

Gem Trade LAB NOTES

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Star (or Cat's-Eye?) ALMANDITE GARNET

Although star garnet is not especially rare, the East Coast laboratory recently encountered one that was different from most others we have seen. Figure 1 shows the 2.52-ct stone that was identified as almandite from the typical properties obtained by standard gemological testing procedures. The difference is that one arm of the star is so weak that the stone almost has the appearance of a cat's-eye. A garnet such as this would be a welcome addition to any collection of phenomenal stones.

Clayton Welch

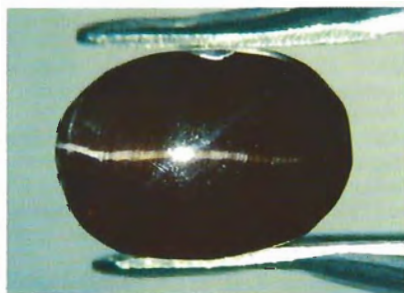


Figure 1. One leg of this 2.52-ct star almandite garnet is so weak that the stone appears to be a cat's-eye. Magnified 10 $\times$.

DIAMOND

Grayish Purple

In our experience, truly purple diamonds are very rare. A short time ago the East Coast laboratory tested the 0.21-ct grayish purple stone shown in figure 2. The natural color appears to be the result of grayish purple grain-

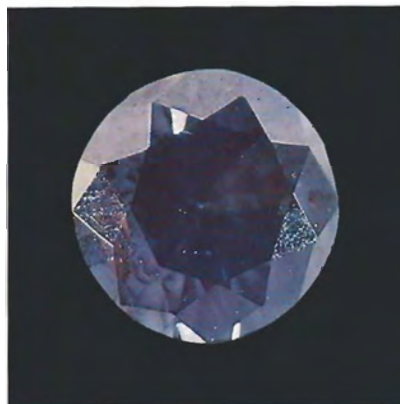


Figure 2. The natural grayish purple color of this 0.21-ct diamond appears to be caused by graining.

ing in the stone. Also present was the 550-nm absorption band typical of natural-color pink and purple diamonds. The diamond displayed a strong yellow fluorescence to long-wave ultraviolet radiation.

David Hargett

Saint Valentine's Inclusion

One of our New York clients was handling a 13.08-ct marquise-shaped diamond just in time for a sale as a St. Valentine's day present. On closer examination, he was delighted to find that the diamond contained a heart-shaped inclusion (figure 3).

One of the advantages of inclusions is that they can provide proof of a stone's identity and ownership. How much better it is when the inclusion is as unusual, attractive, and appropriate as this one.

Clayton Welch

Treated Pink

According to some of the people who color enhance diamonds commercially, pink in a treated stone is usually an accident of the treatment process. In most of these rare cases, the treater is trying for a fancy yellow color when, for some unknown reason, the stone turns pink instead.

Fourteen pink diamonds, ranging from 1.5 mm to 4.0 mm in diameter, were recently seen in our East Coast laboratory. They had been represented to our client as natural-color pink diamonds from Australia. However, the 575-nm fluorescent line and 594-nm and 637-nm absorption lines proved that the color was the result of treatment. Further proof was provided by additional lines in the red area of the spectrum, at approximately 620 and 630 nm, that are typical of treatment.

These treated stones are color zoned yellow and pink. The zoning appears to be related to a zoned fluorescence that is also evident when the stones are exposed to long-

Figure 3. At 45 $\times$ magnification, this heart-shaped inclusion is readily visible in the 13.08-ct host diamond.



