviolet radiation, but inert to long-wave ultraviolet radiation. We determined the specific gravity by the hydrostatic method to be 3.31. The properties of this stone indicated diopside, despite its unusual color. X-ray diffraction confirmed our other test results. *K.H.*

Figure 3. The arrow points to areas of coating that are evident on both sides of the girdle of this coated diamond. Magnified 30×.

Figure 4. This unusual dendritic inclusion in diamond resembles a step-like laser drill hole. Magnified 20×.

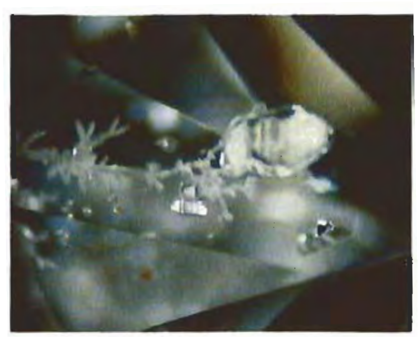


Figure 5. Artistically stained nephrite carving, 23.4 × 7.2 × 9.5 cm.

JADE

Artistically Stained Nephrite

The Los Angeles laboratory received for identification a translucent to opaque variegated pale green and brown carving of two birds which measured approximately 23.4 × 7.2 × 9.5 cm. Subsequent testing of the carving revealed that it was nephrite jade.

During preliminary examination, we observed that the variegated brown coloration was unnatural in appearance. In addition to somewhat large areas of brown color on the carving, nearly all of the shallow carved depressions (see the wing areas of figure 5) showed brown coloration in contrast to the pale green raised areas directly next to them. This appearance very strongly suggested that the brown color in these areas was probably caused by artificial staining or dyeing in an attempt to highlight the carved details.

The least destructive test for dyed gem materials was then implemented. When an inconspicuous brown area was rubbed with an acetone-soaked cotton swab, however, absolutely no stain appeared on the swab. Inasmuch as some dyes and stains are not removed from certain gem materials with acetone alone, we decided to try a 10% hydrochloric acid solution next. When the same area of the carving was rubbed vigorously with a cotton swab soaked in the acid solution, a light brown stain was produced on the swab. This evidence, together with the unnatural appearance of the piece, led us to conclude that this carving had been artistically stained in a manner similar to that commonly seen on nephrite jade carvings. Since no attempt had been made to enhance the color of the entire carving, with the dye or stain having been applied only in selected areas to highlight the details of the carving, the following conclusion was stated on our gem report: NEPHRITE JADE, with some areas of artistic staining. *R.K.*

Figure 6. A strand of dyed green nephrite beads, each approximately 9 mm in diameter.

Dyed Nephrite

Unlike the artistic staining described above, some nephrite is being dyed so that the color is changed throughout the material. The first potentially commercial quantity of green dyed nephrite we have encountered for some time were the cabochons reported in the Spring 1984 issue of *Gems & Gemology.* Figure 6 shows the first strand of beads of this material submitted to our New York laboratory. The absorption spectrum of these 9-mm beads is very similar to that seen in the more familiar dyed jadeite, indicating that the same dye may have been used. If so, the stones would probably be just as susceptible to fading as dyed green jadeite is.

R.C.

PEARLS

Imitation Mabe Pearls

The two items shown in figure 7 were brought to our Los Angeles lab-

Figure 7. Imitation Mabe pearls. The finished "pearl" on the right measures 17 × 15 mm.

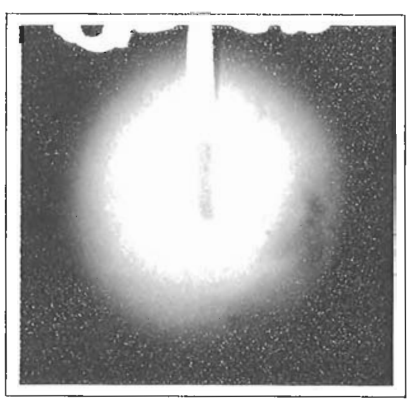
oratory for identification. They were being offered on the market as "Mabe pearls." Gemologists should remember that a Mabe pearl is an induced blister pearl that has been cut from the shell and the nacreous half-dome then cemented over a mother-of-pearl bead of approximately the same size as the hollow in the dome. The rest of the hollow is then filled with a material that looks like Canada balsam and a base of mother-of-pearl is cemented on.

