Pictographic History of the Natural Trumpet

by

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Abstract: This paper is a brief pictographic history of the natural trumpet in Europe. This subject is an adjunct to the previously published theory that the European Folk Music Scale was created on shepherds' trumpets (a synopsis on: http://ethnomusicologyreview.ucla.edu/content/origin-european-folk-music-scale-new-theory and complete version: http://www.academia.edu/2627765/The_European_Folk_Music_Scale_A_New_Theory). My investigation into this topic has led me to question the assumption that metal natural trumpets (with the appearance of Baroque trumpets) have a unique development; previously, it has been assumed that metal trumpets were not imitations of shepherds' trumpets but have a separate military or religious provenance. Additionally, the assumption that the history of trumpet playing at aristocratic courts springs from the military encampment and not the pasture seems doubtful. This paper displays a series of photographs taken from the internet that, at-a-glance, parallels my scholarly, written investigations. The material is easily available and accessible online; therefore, only general references are provided in the Bibliography.

Introduction

My research over that last ten years has led me away from what one considers traditional European musical thought. It has placed me in different societies/cultures and given me what my colleagues consider a foreign, odd manner of thinking. When I now look at European folk music, I see something most people don't recognise. The conclusion that I have reached is that folk music is not, in fact, general folk music; rather, it is specifically pastoral music. It is the music created by a pastoral society that is alien to our modern one where land, agriculture, and animal husbandry are treated as an industrial-complex. The world of the shepherd is not the world of the music researcher. The typical shepherd once had needs and concerns wholly different from those of the average modern-day technology-savvy urbanite. Therefore, developing arguments and reaching conclusions seem fruitless unless one understands the material world of the average shepherd, a world that shows remarkable consistency and exhibits a massive and momentous resistance to change.

Shepherds needed to gather their domestic animals to travel to/from the pasture in the morning and evening, call to other shepherds, and frighten away dangerous wild animals. Every shepherd had a tool to do this. If you look at marginalized societies where there are still shepherds working in relative isolation in the Carpathians (Russia/Ukraine), Poland, the Balkans, Sweden, and Norway, etc., you will see them carrying this tool. It was made by taking a tree trunk or branch, splitting it, hollowing it out, putting the two halves back together at the edges with sap in between, and securing the halves with birch-bark or wooden osier (willow) rings steamed/boiled to make pliable. In short, the instrument was a wooden, valve-less, hole-less trumpet or simply a wooden shepherd's trumpet.[1] These shepherds' trumpets seem to fall into two functional groups. One group consists of long 6 to 12 foot-long (2-3 metre) trumpets made

[1] Sachs defines the difference between a trumpet and a horn as that a trumpet in 1/3 conical and 2/3 cylindrical while a horn is 2/3 conical and 1/3 cylindrical. This definition came about from the analysis of metal instruments mainly from the 17-18th centuries. Since the words for a wooden shepherd's trumpet are variously: *trombetta*/*trembita*/*trambita*, *trumpa*, etc. I would tend to believe that the name "tromba" ("trumpet") is the name originally given to this conical-bored shepherd's instrument. Sachs's definition is therefore pertinent to how instrument makers adapted the common/pastoral form into a method of metal-work manufacture, not to the form of a shepherd's trumpet whence the word originated. Therefore, Sach's definitions are incorrect. Modern B♭ valved trumpets are now conical except when there is a need of a tuning slide. See the work of Benade/Schilke.

long so as to facilitate playing the upper notes in the harmonic series; they are constructed from either the trunk or the limb of a tree. The other group consists of instruments much shorter and seems to be made to play the lower notes of the harmonic series, perhaps for a droning effect; they seem to possess a slightly sloping curve which resembles an ox horn. This latter group has a rather marked flare to the instrument (roughly swelling to 8" over its 2-4' length). Both groups share various names such as *trembita* (*трембіта*), *trombita*, *trambita*, *trâmbiţa*, *näverlur/neverlur* (birch bark trumpet in Swedish or Norwegian respectively), *raklur* (straight lur), *langlur* (long lur), *touhitorvi* (Finland), *alphorn*, *vallehorn*, *midwinterhoorn*, *trimitis*, *taures*, *karjapasun*, *torvi*, and the Slavic *trambica*; in Bucovina they are known as the *trâmbiţă*; in Oaş and Maramureş they are known as the *trâmbiţă* or *trânghită*. In the Apuseni Mountains, shepherds' trumpets called *tulnic*, and are often played by women. This point exemplifies the extreme proliferation of shepherds' trumpets. That both men and women used them and their use was not gender-specific demonstrates how this musical tool was basic and common.

