blue, bluish gray, and near-colorless zones also were analyzed. Generally, five analyses were obtained from each stone, or from each major color zone in the multicolored samples.

The data summarized in figure 18 represent averages of each stone or color zone analyzed, and show that approximately half the analyses correspond to elbaite and half to liddicoatite compositions. We were pleasantly surprised to discover that two analyses fell within the rossmanite field, making this the first time we have documented this rare tourmaline species in faceted stones. Rossmanite, named in honor of California Institute of Technology professor (and *G&G* Editorial Review Board member) George Rossman, was recognized as a new lithium-aluminum tourmaline species in 1998, and is characterized by an elemental vacancy in the X site (see Fall 1998 Gem News, p. 230). A few faceted examples of rossmanite (in colorless to pale pink) are also known from the island of Elba, Italy (F. Pezzotta, pers. comm., 2003).

As documented previously by Dirlam et al. (2002), the analyses showed no systematic correlation between color and X-site occupancy; that is, there was no correlation of color with the identification of the material as elbaite, liddicoatite, or rossmanite. The two samples containing rossmanite (again, see figure 17) were analyzed in more detail to better define the distribution of this species. Rossmanite was detected in some analyses of the green portion of a 3.69 ct tricolored (green–near colorless–pink) emerald cut, and liddicoatite was found in both the green and pink portions of this stone. The other sample containing rossmanite (in a pink area) was a 7.50 ct pink/green cushion that consisted mostly of elbaite. In both cases, the analyses fell fairly close to the border of the rossmanite field (again, see figure 18).

Some additional samples of Nigerian tourmaline from the Ibadan area—showing unusual coloration—were loaned by Mark Kaufman (Kaufman Enterprises, San Diego, California). Included were three particolored rectangular step cuts (1.39–1.70 ct) and two particolored crystals from the same parcel, as well as a bright orange 7.85 ct elongate cushion accompanied by a piece of rough of identical color (see, e.g., figure 19). Electron microprobe analysis of the orange rough showed that it was elbaite with 4.92 wt.% MnO and 0.42 wt.% TiO_2; iron was below the detection limit of 0.016 wt.% FeO. All three of the particolored stones were liddicoatite, with the exception of one area with an elbaite analysis that fell very close to the liddicoatite field. Interestingly, the color zones in this tourmaline were oriented perpendicular to the c-axis, rather than being parallel to a pyramidal direction as is the case with liddicoatite from Madagascar. The colors of these five Nigerian liddicoatites also were less pronounced and showed a narrower range of hues (in colorless to pink, yellowish green, or bluish green) than their Malagasy counterparts.

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Figure 19. These particolored tourmalines (1.39–1.70 ct faceted, as well as 5.82 and 10.06 ct crystals) from Nigeria show color zoning perpendicular to the c-axis. Chemical analysis of the faceted stones proved that they were liddicoatite (with the exception of one area that gave an elbaite analysis). The bright orange color of the 7.85 ct Nigerian sample in the inset is unusual for tourmaline. Chemical analysis of a rough sample of identical color showed an elbaite composition with appreciable amounts of manganese, traces of titanium, and no detectable iron. Courtesy of Mark Kaufman; photos by Maha Tannous.

Uvite tourmaline from Afghanistan. Beautiful gem tourmalines have been commercially available from Afghanistan for nearly three decades, typically in pink, green, and blue hues. Available chemical analyses indicate that these tourmalines are of the elbaite species (see, e.g., R. Leckebusch, "Chemical composition and colour of tourmaline from Daràe Pìch (Nuristan, Afghanistan)," *Neues Jahrbuch für Mineralogie, Abhandlungen*, Vol. 13, 1978, pp. 53–70).

In July 2002, Sir-Faraz ("Farooq") Hashmi of Intimate Gems, Jamaica, New York, sent GIA some brownish orange samples from Afghanistan that were tentatively identified as either tourmaline or bastnäsite. Included in this donation were two faceted stones (0.59 and 1.46 ct) that were cut for our research by John Bailey (Klamath Falls, Oregon), several loose crystals, and two specimens of the brownish orange crystals in a white, talc-like matrix (figure 20). Mr. Hashmi was told by Gaus-ud-din, an Afghan partner, that the material was mined from the "Wata Poore" area in Konar Province. Reportedly a few dozen kilograms of the material has been mined, although production has slowed in recent months due to the unrest in the region.

The crystals were equant and lacked the striations on their prism faces that are typically seen on tourmaline from Afghanistan and elsewhere, and the mineralogy of the matrix material indicated that it was not derived from a granitic pegmatite. Nevertheless, standard gemological

