AN EXAMINATION OF FOUR IMPORTANT GEMS

By C. W. Fryer and John I. Koivula

The authors report on their gemological examinations of four important gemstones: the Star of Bombay sapphire, the Portuguese diamond, and two large diamonds known as the Marie Antoinette earrings, all of which are part of the collection at the Smithsonian Institution. Brief historical information on some of the pieces is also included.

In May of 1985, the Los Angeles County Museum of Natural History opened a new gallery devoted to Gemstones and Their Origins. This gallery, funded by Mr. Alex Deutsch and the Weingart Foundation, is a permanent part of the E. Hadley Stuart, Jr., Hall of Gems and Minerals. In conjunction with the opening of the new gallery, arrangements were made for a special exhibit of fine jewelry items provided by Harry Winston, Inc. of New York as well as some important stones from the collection of the U.S. National Museum of Natural History in Washington, D.C., a part of the Smithsonian Institution. While the special exhibit was in Los Angeles, the authors were offered the rare opportunity to perform gemological examinations on three famous pieces from the Smithsonian collection: the Star of Bombay sapphire, the Portuguese diamond, and the Marie Antoinette earrings. The results of these examinations are reported below.

THE STAR OF BOMBAY SAPPHIRE

A bequest to the Smithsonian by movie actress Mary Pickford, the Star of Bombay is a medium-intensity blue oval star sapphire (figure 1) that measures 36.30 × 28.82 mm and is 17.55 mm deep. Unfortunately, nothing is known of the history of this stone before Miss Pickford obtained it. Using the GIA weight estimation formula for cabochons, we estimated the weight to be approximately 184 ct, in very close agreement with the weight of 182 ct recorded at the Smithsonian. The dichroic colors are distinct to strong blue and slightly bluish green. The refractive index (spot method) is approximately 1.76–1.77. The specific gravity was not determined. Spectroscopic examination revealed a sharp line at 450.0 nm and a general absorption in the green area of the spectrum. No evidence of any lines at 460.0 nm or 470.0 nm was observed. The stone is inert to ultraviolet irradiation.

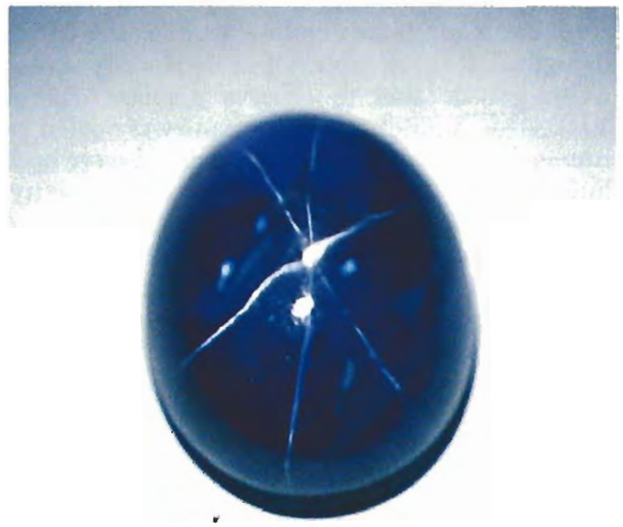

Figure 1. The 182-ct Star of Bombay sapphire. Courtesy of the Smithsonian Institution.

Several interesting inclusions were observed with the microscope. In addition to the rutile needles responsible for the star, the most prominent inclusion found in the Star of Bombay is a primary negative crystal that contains two different solid phases (figure 2). One phase is a small grouping of opaque dark gray to black submetallic hexagonal

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Acknowledgments: The authors would like to thank Dr. Peter Keller for arranging the loan of these items with John Sampson White of the Smithsonian Institution. Our thanks also go to Dr. Anthony Kampf for inviting us to examine the stones and allowing us to use the facilities of the Los Angeles County Museum of Natural History.

