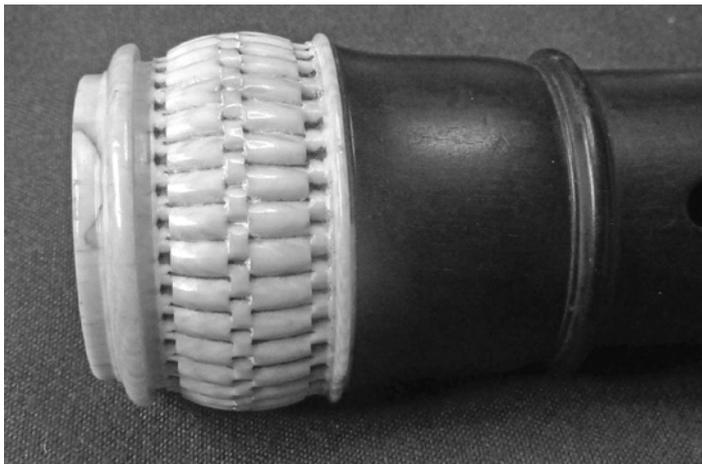


### Making woodwind instruments 5a: Ivory and natural ivory substitutes

#### The beauty of ivory

Ivory from elephants is a highly priced luxurious material which was used many times for woodwinds: for ornamentation or even for complete instruments. I have seen ivory recorders (from sopraninos to basses), traversos, oboes and cornetts (cornettos). Ivory is a heavy material: its specific weight is 1.9, which makes it about twice as heavy than boxwood. That means that ivory instruments become rather heavy. To compensate you can them make with thinner walls, but that has acoustical consequences, for instance for the size and the shape of undercutting of the tone holes. Giovanni Maria Anciuti made some oboes with a partly octagonal profile, maybe to reduce the weight. On the photo (right) we see an oboe by Anciuti in the Musée de la Musique in Paris; I recently saw another octagonal oboe by the same maker in the museum of musical instruments in Milano; that instrument was made in 1722.

But ivory lends itself perfectly - perhaps better than any other material - to carving. The photo below shows one of the ivory rings on an oboe (from a private collection) by Hendrik Richters (Amsterdam 1683 - 1727). This type of carving was not done with knives or other hand tools, but on a special ornamental lathe (French: *tour à guilloche*).



Cecil Adkins wrote about the oboes of Hendrik Richters and his brother Fredrik, and their ornamental turning in his extensive article 'Oboes beyond compare' in the *Journal of the Americal Musical Instrument Society* (1990, Vol. XVI).



The website of Richard I. Miller ([www.ivoryturningsculptures.com](http://www.ivoryturningsculptures.com)) gives concise information about ornamental turning (OT). About this craft he writes: OT is accomplished with a very specialized lathe that has a variety of chucks and cutting frames adapted specifically for the OT lathe. Small tools such as fly cutters and drill are used to create a pattern as the work is arrested at various points on the lathe. A variety of chucks allow the work to be placed in an offset position; a dome to be decorated; or an oval shape to be created on the work piece - all shapes that are mostly out of the realm of ordinary or plain turning. The highly sharpened tools impart a finish that leaves the work piece with no further need for polishing or finishing. The work takes a great deal of patience, but the reward of an attractive piece is well worth the time spent to create it.

Some history: OT dates back to the early 1700's when artisans were patronized by royalty and were commissioned to make exceptionally complex pieces, many of which survive today in museums, mostly in Europe. 'Modern' Ornamental Turning is said to have begun with an Alsatian immigrant to London, John Jacob Holtzapffel who produced his first OT lathe in 1795. There followed three generations of Holtzapffel OT lathe makers until the early 1900s when interest in OT by the mechanically inclined gave way to interest in the automobile! The elder Holtzapffel's son, Charles Holtzapffel wrote the first three volumes of the epic OT classic, *Turning and Mechanical Manipulation*. Upon his death the last two volumes were written by his son, John Jacob Holtzapffel II. Some 2,500 OT lathes were built by the Holtzapffels during this period and perhaps another 1,000 by other lathe makers. Today, there are only a few hundred original OT lathes in existence, of which a limited number are used by modern enthusiasts.



