

**OXUS TRUMPETS, CA. 2200 – 1800 BCE: MATERIAL
OVERVIEW, USAGE, SOCIETAL ROLE, AND CATALOG**

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Introduction

Today trumpets¹ are known as musical instruments, but for most of their 4,000-year history they were signal makers² on account of their loud sound. According to Machiavelli, successful warfare required them³: "The general, then, should have his trumpets about him, since they are the proper instruments for inspiring the army, and since they can be heard farther than any other... [he] can immediately make his army understand when he would have it halt, advance, or retreat... by various notes and sounds he can acquaint them with all the different maneuvers" (1521, p. 108). Hunters, likewise, commanded extensive repertoires of signals (Halfpenny, 1953-4) which rang across fields. Beside conveying information, the piercing sound would "inflame the army and scare the enemy out of his wits"⁴ and such awe-inspiring qualities may have given trumpets numinous associations⁵. At

¹ Current terminology distinguishes trumpets, trombones, tubas and horns mainly on the basis of size. But visible differences are immaterial from the acoustical perspective and the designation "brass instruments" is inappropriate a millennium before this copper alloy was discovered. In every case, the sound is produced by vibrating lips which cause oscillations in the air column of the instrument tube. Long tubes produce low pitch, short ones high pitch. Some obvious features, like differences in the folding of the tube, have little effect. Current brass instruments can change tube length by mechanical devices (slides and valves), but the earliest trumpets had fixed length and straight shape. Yet, several pitches could be produced by overblowing. The parts of an Oxus trumpet are defined in fig. 1.

² Efforts to make trumpets adequate for "proper music" began as recently as 1600 CE (Tarr, 1988, pp. 85-90).

³ For Greek war trumpets, see Krentz, 1991 and Nordquist, 1996.

⁴ Machiavelli, as quoted in Baines, 1976, p. 32.

⁵ Seven trumpets will mark the end of the Christian world (Rev. 8) and *Isrāfīl*'s "Trumpet of Doom" (*ṣūr*) will do much the same for Muslims (Rippin & Knappert 1986, p. 86). J. Duchesne-Guillemin (1980, pp. 544-548) has proposed that *ṣūr* ultimately derives from

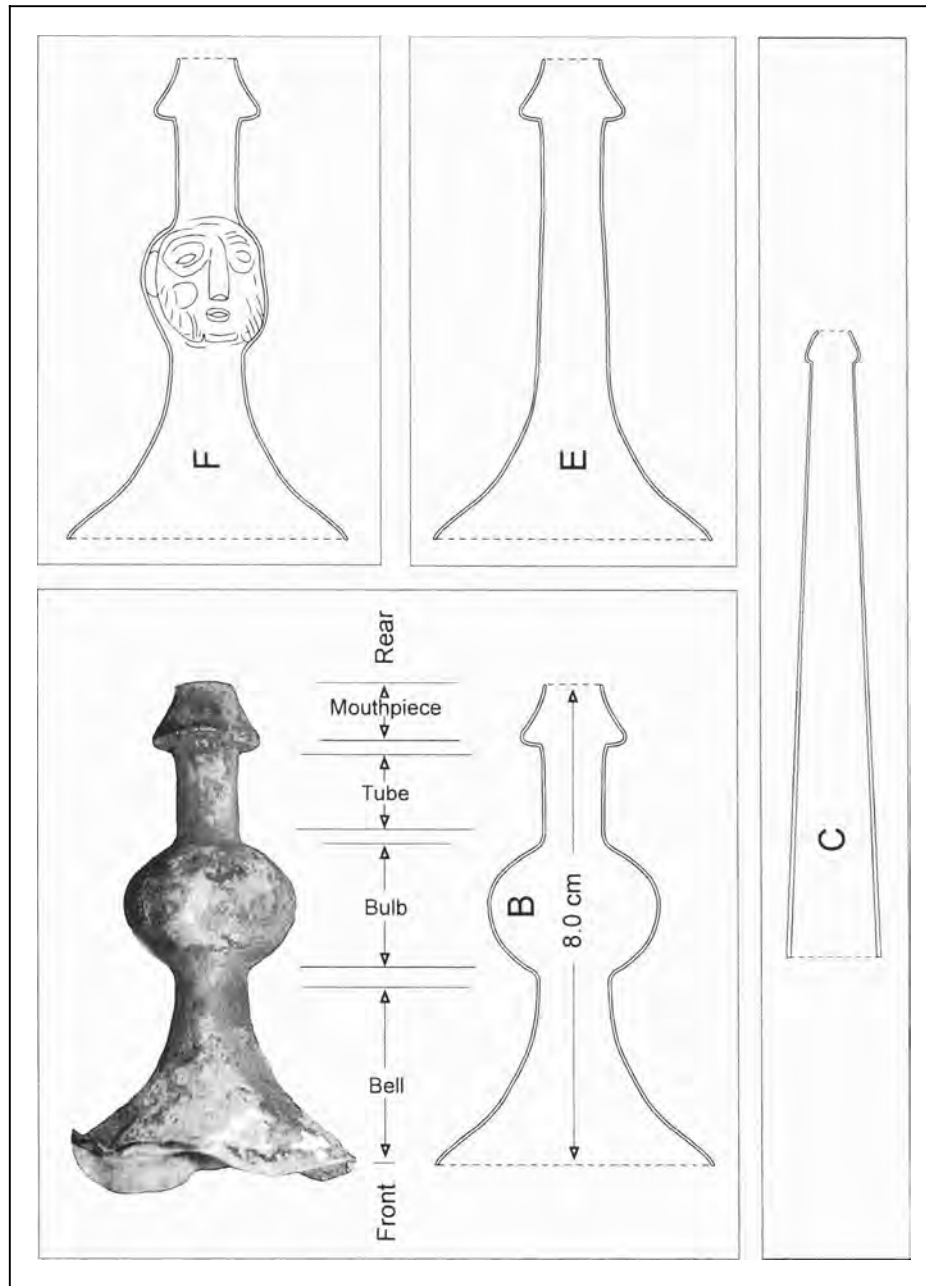


Fig. 1. Shapes and parts of Oxus trumpets. B = bulb trumpet; F = face trumpet; E = plain exponential trumpet; C = plain conical trumpet.

any rate, primitive versions, such as modified seashells⁶ and animal horns⁷, were often present in sacred rituals.

Oxus trumpets (fig. 1) differed significantly and occupied a niche usually not considered musical⁸. Still, they were true trumpets: the player's vibrating lips made the sound and the instrument's acoustical properties determined the pitch. Their short lengths (ca. 8 cm) resulted in high pitches and soft sound, a combination that rendered them useless for signals and music but enabled them to mimick animal calls.

During the 1970s many Oxus trumpets were looted from the desert region of southern Bactria and soon surfaced in the antiquity markets of Kabul⁹. Lacking stratigraphic information, their dates and context are lost, but their lineage had been established by their similarity to trumpets scientifically excavated at Iranian sites (Tepe Hissār [or Tappeh Hesār],

supra-, the Avestan word for trumpet (see note 72 below). He surmised that the Apocalyptic trumpets entered the Bible as part of an eschatology borrowed from Zoroastrianism.

⁶ A conch shell can easily be played if the narrow end is cut to provide a mouthpiece. Its sound is clear but the range narrow. The shells usually belong to the genus *Charonia*. Their distribution is world-wide (Jackson, 1917), and Sachs lists ethnographic documentation in Europe, Africa, Asia, South Pacific and America (1928, pp. 33-36). They are first documented in the Mediterranean, especially on Cyprus (Åström & Reese, 1990; Skeates, 1991; Evans, 1901, p. 142; Ridout Sharpe, 1991, pp. 76, 80; Montagu, 1981). During the Bronze Age a few shells were modified as trumpets. Modifications became increasingly common until the Iron Age when most shells are converted to trumpets (Ridout Sharpe, 1991, p. 83). The inside channel of a shell has the geometry of an equiangular spiral: as one proceeds toward the opening, the channel increases in breath at a steady and unchanging ratio, and forms a cone coiled up on itself (Thompson, 1942, p. 753). The conicity accounts for the good playing properties of shells: the tubes overblow in a perfect series of harmonics. Whereas the conical shape is acoustically important, the spiral is not. Conch shells have been put in religious service in tempered coastal regions around the world. In India it became an attribute of Viṣṇu. He is often shown holding a triton shell in his outstretched left hand (Stutley, 1985, p. 86).

⁷ The *Shōfār* is made from one of the horns of a ritually killed ram or goat with the narrow end truncated to form a mouthpiece. Precursors were excavated on the Uluburun ship (ca. 1300 BCE, Pulak, 1998), at Ugarit (Caubet, 1996, fig. 10) and at Tell Abu Hawam (Pulak 1998, p. 205). These were made of hippopotamus incisors carved into the shape of ram's horns and decorated with spiral patterns. Presumably, these imitated earlier undocumented trumpets made from such horns.

⁸ In an earlier paper (Lawergren, 2001a, fig. 5) I used the name "Bactrian trumpets" because most trumpets had been found in southern Bactria, but it is now clear that both Bactria and Margiana (home of the Oxus Civilization) had plenty of trumpets, and they probably originated somewhere in that broad region.

For photographs of landscape, looters, and bazaar, see Sarianidi 1986, pp. 18-20, figs. 2-6 and Ligabue & Salvatori, 1989, figs. 39-40.

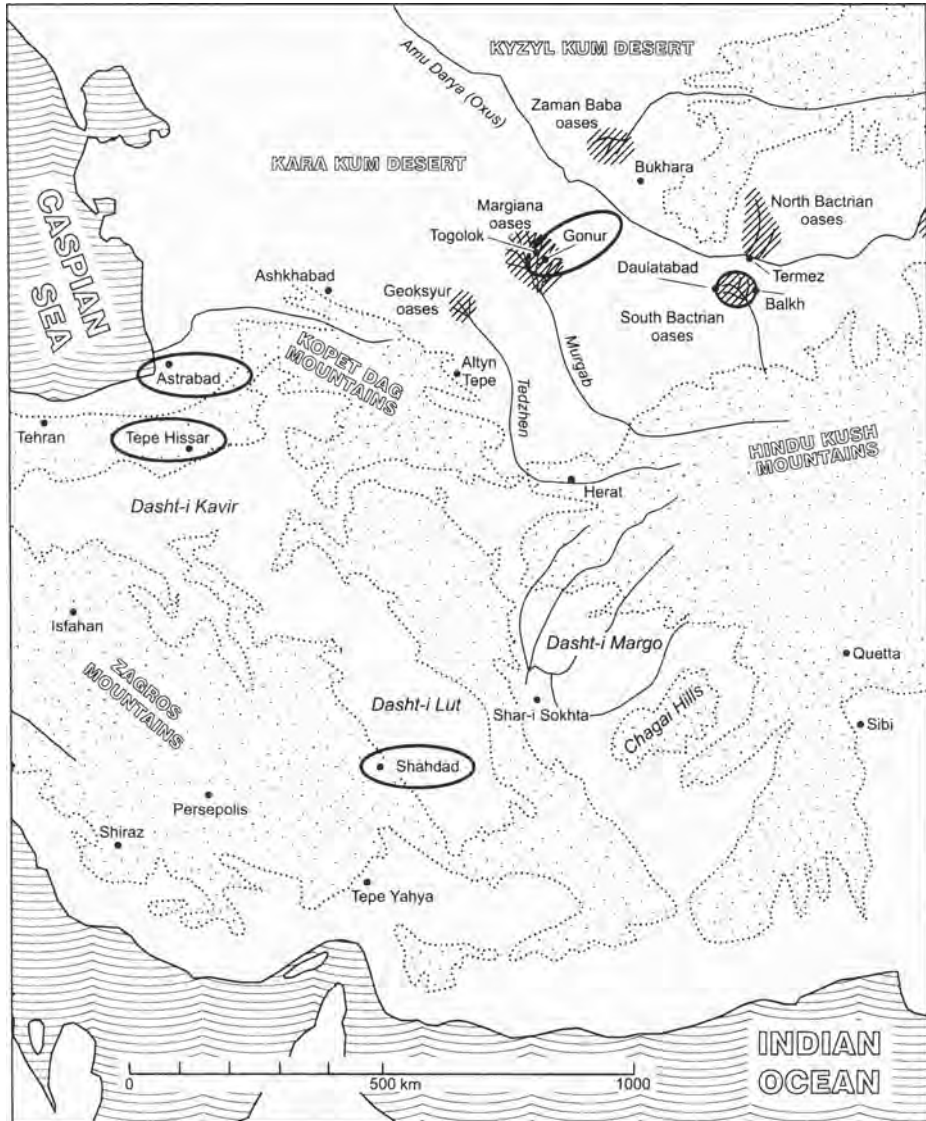


Fig. 2. Regions with Oxus trumpets. Dotted areas are 1000 m above sea level. Oval areas mark sites where trumpets have been found. Oasis regions are hatched.

Shahdād, and Astrābād). Since the latter are dated 2200 – 1800 BCE, this is also the likely period for the Bactrian corpus. Finally, removing any uncertainty, five trumpets were recently excavated at Gonur, a site in the region of Margiana, 400 km west of Bactria. All are similar to the

Bactrian corpus. Oxus trumpets predate other extant trumpets, such as those of Tutankhamun'' (1350 BCE) and recently discovered examples of the proto-*shōfār* (1300 BCE, see note 7).

When the trumpets flourished, southern Bactria and Margiana were fertile regions irrigated by rivers flowing north from the Hindu Kush (fig. 2). Beyond the foothills the rivers spread into deltaic systems of rivulets and streams. The two principal systems are Margiana and Bactria, here collectively called the Oxus civilisation. It arose shortly after the middle of the third millenium and ceased a millennium later, possibly because of increased aridity (Hiebert & Lamberg-Karlovsky, 1992, p. 12).

Systematic excavations in Margiana, Bactria, and adjacent regions were started in the late 1960s by Soviet archaeologists and have been continued by Russian and international teams. They found that, for a relatively brief period (ca. 2200 – 1800 BCE)¹², sites in Margiana and Bactria contained similar objects, the "Bactria and Margiana Archaeological Complex" (BMAC). Hiebert (1994a, table 2) has discussed the emergence of objects (figurines, amulets, bone tubes, bone axes) characteristic of the complex. We add trumpets.

Recently, evidence for writing has been discovered (Klochkov, 1998, p. 173; Hiebert, 2001, p. 48), and the Oxus civilization is now increasingly seen as a culture approaching the level of complexity seen in early Egypt, Sumer, and Indus. One manifestation of complexity is the wide range of musical instruments in the two former regions¹³ (2500 – 1500 BCE) but, so far, only trumpets and drums¹⁴ are known in the Oxus (2200 – 1800 BCE),

¹⁰ The latter carry a dedication to Amun which implies they probably were used in the temple, not in the army.

¹¹ On the map (fig. 2) hatched areas represent clusters. Already Pumpelly's survey of 1908 showed the clusters (fig. 488), and Hiebert's map, drawn more recently (1994a, fig. 1), adds positions of excavated sites. For further discussion of geography, see Hiebert, 1994b, pp. 4-14 and Tosi 1989, fig. 3.

¹² Hiebert & Lamberg-Karlovsky, 1992, p. 5; Hiebert, 1994a, p. 374; Simpson, 1995.

¹³ For recent discussions, see Lawergren 2001a and Lawergren 2001b.

¹⁴ The Oxus drum is illustrated in fig. 30 (Francfort, 1994, fig. 6). It is a circular frame-drum of approximately 60 cm diameter, held with the vertical skin facing toward the side of the sitting drummer and played with a stick. Its shape resembles Mesopotamian drums of the same period (e.g., Rashid, 1984, pp. 68-73), but these were played with bare hands. Texts, however, mention drum sticks: in the ritual preparation of *lilissu* kettledrums the *kalū*-priest/musician is instructed to "wrap the drum-sticks [sikkatu] with fluffy wool and

while pipes¹⁵, harps¹⁶ and drums¹⁷ are depicted in the Indus civilizations (2500 – 1900 BCE).

A search in museums, collections, and archives has yielded the 40 Oxus trumpets¹⁸ listed in the appendix. They fall into three categories on account of shapes. Those with a bulbous expansion will be called bulb trumpets, and their catalog entry starts with letter B. Some, where the bulb is decorated with faces in relief (face trumpets), have entries beginning with F. The third category lacks bulb and face and is labeled E (plain exponential trumpets) and C (plain conical trumpets) depending on the curve of their contour (fig. 1).

1. Excavated trumpets of Oxus type

The eleven excavated trumpets in fig. 3 provide the most valuable material. Without them one could reasonably question the authenticity of the numerous Bactrian trumpets. But most features of the excavated set are

cover it with varnish" (Thureau-Dangin 1920, p. 75 [French] and Pritchard 1969, p. 336 [English]). At the East Iranian site of Shahr-i Sokhta wooden sticks were found, apparently drum sticks (late third millennium BCE, Lawergren, 1997, columns 148-150).

¹⁵ The player sits in a tree with a long musical pipe (ca. 50 cm) in his mouth. He holds it at 45° angle, pointing it toward an over-sized tiger (fig. 29b; Joshi & Parpola, 1987, seal M-478 B). The alternative interpretation — that the pipe is a blow-pipe (weapon) — is implausible (Gregory Possehl, private communication).

¹⁶ A C-shaped pictogram was used in the Indus script (Mahadevan, 1977, nos. 311, 1046, 4680 & 4692). Several vertical lines were added inside the letter and, as a result, it looked like an arched harp. Considering the popularity of arched harps in early Buddhist iconography, and the mention of the instrument in Vedic texts (see note 99), the interpretation looks reasonable. A similar use of a musical instrument as a pictogram had already occurred in the early Sumerian script (ca. 2900 BCE) where the BALAG-sign depicted an arched harp or a drum (Lawergren, 1997, column 145, fig. 2b), and was to occur again in the Cretan hieroglyphic script with the harp as the sign (ca. 1700 BCE, Neumann, 1982).

¹⁷ The Indus drum (fig. 29a) is illustrated in Vats (1940, seal number 306) and in Joshi & Parpola (1987, p. 209, seal H-182 A); another impression of the same seal is in Meadow & Kenoyer (1993, fig. 40.8h). A drummer faces an over-sized tiger, and his barrel-shaped drum is ca. 80 cm long, has drum skins of ca. 15 cm diameter at each end, and swells to 30 cm diameter in the middle. He plays it at both ends with bare hands. It is the first instance of the barrel-shaped drum frequently illustrated in India during the first century BCE at Sāñcī (Kaufmann, 1981, pp. 65, 66, 77) and continuing during the 1st to 3rd centuries CE at Mathurā (Kaufmann, 1981, p. 121), in Gandhāra (Kaufmann, 1981, pp. 141, 147 & 155) and Bactria (Lo Muzio, 1995, p. 245, fig. 16). A millennium later it is shown in Mysore (Blades, 1970, fig. 44).

¹⁸ There are 43 items in the catalog, but three (nos. 14-16) may not be trumpets.