These trumpets played the notes of the harmonic or overtone series. I prefer the expression "natural scale." English folk tunes brought over to the Americas, Scottish and Irish folk tunes, some Norwegian Swedish, Finnish, Estonian, Russian, etc. folk tunes can all be played on the long 6-10' long shepherds' trumpets. A fuller discussion of this was done here:

http://www.academia.edu/2627765/The_European_Folk_Music_Scale_A_New_Theory

Pictures of Shepherds' Trumpets Made from Tree Trunks

Shepherds' trumpet may all appear as though they are in a vast array of shapes, but actually can be roughly divided into three groups (there are two functional groups: one for lower partials for droning and bugle-like calls and the other for playing in the upper range of the natural scale). They are shaped from the trunks of saplings, tree branches, or to resemble an animal's horn. The first group can further be divided into a straight bell subset and a curved bell subset. With the curved bell subset, the bell area is shaped from trees growing on the side of a hill/mountain to create a large up-turned cup at the end.

The internet has many deleterious characteristics, but one positive one is that it has the ability to link formerly separated communities through the display of visual and audio examples of remote and marginalized societies. The necessity of shepherds to play wooden trumpets to collect their flocks, send an alarm, and to communicate to other communities that are geographically separated still exists in many Eastern European communities.

Therefore, imagine three possibilities when observing the images below: trumpets made to resemble an animal's horn, made from a straight sapling truck, or made from a curved branch. Additionally, look at the manner with which they are held (either rested on the ground or held with the bell high).

Here is the first example (Figure 1, below):

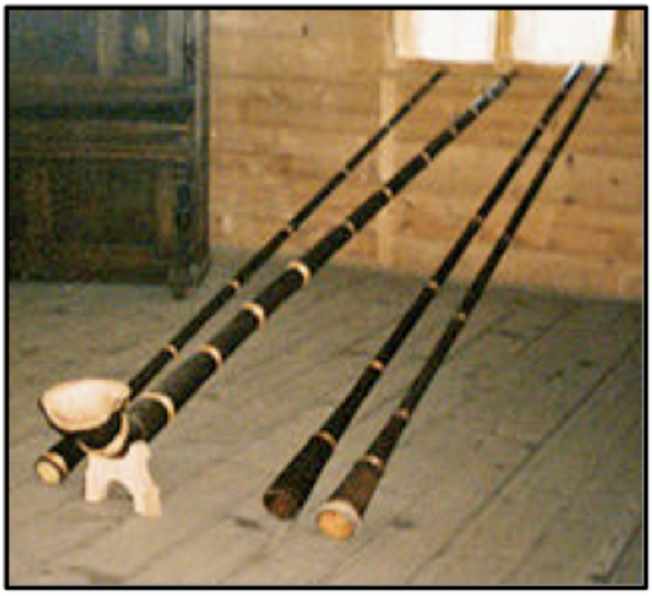

Figure 1: Four Polish Shepherds' Trumpets

The above figure is interesting for a number of reasons. Firstly, the osier rings are clearly present and run the length of the instrument. Secondly, note that one of the trumpets curves up at the end. This feature is often due to the branch curving up sharply from the trunk, or a small tree growing on a steep bank.

Here is an example of a Ukrainian *trembita* (Figure 2, below):

Figure 2: A Famous Ukrainian Folk Musician

Notice how this instrument is both thin and straight. This normally occurs when the instrument is made from the trunk of a tree that is grown in close proximity to other trees. It therefore struggles to get as

much sunlight as possible which limits the energy that the tree directs to lower branches. All the energy is directed toward lifting the tree above its surrounding competition; this makes the trunk rather straight.

Here is another example of a thin, straight shepherd's trumpet (Figure 3, below):

Figure 3: Romanian Shepherd with a Trâmbiţă/Trambita

Here is another example (Figure 4, below):

Figure 4: Shepherds in the Field/Woods

Here is an example of a trumpet, a Scandinavian *lur* in this case, wrapped in birch bark (Figure 5, below).

Figure 5: A Typical Lur made by Magnar Storbekken, Photo: Hans Bøvre

The typical *lur* today is made from laminated or planed sawn lumber which is then hollowed out and joined together. They are seldom made from a branch or trunk where the diameter is near that of the finished instrument. Osiers are not used here, but the instrument is wrapped with wet, warm birch bark which is then allowed to dry. It shrinks slightly when doing so, securing the two split halves together.

