Secret Aerophones?

The extent to which the contained air inside the body of an instrument is a dominant, even a predominant characteristic of its sound is something that has been concerning me for some time. It is not, so far as I know, something that has been studied in any detail, save spasmodically in a few special cases mentioned below.

For example it can be demonstrated easily that slit drums, although nominally idiophones, function as giant Helmholtz resonators. If one strikes the drum while progressively occluding the slit with the hand, the pitch will drop as one reduces the area of open hole. This was first established by Raymond Clausen in his fieldwork on Malekula, when the people he was studying tried to produce a drum with the lowest possible sound by making the slit as large as possible, and discovered to their horror that the sound was much higher than usual.

Stamping tubes are nominally idiophones but the pitch they produce when stamped on the ground is that of the contained air column. This can be demonstrated, as well as by listening to the type of sound, by blowing across the open end. The same may also be true of tubular bells, a type of idiophone that has not yet been adequately studied.

The better made English hunting and coach horns produce the same pitch when struck as when blown; this is presumably done to reinforce their sound.

New Guinea dance drums are clearly drums, but it is clear to the ear that the pitches they produce are those of the contained air column, not those of the membrane and that they also function as stamping tubes. New Guineas drums are nominally membranophones.

The area of their soundholes is an important factor for the sound of violins, which are string instruments or chordophones. Professor James Beament, after I had written to him with a question on this subject, demonstrated the importance of this factor. It is also an important factor for the sound of Renaissance and Baroque lutes and guitars, which have a pierced rose in their soundboard rather than the open hole that we see in classical guitars today. Lynda Sayce in her PhD thesis on Italian Continuo Lutes established that this was a major factor in the switch to the triple roses of some models of theorbo as body shapes changed. With both, the pitch of the air volume contained in the body, tuned by the area of open hole, as with any Helmholtz resonator, is vital to their response in performance.

With the trump or jews harp there is dispute between those who consider the tongue of the instrument, an idiophone, to be the more important factor, and those like me who believe that it is the volume and shape of the air-body inside the player's mouth that is the dominant, for it is that which controls the pitches produced. The same pitches can be produced in exactly the same way when the tongue of the trump is replaced by a drone in the player's vocal tract.

The area of open hole controls the success of cross-fingering on all woodwind instruments. It also controls the tuning of transverse and end-blown flutes (both rim-blown and notch-blown) by covering more or less of the embouchure.

This applies also to the hand in the bell on horns (not only orchestral – conches and African side-blown horns are also hand-stopped, as was the demi-lune trumpet), where one is reducing the open-end area.

So too the picco pipe (finger-stopped rather than hand) and the Basque txistu, the only fully chromatic tabor pipe. There are many other examples I could cite.

I am coming to the conclusion that many of our instruments, wind, string, and both types of percussion, skin and hard, all share characteristics of the Helmholtz resonator and of the ocarina, which is generally accepted as a blown Helmholtz resonator.

Has anybody any useful, especially helpful, comments, for or against, about this? And does it mean that many more instruments than we normally reckon on are really aerophones? And if so, what shall we do about Hornbostel-Sachs or any other classification system?

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