JADEITE OF GUATEMALA: A CONTEMPORARY VIEW

By David Hargett

Although lost for literally hundreds of years after the Spanish conquest of the Aztecs, many deposits of jadeite have been found in Guatemala during the last two decades. Following the discovery of the first significant outcrop in 1974, literally tons of jadeite in a wide variety of colors have been removed from the area and sent to cutting shops for use in tourist carvings, in fine reproductions of Indian artifacts, and in jewelry.

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Of all the world's occurrences of jadeite, Guatemala may be the least known. Ironically, the English word *jade*, which most people associate with the Far East, is actually derived from the Spanish phrase *piedra de ijada*, or "loin stone," from the material's reputed value as a cure for kidney ailments. Between about 1300 B.C. and the Spanish conquest in the 16th century A.D., a number of highly civilized, complex societies flourished in Central America, including the Olmecs, the Mayans, and the Aztecs. These great civilizations left behind carved jadeite in many forms. In modern times, several pieces were taken from ritual burial sites (Proskouriakoff, 1974); most are believed to have been the property of the wealthy, the nobility, and the priests. Items found include burial masks, rings, collars, and ear flares, as well as disks and pendants. The Aztecs are believed to have used jade during human sacrifices while the Olmecs are noted for their striking ax-god pieces (figure 1). The finest ax gods were found primarily in Costa Rica, although it is virtually certain that jade does not occur there (Desautels, 1986).

Jadeite artifacts of these ancient civilizations have been unearthed throughout Central America, Mexico, and even Peru; yet the actual sources were lost for nearly 500 years. Recently, however, commercially significant deposits have been found in Guatemala. This newly rediscovered jadeite is fascinating not only because its very study recalls the grand civilizations that existed before the Spanish Conquest, but also because it occurs in a wide variety of qualities and colors. The author visited Guatemala in 1988 and returned with samples of the materials that are currently being mined there, as well as information on the recent history and development of these deposits. The samples were subsequently tested, and their gemological properties are also reported here.

HISTORY, LOCATION, AND ACCESS

When the Spaniards arrived in the region that is now Guatemala (about 1519), Mayan chiefs dispatched entire

Figure 1. "The Kunz Ax," made of translucent dull blue-green jadeite that undoubtedly originated from the area that is now Guatemala, is typical of the ax gods fashioned by the Olmecs in pre-Columbian times. This 27.2-cm-high artifact was found in Oaxaca, Mexico, around 1869. Courtesy of Department of Library Services, American Museum of Natural History.

families to guard the mines and the secret of their location. The Mayans did not realize that the Spanish had little use for, or interest in, jadeite; they were after gold and emeralds. With the decline of the indigenous cultures and the eventual deaths of the guard families, the knowledge of where the great mines had been was lost.

In 1952, however, Robert Leslie of the Smithsonian Institution identified some green jadeite that had been found near the small town of Manzanal, in the department of El Progreso (figure 2), when it became lodged in a cultivating disker being used on a field of tomato plants (J. Ridinger, pers. comm., 1989). Leslie subsequently found a number of detrital nodules in the alluvial terraces of the Motagua River near Manzanal (McBirney et al., 1967). In 1963, McBirney reported finding detrital jadeite in the gravels of the same river, but about 70 km upstream. As late as 1967, McBirney et al. lamented that no occurrences of the jadeite in bedrock had yet been reported.

In 1973, Jay and Mary Lou Ridinger, American expatriates living in Antigua, Guatemala, began their search for jadeite. For almost a year, they explored the mountainous region on foot; the difficult task was made even more dangerous by the ongoing guerrilla warfare in these remote regions. Another concern is the deadly "cigarette" snake; once bitten by this serpent, the victim lives only long enough to smoke a single cigarette.