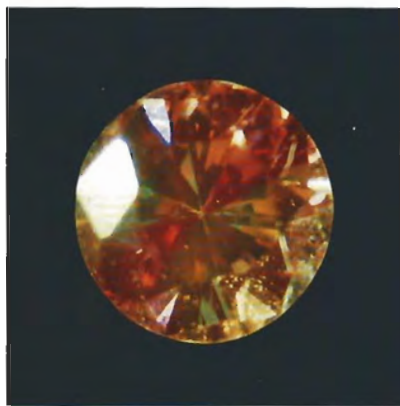


Figure 4. Pink and yellow zoning is evident in this 0.12-ct treated pink diamond. Magnified 20 $\times$.

wave ultraviolet radiation. The zoning in the 0.12-ct stone shown in figure 4 displays a dramatic yellow and pink cruciform pattern. It has been our experience that treated pink diamonds invariably fluoresce orange to long-wave U.V. radiation.

David Hargett

Biron Synthetic EMERALD

The West Coast laboratory received a Biron synthetic emerald for identification that displayed higher refractive indices (1.570–1.578) and birefringence (0.008) than we had previously observed. The Fall 1985 issue of *Gems & Gemology* (pp. 156–170) reported on the extensive examination of 202 samples of Biron synthetic emerald. Those stones all showed R.I.'s of 1.569 to 1.573 or 1.574, with a corresponding birefringence of 0.004 or 0.005. Although higher refractive indices ranging up to 1.570–1.577, with a birefringence of 0.007, had been reported in the literature by others, this is the first such stone we have examined. The inclusions and other gemological

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

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properties of this stone are the same as those described for Biron synthetic emeralds in the 1985 article.

These refractive indices and birefringence may be the result of minor differences in chemical composition caused by slight changes that are occasionally made in the manufacturing process. Studies of natural beryls have shown that both the filling of structural voids and the substitution of Cr, Fe³⁺, Fe²⁺, Mg, Li, other ions, and water molecules appear to be the major cause of variations in the refractive indices and specific gravity. These same properties in hydrothermal synthetic emeralds are also dependent on the nature, and amount, of impurity ions and molecules the synthetic products contain.

RK

Unusual GLASS

The 12.38-ct opaque black modified round brilliant shown in figure 5 recently provided the staff of the East Coast laboratory with an interesting identification problem. This stone had an almost metallic luster and an indistinct red/green blink to the refractive indices of 1.59 and a very low 1.35. Further testing revealed a specific gravity of 3.21, a Mohs hardness of approximately 4 to 5, vitreous conchoidal fractures, and no reaction to either the hot point or dilute HCl acid. The stone was warm to the touch when compared to a known crystalline sample of similar size at the same temperature.

The test results suggested glass, except for the red/green blink, even though the latter looked unusual when compared to the typical carbonate blink. We discovered that we could not go from the high R.I. reading to the low one by simply rotating the stone as is usually done.

Conclusive proof was provided by high magnification (approximately 100 $\times$), which revealed a shallow ring of bubbles at the girdle. This stone seems to have been cut from a glass preform or cylinder. We suspect that the unusual appearance

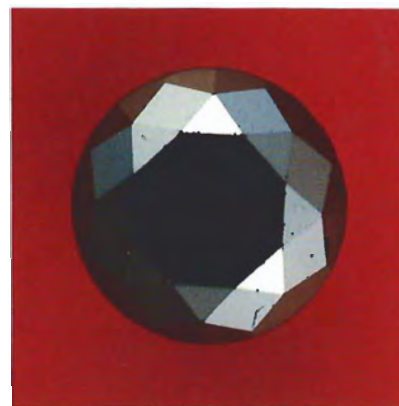


Figure 5. This 12.38-ct opaque black round brilliant cut proved to be glass, although there appeared to be a red/green blink when the R.I. was measured.

and strange optical characteristics are probably due to a high opacifier content and the tarnishing of this substance. The cause of the apparent blink remains a mystery.

Clayton Welch

JADEITE JADE

Pendant

A fine jadeite piece was recently examined at the West Coast laboratory (figure 6). This pendant, of yellow and white metal, is set with 18 small brilliant-cut diamonds around a green hololith (27.1 mm in outside diameter). The hololith has been cemented into the brightly polished yellow metal closed-back bezel mounting.