Here is an example of a trumpet made from the trunk of a tree as it grows on the side of a hill. It either starts in a group of stems and struggles to survive by growing out and then up, or it is a single trunk which is rooted in the side of a hill and then grows straight upward after an initial bend (see Figure 6, below):

Figure 6: Bucium Player in Gârcina, Neamţ County, Moldavia, 2003

Here is an example where the end of the trumpet is turned upward, but is carved with finesse (see below, Figure 7):

Figure 7: A Romanian Shepherd and his Trumpet, 1938 (Photograph: Kurt Hielscher)

Photographs similar to the ones above are lavishly displayed on the internet. One need just look for them. For example, a recent interview of a *trombita* maker and player is displayed online for an episode entitled "Predchodcovia telefónov? Trombity" on the show "Nehaňte ľud môj." The video shows how players call to one another, how the instrument is made, how popular tunes were made on the instrument, and how players play together in a group.

Here is an example of a photograph from that interview (Figure 8):

Figure 8: Trombita Players. Photograph: Martin Kleibl

Notice how similar these images (Figure 6, Figure 7, and Figure 8, above) are to the typical Swiss alphorn (Figure 9, below). It seems that the shepherds choose to have a curved bell when they know that the instrument will be long, and they intend to rest it on the ground.

Figure 9: Alphorn player in Nendaz, Wallis, Switzerland. Photo by Hans Hillewaert

Notice the osier ring at the base (bell) in the image above.

Here are some pictures of an *alphorn* maker splitting the end section (see Figure 10 and Figure 11, below):

Figure 10: An Alphorn Maker in Switzerland Preparing to Split the End Section

This documentary of the construction of alphorns can be seen here:

http://www.youtube.com/watch?v=UTyC7DfWeSo. The result of the splitting can be seen below in Figure 11:

Figure 11: The Split Alphorn End Section

Pictures of Shepherds' Trumpets Made from Branches

Often shepherds' trumpets are made from the branches of a tree rather than the trunk. This results in the wood being rather curved. It also helps to create a bell section that is flared (over an 8' span, branches seem to flare more than trunks). The flaring of the bell helps to increase the impedance from inside to outside the instrument which both solidifies the individual pitches of the natural scale and also increases the volume of the instrument. It is little known that the purpose of the bell is not to project sound but to reflect it so as to create a firmer standing wave.

The long trumpets made from branches often have a sinuous appearance. They generally grow away from the trunk at a shallow incline upward toward the light, but they also may curve again outward. In this form, they may somewhat resemble the letter < S >.

Here is an example of a trumpet probably made from a branch (Figure 12, below):

Figure 12: Polish long Trombita

In the latter form, they are made short, perhaps to resemble an animal (cow, sheep, goat) horn. In this shape, the bell is flared and the instrument is easy to carry. The short length does limit the number of playable notes of the natural scale. Here is an example of the short form (Figure 13, below):

Figure 13: Polish Trombita

This shorter, gently curving form is often portrayed in iconography (see Figure 14, below):

Figure 14: A Mural a Monastery in Gura Humorului, Moldavia (Romania) Showing an Angel Playing a Bucium

With an understanding of how shepherds' trumpets are shaped and their approximate length (greater than 6' for melodic playing by perhaps senior shepherds, under 4' for rough signals played by perhaps youthful shepherds), integration with modern, urban forms of trumpets can be perhaps better understood.

Transformation from Wood to Metal

If the above representations of shepherds' trumpets are the basis for the shape of our modern valved trumpets, we should be able to see how a wooden trumpet may have been adapted slowly to the metal form.

Firstly, it seems appropriate to view the oldest depictions available of shepherds' trumpets in Europe. There are innumerable examples, here are but a few. This first example is from a tapestry (Figure 15, below):

Figure 15: Detail of "La Somme Le Roy" Between 1290-1300. The British Library, London