In 1974, Mary Lou Ridinger discovered a major block of jadeite in a serpentinite body on a hillside in the Zacapa region of the Motagua River Valley. Located about 10 km east of Manzanal, this occurrence of jadeite was about 2 × 3 m (6 × 9 ft.), while the surrounding albitic material extended another 6–7 m in each direction. These and the other eluvial deposits (drift from the weathering of jadeite tectonic blocks; Harlow, pers. comm., 1990), are probably the source of the alluvial material reported by Foshag in 1955 and McBirney in 1963.

The Ridingers have since found jadeite in a number of locations in the Motagua River Valley; they and others (primarily independent operators) continue to prospect in the area (figure 3). Small boulders or "cobbles" are also recovered from the beds of streams (notably, Río La Palmilla and Río Huijo) that pass near the outcrop (figure 4). George Harlow, of the American Museum of Natural History, has visited the region and believes that there may be other sources yet undiscovered in the valley (pers. comm., 1990).

Today, for the most part, sophisticated techniques are not used to search for jadeite in Guatemala. According to Harlow, searchers commonly explore until they encounter serpentinatious terrain, then walk along the area's river and stream beds until they sight jadeite. Sometimes aerial photos are examined for tectonic blocks of jadeite in the serpentinite. Because of the proprietary

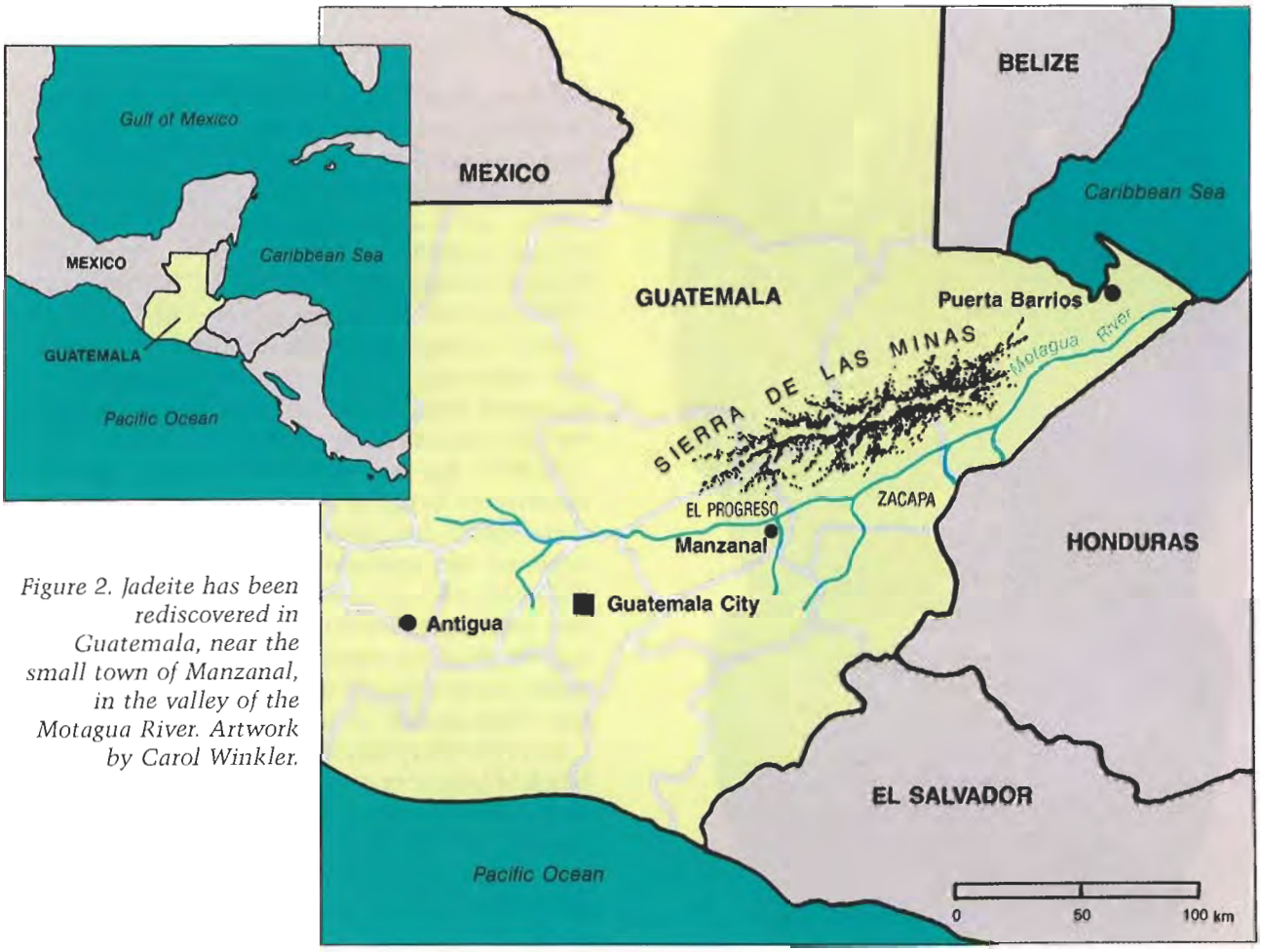

Figure 2. Jadeite has been rediscovered in Guatemala, near the small town of Manzanal, in the valley of the Motagua River. Artwork by Carol Winkler.

nature of the mining sites, precise directions to the locality are not provided with this article.

GEOLOGY OF JADE

Formed as a result of metamorphic activity, jadeite the world over occurs in lenses and masses, usually in serpentinatious rock (Desautels, 1986). Specific information on the occurrence and formation of Guatemalan jadeite is available in Harlow (1986 and in press). Guatemalan jadeite itself is coarsely grained, often with large, eye-visible crystals of jadeite. This is consistent with the detrital material examined by McBirney et al. (1967).

MINING METHODS