The hololith, which was estimated to be approximately 1 mm thick, was proved to be jadeite by the refractive index of 1.66 and the characteristic 437-nm absorption line. Although the jadeite was inert when exposed to ultraviolet radiation, the glue around the edges of the hololith fluoresced a strong chalky yellow to long-wave, and a weaker chalky yellow to short-wave, U.V.

The most interesting feature of this jadeite is the strong contrast between the green and white por-



Figure 6. This natural-color jadeite jade hololith (27.1 mm in outside diameter) displays an unusually strong contrast between the green and white areas.

tions of this variegated piece. Microscopic examination revealed a fine crystalline structure, with an almost fibrous appearance to the green portion. To a gemologist not familiar with this type of jadeite, this appearance could be mistaken for dye concentrations; however, the prominent chromium lines in the red area of the absorption spectrum easily prove that the color is of natural origin.

RK

Teapot

The West Coast laboratory also recently examined the magnificent "white" jadeite jade teapot shown in figure 7. The entire piece measures

19 cm long × 10 cm wide × 12 cm high (with the lid). The thickness of the domed portion of the delicate and beautifully carved lid ranges from 0.3 mm to 2.7 mm. We could not measure the thickness of the center portion of the teapot, but we estimated that it ranges from approximately 2 mm to 4 mm. Some areas, such as the carved ridges and portions of the spout, are, of course, much thicker.

The identity of the carving as jadeite was based on the standard gemological properties for this gem material: R.I. of 1.66, an aggregate reaction in the polariscope, specific gravity estimated with heavy liquids

at 3.34, and a fairly strong 437-nm line in the absorption spectrum. A patchy, very dull yellowish green fluorescence of weak intensity was observed in the white areas when the piece was exposed to long-wave ultraviolet radiation. The colorless areas were inert.

This exquisitely carved teapot is strongly mottled with translucent to opaque white areas and transparent to semitransparent colorless portions; there are also a few small areas of pale green. The presence of relatively large areas that are both transparent and colorless is another highly unusual feature of this piece (figure 8).

RK

PEARLS

Imitation

The East Coast laboratory recently had the opportunity to examine the earrings shown in figure 9. The drop-shape "pearls" (approximately 10 × 14 mm) proved to be a glass imitation with *essence d'orient* coating. However, the smaller pearls were of natural origin. The style and quality of manufacture of the earrings strongly suggest that the imitations were probably replacements.

Just when this type of imitation pearl (solid glass with *essence d'orient*) supplanted the older wax-filled type is not known. If the earrings were made in Edwardian times (late 1800s to early 1900s) as the style suggests, would these imitations have been the wax-filled type? Max Bauer, writing in 1896, did not mention essence-coated solid glass beads in the imitation-pearl section of his great book *Precious Stones*. He does mention, however, that the hollow glass types were made in many shapes, including spherical, oval, pear shape, and even baroque. RC

A Rare Cultured Pearl

Another mystery encountered in the East Coast laboratory is shown in figure 10, a routine X-radiograph of an unusually fine necklace of uni-



Figure 7. This teapot is beautifully carved out of highly translucent white jadeite jade. The piece measures 19 × 10 × 12 cm high, including the lid.

Figure 8. The lid of the jadeite jade teapot is almost transparent.



form-size 9-mm cultured pearls. The mystery is the single light-toned sphere that appears in the upper left of the X-radiograph. Unlike the other cultured pearls, this one did not fluoresce to X-rays in a dark room. A pin inserted through the drill hole established that the core was soft; in addition, a small bit of the core melted under low heat. The surface of this bead was clearly nacreous, with the same structure as the other cultured pearls in the necklace.

Although we have encountered spherical cultured pearls with plastic nuclei in the lab, we had not previously seen any with wax cores. One possible deterrent to using either plastic or wax as a nucleus is the low specific gravity of these materials, which contributes to necklaces with the "wrong heft." They just feel too light for their size.