In this example, the instruments are apparently made of wood since there are a number of osier rings on each instrument. Also note that the trumpet bells are lifted high. The tapestry appears to be a depiction of the Moses and the Commandments where the top two panels (not shown here) depict Moses receives the commandments from God and breaking them. The lower two (shown here) display three men blowing trumpets and the golden calf under an elaborate architectural canopy. Notice how the golden calf is paying close attention; why? If Moses was announcing the Ten Commandments, then that would imply royalty and metal trumpets. Yet the golden cow is looking at them as a dairy cow might to a shepherd. It could be that in the time when the tapestry was made, there was a closer connection between royalty and the pastoral community. This is true in Irish Gaelic society in the Middle Ages where both the 12th-century *Book of Leinster* and the late 14th-century *Yellow Book of Lecan* describe the musicians in the mythical Hall of Tara. In it, musicians are described at a feast where they are seated amongst other members of the court including druids, wrights, hunters, poets, etc. according to rank. Our modern way of thinking sharply divides nobility and peasantry perhaps due to the Norman invasion and subsequent subjugation of the English. That delineation may not have been the norm in other courts, particularly lower ranking/petty courts, in Europe.

In any event, the above figure is interesting because it depicts (apparently) wooden trumpets being used to herald (a mark of royalty) the entrance of God' commandments (religious).

Here is a detail of another example (Figure 16):

Figure 16: Detail of a 13th Century Book of Songs (Lessing Photo Archive)

This is interesting since the trumpet players are women (hair coverings, perhaps dresses). It is quite common to see women playing shepherds' trumpets even today. In those images, it seems as though women play their instruments together, that is, not in mixed company.

Here are some trumpets clearly in a heralding situation (Figure 17, below). It might be possible to see a few of the bosses, but this picture was included to show that straight trumpets were in use at least until the beginning of the 16th century:

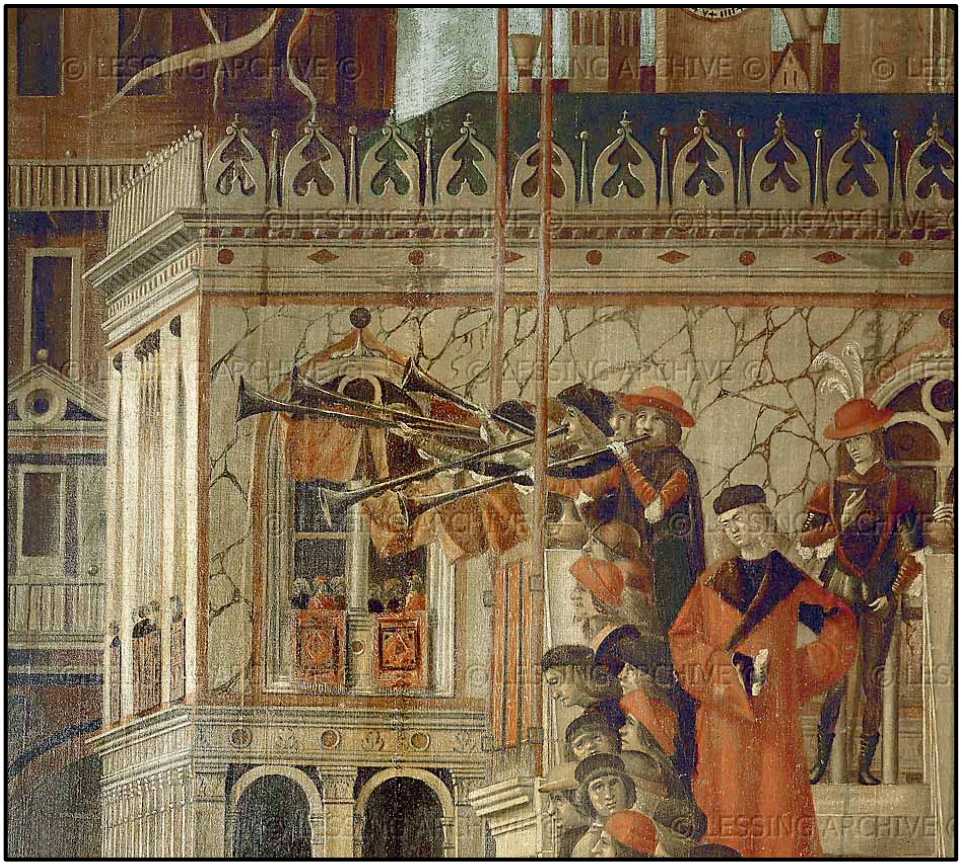

Figure 17: The meeting of Ursula and her fiancé Ereo, 1494

Therefore, the shape of both the metal and wooden trumpets shown above seem to be the same. The difference apparently is that wooden trumpets need osier rings along most of the instrument's length; metal trumpets don't seem to require this as much. It therefore seems reasonable to assume that the metal trumpet was a replica of the wooden one.