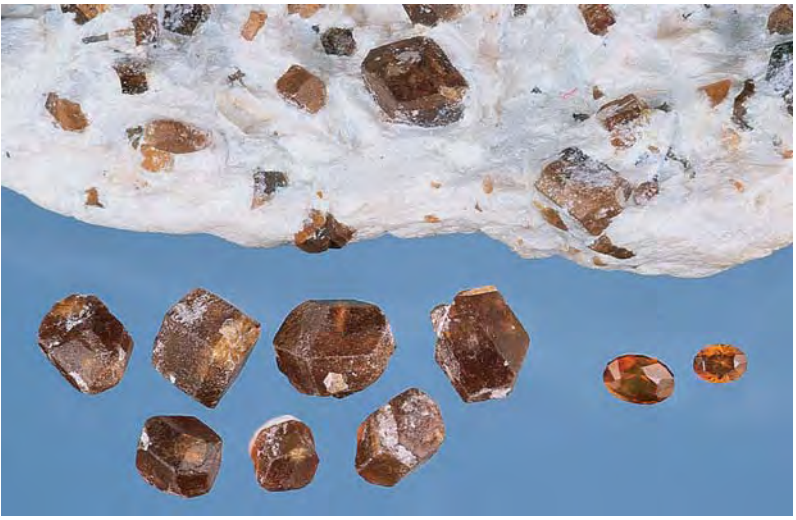

Figure 20. These samples of brownish orange uvite tourmaline were reportedly mined from Kunar Province, Afghanistan. The equant, well-formed crystals are found in a soft, white, talc-like matrix. The two cut stones weigh 0.59 and 1.46 ct. Courtesy of Intimate Gems; photo by Maha Tannous.

properties obtained on the two faceted stones indicated that they were tourmaline (i.e., uniaxial negative optic character, R.I.—1.620–1.641, birefringence—0.021, and S.G.—2.99 and 3.04). Microscopic examination revealed abundant mineral inclusions of colorless to white, anhedral, birefringent particles; partially healed fractures; and "feathers." A few dark brown (nearly black), transparent inclusions also were present. The stones were inert to long-wave UV, and showed a chalky greenish orange fluorescence of moderate intensity to short-wave UV radiation.

To better characterize these unusual tourmalines, one of the crystals was analyzed by electron microprobe at the University of New Orleans. The sample proved to be uvite, a Ca-Mg tourmaline that is uncommon in facetable quality. The six analyses revealed a rather homogeneous composition, with an appreciable dravite component (as shown by the presence of 1.35 wt.% Na_2O). In addition, the analyses showed an average of 1.14 wt.% TiO_2, 0.06 wt.% FeO, and 0.50 wt.% F. Polarized visible-range spectroscopy of one sample showed that the brownish orange color is due to a combination of Fe^{2+}–Ti^{4+} intervalence charge transfer and Fe^{2+} (G. Rossman, pers. comm., 2003).

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SYNTHETICS AND SIMULANTS

An assembled agate "nodule." This contributor was recently shown an unusual agate that was reportedly purchased in 2002 at an agate mine near Lhasa, Tibet (figure 21). After the owner returned to the U.S., he noticed that the agate slab had separated from its matrix, revealing its assembled nature.

The thin slab of translucent agate was backed with pink tissue paper and attached to a piece of granitic rock (probably rhyolite). A clay "bezel" had been built up around the slice. The slice was apparently polished after it was assembled, since there were traces of what appeared to be chrome oxide in the porous areas of the agate and the matrix. The green color of this polishing residue resembled that shown by celadonite, a clay-like mineral that commonly forms in association with agate nodules.

This contributor has been involved with research on agates for about 40 years (see http://csd.unl.edu/csd/programs/agateres.html), and has never seen such a specimen before. Considering the poor quality of the agate slice, it is surprising that someone would take so much time to forge the specimen. This does point out, however, that buyers should exercise caution even when purchasing the most inexpensive stones. It is conceivable that forgers might assemble such stones from slices of finer agates such as those from northern Mexico, which can command high prices.

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A glowing manufactured gem. At the 2002 Tucson gem show, this contributor encountered a unique new manufactured material that was represented as "Nightglow Stone."

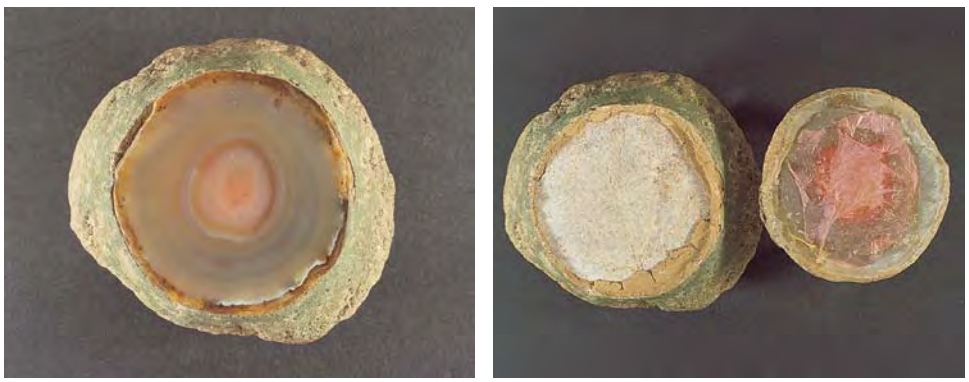

Figure 21. The sliced agate "nodule" on the left (10–12 cm in diameter) was recently purchased at a mine in Tibet. On the right, the assembled nature of the specimen is revealed. A thin slice (5 mm) of agate was backed by pink tissue paper, and embedded in a layer of clay adjacent to the rock matrix. Photos by Roger K. Pabian.