OXUS TRUMPETS, CA. 2200 – 1800 BCE

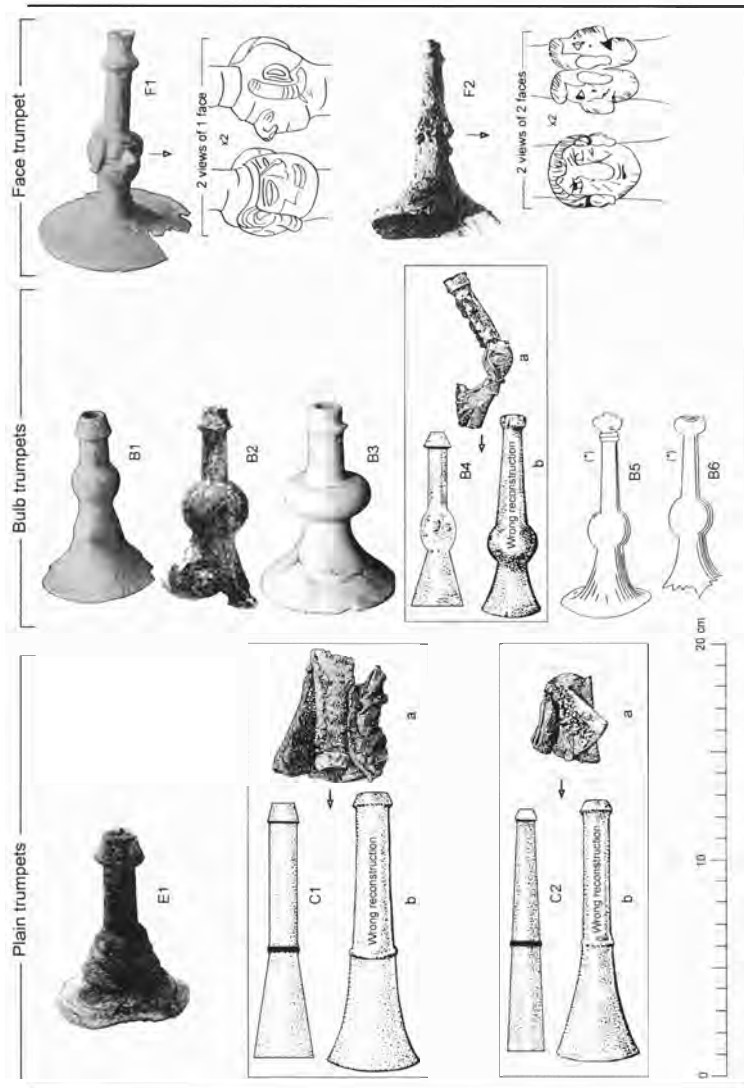


Fig. 3. Excavated trumpets displayed on the same scale — except those marked (*). — E1. Gonur (Margiana). Excavation and photo: Sarianidi (Spring 2001). — C1. Tepe Hissār (Iran). Author's reconstruction based on the photo in fig. 5. — a. Drawing of the squashed trumpet as originally found. — b. Excavator's surmised restoration. — C2. Tepe Hissār (Iran). Author's reconstruction based on fig. 5. — a. Drawing of the squashed trumpet as originally found. — b. Excavator's surmised restoration. — B1. Gonur (Margiana). Excavation and photo: Sarianidi (Spring 2001). — B2. Gonur (Margiana). Excavation and photo: Sarianidi (Spring 2001). — B3. Gonur (Margiana). Excavation and photo: Sarianidi (October 2001). — B4. Tepe Hissār (Iran). Author's reconstruction based on extant trumpet in fig. 4. — a. Drawing of the squashed trumpet as originally found. — b. Excavator's surmised restoration. — B5. Astrābād (Iran). Drawing: de Bode (1844). — B6. Astrābād (Iran). Drawing: de Bode (1844). — F1. Gonur (Margiana). Excavation and photo: Sarianidi, Spring 2001. Two views of the face are shown doubly magnified. Drawing: author. — F2. Shahdad (Iran). Drawing by Hakemi (1997, p. 635). The faces are doubly magnified.

also present on the unexcavated material, and the correspondence eases our concerns. The excavation sites are marked in fig. 2.

1.1. *Gonur.* The fact that the site is large and contains a palatial structure has led to the surmise that Gonur was the capital of Margiana around 2000 BCE. Because of its extensive remains, the region has been called a Mesopotamia-in-miniature¹⁹. The citadel and its central palace at Gonur South has received much attention (Sarianidi, 1994, pp. 388-391), and recently the excavations have moved on to the large cemetery (ca. 200 meters by 200 meters). Many tombs were looted in antiquity (Sarianidi, priv. comm., 2001; Salvatori 1994, p. 22; Salvatori 1995, p. 11; Cremaschi 1998, fig. 7), but a considerable amount of goods still survive. Of about 3,000 tombs investigated by Sarianidi, five contained one trumpet each (B1- B3, E1 & F1 of fig. 3), but lacked skeletons. Such tombs with grave-goods but without a body ("cenotaphs") leave no information on the gender of the trumpeters but, according to Sarianidi, the associated goods are typical of male tombs. In spite of extensive excavations, no trumpets have been found in the citadel. They appear to be restricted to tombs. One could, in principle, make more precise dating of the trumpets, for the tombs contain material from two district phases: (1) Middle Bronze Age, 2200-1900 BCE and (2) Late Bronze Age, 2000-1750 BCE (Hiebert 1994b, p. 80). Each phase had distinct ceramics (Hiebert 1995b, pp. 39-73), but the ceramics in the trumpet tombs have not yet been analyzed.

Two trumpets are made of copper, two of silver, and one of gypsum (or its fine-grained variety, alabaster). The latter medium is unique as trumpet material but otherwise common in the BMAC²⁰. The three bulb trumpets are typical, but the single plain trumpet has an unusual combination of conical and exponential shapes. The face trumpet is also typical (fig. 24).

1.2. *Shahdad.* Copper²¹ trumpet F2 was found in grave no. 081 (item 0787) which also contained two other copper objects (dagger, bowl) and 11 ceramic jars (Hakemi, 1997, pp. 245-6, 635). The skeleton had disintegrated

¹⁹ Sarianidi, private information November 20, 2001.

²⁰ Hiebert, 1994a, p. 375. In *Shahdād gypsum was used for beads* (Hakemi, 1997, pp. 657), and *at Tepe Hissar III C for figurines and vases* (Schmidt, 1937, pp. 188, 215, 217). The material was common in Mesopotamia, e.g. at Ur during Early Dynastic I and II: *bowls, cosmetic vessels, and ornamental stone* (Moorey, 1994, pp. 45 & 83).

²¹ *Copper objects at Shahdād contained considerable amounts of arsenic and perhaps up to 10% tin* (Hakemi, 1997, p. 59), but nothing specific is said about the trumpet.

so, again, the player's gender cannot be determined. The site has been dated broadly: Hakemi (1997, pp. 76-77) gives 2700 – 2500 BCE, Hiebert & Lamberg-Karlovsky 2300 – 1700 BCE (1992, p. 8), and Salvatori & Tosi 2500 – 1800 BCE (1997, p. 123).

The photo reproduced in fig. 3, the only one known, shows a flaring trumpet with the reliefs of two male faces mounted back-to-back near the middle. Because the metal is badly corroded, one cannot discern facial features clearly and must rely on Hakemi's rough line-drawing reproduced below the photo. It is hard to know which marks represent shadings introduced by the modern artist and which are actual lines in the metal. Those on the chins may indicate a beard and those on cheeks scars. But gross features are obvious: both faces have larger noses and coarser features than the Gonur face.

1.3. Tepe Hissār. Erich Schmidt began excavating Tepe Hissār, 280 km east-northeast of Tehran, in 1931. During the second season he found trumpets B4, C1 and C2 (figs. 3-5; Schmidt, 1937, p. 210 & fig. 121; Schmidt, 1982, figs. 17 & 31). They belong to Hoard I found on the Treasure Hill in stratum IIIC, a level dated 1900 – 1800 BCE²². Being part of a treasury²³, they may have been old when deposited, but this added uncertainty in age is hardly significant considering the general uncertainty in dating the site. According to the report, two trumpets were made of silver and one of gold. All were crushed nearly flat by earth pressure, but those of silver had also been sharply folded before deposit (in fig. 3: C1a & C2a; fig. 5), an act that would have rendered them unplayable. The excavation report shows no other folded object, so the "killing" was specific to the trumpets. It did not occur at other trumpet sites, but similar destruction took place at Ur (2450 BCE), when silver pipes were folded into three overlapping sections²⁴. Because the trumpets were part of a treasury, there were no associated skeletons, and the trumpeter's gender is uncertain.

²² C¹⁴ date cited in Schmidt, 1982, p. 26. Also Dyson & Howard, 1989, p. 57 (2150-1885 BCE). Schmidt (1937) gives only vague dates. In a letter written July 26, 1951 to Bella Weitzner at The American Museum of Natural History, New York, he called level IIIC "2000 +/-."

²³ Many objects in the hoard are related to BMAC (Sarianidi, 1998, fig. 70).

²⁴ Lawergren, 2000, 123-4. Bronze lurs, which flourished 1300 – 600 BCE in the southwestern region of the Baltic, are sometimes also said to have been wilfully destroyed. They had a full length of 150-225 cm and could be disassembled at several joints. Most were found in fragments, but the breakage was probably a result of natural erosion rather than an act of wilful destruction. Indeed, they seem to have been carefully disassembled before burial (Broholm, et al., 1949, p. 69).

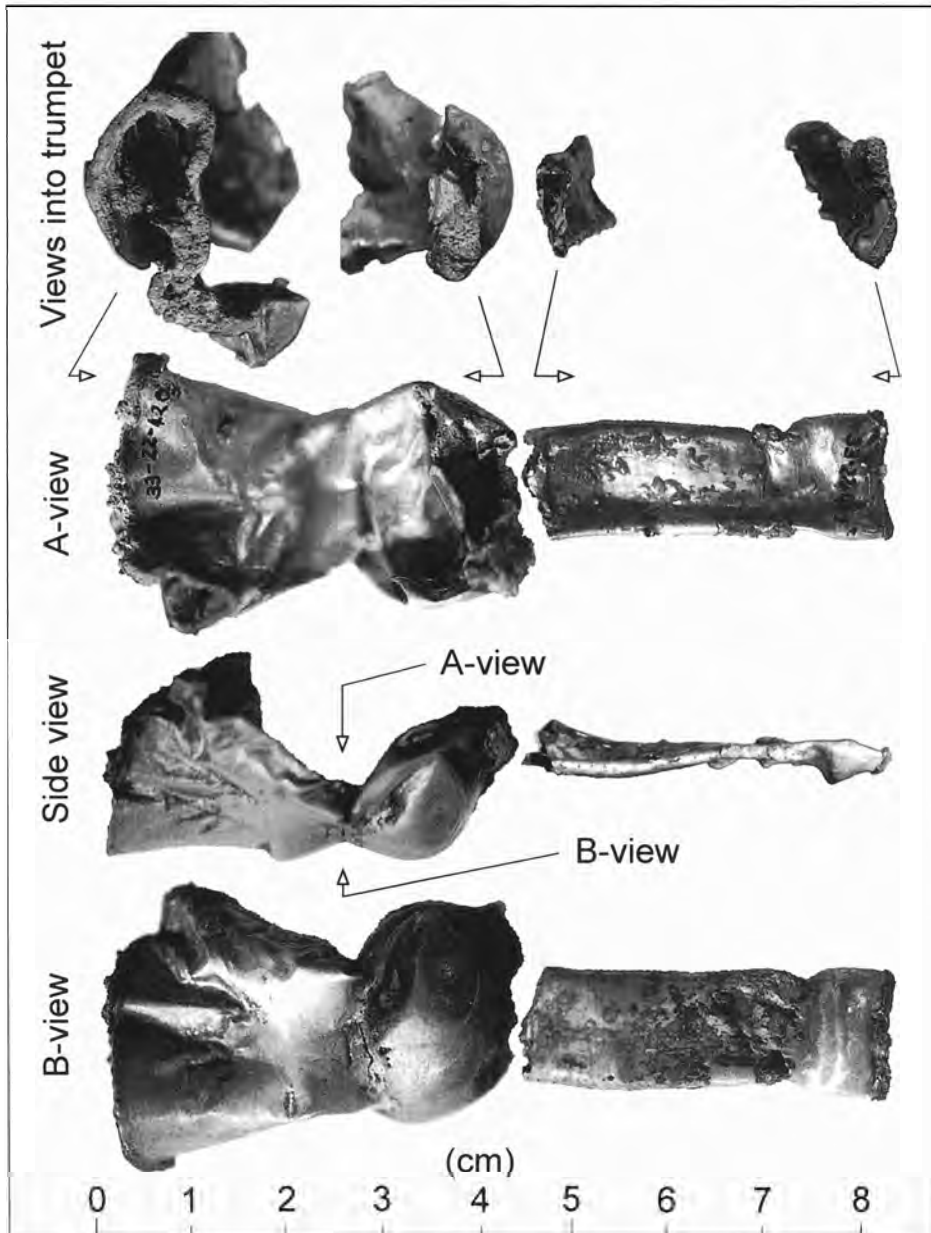


Figure 4. Gold trumpet from Tepe Hissār (B4) viewed from several directions. The slim side-view is seen from the top (the "A-view") and the bottom ("B-view"). At the top are views taken in four directions along the axis of the instrument. Photos: author.

Until now only a one-page picture (1937, p. 121; scale 3:4) has been published, and Schmidt's remark "[they are] problematic devices of silver and gold... [which] remind one of signal horns, since they are open at either end" (1937, p. 210) has remained the last word for 66 years. But the report is confusing, e.g., the inventory (1937, p. 424) lists sizes, materials, and "present location" at variance with the information on the one-page picture (1937, fig. 121) and in the museum records. To compound the difficulties, the two silver trumpets can no longer be found — but the gold trumpet (fig. 4) is in the University of Pennsylvania Museum of Archaeology and Anthropology in Philadelphia (formerly called The University Museum, Philadelphia), although it was said to have been deposited in Tehran (table 1). Fortunately, the archives of the museum hold two informative, unpublished, documents. The first is a photograph (scale 1:1) of several silver trumpets and the second is the original of the one-page picture (now scaled 1:1). Both are reproduced in fig. 5. They cause a revision of the dimension (table 1).

None of the trumpets were ever restored, but the excavator, who thought "their original form is clear," published drawings of his conception (all labeled b in fig. 3) together with the squashed originals (labeled a). But, as discussed below, new drawings introduced here give better agreement with the shapes in fig. 4 and 5.

1.3.1. Gold trumpet. Trumpet B4 is made of gold in a single seamless piece, apart from the midpoint break already present in the earliest illustrations (fig. 3: B4a). Since the break has jagged edges and a bad fit (fig. 4), it may also have been deliberately broken before the burial. Although squashed after the burial, one side of the bulb still retains its semispherical shape, and the bell still flares. The three sections (bell, bulge, and tube in fig. 4) are well articulated²⁵.

A modern coat of varnish covers the gold surface (ca. 0.5 mm thickness), but does not touch a thick whitish-gray layer partly filling the inside

²⁵ To estimate tube diameters, the observed width of the flattened tube should be reduced by the factor $2/\pi$ to account for the restored three-dimensionality.

²⁶ The view in the excavation report (reproduced as B4a in fig. 3) is incorrect: it gives the side-view of the bell and the A-view of the tube. Moreover, Schmidt drew a conical tube although the extant fragment is cylindrical.

Table 1. Data on Tepe Hissār trumpets. Lengths in cm.

Designation in the present catalog	B4	C1	C2
FROM THE EXCAVATION REPORT (Schmidt, 1937, p. 210, fig. 121)			
Museum inventory number	H 3224	H3225	H 3226
Material shown in fig. 121	Gold	Silver	Silver
FROM THE INVENTORY IN THE EXCAVATION REPORT (Schmidt, 1937, p. 424)			
Location and field number material	Tehran Silver	UM 33-22-420 Silver	UM 33-21-892 Silver
Length	1 7 . 1	6.3	1 4 . 1
FROM A DRAWING AND A PHOTO IN THE UNIVERSITY MUSEUM:			
Material shown on the drawing	Gold	Silver	Silver
Length on archival photo — here fig. 5 (top)	—	12.0 ± 0.4	11.9 ± 0.5
Length on archival drawing — here fig. 5 (bottom)	8.7 ± 0.2	11.9 ± 0.3	12 f 1
Length on published drawing — here labeled "a" in fig. 3	8.6 ± 0.3	12.1 ± 0.4	13 ± 1.5
Length on published drawing — here labeled "b" in fig. 3	9.3 ± 0.1	12.7 ± 0.1	11.9 ± 0.1
Best estimate of lengths		12.0 ± 0.4 *	11.9 ± 0.5 *
OBSERVED ON EXTANT OBJECTS IN THE UNIVERSITY MUSEUM			
Location and field number	UM 33-22-420	Unknown	Unknown
Material	Gold & Silver	—	—
Length	7.4 ± 0.2 *	—	—

UM = University Museum, Philadelphia (old name) = University of Pennsylvania Museum of Archaeology and Anthropology (current name). * = accepted lengths.

of the gold shell (visible in the cross-sections at the top of fig. 4). PIXE analysis²⁷ proves it to be silver chloride, the only surviving evidence of an

²⁷ Proton Induced X-Ray Emission Spectroscopy gave the following levels: silver 95.3%, copper 0.41% (added to make the silver less brittle, according to Stuart Fleming, private communication), chlorine 3.4% (causing heavy corrosion), and bromine 0.7%. There were trace levels of elements such as iron, aluminum, and silicon — probably contaminants from the soil.

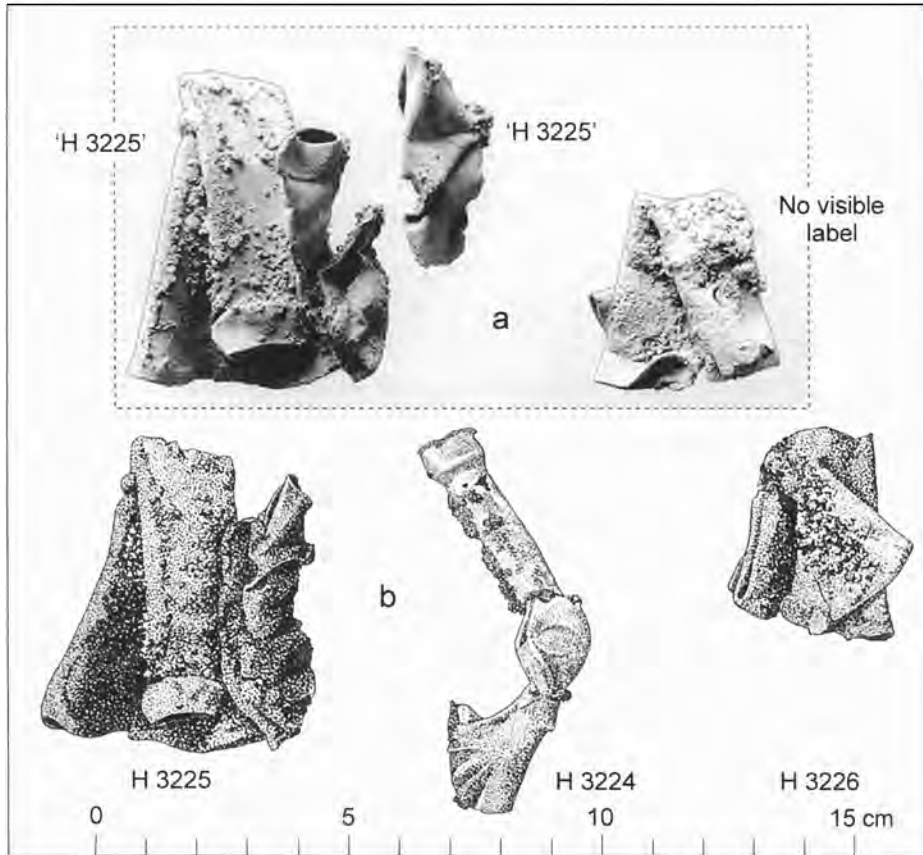


Figure 5. Original images of the Tepe Hissār trumpets (from the archives of University of Pennsylvania Museum of Archaeology and Anthropology).

a. The photograph (PE 2338) inside the dashed-line frame shows three (?) silver trumpets which no longer are extant. The caption “1/1” has been handwritten on the photo, and the labels “H 3225” and “H 3226” have been typed below the objects at the left and right side, respectively. The objects themselves show handwritten labels: H 3225 is written on both the left-side and the middle objects. The right-most fragment carries no visible label. Presumably, it was written on the down-turned side.

b. The original image (scale 1:1) published (in scale 3:4) in the lower part of fig. 121, Schmidt, 1937.

inner trumpet made of metallic silver. What Schmidt called a gold trumpet was, in fact, a double trumpet: a gold trumpet surrounding an inner silver trumpet.

Schmidt's drawing of the surmised pre-burial shape is inaccurate on two accounts: (1) the extant tube has parallel sides (fig. 4), not expanding as in the drawing, and (2) the extant mouthpiece is shaped like a truncated cone (lower half seen at the right end of the side-view of fig. 4); the same shape is present on other excavated trumpets (B1 & E1, fig. 3) and on most unexcavated ones (e.g., B7, B9-B18 & fig. 7).

1.3.2. Silver trumpets. According to museum records, the University Museum was given one silver trumpet, but it can no longer be found and may have crumbled and been discarded²¹. In the absence of any surviving silver trumpets, I use the archival photograph to estimate the lengths of the two trumpets (12.0 ± 0.5 cm) and conclude:

(1) Every side shown on the photograph (fig. 5a) is straight, giving the trumpets cylindrical or conical bores — not curved as Schmidt drew them ("wrong reconstruction" in fig. 3). As far as one can see, the trumpet on the right in fig. 5a has a straight and continuous conical shape from the mouthpiece to the front end, whereas the trumpet on the left has a straight cylindrical tube between the mouthpiece and the ring-shaped center followed by a straight conical bell. I have drawn these shapes in fig. 3 (C1 & C2). This revision is important since the shapes now agree with the unexcavated plain silver trumpets (C3-C7 in fig. 6). Because the true Hissār shapes have not been known earlier, these unexcavated plain trumpets can not be forgeries based on the Hissār precedent.

(2) It is impossible to correlate all pieces on the photo (fig. 5a) and the line-drawings (fig. 5b), but some correspondences are clear: the large piece on the left (the label H 3225 is inked directly on the metal near the bell of the trumpet) is identical to the large trumpet drawn directly below (= C1a, fig. 3). But confusingly, the large piece has an additional fragment stuck to its right side (with mouthpiece in the photo [fig. 5a] but without mouthpiece in the drawing [fig. 5b]). In the middle of the photo there is a detached fragment ending with a bell (also labeled H 3225 on the metal near the bell). The additional pieces probably constitute one or two silver trumpets ignored in the excavation report.