So, if you look at trumpets before metal smiths knew how to bend metal effectively and thereby allow the instrument to be more compact and manageable, you will see that they were made to exactly resemble wooden trumpets held together with osier rings. Here is the 13th century brass Billingsgate trumpet which can clearly be seen to be made to resemble an instrument as depicted in Figure 17, above (see Figure 18, below):

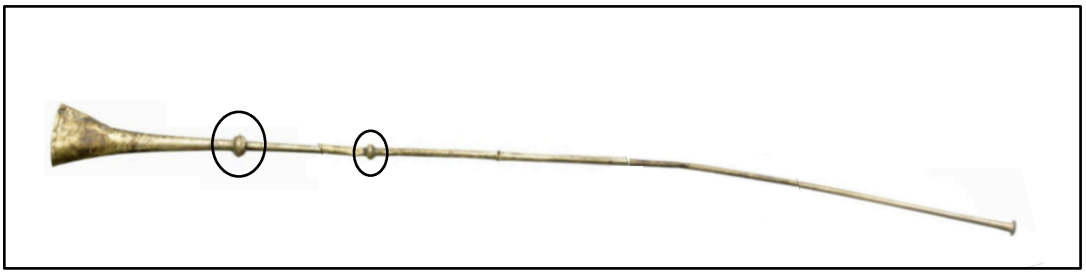

Figure 18: Pictorial representation of the Billingsgate Trumpet c.1300

In the figure above (which I put together from pictures as displayed, individually, from the British Museum, London), I have circled two elements of the Billingsgate trumpet, termed bosses. For metal trumpets, bosses are purely decorative and serve no apparent purpose. They are simply small cups soldered together and cut to fit on the bell section. It seems likely that they were added to resemble the wooden osiers used in wooden trumpet construction. There are certainly many examples of this in iconography, but relying upon images can be problematic.

In the hands of a skilled trumpeter, these shorter (by Baroque-era standards, where trumpets were generaly pitched in E♭ or D) 5-6' instruments were quite capable of playing melodic lines. Below is an example provided by the co-author Reidar Sevåg from "Det gjallar og det laet" (Oslo, 1973). This is his transcription of a tune as played on a *lur*[2] but adapted to match the way that the natural scale is normally displayed to be read by trumpeters, with the exception of depicting the 7th partial as A_4 instead of $B♭_4$.

[2] Huldt-Nystrøm, Hampus and Sevåg, Reidar, "Norway," in *The New Grove Dictionary of Music and Musicians*, ed. Stanley. Ed. Sadie (London: MacMillan Press Limited, 1980), 324.

