GEM TRADE LAB NOTES

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Inscribed ALEXANDRITE

Although inscribed diamonds are not rare (in fact, the GIA Gem Trade Laboratory offers a computer-driven inscription service for diamonds), inscriptions on colored stones are uncommon. However, the East Coast laboratory recently encountered an inscription on a lower girdle facet of a 19.95-ct alexandrite.

The characters appear to have been inscribed by hand; the largest character measures about 1 mm high, which a careful observer can see without magnification. As illustrated in figure 1, the first two characters are the Arabic numerals *9* and *7*, while the remaining three characters are not recognizable. It is probable that a sharp, fine-pointed instrument was used for the two legible numbers, and a cruder instrument for the other, comparatively rougher, characters.

The client who had submitted the stone for identification suggested that these inscriptions were done decades ago in Russia. However, a staff member who is fluent in Russian and the Cyrillic alphabet did not recognize the remaining three characters.

The last time we saw an inscribed alexandrite was in 1982. See *Gems & Gemology*, Summer 1982, p. 102, for a description and illustration. *DH*

Figure 1. The inscription on this 19.95-ct alexandrite, seen here magnified at 15×, was actually visible with the unaided eye.

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

Gems & Gemology, *Vol. 27, No. 1, pp. 40–45*

CHALCEDONY, "Turquoise" Color

The operator of a mine in Mexico recently shared his unusual "turquoise" blue–colored chalcedony with the East Coast laboratory (figure 2). The color is lighter than chrysocolla, with less of the green component common to chrysoprase and most chrysocolla.

Standard gemological tests proved that the material was chalcedony: R.I. (spot method) of 1.54; S.G. (heavy liquids) of approximately 2.60; and Mohs hardness (taken on an inconspicuous area, with the client's permission) of 6 1/2 to 7, which is slightly harder than most chalcedony that is naturally colored by chrysocolla. The absence of dye was proved by the lack of a spectrum visible with the Beck handheld spectroscope (an aniline dye would have produced dye bands) and a negative reaction to the color filter (which produces a faint red appearance in dyed blue or green chalcedony).

Analysis of the specimen with a Tracor X-ray fluorescence spectrometer revealed that the material was colored by copper and, possibly, titanium and iron as well.

According to the owner of the mine, supplies are abundant and the material will be marketed commercially by the end of the year. *DH*

Figure 2. This chalcedony from Mexico is an unusual turquoise blue. The largest cabochon weighs 24.72 ct and measures 23.71 × 15.03 × 10.06 mm.

Highly Conductive Blue DIAMOND

The GIA Gem Instruments Duotester measures the rate at which heat passes through a stone as a means to distinguish diamond from its simulants; it features an alarm that buzzes when the probe tip touches metal, a reaction to the high electrical conductivity of the metal (a different property from heat conduction). The East Coast lab was surprised when a routine test of a 1.07-ct fancy gray-blue diamond (figure 3) made the Duotester alarm sound. Repeated trials set off the alarm when the stone was held either with tweezers or fingers. When the stone was set in clay, the alarm did not go off, but the tester needle moved all the way to the right, indicating the high thermal conductivity of the diamond.

Figure 3. Routine testing of this 1.07-ct fancy gray-blue diamond revealed that it had unusually high electrical conductivity.

Type II diamonds, which have very low levels of nitrogen, typically show higher thermal conductivity than type I diamonds (see the Fall 1972 issue of *Gems & Gemology,* p. 72). These low-nitrogen stones are subdivided into two categories: high-purity, electrically insulating type IIa and boron-bearing semi-conducting type IIb. This stone showed much higher electrical conductivity than the typical IIb diamond, in that it transmitted 90% of the voltage applied to it (as compared to 80%, and as low as 15%, for other blue diamonds). Infrared spectroscopy confirmed that the stone is type IIb. In addition, it was inert to long-wave ultraviolet radiation, but fluoresced and phosphoresced a weak red to short-wave U.V., a characteristic of many blue type IIb diamonds.

Ilene Reinitz

"EMERALD" with Unusual Color Zoning

Concerned that a 3.90-ct transparent green cabochon might be assembled, a client submitted it to the East Coast lab for examination. Viewing the stone with magnification and immersion (figure 4), we noted a plane of color separation that could lead one to believe that the stone was, indeed, assembled. However, closer examination led to the conclusion that it was not.