²⁸ As noted above, the silver in the gold trumpet has eroded severely and only survived because it was held in place by the well-preserved gold. On the other hand, the gold probably accelerated the erosion of silver, the baser metal.

(3) The piece (fig. 5a, right side) corresponds to the drawing directly below (H 3226), but viewed from the opposite side. There is no visible label on the photo, possibly because it was inked on the other side.

1.4. *Astrābād.* In 1841 the Shah in Tehran received "some ancient gold vessels and other curious objects" found in a mound near the town of Astrabad, 100 km north of Hissār (fig. 2). Three years later line-drawings were published (de Bode, 1844) but the objects soon vanished. Rostovtzeff republished and discussed the material in a review 76 years later. The original publication included (unreliable?) line-drawings of two gold trumpets (here reproduced as B5 & B6, fig. 3). No dimensions were published, but the total weight of both was said to be 5.5 oz²⁹. According to de Bode they "resemble in miniature the trumpets used in Persia at the pavilion where music is performed at sunset in honor of the Shah," but Rostovtzeff (1920, pp. 17-18) rejected the idea: "I would rather suppose that they may have served as supports for spherical or egg-shaped objects, recalling the support for the egg-shaped engraved vessel of Entemena³⁰. I cannot point to anything analogous to these trumpet-shaped objects. (They might also suggest the notion of covers for the ends of the short staffs on which the mace-heads were fixed.)" The finds from Astrābād are now thought to have come from the large archaeological site of Tūrang Tepe (Wulsin 1931, p. 2, and 1938, p. 2, and 1938, p. 163).

The two Astrabad trumpets have the same flaring bell, spherical bulb, cylindrical tube, and mouthpiece as the Gonur and Hissār instruments. One trumpet has a pair of rings near the mouthpiece (B5, fig. 3), a feature resembling the single ring on each of the two plain trumpets at Hissār. The mouthpiece of the other (B6, fig. 3) looks different from the norm, but it may just have been badly drawn in 1844.

1.5. *Shapes.* We distinguish three types of excavated trumpets:

1.5.1. Plain trumpets, exemplified by copper and silver trumpets at Gonur and Tepe Hissar, have fairly straight tubes, some of which flare more at the front than at the back. Indeed, some of the rear tubes are cylindrical

²⁹ No errors were given, but the printed numerals probably imply an error of at least 0.2 oz. This weight corresponds to a mass of 156 ± 6 grams but, since one of the trumpets is a fragment, the initial mass would have been higher, perhaps 190 ± 20 gram.

³⁰ For a view of this vessel which entered the Louvre in 1896, see Caubet & Bernus-Taylor, 1991, p. 21. It was dedicated by prince Entemena of Lagash, ca. 2400 BCE. The egg-shaped silver vessel (ca. 30 cm high) rests on a low ring-shaped copper base a few centimeters high. The arrangement bears little resemblance to Oxus trumpets.

while the front is conical. With their various amounts of flare and differing lengths, this type exhibits the largest internal range of shapes. Each mouthpiece is fashioned into a short truncated cone expanding toward the front. The only decorations are rings in raised relief near the midpoint.

1.5.2 Bulb trumpets are made of gold at Hissār and Astrābād and silver at Gonur. Their bodies are patterned on the shape of a plain trumpet with a rapidly expanding bell at the front, but a nearly spherical bulb is added at the mid-point. The only rings are those at the rear end of an Astrābād trumpet.

1.5.3. Face trumpets were found at Gonur and Shahdād with one and two faces, respectively. Like the ball on bulb trumpets, the protruding faces create a nearly spherical volume at the trumpet's mid-point. All three faces are male and, at least at Shahdād, have beards and scars. Faces are upright when trumpets rest on their bells.

1.6. The ratio of "trumpets per tomb" at Gonur, Hissār and Shahdād and statistical uncertainties. At looted and undocumented sites, such as those in south Bactria, we know neither the total number of trumpets nor the total number of opened tombs, but three excavated sites yield such information (table 2) (As already stated, Gonur was partially looted, but for the sake of argument I shall briefly assume it was not. The quantitative effect of the looting will be discussed at the end of this section.). We wish to find the ratio between the total number of trumpets (N_{tr}) and total number of tombs (N_{to}) belonging to the period of the BMAC. The ratio $R (= N_{tr}/N_{to})$ would indicate the relative popularity of trumpets in the ancient population living at the site.

Table 2. Relative population of trumpets among excavated tombs.

Site	N_{to}	N_{tr}	σ_{tr}	σ_{tr}/N_{tr}	R	σ_R/R
Gonur	3,000	5	2.2	45%	0.0017	-45%
Hissār (in stratum IIIC)	53	0	0	-	<0.019	-
Shahdād	375	1	1	-	0.0027	-

Because Gonur has the largest number of excavated trumpets, its data has the best accuracy. To estimate how much the value of N_{tr} would vary if the excavations were repeated at Gonur, and find the uncertainty this variation would introduce, we need to model the statistical distribution of N_{tr} . Trum-

pets are relatively uncommon: with 3,000 excavated tombs only 5 trumpets were found. Such low probability points to a Poisson distribution. As an illustration, assume that another lot of 3,000 tombs were examined. That lot would not necessarily contain $N_{tr} = 5$ trumpets, but another integer number close to 5. Repeated many times, the procedure would lead to a Poisson distribution of N_{tr} -values. Assume the mean of those N_{tr} -values is N_{av} , then the standard deviation (σ_{tr}) would equal the square root $(N_{av})^{0.5}$ (Bethea et al., 1985, pp. 59-63). Since the accuracy in N_{tr} is high, the relative uncertainty in the ratio (σ_R/R) would be approximately equal to the accuracy in σ_{tr}/N_{av} [= $(N_{av})^{-0.5}$]. Table 2 contains the appropriate quantities.

Assuming $N_{av} = 5$, the relative uncertainty would be $1/\sqrt{5} \approx 112.2$ ($\approx 45\%$). There is a 78% chance³¹ that the "true" N_{tr} -value would lie within the limit 5.0 ± 2.2 or that the "true" R-value is $5/3000 \approx 0.0017 \pm 45\%$ ($= 0.0017 \pm 0.008$). In other words, the Gonur data imply that one needs to excavate $[1 / (0.0017 \pm 0.008)] \approx 600 \pm 270$ tombs to have a 78% chance of finding one trumpet. To have reasonable chance of finding a trumpet at Gonur, one needs to excavate at least 330 tombs, the lower limit of 600 ± 270 .

Although Hissār IIC has yielded several trumpets, none came from tombs. Since only 53 tombs were investigated in level IIC (Schmidt, 1937, p. 233), we do not expect any if the ratio is the same as at Gonur. At Shahdād the required minimum number of tombs was exceeded³² and one trumpet found. Since the ratio of trumpets-per-tomb appears to be consistent at the three sites, it is worth applying it to the looted Bactrian territory. About thirty trumpets in figs. 6-8 probably came from that region. That number would require $30/(0.0017 \pm 0.008) \approx 18,000 \pm 8,000$ looted Bactrian tombs. Unfortunately, this seems entirely plausible when we view the vast south Bactrian landscape pockmarked by looters in Ligabue & Salvatori (1991, p. 102).

If the assumption of no looting at Gonur was correct, the available data would imply a uniform density of trumpets at Gonur, Hissār, and Shahdād. But Gonur was looted, and the reality indicates that more trumpets were buried than excavated. Salvatori has suggested that 90% of the tombs were looted (priv. comm 2002), a number that gives 10 times higher density of

³¹ Obtained by interpolation of the Poisson distribution f at $a = 4, 9, 16, 25$, where a is the mean value of each distribution (called N_{av} in the text). The following *Mathematica* program calculates the probability for $a = 4$: `Clear(a, b, n); a = 4; b = Sqrt[a]; f[a_, n_] = N[(a^n)*(E^(-a)) / n!]; Sum[f[a, n], {n, (a-b), (a+b)}]`. If we give high values to a , the probability approaches the value of 68.3% which coincides with the probability that an event falls within $\pm \sigma$ of the mean of the Gaussian distribution.

³² In cemeteries A and B dated 2400-1700 BCE. Hakemi has a total of 382 tombs (1997, p. 555), but 7 (nos. 048-054) belong to cemetery C dated after the period of interest.

trumpets at Gonur than at Iranian sites. Although the percentage may be too high, it is clear that tombs at Gonur were much more likely to have trumpets than at Hissār and Shahdād. This circumstance fits our picture of trumpets originating in the Oxus civilisation.

2. Unexcavated Oxus trumpets

The looters worked in a narrow region south of the Amu Darya, bordered west and east by the cities of Daulatabad and Balkh near the provincial capital of Mazār-e Sharif (fig. 2). Their finds began to appear in Kabul in the early 1970s (Salvatori & Tosi, 1997, p. 122) and continued until the Soviet invasion 1979, after which time I have seen no documentation. The lack of control brings uncertainties. I consider the material secondary. But it seems genuine because individual features are similar to those on excavated trumpets. Since the Kabul corpus is large, one expects a wide range of forms. Yet, all unexcavated trumpets adhere to the same distinct groups (plain, bulb, and face trumpets) as the excavated ones.

2.1. Trumpets documented in Kabul 1978-79. Pottier, while conducting field research in Kābul 1978-79, photographed 12 trumpets from south Bactria, and most of these are published here for the first time (figs. 6 & 7). The bulb trumpets (B7-B12, fig. 7) have the same cylindrical tubes, bulbs, and flaring bells as the excavated ones (B1-B6, fig. 3). Most mouthpieces have the same truncated conical shape. Trumpet B8 has a more cylindrical mouthpiece, but there is a precedent in the Shahdād trumpet.

Until recently, Pottier's examples of plain trumpets (E2-E6, fig. 6) seemed more problematic, but a recently excavated Gonur trumpet (E1) can now be taken as a precedent. Moreover, the ring on E2 is also present at Hissār (C1 & C2).

A copper object labeled "hollow tube" by Sarianidi (1989, fig. 6:10) is probably another bulb trumpet from the bazaar. Only the bell, ring, and bulb survive. The latter has a row of holes — random erosions rather than man-made finger holes.

2.2. Trumpets not documented in Kiibul. A number of trumpets in Western collections are likely to have come from Kābul during the 1970s although not documented there. Few of them are published, and only one museum (the Louvre) collected them before 2001. One hopes that the lack

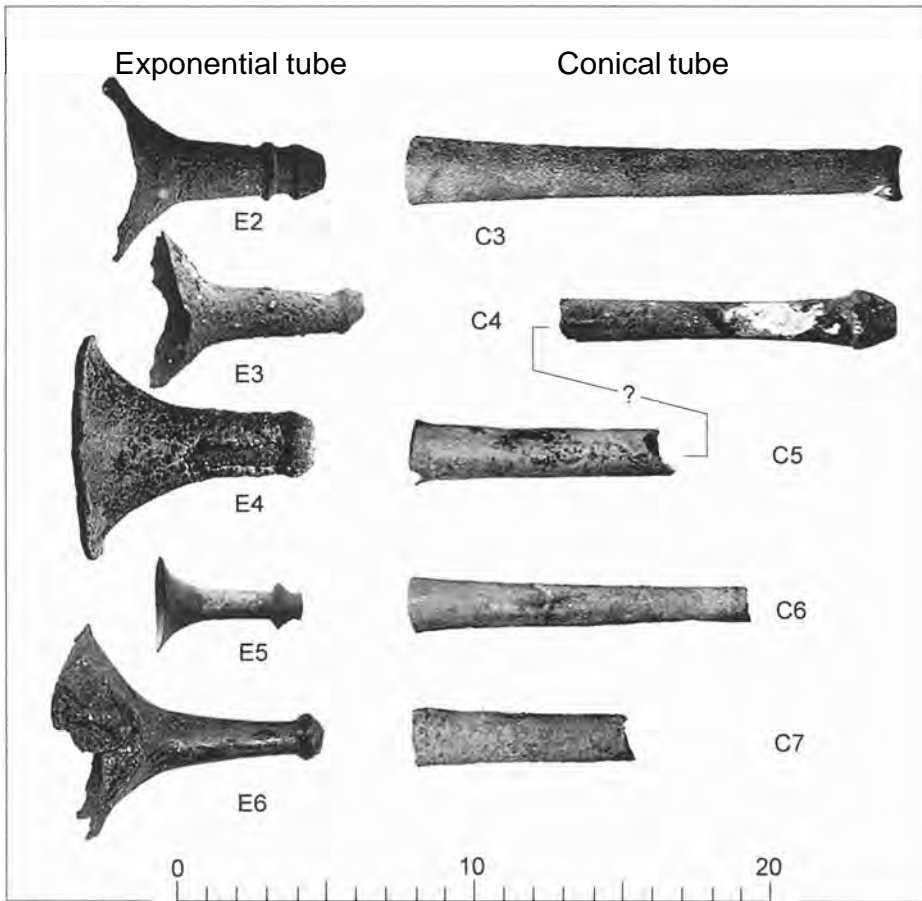


Figure 6. Unexcavated plain trumpets. Left side: Rapidly expanding (quasi-exponential) bore. Photos: Pottier. Right side: Slowly expanding (conical) bore. Photos: author

of illustrations and the mild interest from collectors have kept forgers at bay.

The Louvre trumpet collection was started in 1978 (references at item 6, table 1) with a plain trumpet³³ (E6) first photographed by Pottier in Kābul, and a bulb trumpet (B14). The collection expanded in 1997 with a

³³ According to the dealer who supplied the trumpet, it was found in a tomb with a copper arrow head. The latter was also acquired by the Louvre and given inventory number AO 26426 consecutive to that of E6 (item 6, table 1). The circumstances of the find cannot be independently confirmed.

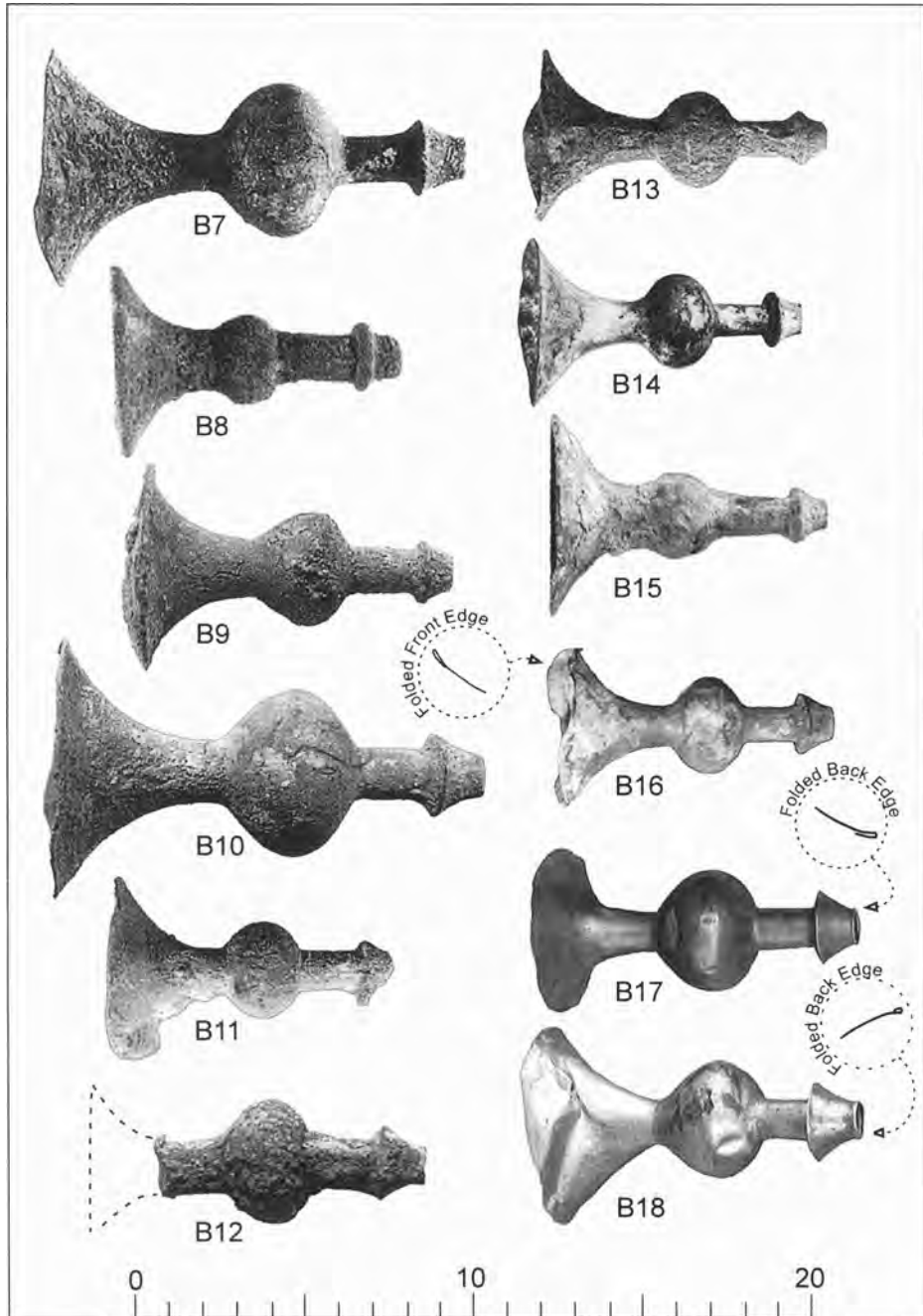


Figure 7. Unexcavated bulb trumpets. Inserts show the folded silver wall (twice magnified). Photos: Pottier, except B15 — B18 (by author) and B14 (Louvre).

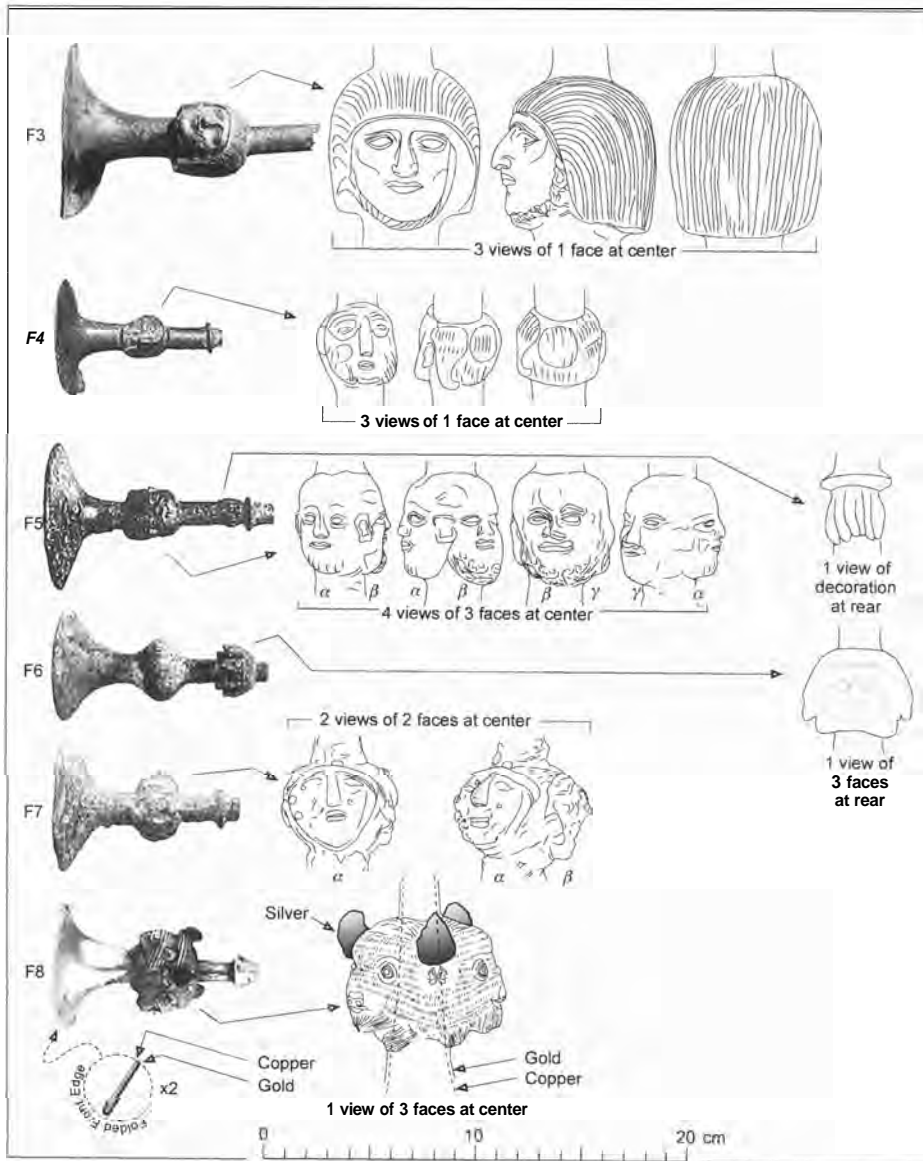


Figure 8. Unexcavated face trumpets

The photos in the left column are shown on the scale at the bottom. The line-drawings, given at double scale, show the faces from several directions. Faces located near the rear of the trumpet are placed on the right side and those located in the middle are put in the center. Drawings by the author. F3. One male face located near the middle. F4. One male face near the middle. F5. Three male faces (labeled α , β , and γ) placed near the midpoint with a decoration (mop of hair?) near the mouthpiece. F6. Three (?) faces near the mouthpiece. F7. Two male faces (labeled α and β) placed near the middle. F8. Three bison faces (all nearly identical) placed near the middle

