

## CHAPTER 2: The Horn and Tuba in the Ancient Mediterranean World

Throughout the modern world, in the ethnographic record and, it appears, much of the ancient world, the animal horn has been used as a PVA. By its form and nature it provides a hollow cavity which is easily entered, to provide an instrument's resonant cavity, or when left intact provides a hollow container that is useful for the storage of liquid or for drinking. Within this duality of function lies a problem, that of determining in a specific case whether a "horn" is adapted for use as a drinking horn or as a musical instrument. With fragmentary finds, this problem can be acute, the only answer being to consider, on its merits, each particular case. The presence or absence of the horn tip may be a guide but the horn, being capable of use as an end blown or a side-blown instrument may retain this or lose it to suit the specific case.

As the cavity of the horn itself is designed by nature, man's influence is felt most on the mouthpiece design. Kept with a small throat, a horn can be capable of yielding two or sometimes three notes, these being the 2nd, 3rd and 4th formants of its resonant cavity and this form of PVA is seen in a myriad of forms in societies utilising the wide range of animal horns from which instruments can be made.<sup>52</sup> Probably the best known of this group is the Shofar which has a long recorded history and is still utilised today in Jewish ritual.<sup>53</sup>

Almost as ancient in the archaeological record is the simple trumpet, a straight tubular instrument which developed by the end of the Roman era to the tuba. However, following the demise of the Romans, the practice of writing in Latin continued and early medieval authors retained the name for the long instrument which later became the buisine. In the present study, this group of instruments will be referred to as the Tuba.

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<sup>52</sup> See Diagram Group 1976, pp. 66 and 67.

<sup>53</sup> Sendrey, p. 542.

Being made of metal, it probably represents the first actually manufactured PV aerophone that man had, and is thus among the earliest outputs from the metal instrument industry.<sup>54</sup> However, ethnographic evidence shows that a wide variety of naturally-occurring tubular objects such as wood, bamboo, bark, gourds and reeds are used to make what are essentially cylindrically-bored instruments.<sup>55</sup> It is not proposed in this study to maintain a rigid distinction between "horns" (i.e. conical bores) and "trumpets" (cylindrical bores) as this distinction cannot be readily applied to the ancient instruments considered here, although its value in acoustic terms cannot be gainsaid. (as discussed in chapter 1) In this chapter, therefore, the horn and tuba are examined, representing as they do the typical combination of PVAs in use prior to Etruscan times.

## ANIMAL HORNS

The earliest reference to the use of these as instruments is in an inventory, (DR 6) where the instrument name "Sim" is prefixed with the copper determinative and the item is included in a list of copper articles dating from the middle of the third millennium BC.<sup>56</sup> A somewhat later reference (DR1) tells of 40 horns given to Amenophis IV, c. 1400BC. These were covered with gold and some were studded with precious stones, 17 of these being specifically referred to as ox horns.<sup>57</sup> The earliest iconographic reference to depict a horn of this form is on a painting in a palace at Thebes, (IC195) which dates between 2160 and 1580BC. The earliest references found, where the morphology of the instrument is seen, is on the Carchemish reliefs (IC7), c. 1250BC, where a horn is blown alongside a large frame-drum.<sup>58</sup>

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<sup>54</sup> The award for the earliest is rather populist and it is equally likely that a cast form of instrument was among the first.

<sup>55</sup> See Diagram Group, 1976, pp. 58, 59.

<sup>56</sup> Galpin, *Sumerians* 1957, p. 25.

<sup>57</sup> Sachs, 1940, p. 75.

<sup>58</sup> Galpin, *Sumerians* 1957, pl. III. See fig. 2.1.



**Figure 2.1**

So suitable is the design and manufacture of the material that nature provided, that little development of this basic instrument took place. Its outer surface was covered by metal, as described above but no ancient examples were found in which the natural material was totally replaced.<sup>59</sup> This seems to be as true of recent material, where metal may be used to provide a mouthpiece, carrying ring mounts or a garland or, in some cases, to cover the whole instrument as on the Bolivian horn in the Naprstek Museum Prague.<sup>60</sup> Although such fittings have been found elsewhere in ancient contexts (for examples from North Germany, see Chapter 5) no such material is forthcoming from this area.

One iconographic reference, IC151, shows the Roman army in Egypt with one of the group blowing an animal horn. Around the bell of this instrument is a considerable annular bell—disc and it seems reasonable to suppose that the remainder of nature’s product had been adorned, perhaps with a mouthpiece and decorative bands.

Instruments made in horn form are known widely from the iconography of the Mediterranean area, those found in this study being: IC156, Assyrian c. 700BC; IC96, Greek c. 550BC; IC100, Etruscan; IC145 from Este c. 50BC; IC150, Roman Spain c. 70AD; IC149, Shofar, Hebrew c. 200AD; IC21 and IC147, Sassanian. It is not possible to say from the illustrations whether these instruments are of

<sup>59</sup> This statement might really call for some modification as, in the case of the Irish horns, some of the instruments are metal analogues of animal horns.

<sup>60</sup> Diagram Group, 1976, p. 67.

horn or metal but IC96 clearly has some feature at its tip, most probably a mouthpiece.

In spite of the utility of natural horns, however, analogues were made in other material. In Northern Italy, for instance, in the Po valley, a clay animal horn form of instrument was found in a Terremaren cultural context of roughly 1200BC. On this instrument (0.43m in length, with an obliquely cut tip) the first formant can be sounded and, with great difficulty, the second.<sup>61</sup> However, this instrument, a manufactured horn analogue tells of manufacturing activity in this region at a time roughly contemporaneous with SD201 and 202, the Tutankhamen instruments. This could suggest the independent evolution of these instruments (See also Chapter 6) and their manufacture in a medium, well understood by these urnfield people who migrated South from the Danube area.

One other clay horn found in the Fayum dates from the first century BC and is identified in Bessaraboff<sup>62</sup>, as a Graeco-Roman Bacchic horn. It is red earthenware and elaborately decorated with low reliefs, and appears to have a mouthpiece of about 17mm rim diameter, The use of a clay medium to reproduce a naturally occurring object undoubtedly resulted from the knowledge that the properties of the animal horn could be replicated in a medium that the maker could control and, in return, gave him the ability to decorate it in a way appropriate for its use. Given the ability of the Greeks to manufacture ceramics, their use in this case is not surprising, nor is their lack of organological imagination in retaining the natural form and rejecting the opportunity for change that this medium offered.

A further analogue from about the fourth century was found at Etruscan Populonia. This instrument is in the shape of a curved horn with a well-developed mouthpiece, probably cast integrally with the horn body. Unfortunately few other details of this instrument have been found, nor has its current location<sup>63</sup>. However, the presence of an instrument such as this, a well-constructed bronze analogue of an animal horn, shows that this form was not simply regarded as inferior to the other types that had been developed by the fourth century BC, but was a type in its own right.

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<sup>61</sup> Behn, 1954, p. 127.

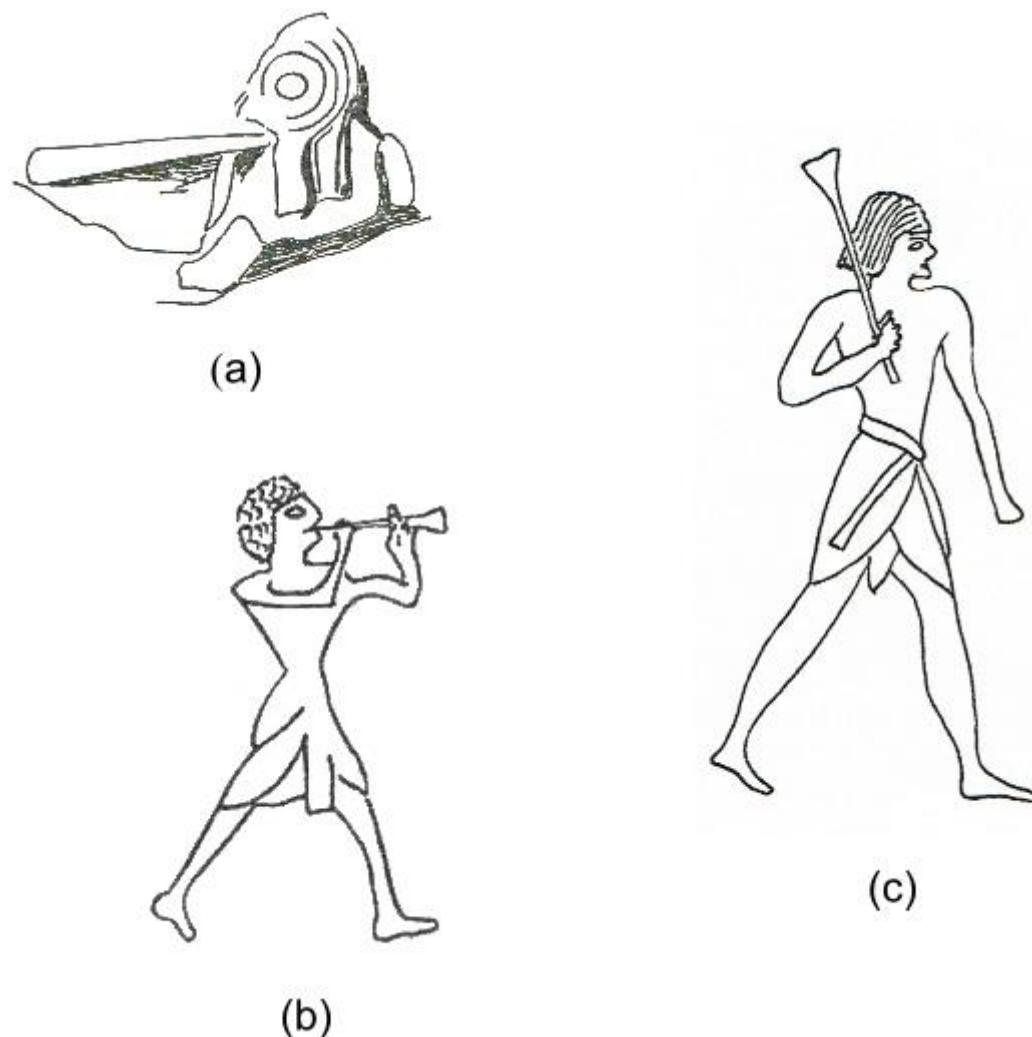
<sup>62</sup> Bessaraboff, (1941, p. 156, no. 154)