Commercial mining of jadeite in Guatemala is a rudimentary process. In the Ridinger operation, a pick-up truck carries the equipment as close as possible to the site, but a full day or longer may be needed to then transport the materials by mule or on foot to the mining area. Gasoline-powered jackhammers are used to remove the jade lenses and boulders from the host rock (figure 5). These pieces are then moved by animal and human power back to the truck, to be driven to the factory in Antigua. No more than five to 10 people at a time are involved in any one mining operation (J. Ridinger, pers. comm., 1988).

DESCRIPTION

The jadeite found in Guatemala is wonderfully varied (figure 6), although even in its finest qualities, it does not approach the translucency, texture, or rich "emerald" green of the classic Burmese "Imperial" jadeite. Nevertheless, the Spaniards originally thought that fine Guatemalan jadeite was emerald (Foshag, 1957). As with many gem products, colorful commercial names have been created for Guatemalan jadeite; these include "Olmec Blue," "Galactic Gold," "Watermelon," and "Emerald Green." The following are brief descriptions of the Guatemalan jadeite commercially available today:

Figure 3. Prospectors in Guatemala uncovered this field of eluvial (weathered tectonic block) jadeite on the northwest side of Cerro Colorado, near the town of La Palmilla. To the north can be seen Sierra de las Minas. Photo courtesy of George Harlow.

Green: Slightly variegated medium to dark green; semitranslucent to opaque; fine to medium texture. This color variety includes the best quality found to date in Guatemala (figure 6, bottom).

"Blue": Actually a slightly variegated bluish green; translucent to semitranslucent; fine to medium texture (figure 7). This is the rarest color found by the Ridingers (pers. comm., 1990), although they have not seen the almost pure "Olmec Blue" illustrated in Easby (1968), and its source remains a mystery.

Variegated Green: Small, randomly oriented patches of white and light grayish green; semitranslucent to opaque; coarse texture with eye-visible single crystals of allanite or jadeite (figure 6, top).

White: Slightly variegated with brown and gray (again, see figure 4); semitranslucent; coarse texture with eye-visible single crystals. This is the most abundant color (J. Ridinger, pers. comm., 1990).