RC



Figure 9. The two small pearls at the top of these earrings are natural, but the larger drops (approximately 10 × 14 mm) proved to be imitations made of solid glass coated with essence d'orient.

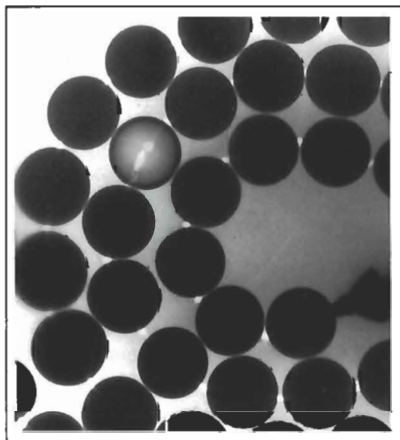


Figure 10. The unusual wax nucleus of the 9-mm cultured pearl in the upper left of this X-radiograph is responsible for the light center.

PLASTIC Costume Jewelry

The West Coast laboratory received a round yellow metal earring with a center segment of highly reflective

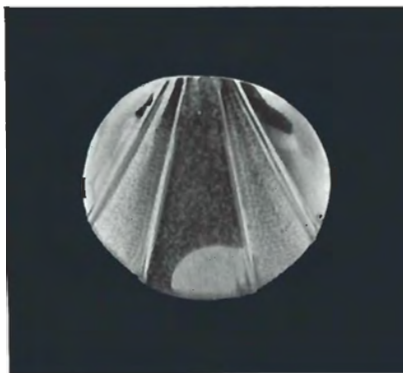
tinsel-like flakes embedded in a transparent colorless material, which was purported to contain diamond. As shown in figure 11, part of the center section had broken off, which exposed the metal backing. We were asked to determine if there was indeed any evidence of diamond in the colorless material. Permission was granted to perform any destructive tests that might be necessary.

Examination under the microscope revealed that the tinsel-like particles are rectangular in shape, very thin, and quite transparent in transmitted light. X-ray diffraction of one of these platelets resulted in an amorphous pattern, which proved that they are not diamond.

Numerous gas bubbles were visible in the surrounding material (figure 12), which was very soft and could be indented easily by the pin-point end of a brushprobe. Application of the thermal reaction tester probe (a hot point) produced the acrid odor that is characteristic of some plastic.

To determine if any diamond powder was present in this plastic material, we dissolved a portion in sulfuric acid. No residue resulted from this solution process. As an additional test, another portion of the material was melted and vaporized. Again, there was no evidence of any residue. The conclusion reached

Figure 11. A search for evidence of diamond in the decorative material on this earring revealed only plastic on the metal backing.



was that this plastic material shows no evidence of containing any diamond. KH

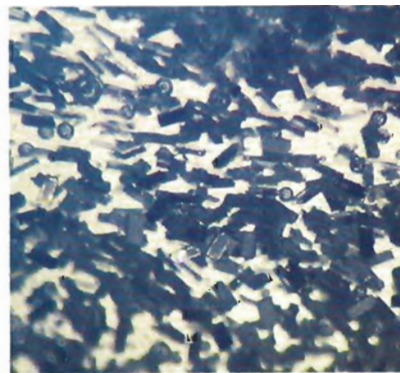
Black PYROPE GARNET

One of our friends of the West Coast laboratory submitted several small faceted and cabochon stones that he had cut from rough material represented to him as black pyrope. Figure 13 shows a small cabochon as it appears in reflected light. The stones were submitted to us for testing to see if they really were black pyrope.

The single refractive index was 1.740 and the specific gravity was determined to be 3.72 by the heavy liquid method; both of these properties are consistent with pyrope. The absorption spectrum showed a general absorption up to about 480 nm and again above 620 nm.

Examination by transmitted light revealed that the color is actually a dark brown. With magnification (figure 14), we observed numerous black ilmenite inclusions, which contributed to the black color apparent when the stones were viewed by reflected light. X-ray diffraction confirmed that the material is indeed pyrope, with perhaps just a little admixture of andradite indicated by the line spacing in the diffraction pattern. CF

Figure 12. Gas bubbles in the decorative material on the earring shown in figure 11 proved that it was man-made. Magnified 30×.