<sup>63</sup> The instrument is now known to be in the Museum in Florence and has a relatively simple mouthpiece in the form of an oval plate joined, probably by brazing, to the wrought body of the instrument.

## The Tuba

One of the earliest instruments to break away from naturally occurring forms and to be constructed from a variety of materials was the Tuba. Being essentially a straight tube of cylindrical or conical form, its natural beginnings would seem to lie with hollow reeds, bamboo, bone or similar material. However, the ethnographic evidence illustrates the enormous variety of materials that can be taken from nature perhaps used initially as voice modifiers and later utilised as PVAs. Interestingly, from 4th Dynasty Egypt (2725 - 2565 BC) comes a reference to the use of a megaphone to summon troops, paralleling exactly the use of the trumpet seen from the 18th Dynasty onwards and, perhaps, pointing to a sequence of development from megaphone to PVA.

The first reference to an instrument of a tuba type is probably an illustration carved from a limestone fragment from Khafajah, (IC9) c. 2600BC.<sup>64</sup> Figure 2.2(a). This is a straight conical instrument, about 0.74m long (scaled), with a semi-vertical angle ( $\alpha$ ) of 55mrad. (See Chapter 1, Figure 2,2,(a)).



**Figure 2.2**

<sup>64</sup> Frankfort, 1959, pl. 100(c)

The tuba is again referred to shortly after this, in text found in a pyramid in Egypt, dating from c. 2423BC, giving the name *snb*. An iconographic record contemporary with this text (IC152), shows a trumpet player on a boat crossing the Nile. Unfortunately, this carving has lost its upper portion and only the bell of the instrument can now be seen, with its end diameter scaling at about 120 mm, i.e. of the same order as in the much later references, which appear some 900 years later.

The first of these later instruments, IC51, on the temple of Deir el Bahari (1505 - 1484BC), shows the form of this instrument clearly. On this illustration (See figure 2,2 (b)), it consists of a tube yard which is depicted by a single line and a bell yard which is short and opens out rapidly i.e. (length = 0.29m.  $\alpha = 0$ ), hereafter written: (0.29, 0.0 (tube-yard) 0.14, 5.18 (bell-yard)). Other depictions such as IC52, from shortly after this (c. 1400BC), show clearly parallel tube-yards represented by two lines. (Figure 2.2 (c)).

Thus, the form of these instruments is different from that seen at Khafajah (Figure 2.2 (a)) and, on IC52 mentioned above, the soldiers in this representation have feathered head-dresses which Hickman describes as typical Lybian.<sup>65</sup> The two-cone type of instrument with defined bell and tube yards could well have originated either in Egypt or perhaps further to the west, in North Africa. Whatever its origin, however, it remained the key instrument of the military unit up to at least 1000BC, when the iconographic evidence ceases. Several instruments are depicted as having separately made bell yards, and for technical reasons (discussed below) this would be the obvious way of constructing the instrument. However, the form of this bell yard varies greatly both in size and morphology, and the flared bell can be seen alongside the straight conical bell throughout the iconographic record. Indeed the Tutankhamen instruments themselves (SD201, SD202) consist of one with a conical and one with a (slightly) flared bell.

## THE TUTANKHAMEN INSTRUMENTS

**T**hese instruments, found in the tomb of Tutankhamen and known as Tutankhamen's Trumpets, date from about 1350BC and are made, one of silver with gold mountings and the other of bronze with

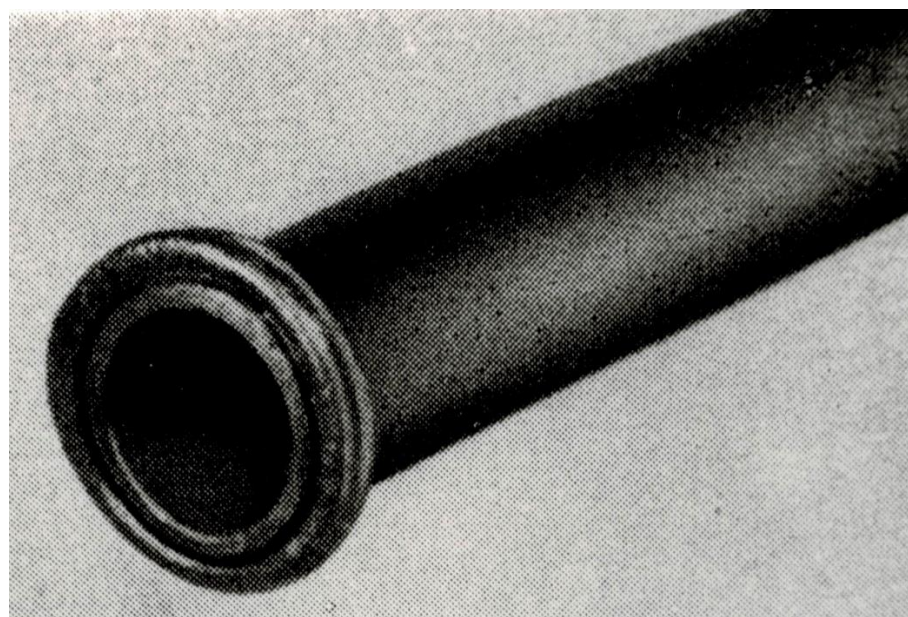
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<sup>65</sup> Hickmann, 1961, p. 74 and Abb. 52.

somewhat longer gold mountings.<sup>66</sup> They are 494mm (bronze) and 582mm (silver) in length, the remainder of the dimensions being as shown on Figure 2.5. Further valuable information about the bronze trumpet's mode of construction came to light in 1975 when the Tutankhamen exhibition visited London<sup>67</sup> and this demonstrates, from the very high quality of technical skill involved in manufacture, that this instrument would clearly be a highly valued object. They are made of 9 parts:-

1. Tube yard
2. Bell yard
3. Mouthsupport forming ring
4. Rivets (four-off)
5. Mouthpipe decoration
6. Tube/bell yard decoration

Both yards are fabricated from thin sheet metal, the tube yard of 0.2 – 0.25mm thick sheet and the bell yard of 0.1 - 0.13mm material. Four rivets fix the two yards together the tube yard fitting into the bell cone and this joint is covered by a very-thin gold sleeve. At the instrument tip a scarfe-jointed ring is placed over the tube and the end of this swaged over this ring to form a smooth mouthsupport. The ring appears not to be fixed in position by means other than an interference fit between it and the tube and it appears to have slipped down the tube somewhat since manufacture. (Plate 2.1 (a))