Figures 1, 2, and 3 were photographed by the authors.

platelets which, from past experimentation with similar solid phases in Sri Lankan sapphires, the authors believe to be graphite. The second phase is an unidentified stalk-like spray of birefringent crystals extending inward from the cavity walls. Because primary negative crystals in Sri Lankan corundums commonly contain carbon dioxide, we thought that if the cabochon were slightly cooled we might be able to observe a phase change (gas ⟶ liquid). After the stone was cooled by immersion in cold tap water, we did observe both liquid and gaseous carbon dioxide in the cavity. Slight warming with the microscope lamp caused the two phases of carbon dioxide to homogenize and the meniscus between the liquid and gas bubble to disappear. These test results indicate that the stone is from Sri Lanka.

This conclusion was further supported by the presence of a slightly rounded, nearly equidimensional, metallic opaque crystal that was visible without magnification. Although the inclusion could not be analyzed because of its position within the stone, experiments on Sri Lankan sapphires with very similar inclusions suggest that it is probably a protogenetic crystal of the iron sulfide pyrrhotite (figure 3).

THE PORTUGUESE DIAMOND

The Portuguese diamond (figure 4) was first mentioned in the literature by John Mawe (1813), who referred to it as the Regent of Portugal and listed it as the third largest known diamond, weighing 1 oz. troy (156 ct). He stated that the stone had been found in Brazil, which was then a colony of Portugal. Edwin Streeter (1882) also maintains that the Regent of Portugal came from Brazil and states that it was found by a slave near the Abaité River. However, he lists the weight as 215 ct, which is substantially larger than that given by Mawe. In any event, the stone was subsequently recut to its present size and shape. Somewhere along the line its name was shortened to the Portuguese. According to Krashes (1984), Harry Winston, Inc. purchased the stone in 1951, sold it, bought it back, and ultimately sold it to the Smithsonian in 1963.

The Portuguese is a lovely stone with a nearly octagonal outline, the corners being almost the same length as the sides and ends. The diamond measures 32.75 × 29.65 mm and is 16.01 mm deep. It is set in a very simple four-prong mounting that ensures that the stone will rest in an upright position when exhibited. The mounted stone could not be weighed, but the GIA weight estimation formula indicated a weight of approximately 128 ct, less than 1 ct difference from the recorded weight of 127.01 ct (Krashes, 1984).

Although mounted stones cannot be graded accurately for color, the authors tentatively assigned a grade range of G to H, or I, on the GIA color scale, which is consistent with the observed presence of a 415.5-nm absorption line in the spectrum. (Colorless stones [D on the GIA scale] do not show the 415.5-nm line.) No other absorption lines were observed.

Figure 2. This negative crystal in the Star of Bombay sapphire has two distinct solid crystal phases. Transmitted and oblique fiber-optic illumination, magnified 15×.

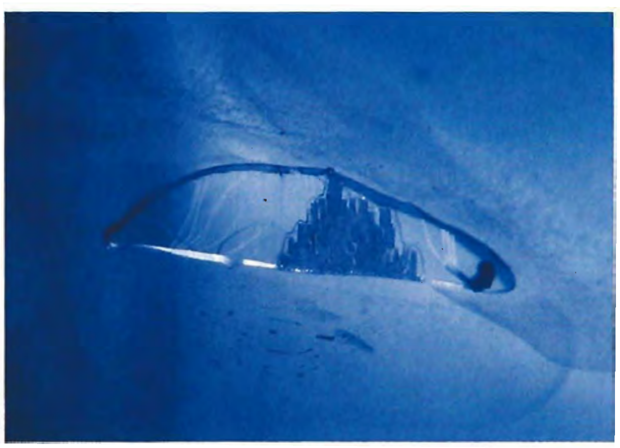

Figure 3. This solid crystal inclusion in the Star of Bombay sapphire is probably pyrrhotite, a familiar inclusion in Sri Lankan corundum. Oblique fiber-optic illumination, magnified 10×.

