

The Artificial in Musical Instruments

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The use of artificial materials in musical instruments has quite a long history, going back to the early sixteenth century or before, when metals replaced natural horns. The main thrust, however, came from the mid-nineteenth century when materials such as vulcanite (hard rubber) became available for woodwind instruments.

The main reasons for the introduction of these and other artificial materials would seem to be for ostentation, practicality, convenience, cheapness, and today, with CITES, force majeure.

With ostentation, a silver hunting horn is much more aristocratic in appearance than a plain cow, goat or other animal horn. And a highly-polished demi-lune bugle horn looks much better than a plain old demi-lune oxhorn at the head of a regiment.

Practicality came with Empire. Instruments of vulcanite would withstand the heat and rapid changes of humidity of the tropics far better than wood, and so military bands that were sent to India and beyond, and later to Africa, were equipped with fifes, flutes, clarinets, and even though more rarely, oboes and bassoons of that material. And while both had natural soundboards, banjos were more popular in the tropics than mandolins or guitars because a skin soundboard could be easily replaced when a wooden one could not, which is why we have so many surviving guitar-banjoes, mandolin-banjoes, and even ukulele-banjoes (as used when cleaning windows).

Metal substitutes for wooden flutes was a matter of practical manufacture as keywork became more complex. Cornelius Ward famously complained that boxwood was more suited to a hygrometer than to a flute as expansion and contraction of the wood under differing humidity led to disarticulation or jamming of link-

ages in the growing complexity of long rods and axles on his and on Boehm's mechanisms. Less successful, though still available, were metal oboes, clarinets and bassoons, but other makers such as Sarrus brought out whole families of substitutes for those instruments in competition with Sax's new families of saxophones.

Convenience had already led to wooden upright serpents, replacing the original sinuous model especially on the march, and for practicability these were replaced with metal substitutes, first with the copper or brass bass horns, and then with Halari's invention of a whole family of key bugles, the bass of which was designed to replace the keyed serpent with, in a barbarous mixture of Greek and French, the ophicléide.

Much later, convenience, for portability of heavy brass instruments, led to the fibre-glass bells for sousaphones, and then to their whole bodies save for the valve section, though that material never seemed to catch on for the tubas, nor did anyone try to produce a lighter material for the bass drum.

Back in the 1960s, people like Northern Renaissance Instruments were making rebec bodies of resin plastics to make them cheap and attractive to school children in the days when mediaeval music was becoming popular. And Christopher Monk led the cornett revival by making those instruments out of resin plastic – almost all our modern cornett virtuosi started on one of his resin instruments before they moved on to the more traditional materials. He and many others were also making serpents from fibreglass and various plastics.

More important for schools was the Dolmetsch introduction of plastic recorders, though these tended to be heavier than the wooden ones, and they felt a bit clumsy in the hands. Much better were those produced by Edgar Hunt with Walter Bergmann of Schott's, and these led to a proliferation of light-weight plastics, especially the descants for young beginners. They were cheap, and all the parts were easily replaced when they were dropped in the playground.

Of all these, it was only the metal flutes, vulcanite woodwinds, brass ophicleides (the accents vanished and the pronunciation changed in English) and fibreglass sousaphones that were adopted by serious players.

But plastics are still very much with us. Hélène La Rue bought for the Bate Collection the first transparent pink recorder she saw (and gave me one), and now we see plastic trombones, trumpets, and flutes, oboes, and clarinets in all the colours of the rainbow. These are all cheap, and fun and attractive to children and they encourage them to take up playing instruments.

Aulos led the way in producing a precise plastic reproduction of a Stanesby jr 'ivory' flute. My own original has a shortened head and an enlarged embouchure; with the Aulos head replacing the ivory one, it brings the pitch back to the original A=409 – I'm not sufficiently a flautist to judge the comparative tone quality properly, but it seems to me to be at least adequate, though ivory was always more a matter of ostentation than boxwood tone quality would be for a serious player.