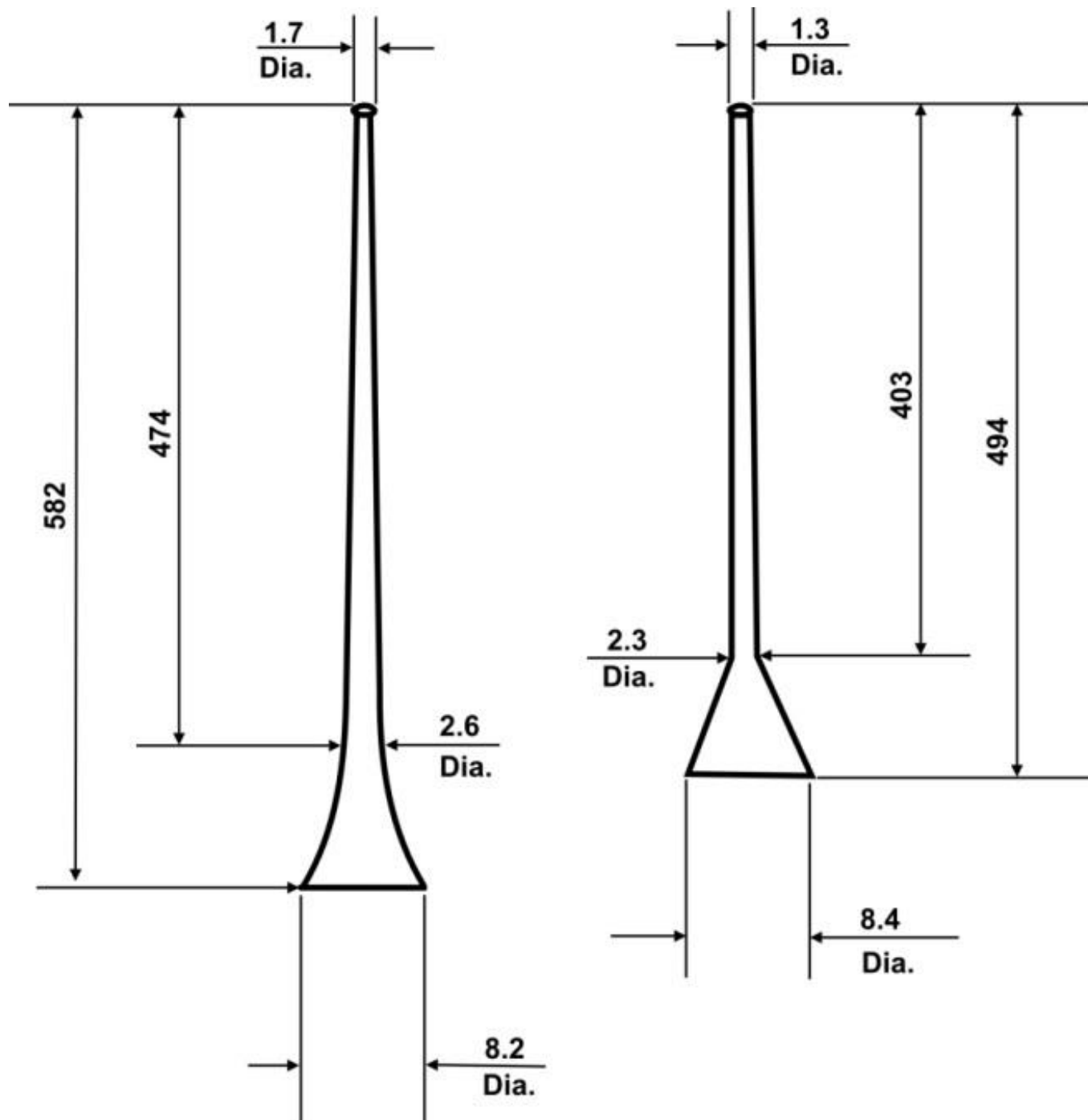


***Plate 2.1: Tutankhamun Trumpet Lipsupport***

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<sup>66</sup> Kirby, 1946, p. 55, Hickmann, 1946, p. 62 plus many other references.

<sup>67</sup> Montagu, 1976, p. 115.



**Figure 2.3: Dimensions of the Tutankhamun Instruments**

Along the tube yard, the seam can be detected; it was formed by interlocking the slotted edges of the sheet and then brazing as is done in modern instrument manufacture. On the bell, no seam was visible and Montagu<sup>68</sup> suggests that it ‘was pressure welded.’<sup>69</sup>

Being very fragile, by virtue of its fine wall thickness, this instrument is provided with a decorated wooden stopper which slides into the bore. To the manufacturer, this stopper would probably represent an analogue of the mandrel used in forming the tube. In this area the tradition of beating metals, perhaps initially native copper and gold, over carved wooden patterns was already old by the time of Tutankhamen, although the seaming of the metal as described above was probably of no great antiquity at that time. In the case of the bell,

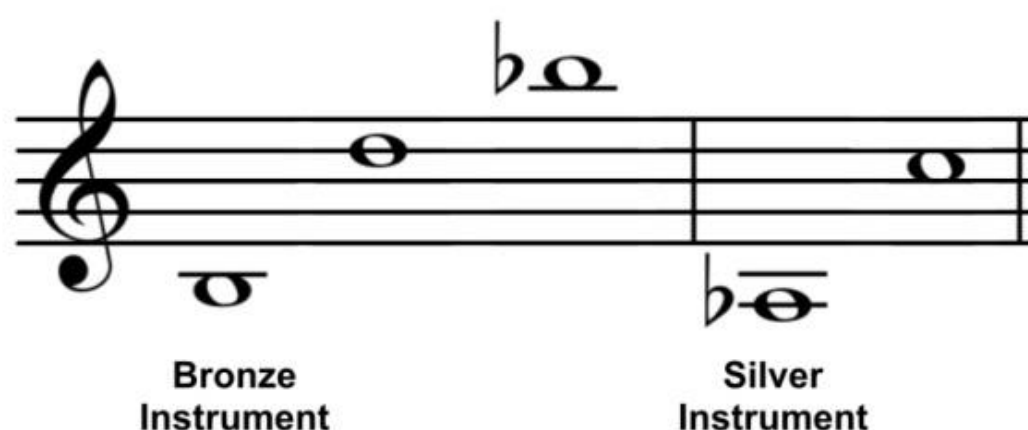
<sup>68</sup> Montagu, 1976, p. 115.

<sup>69</sup> While this might have been possible with the gold pieces, some other method must have been used with the silver and copper components.



the seam of any gold components could indeed have been produced by hammer welding, but it would seem more likely to have been raised from sheet over a mandrel. If formed from sheet, from a developed shape, the process of hammer welding would be quite difficult to carry out on a seam such as this.

In view of the delicate nature of this instrument's mouth support, and the apparent lack of fixing to the tube yard, Montagu<sup>70</sup> considers that only the middle note of the three playable on this instrument (see Figure 2.4) would have been used.



**Figure 2.4: The Range of the Tutankhamun Instruments in Modern Notation**

This seems reasonable in view of the fact that the lower note is rather poor, the middle note is a good trumpet tone, and the higher note requires a considerable pressure to be applied in order to sound it. However, it was possible to sound this, higher, note on a copy of the instrument made for this study using metal of the thicknesses quoted above. Indeed, in spite of the thin gauge of the metal, the instrument proved to be surprisingly robust.

On the silver instrument, SD201, the bell is slightly flared. Acoustically-speaking this helps a little in easing the wave-impedance discontinuity at the bell opening and also produces an instrument which may have been more attractive to the users. In addition, the flared bell has much greater rigidity than the straight cone, being structurally superior in terms of resisting deformation due to banging, dropping etc.

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<sup>70</sup> Montagu 1976, p. 117.

One of the peculiarities of the two Tutankhamen instruments is that they are not a pair in any sense of the word. They are tuned a second different (C<sub>5</sub> and D<sub>5</sub>), made out of different material, and have different bell shapes. One could accept the difference in tuning, as the instruments could have been made to be used alternately, but the other differences seem unacceptable in a pair. Furthermore, a passage in the talmud tells that the sacred trumpets used at various rites were of exactly the same dimensions<sup>71</sup>, and, although this refers to a different religious usage at a different time, the parallels are generally quite close. It seems, therefore, that as with other aspects of his burial, Tutankhamen's untimely death led to a certain amount of haste, and the requirement for a pair of trumpets was met by the use of two "odd" instruments.

## INSTRUMENTS OF THE TUTANKHAMEN TYPE

The majority of the instruments seen in Egyptian iconographic records are of the type with bell and tube yards of different conicity. On some of these the slightly flaring bell runs smoothly into the tube slope, the joint between the two being visible. One instrument of this flared-bell type dates from the time of Cleopatra, c. 120BC (SD217). It is 540mm long with a tube yard tapering from 15 to 25mm, and opens out to a bell of 160mm, thus having a very pronounced flare.<sup>72</sup> As with the other instruments from this area, it is made of sheet, having a seam down its length, which has now failed. In spite of the late date of this instrument, it is interesting to note that it still retains characteristics more typical of this area than the Roman North and, were its bell to be convex rather than concave would be a perfectly good example of a Salpinx.

The latest of the Egyptian iconographic references found in the present study (IC164) dates from the Roman period, 30BC to 395AD, and a gap of approximately 1000 years exists between this and the previous record. However, the instrument in IC164 could easily be mistaken for one from 1000 years earlier. It has the same morphology and, in particular, retains the same tube/bell yard form of construction seen in the early instruments. In fact, Hickmann (1946) illustrates an Arab

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<sup>71</sup> Sendrey, 1969, p. 356.