As figure 7 shows, the "pearl" on the left appears to be a blister pearl still attached to the shell, whereas the one on the right looks like a finished product. Clearly visible in the specimen on the right is a line of demarcation, which suggests a mother-of-pearl base cemented to the blister pearl. Preliminary examination indicated that both items were imitations, since both had a very low specific gravity judging by their heft; both felt very smooth and warm to the touch; and neither had any orient. Under magnification, some small gas bubbles were visible; in addition, both items were easily indented by the pin point of a brush probe, which suggests that these "pearls" were made from some type of plastic.

When we viewed the two samples with the microscope, we noticed many small bubbles oriented in very closely spaced parallel layers, thus producing the appearance of a demarcation line within the otherwise uniform material. These "Mabe pearls" were certainly the most realistic imitations we have encountered. *K.H.*

Figure 8. Flattened freshwater cultured pearl earrings, 18 mm in diameter.

Figure 9. This X-radiograph of one of the pearls pictured in figure 8 was taken in the flat direction and shows no evidence of a nucleus.



Unusual Cultured Pearls

An attractive pair of somewhat flattened 18-mm pearls on pendant earrings (figure 8) fluoresced strongly to X-radiation, indicating freshwater origin. Although the X-radiograph taken in the flat direction (figure 9) was inconclusive, that taken with the pearls on edge (figure 10) shows flattened lentil-shaped nuclei. These are the first freshwater cultured pearls of this type we have seen in the New York laboratory.

Coincidentally, the New York laboratory also received a pair of button-shaped pearls set in stud earrings for testing (figure 11). They displayed weak to moderate fluorescence when exposed to X-radiation. The X-radiograph (figure 12) shows that they, too, are cultured pearls with lentil-shaped nuclei. The weak fluorescence indicates saltwater origin. We have only encountered such nuclei a few times in the past 30 years. We have been told that such pearls are rare because off-round nuclei in saltwater mollusks increases the mortality rate to an unacceptable level.

Figure 10. This X-radiograph of the pearls in figure 8 was taken with the pearls on edge; it shows their lentil-shaped nuclei and thus proves their cultured origin.

Figure 11. Saltwater cultured pearls set in earrings, 10 mm in diameter.

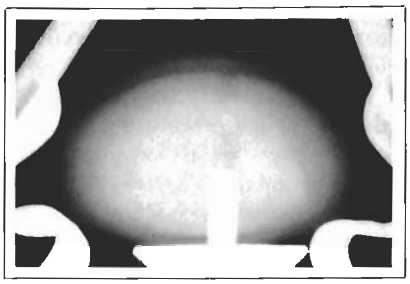


Figure 12. This X-radiograph of one of the pearls in figure 11 also reveals a lentil-shaped nucleus under a thin layer of nacre.

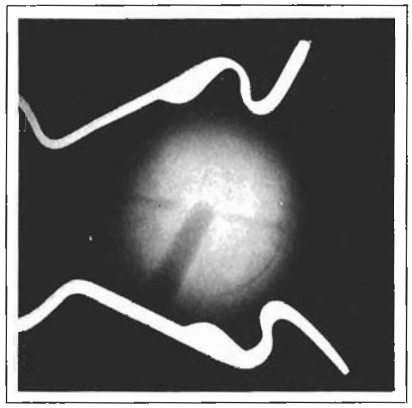


Figure 13. Note the drilled nucleus evident in this X-radiograph of a 13-mm cultured pearl.

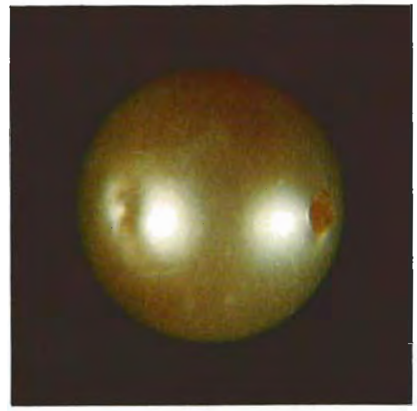


Figure 14. These surface dimples suggest the presence of a drill hole in the nucleus of this 13-mm pearl.