This photo shows the ornamental lathe of queen Sophie Magdalene of Brandenburg-Kulmbach (1700 -1770), who was the wife of King Christian VI of Denmark and Norway. This lathe can be seen in the Rosenborg Castle in Copenhagen, together with many ivory artefacts (but no musical instruments) which were made on it: the results of the (expensive) hobby of the queen.

## The problems with ivory

Ivory is a hard and dense material, but it is vulnerable to microbiological attacks. I have seen quite a lot of woodwind instruments with internal cracks, triggered by enzymes in the saliva of the players.



The photo above shows a dramatically damaged alto recorder by Engelbert Terton (private collection). Two cracks resulted in the 'roof' of the windway becoming loose (which - by the way - gave me a chance to investigate its strong longitudinal curve); an attempt was made to fasten this piece of ivory with a metal ring, for which construction some ivory at the surface of the mouth piece was cut off. There were also problems with the upper tenon and the foot. That part was apparently made in two sections which were screwed together, but this connection was damaged.



This photo (left) shows internal cracks in the head of an alto recorder (private collection) by Klenig, a probably German woodwind maker from the first half of the 18th century.

Ivory rings were used to strengthen the sockets of woodwind instruments. But ivory can also be more or less flexible; I have seen rings on oboe bells which have warped more or less into an oval shape, together with the underlying wood.

The big problem nowadays with ivory is the poaching of elephants and the illegal trade in tusks, especially into countries in the Far East. It is not allowed to bring instruments with ivory parts into several countries, unless you can prove that these were made before 1947. And that is often very difficult.

Some instrument makers still use real ivory, especially for restoring instruments, but I have also seen recently some completely new flutes or recorders made of (old?) ivory. I do not know where you can buy legal ivory, I couldn't find information on internet.

And what should I do if somebody offered me a nice piece of ivory, even with the guarantee that it is old enough to be legal? I know that I am easily tempted buying pieces of beautiful wood; but I believe that in the case of ivory and some of its natural alternatives (see below), we have to be firm and must reject it.