<sup>72</sup> Kirby, 1946, p. 56 and fig. 2.

trumpet from the Middle Ages (Plate II), and this too remains, in all its essential features, unchanged from ancient times.

However, to the North-West of Egypt, contemporary illustrations depict instruments of the straight conical type which seem more related to those coming from the East, as on IC9 (See figure 2.2 (a)). Only one other group of instruments, the Greek salpinges have similar form to these double-coned Egyptian instruments.

### **The Greek Salpinx**

**T**his instrument has a most-distinctive form being made up of a long narrow cylindrical tube-yard, with a cup-like bell at its end. Figure 2.5, (IC75).



***Figure 2.5: A Greek Salpinx***

It could quite simply have been a development indigenous to the Greek people, alternatively an import from North Africa where instruments of this type were being made from about 1500BC onwards, or it could have been adopted, (the accepted Greek view) from the Tyrrhenian people. In fact, about 560BC, the Greeks established a colony at Cyrene in Libya, thus creating a suitable link with an area that, around that time was alternately just inside and just outside the Egyptian Empire.

The Greeks, however, held the view that the Salpinx and the musical horn were invented by the Tyrrhenians, (Peoples of western Italy including the Etruscans). (DR57). According to Greek tradition, the instrument was frequently used by Tyrrhenian pirates as a signal instrument, and was thus taken over by Greek sailors who gave it the name "pirate- trumpet". The earliest certain reference to its use, in DR72, dates to the 5th century BC. Certainly, about this time Greek colonies were being established on mainland Italy, bringing them into cultural contact with this area. As is discussed in Chapter 3, a wide range of instruments were being produced in Italy around 500BC, and one of these types (SR2) has a very salpinx-like form. It was found in Campania and dates to about 470BC and, although it appears to be a side blown type, its tube and bell form are of the forms adopted on the Greek salpinx.

About this time, the representations of Salpinges also begin to be seen on Greek ceramics viz. IC95, 527-514BC; IC74, 525-500BC; IC97, 520-490BC; IC75, c. 510BC. For this century or so they are seen, and then they disappear, a similar pattern to that seen for the Egyptian trumpet between 1500BC and 1200BC. This is perhaps a sign that the form is novel and imported, it being depicted frequently during its early days. However, literary references to the continued use of the salpinx are seen, but no illustrations within Greece itself found. For some reason, the instrument did not spread beyond the range of Greek influence but was taken by them into Thrace. At Kazanlik, two salpinx players are illustrated in a scene from a funeral, dating from 280BC.<sup>73</sup> In this Scene, (Plate 2.1 (b)) the two players are blowing salpinges held in their right hand. It gives the only illustration of a salpinx where the cup shaped form of the bell can be seen clearly. This cup is attached to a tube yard which is parallel over most of its length and then over the last quarter of this, flares out slightly to run into the cup shaped bell. With its total length of 580mm and a cup diameter of 159mm (both

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<sup>73</sup> IC90; Zhivkova, 1975; Venedikov, 1974.

scaled), this instrument presents an oblique view which appears like a tube with disc attached at its end as seen on IC70 and IC74. Lacking an extant instrument, little can be said of the presence or absence of a mouthpiece on this instrument, as no illustrations clearly show one.



***Plate 2.1b: The Khazanluk Salpinges Photo Courtesy of Klearchos Kapoutsis***

The illustration of a salpinx in Behn<sup>74</sup> does appear to show a mouthpiece but this is a line drawing, and the slight bulge at the tube end is not visible in the photograph published in Boardman<sup>75</sup>. Behn<sup>76</sup> does say that the mouthpiece of the Salpinx was of bone but he quotes no authority.

Thus, from the iconographic record, the salpinx had a very uniform form and restricted distribution. So uniform, in fact that one can be certain that SD262, the so-called Salpinx in the Boston Museum of Fine Arts is not a salpinx but comes from further East, possibly being contemporary with the Salpinx.<sup>77</sup>

## **USE OF THE TERM "SALPINX"**

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<sup>74</sup> Behn, 1954, Taf. 66, Abb. 151)

<sup>75</sup> Boardman 1975, No. 169.

<sup>76</sup> Behn 1954 p. 118

<sup>77</sup> Having carried out much more work on Greek instruments since this date, I would no longer agree with this statement.

The Greeks used the term 'salpinx' to describe not only their characteristic instruments but also, in a general sense, as "trumpet." Similarly the nations that used the Greek language were constrained by the use of this term. For instance, Diodorus Siculus writing of the Celts (DR9) refers to their trumpets ("Salpinx") as "peculiar as well to themselves as to other nations." Polybius refers to the use of an infinite number of horns (bukinaton) and trumpets in the armies of the Celts. Also in the translations of the Bible into and from Greek, confusions abounded in the use of terminology in describing instruments such as the Salpinx, Bucina, Keras and Karnyx. An attempt was made by Jerome to clear up this confusion about 400AD, (DR177) he says: "Buccina pastoralis est et cornu recurvo efficitur, unde et proprie hebraice shofar, graece keratine appellatur. Tuba autem de aere conficitur vel argento quae in bekkus et solemnitatibus concrepabant." "The buccina is the instrument of the shepherds, made from curved horn, therefore, it is called in Hebrew shofar, in Greek keratine, The tuba, however, is made of brass or silver and its resounding tone is used in wars and festivities."

## THE SINGLE CONE INSTRUMENT

As discussed above, IC9 from Khafajah is the earliest illustration of a single cone type of horn (c. 2600BC). However, it is followed only shortly after this by a roughly-contemporaneous illustration of a much more complex instrument, IC155. This is a slim 900mm long (very approximate) instrument with a gentle flare on the bell. It confirms the presence of this design of instrument during the third millenium BC. A similar instrument is seen around 700BC, where two trumpeters are giving signals during the hauling of a colossal bull, IC10.

Whether or not this instrument evolved from a tube plus bell yard, is hard to say, none of the three early instruments (IC9, IC10, IC155) show signs of having been made in two parts but are of a uniform form. However, a documentary reference (DR5) from Ur, c. 1950BC, records the invention of the trumpet by Gilgamesh. This he makes from two hollow pieces of wood, the "pukku" and "mekku", presumably the tube

and bell yards.<sup>78</sup> Presumably this instrument would be of a form that had a break in morphology between the yards, as on the Egyptian instruments. Presumably too, it would require some form of seal between these two yards which, when simply constructed would produce some form of boss. Features such as these are seen on the Tepe Hissar (SD254/5) and Asterabad horns (SD256/7) c. 2000BC but these seem to be too far north and east to suggest a relationship between these and Ur.<sup>79</sup>

A further reference from this period is found in an inventory of presents from King Tushratta of Mitanni in Upper Mesopotamia to King Amenophis III (DR1, c. 1580BC). Some of these were trumpets, "the pattu, reed or tube corresponding to the older mekku being bound, probably with willow bark or bast and the Kizallu (gourd or bell), the older pukku, made of wood overlaid with gold."<sup>80</sup> Once again the actual outline of the instruments cannot be deduced from this reference.

Shortly after this date, an instrument of this Northern type is seen on a stela found at Tell Horbet, dated to between 1298 and 1232BC. It is quite clearly straight-coned with a slight flare to the bell and lacks the usual clear break in outline between tube and bell yards which is seen on most Egyptian instruments. It scales at (0.91, 19.8) with the narrow mouth-support of the instrument about 12 mm diameter and, although some feature can be seen in this depiction, its exact form cannot be determined. Being longer and slimmer than the other instruments of this area, this instrument would be considerably better in terms of its playable range. It is significant that it is shown in the hand of Hosity, who according to Hickmann<sup>81</sup>, was the first named trumpeter in Egyptian history.<sup>82</sup> Perhaps this instrument represents the choice of the virtuoso with the regular military use being satisfied by the standard instrument previously in use over several centuries. The new type probably came from the North, not necessarily on the occasion referred to in DR1 but quite probably from contacts with Palestine during one of the periods when Egypt dominated the region prior to that date. Depending on the detailed form of the mouthsupport of this instrument, it would be possible for an accomplished player, as one supposes Hosity was, to sound I three or, at the most four, notes on this

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<sup>78</sup> Galpin, 1957, Sumerians, p. 22.

<sup>79</sup> Piggott, 1967, p. 96, fig. 23 and 24.

<sup>80</sup> Galpin, 1957, Sumerians, p. 24.

<sup>81</sup> Hickmann, 1961, 122.