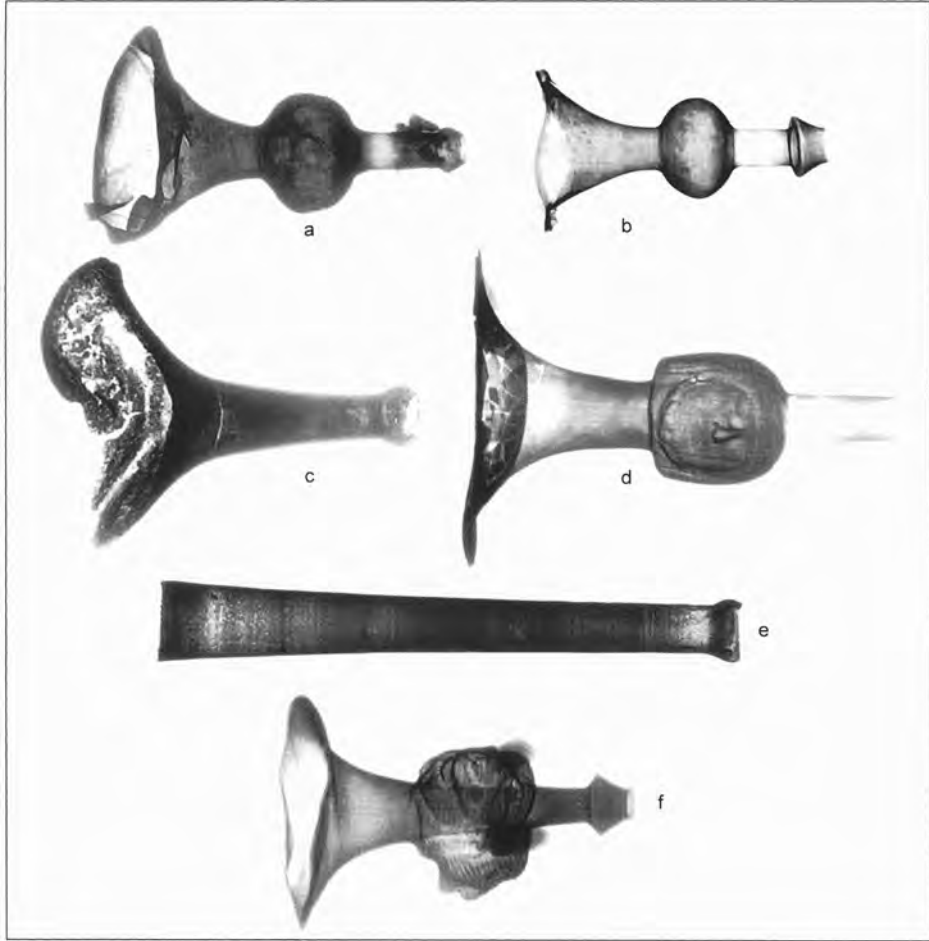


Figure 9. X-rays photos of representative trumpets. The images have been inverted to provide white backgrounds, i.e. dark pigmentation corresponds to thick materials.

(a) F9; (b) B16; (c) E6; (d) F3, where the shadow on the bell is caused by the bent front-edge of the bell; (e) C3; (f) F8, where the inner copper trumpet looks like a plain exponential trumpet, and the darkness of the horns indicates solid silver.

face trumpet (F3), and three years later with a batch of plain trumpets (C3-C7) and, perhaps, another face trumpet (F9).

A private collection in the USA was assembled during the 1980s (B15, B17, B18, F7 & F8). The latter is a finely sculpted gold trumpet (figs. 8-9, 11-13). Rumors about it circulated among scholars and dealers in Kābul

1978-9 and a snapshot was published³⁴ by Pottier (1984, no. 315). A US collector acquired two face trumpets (F4 & F5) in Kabul ca. 1978.

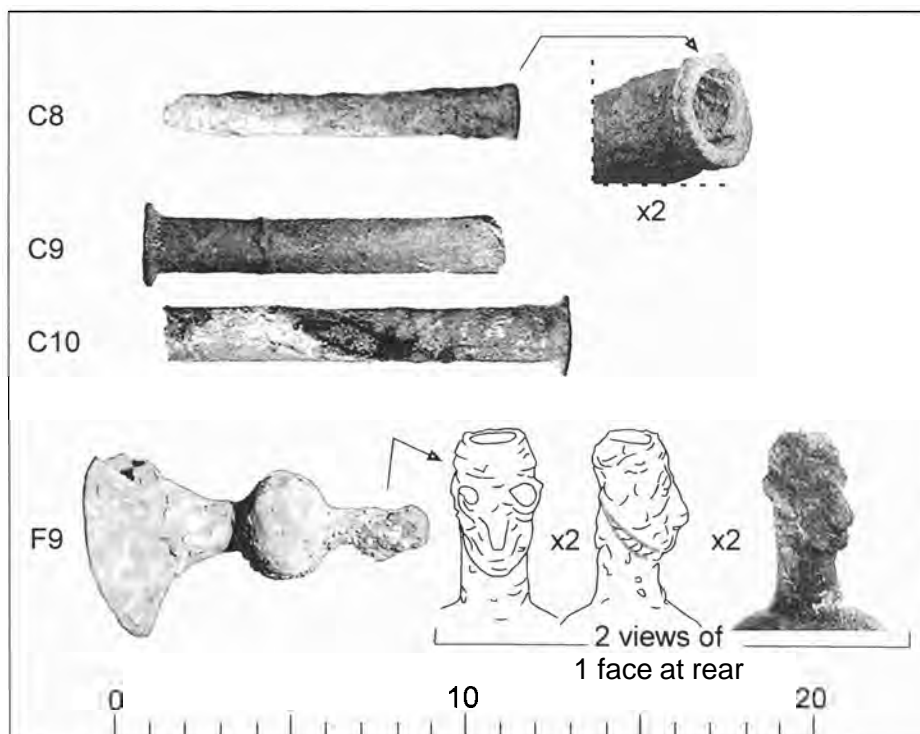


Figure 10. Problematic pieces.

2.2.1. *Plain trumpets.* The plain trumpets in the Louvre are exponential (E6) and conical (C3-C7) in shape³⁵. Of the latter, only one is intact, but all have the slow conical expansion familiar from Hissār (C1-C2). The intact instrument is unusually long, 40 % more than at Hissār. The other conical trumpets are fragments, one (C4) being a rear-end and three (C5-C7) being front ends. Perhaps fragments C4 and C5 form one trumpet,

³⁴ Pottier saw an unclear photograph of this instrument in Kabul 1979, but the actual trumpet was not shown.

³⁵ According to unverified information from the dealer, the trumpets came from the same tomb that had the objects shown in Ligabue & Salvatori, 1989, figs. 74-78. One vessel contained beads of stone and gold and fragments of (dateable?) bones.

since both have matching diameter and thickness at the joint and similar high purity silver (> 90.5% with < 72% for the others: C3 & C6-C10) with little AgCl (< 1% while C3 & C6-C10 have 13-25%). If so, the composite trumpet would be 20 cm long.

2.2.2. *Bulb trumpets.* Shapes, dimensions, and materials of trumpets in Western collections (B7-B18, fig. 7) resemble those of excavated ones. The consistency of shapes is remarkable considering the vast geographical spread of this type. Generally, the workmanship is very fine. In several cases special attention has been paid to the edges: on silver trumpet B16 the front edge is folded — probably to add strength — and on gold trumpets B17 and B18 the same treatment is given to the rear of the mouthpiece.

2.2.3. *Face trumpets.* Excavated trumpets have produced three examples; the unexcavated material increases this number three-fold. The wider range of facial expressions offers a good basis for systematics. Most faces are placed near the mid-point of the instrument, but one is at the rear (F6, fig. 8). Trumpet F5 (figs. 8 & 20) combines both types: it has three faces at the mid-point and a relief (tufts of hair?) around the tube near the mouthpiece. Most mouthpieces, bells, and tubes have exact precedent among the previously discussed trumpets. However, the rear end of copper trumpet F3 (figs. 8 & 12) is missing. When complete, the trumpet must have been longer (> 12.2 cm) than other face trumpets but shorter than the longest plain trumpet (C3, 16.5 cm).

Gold trumpet F8 with three bison faces is supported by an inner core of thin copper, some of it cracked (fig. 17). The X-ray photo (fig. 9f) reveals a core shaped like a plain trumpet. The gold and copper layers (both 0.5-0.7 mm thick) are bound together by bitumen.

2.2.4. *Problematic pieces.* When trumpets C3-C7 were acquired, the four silver objects in fig. 10 were part of the lot. They may be trumpets, but the mouthpieces of C8-C10 deviate considerably from the norm, and their cylindrically shaped tubes add further concerns. The mouthpiece of C8 seems to be nothing but a solid ring added to the cylindrical tube (see the top right enlargement in fig. 10); on other trumpets it is part of the thin wall, beaten out to an integral mouthpiece (fig. 1). Moreover, a thin silver foil seems to have been inserted into the mouthpiece, while other trumpets lack extraneous pieces.

The rear ends of C9 and C10 are forced outward to form an annular ring. Although such flat mouthpieces are known on later oriental trumpets (Baines, 1978, fig. 12a), they are not found on other Oxus trumpets. The metallic composition of C9 and C10 is different from the others (having unusually large percentages of Cl and Br) but similar to each other (and C7), suggesting that they may have formed one piece. If so, the shape lacks parallels in the BMAC repertoire. However, there are other archaeological pipes without musical connections (e.g., Gautier & Lampre, 1904, fig. 300), and these silver pipes may just be another example.

Face trumpet F9 has a genuine bulb-shaped body, but the face near the mouthpiece may be a recent addition. Its heavily corroded silver surface looks genuine, but X-rays show a narrow unfilled slit³⁶ between the nose and the tube (fig. 9a). Apparently, the nose, eyes, and cheeks were not hammered out from the silver surface as on other face trumpets, nor were they soldered to the surface. There are two possible explanations: either the facial details were attached recently to enhance the value of an ancient bulb trumpet, or it was loosely attached in antiquity. In the latter case a thin film of silver chloride (ca. 2 %) may have seeped across the surface after burial and sealed the face into a package integral to the bulb trumpet. All items in fig. 10 are problematic, but none can be unequivocally condemned as a fake. Until further evidence comes along, I will disregard them.

3. Time, place, and origin

There are close similarities between BMAC objects in Margiana, Bactria, Hissār, and Shahdād (Sarianidi, 1998, figs. 69-71). For trumpets the correspondence extends across all types. Being part of the same cultural complex, their dates are similar. The geographical sphere includes the parts of Central Asia and Iran that has been called "outer Iran" (Amiet, 1989, p. 159; Frye 1993: 3). Short trumpets were characteristic of that region but existed nowhere else.

Did Oxus trumpets spread from Bactria/Margiana to the south or vice versa? Since the dates of BMAC overlap (Bactria/Margiana: 2000 – 1800

³⁶ *The divergence of conventional X-ray beams result in smeared edges on images. But in this case the X-rays are diffracted by a Göbel mirror which produces a parallel and monochromatic beam capable of imaging the very narrow slit (0.3 mm) discussed here.*

BCE; Hissār: 1900 – 1800 BCE; Shahdād: 2300 – 1700 BCE), they do not determine the direction of the migration. Because of the overlap, Amiet has called the phenomenon Inter-Iranian (1986) or Trans-Elamite (1997, p. ix) with no clear antecedent. But Hiebert & Lamberg-Karlovsky (1992, p. 10, also Lamberg-Karlovsky, 1997, p. 98) have argued that artifacts associated with BMAC originated in the north (Margiana and Bactria) and spread to the south (Iran). They showed that objects that later became associated with the BMAC had predecessors in the Oxus region. There they developed into BMAC artifacts following a "clear overall cultural continuity of ceramic and architectural traditions" (Hiebert, 1994a, p. 385). On the other hand, the BMAC was an intruder at Hissar, where a long stratigraphic sequence prior to the BMAC contains no material resembling that of the BMAC. The intrusion is less apparent at Shahdād because the site contains little material earlier than the BMAC. The authors proposed that the BMAC was carried by Oxus people who traveled south in search of raw material (the oases lacked indigenous supplies of large stones, semi-precious stones, and metals, Hiebert, 1994a, 376). Lamberg-Karlovsky (1994) emphasized that "the extensive migration of peoples of the Oxus Civilization to the distant regions of the Iranian plateau. This most likely took place... toward the end of the Margiana/Bactria archaeological sequence, ca. 1700 BC."

If we narrow the search for origins to trumpets, the sheer abundance in south Bactria, and the paucity elsewhere, seem to favor that region. But the analysis in section 1.6 indicates that Bactria had the same density of trumpets as Margiana, Hissar, and Shahdād, and none can claim precedence. We can only assume that trumpets followed the trend of the general BMAC material: they originated in the Oxus civilization and diffused into Iran. After 1500 BCE the BMAC disappeared from the archaeological records and with it the Oxus trumpet. Short trumpets were never played again³⁷.

³⁷ According to Baines (1978, p. 57), a Macedonian victory coin shows a short trumpet but it is, in fact, far longer than any Oxus trumpet. The coin (Ashmolean Museum, Oxford, no. 3243 and 3244, in *Sylloge Nummorum Graecorum: Ashmolean Museum*) is a silver tetradrachma with Nike standing at the prow of a ship blowing a 50 cm long trumpet (assuming the goddess has human dimensions). She celebrates Demetrius Poliorcetes' (306-283 BCE) victory over Ptolemy. The former was a Macedonian ruling parts of Asia Minor, and the coin was minted in Salamis. There is a similar coin in The Cleveland Museum of Art, no. 29.911.



Figure 11. Trumpet B14. Photo: Musée du Louvre.

4. Systematics of shapes

Oxus trumpets differ in many ways from previously known trumpets. Their miniature size is unprecedented, and their use of precious materials unparalleled, but in common with any trumpet they have three distinct parts: flaring bell, narrow cylindrical tube, and mouthpiece. There is a profusion of shapes among Oxus trumpets, but all are variations of the basic three types in fig. 3. Because of the narrow range of types, we suspect the designs to have a specific purpose. For example, the bulbs look odd³⁸, but they have a definite acoustic function (Lawergren, 2003).

5. Systematics of mouthpieces

The rear-end of a typical Oxus mouthpiece has a sharp edge, see fig. 1. It would be uncomfortable, even dangerous, to push lips against it. On the

³⁸ The bulbous shape may have inspired the large spherical pommels seen on long Islamic trumpets some millennia later. These are frequently shown in Persian manuscripts as army trumpets (e.g. Robinson, 1976, figs. 102, 226, 237, 244, 248, 273, 278, 369, 394, 397, 1133). A shorter type with two bulbs became an heraldic Islamic sign before the Ottoman conquest (Mayer, 1933, p. 8, no. 20). Pommels reached the West at the time of the Third Crusade (ca. 1200 CE, Baines, 1978, p. 73).

B. LAWERGREN



Figure 12. Trumpet F3. Front view. Photo: Louvre.



Figure 13. Trumpet F3. Oblique view of the face. Photo: Louvre.

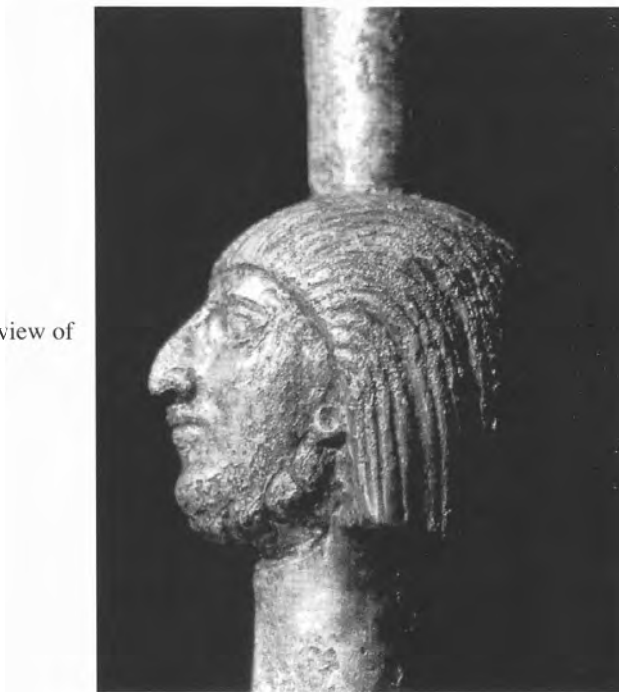


Figure 14. Trumpet F3. Side view of the face. Photo: Louvre.



Figure 15. Trumpet F8. Photo: author.



Figure 16. Closeup of trumpet F8. Photo: author.



Figure 17. Trumpet F8, showing the (chipped) copper layer inside the bell. Photo: author.

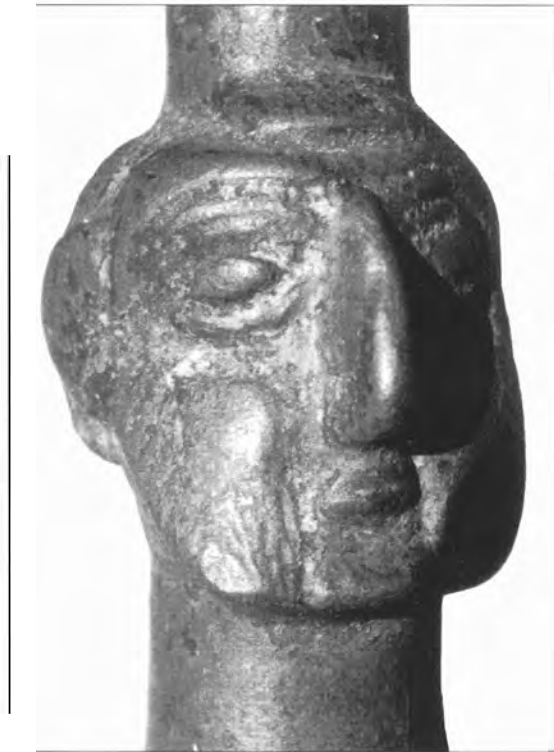


Figure 18. Closeup of trumpet F4. Front of face. Photo: Gamer.



Figure 19. Closeup of trumpet F4. Back of head from two angles. Photo: Gamer.



Figure 20. Trumpet F5. Photo: author.



Figure 21. Closeup of trumpet F5. The α -face (young man) is on the left. The β -face (old man) on the right. Photo: author.



Figure 22. Closeup of trumpet F5. Looking at the β -face (old man) with α and γ on the left and right, respectively. Photo: author.