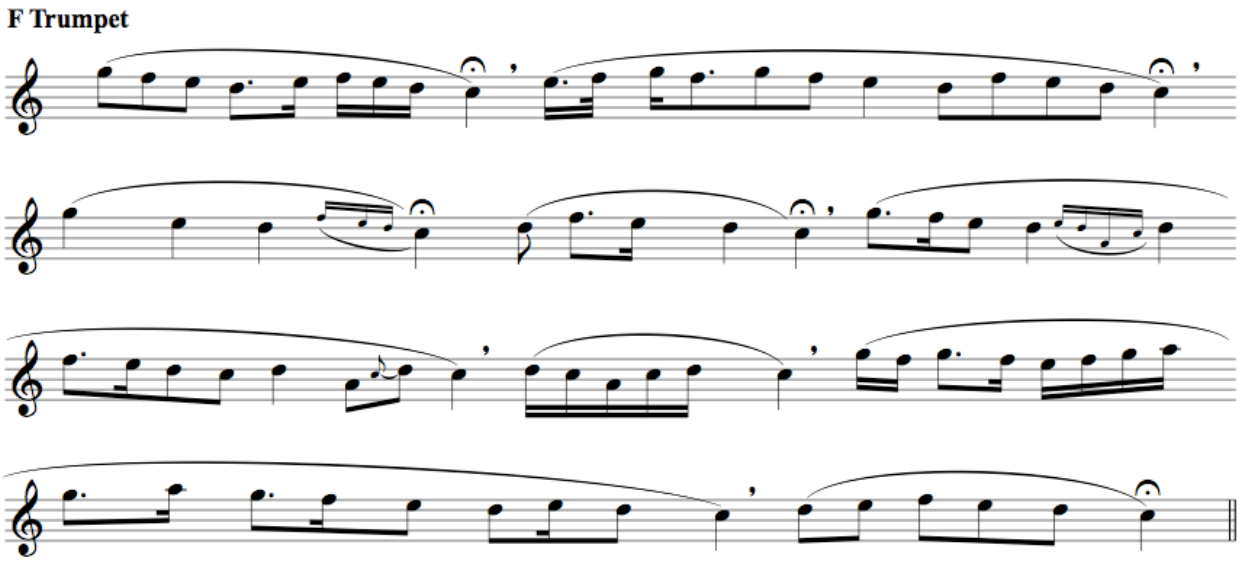

Figure 19: "Det gjallar og det laet"

The B♭ valved trumpeter today would be surprised by the range displayed in the music (Figure 19, below). The trumpeter ascends to concert D_6 and does so without valves which are used on a shorter instrument to separate the pitches for accuracy. The highest note, an A_5 in the example above, is a perfect fourth below the highest note of D_6 (concert G_6) that Bach wrote in his Brandenberg Concerto No. 2. Again, this casts doubt as to the genesis of trumpet playing at an aristocratic court. "Feld" (field) trumpeters played lower pitches of the natural scale while encamped. Playing high is not a requirement for military signals played on a trumpet.

There are certain advantages to using metal over wood in the construction of trumpets. The primary advantage is that with metal, the bore can be made consistent from one instrument to the next through the use of a mandrel. This means that the individual pitches of the natural scale will be approximately the same. The exact pitches of the natural scale vary by instrument since both the bore shape and the bell flare will change for each wooden trumpet made. Both the bore and bell shape push and pull on the ends of the natural scale.[3] Metal is also less resistant to the ravages of human saliva and condensation of the players' breath. However, it should be pointed out that long metal instruments are rather fragile. The use of them in the battlefield seems incongruous. Shorter instruments make more sense; this has been the norm for the last few centuries as the short, compact, and relatively strong bugle has been used and continues to be used in ceremonial, and in some cases, practical applications.[4]

There are concerns that would limit the probability of using metal in the construction of trumpets. Metal is very expensive and would be beyond the scope of the average person until the rise of the cities and subsequent accessibility to metal. Of course, religious requirements would supersede cost. Metal lurs, cast

[3] The greater the flare of the bell, the greater the apparent length (the point where the wave is reflected back to the instrument). This pushes down on the upper end of the natural scale. The more conically flared the lead pipe, the more the pitch seems to push up on the bottom end of the natural scale. Metal natural trumpets of the Baroque era had lead pipes (first yards) that were cylindrical.

[4] I have been asked to play bugle calls in the military not only for ceremonial reasons such as for flag raising ceremonies, but also for practical reasons such as "reveille" and "taps." I was also asked to play for certain functions aboard a naval destroyer; however, I am not aware of bugles being used in the heat of battle recently.

bronze Irish trumpets, and cast litui (as opposed to the wooden counterparts used by the Roman cavalry) attributed for religious use.

Additionally, there were technological limitations that would hamper the production of metal trumpets *en masse*. Firstly, the technology of bending tubes with a sharp circumference did not exist, or at least was in limited use until the end of the 14th century. Metal tubes could be bent, but only in a gentle curve, hence the shape of the Roman *cornu*; see Figure 20, below:

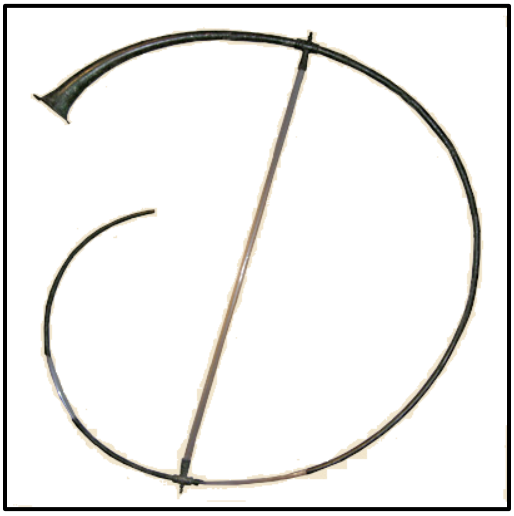

Figure 20: Roman *Cornu*, First century A.D. "Gladiatores" Exhibit; from the National Archaeological Museum in Naples. Photo: Barbara McManus