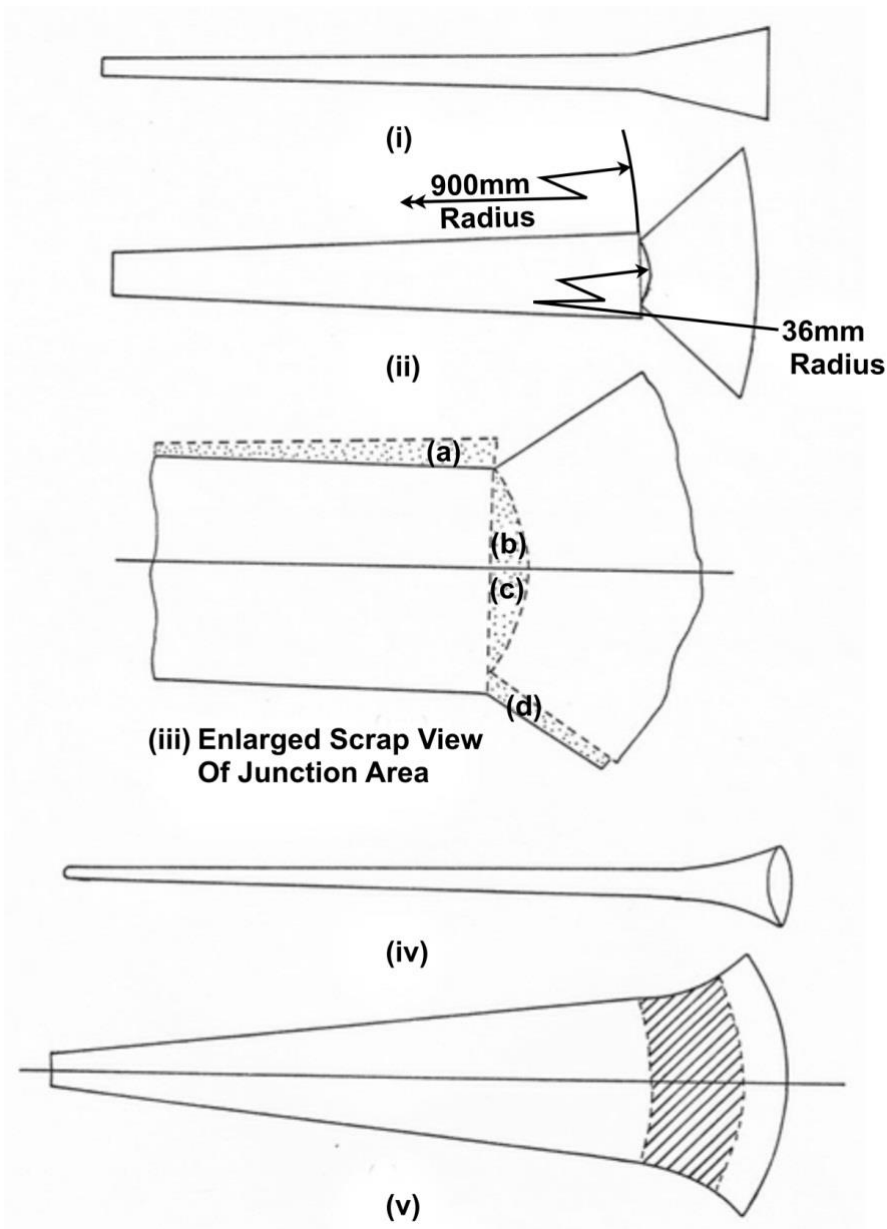
<sup>82</sup> Hickmann, 1961, pl. 2.2 (a), p. 55.

instrument, Thus, the performance on this would be markedly different from that on the simple Tutankhamen instrument of earlier times. It seems probable, therefore, that the two other trumpet players named from the 20th Dynasty, c. 110BC, Perpetschau and Amonchau would also have used instruments of this form.

### **The Trumpets of Israel**

“And the Lord spake unto Moses saying, make thee two trumpets of silver; of a whole piece shalt thou make them.” Thus Israel was told to make its trumpets or chatzozerah, for use in "the calling of the assembly..... the journeying of the camps..... (to) blow and alarm" etc. Undoubtedly, after the sojourn in Egypt, they would be of the Egyptian pattern, either to the old design or to the northern pattern. Technically speaking, the difference is considerable, as the break in outline where the old type bell meets the tube yard, is of a form difficult to produce from a single sheet of metal. Figure 2.6 (ii) shows the developed surface - shapes of sheet to produce the tube and bell yards shown in Figure 2.6 (i).





**Figure 2.6: Cutting Out Material to make a Tutankhamun-Style Trumpet**



**Plate 2.2a: Hosity the Egyptian Trumpeter**

In (ii) a gap can be seen between the two sheets where the 900mm radius of the tube surface butts up against the 36mm radius of the bell

surface. The top half of (iii) shows where the tube-yard surface development has been trimmed to blend in smoothly with the bell yard surface. In this case, the tube yard section is now deficient by the amount of 'a', and the piece between the yards is surplus by 'b'. To accommodate this, the tube would have to be stretched by about 25% during working, and the material in the area of 'b' differentially thickened. The bottom half of (ii) shows the situation where the bell yard's developed surface has been enlarged to blend in with the tube yard. In this case both pieces 'c' and 'd' are now surplus, and the metal must be thickened here to accommodate this.

From the point of view of the smith working material of this very fine gauge, both the stretching and contracting are difficult to achieve. When stretching the material the danger is of thinning excessively, thus breaking through the wall altogether. When contracting the material i.e. thickening it, the problem is one of avoiding ripples in the sheet.

In addition, Moses had his metal specified as silver which, because of its work-hardening characteristic, would require frequent annealing. Had gold, or an alloy rich in this been used, then this problem would have been far less severe and the construction feasible. Indeed, the problem of joining together the two yards is so simple compared with the task of producing the tube seam that construction would be unlikely to be undertaken in any way other than that of the Tutankhamen instruments. Figure 2.6 (v) shows the developed shape needed to produce the straight single-cone instrument with a slight flare as shown in Figure 2.6 (iv). It can be seen that only a slight stretching of the metal is required in the area where the tube form is slightly spherical (shaded in on (v)). Were the cone to be made perfectly straight, i.e. without flare, no stretching of the metal would be required.

Thus, from the point of view of technical simplicity, and the fact that Moses was told to make the instrument of a single piece of silver, it seems probable that the northern type of instrument was made. By 1240BC, at the time of the exodus, this type of trumpet had been seen in Egypt for some time (IC167, Hosity, is approx. 1298BC), and was perhaps the type sent to Amenophis IV about 1400BC. In addition it would probably be the type that the Israelites would have met during their travels prior to the instruction to Moses.

Only three illustrations of the chatzotzerah exist, two on coins, IC55, IC194, 152-155 AD<sup>83</sup> and one from the Synagogue of Dura-Europos, IC154, 250 AD.<sup>84</sup> However, these are all late instruments, over one thousand years removed from the instruments in use at the time of the exodus. Nevertheless, they all show instruments of a single-cone form, one, of the two Bar Kokba coins, IC55, appearing to show a developed mouthpiece or mouthsupport. IC154 depicts a slender instrument, which scales at 400mm (very approximately). This dimension accords well with the figure quoted by Josephus (DR149)<sup>85</sup> of one Ell (457mm)<sup>86</sup> and an instrument of this length would be capable of sounding two notes. Because of the interchangeability of the trumpet and Shofar<sup>87</sup> prior to the destruction of the Temple in AD71, these two notes would be all that the chatzotzerah was asked to perform.

Because of the carefully regulated religious use of the instrument, it seems unlikely that it developed significantly for secular purposes and that the figures of Josephus (DR149) are reliable as a basis for reconstructing this instrument. It is surprising, therefore, that all students of this subject identify the two instruments on IC8 as chatzotzerot. In that scene, showing the Roman Army carrying off trophies after the sacking of the temple, two instruments can be seen pointing into the air. These scale at (0.99; 50) and (1.02; 25), thus being about twice the length of a chatzotzerah, but quite normal for a Roman tuba of that period. That Roman tubae, such as these, should be present at such an event, is not at all surprising. They are a normal feature of scenes depicting the Roman army in action, (see below, this Chapter) and were commonly carried and blown in this way, thus being quite in place here as, indeed, are the other accoutrements of the army seen in the illustration.

Had the chatzotzerot from the temple been captured by the Romans, it is unlikely that Roman tuba players would have played them, preferring their own instruments for several reasons: Roman tubae had developed mouthpieces while there is no evidence for the presence of these on chatzotzerot: Roman instruments had developed for complex military and entertainment usage; Roman players would be unskilled in the use of this, different type, of instrument. Thus the army would tend to display the trophies and play on the instruments they

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<sup>83</sup> Sendrey, 1960, p. 64/65.

<sup>84</sup> Baines, 1976, Fig. 5f.

<sup>85</sup> Josephus

<sup>86</sup> Tarr, 1977, p. 15.