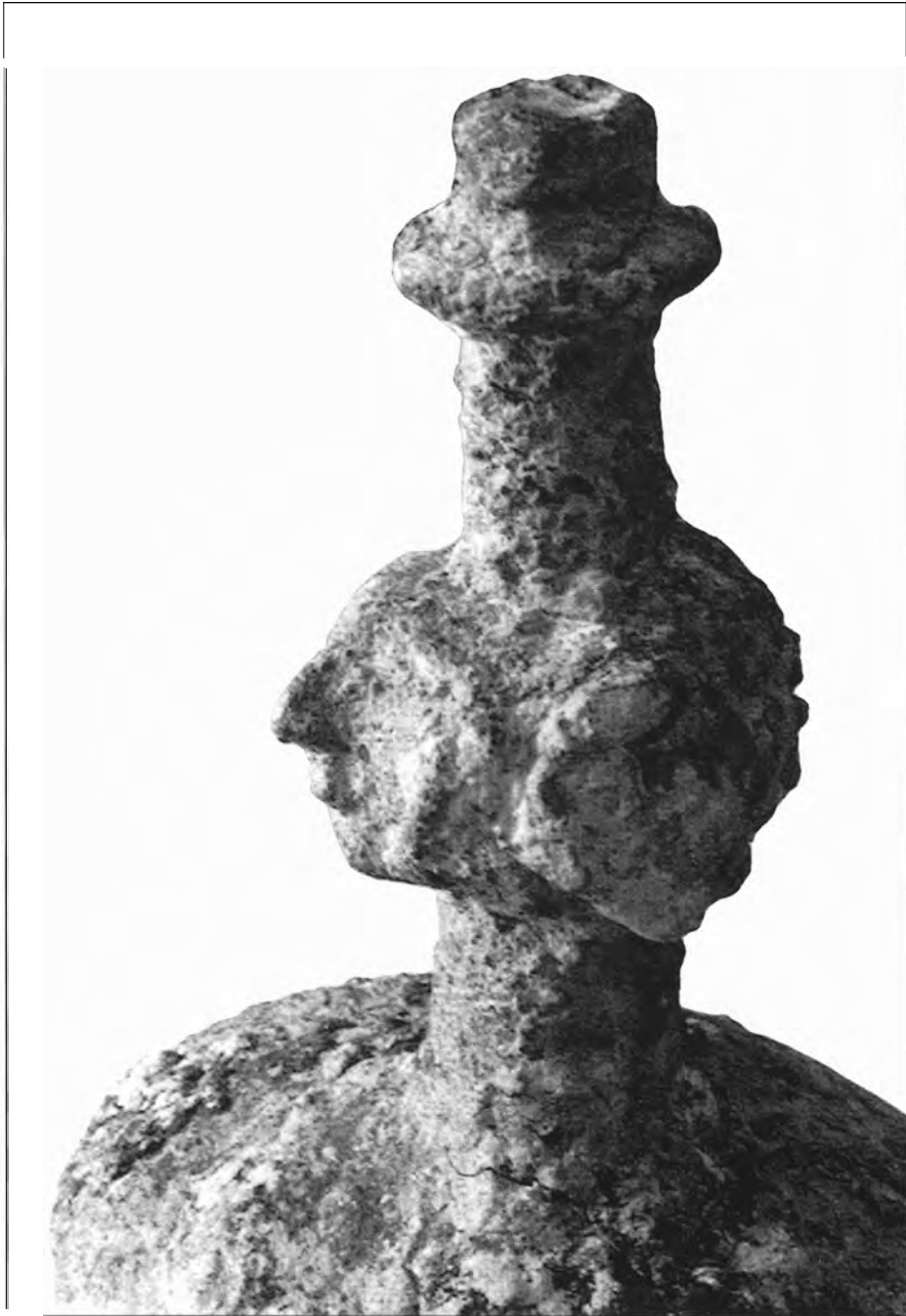


Figure 23. Trumpet F7. Only the a-face on the left is recognizable. Photo: author.



Figure 24. Trumpet F1. Photo: Sarianidi.

modern trumpets, lips are, indeed, pressed against the mouthpiece, but it has rounded ends which act as cushions (fig. 27c). Obviously, one cannot put lips against the end of an Oxus trumpet, but a little experimentation shows the way. Instead of pushing against the edge, the lips ought to embrace the conical sides of the mouthpiece. Then the sharp edge of the pipe lies safely at the back of the lips causing no harm (fig. 27b), but allowing a thin sliver of the lip to vibrate.

This design disappeared with the demise of the Oxus trumpet and never returned. The mouthpiece on the next major type of trumpet, that of Tutankhamun (1350 BCE), was nothing more than the sharp end of the pipe broadened with a thin wire ring (Hickmann, 1946, p. 27). In 1933 only one note could be coaxed from the instrument, but six years later a modern mouthpiece was inserted and many notes became accessible (Manniche, 1991, pp. 76-7). Modern mouthpieces have cup-like design with rounded edges. These were first introduced 3,000 years ago on Scandinavian Bronze Age lurs³⁹ and few major changes have followed.

6. Systematics of faces

Oxus trumpets have one, two, or three faces mounted side-by-side (table 3). In the case of one face, all is visible, including hair at the back and ears at the side (F1, F3 & F4, figs. 8, 12-14, 18-19 & 24). In the case of multiple faces, there is no room for side-hair, and the ears merely serve to delimit each face (F5, F7 & F8, figs. 8, 15-16, 20-23). Only male faces occur. All are human except for a trio of bisons on one trumpet (F8).

Some faces are deftly sculpted. The subtle character and individuality of the portraits on F1, F3, F4, F5 & F8 (figs. 3 & 8) are unusual at this time and place and unexpected as decorations on trumpets. But some are badly corroded, e.g., F7 where two faces are obliterated and one face is only visible at favorable angles. Another (F6) is only known from a blurred photo, but Pottier states that there are three female faces (1984, p. 47). The triple-faced trumpet F5 (fig. 8) is partly corroded: two faces are clearly visible but a third (labeled γ) is only intelligible from some angles. The two clear faces are idiosyncratic and expressive enough to indicate age and character: the α -face is young and innocent-looking (figs. 8 & 21 left) and may have a beard; the β -face is old and worldly (figs. 8, 21 right

³⁹ See note 24.

& 22) with a definite beard. Both look quite harmless, but the face on F4 (figs. 18-19) seems more menacing with small sunken eyes framed by deep folds. His cheek bones are prominent, and a thin beard surrounds the lower part of the face.

Many faces have beards but seem to lack moustaches. The hair on top of the head is subject to individual whims: the thick hair on F3 (figs. 8, 12-14) fits like a helmet and the sculptor went to great lengths to show individual strands of the "page-boy" cut. The most unusual hairstyle adorns the head of F4 (fig. 19). It is neatly trimmed on the back and tied into oddly shaped patches with descending curls. (Perhaps F1 has a similar hair style at the back, see figs. 3 & 24). The three faces on F5 (figs. 8 & 20-22) have little or no hair, but it may have disappeared through surface erosion. One face is framed by ample top hair, thick side whiskers and a trimmed beard (F7, figs. 8 & 23). Such "mutton-chop whiskers" also decorate the face of F1.

Superficial scars are common. The face on F2 (figs. 3) seems to have multiple scars, and F3 has a long S-shaped furrow under the right eye and a shorter C-shaped one over the left cheek bone (figs. 8, 12-13). The cheeks of F1 seem to have long zigzag marks (possibly scars), and the brow is deeply furrowed.

One of the faces on F7 (fig. 23) has an arched nose and full lips, prominent enough to extend far outside the rough surface. Boldly arched noses also adorn F1 and F3 (figs. 3, 8, 14 & 24), with the former having a flattened tip. Face F2 has a protruding nose (fig. 3), but it is hooked rather than arched.

6.1. The bison trumpet. The artistic tour-de-force of the whole corpus is F8. Its gold surface is hammered to form three bison faces in deep relief (figs. 8 & 15-17). The typical features of a bison are emphasized: it has a broad face covered by medium-length hair, a long goatee under the chin, and long hair at the top between the short horns. Here the horns are made of silver inserted through holes in the gold face. The whole contraption is put outside an inner, plain, copper trumpet (fig. 9f). The trumpet qualifies, by any measure, as a masterpiece of ancient art.

But there is a problem with bisons in Bactria⁴⁰. The Eurasian bison (*Bison bonasus*) is considered not to have lived further east than the

⁴⁰ Where it must have been found, see note 33.

Caucasus in historical times (Grzimek, 1990, p. 405; Vereshchagin & Baryshnikov, 1984, p. 502)⁴¹ although, at much earlier times, members of the genus *Bison* had spread across the temperate zones of Eurasia. But it has recently been shown that a small type of *Bison priscus* survived in the Don basin and west of Lake Baikal until a millennium ago (Vereshchagin & Baryshnikov, 1984, p. 502). The two sites lie on the Russian steppe, far north of Bactria. But the trumpet shows that bisons must have lived much nearer Bactria four millennia ago, and a copper plate from Shahdād (ca. 2000 BCE) seems to represent a bison (Paillet, 1999, Fig. 11). Apparently, the climate at the time of the BMAC had created an oasis environment satisfactory to bisons.

6.2. *Face comparanda.* The best known source of comparative human faces is a set of chlorite statues from Bactria/Margiana or northeastern Iran⁴². They are approximately contemporary with the trumpets. In common with most trumpet faces, they have beards, scars, and lack moustaches (fig. 25), but these features are more emphasized than on trumpets. Whereas the scars are deep gashes on the statues, they are merely cosmetic blemishes on the trumpets. The beards are wild and bushy on statues, but thin on trumpets. The statues depict brutish monsters, but the trumpet faces belong to benevolent-looking men. No anatomical details beyond faces are given on trumpets, but the chlorite men possess massive bodies covered with scale-patterns which prompted Francfort to call them anthropomorphic dragons (1994, p. 409)⁴³. Trumpet faces are decidedly human.

One striking detail on the chlorite faces is absent from the trumpet faces, but it suggests a curious connection between the two. The upper and lower lips of each chlorite face are pierced by wide holes. The holes are now empty, but something (a wire or thread) must originally have been

⁴¹ For a 19th century illustration of the Caucasian bison, see Demidoff 1898, p. 77.

⁴² Amiet, 1989, p. 174. Ghirshman, 1963 has five statuettes. For the sixth, see Sotheby, 1999, pp. 50-3, and anonymous loan in *The Metropolitan Museum of Art*, inv no. 1999.70. The corpus is also discussed in Parrot, 1963, Spycket, 1981, p. 213, Amiet, 1989, p. 176-177, and Francfort, 1994, figs. 3-5.

⁴³ Others interpret the pattern as body hair, Ghirshman, 1963, p. 159; also Amiet, 1989, p. 174 who sees influences from the Indus Valley. Nor is there agreement about the round object the men carry in the crook of the elbow. It has been called a container (Amiet, 1989, p. 174; Francfort, 1994, p. 410) and a drum (Seidl, 1966). Could it be an Oxus trumpet?

there — probably attaching an object to the lips. Commentators have not found a convincing explanation, but it is clear that among the possible objects we must now consider Oxus trumpets and other objects meant to modify the voice.

A more extensive source of contemporary faces is offered by clay statues of men and women at Shahdād (Hakemi, 1997, p. 79). Their faces look other-worldly, akin to death-masks. In fact, Hakemi proposed the figures were portraits of the deceased (1997, p. 64). All men seem to have beards but it is not clear⁴⁴ if they lack moustaches⁴⁵. The meek countenance of the Shahdād statues and the fierce demeanor of the chlorite men represent extreme poles of facial expression. Trumpet faces occupy a middle ground.

Table 3. Location of faces on Oxus trumpets

Catalog designation	Material	Middle	Rear
F1	Silver	1 male human face	–
F2	Copper	2 male human faces	–
F3	Silver	1 male human face	–
F4	Copper	1 male human face	–
F5	Copper	3 male human faces	1 tuft of hair (?)
F6	Copper	–	3 female faces (?)
F7	Copper	3 human faces	–
F8	Gold & Copper	3 bison faces	–
F9	Silver	–	(1 male face)*

*) Possibly a modem addition, see section 2.2.4.

⁴⁴ Facial hair is marked by black paint (Hakemi, 1993, p. 218). A recently published large color photo has black paint on the upper lip (Pourjavadi, 2001, p.121), but it seems more like stubble or dark skin, since the surface is not raised to give the moustache thickness.

⁴⁵ Hakemi, 1997, p. 549; Amiet 1986, fig. 129, p. 165.

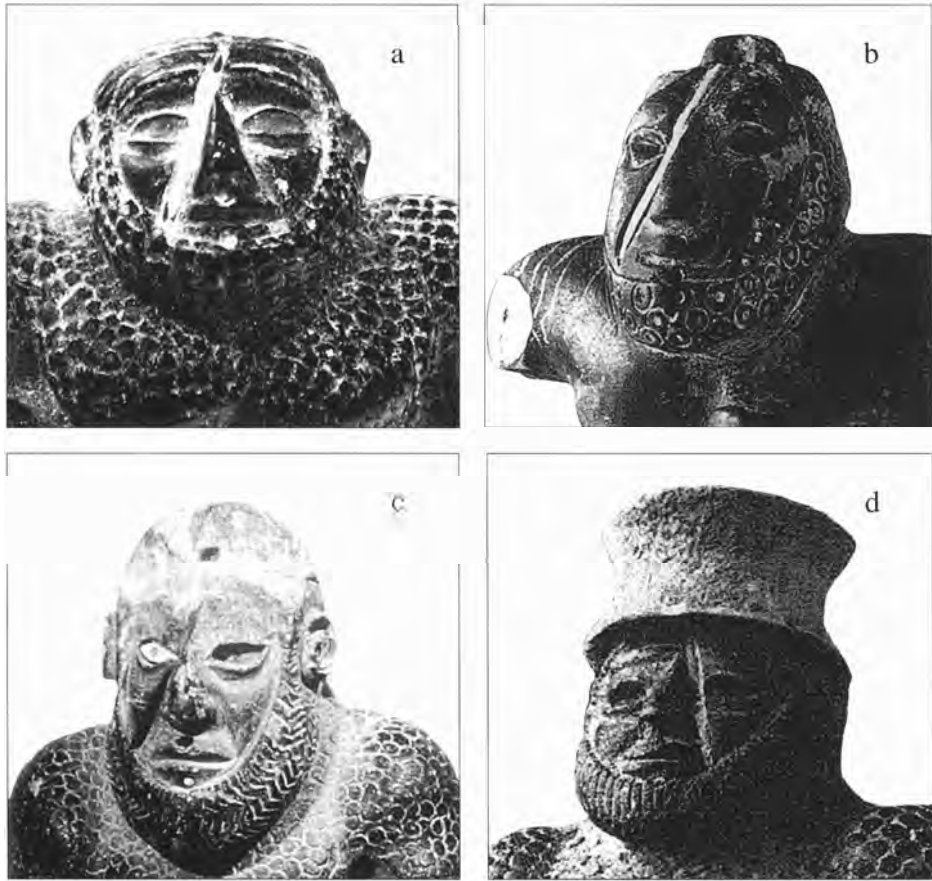


Figure 25. Chlorite men from Bactria/Margiana or northern Iran, 2300-1700 BCE.

a: The Metropolitan Museum of Art, Anonymous loan, L 1999.70.

b: Foroughi Collection, Ghirshman, 1963, fig. 9.

c: Musée du Louvre, AO 21104, Ligabue & Salvatori (1989, color fig. 106).

d: Foroughi Collection, Ghirshman, 1963, fig. 1.

7. METALS

7.1. Alloys and mixtures. To assess the metallic compositions of Oxus trumpets, some were analyzed using EDS⁴⁶. In all cases the tests were done on the outside surface of the bell near the front. Since copper surfaces may have picked up impurities and silver may be

⁴⁶ Energy-Dispersive X-ray Fluorescence Spectroscopy.

tarnished, the analysis gives only an approximate idea about the original metal.

Gold trumpet F8 (fig. 15) contains about 70% gold, 28% silver, with traces of copper and zinc (<1% each). It is electrum (Moorey, 1994, p. 217), but I will continue calling the instrument a "gold trumpet." Silver trumpet B16 is nearly pure (99.8%) with minute traces of gold, lead, and copper.

PIXE analysis⁴⁷ on the plain silver trumpets in the Louvre reveals equally low levels of heavy elements: <0.2% Sr, <0.5% Pb, and <0.03% Au except for the pair C4 and C5 which, for that reason, may have been one object. On some Louvre trumpets the silver had converted to AgCl (ca. 25% for C7 & C8 and ca. 13% for C3 & C6); C6 had calcified and contained 44% Ca. The level of bromine was low (ca. 05. %) except in C7, C9 & C10 (3%). It was probably absorbed from organic matter in the soil (Hedges, 1976).

The thick copper trumpet B15 has >90% copper, <8% lead, a few percent arsenic, and an undetectable (< 1%) amount of tin⁴⁸. It is virtually pure copper, hardly "copper alloy" or "copper-rich bronze," terms sometimes used to describe BMAC copper. The high purity of silver, the silver-rich gold, and the absence of bronze agree with measurements on unexcavated cups and a goblet claimed to come from the Bactria/Margiana region⁴⁹.

Beside gold, silver, and copper, lead-trumpets may also have been used. A lead "vessel" at Shahdād has the same shape as a bulb trumpet (Hakemi, 1997, pp. 371 & 635, part Gn. 1) and is, as required, open at both ends. It lacks a mouthpiece but, with a length of 8.0 cm, it could well be an incomplete trumpet or a trial piece cast in an easily worked metal.

7.2. *Distribution of metals in the corpus: the untypical emphasis on silver and gold.* The total corpus given here consists of 41 trumpets⁵⁰. Most are made of metal: gold, silver, copper. One is made of stone, and another is probably lead. The percentages are put in the second column of table 4.

⁴⁷ Performed at the Centre de Recherche et de Restauration des musées de France (C2RMF) and reported in *Compte-Rendu d'étude C2RMF/R 2978* (Paris, October 30, 2001).

⁴⁸ The values are similar to those measured on an arrow head from Hissār III: 97.8% copper, 0.05% tin, 0.08% lead, 0.04% zinc & 1.06% arsenic (Muscarella, 1988, p. 109, no. 176).

⁴⁹ Meyers, 1996, pp. 173-175; cf. Moorey, 1994, p. 239 on Iranian material.

⁵⁰ I.e., 40 gold, silver, copper, or gypsum trumpets (see note 18) + 1 lead trumpet (see previous paragraph).

Table 4. Materials used for object belonging to the Oxus Civilization

Material	Trumpets*	General items on the Bactrian antiquities market (from Pottier 1984, pp. 91-100)
Gold	15%	1%
Silver	58%	7%
Copper	23%	85%
Lead	2%	7%
Gypsum	2%	0%

* Problematic pieces (section 2.2.4) are omitted.

To get a quantitative estimate of a representative "general" sample, I count the objects in Pottier's catalog (1984, pp. 91-100) which contains looted Bactrian objects found in the Kābul bazaar 1978-9. The percentages, given in column three of the table, show that copper is the most common metal by far. Gold is exceedingly rare (half of the 1% Kabul-entry consists of gold trumpet F8) and silver is only slightly less so. On the other hand, precious metals dominate in trumpet manufacture, and the contrast to the general corpus is dramatic. The difference between the two columns in table 4 is too large to be explained as a preference for gold by collectors and/or disinterest in copper trumpets by looters.

The prevalence of precious metals, the exquisite designs, and the technical virtuosity point toward an ancient élite audience. The preference for technical brilliance can be seen in the relative distribution of types:

Plain trumpets	32 % (17 % conical, 15 % exponential)
Bulb trumpets	49 %
Face trumpets	19 % (17 % humans, 2 % animal)

It is harder to make a bulb or a face trumpet than a plain one. Yet, the former types dominate.

7.3. Silver and copper reinforcements inside gold trumpets. Six trumpets are made of gold. Two of those, the Hissār trumpet and the bison trumpet, are built on top of inner trumpets made of harder metals (silver or copper). The silver trumpet inside the gold trumpet from Hissār (B4) long escaped

notice, but deposits of silver chloride betray it (fig. 4). Inside the bison trumpet (F8) is a copper trumpet, still nearly intact. X-rays show it to have a contour similar to the exponential plain design, creating empty cavities between the two shapes (fig. 9f). Now the spaces contain rattling objects, probably loose pieces of bitumen which, initially, had acted as an adhesive between the two metals.

At first look the two double trumpets appear to differ from the norm since the other four gold instruments (table 5) lack inner trumpets. But there are indications that they, too, had been double. Unfortunately, the two Astrābād trumpets (B5 & B6) are lost and the 1844 report provides no clue. But the two remaining gold trumpets (B17 & B18) show signs of recent restorations that removed material from the inside surface of the bell. Modern tools have been used to cut the front edge of B18. It is sharp and show file marks with crisp grooves. Tiny hair-like strips of gold hang from the edge. On trumpet F8 the front-edge is folded around the copper of the inner trumpet, and this technique was probably also used on B17 and B18. To free the inner metal, the restorer cut the edge and removed the remains of the inner trumpet. Using EDS on the inside bell surface, small amounts of zinc were found, probably a residue from attempts to clean it electro-chemically⁵¹. Most likely, the two trumpets had (broken and unsightly?) layers of copper or tarnished silver inside the gold surface, and these were removed to enhance the market value.

Table 5. Weights and composition of gold trumpets

Catalog designation	Metals	Mass (grams)
F8	gold & copper	64.7
B4	gold & silver	10.9
B5	gold (only?)	170 (2 trumpets), see note 29
B6	gold (only?)	
B17	gold (&?)	25.7
B18	gold (&?)	17.7

⁵¹ The trumpet would have been put in a bath of caustic soda surrounded by metallic zinc (Plenderleith, 1971, pp. 195-197). In the chemical reaction, bubbles of hydrogen rise from the surface and break deposits, but the process leaves traces of zinc.

8. Manufacture

I have personally inspected 20 trumpets (B4, B14, B16-B18, C3-7, C9-C10, C8-C10, E6, F3, F5, F7, F8) and found no visible solder joints. X-ray photos (fig. 9) confirm this. There are no dark patches indicating lumps of solder, and wall thicknesses vary smoothly from rear to front. Evidently, every trumpet was made in a single piece, either hammered or cast.

The ductility of metals varies from high (gold), via medium (silver) to low (copper). As a result, the first two metals can be hammered into complex shapes. Copper is much more difficult to hammer, making it nearly impossible to "raise" copper into protrusions, i.e. the noses seen on F4, F5 & F7. As a result, face trumpets were cast in copper and hammered in gold and silver.