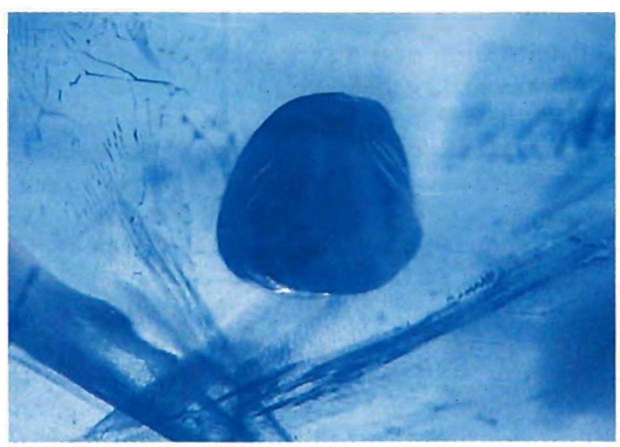

Figure 4. The 127.01-ct Portuguese diamond. Courtesy of the Smithsonian Institution; photo by S. Gipson, courtesy of the Los Angeles County Museum of Natural History.

Whatever color is present in the stone is most assuredly masked by the very strong blue fluorescence; in fact, the Portuguese was once thought to have been a blue diamond (Krashes, 1984). The stone fluoresces extremely strong blue on exposure to either short- or long-wave ultraviolet radiation. Even the relatively low proportion of ultraviolet light in an incandescent light source will cause the stone to fluoresce a soft blue color. In addition, there is a decided blue color to the strong ray of light that is transmitted through the stone when it is placed over the diaphragm of a spectroscope unit with the light turned on for spectroscopic observation.

The only reference to the clarity of the Portuguese diamond that could be found in the literature was that by Gaal (1977), who said that the stone was flawless. However, our examination of the mounted stone revealed a small bruise on the junction between the first and second facets up from the girdle on one side of the crown, and two very minor scratches on the table, which would place it in the VVS category. These characteristics could have occurred subsequent to Gaal's report. However, there are also five extra facets at the corners of the pavilion facet junctions. The stone was also examined with the polariscope, but only a generalized strain pattern was observed, with no indication of any localized stress such as is usually found around inclusions.

THE MARIE ANTOINETTE EARRINGS

Although the Marie Antoinette necklace is mentioned several times in the literature, little has been recorded about the earrings (figure 5). They were probably part of a suite of extremely large pear-shaped diamonds that were assembled by the court jeweler for Madam Jeanne du Barry, mistress to Louis XV of France. After his father's death, Louis XVI reportedly gave them to his queen, Marie Antoinette, who is said to have worn them constantly. The earrings were left in the Tuileries when the royal family attempted to escape from Paris in June, 1791.

The center stones in the earrings were the only ones examined by the authors in detail. Although the stones are rather large pear shapes, they are very shallow. One measures 23.21 × 19.36 mm and is 6.80 mm deep, and the other measures 24.40 × 17.00 mm and is 5.13 mm deep. Application of the GIA weight estimation formula provided weights of approximately 19 and 13 ct, respectively. It appears that the weight of 36 ct each indicated on the information card that accompanied the exhibit is in error and represents, instead, the total weight of the two stones.

Figure 5. The Marie Antoinette earrings. The large diamond drops weigh approximately 19 and 13 ct each, respectively. Courtesy of the Smithsonian Institution; photo © Harold & Erica Van Pelt.

The stones appear to be colorless, or nearly so, as would seem to be confirmed by the absence of a 415.5-nm line in their absorption spectra. However, it should be noted that the stones were tested at room temperature, and there is always the possibility of a weak 415.5 line becoming discernible if the stones were cryogenically cooled. One of the stones was inert to any ultraviolet radiation, while the other fluoresced a weak blue to both long- and short-wave rays.

Both stones had extremely thin girdles. As a result, over the years they have acquired a number of chips along the girdle edges. Some of these chips are relatively large and would probably place the stones in the VS category. Using a microscope at 10× magnification, we did not see any internal characteristics other than bearding at the girdle edge. However, the stones would have to be graded out of their mountings before any claims could be made that they might be potentially flawless if recut. Both stones showed considerable strain when examined in the polariscope, but no localized strain pattern.

CONCLUSION

Few stones equal the Star of Bombay sapphire, Portuguese diamond, and Marie Antoinette earrings in size, quality and, in the case of the latter, historical interest. We hope that our examinations will provide a more complete record on these stones for future researchers, and that the opportunity will become available to provide similar reports on other named pieces as we seek to learn more about these touchstones of gemology.

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