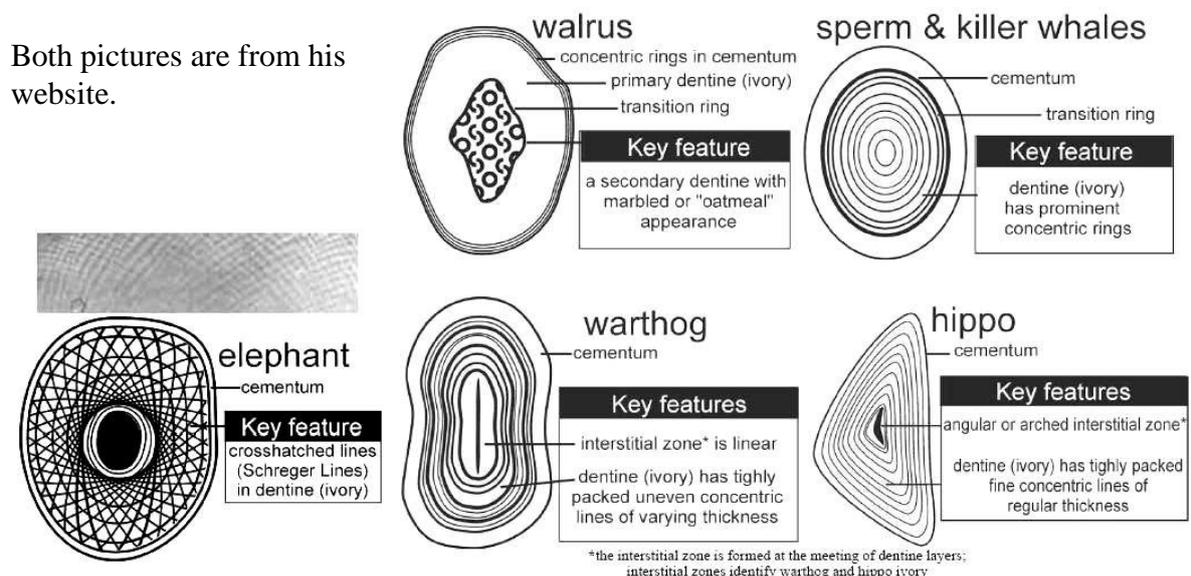
### Alternatives for elephant ivory

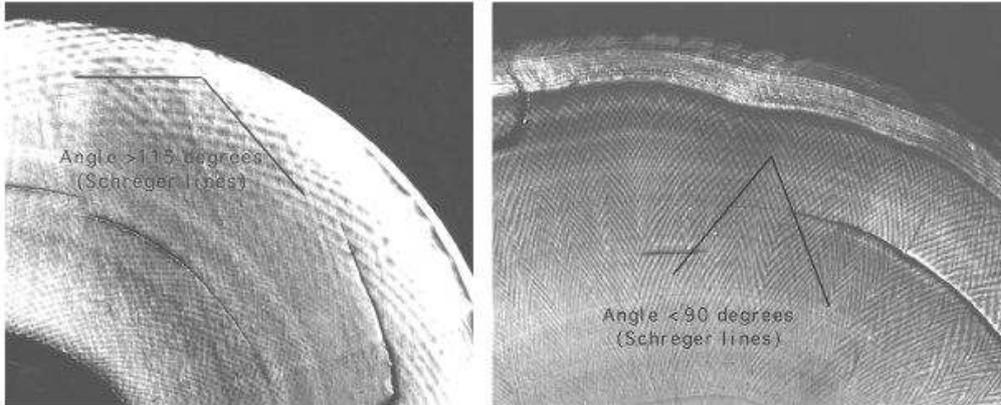
Mammoth tusks has been used for several centuries as replacement for elephant ivory. There seems to be a lot still buried in the permafrost soils of the Siberian tundras, and with the recently rising temperatures we may expect a rising supply of these tusks in the next years. It is not so easy to see the differences between the two types of ivory (and it is even harder to do that between ivory of African and Asian elephants) and I saw an article about the danger that traders of illegal ivory may use the mammoth variety to deceive the investigators.

Mark Chervenka writes on [www.realorrepro.com/article/Ivory-genuine-fake--confusing](http://www.realorrepro.com/article/Ivory-genuine-fake--confusing) about recognizing several types of natural ivory.

Using black light is an important first step because it saves time by ruling out artificial materials. Virtually all plastics and resins fluoresce blue or blue/white under long wave 'black light' regardless of the surface color in ordinary light. Genuine ivory usually fluoresces white but this can vary depending on whether the ivory has a patina. Most natural old patinas fluoresce dull yellow or brown. Be very suspicious of any brightly-coloured fluorescence such as yellow fluorescence as this indicates artificial ageing in dung, urine or animal fats. Use black light as your first test, not your only test. Black light is useful for eliminating artificial materials but cannot alone prove a piece is ivory. Bone, vegetable ivory (cellulose) and glued together ivory dust, for example, all react like genuine ivory under black light.

Both pictures are from his website.





Ivory of elephants and mammoths have always so-called Schreger Lines on cross sections of the tusks at different angles for elephants (> 115 degrees) and mammoths (< 90 degrees). But it is difficult to see those lines - or to establish the angles - on the small ivory rings of instruments, especially where you don't have a proper cross section.

I do not know where you can buy legal ivory from the other animals: whales, walrus, hippo and warthog. If you have this stuff, be careful putting it on instruments if you are crossing borders.