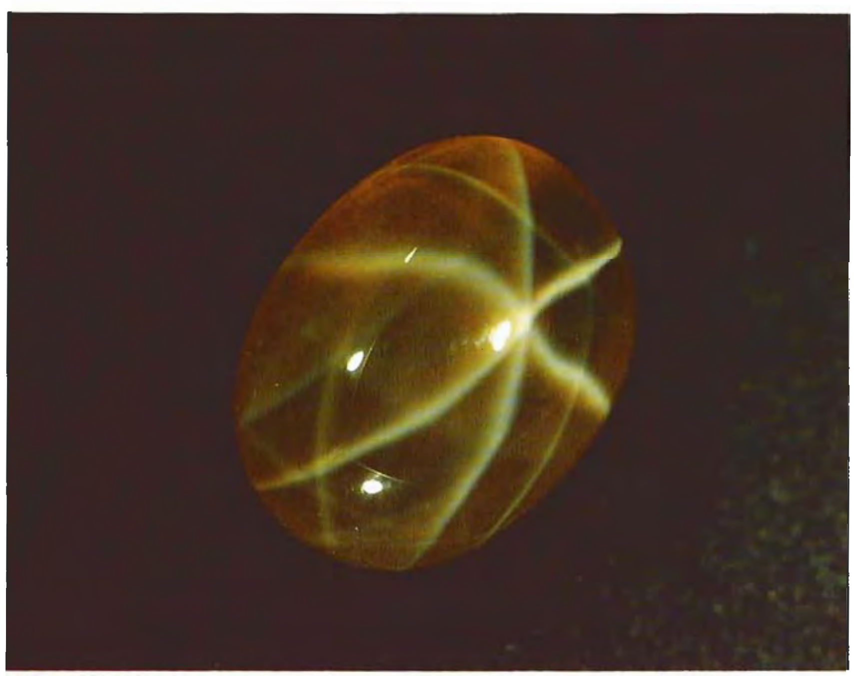
A third pearl received for testing proved to be a half-drilled freshwater cultured pearl. The X-radiograph shown in figure 13 revealed that the nucleus had been drilled prior to insertion in the mollusk. Evidence of the drilled nucleus shows up in the finished pearl as small depressions on the surface (figure 14). In an article on freshwater pearl cultivation (*Gems & Gemology*, Spring 1962), we learned that round nucleated freshwater pearls were still in the experimental stage at Lake Biwa. Nuclei insertion in freshwater clams, unlike insertion in saltwater mollusks, required special tools which in turn required the drill hole in the nucleus. With a diameter of more than 13 mm, the pearl described here is larger and more attractive than any we have seen before. It may be an American nucleated freshwater cultured pearl; however, we do not know whether the same drilled nucleus technique is used in the Mississippi area. *R.C.*

QUARTZ,
Unusually Large Multi-Star

Contributing Editor Bob Crowningshield reports that he was surprised to see a selection of multi-star quartz cabochons at the Tucson Gem and Mineral Show held in February of this year. Few of these attractive stones have come to our attention since we first added the beautiful cabochon shown in figure 15 to our New York study collection (*Gems & Gemology*, Summer 1977).

Dr. Edward Gübelin studied

Figure 15. Multi-star quartz cabochon in the collection of the New York Gem Trade Laboratory, 22 ct.



several stones from Sri Lanka to establish that sillimanite inclusions cause the star in that material. However, we had not encountered any significant commercial offering of these stones until Tucson, 1984. Our thanks to the New York gem dealer who allowed us to photograph the 170-ct multi-star quartz shown in figures 16 and 17. We are still hoping to see a sphere made of this phenomenal material. *R.C.*

RUBY, Heat Treated

Because Burma rubies fluoresce stronger than those from other sources, a gem dealer exposed the 83.01-ct ruby cabochon shown in figure 18 to ultraviolet radiation in an effort to determine if the stone was of Burmese origin. When exposed to long-wave ultraviolet radiation, it fluoresced a bright red similar to that of a Burma stone. However, with short-wave ultraviolet radiation, a peculiar bluish patchiness and a number of concentric rings became evident (figures 19 and 20). Because it was suspected that the ruby might have been oiled, the stone was submitted to the New York lab. This theory was rejected when it was determined that the bluish areas did not follow fractures or rhomboidal "bulls-eye" zones. The irregular patch (figure 19) corresponds to a lighter color zone in the stone. It was concluded that the stone was probably heat treated, a process known to produce bluish fluorescence in blue sapphire when exposed to short-wave ultraviolet radiation. The heating could also be responsible for the absence of identifying silk in what the dealer assumed to be a Burma stone. *R.C.*