"Black": Actually very dark green, as is readily apparent when viewed with transmitted light through a thin section; uniform color; opaque; fine texture; potentially commercially important (figure 6, left; figure 8).

Figure 4. This stream-polished boulder of white jadeite was found in one of the small rivers (Río La Palmilla, a tributary of the Motagua River) in the department of Zacapa. Photo courtesy of George Harlow.

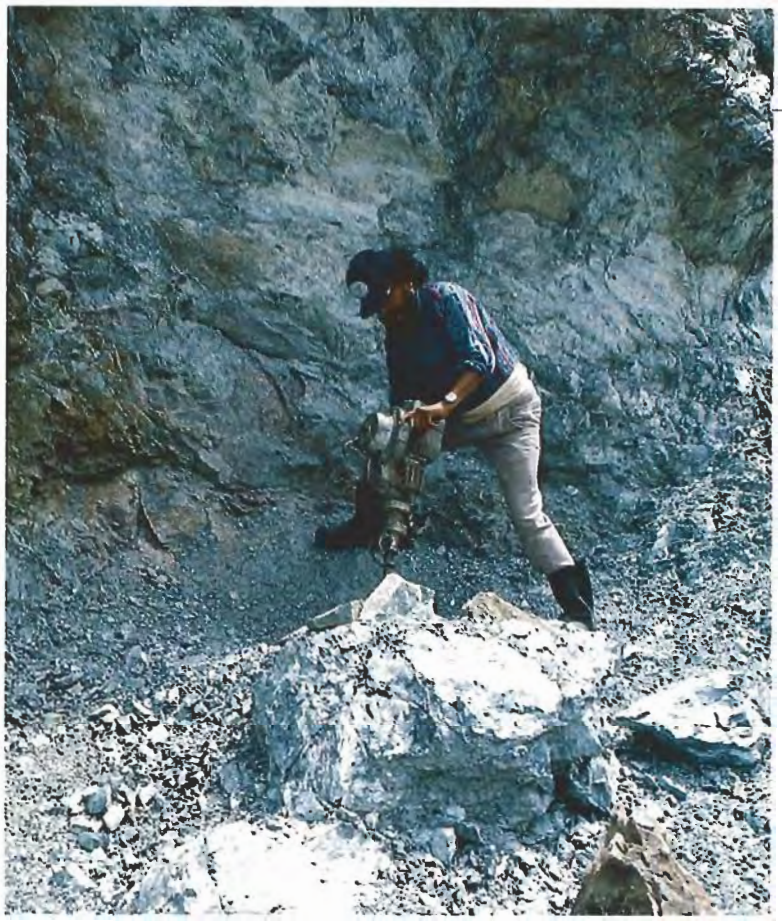

Figure 5. To remove jadeite from the area, large pieces are usually broken up with a gasoline-powered jackhammer. Photo courtesy of Jades S.A.

Figure 6. The jadeite found to date in the Motagua River Valley occurs in many different "varieties." Shown here are: top, variegated green; left, "black" (actually, very dark green); right, pyrite bearing; bottom, green. The largest piece (top) is 24.04 × 17.12 × 5.29 mm. Photo © Tino Hammid.

Pyrite-bearing: Uniform dark green with flecks of pyrite throughout; fine to medium texture; opaque (figure 6, right). Guatemala is the only known source of this material.

No precise production figures are available for the individual "varieties" of Guatemalan jadeite or for the total mined to date. At the end of 1989, however, Jay Ridinger (pers. comm.) reported that he currently had on hand 20,000 tons of "top quality" carving material.

GEMOLOGICAL PROPERTIES AND CHEMISTRY

The author performed standard gemological tests on 43 pieces of jadeite from this locality: two green, one "blue," 28 variegated green, four white, four black, and four pyrite bearing. The gemological properties of the various colors were remarkably similar. Also, despite the higher content of diopside in Guatemalan jadeite, the gemological properties are the same as for jadeite from other localities with the exception of the coarse granular crystalline structure. Table 1 compares the gemological properties of Guatemalan jadeite to those of jadeite from Burma (now Myanmar).