8.1. Hammered silver and gold. The difficulties were formidable and made worse by the small size of the object. The smith began with a single lump of gold or silver and formed it into a doughnut shape (Moorey, 1994, p. 28; 1994, p. 216). Anvils and stakes were forced into the hole to act as supports against the hammer blows. The metal gradually thinned and expanded into the desired shape. In 1950 similar tools were still used by Iranian smiths (Wulff, 1966, pp. 20-37) who stretched metal bowls by beating them with pointed iron hammers against iron stakes trust into the ground (Wulff, 1966, fig. 19). The anvils (flat, round, curved, and beaked) were just as important as the hammers (Wulff, 1966, pp. 25 & 34), but the most useful implement was the snarling iron. It is a long slim platform with a curved iron prong at the front. In repoussé (embossing) work the smith employed a large variety of chisel shapes (Wulff, 1966, fig. 43). Similar tools were probably used by trumpet makers 4,000 years ago⁵².

In 1998 an expert craftsman⁵³ replicated the bulb trumpet in fig. 1B. Using modern tools, he set out to make the entire instrument from a single lump of silver, but the effort came to naught. Instead, it had to be made in two parts with the mouthpiece soldered to the main body. The

⁵² Some ancient bronze anvils and hammers shown by Deshayes (1960, Pl. xxxvr, 1-3, no. 19; Pl. XL, nos. 1-6; Pl. LXIII, nos. 1-4; lx, nos. 9-12) seem suitable, but all have later dates (second millennium BCE) and none was adequate for all phases of the work. But as Deshayes pointed out, smiths may have used tools of other materials than bronze.

⁵³ Trained as a silversmith in Copenhagen.

joint was invisible on the outside but easily seen on the inside. The smith, accustomed to making dinner ware and decorative objects, found the trumpet his most difficult assignment.

8.2. Cast copper. Although most copper trumpets probably were cast, few show the characteristic signs of such a process. Most surfaces have been thoroughly cleaned and lost their original structure, but trumpet B15 is an exception. Its exterior has large patches which emit colors characteristic of copper compounds. Green layers of malachite mingle with blue spots of azurite on top of purplish-red copper oxide (cuprite), and display dendritic patterns in which long lines are crossed by many short lines. Such patterns reveal the crystalline structure acquired by the metal when heated to the melting point, i.e., the piece was cast⁵⁴. If hammered, the pattern would have been a random collection of lines inflicted by hammers at temperatures well below melting.

9. Are they trumpets?

In 1920 the only evidence for trumpets were sketchy drawings of two Astrābād trumpets, and Rostovtzeff questioned their identity. Seventeen years later Schmidt called his Hissār objects "problematic devices." Another 40 years had passed when Hakemi concluded his trumpet (F2) was not self-sufficient but "part of a musical instrument (trumpet) made of wood and metal. The wooden part has decayed and disappeared." He thought it necessary to lengthen the instrument with a hollow wooden tube to which the surviving metal part was attached. The short length has troubled other scholars too. Amiet proposed they were non-functional miniature versions of large trumpets⁵⁵. As precedent he pointed to small non-functional terracotta axes (ca. 2200 – 1800 BCE), presumably votive offerings (Amiet, 1986, fig. 81; also Woolley, 1956, Pl. 16, U. 16.221 and Speiser, 1935, Pl. LXXX, nos. 6 & 7). But this cannot be the case here, for no large version of the trumpets has been found, and the small ones function well as sound-producers.

⁵⁴ Freshly cast metal would have had a similar, but invisible, crystalline structure. Visible lines form over a long time when the borders between crystal sections slowly oxidize and acquire distinct colors.

⁵⁵ Private communication, July 1997.

Circumstantial evidence points to them being trumpets. The clinching argument would be a picture of a person holding a trumpet in front of his mouth playing it. Such a scene is nearly present on a silver vessel: a man is shown putting a bulbous object to his mouth (fig. 26)⁵⁶. It looks like a trumpet but, alas, it is merely a drinking vessel appropriate for a banquet scene. Such vessels have been excavated (Hiebert, 1994, fig. 9.26 no. 19 & Sarianidi, 1998, figs. 69, 72). The trumpet and the vessel shapes are very similar; perhaps one inspired the other⁵⁷.

Yes, the objects are trumpets. The assertion has three underpinnings: (1) the consistency of the trumpet corpus, (2) the design which favors sound production, (3) the similarity of the sounds to animals calls, and (4) references in ancient Zoroastrian texts to trumpets that interact with animals and humans.

9.1. *Corpus consistency.* To be a trumpet, a pipe must have (1) an unblocked passage through which the air can flow, (2) a shape expanding toward the front, and (3) a comfortable mouthpiece at the rear. All three criteria are met by every member of the corpus. Not a single intact trumpet has a blocked pipe, contracting shape, or impractical mouthpiece. For a corpus of this size (figs. 3, 6-8), such consistency can hardly be coincidental.

9.2. *Acoustic match between pipe and mouthpiece.* Two unique features cooperate to make it a successful trumpet⁵⁸. Its short length results in a high pitch, and the mouthpiece is designed to help the lips vibrate at that pitch. With a pipe of 8 cm length, we expect⁵⁹ a fundamental resonance frequency near 1000 Hz, and that is what we get when the instrument is blown. It is the frequency of a tone pitched near c''' (two octaves above middle-C).

⁵⁶ Amiet's rendition of the scene (1989, fig. 9) shows more beard than Sarianidi's (1986, pp. 168-9), but the clearest illustration is in Arnold (1996, pp. 14-17).

⁵⁷ Unlike trumpets, vessels have closed bottoms.

⁵⁸ Details are examined in an accompanying paper (Lawergren, 2003), but an outline is given here.

⁵⁹ Using the formula $f = c / (4 \cdot L)$, where f , c , and L are frequency, speed of sound in air (ca. 340 m/s at room temperature), and pipe length. The formula applies to a tube open at one end and closed at the other. This condition pertains to trumpets because the lips nearly close the rear end.

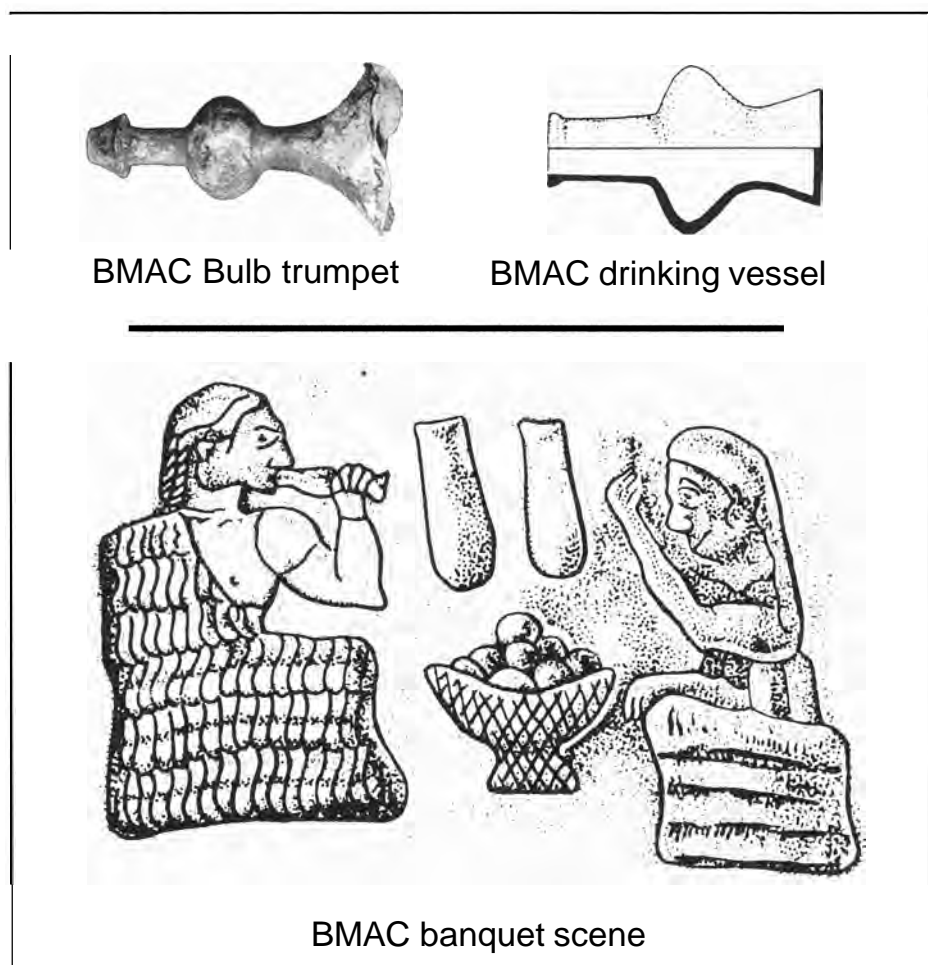


Figure 26. Bottom: Drinking scene from an Oxus gold vessel (Sarianidi 1986, p.168; Arnold 1996, pp. 14-17). Top: Comparison with bulb trumpet B14 (8.0 cm long) and a metal drinking vessel from Margiana (7.6 cm long, Hiebert, 1994b, fig. 9.26.19).

The pitch is high, but similar ones can be coaxed from regular (long) trumpets in overblown modes. A modern orchestra trumpet in C (116 cm long) would have to be overblown to the eighth harmonic⁶⁰. Valveless trumpets at the time of J.S. Bach (early 18th century CE) were even longer

⁶⁰ For tables of trumpet harmonics and lengths, see Baines (1978, pp. 26-29) or Tarr (1988, pp. 7-18).

(ca. 240 cm), and the same pitch would occur at the 16th harmonic⁶¹. For a single pitch there is little difference between an 8-cm Oxus trumpets and a long modem one. The difference arises when we want to play stepwise diatonic or chromatic scales up and down from this pitch. Long trumpets can do so because their overtones lie closely together in this high range, but short ones are limited to the single pitch of their fundamental⁶².

On the other hand, the pitch of short trumpets is not locked firmly to the resonance, but can slide up and down. This is due to the relatively small air mass in the pipe. It, and the lip tension, control the lip frequency. Here the lips are more important, but on long trumpets the air mass dominates. On short trumpets the lips can force the pitch to slide (as in a glissando).

Although cavities of Oxus trumpets are designed to resonate at approximately 1 kHz, it is quite a different task to make the lips vibrate at that high rate. Players of modem instruments need much practice to do so, and achieve it by exerting very high lip tensions. Here the second unique acoustical concept of Oxus trumpets comes into play: they are designed to require modest lip tension at this high frequency. This is brought about by the mouthpiece, which is designed to restrict the vibrating mass to a small sliver of flesh at the back of the lip (fig. 27b). A small mass can vibrate at high frequencies even when the lip tension is low. It becomes relatively easy to reach the high c''' on Oxus trumpets. The author, an untrained trumpeter, has little difficulty producing this pitch. Accomplished players get the pitch with less extraneous wind noise⁶³.

The action of the mouthpiece is illustrated in fig. 27. The modem trumpet has a large mouthpiece covered by the lips which vibrate with their full thickness (fig. 27c). But Oxus trumpets use truncated cones that intrude between the lips and leave a tiny fraction of the lips free to vibrate (figs. 27a & 27b). It is only a few millimeters thick whereas the full lip is

⁶¹ One work (Brandenburg Concerto No. 2) is a trumpeter's nightmare. Bach included many virtuoso passages at even higher harmonics. Modem trumpeters — used to instruments with mechanical valves and tubes of half the length — have only recently learnt to play it on the long valveless trumpets that would have been familiar to the composer.

⁶² In principle, they can also produce overtones, c'''' (an octave above at 2 kHz) being the first, but lips resist such fast oscillations.

⁶³ On the other hand, highly trained players of modem trumpets have difficulties. Their embouchures are precisely adjusted to the requirements of modem instruments and cannot easily readjust to the radically different conditions of Oxus mouthpieces.

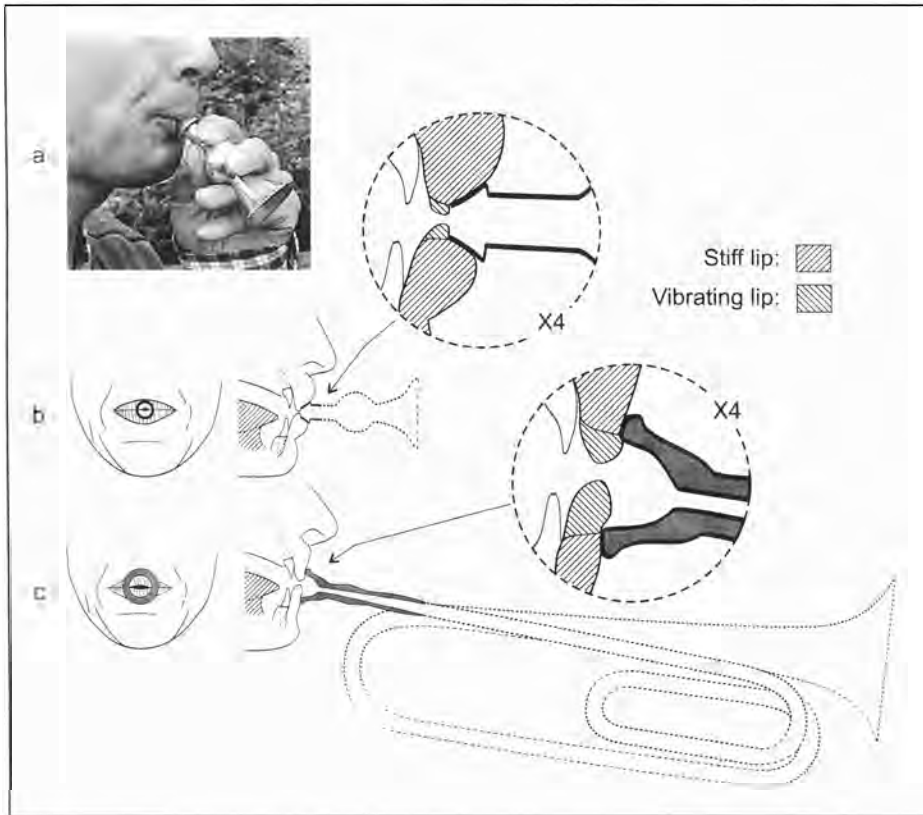


Figure 27. Comparing Oxus mouthpieces to a modern one. All are drawn to the same scale, except the encircled areas which are expanded four times.

a & b. The Oxus trumpet.
c. A modern bugle.

approximately 6 mm thick. It is difficult to measure the effective mass of the vibrating lip⁶⁴, but a rough estimate indicates that the lip tension on an Oxus trumpet playing a pitch of c''' should be similar to that used on a modern trumpet playing two octaves lower. However, the narrow lip passage allows relatively little air into Oxus trumpets, and the sound volume is low. Compared to long trumpets, their sound is high-pitched, soft, and easily able to slide within a small range.

⁶⁴ Elliott & Bowsher (1982) obtained the effective lip-mass on modern instruments by measuring air flow and vibration frequencies.

The match between the short length and the shape of the mouthpiece appears too uncanny to be coincidental and could hardly have arisen without the trumpet being played. Although the Oxus objects are trumpets as defined by the rules of acoustics and organology⁶⁵, they may not necessarily be musical instruments. With a range more or less restricted to one pitch, they cannot produce music (as we know it), and with small loudness they are ineffective as signal instruments. On the other hand, the soft and sliding sounds with frequencies near 1 kHz are reminiscent of animal calls.

The narration could stop at this point, having dealt with the trumpets and their sounds. Were it not for an ancient Zoroastrian text, apparently referring to these trumpets, little more could be said — apart from vain speculation about purpose and societal function. But the ancient text is accepted by Zoroastrian specialists, and it states that the trumpets were once used to lure animals peacefully. From there it is a short step to bypass the peaceful element, and view it as a hunting tool which lured quarry. Could its sound mimic the calls of hunted animals?

9.3. An example of animal sounds: deer calls. To evaluate the possibility we need the sounds of all animals hunted in the region of the BMAC, but there are good reasons to concentrate on deer. They are, and were, a desirable quarry in many parts of the world, and existed in the region. In England deer have long been considered the prime quarry, as demonstrated by the fact that the king claimed most of them. He owned large forests across the country (e.g., Sherwood forest, the forest of Dean). The 13th century Forest Law forbade anyone to hunt the "beasts of the forest" since they were the king's property (Turner, 1899, p. cxvii). The beasts, also known as "the king's venison", were defined as the red deer, the fallow deer, the roe, and the wild boar (the latter had become scarce already at that time, Turner, 1899, pp. xiii). But the exceptional value of deer was demonstrated earlier by William the Conqueror whose hunting laws singled out "deer, hart, and hind" for protection. Anyone (except the king) who killed such animals would be blinded, according to the Anglo-Saxon Chronicle (Savage, 1982, p. 220).

⁶⁵ See note 1.

Deer calls are relatively easy to imitate⁶⁶. At rutting time both the female roe deer (*Capreolus capreolus*) and the young female fallow deer (*Dama dama*)⁶⁷ emit sounds similar to those of the Oxus trumpet. The sounds resemble short moaning cries ("bleeping"). In sonograms they appear as short overtone-rich bursts of ca. 500 ms duration with the lowest frequency components near 1.0 kHz (for the fallow deer) and 1.5 kHz (roe deer)⁶⁸. The initial part of each burst is loud but it quickly descends in pitch (some 30%) and loudness. Fallow deer usually put out a 5 s long sound cluster containing 5-6 bursts at seemingly random time. The loudness of the bursts increase progressively until the animal falls silent for approximately 10 s. The sequence is repeated with slight variations time and again. Young red deer have similar calls (Vaňková & Málek, 1997, fig. 2). But male deer usually emit bass sounds outside the range of Oxus trumpets⁶⁹. On the other hand, animals not related to deer may also have sounds with fundamentals near 1 kHz (Fischer et al., 2001, fig. 1).

The accuracy of the imitation must be judged by the animals themselves, and they signal the verdict by their behavior. If a male deer finds the sound similar to a female deer, he will be curious and approach the source of the sound, especially in the rutting season. The response is, of course, also influenced by other factors, such as the degree of sexual excitement, the presence of a "natural habitat," and the absence of distracting noise. To my ears, though, the sounds of Oxus trumpets seem close to deer calls. Further research could settle the issue⁷⁰.

⁶⁶ The most complete collection of animal sounds seems to be in the Wildlife Section of the British Library National Sound Archive (Internet address: <http://www.bl.uk/index.html>), but there are wide lacunae. There are also many types of call pipes available in hunting stores.

⁶⁷ Cassette tape supplied by British Library of Wildlife Sounds (September 22, 1980).

⁶⁸ As one would expect, young animals give higher pitch than adults since they are smaller. There may, indeed, be size-effects in sound production, just as there is in reception (Heffner & Heffner, 1990, fig. 4).

⁶⁹ Male roe deer and fallow deer tend to grunt with fundamental frequencies several octaves below those of female calls. Adult female red deer can also produce sounds of fundamental frequencies near 110 Hz (Vaňková & Málek, 1997, p. 285).

⁷⁰ There seem to be no scholarly studies of an animal's response to an artificially produced call. The widest published survey of emitted animal sounds is Tembrock's, but his results (1963, table 65), are incomplete and unreliable (due to inadequate instrumentation in the 1950s?). Recently, the proliferation of microcomputers has put sophisticated sound analysis within easy reach (Owren & Linker, 1995). Academic research has intensified but concentrates on the information carried by calls (Marler, 1977, pp. 24-29), mostly on birds and primates (e.g. Fischer, et al., 2001).

9.4. Zoroastrian texts about trumpets that control animals. According to Zoroastrian mythology, the first two rulers of mankind were Yima⁷¹ and Žaḥḥāk (Arabic: al-Ḍaḥḥāk). The former was as benevolent as the latter was evil, but both used trumpets to call humans and animals.

Yima's story, told in the Avestan language, appeared in *Vendīdād*. Early in his reign Ahura Mazdā gave him two tools⁷², "a golden trumpet and a gold-adorned whip." Many pleasant years passed during which Yima extended his earthly dominion, and creatures multiplied. Yima used his tools⁷³ to "drive [the inhabitants of] this earth on with the golden trumpet and strike [them] with his whip." But Ahura Mazdā announced that many cold and wet years would follow and ordered Yima to make a large underground shelter in which to gather humans and animals. "Go over the shelter with the golden trumpet." Apparently, Yima used the trumpet and the whip to control⁷⁴ the beings living in his clime.

Vendīdād was committed to writing during the Parthian period (ca. 200 BCE – 200 CE). It has pre-Zoroastrian elements (earlier than 1200 – 1000 BCE)⁷⁵, and some are woven into Yima's story. Conspicuous details may well have survived in folk memory during the time between the demise of Oxus trumpets and the rise of Zoroastrianism (i.e., 1800 – 1200 BCE), although the recollection might be vague and padded with

⁷¹ Aspects of Yima are extensively discussed by Zaehner (1961, pp. 126-7, 131-41), and Boyce (1975, pp. 92-7).