Standard gemological testing proved that the stone was natural near-colorless beryl with a zone of emerald. As seen in figure 5, there are fractures that cross the planar interface between the colorless and colored areas. In our experience, such fractures would not be smoothly continuous if the interface was a cement plane joining two different pieces of material.

Although ruby or sapphire doublets are fairly common, true emerald doublets are rare. A stone similar in superficial appearance to the one we examined was described in the Gem News section of the Spring 1990 *Gems & Gemology* (p. 100); it turned out to be a beryl triplet.

Nicholas DelRe

Figure 4. The colorless and green zones in this 3.90-ct cabochon are readily apparent with immersion. Although they suggest that this might be an assembled stone, testing proved that it was natural near-colorless beryl with a zone of emerald.

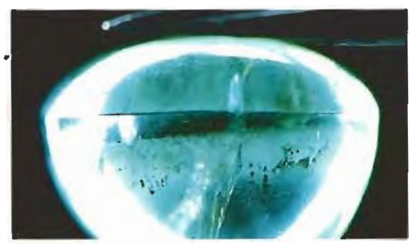


Figure 5. Fractures can be seen crossing the plane that separates the color zones in the emerald in figure 4. The continuity of these fractures proves the stone is not assembled.

More Banded LAPIS LAZULI

A reader of the entry on page 155 of the Summer 1990 issue was intrigued by the possibility of finding banded lapis rough, as he deals in Afghani minerals. Recently, he showed the East Coast lab a 4-oz. (113 g) specimen that he said was the only one he was able to find in a sizable lot of material he had just imported. The banding is very similar to that illustrated in the Summer issue (p. 155). In this particular specimen, the banding occurs in roughly one-third of the piece, which measures approximately 2 1/2 in. (6–7 cm). The material is of very fine color.

GRC

MOONSTONE and IOLITE Beads

It seems to this editor that the popularity of beads as items of jewelry is cyclical. In the early 1950s, they were practically unobtainable and there was virtually no demand. Today,

Figure 6. The strong pleochroism of iolite is evident in the unusual flattened oval beads (largest, 11.65 × 16.50 mm) of this necklace.

Figure 7. Three colors of orthoclase moonstone (largest bead, 8.0 × 11.5 mm) are attractively combined in this necklace.

their popularity and the variety available are most impressive, as anyone who has attended the February Tucson shows will attest. There are now meetings of bead collectors as well as books covering both contemporary and antique examples.

Recently, the East Coast laboratory identified two bead necklaces of materials that no Eastern staff member recalled seeing before. Figure 6 shows the characteristic pleochroism of iolite in an attractive necklace of flattened oval beads that ranged from 5.40 × 6.35 mm to 11.65 × 16.50 mm. Figure 7 shows a necklace of three different colors of orthoclase moonstone in the form of lentil-shaped oval beads, which ranged from 4.5 × 9.5 mm to 8.0 × 11.5 mm.

The beads were identified by standard gemological tests. While iolite and moonstone are by no means uncommon, their use as beads is unusual. GRC

PEARLS

From Baja California

Figure 8 illustrates one of the most striking natural pearls that we have tested in the East Coast lab. This "bronze" pear shape had a lovely green overtone that gave an aura to the pearl. At 17.7 × 11.0 mm, it weighed 47 grains (there are 4 pearl grains to the metric carat). The pearl fluoresced a distinct pink to red to long-wave U.V. radiation (figure 9).

The owner stated that he had purchased the pearl in the fishing village of Mulege in Baja California (Mexico), selecting it from a large lot of multicolored pearls purportedly fished recently in the La Paz area of Baja. If the information he was given is accurate, this could signify that a "lost" source of fancy-colored natural pearls has again started to produce after more than half a century of dormancy.

From the earliest days of the Spanish occupation of Mexico, the Gulf of California was fished for pearls. Black and multicolored pearls were especially prized, and the name *La Paz,* from the capital of the province, was at one time synonymous with black pearls. The 400-year-old industry came to an abrupt end in 1938 when a mysterious malady struck all of the oyster beds in the Gulf of Cortez – in some cases hundreds of miles apart – simultaneously (see the Summer 1943 *Gems & Gemology* for further discussion of this bizarre occurrence).