The refractive index (spot or shadow) of the Guatemalan material ranged from 1.65 to 1.67, but was usually 1.66. The specific gravity of the material tested was within the normal range for jadeite, from as low as 3.20 to, more commonly, approximately 3.34. Most stones showed the 437-nm absorption line in the Beck hand-held spectroscope. Several of the green stones also showed chromium-related bands at about 630, 660, and 690 nm. Although the "black" material did not show the 437-nm line, X-ray diffraction analysis proved it to be jadeite. Incidentally, X-ray diffraction analysis also proved that the yellow mineral found in some Guatemalan jadeite is, indeed, pyrite. The color filter reaction was inert for all but the bluish green material, which was faint red.

Guatemalan jadeite contains about 10% diopside, which is significantly more than the 1%–2% found in Burmese material (Foshag, 1957). Chemical analyses of various specimens of jadeite from the earlier Manzanal discovery as well as from archeological finds in Guatemala were performed and compared to the theoretical composition of pure jadeite by McBirney et al. (1967); their results are reproduced here as table 2, and include Foshag's (1955) analyses.

Figure 7. This slab (12.73 × 9.51 × 2.00 mm) is typical of the rare "blue" jadeite that has been found in the rediscovered jadeite deposits of Guatemala. Photo © Tino Hammid.

TABLE 1. Gemological properties of jadeite from Guatemala and from Burma (Myanmar).[a]

Property	Guatemala	Burma
Physical appearance	Granular appearance with eye-visible crystals; pyrite inclusions; greasy luster	Individual crystals rarely visible; no pyrite; greasy to vitreous luster
Colors	"Black" (very dark green); bluish green; white; variegated green; dark green; pyrite-bearing	Green; white; brownish orange; lavender; "moss in snow"
Transparency	Semitranslucent to opaque	Semitransparent to opaque
Refractive index (spot or shadow)	1.65–1.67	1.65–1.67
Specific gravity	3.20–3.34	3.25–3.40
Color filter	Negative except for the bluish green material, which showed faint red	Negative
Mohs hardness	Approx. 7	6½–7
Chemical composition	$NaAl(SiO_3)_2$ with $CaMg(SiO_3)_2$ up to 10%	$NaAl(SiO_3)_2$ with $CaMg(SiO_3)_2$ 1–2%
Visible absorption spectrum	437 nm in all except black; Cr bands in some green	437 nm; Cr bands common in green

[a]*Properties for Burmese jadeite are from GTL files.*

Figure 8. "Black" jadeite is actually a very dark green. This material is frequently used in fine jewelry (here, a 13.0 × 11.0 × 6.2 mm cabochon set with fancy-intense yellow diamonds in an 18K gold and platinum ring). It also holds a polish well: With normal wear, the polish on this cabochon should last many years, owing to the hardness and tough interlocking structure of the jadeite. Photo by Robert Weldon.

Diopside-jadeite and acmitic jadeite are also found in Guatemala, but neither was examined for this article. The refractive index of diopside-jadeite, which contains about 50% diopside, is 1.68 (Foshag, 1957). None of the Guatemalan material tested for this study had a refractive index that high. According to C. W. Fryer, West Coast director of the GIA Gem Trade Laboratory (pers. comm., 1988), if the material being tested possesses all of the gemological properties of jadeite—that is, the appropriate refractive index, specific gravity, spectrum, and hardness—it can be correctly called jadeite even though the diopside content is higher than that usually associated with jadeite.

CUTTING AND POLISHING

The first step of the cutting process requires that the large boulders, many of which weigh hundreds of pounds, be broken up. The Ridingers use a magnesium torch to heat the boulders (Ward, 1987)

Figure 9. These reproductions of Olmec carvings in jadeite, with jadeite and rose quartz beads, are typical of jewelry found in tourist shops in Guatemala. Courtesy of Jades S.A.

and then douse them with water to create cracks. Smaller pieces can be placed directly on a 12-inch or smaller diamond saw. The pieces are then carved or cut *en cabochon* or into beads. Most of the material is processed in Antigua, where there are a number of factories, the largest of which is Jades S.A., with 10 people employed in cutting and polishing.