⁷² The Avestan terms for the two gadgets are *suβrā-* and *aštrā-*. These have long been translated "goad and whip," but in 1980 Duchesne-Guillemin showed that the correct translation is "trumpet and whip." Žaḥḥāk's golden trumpet was known as a *sūrākōmand* (in Pahlavi) and *minfakha* or *mashdra* (Arabic). The translation is now generally accepted by Iranologists, e.g. Kellens, 1984. — In writing *supra-* the first part forms the stem and the hyphen stands for a suffix determined by the rules of Avestan grammar. The *β* is pronounced as a bilabial voiced fricative approximately like "v" in "verb." The letter is sometimes written "w," especially in German literature, i.e. *suwrā-*.

⁷³ Boyce, 1984, pp. 94-96, with "trumpet" substituted for "goad."

⁷⁴ The *Vendīdād* text does not explicitly state that Yima's trumpet attracted, lured, or controlled animals and humans into the shelter. But "attract" is used in the supporting texts Duchesne-Guillemin introduced to ascertain the meaning of *suβrā*, e.g. in the passage cited below (n. 80): "Et que, chaque fois que dans un climat il trouvait une belle femme ou une bête élégante, il soufflait dans cette [trompette] et, par la magie, les attirait à lui."

⁷⁵ Boyce, 1984, p. 94; Gnoli, 1980, p. 151; Skjærvø, 1995, p. 165. Traditionally, scholars had put Zoroaster much later (ca. 600 BCE, Mallory & Mair, 2000, p. 105), but arguments now favor the second millennium date.

elements of myth⁷⁶. Memories may have been strengthened by the fact that Zoroaster is thought to have lived not far from Margiana and Bactria⁷⁷. Three elements stand out in the story: (1) the trumpet occurred at the beginning of time, (2) it was associated with the highest stratum of society, and (3) it could lure animals and humans. These details fit the circumstances of Oxus trumpets. Although the trumpets became the subject of Zoroastrian legend, they had no other influence on Zoroastrianism. Specifically, they played no role in its ritual practice⁷⁸.

Žaḥḥāk's story echoes Yima's tale. His trumpet had the same ability to lure humans and animals, but he used it with wicked intent. As an early Pahlavi text⁷⁹ put it: "When he learns that someone has a good woman, he attracts her with his trumpet (Pahlavi: *sūrākōmand*) of gold and makes her his slave." According to a tenth century Arabic text⁸⁰, "whenever he wishes to exercise his magic, he blows this trumpet (Arabic: *minfakha* and *mashāra*) and spreads death, sickness, or famine in a clime. Every time he finds a beautiful woman or an elegant animal in a clime he blows his trumpet and, like magic, she/it is attracted to him." Slightly later an Arabic writer describes Žaḥḥāk as "the first who sang and [the first] to whom [musicians] sang... when he wished to attract something he owned or liked, such as a woman or a servant or an animal for riding, he used to blow into a golden trumpet (Arabic: *qasaba*), that he owned, and everyone he wanted [to attract] would obey

⁷⁶ The longevity of ancient oral traditions is hard to quantify, but some insight was given by Staal's examination of memorization techniques of the Nambudiri Brahmans of Kerala, India. Pairs of Brahmans recite hymns in complex patterns of repetitions, and inverted repetitions, of words and syllables. When this takes place at temple feasts, diners finish courses at certain points in the recitation and the last mouthful is taken simultaneously with the last strain (Staal, 1961, pp. 45-47). Since memories of two reciters are matched, and the performance is both playful, precise, and integrated into the rules of society, retention is cultivated. Moreover, the Sanskrit grammatical rules given by Pāṇini (second century BCE) still apply, a documented retention for more than two millennia, much of it as oral tradition.

⁷⁷ References in note 75.

⁷⁸ According to its sacred texts (West, 1965; Darmesteter & Mills, 1965; Wintemitz, 1965a), Zoroastrian rituals were devoid of music.

⁷⁹ *Dēnkart* (IX, 21, 13), a Pahlavi commentary on the Avesta collected in the ninth and tenth centuries CE, but "very ancient in substance" (Boyce, 1984, p. 4). Translation taken from Duchesne-Guillemin, 1980, p. 541.

⁸⁰ al-Maqdisi (d. 966 CE), *Kitāb al-bad' wa al-tārīx*. French translation in Duchesne-Guillemin, 1980, pp. 541-2.

whenever he blew that [instrument]... that is why the Jews blow the trumpet."⁸¹

Quite likely, Yima's story was the result of a long backward glance at Oxus trumpets. The glance pierced through six centuries' mist-of-time, and the nebulous image was passed on to Zoroastrian priests who transmitted it orally into the first millennium CE. There can never be absolute proof that the Oxus trumpet was remembered as the *suβrā*, but several aspects are persuasive, such as the highly specific meaning of the term (it did not designate wind instruments in general), the rise of the story in a region where the unique instrument once had flourished, the assertion that the trumpet was made of gold, and the ability of trumpets to communicate with animals.

10. Societal role: hunting implement

10.1. Previous idea: trumpets commanding horses. Twenty-six years ago Ghirshman searched for a device that could command chariot horses. "The excavated sites have produced that object, but it has remained misunderstood and has not aroused any interest. They were bugles, five in all: three in gold and silver unearthed at Tepe Hissār and two of gold, part of the Astrābād Treasure. Asia did not have to wait for Greece to introduce the sound of bugles to the cavalry. In fact, the trumpets one sees in the hands of Amazons, Phrygians, and Persians were inherited from the Orient. The sound of trumpets is also indispensable when training horses, let alone pulling chariots or employing them in battle. The drum is bulky and its sound is too dull to overcome the noise of rolling chariots. On the other hand, the sound of trumpets carries far. The precious metals which were used in the manufacture of the excavated bugles and their number would indicate that they were reserved for those on the highest ranks in society, for princes or high dignitaries who commanded the army from chariots" (1977, pp. 16-18). Ghirshman was thinking of the well-established function of trumpets stated in the first paragraph of the current paper⁸², but it does not work here. The sound of Oxus trumpets is far too weak to control horses and would drown in the noise of drums.

⁸¹ Hebrew *shōfār*, see Zotenberg, 1900, pp. 22 & 24. Presumably, the writer adopted earlier Zoroastrian sources for the first part of the quote. The fanciful comment on the Jewish *shōfār* might be his own 10th-century spin.

⁸² Ghirshman's statement has become an oft-repeated orthodoxy, e.g., Parpola, 1995, p. 361.

On the other hand, Ghirshman's linkage of precious metals and high societal rank seems reasonable. Had he known the extraordinary workmanship invested in the trumpets, he would, no doubt, have found it just as significant. For him the Clite was the leaders of the army, but for Tosi, Shahmirzadi, and Joyenda (1992, pp. 221-2) it was the priesthood or the civic leaders.

10.2. Present surmise: trumpets for hunting. Having introduced the idea that Oxus trumpets can mimic animals calls, I proceed to evaluate their role in hunting and determine who hunted. Most likely, the Clite did, and their predilections would explain the use of precious metals.

10.2.1. Animal calls used in hunting. Today some hunters use sound imitations to lure animals into close range. The outcome may not be entirely predictable, but under favorable circumstances the method is efficient⁸³. Various strategies are available. Not only can hunters lure bucks with the sound of roes at the time of rut, they can also alert the female roe by imitating the sounds of her new-born offspring (Grzimek, 1990, p. 206). A buck may be challenged by noises mimicking an infringing buck and may approach for combat. Feeding instincts can arouse a fox when he hears the squeaks of a mouse. Some of these sounds can be imitated by Oxus trumpets and, in the case of the buck, the prize would be a large animal with impressive antlers. Indeed, an esteemed quarry.

Stalk hunting (Pirsch or *Pürsch*) with sound imitation (*Lockruf*) is well attested in present-day Germany. It proceeds at a slow pace with the hunter cautiously sneaking up on the animal, all the while softly emitting mimicking sounds. The method has gained a following in Britain (Whitehead, 1986, pp. 95-98). Berger observed many devices to help hunters produce animal sounds in Hungary (1928, p. 204) and found a German hunter who produced convincing results by manipulating only his voice, hands, and nasal passage. Commercial devices made in Germany (Whitehead, 1993, p. 333) produce a variety of animal sounds⁸⁴. In

⁸³ Today, with dogs and guns, it is difficult to appreciate the challenges of ancient hunting methods, but a Corsican proverb is corrective: "The hair that a hunter lost is heard by the deer, smelled by the boar, and seen by the mouflon ram" (Grzimek, 1990, p. 545).

⁸⁴ In 1986 I met a woodsman with an extensive repertoire of animal sounds. He lived in a small cottage deep in a deep forest some 200 km north of Stockholm. His imitations

America⁸⁵ and Scandinavia (Sundh, 1989, pp. 62-67) hunters use small birch trumpets, about 30 cm long, to imitate elk and moose. The Ainu of northern Japan mimic deer sounds with a complex contraption of wood, fish skin and fish gut (Coon, 1971, p. 87). Whitehead shows an Iranian man blowing a curved animal horn to call a maral (a kind of deer)⁸⁶. One can easily imagine the vital role of *Pirsch* and *Lockruf* when specialized hunting dogs were uncommon and long-range weapons few.

10.2.2. Hunting calls in Margiana. From excavated bones, we know that onagers, hares and birds were hunted in Margiana ca. 2000 BCE⁸⁷. Still wider fauna appears on local art from that time, e.g., tigers and mouflons. At present deer live on the banks of the river Murgab which runs into Margiana (fig. 2), and they populate the region along the Oxus (Tshlenova, 1963, p. 58). In fact, they are widely distributed in Eurasia (Grzimek, 1990, p. 204). With deer abundant in Bactria and Margiana, and highly esteemed as a quarry in many societies, it is hard to imagine they were not hunted in the Oxus region. Since deer are easily lured by sound imitation, and appropriate sounds can be made on Oxus trumpets, one sees a role for Oxus trumpets in Oxus hunt. Iran, too, has abundant deer (red deer, roe deer, fallow deer), as well as wild goats, onagers, and mouflons (Misonne, 1968, p. 295). Oxus trumpets could have found similar use at Hissār, Shahdād, and Astrābād.

Pirsch with sound imitation was not the only hunting method at this time and place. A vivid scene (fig. 28) on a silver vessel shows a noisy ibex hunt with hounds, whips, and archers (German *Hetzjagd*). Drawing on current hunting practice, we interpret the large person on the right as the Master-of-Hounds who controls his pack with the crack of a whip. The whip has a rigid handle and a flexible string below. Fringes tied to the

of local animals (many types of birds, deer, elk, bear, fox, etc.) sounded convincing and looked simple to produce. He used only his voice, cupping his hands in front of the mouth.

⁸⁵ The Penobscot Indians of Maine imitate the-amorous calls of the cow moose through a cone of birchbark (Coon, 1971, p. 86).

⁸⁶ Nature provides many objects that aid sound production, e.g., leaves can be put between one's lips and blown to make loud bleating tones; hands can be cupped and blown to make soft owl-like sounds. Some are age-old children's toys (Lund, 1985) and may not necessarily be effective in hunt.

⁸⁷ Hiebert, 1994, pp. 133-4. Ligabue & Salvatori (1989) have color photos of several wild mammals now living in the region: cheetah (pl. 9), saiga (pl. 11), onager (pl. 12), and wild goat (pl. 13).

string make a lashing noise when the whip is cracked. It does not hit the hounds but the sound sends a signal to them. The hounds chase a flock of ibex, three adults and one fawn. The flock is in full flight, but one ibex has been stopped by a bite around the nose. Nearby, another hound has stopped to bare his teeth and bark. Archers, crouching in the front, kneel ready to shoot the approaching animals. The *Hetzjagd* and *Pirsch* represents two opposite poles in the hunter's soundscape.

Oxus trumpets could direct the quarry in *Pirsch* hunt, and this circumstance may have given rise to the notion that Yima used them to affect animals. Ahura Mazda's other gift, a whip like that in fig. 28, would have communicated to animals in a different mode.

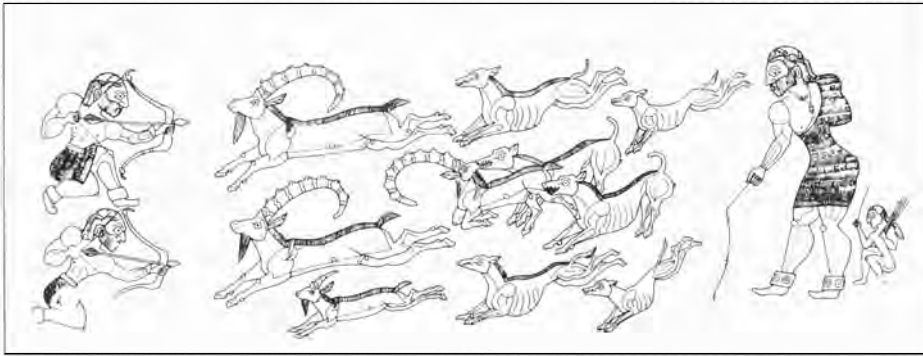


Figure 28. The hunt of four ibex animals shown on a silver cup from highland Iran or northern Afghanistan, first half of the second millennium BCE. Bothmer, 1990, p. 44. Drawing: Elizabeth Simpson. Private collection.

10.2.3. Hunting and the élite. The societal rules of hunting are not known in the Oxus civilization, but in many ancient societies large animals were reserved for the Clite who controlled the grounds. Big-game hunting was considered a royal prerogative in the ancient Near East and Egypt. Neo-Assyrian wall reliefs show the royal hunt of lions^{gg}, gazelles^{g9}, stags^{g0}, and onagers^{g1} in royal parks. Texts also mention elephants, wild bulls, and

⁸⁸ Barnett, 1976, pls. X, XI, XII & XIII.

⁸⁹ Barnett, 1976, pls. XLVI & XLIX.

⁹⁰ Bamett, 1976, pl. XLIV.

⁹¹ Bamett, 1976, pl. XLVIII.

ostriches (Oppenheimer, 1964, p. 46). At the end of the hunt ritual libations were poured over dead animals in the presence of the king and to the sound of doubled harps standing side by side⁹². On the other hand, small animals like hares and birds were hunted and transported by low-ranking foot soldiers (Albenda, 1986, pls. 85-87). On Egyptian illustrations of the Old Kingdom only rulers hunt (Altenmiiller, 1975, p. 222).

The Clite status of the Master-of-Hounds is expressed in the hunting scene of fig. 28. He has two pendants hanging from chains around his neck and carries another one in his hair. This contrasts with the archers who lack expensive adornments. Their lower-class affiliation is probably also signified by less elaborate dress. The double circles on the master's ankle cuffs may represent expensive adornments. The archers lack circles. The Master/hunter has a helper who sits submissively and supplies spare parts for the whip. The acquisition of hounds required wealth and their training demanded specialized knowledge. This puts the hunter among the Clite.

As mentioned in section 9.3, the hereditary Clite of medieval Europe regarded deer as their property, but the custom was only the tail-end of a long tradition. If such privileges were upheld in Bactria/Margiana, one would expect Oxus trumpets to be used by the Clite in deer hunt. To mark their status, they probably acquired gold and silver trumpets. Lower-ranking hunters would have put up with plainer models.

At some stage the hunt may have begun to incorporate ritual aspects, just as it did in Assyria. If confined to ritual use, elegant trumpets would have avoided exposure to the bustle of the field hunt and become a tool of the priesthood.

10.2.4. Tentative links between trumpets and hunting in archaeological records. At Hissār the trumpets had been placed near luxury representations of the mouflon. Most items were crowded together in Hoard I, but the trumpets lay in a separate cluster apart from the rest. Schmidt's map of the treasure shows them in two spots, ca. 50 cm from the nearest item (fig. 29). They shared the secluded spots with five decorative mouflon faces cut from flat sheet gold, about 13 cm wide and 0.2 mm thick. According to Schmidt the faces had "seven pairs of perforations [that] pierce the long coiled horns and the beard of the animal," and they possessed "elliptically

⁹² Reade, 1983, p. 57. A millennium later, a royal boar hunt is still shown accompanied by harps at Tāq-e Bustān (Heimpel, 1970).

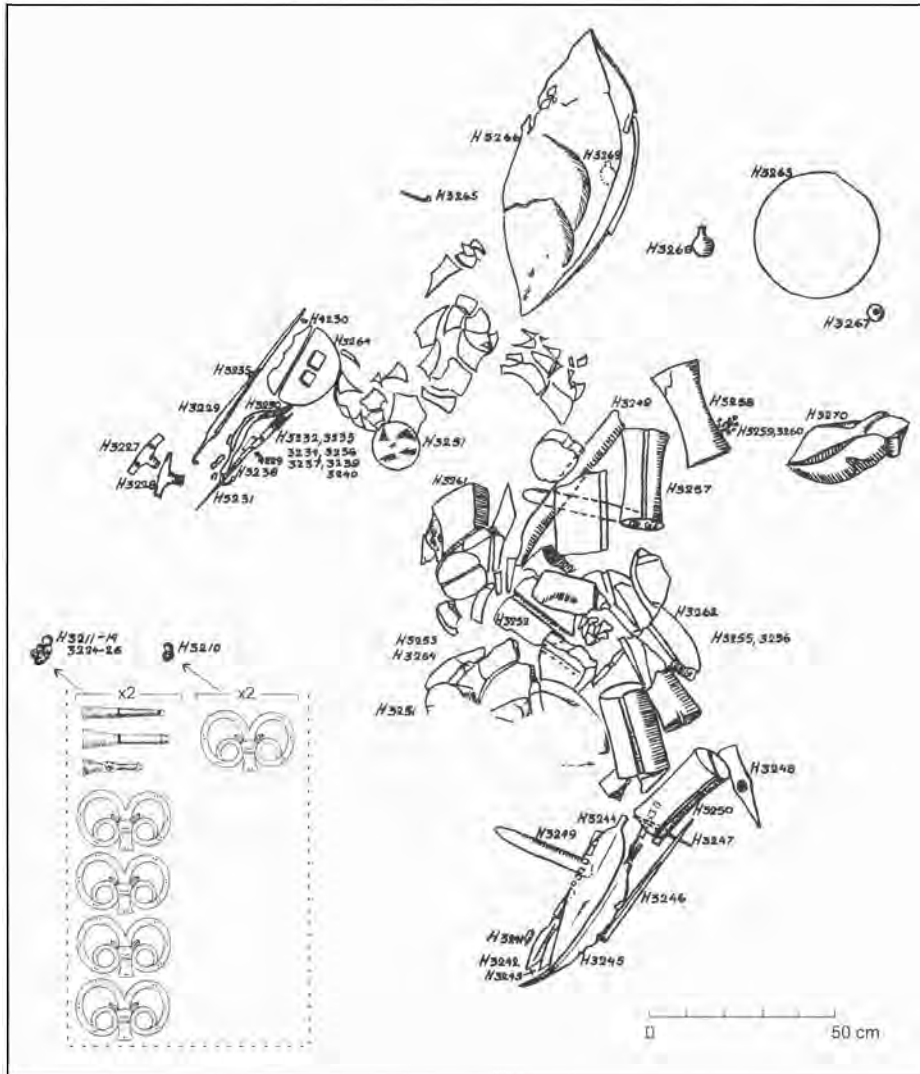


Figure 29. Plan of Hoard I on Treasure Hill at Tepe Hissar (Schmidt, 1937, fig. 97). Two isolated spots contain trumpets and mouflon faces (Schmidt, 1982, figs. 15 and 19), objects that are displayed at double size inside the dashed rectangle.

shaped eyes, well-defined eyebrows and raised ears" (1937, p. 189). He concluded that the mouflon heads had been sewed to cloth or leather. Because of the isolated position and the proximity of the trumpets and the heads, the spatial association seems intentional.

The mouflon, a wild sheep, was an elusive and desirable quarry: they "stay on the highest mountain tops where they are best protected from other animals, humans included... they are exceedingly shy... unfortunately, they have been extensively hunted, not only because of their impressive horns, but also for their meat which is excellent; even the guts are delicious" (Lieberkind, 1937, pp. 240-1). Judging by the many gold images on the garment, mouflons were greatly esteemed at Hissār, perhaps on par with trumpets. The proximity in the Hoard may indicate that trumpets and (mouflon) animals were associated, possibly through their role in hunting.

The burial of trumpet E6 may provide another indication that trumpets and hunt were affiliated. It is said to have been found with an arrow head⁹³, but the information and the interpretation are tenuous.

11. Indo-Iranian roots: Yima and Yama, legendary first musician-kings

The Avestan text about king Yima has a parallel in a Sanskrit text⁹⁴, and the correspondence opens a window into the mythological past of Indo-Iranian music. Just as king Yima was the first mortal in Iran, so king Yama was the first mortal in India, and both were musically inclined. While Yima sounded the trumpet, the praiseworthy Yama played the pipe:

"this is the seat of Yama, called the god's (or gods') place. His pipe (*nāḷī*) is played here, he is praised by praise-poems" (O'Flaherty, 1981, p. 55, from *Ṛgveda*, 10.135.7).