SAPPHIRE, Verneuil Synthetic

Figure 21 illustrates the curved color banding typical of a Vernueil synthetic blue sapphire. In this instance the approximately 5-ct stone, set in a ring, had been submitted to the New York lab for identification. When the stone was viewed through the table, however, a series of bright parallel reflection planes were seen (figure 22). These planes reached the surface of the table and appeared similar to the surface grain lines in diamond. We could not determine if they were present before the stone was polished and therefore were inherent to the rough material, or if they are the result of some treatment or trauma after cutting. Certainly, they are not typical of synthetic material. Since some heat-treated natural blue sapphires fluoresce a chalky greenish white similar to synthetic stones, a casual examination of this stone after a fluorescence test could mis-

Figure 16. Note the sharp star in this 170-ct quartz cabochon.

Figure 17. Viewed from a different angle, the stone pictured in figure 16 shows other stars.

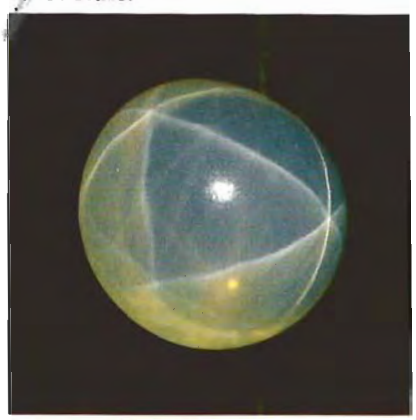


Figure 18. An 83.01-ct ruby cabochon.

Figure 19. The stone illustrated in figure 18 fluoresced a patchy blue when exposed to short-wave ultraviolet radiation.

Figure 20. Concentric rings were also evident in the fluorescence of the stone in figure 18 when exposed to short-wave ultraviolet radiation.

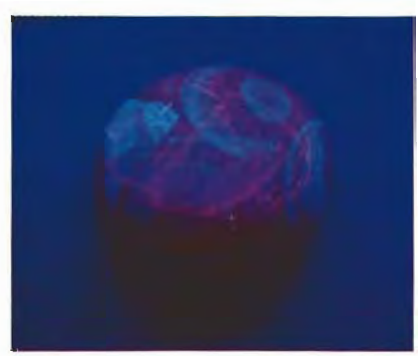


Figure 21. Curved striae in a synthetic blue sapphire. Magnified 15×.

Figure 22. Unusual reflection planes observed in the stone shown in figure 21. Magnified 15×.

lead the gemologist if he noted only the reflection planes and not the curved striae. It is possible that since this type of structure has been seen only recently in both New York and Los Angeles, it may be the result of the continuing experimentation with heat treatment in gem-cutting centers. *R.C.*

Black SPINEL

In the Gem Trade Lab Notes section of the Fall 1982 issue of *Gems & Gemology*, we mentioned that our New York laboratory had been asked to identify an oval, black, opaque faceted stone that was supposed to have been cut from a portion of a Mexican meteorite named "The Black Ruby." Limited gemological testing indicated that the material was black spinel. However, its identity could not be verified by means of X-ray diffraction since permission for this test could not be obtained.

By chance, we recently received the same material for identification in our Los Angeles lab. The sample consisted of a rough specimen and two faceted stones that weighed approximately 2 ct each. The client stated that the stones came from a Mexican "andromediorite" (black metallic ruby). Limited testing again indicated that the faceted stones were probably cut from black spinel. With the permission of the owner, we performed an X-ray diffraction analysis that confirmed our tentative identification: the material was indeed a variety of spinel and not meteoritic. *K.H.*

Figure 23. An 8.63-ct. brownish yellow cat's-eye zircon with a fine eye.

Cat's-eye ZIRCON

In this section of the Winter 1983 issue of *Gems & Gemology*, we featured a green cat's-eye zircon that had been brought to the Santa Monica laboratory. Recently, another of these rare stones, but in a different color, was submitted to our New York lab. Figure 23 shows this attractive 8.63-ct brownish yellow cat's-eye zircon, with an "eye" equal to that found in fine chrysoberyl. The stone was easily identified by its typical absorption spectrum. Unfortunately, we have no information on its country of origin. *R.C.*

PHOTO CREDITS
Ricardo Cardenas took the photos used in figures 1, 3, 4, 6, 16, 17, and 21–23. Shane McClure is responsible for figures 2, 5, and 7. Andrew Quinlan provided figures 8–15 and 18–20.