Up to that point in time, to make a tube, a rectangular (or slightly cone-shaped) sheet of brass was bent around a cylindrical (or slightly flared) solid mandrel. The seam was soldered. The tubing was worked to eventually harden the metal. What the smiths could not do well was to bend the resulting tube. If they made the arch radius of the metal being bent too short, the metal would crimp and break. A new technology developed where the instrument makers would fill the tubing with lead and then gently and carefully bend the tubing; in this way, the crimping could be managed. The direction of the bend was always 90° to the seam so that it was never stretched. This technology did not develop until the eleventh century where the straighter, shorter, metal trumpets began to be replaced by S-shaped trumpets. Straight trumpets were still cheaper and easier to build. Iconography of straight metal trumpets existed until at least the sixteenth century.

With the new technology of bending tubing, trumpet makers now had the possibility of making trumpets that had longer tubes, but could be folded back on themselves to make them more compact. This was desirable because the additional length extended melodic ability, since the longer the instrument, the easier it is to produce notes in the higher partials. At the same time, since the instrument was folded back, it was easier to control. A straight eight-foot trumpet would certainly break from the torque exerted by the weight of the bell against the player's arm over time. If the instrument was folded back, the trumpeter had the option of holding the second yard (the tube after the first bend, coming back toward the player in the direction of the air flow).

Positioning/Holding

How the shepherd's trumpet is held is perhaps a reflection of its natural wooden shape. If the instrument is made from a branch, it is natural to hold the instrument so that it is pointing upward. If you look at another photograph of a shepherd's trumpet (Figure 21, below), you might see this. The instrument in the figure below is a *Karjapasun* from Estonia:

Figure 21: Karjapasun from Estonia

Holding these instruments high is not a modern fad. Here is an image of the Gundestrup cauldron showing trumpeters playing the carnyx (Figure 22):

Figure 22: Three Warriors Playing *Carnyx*

In a similar fashion, here are t*rembita*s being used during a Hutsul ceremony (Figure 23, below):

Figure 23: Trumpet Positioning During a Hutsul Ceremony

Here is Simon Dwyer demonstrating how he believed that the Loughnashade trumpet may have been played (Figure 24, below). This is an Irish instrument dating from perhaps the 3rd century B.C.

Figure 24: Demonstration of the Loughnashade Trumpet

In the end, it just appears as though all trumpets are related to the shape of branches and may have been played as they appear to grow (upwards). Perhaps this is a religious reference/custom.

With the ability of metal smiths to make bends in tubing that were of a small diameter, they could now make the instrument more compact and of a longer length. If the smiths made the bends at 90^{o}, there is little advantage; the instrument is still long and unwieldy, albeit, it looks more like a carnyx or a branch. If the bend is 180^{o}, the instrument becomes much more compact and easier to hold.

The first shape that emerged with this new bending technology was an S-shaped trumpet; see Figure 25, below. Notice its similarity to a branch shepherds' trumpet and a carnyx:

Figure 25: Angel with S-Shaped Trumpet (note the bosses)

There are a few peculiarities of the image above. The bell is flared excessively for the time period. It was difficult to make a bell with a pronounced exponential flare since that would make the metal on the outside rim very thin and brittle. Discs were added to that area (as shown in the picture) to strengthen the edge. The bosses are in interesting places. There are two of them (natural trumpets of the Baroque era only had one boss).

Here is another example (see Figure 26, below). This instrument has bends of very small diameter which make it resemble what the Germans call a *Zugtrompete*.

Figure 26: An S-Shaped Trumpet of the Late 14th Century

Eventually, these S-trumpets were made more compact (and less fragile) by folding them back on themselves horizontally as well as vertically. Yet the boss remained and was still a decorative element.[5]

Here are three examples of natural trumpets with one boss per instrument shown in Figure 27, below:[6]

[5] English natural trumpets often did have large bosses so as to surround the first yard (lead-pipe) of the trumpet. This increased the instrument's rigidity. In most other countries, the first and third yard had a wooden block placed between and wrapped with cordage for strength.

[6] The term "Baroque Trumpet" has come to mean (it had a different meaning at the turn of the last century) a natural trumpet with holes drilled in the bore of the second yard. These small holes aid in modern trumpeters' intonation. While it could be that trumpeters from the 18th et al. centuries were more adept at bending pitches to match the form of equal temperament that was being used, it is also possible that other instrumentalists changed their intonation to match that of the natural trumpets whenever they played with trumpets.