Not until the early 1960s was there any sign of recovery of the beds (*The Gemmologist,* June 1962). To date, no great production has been reported. GRC

Figure 8. This 47-grain (17.7 × 11.0 mm) fancy-color pearl was reportedly fished from the waters near La Paz, Mexico.

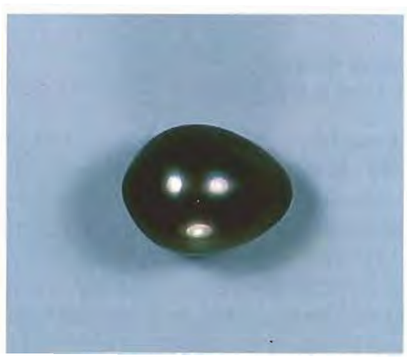


Figure 9. The pink-to-red fluorescence to long-wave U.V. radiation proves natural color in the pearl shown in figure 8.

Uncommon Cultured

We seldom see cultured pearls as large as 17 mm in the lab. However, at the East Coast laboratory we received two in the space of a few months. Of particular interest was the great difference in the sizes of the two nuclei.

The first cultured pearl (approximately 17 mm in diameter) was in the center of a turn-of-the-century "star burst" pin (figure 10) that featured numerous old-mine-, rose-, and Swiss-cut diamonds set in silver and gold. We asked the client to remove the pearl for X-radiography and were surprised to learn from the X-radiograph that it was a cultured pearl with very thin nacre. In fact, the core was exposed near the drill hole. In spite of the thin nacre, the pearl did not fluoresce to X-rays, which indicated that it had a saltwater shell nucleus. It would be very unlikely for a 17-mm nucleus to be made of freshwater shell. The X-radiograph (figure 11) not only shows the very thin nacre but also some additional drill holes. The latter were made, perhaps, to introduce bleaching agents, since saltwater shell seldom approaches the whiteness of freshwater shell. This cultured pearl was undoubtedly a replacement for the original, since cultured pearls were probably not available at the time the pin was manufactured.

The other large cultured pearl was a button shape (figure 12) that measured nearly 17 mm in diameter. The X-radiograph (figure 13) shows a relatively small nucleus of freshwater shell, the fluorescence of which was visible down the drill hole.

GRC

Figure 10. The unusually large (17 mm) cultured pearl in this pin was found to have a very thin nacre. Because the pin appears to date from the turn of the century, the cultured pearl is probably a replacement for the original natural pearl.

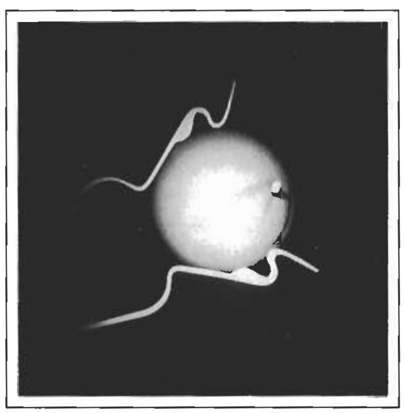


Figure 11. This X-radiograph of the cultured pearl in figure 10 clearly shows the thin nacre and some other drill holes, which were probably made to introduce bleach under the nacre to whiten the nucleus.

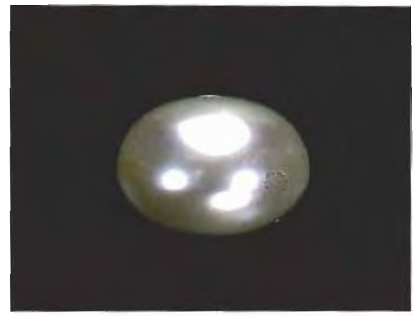


Figure 12. This unusually large (17 × 12 mm) button-shaped cultured pearl was found to have a surprisingly small nucleus.

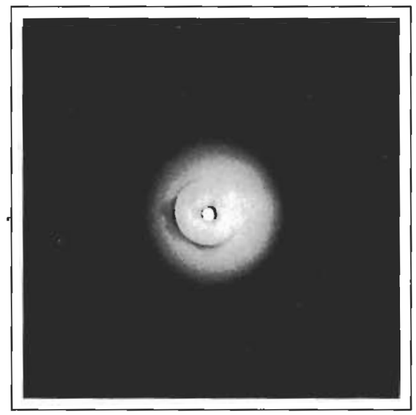


Figure 13. The relatively small nucleus of the cultured pearl in figure 12 is evident in this X-radiograph.