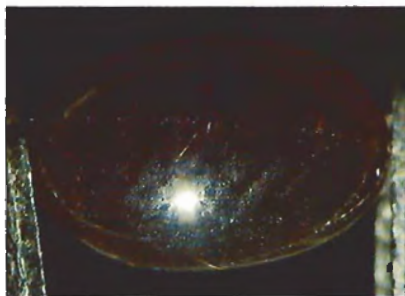


Figure 13. In reflected light, this pyrope cabochon appears to be almost black.



Figure 14. When the stone shown in figure 13 is viewed with transmitted light and at 10x magnification, both the actual brown color and the ilmenite inclusions that make the stone look black in reflected light are evident.



Figure 15. Plato lines characteristic of synthetic yellow sapphire were visible in this 6.93-ct stone even without magnification (shown here at 10x for clarity).

Synthetic SAPPHIRES

In the Lab Notes section of the Summer 1987 issue of *Gems & Gemology*, we reported on unusually strong curved color banding in a synthetic yellow sapphire. More recently, the East Coast laboratory had the opportunity to examine two synthetic yellow sapphires that were unusual in other ways.

When no color zoning or inclusions are present in a yellow sapphire, it is standard procedure to use immersion, magnification, and crossed polarizers to look for Plato lines as proof of synthesis. One of the two stones we examined displayed such strong Plato lines that they were actually visible without magnification or immersion (figure 15). In contrast, the second stone showed no discernable Plato lines at all, which is unusual for a flame-fusion synthetic yellow sapphire. This stone was proved to be synthetic when high magnification revealed the presence of several small gas bubbles.

An interesting blue synthetic sapphire, also examined in New York, showed two sets of curved color banding that intersected each other at a very shallow angle. This is clearly indicated in figure 16 by the wedge of blue with its point almost dead center in the photo. The wedge marks the boundary between the two sets of banding, which are probably a result of changes in the growth conditions while the boule was being formed.

Clayton Welch

Brecciated TIGER'S-EYE QUARTZ

The West Coast laboratory recently received for identification two interesting pieces of brecciated (i.e., containing angular fragments naturally cemented together into one mass) tiger's-eye quartz. Our client had obtained the samples from a deposit in South Africa. The polished slab shown in figure 17 (8.2 cm long $\times$ 3.4 mm thick) illustrates quite well the



Figure 16. Two sets of curved color bands intersect in the wedge-shaped area at the center of this synthetic blue sapphire (7.5 $\times$ 5.0 $\times$ 3.1 mm). Magnified 10x.

Figure 17. This 8.2 cm $\times$ 3.4 mm polished slab is a good example of brecciated tiger's-eye quartz.





Figure 18. In this rough piece (5.4 cm at its largest dimension), the components of this material are evident in a 1-cm-deep cavity lined with drusy quartz on the left, brecciated tiger's-eye quartz in the center, and unaltered blue crocidolite on the right.

brecciated nature of this material. Most areas are the typical brownish yellow to brown color of tiger's-eye, while some are reddish brown and a few portions are distinctly gray-blue. In several places on the top and bottom of the slab, a few small cavi-

ties lined with tiny, well-formed, colorless quartz crystals are evident.

Tiger's-eye is the variety of quartz in which quartz has replaced crocidolite (an asbestos variety of the amphibole mineral riebeckite) without disturbing the fibrous structure

of the original mineral. Figure 18 shows an excellent example of this interesting mineralogic relationship. The left side of this specimen (5.4 cm at its largest dimension) has a 1-cm-deep cavity lined with drusy quartz, the center is the brecciated tiger's-eye, and on the right is some of the unaltered blue crocidolite.