More easily available, now that we have precise measurements and scans of historical instruments, combined with the invention of 3D printers, we have a whole range of possibilities of very precise reproductions of original instruments. Cornetts have been very successful, serpents seem to be. To what extent people have made woodwinds by the great makers of the past, I do not know. To a great extent I imagine that it will be a matter of the availability of extrudable materials that will match the tone quality of boxwood, ebony, palissandre, and maple.

Also a matter of materials is the problem of reeds. The best reed cane, *Arundo donax*, has always been grown in southern France, but modern air and water pollution has degraded its quality, as has modern quick seasoning, to the extent that older reed-instrumentalists complain that what they buy now does not compare with what they used to get. Plastic reeds are available for all the woodwinds, but none, they say, are of professional quality. As the quality of natural reed cane degrades further, future experimentation with different plastics becomes more and more urgent.

Much has been done with drumheads in recent years, and although many of us retain our love for the sound quality and response of calf and goat heads, the firms that are willing to produce heads of the sizes and quality that we need are getting fewer. Small sizes of vellum or parchment for documents are easier to produce, but a 32-inch timpani head needs to be at least 36 inches in diameter before it is lapped on its hoop, and it is essential that it is absolutely even in thickness all

over. It then needs to be lapped on its hoop, a process that takes skill, space, and at least 24 hours to dry before it can be used, whereas a plastic head is cheaper and comes ready-welded to its hoop and can be placed quickly on its drum and is then immediately ready for use. In addition, sound engineers have a preference for the shorter resonance period of plastic heads for broadcast and recording work. And the propensity of modern concert halls to produce a waft of humid and air-conditioning climate change just before a concert can play hell with the tuning of natural skin heads.

Plastic heads are also far more convenient for marching drums of all sorts, because bands march on specified dates, irrespectively of whether the sun is shining or the rain is pouring down. A soaking wet drum head will produce nothing but a dull thud whereas a plastic head will behave equally well, rain or shine.

And finally we come to CITES. The great forests of South America and South East Asia are dwindling under the pressure of pasturage and ploughland for meats and for crops such as oil palms and soyas. As the forests dwindle, so do the tonewoods such as the Dalbergias, which include rosewood and other favourite timbers, and so also does pernambuco, which has provided wood for the bows of all the violin family for the past hundred years and more.

We may say there are plenty of other trees in the wood, but look what has happened to the elms, and now the ash and the oak are threatened – who's next? Yes, there are flute makers I know who are using new woods that look fine, and some players seem to like them, but we do not know as yet how well they will stand up to professional playing, and anyway we are concerned with those instruments only in the early music world – there is still plenty of silver for the modern instrument flautists. What about oboes, clarinets, and bassoons? These depend on tonewoods, and there may yet appear a beetle that likes maple. And what about all the fiddle bows? Carbon fibre has been tried and some people like it, but here again we are back to plastics. And, too, there are fewer horses around for bow hair, though we may come back to breeding them as we try to get away from oil, so bow hair may be safe. Remember that a busy professional has at least two bows, one in use and the other being rehaired.

The best xylophones and marimbas are barred with Mexican rosewood, and the best claves as well, though there's only two of them to a set. But rosewood is forbidden now, and the only substitute seems once again to be plastic.

And here is our last problem: plastic has become a dirty word. The world, both land and sea, is deluged with plastic. Can we keep the plastics we need for our instruments while all the rest of the world is abandoning plastics for packaging, toiletries, and all other purposes? Perhaps we can, if it can be shown that plastic is produced with fewer toxic emissions than brass and if plastic trombones could be more effectively recycled than brass ones. But even if we want to, will we even be allowed to think of plastic? Yes, we can use cheap woods for our children's recorders, and maybe better quality woods for amateurs. But what about the rest of us? Will orchestral music die out just because there is no more wood for woodwinds, and no more bows for fiddles?

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