PERIOD JEWELRY

At various times, we have discussed period jewelry in this column. In addition to replacement pieces, such as the cultured pearl in the "star burst" pin described above, we have also looked at original pieces and reproductions.

There is, however, a fourth category: a piece in which an original section has been used in a more recent assemblage. Figure 14 shows a pin/pendant in which the center cluster ornament featuring a large emerald cabochon is surrounded by numerous old-mine-cut diamonds set in silver with gold backs, which strongly suggests that this section was manufactured before 1900. The brown pearls and pear-shaped pendant pearl in the piece are cultured, but of an unusual natural color. They are in a more modern section of the piece, which has tube-set round brilliants of the same recent vintage as those in the crown. *GRC*

SYNTHETIC RUBY

"Manufactured" Mineral Specimen

The transparent, slightly purplish red 38.05-ct specimen shown in figure 15 was recently submitted to the

West Coast laboratory for identification. The refractive indices of 1.762–1.770, very strong red fluorescence to short-wave U.V. radiation, typical absorption spectrum, and easily visible curved striae and spherical gas bubbles proved that the material was a flame-fusion synthetic ruby. This cut and partly polished hexagonal prism was quite similar to one that we examined and subsequently described in this section of the Spring 1984 issue (pp. 49–50). Except for one large well-polished "prism face," this imitation was etched or abraded to resemble the surface characteristics of a natural crystal. *RK*

Flux Grown

The West Coast laboratory was asked to identify a 3.5-ct, orangy red, mixed-cut cushion shape. Standard gemological testing methods readily identified the material as synthetic ruby. The internal characteristics, however, proved to be quite unusual.

Figure 14. In this pin/pendant, the center "period" section containing a large cabochon emerald was combined with a more recently constructed outer piece featuring a crown and natural-color brown cultured pearls and cultured pearl pendant (10.5 × 14.8 mm).

Figure 15. Although this vaguely resembles a red beryl crystal, it is actually a flame-fusion synthetic ruby. The piece measures 23.09 × 11.83 × 10.22 mm

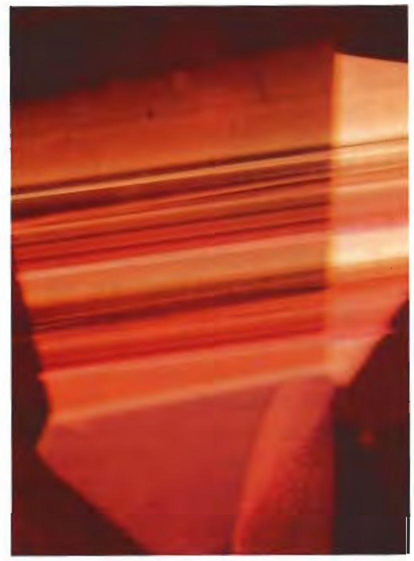


Figure 16. These straight, parallel, near-colorless and orangy red bands are not commonly seen in flux-grown synthetic rubies. Magnified 25×.

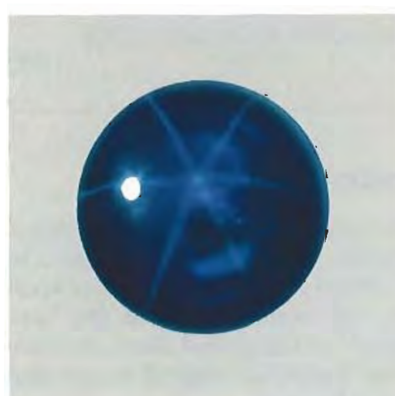
In addition to the flux "fingerprints," rain-like inclusions, and angular graining that are commonly seen in flux-grown synthetic ruby, this specimen showed some unusual color zoning: near-colorless straight, parallel bands sandwiched between areas of orangy red color (figure 16). *KH*

Diffused Star SAPPHIRE Update

The East Coast laboratory recently examined the 8.56-ct dark blue star sapphire shown in figure 17. Testing with immersion in methylene iodide determined that both the color and the asterism were produced by surface diffusion. Although this is not a new process (it was patented by Linde Air Products in 1954), we have not encountered such a dual diffusion-treated stone for many years (see, e.g., *Gems & Gemology*, Summer 1982, p. 107).

