Figure 40. The presence in corundum of a white, sugary crystal with an associated stress fracture (left) is typically associated with high-temperature heat treatment. Surface-reaching fingerprint-like inclusions (right) are further evidence of heat treatment. Photomicrographs by G. Choudhary; magnified 80× (left) and 60× (right).

inclusions (figure 40, right), both of which are commonly seen in corundum that has been exposed to high-temperature heating. The latter features are essentially surface breaks into which some foreign substance (e.g., borax) penetrated the stone during heat treatment.

The exact nature of the *en echelon* inclusions could not be determined. However, our observations of the overall inclusion features led us to identify the sapphire as natural with "indications of heat treatment."

Gagan Choudhary

Serpentinite artifact resembling Libyan desert glass. In February 2008, the SSEF Swiss Gemmological Institute received an unusual object (figure 41) that was found at an archeological site in the Lop Nur dry lake bed in the Taklamakan Desert of Xinjiang Province, northwestern China. According to Dr. Christoph Baumer, a Swiss archeologist who worked on the excavation, the artifact was reportedly discovered near a 2,000-year-old jade axe.

The translucent yellow bar (56.02 ct) had a distinctly worked outline. One end was rounded while the other was irregular, suggesting that it had been broken in the past. Visually, the item resembled natural desert glass from Libya. The heavily etched surface was similar to that commonly seen on desert glasses, which have typically been exposed to prolonged abrasion by sand storms (figure 42). However, the uniform shape strongly suggested a manufactured object.

Standard gemological testing was inconclusive: hydrostatic SG—2.59; fluorescence—slightly yellow to long-wave UV radiation and no reaction to short-wave UV; handheld spectroscope—no absorption seen; polariscope reaction—always bright, indicating an anisotropic aggregate. Due to the irregular surface, no refractive index could be measured.

As a next step, the chemical composition of the item was qualitatively determined by EDXRF spectroscopy. In contrast to Libyan desert glass, which is nearly pure silica glass with some minor amounts of Fe and other trace elements, this specimen showed both Si and Mg as main constituents; minor amounts of Fe were also detected. Based on the chemical composition and the appearance between crossed polarizers, it was evident that the material was not a glass but rather a polycrystalline aggregate of a Mg-silicate such as antigorite (serpentine group). The Raman spectrum confirmed this identification, with four distinct peaks at 1045, 688, 377, and 231 cm^{-1}, which matched our reference spectrum for antigorite. In the gem trade, translucent light yellow antigorite is known as *bowenite serpentine*.

Figure 41. This unusual artifact (39.3 × 18.3 × 6.8 mm), which was discovered at an archeological site in the Taklamakan Desert of China's Xinjiang Province, proved to be antigorite (bowenite serpentine). Photo by H. A. Hänni, © SSEF.

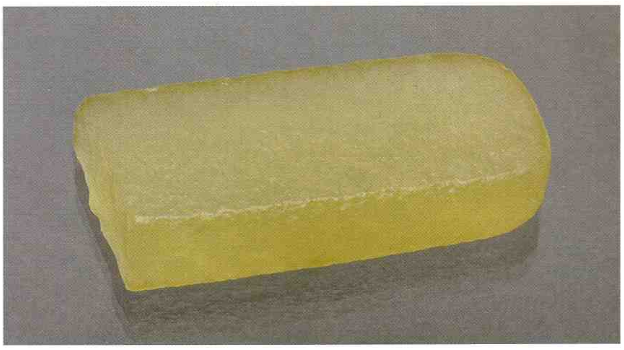

Figure 42. The serpentinite artifact's irregular surface etching is likely due to prolonged abrasion by wind-blown desert sands, as is often seen in desert glasses. Photo by H. A. Hänni, © SSEF.

As antigorite is relatively soft (5.5 on the Mohs scale), it has long been used for jewelry and carving purposes, especially in China (see R. Webster, *Gems*, 5th ed., revised by P. G. Read, Butterworth-Heinemann, Oxford, UK, 1994, pp. 275–276). The etched surface of the broken end indicated that it had been broken before it was exposed to prolonged abrasion in the dry and windy climate of the Taklamakan Desert.

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Star and cat's-eye topaz from Brazil. Topaz is a common gem, but only rarely does it occur with chatoyancy or asterism. The largest cat's-eye topaz described in the literature thus far was a 270 ct stone from Ukraine (Winter 2004 GNI, p. 346); star topaz has not been previously reported. However, in August 2005 this contributor acquired a star topaz in Brazil, and it was even larger than the 270 ct cat's-eye stone.

Figure 43. This extremely rare star topaz from Brazil (333.27 ct) shows asterism—composed of a vertical yellow ray and a white ray oriented at about 40° to the yellow ray—that is caused by oriented growth tubes and internal striations within the tubes. Photo by J. Hyršl.

The egg-like cabochon (figure 43) weighed 333.27 ct and measured 38.2 × 33.5 × 28.0 mm. It was identified as topaz by standard gemological methods. The stone was filled with semiparallel flat, hollow channels, similar to a pale blue 152.15 ct cat's-eye topaz from Brazil that this contributor also described (figure 44; J. Hyršl, "Some new unusual cat's eyes and star stones," *Journal of Gemmology*, Vol. 27, No. 8, 2001, pp. 456–460).

The channels were much more common in one half of the stone, and the border between the two halves was sharp, confirming that the tubes were the result of a growth phenomenon, not etching. The stone showed two rays when illuminated with a strong spotlight (again, see figure 43). One ray was yellow and oriented perpendicular to the hollow channels. The second ray was white and oriented at an angle of about 40° from the first ray; with magnification, it showed bright iridescent colors (figure 45). The cause of the second ray was apparent only with high magnification: The channels were not smooth inside, but rather showed strong striations at an angle of

Figure 44. This cat's-eye topaz (152.15 ct), also from Brazil, shows chatoyancy resulting from internal features similar to those causing the asterism in the stone in figure 43. Photo by J. Hyršl.

Figure 45. Striations on the inner surface of the subparallel hollow channels are the cause of the reflective white ray in the star topaz. Photomicrograph by J. Hyršl, reflected light; field of view 2 mm.