The material displayed the gemological properties expected of tiger's-eye. X-ray diffraction showed a quartz pattern, with one extraneous line. This material appears to be very similar to a sample illustrated on page 90 of an article by Robert Webster titled "Pseudocrocidolite," published in the *Journal of Gemmology*, Vol. 11, No. 3, July 1968. Webster reported at that time that the material had been marketed under the name "Pietersite." RK

FIGURE CREDITS

Figures 1, 3, 5, 9, 15, and 16 were supplied by Clayton Welch. Dave Hargett took photos 2 and 4. Shane McClure is responsible for figures 7, 8, 17, and 18. Figure 6 is © Harold and Erica Van Pelt. The X-radiograph in figure 10 was taken by Tom Moses. Karin Hurwit took the photos in figures 11 and 12. Figures 13 and 14 came from John Koivula. Sotheby-Parke-Bernet supplied the photo of the original pink diamond used in the "Historical Note"; Andrew Quinlan took the photo of the "painted" stone.

A HISTORICAL NOTE

Highlights from the Gem Trade Lab 25, 15, and five years ago

SUMMER 1963

One of the most unusual items encountered 25 years ago in the New York lab was petrified dinosaur bone. The material is believed to occur in several localities in the western United States. The stones examined had a mosaic structure of reddish to yellowish chalcedony replacing part of the bone, with the balance of the material intact as calcium carbo-

nate. Other examples previously seen had the bone completely replaced with chalcedony.

The Los Angeles lab encountered a number of unusual collector stones in this same time period. Notable among those mentioned were a 4.5-ct emerald-cut benitoite and an unusual colorless benitoite. Others of interest were faceted lazulite, blue apatite, chrome green sphene, and

transparent faceted rhodochrosite, tremolite, and yellow zoisite.

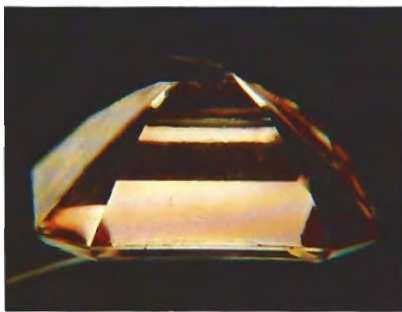
SUMMER 1973

The highlight of the Summer 1973 GTLN column from Los Angeles was the identification of the very rare material jeremejevitte. A 1.52-ct long slender emerald cut was submitted



This 9.58-ct fancy pink diamond was stolen from Sotheby's in New York.

for identification. Prior to this, jermeyevite was known only as particles the size of sugar granules from the USSR. This material has the



This 10.88-ct light yellow diamond was coated with pink nail polish and substituted for the stone shown at left.

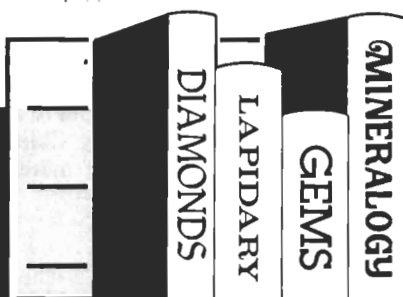
unusual property that some parts of a single crystal are uniaxial while others are biaxial. Other properties include refractive indices of 1.639–1.648 and a specific gravity of 3.30.

The New York lab provided a rather lengthy discussion on the irra-

diation of gem materials with gamma rays. The known effects of such irradiation on topaz, quartz, spodumene, cultured pearls, and beryl were given. The lack of any test to detect this type of treatment, except for the fading of some materials, is mentioned.

SUMMER 1983

The big story of the Summer 1983 GTLN section was the switching of a painted stone for a fancy pink diamond during a presale viewing at one of the large auction galleries. A 10.88-ct light yellow emerald cut was painted with pink fingernail polish and switched for an attractive 9.58-ct fancy pink stone. The pre-auction estimated value of the fancy pink was in excess of \$500,000, compared to an estimated \$12,000 to \$15,000 for the substituted stone.



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