<sup>87</sup> Wulstan, 1975, p. 29.

knew, in the manner they know rather than perform poorly on alien instruments designed for an alien religious observance.

### **The Use of the Chatzotzera and Shofar**

**A**lthough the shofar itself is not discussed until later in this chapter, its use is so interconnected with that of the chatzotzerah that this is discussed here. No attempt is made to deal with this subject in more than summary form, as it has been dealt with in such detail previously.<sup>88</sup>

As early as in DR82, Numbers 10.1, when the Lord told Moses to make the trumpets, the ground rules for their use was laid down. He told that they were to be used for the calling of the assembly, to sound the alarm to use in days of gladness and at time of sacrifice. Their use was reserved for the sons of Aaron although, on secular occasions, people other than priests were allowed to blow them.

At the daily sacred service, the chatzotzerot were used to mark the progress of the ritual and the practice is mentioned by the Rabbinic scribes, "When they reached a break in the singing they (the priests) blew upon the trumpets and all the people prostrated themselves." DR180.<sup>89</sup>

As mentioned above, the chatzotzerah was used in battle but Yadin<sup>90</sup> characterises the difference between the Israeli use and those of other cultures as a very basic one "While with the others they were mainly for tactical purposes, to encourage the warriors and frighten the enemy with their terrifying sound (DR181, Caesar); their principal function in Israel was to stress the religious character of the War - "to be remembered before the Lord - and only secondarily for actual signalling." Be that as it may; the explicitness of the use of trumpets in battle is remarkable as revealed in the Scroll of the War of the Sons of Light.<sup>91</sup>

*Section 12 ~ When the battle formations are deployed over against the enemy "The one priest shall be walking along in front of all the*

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<sup>88</sup> Sendrey, 1969, p. 332 ff. Wulstan, 1973, p. 29 ff. Yadin, 1962.

<sup>89</sup> Sendrey, 1969, p. 336.

<sup>90</sup> Yadin, 1962 p. 113.

<sup>91</sup> Yadin, 1962, 292.

*men of the line, to strengthen their hands in battle. In the hands of the six other shall be the trumpets of summoning, the trumpets of remembrance, the trumpets of the fanfare, the trumpets of pursuit, and the trumpets of withdrawal. When the priests go forth into the space between the lines, there shall go forth with them seven levites carrying seven ram's horns, and three provosts from among the levites walking in front of the priests and the levites. The priests shall blow the two trumpets of sum(moning when the battle intervals shall open) to a width of fifty shields, and fifty skirmishers shall come forth from the one interval (and fifty from the other interval, and there shall go forth with them) levitical provosts. With every formation they shall go forth according to all (this disposition. The priests shall blow the trumpets and two) skirmishing (battalions shall go forth) from the intervals (and take up position) between the two lines, carrying sling and shield ..... and the priests shall blow for them upon the trumpets of the (batt(le array)s (a level note).*

#### COLUMN VIII

*The trumpets shall keep blowing to direct the sling-men until they have finished throwing seven times. Then the priests shall blow on the (trumpets of withdrawal, and they shall come to take up position by the side of the first formation to fall in at their proper position. The priests shall blow on the trumpets of summoning, and three skirmishing battalions shall go forth from the intervals and take up position between the lines, with cavalry on their flanks on the right and on the left. The priests shall blow on their trumpets a level note, signal to array for battle, and the columns shall deploy into their proper arrays, each man to his place. When they are drawn up in three arrays, each man to his place. When they are drawn up in three arrays, the priests shall blow for them a second fanfare, a low legato note, signals for advance, until they approach the enemy line and stretch their hands to their weapons; then the priests shall blow on the six trumpets of assault a high-pitched intermittent note to direct the fighting, and the*

*levites and all the band of the horn-blowers shall blow in unison a great battle fanfare to melt the heart of the enemy. At the sound of the fanfare, the battle darts shall go forth to fell the slain. The sound of the horns shall cease. While on the trumpets the priests shall keep on blowing a high-pitched intermittent note so as to direct, signals for fighting, until the skirmishers have hurled into the line of the enemy seven times. Then the priests shall blow for them the trumpets of withdrawal, a low note alternately level and legato. According to this disposition shall the priests blow for the three battalions. When the first battalion throws, (the priests and the levites and the whole band of horn-blowers) shall blow a great fanfare to direct the fighting (until they have thrown seven times. Then there shall blow) for them the priests on the trumpets (of withdrawal a low note alternately level and legato, and they shall come and take up position) at their proper place in the formation, (and the priests shall blow the trumpets of summoning, and two skirmishing battalions shall go forth from the interval)s and shall take up position (between the two lines within throwing range. The six priests shall blow a fanfare on the trumpets of) assault, (and the levites and the whole band of horn-blowers shall blow a battle fanfare very loudly. And as the sound goes forth,)"*

From this document, the number, length and tone of all the calls can be handed on and the troops, and trumpeters, may learn to co-ordinate the progress of the battle. It does, indeed outline the crucial part played by the priests but is explicit in its definition of all the calls in a purely military sense.

Modern religious observance in Judaism uses the shofar where perhaps once the chatzotzerah was used. The calls used today are traditional and were handed down, possibly from antiquity. These quoted in Figure 5.7<sup>92</sup> may, therefore, give some idea of what ancient calls were sounded.



**Figure 2.7: Shofar Calls**

<sup>92</sup> Sendrey, 1969, eg. 12.

## Later Instrumental Usage in the Middle East

The view of instrumental usage in any area is built up from the evidence available at present. Thus, in the 1000 year period before the Christian era in the Middle East, the very sparse evidence remaining could lead one to suppose that little development and use of instruments took place. However, the Scroll of the war of the Sons of Light, as quoted above, tells of the large numbers of shofarot and hazozerot used in battle and, as far as is known, not one instrument survived to this day. E. v. Nischer, cited in Yadin<sup>93</sup> estimates, from inscriptions of the time of Caracalla that each legion had 37 trumpet-blowers and 35 horn blowers. From the ones remaining today, one could make at most a couple of cohorts!<sup>94</sup>

It is only possible to guess, therefore, at the level of activity which took place at that time, while two references give an indication of its nature. IC38 (beginning of 1st millennium BC), an illustration on the wall surrounding the Hittite Royal castle at Ujuk, depicts a short trumpet, probably c. 300 mm long, with some bell-like feature at its end. The player is blowing this while holding it in both hands,<sup>95</sup> in some ways reminiscent of the Egyptian iconography. This evidence tells, at the least, that the trumpet was being used in this area, and that some form of bell termination had been devised, possibly indigenously.

One later illustration from Palestine, IC140, depicts a player blowing an instrument which scales at 1.06m long. This painting is from a tomb at Marisa, and dates from the second century BC. The instrument appears to have a fairly gentle taper along its length, and opens out at the bell end with a slight flare to a diameter of about 120mm. It is being blown by what appears to be an attendant on a hunting trip, who is walking along behind a mounted hunter holding a long spear.

This instrument is very long for this area, but it is exceeded in length by an instrument now at Boston (SD262) This latter instrument has generally been recorded as a Greek salpinx but, being of the same form as IC140, and having an overall length of 1.57m, it is clearly not of

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<sup>93</sup> Yadin, 1962, p. 115.

<sup>94</sup> Even that is an over-estimation.

<sup>95</sup> Kinsky 1929, P.4.

salpinx form.<sup>96</sup> According to Caskey<sup>97</sup>, it has a tube yard made up of thirteen ivory sections and a 129mm bronze bell. These ivory parts appear to be turned<sup>98</sup> are designed to fit one in the other and are strengthened with bronze ferrules. At the tip end a mouthsupport is provided which has a rim of larger diameter than the tube but no throat. With the instrument was purchased a chain said to have been found with it, and on the bronze bell were remnants of what was an applied bronze strip. According to the museum, this instrument was found in an "unknown Greek context" and is normally referred to as a "Greek trumpet" or a "salpinx." However, no references to the presence of an instrument of this type have been found other than IC140. It seems likely, therefore that this instrument came from Asia Minor or the Middle East rather than from the area of what is now modern Greece. Caskey<sup>99</sup> states that the instrument has "a severe beauty which makes one wish to assign it to the second half of the fifth century BC rather than to a later period." Be that as it may, there seems to be absolutely no reason for the assumption of such an early date. Admittedly, the evidence for a later date is itself tenuous but, both the lack of iconography of this type in 5th century BC Greece, and the presence of references to the type in the East, point to an eastern origin. If the Greeks did, as they constantly state in their literature, derive their instruments from the Etruscans, they would probably have obtained no instruments such as these. However, the Greek adventure to the east at the end of the 3rd century BC would take them into what appears to have been fertile country as far as musical instruments were concerned and, no doubt, introduce them to instruments such as SD262 and IC140.