### **Bone**

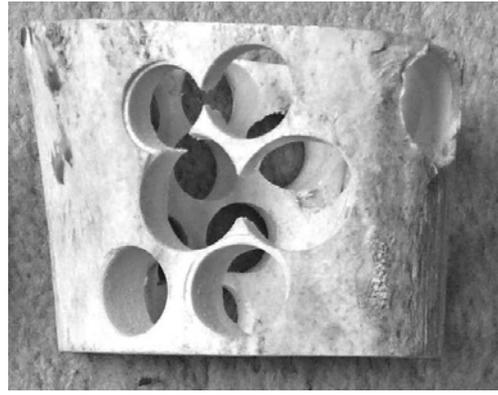
Bone (from cows or other animals) has a more open structure, caused by the Haversian canals, which are microscopic tubes in the outermost region of bone that allow blood vessels and nerves to travel through them. Bone is harder than ivory. Pieces of bone can be used for rings for woodwind instruments, but as you



can see on the picture above, the hole in the centre usually has an irregular shape and there is a job to do first to make the inner space perfectly round.

The best method to do that is to attach the ring firmly with bolts on a clamping plate (photo, left). The clamping plate is mounted on a metal working lathe, the cutting tool of the lathe must then do its work. When the hole is finished, the ring must be mounted on a wooden shaft, after which the exterior can be turned.



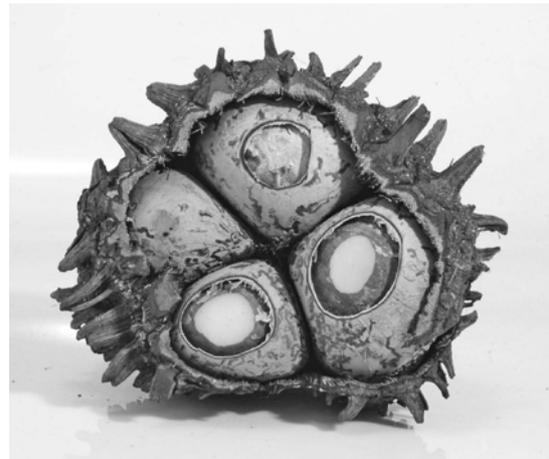
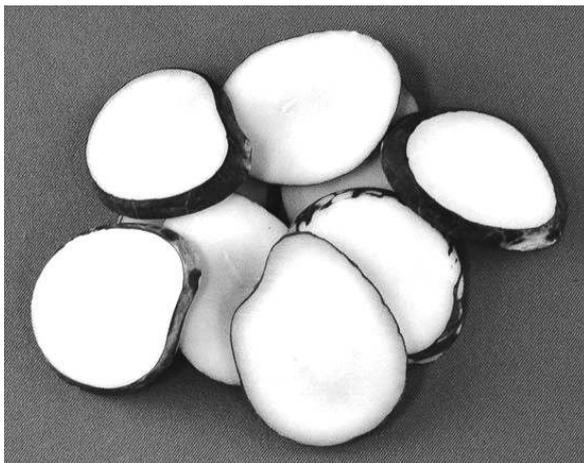


I use smaller pieces of cow bone for the small thumb rings for my recorders (photo, right). It is easy enough to get the pieces out of the side of the bone, I made a special hollow drill to do that. On the photo you can see my 'ring cutter' at the right, and a 'plug cutter' (which has much thicker cutting walls) from the DIY-shop, at the left.

### **Tagua nuts**

Concerning tagua nuts I found the following information: ivory nuts, which are the hard cellulose kernels from Tagua palms, are frequently confused with genuine ivory. They fluoresce like genuine ivory under black light and show a fine grain under magnification. Although they can grow to the size of a small apple, the majority of ivory nuts are under 2 inches which makes them unsuitable for large carvings.

The most common use of ivory nuts is for new netsuke, but I have read that some bagpipe makers also use them. The definitive test to recognize Tagua nuts is to apply a small drop of sulphuric acid. This will form a pink stain on ivory nuts in 10-12 minutes but will not stain genuine ivory. However, the stain is permanent and not removable.



Slices of tagua nuts, and the Tagua fruit.