Ancient American Ritual Bells

Metallurgy emerged independently at least twice in human history, once in the Near East about 7200 BC and in the Central Andes (Peru and Bolivia) at around 1500 BC. The Central Andes contain some of the richest mineral deposits on the American continent. These include copper, silver, and tin ores, along with deposits of silver and gold. The metallurgies of Colombia and Mexico, both related to the earlier metallurgy of the Central Andes, also developed in mineral-rich areas. Metalsmiths in all three regions of the Americas made bells which they fashioned using copper, copper-tin, copper-arsenic, or copper-gold alloys.

Historical, linguistic, and ethnographic sources make clear that in the ancient Americas bell sounds were sacred. In Mexico, bells were sounded in ritual celebrating human and agricultural fertility. In battle, the sounds of bells attached to warriors' shields protected those individuals. Bell sounds created the ancient Mexican afterworld, a sacred paradise populated by deities and filled with these sounds and shimmering colors.

Central Andean and Ecuadorian metalsmiths often worked metal to make bells, which made up some 20% of their metallurgical repertoire. Central Andean and Ecuadorian bells are small, spherical (2–5 cm in height), and contain a loose pebble clapper. Two holes at the top serve for suspension, and an elongated slit was left at the base. Most bells were made from copper, or copper-arsenic alloys with arsenic present between 1 and 2 wt%. Gold and silver specimens, and examples made from copper-silver alloys and tin bronze, are also found. These Andean metalsmiths initially cold worked the bell metal to shape, then annealed the bell, leaving it in the annealed condition. Priests and shamans wore bells attached to their ankles and sewn onto garments. Bells also are a part of composite ritual instruments known as rattle sticks which were sounded in curing ceremonies and other rites.

Metallurgy emerged in Colombia by approximately 100 AD. Although Colombian metallurgy was related to that of the Central Andes, it developed technically along different lines. Colombian metallurgy was based on lost-wax casting, primarily of copper-gold ritual objects. In Colombia, gold is common and copper deposits occur; however, the ore minerals required for a bronze metallurgy—either tin and/or arsenic ores—are rare. Bells comprise some 30% of all ancient Colombian metal objects. They range in size from about 2 to 7 cm, they are suspended from the top by a ring, and contain a loose pebble clapper. Most are cast from copper-gold (tumbaga) alloys containing various concentrations of gold. To enhance the golden colors, the castings were heated to oxidize the surface copper to produce the copper oxide scale, which was then pickled off with mild acid plant juices or other corrosive solutions. Repeated cycles of heating and pickling removed sufficient copper to leave the surface enriched with gold. These bells, like their Central Andean counterparts, were also worn or used by shamans, priests, and other elites.

In ancient Mexico, bell production was the primary focus of metallurgical activities. Bells comprise the majority (some 60%) of metal objects made in Mexico from the introduction of metallurgy around 650 AD to the European invasion in the 16th century. Rattle sticks with bells attached were sounded in rain-making and fertility ceremonies; priests wore bells in dance and other ritual activities. These Mexican bells, like Colombian bells, are lost-wax cast to shape. They are suspended by a ring at the top of the bell, and have a slit opening at the base. The clapper is a pebble or occasionally a piece of ceramic.

Metallurgy was initially introduced to Mexico's western region (the modern states of Guerrero, Jalisco, Michoacan, Colima, and Nayarit) from South America through an Ecuador-based Pacific coast maritime trade network. Lost-wax casting came from Colombia. A few prototype Colombian bells were probably traded into Mexico; later, these were copied using local materials. West Mexican smiths had available to them a more varied array of ore minerals than their Colombian counterparts, including copper carbonates and sulfides, arsenopyrite (the sulfide ore of iron and arsenic), native silver, and silver ore minerals. Cassiterite, the tin oxide ore, also occurs although it is less abundant in this region than to the northeast, in the area encompassed by the modern states of San Luis Potosi and Zacatecas.

Between 650 and about 1200 AD West Mexican metalworkers principally used copper to cast bells. Bells dating to this period range from 0.5 cm to 10 cm in height and occur in a variety of sizes and shapes. Pitch in these bells is primarily a function of the internal volume of the resonator chamber and the length and width of the slit opening at the base. These bells, which sounded as the individual moved in ritual performances, produced various pitches simultaneously. This "textured sound" has been described as one characteristic of the indigenous musical systems of the Americas.

After 1200 AD West Mexican metalsmiths began producing the two bronzes, copper-arsenic and copper-tin, and alloys of copper and silver. The technical knowledge required to manufacture these alloys was also introduced from South America. West Mexican artisans took advantage of the fluidity, strength, and solidification characteristics and color of the bronze and copper of copper-tin and copper-arsenic bronze to cast a variety of new bell designs. These bells (which contain the alloying element of either tin or arsenic between 5 and 23 wt%) are larger and thinner-walled than their copper counterparts. Resonator walls are formed by intricate wirelike patterns. The high-tin tin-bronze bells look golden. The high-arsenic arsenic-copper bells look silvery.

These color effects were intentional. The colors of gold and silver were associated with the solar and lunar deities, so were venerated in ancient Mexico. Yet metalsmiths interested in casting gold and silver bells—with these particular design characteristics—did not use the pure metals because they lacked the solidification characteristics, strength, and other properties of the copper alloys. Mexican artisans met the requirements of the color by employing the unusual technical expedient of adding tin or arsenic in high enough concentrations to alter metallic color to gold and silver, respectively.

These sacred bronze bells were common in west and central Mexico after 1300 AD. The bells, through their sounds and through their golden and silvery colors, linked the priests and elites to the supernatural.

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FOR FURTHER READING: D. Hosler, *The Sounds and Colors of Power: The Sacred Metallurgical Technology of Ancient West Mexico*, MIT Press (Cambridge, MA 1994) and H. Lechtman, "The Central Andes: Metallurgy without Iron," in *The Coming of the Age of Iron*, T.A. Wertime and J.D. Muhley, eds., Yale University Press (New Haven, 1980), p. 267. The bells can be seen at the National Museum of Anthropology in Mexico City and in regional Mexican museums.