Of greater significance perhaps, is the representation of a tuba player on an Anatolian bronze from Mylasa, Caria, c. 800BC (SR15). On this, a figure is blowing a single-cone type instrument of about 700 mm, length which he holds in his left hand. Coming from the very West of Anatolia, this instrument indicates that tubae of a fairly advanced form had either spread West as far as this, or had evolved here at a period when Greek colonies were becoming established on the Anatolian coast.

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<sup>96</sup> It is now clear that the term 'salpinx' was applied by the Greeks both to the cup-belled form and the conical instrument or tuba.

<sup>97</sup> Caskey, 1937, p. 525.

<sup>98</sup> Caskey, 1937, fig. 3 and 5.

<sup>99</sup> Caskey, 1937, p. 527.



Although this tuba (SR15) was present at Mylasa, and was contemporaneous with the Greek presence, it was quite clearly indigenous to the region and not an import from Greece as suggested both by the form of this statue and the fact that the Greeks subsequently adopted the salpinx rather than the tuba.

### **The Etruscan and Eastern Italian Tuba**

**W**ith the adoption and development of the tuba, among other instruments, the Etruscans evolved the form that was to remain essentially unchanged for a thousand years or so. The secret of this success may well have been in the adoption of the throat constriction at the mouthpiece end of the instrument. It is not possible to say whether or not the Etruscans developed this feature as it had been in use on the lurs in Scandinavia for some time before the date of the earliest known Etruscan instruments.<sup>100</sup> Similarly in the Middle East, particularly in Israel when producing a shofar, the solid horn tip had to be broken through as part of the process of forming a mouthpiece and, here, the diameter of the drill would determine the diameter of the throat produced. This matter is discussed in more detail in Chapter 3.

The tuba begins to appear on Etruscan carvings in the 5th century BC where it is seen in use as a signalling instrument in battle (IC131, 132, 136) and scales at about 700mm long. Shortly after this, it begins to appear in social contexts, such as on IC72, a painting of a player standing with a group of other people blowing a tuba that scales at 890mm long with a bell diameter of 110mm. Significantly however, the tuba begins to appear in use with other instruments in the 5th century BC. On a stele from Vele Cecina, three tuba players take part in a solemn procession along with a lituus player and several others (IC99). This scene is mirrored many times in later Etruscan and Roman funeral and other processions.

From shortly after this reference comes IC76, an illustration on a vase from the Western coast of Italy.<sup>101</sup> Unfortunately, Behn, in whose book this is illustrated, provides little other information about the

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<sup>100</sup> My recent research has shown that the Etruscans did, in fact, use a mouthpiece with a developed throat.

<sup>101</sup> Behn, 1954, Abb. 153 and p. 118.

provenance of this. On this illustration, two players, whose dress and style of portrayal clearly display strong Greek influence, blow a slightly curved tuba and a strongly curved animal horn type of instrument.<sup>102</sup> Interestingly, on this illustration, the animal horn blower is clearly puffing out his cheeks while the tuba player seems to be adopting what looks much like a modern embouchure.

## The Roman Tuba

**A**lthough musical instruments appear on Roman reliefs from about the 5th century BC, no tubae are illustrated until about the 1st century BC. The earliest of these is of a single tuba player on a relief in a temple to Apollo (IC127) in a scene from a triumphal procession. His instrument scales at 0.9m and appears to taper slowly along its length with a slight flare at the bell, thus being very similar to the Etruscan instrument. On two slightly later representations, IC118 (c. 50BC) and IC124 (8 or 9BC), both of which are in poor condition, players can be seen taking part in processions only in pairs.

However, by about 75AD, the Romans developed the tuba into a variety of different forms. The iconographic material is insufficient to allow dates to be given for these developments and many may have been derived from the Etruscan or Greeks. In fact, the two basic types of tuba in use, from this period on, reflect instruments in use with these two cultures and are illustrated together on IC8 on the Arch of Titus. One's form is very reminiscent of the Etruscan tuba, having a (scaled) length of 900 mm and a bell diameter of 78mm. (cf. IC72. 890/110). The other instrument has a similar length (scaled 925mm) and a much gentler taper which leads into a cup-shaped bell similar to, but somewhat smaller than the Greek salpinx. This form appears to develop later into the parallel form of instrument well represented in later iconography.

## The Single-Cone Tuba

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<sup>102</sup> Behn, 1954, Fig. 3.3, p. 82.

From this period onwards, the tuba increases in length with a general decrease in conicity. On IC121 (c. 74AD), a tuba player is depicted blowing his instrument downwards, this being one of the few illustrations where the instrument is not pointed into the air in the heroic manner. This instrument still appears to be quite conical, although the bell end is no longer clearly visible and has a scaled length of 1.31m. Another illustration, IC119, (C. 50AD) contains tubae and shows them used for the first time in a group of three instruments, a pattern of usage that subsequently became a common Roman one. In addition, this relief shows detail of the instrument mouthpiece for the first time and appears to depict features that push onto the tip end of the instrument having a taper in the opposite direction to the tube. On the relief too, the players are depicted using a modern looking embouchure.

This contrasts with IC41 (c. 50AD) where one of the two tuba players taking part in a performance at the gladiatorial contest is blowing and clearly puffing out his cheeks. On this illustration, the tip end of the instrument has a large bulge where one would expect the mouthpiece to be. This is clearly some form of mouthpiece and may well be one made of bone and wedged onto the end of the tube as in DR182, Pollux states that the mouthpieces of tubae are made of bone.

One feature appearing for the first time on this illustration is the cord that runs between a mount on the bell to somewhere near the tip. The instrument is held in the player's right hand only and the cord is pulled down towards the right of the instrument and held between the thumb and fore-finger. (See pl.2.2b). It appears, therefore, that this cord serves no purpose during the playing of the instrument and is probably provided for slinging the instrument over the shoulder in order to transport it safely.



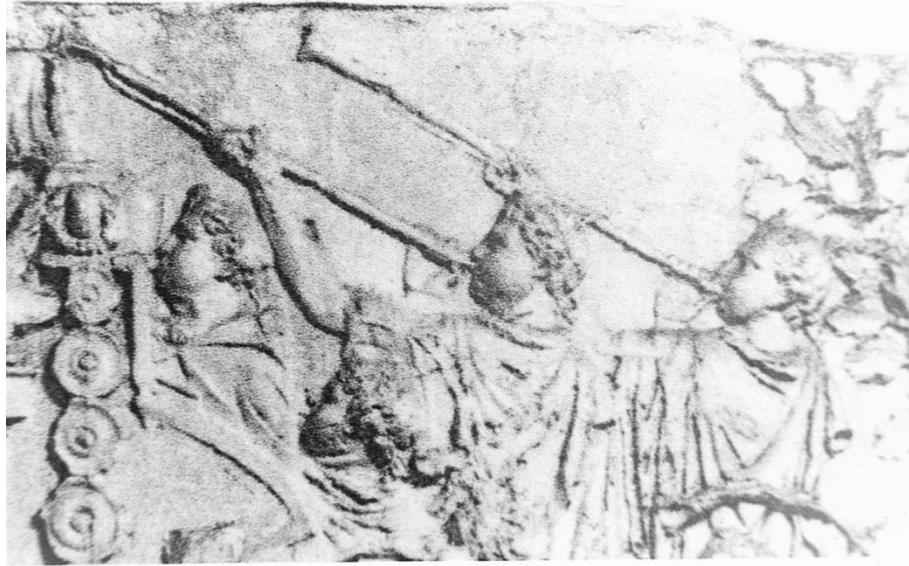
***Plate 2.2b: Supporting a Tuba***

This feature also appears on IC19 (c. 350AD) where the mounts can be seen which support this cord and here the player again grips the instrument in his right hand but, on this occasion, leaves the cord free. This contrasts with the use of a cord on IC108 (Plate 2.3a, 110AD) where three players appear to be gripping this cord with the left hand as a means of support. Behn<sup>103</sup> shows a reconstruction of a tuba on which the player grips a loop attached to a point near the bell tip. In his text<sup>104</sup> Behn concludes that the loop was to help press the mouthpiece against the lips and to enable the player to support the instrument without gripping the tube. This feature he considers to be of importance in avoiding the hand becoming moist from sweat, leading to corrosion of the tube and an unpleasant grip. His view does appear tenable as an interpretation of IC108 although not of the other references cited here. It seems much more likely in these cases that the cord was a simple carrying device.

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<sup>103</sup> Behn, 1954, Abb. 174.

<sup>104</sup> Behn, 1954, op. cit. p. 156.