It is not clear if Yama's instrument was a reed/bamboo pipe⁹⁵, or if the reed was cut and shaped to form a short vibrating membrane at the mouth-end of the pipe. In the former case it would have acted like a flute, in the latter like an oboe or a clarinet. But certainly, Yama and Yima both played wind instruments. The main difference was the material of manufacture:

⁹³ See note 33.

⁹⁴ Dated ca. 1500 BCE (Witzel, 1995, p. 97).

⁹⁵ The *Ṛgvedic* expression translated "musical pipe" is *nāḷī* which is derived from *naḍa* "reed," thus "reed pipe." Duchesne-Guillemin (1980, p. 543) cites the standard Sanskrit form *nāḍya*.

metal in Bactria/Margiana/Iran and bamboo or reed in India. Perhaps the choice reflects a difference in indigenous material: reeds were probably abundant near the Indus but less so in desert oases, although not absent (cf. the proposed reconstruction of the oasis environment in Bronze Age Margiana, Hiebert, 1994, p. 136).

These were the first documented instruments of people from whom Indo-Europeans descended⁹⁶. Because of their early prominence, one might expect wind instruments to occupy an exalted place in later Indo-European imagination, but that is not the case. That position is instead held by string instruments, at least in the Classical world. In ancient Greece Apollo's kithara and Hermes' lyra triumphed over Marsya's pipes⁹⁷. Even before the arrival of the Indo-Iranians, the image of a three-stringed arched harp was used as a writing sign of the Indus script⁹⁸. After the arrival, the harp (*vīṇā*) frequently occurred in Sanskrit texts⁹⁹ although not to the exclusion of wind instruments¹⁰⁰. Likewise, Sumerians had large numbers of lyres and harps but few winds (for strings, see Lawergren & Gurney, 1987; for winds, Lawergren, 2000). In modern times this imbalance remains: guitars, pianos, and members of the violin family are ubiquitous¹⁰¹.

⁹⁶ For Indo-European language relations, see Mallory, 1989, pp. 22-23.

⁹⁷ It has long been accepted that string instrument held the loftiest position during the first millennium BCE in the eastern Mediterranean. Classical Greek literature and the Bible bear ample witness and, adding some guesswork, Frazer (1935, pp. 54-55) thought Cyprus displayed the same preference. Egyptian text hardly rank instruments, but tomb illustrations show large and prominent harps already during the Old Kingdom. Subsequently, harper's songs became a prominent literary genre.

⁹⁸ See note 16.

⁹⁹ The *Ṛgveda* (1500 – 1000 BCE) mentions the gargara which Sachs equated to the viqd harp (1940, p. 152). Other early instances of the *vīṇā* in Sanskrit texts were examined in a series of publications by Coomaraswamy (1930, 1931, 1931a & 1937).

¹⁰⁰ E.g. *vaṃśa* of classical Sanskrit texts (*Raghuvamśa* of Kālidāsa 2.12, *Mrcchakatika* 49.2) is "reed pipe" (but *vaṃśaka*, is "bone pipe"); other reed pipes: vequ (e.g. *Mahābhārata*, *Harivaṃśa*, *Raghuvamśa* 19.35) and vequka (*Harivaṃśa* 15599). However, the cow-herd Kṛṣṇa plays the vequ and *vaṃśa* and both have been translated "(reed) flute" (Stoler Miller, 1977, p. 24; Kinsley, 1979, pp. 95-103).

¹⁰¹ Leonardo da Vinci arrived at the reverse evaluation. In his days bowed strings were less common than plucked ones. He observed that plucked sounds decayed quickly whereas sound of a winds could be sustained. Likewise, without a tape recorder the memory of a music performance also fades (unlike the painted canvas) and Leonardo diagnosed the two manifestations of sound decay as the *malattia della musica* (Wintemitz, 1984, pp. 97, 219). As a result, he preferred winds and bowed string instruments.

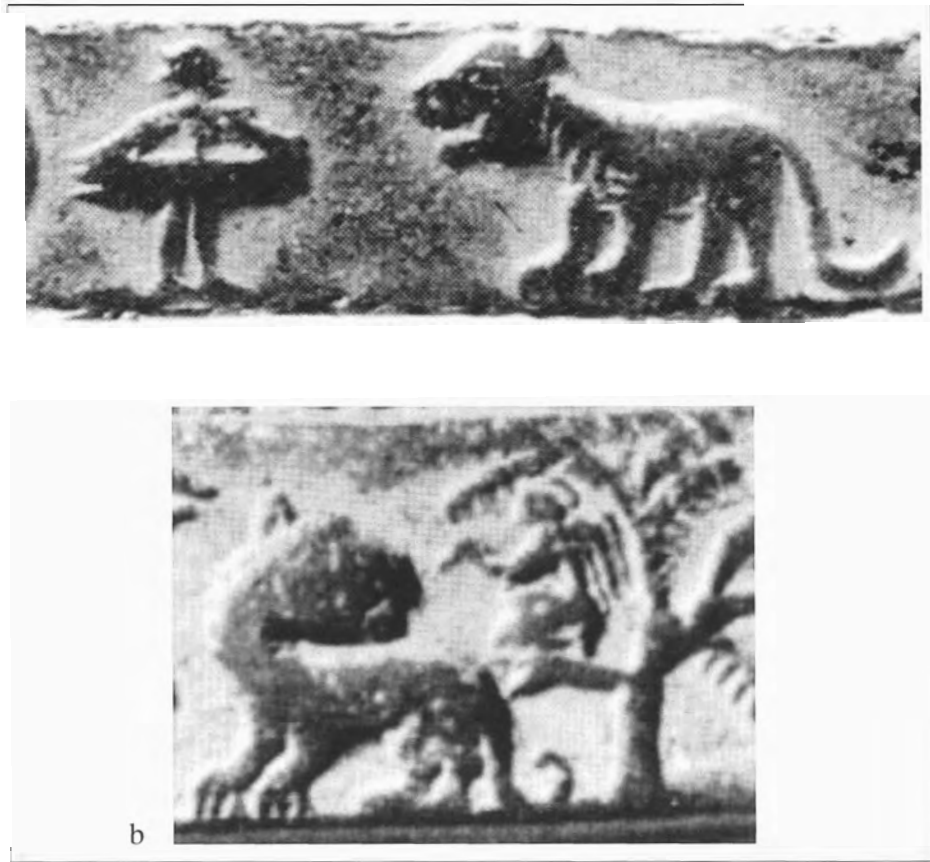


Figure 30. Tigers listening to musical instruments on two Indus seals.
 a. Tiger and a two-sided horizontal drum. Seal H-182 A from Harappa.
 b. Tiger and a piper. Seal M-478 B from Mohenjo-Daro.

12. Other ancient instruments that mimicked animal sounds

Ancient literature contains little documentation on animal sound mimicry. In particular, Xenophon and Arrian bypass the subject in their works (*Cynegeticus*) on hunting. But there is a report from Egypt written when Greek-speaking immigrants had settled in small enclaves (ca. 100 CE). Busiris, a city located near the middle of the Nile delta, was an important native center, while Naukratis, 60 km away on another Nile branch, had been settled by Greek immigrants (Boardman, 1999, pp. 118-121). The Egyptians in Busiris

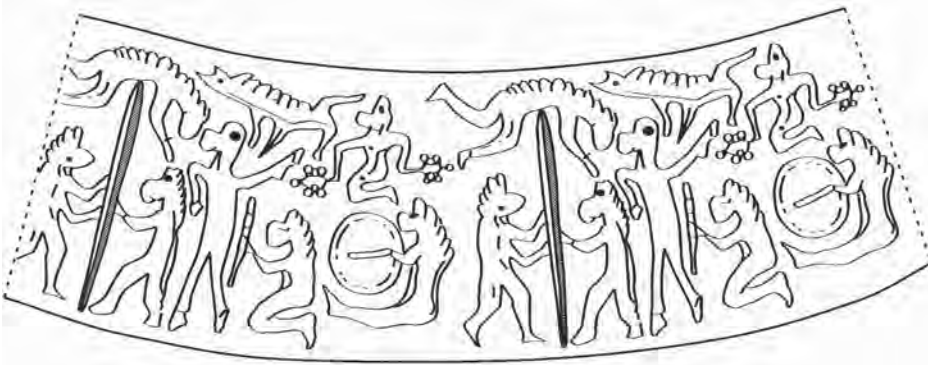


Figure 31. Shamanistic scene on a cylinder seal from Togolok, Margiana (Hiebert, 1994a, fig. 6D).

complained that Naukratians used asses' bones for pipes and trumpets. For Busirians "even to hear a trumpet is a sin"¹⁰², because they think it sounds like the bray of an ass" (Plutarch, 1928, p. 373). Perhaps Plutarch wanted to ridicule the credulity of non-Greeks, but in passing he also documented a sound imitation close enough to horrify Egyptians.

13. Animals, humans, and music, ca. 2000 BCE

We are facing a world where music affects humans and animals alike. Was it depicted? Although the BMAC has no images of animals listening to trumpets, the Indus civilization (2500 – 1900 BCE) has two illustrations of music for large tigers. In one scene the animal views a drummer on the ground (fig. 30a, and note 17); in the other he turns his head toward a piper in a tree (fig. 30b, and note 15). Both tigers listen¹⁰³, just as Oxus animals would have done when trumpets imitated their call, although drums and pipes cannot mimic the tiger's roar. The scenes unfold approximately 1500 km southeast of the Oxus civilization. Mesopotamia lies at a similar distance in the southwesterly direction. It, too, had pictures of animals in musical contexts, although they tend to be players rather than listeners. Sumerian

¹⁰² The malevolent deity Seth was sometimes represented with the features of an ass (Plutarch, 1928, p. 372, note b).

¹⁰³ One cannot know if the tigers are more excited by the musician's sound or meat. The former seems more likely, since it would be unnecessary to show instruments in the latter case.

scenes (ca. 2400 BCE) show donkeys plucking lyres and a harp while a fox shakes the sistrum (Rashid, 1984, figs. 8 & 31). In Egypt the idea of animal musicians occurred later and persisted longer: a lion plays the lyre 1150 BCE (Lawergren, 1996, fig. 5j) and a monkey strums the lute 150 BCE (Manniche, 1991, fig. 71). Such illustrations continue well into the first millennium BCE (Lawergren, 1998, p. 53) in the Near East. At this date Orpheus inherited the theme. When he played the lyre, animals listened and their savage hearts were tamed¹⁰⁴. With time the story grew increasingly elaborate, and received much attention from poets and artists down through the Renaissance (Warden, 1982). Roman mosaics often showed lyrical scenes of Orpheus amidst phlegmatic animals (Jesnick, 1997). Indeed, the notion of animals-affected-by-music is widespread. Thompson lists folk-tales from around the world in which animals make, or listen to, music: a cat lures foxes with music; a tiger lets the hero escape to the strains of music; animals learn music (1955, vol. 6, p. 531); a bull lows musically, a bird plays timpani; a toad and a chameleon play the drum and the xylophone (1955, vol. 1, p. 421).

It is possible that Oxus trumpets and their animal context stimulated the belief that animals understand music. This lent human traits to animals, yet humans called the tune and remained in charge. In this world-view, animals and humans are intertwined symbiotically. Students of ancient iconography, mythology and religion have long been familiar with such a view, but it is less familiar to students of music history.

Shamanism provides another nexus of people, beasts, and music. Shamans beat drums dressed in animal garb. Contemporary practice has been explored by ethnographers (e.g., Eliade, 1964) and ethnomusicologists (Emsheimer, 1991; Rouget, 1985), but there is less certainty about ancient practice (Ripinsky-Naxon, 1992). A scene from Margiana (fig. 31) looks shamanistic¹⁰⁵: a seated shaman is dressed in a lion's (?) mane, and he or she beats a round drum with a long stick; a person kneeling above the shaman waves objects with clusters of

¹⁰⁴ The Orpheus myth was known already to Simonides, ca. 500 BCE: "Above his head there hovered birds unnumberable, and fishes leapt clean from the blue water because of his sweet music" (Edmonds, 1924, p. 311).

¹⁰⁵ Alternatively, the scene shows "two men with monkey heads holding a pole over which an acrobat is springing while a musician beats a large [round] drum. This is a ritual festival in which all the actors wear animal masks. The figure of the deity Shamash is at the top of the scene, thus stressing the deeply ritualistic character of the whole scene on the seal. The mysteries associated with the acrobatic feats performed to music may have been widely performed in ancient Margiana. The mystical character of such ceremonies is stressed by the fact that all the human characters were wearing animal masks" (Sarianidi, 1994, p. 394).

balls (rattles?); two "animals" hold a vertical pole while an acrobatic animal jumps over it; a hoofed animal performs a two-legged dance nearby, and a kneeling creature holds a long stick. Similar paraphernalia (drum, animal disguise, sticks) were indeed part of Central Asian shamanism as depicted on rock carvings several millennia before our era (Rozwadowski, 2001, pp. 71-82). These busy Oxus animals fit well into a world where living beings experience the power of musical sounds regardless of their position on the evolutionary tree.

14. Summary and conclusions

Eleven Oxus trumpets are known from controlled excavations at Astrābād, Tepe Hissār, Shahdād, and Gonur. They share many features with each other and with a large number of unexcavated trumpets from southern Bactria published here for the first time. Because of the consistency of design, all are likely to be genuine and have dates similar to the excavated material (ca. 2200-1800 BCE).

Oxus trumpets have the three basic shapes illustrated in figure 1: plain, bulb, and face trumpets. The latter type has one, two, or three faces modeled in relief on the exterior. Some of these possess high artistic merits, unusual for the time and place — and totally unexpected on trumpets at any age.

Many trumpets were made of silver or gold. The latter are often double trumpets where a gold trumpet is put on the outside of an inner plain trumpet. The preference for precious metals differs markedly from the tendency to use copper for general grave goods.

Because of their small size (ca. 8 cm length), some scholars have doubted that the items were real trumpets. But replicas play well and show that several design features cooperate to facilitate the sound production. The sound is not musical by any recent definition of the term, but its high pitch can mimic the calls of soft-voiced animals such as the female roe deer. If this sound is played at the time of rut, male deer would be attracted. The ability to lure animals, and trick them to approach, would have been useful in hunting — as it still is in some parts of the world.

A Zoroastrian myth relates that Yima, the first king, had a golden trumpet which he used to control animals. Some elements in the myth date back to pre-Zoroastrian times, i.e., before 1200 BCE, and could be based on memories of the Oxus trumpet. Indeed, that region was not far from the birthplace of Zoroaster. The trumpet's ability to lure animals fits the central theme of Yima's myth.

If used in hunting 2200 – 1800 BCE, one could understand the preference for precious metals. There is no information on the social conditions of hunting in the Oxus region, but if we take a cue from third-millennium Egypt and first-millennium Mesopotamia, large-animal hunt was a privilege of the élite. Those in the Oxus region may have used trumpets in the hunt and required them to be luxurious.

Acknowledgments

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Appendix: Catalog of Oxus trumpets

— APPENDIX —

No.	Catalog Designation	Type	Provenance	Material	Length	Width at front	Figure	Museum/ collection	Collection date	Comment
1	E1	Plain E	Gonur	Copper	7.8	5.8	3	Ashkhabad	2001	Grave N 1758
2	E2	Plain E	UE(*)	Silver	7.1	6.4	6	unknown	1978-9	Pottier negative 890 bis
3	E3	Plain E	UE	Silver	6.8	5.5	6	unknown	1978-9	Pottier negative 890
4	E4	Plain E	UE	Silver	7.5	7.6	6	unknown	1978-9	Pottier negative 950
5	E5	Plain E	UE	Silver	6.0	4.3	6	unknown	1978-9	Pottier negative 1015; Pottier 1984, no. 313
6	E6	Plain E	UE	Silver	9.2	8.1	6, 9	Louvre, Paris	1977	Amiet 1978, fig. 4; AO 26425; Pottier negative 724; Amiet, 1988, fig. 19b
7	C1	Plain C	Hissār	Silver	11.7	ca. 2.9	3	Lost		Schmidt, 1937, H3225 (see table 1)
8	C2	Plain C	Hissār	Silver	11.4	ca. 1.7	3	Lost		Schmidt, 1937, H 3226 (see table 1)
9	C3	Plain C	UE	Silver	16.3	2.2	6, 9	Louvre, Paris	1970s	Inv. No. AO 31562
10	C4	Plain C	UE	Silver	11.0	1.8 (rear)	6	Louvre, Paris	1970s	Inv. No. AO 31568
11	C5	Plain C	UE	Silver	9.0	2.3	6	Louvre, Paris	1970s	Inv. No. AO 31567
12	C6	Plain C	UE	Silver	11.2	2.0	6	Louvre, Paris	1970s	Inv. No. AO 31563
13	C7	Plain C	UE	Silver	7.4	2.0	6	Louvre, Paris	1970s	Inv. No. AO 31565
14	C8	Plain C?	UE	Silver	9.5	1.6 (rear)	10	Louvre, Paris	1970s	Inv. No. AO 31566
15	C9	Plain C?	UE	Silver	10.0	2.3 (rear)	10	Louvre, Paris	1970s	Inv. No. AO 31564a
16	C10	Plain C?	UE	Silver	11.3	2.3 (rear)	10	Louvre, Paris	1970s	Inv. No. AO 31564b
17	B1	Bulb	Gonur	Silver	7.7	5.4	3	Ashkhabad	2001	Grave N 2143
18	B2	Bulb	Gonur	Silver	9.0	4.8	3	Ashkhabad	2001	Grave N 2003
19	B3	Bulb	Gonur	Gypsum	9	7.1	3	Ashkhabad	2001	
20	B4	Bulb	Hissār	Gold	7.9	ca. 2.3	3	Philadelphia		Schmidt, 1937, H 3224 (tables 1 and 4)
21	B5	Bulb	Astrābād	Gold	Unknown		3	Lost	1844	Table 5; De Bode, 1844, pl. XVI: 4; Rostovtzeff 1920, pl. III
22	B6	Bulb	Astrābād	Gold	Unknown		3	Lost	1844	Table 5; De Bode, 1844, pl. xv: 4; Rostovtzeff 1920, pl. III

No.	Catalog Designation	Type	Provenance	Material	Width at front	Figure	Museum/collection	Collection date	Comment	
23	B7	Bulb	UE	Silver	12.2	7.3	7	unknown	1978-9	Pottier negative 1851
24	B8	Bulb	UE	Copper	9.8	6.6	7	unknown	1978-9	Pottier negative 1871-1872
25	B9	Bulb	UE	Silver	9.5	6.0	7	unknown	1978-9	Pottier negative 1014
26	B10	Bulb	UE	Silver	12.3	7.6	7	unknown	1978-9	Pottier negative 1127; Pottier, 1984, no. 314
27	B11	Bulb	UE	Silver	8.1	5.6	7	unknown	1978-9	Pottier negative 1128
28	B12	Bulb	UE	Silver	7.8	(incomplete)	7	unknown	1978-9	Pottier negative 1016
29	B13	Bulb	UE	Silver	9.2	5.7	7	unknown	1978-9	Pottier negative 770
30	B14	Bulb	UE	Silver	8.4	5.0	7	Louvre, Paris	1985	AO 28504; Amiet, 1988, fig. 19a
31	B15	Bulb	UE	Copper	8.2	6.0	7	Private coll.		
32	B16	Bulb	UE	Silver	8.0	4.6 to 3.8	7, 9, 20	Private coll., New York	1970s	
33	B17	Bulb	UE	Gold	9.8	4.6	7	Private coll.		
34	B18	Bulb	UE	Gold	9.9	6.0	7	Private coll.		
35	F1	Face	Gonur	Copper	9.0	6.0	3, 24	Ashkhabad	2001	Grave N 2060
36	F2	Face	Shahdad	Copper	9.0	6.2	3	Iran-Bastan Museum, Tehran		Hakemi 1997, pp. 76-7
37	F3	Face	UE	Silver	12.2	8.2	8-9	Louvre, Paris		AO 31013; Paris-Drouot, 1996, no. 603
38	F4	Face	UE	Copper	7.3	5.3	8, 18, 19	The Ron Gamer collection, Sacramento, CA	1970s	
39	F5	Face	UE	Copper	10.5	7.5	8, 20-22	Anahita Gallery, Santa Fe, NM	1970s	Sarianidi, 1993, fig. 23
40	F6	Face	UE	Copper	10.0	5.2	8	Unknown		Drouot, 1981, no. 17
41	F7	Face	UE	Copper	8.2	6.2	8, 23	Private coll.		
42	F8	Face	UE	Gold	9.3	6.0	8-9, 15-17	Private coll.	1978-9	Pottier, 1984, no. 315
43	F9	Face?	UE	Silver	9.5	6.0	9-10	Louvre, Paris	1970s	AO 31561

UE = Unexcavated

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