Figure 27: Three Nürnberg Trumpets

The cords displayed may appear to be decorative but are not. To make the instrument more rigid, a piece of wood is inserted between the first and third yard/bell section and wrapped tightly with the cord to lesson the toque applied to the bends by the trumpeter's right hand supporting the instrument (the player's left hand was placed on his left hip).

As the need for court trumpeters waned in Europe, the patronage of court trumpeters also declined. The technique of playing in the high clarino register became less important. With increased technology, trumpets could be made to pay chromatically in the lower range through the use of vents for keys. Eventually, valves replaced keys and we have now instruments that are manufactured to resemble their natural scale, Baroque-era counterparts. Here is an example of a modern, valved, B♭ trumpet (Figure 28, below):

Figure 28: Roy Benson B♭ Trumpet

Examples in Antiquity

The following images are included in this short paper so as to link older instruments to the pastoral tradition. While one may believe that instruments such as the *tuba* (straight Roman trumpet) or *lituus* (short Roman cavalry and/or religious instrument) were created in a vacuum, it is more likely that the requirement by shepherds to have a musical tool to control their animals preceded or was in-line with the *lituus* and certainly preceded the *tuba*. Here are some examples:

The Lituus:

A *lituus* is an instrument with a confused past. Most scholarship indicates that it was originally a religious instrument that evolved into a signalling instrument used by the Roman cavalry. There are two main shapes. One is where the hollow tube is of about the same diameter for the length of the instrument. It curls back on itself and is in the shape of the letter <J>. It is three feet long. The other shape is where it appears to be a development of a horn-pipe (a pipe with an animal horn stuffed on one end with the other end having a cupped mouthpiece). In this case, the bell expands rather quickly and points upward.

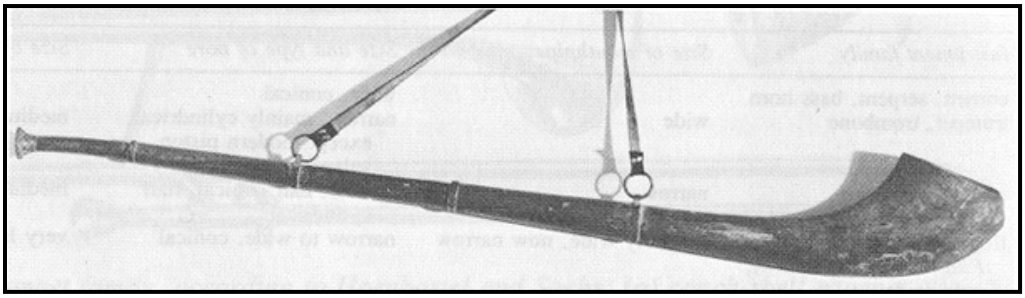

Figure 29: A *Lituus*

This instrument is about 3’ long.

The Tuba:

The *tuba* (pl. *tubae*) was often accompanied by the *hydraulis*, a water-driven pipe organ. Here is an example for a gladiatorial event (Figure 30, below). The combination of *tubae*, *cornua* and *hydraulis* for gladiatorial combat seems to reoccur in mosaics from antiquity.

Figure 30: Mosaic of a Gladatorial Event; Hydraulis, tuba, and Two Cornua

Here is another example (see Figure 31, below):

Figure 31: Another Mosaic of Hydraulis,

Here s another example of a *tuba* playing without a *hydraulis* (apparently). See Figure 32, below:

Figure 32: Tuba Player Announcing Charioteer of the Green Stable. Mosaic from the Piazza Armerina, Villa Romana del Casale. Photo: Barbara McManus

Here is an example of a *cornu* being accompanied by a *hydraulis* (Figure 33, below):

Figure 33: *Hydraulis* and *Cornu*, Mosaic, 2nd-3rd century A.D., Nennig, Roman Villa. Photo: Barbara McManus

Here is another example of *cornua* in relief (see Figure 34, below):

Figure 34: Roman soldiers with cornicae (horns). From the cast of Trajan's column in the Victoria and Albert museum, London. Photo: Gaius Cornelius

Conclusion

The purpose of this article was to show, through images, the links between shepherds' trumpets and our modern-day valved trumpets. I have not included the sources for the images as they were taken from the internet. Their provenance cannot be ascertained, yet, from my experience, they seem to be correct. Examples of S-shaped trumpets are particularly hard to find.

If you need to have the source for any of these photographs, contact me via email and I will provide the link, if it is still relevant.

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