***Plate 2.3a: Tubae on Trajan's Column***

### **The Cylindrically-Tubed Tuba**

**A**lso appearing about this time was a form of tuba with a cylindrical or very-slightly conical bore with a cup-like bell portion very similar to the Greek salpinx. It is first illustrated on IC12, where it is in use during a gladiatorial battle. This instrument scales at 1.26m long and appears to have a cylindrical bore (depiction is on a mosaic) with a cup shaped bell which opens out rapidly to about 110mm over about 40mm length. The cornua depicted in this scene also have this type of bell. (see plate 2.3b, below) Shortly after this illustration comes one from Trajan's column where three players can be seen blowing similar instruments. On these the very shallow and wide cup of the bell can be seen clearly and on these instruments is in the form of a lightly curved cone. (Scaling difficult on this reference).



***Plate 2.3b: The Zliten Mosaic with Tuba and two Cornua***

## Later Developments of the Roman Tuba

From the pattern set in the first century AD, the tuba was little changed during the rest of the Roman period. In the case of the single-cone type of instrument, the major development seems to lie in the acquisition of a slight flare or perhaps cup-shaped bell termination as seen on IC144<sup>105</sup> This is confirmed on SD220, a tuba found in the Temple of Mars at Klein-Winternheim which, in view of the material with which it was associated is considered by Behn<sup>106</sup> be a votive offering. It is made of sheet iron 2-3mm thick and is 1.37m long with a bell opening of 105mm. In its present state it weighs 6.5kg and even though not complete would be rather heavy for a musical instrument. However, IC121 shows an instrument of 1.31m (scaled) length which is being played pointing downwards and there seems no reason why this could not have been used in the same way, prior to deposition.

The only other extant instrument is SD265, a tuba found at Zsambek and now in the Nemzeti Museum in Budapest. According to details supplied by this museum, its length is 1.56m, the bell diameter being 95mm. This lacked a mouthpiece when found and what remained was made entirely of sheet bronze. (See plate 2.4a) The seam of the instrument was made by cutting vee-shaped notches out of one edge of the sheet and slotting these into the other edge. Thus, a technique similar to that used on the Tutankhamen instruments was still in use when this instrument was made and is, of course, the technique still used today. No information has been forthcoming on the presence of solder or braze on this seam.



**Plate 2.4a: The Zsambek Tuba Bell**

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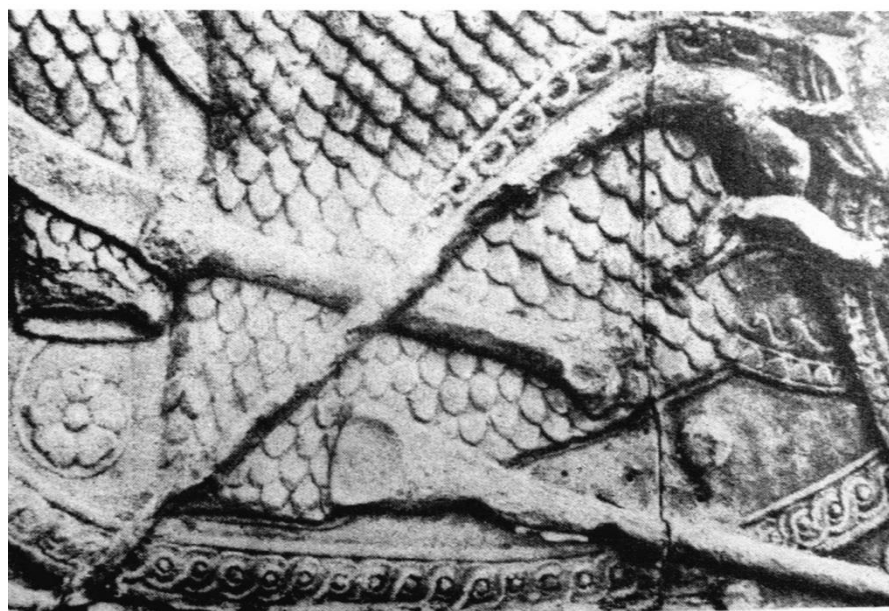
<sup>105</sup> Behn, 1954 Abb. 172 and p. 136.

<sup>106</sup> Behn, 1912, p. 56.

The other type of tuba developed into an instrument having an apparently-cylindrical bore with a cup-type bell termination, thus reverting to the archaic form originally developed by the Greeks. On IC18 (c. 350AD), this parallel section is clearly visible, terminating in a wedge shaped mouthpiece. Of a similar date (350AD) is the latest representation of the single-cone type of instrument, IC19 from Kaiseraugst, showing that both types survived together and were used to a late date.

### **THE CELTIC Tuba<sup>107</sup>**

**T**he Celtic use of a tuba is attested by the very sparse but nevertheless very firm evidence of two extant instruments (SD205/6,) and three datable iconographic references. (IC78, 88 and 201). Earliest of this iconographic material is that from Trajan's Column (IC88 and 201) and datable to before 110AD. On this is shown the bell of a Celtic tuba which is of a gently flaring form<sup>108</sup> and in a further scene on the base of the column, a cylindrically-bored tuba, with a well-developed mouthpiece.<sup>109</sup>



***Plate 2.4b: A Celtic Tuba along with a Carnyx***

The other reference (IC78) shows Caracalla (211-217AD) subjugating the lands of the Rhein (see pl.2.5). Thus, by this time the Celtic tuba had had a recorded history of over a century and from its appearance

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<sup>107</sup> I would now refer to this as a Native Iron-Age Tuba

<sup>108</sup> Behn, 1954, Abb. 187, see plate 2.4.

<sup>109</sup> Lehmann—Hartleben, 1926, Abb. 1.

among the trophies on this battle standard is clearly a local Celtic instrument.



***Plate 2.5a: A Celtic Tuba among Trophies***

Much more Celtic in appearance, however, are the two tubae found in the Loriet region of France. (SD205/6). These lack the functional simplicity of the Roman instruments, and are elaborately decorated both on the sheet metal and cast parts. The instrument from Neuvyen-Sullias (SD205) has a total length of 1.44m and a tube diameter varying from 10 to 58mm (Plate 2.5b). Its mouthpiece is of a simple conical form, with a cone-shaped cup passing into a 2 mm throat. Immediately below this mouthpiece is an elaborate cast (?) boss into which the mouthpiece fits. Made principally from sheet, the individual yards appear to be joined either by sheet-metal or cast ferrules. One of these joints seems to have been formed from a cast-on boss. On the Saumur instrument, the mouthpiece/mouthpipe boss is a large diameter feature with a disc-like front face into which the mouthpiece fits. Undoubtedly, these bosses perform an aesthetic function but their presence is more likely to result from the functional needs of the design.





***Plate 2.5b: The Neuvy-en-Sullias Tuba***

From the illustration of Mantellier<sup>110</sup>, the Neuvy instrument appears to have a mouthpiece with a shank tapered as on modern instruments. Thus, it presses into the tip end of the tuba, effecting a seal. However, while providing a suitably tightly fitting seal, this type of joint is very prone to jamming. This problem is well known with modern instruments, where much of the time of a teacher can be spent removing the jammed-in mouthpieces of their students' instruments. The mouthpipe of a modern trumpet, however, can withstand the jamming-in of a mouthpiece as its rim is normally reinforced by a ring made up of drawn tube and, hence, quite strong. Where tube is produced from seamed strip, however, this seam represents a weakness; the seam is likely to fail if strained by the powerful wedge-action of a gentle taper. Hence, the use of a mouthpiece with a tapered shank would require the provision of reinforcing rim around the end of the mouthpipe and this is, most probably, the reason for the features seen around the mouthpipes of the two Celtic tubae.

Overall, the instruments have the form of a cylindrical or gently tapering tube with a slightly-flared bell at the extreme bell-end. SD205 is said to have a telescopic body<sup>111</sup> although no confirmation can be found of this. Reinach<sup>112</sup> dates it as La Tène, mainly on its decoration, and it is said by Mantellier<sup>113</sup> to date from the end of the 4th century BC. The associated finds are objects from a temple which was sacked at that time, and seems to have been a centre for a college of priests.

<sup>110</sup> Mantellier, 1865, pl. XIII

<sup>111</sup> Bragard, 1968.

<sup>112</sup> Reinach, 1899.

<sup>113</sup> Mantellier, 1865, 227.

Its use, therefore, would be in the ritual of the temple which would account for the elaborate decoration seen on both instruments.

As a musical instrument, it would probably be equally effective, with sufficient conicity to bring its formants into harmonic<sup>114</sup> relationship. Thus with the constricted throat of the mouthpiece an experienced player should be able to sound six or seven notes on this instrument. Also, if the illustration in Mantellier is correct, these notes should be playable with considerable agility as a result of the sharp edge between the mouthpiece cup and back-bore. If the dating is correct, then a direct relationship with the Roman tuba can be ruled out, although a common origin in the Etruscan instrument seems quite likely. Alternatively, with its elaborate and effective mouthpiece suggesting northern influence, it could have been developed from instruments seen in Northern Germany at the northern edge of Celtic cultural area during both La Tène and earlier Hallstatt times.

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<sup>114</sup> To a western ear!