The dark color and weak asterism of the stone we recently examined fall short of the requirements for wide acceptance. One wonders if the shortage of good natural star sapphires has resulted because suitable

Figure 17. This 8.56-ct star sapphire is an excellent example of the diffusion of both color and asterism into the surface of an otherwise colorless or off-color stone.



rough is being heat treated to dissolve the rutile silk and provide a transparent blue for faceting. Perhaps this has prompted the return of the surface-diffusion process to satisfy the demand for star sapphires. Thus far, however, no commercial successes have been reported for this dual surface-diffusion process.

GRC

SYNTHETIC SAPPHIRE, with Triangular Inclusions

Typically, inclusions in flame-fusion synthetic corundum tend to appear round. Recently, the East Coast lab examined 34 calibrated French-cut blue stones in an Art Deco–style brooch. Twenty-eight of the stones were identified as natural sapphire; the six that flanked the near-colorless round brilliant-cut stone in the center were determined to be synthetic flame-fusion sapphires. These six synthetics contained an abundance of atypical triangular inclusions that, to the novice gemologist, could be quite misleading. Closer examination revealed that the inclusions were actually triangular cavities with gas bubbles (figure 18). These inclusions are described and illustrated in R. Webster's *Gems* (4th ed., 1983, p. 390).

Nicholas DelRe

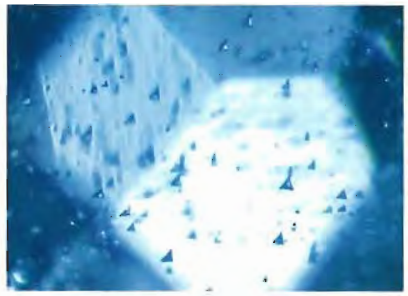


Figure 18. Several synthetic sapphires mixed with natural sapphires in an Art Deco–style pin contained unusual, and possibly confusing, triangular inclusions that contain bubbles. Magnified 30×.

FIGURE CREDITS

Figures 1, 3–10, 12, 14, and 18 are by Nicholas DelRe. David Hargett contributed figures 2 and 17. The photomicrograph in figure 16 is by John I. Koivula. Figure 15 is by Shane McClure. The X-radiographs are by Robert Crowningshield.

A HISTORICAL NOTE

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

SPRING 1966

The New York lab presented an illustrated discussion and comparison of the transparency to short-wave ultraviolet radiation of various synthetic and natural rubies. Solution-grown (flux) synthetics were determined to be slightly more transparent than flame-fusion synthetics.

A diamond set in a ring appeared to have discolored over time, acquiring a distinct brownish tinge that refused to be removed with cleaning. It was determined to be from someone who lived in an area that had extremely hard water. The discoloration was attributed to the iron staining that results from prolonged contact with such water. Boiling in strong acid removed the stains.

The Los Angeles lab had the opportunity to examine and photograph a most unusual natural pearl, on which the nacre was confined to one end. The other end was brown and had no nacre at all. With immersion and high magnification, the West Coast lab also resolved a lawsuit by proving that a blue sapphire with an unusual zone of natural blue color just under the table was indeed one piece and not a doublet.

SPRING 1976

Some of the rare gem materials and collectors' stones seen by the Los Angeles lab at this time were eosphorite, jeremejevite, pectolite, and a synthetic "powellite" that proved to be synthetic scheelite. An X-radiograph of a cultured pearl beautifully illustrated the procedure of drilling several holes at an angle through one common drill hole to reach different areas of heavy conchiolin with bleach to lighten the overall color.

The New York lab reported on their visit to the newly opened gem and mineral hall at the American Museum of Natural History.

SPRING 1986

In addition to a beautiful yellow danburite and three faceted radioactive ekanites, the West Coast lab reported on two particularly unusual items. The advent of laser technology enabled the cutting of all 26 letters of the alphabet from diamond; each measured 6.5 mm high by 4.5 mm wide and 2 mm thick. A 1,126-ct pinkish orange sapphire crystal, first seen at the 1983 Tucson show, was cut and the stones submitted for examination. The largest was 47 ct, far below the 200 ct that the owners had hoped to achieve. The crystal proved to be more heavily flawed, with more opaque areas, than expected when purchased.