COMMERCIAL ASPECTS

There are three commercial uses for modern Guatemalan jade: tourist jewelry and art (figure 9), reproductions of Mayan and Olmec carvings (figure 10), and cabochons or smaller carvings for karat-gold jewelry. The black jadeite is often used in fine jewelry like that shown in figure 8 because jadeite's hardness (approximately 7) and interlocking crystalline structure prevent it from becoming dull over time, a common problem with nephrite (Crowningshield, 1973).

Presently, Guatemalan jadeite is not being extensively marketed worldwide, although it has been exhibited at international gem shows such as the one held in February at Tucson, Arizona. Recently, some material (mostly black) has been sold and shipped to cutters in Hong Kong (G. Harlow, pers. comm., 1990).

TABLE 2. Chemical analyses of Guatemalan jadeite. Table reproduced from McBirney et al., 1967.

	1	2	3	4	5	5a	5b		
SiO_2	59.40	58.21	58.12	58.26	59.18	58.97	Si	1.996	2.000
TiO_2	0.00	0.04	0.31	0.04	0.00	0.00	Al^{IV}	0.004	
Al_2O_3	25.25	23.72	20.32	22.23	23.73	23.77	Al^{VI}	0.942	
Fe_2O_3	0.00	0.91	2.49	0.71	0.31	0.32	Ti	0.000	
FeO	0.00	0.24	0.77	0.21	0.11	0.11	Fe^{3+}	0.008	
MnO	0.00	0.04	0.07	0.03	0.02	0.02	Fe^{2+}	0.003	1.999
MgO	0.00	1.20	2.16	2.18	0.95	0.97	Mn	0.001	
CaO	0.00	1.79	3.13	3.72	0.95	1.43	Mg	0.049	
Na_2O	15.34	13.07	12.43	11.91	14.36	14.42	Ca	0.051	
K_2O	0.00	0.18	0.10	0.40	0.00	0.00	Na	0.945	
H_2O^+	0.00				0.04	—			
		0.46	0.16	0.44					
H_2O^-	0.00				0.06	—			
Total	100.00	99.86	100.07	100.13	100.17	100.01			

1. Theoretical composition of pure jadeite.
2. Jadeite from Manzanal, Guatemala, W. F. Foshag analyst (Foshag, 1955).
3. Jadeite from pea-green colored celt, Guatemala, J. Fahey analyst (Foshag, 1955).
4. Jadeite from "jade worker's tomb," Kaminaljuyu, Guatemala, J. Fahey analyst (Foshag, 1955).
5. Jadeite from Manzanal, Guatemala, K. Aoki analyst (new analysis).
5a. Analysis no. 5 recalculated by subtracting 2 wt.% albite (An_3).
5b. Atomic proportions calculated from 5a on the basis of six oxygen atoms.

Figure 10. This modern reproduction of a famous Mayan burial mask (16 cm in diameter) was fashioned from the newly discovered deposits of Guatemalan jadeite. Photo courtesy of Jades S.A.

CONCLUSION

Mesoamerican jadeite was mined, fashioned, revered, and worn for thousands of years in pre-Columbian civilizations. Although "lost" for hundreds of years, deposits of jadeite were "rediscovered" in Guatemala in 1974 and are presently being mined by very elementary techniques at sites near the small town of Manzanal.

Guatemalan jadeite varies greatly in color, translucency, and texture. It is sold in tourist shops, used in reproductions of ancient pieces, and set in karat-gold jewelry. The "black" material has the greatest commercial potential, while the bluish material is the rarest. To date, thousands of tons of jadeite have been mined in Guatemala.

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