

Fig. 1: three busts from the Museum of St Germaine, showing pan pipes being played. (after Reinach 1907)

# Roman panpipes found in London

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A UNIQUE SET of panpipes (*syrinx*) was discovered in 1989 on the Thames Exchange site on the London waterfront. Following conservation and study<sup>1</sup>, they proved to be the only set of wooden pipes of Roman date found in Britain, although they were initially thought to be of Saxon date<sup>2</sup>. This paper explains where they were found, describes them and compares them with a medieval set from Coppergate in York, similar Roman pipes from France and Germany, and a ceramic set from Shakenoak, Oxfordshire.

1. This report is a summary of more detailed research prepared in an unpublished BA dissertation written by the author for University College London, Institute of Archaeology in 1993.
2. C. Spence & F. Grew *Museum of London Department of Urban*

## The *syrinx*

Although most woodwind instruments can be covered by the generic term 'pipe'<sup>3</sup>, within that category is the flute-type, which use two very different methods of sound production. One method is by blowing into a whistle mouthpiece, as with the recorder or flageolet. The other method is by blowing across a round mouth-hole with the air 'breaking' against an edge of the instrument, as with the panpipes (or *syrinx*) and the transverse flute<sup>4</sup>. Panpipes have their origin in a simple bamboo reed

*Archaeology: the Annual Review 1989 (1990) 27.*

3. M. Remnant 'Medieval Musical Instruments' *Medieval World* 7 (1992) 35.
4. P. Munrow *Instruments of the Middle Ages and Renaissance* (1976) II.

tube stopped at one end and open at the other. Several pipes of different lengths were used and sounded vertically, whereas in the transverse flute a single tube was held horizontally and fingerholes and a mouth-hole were added. Panpipes and transverse flutes are closely linked together by their method of sound production, although their history, appearance and playing technique could not be more different. In classical times panpipes often consisted of simple tubes of different lengths fixed together<sup>5</sup>. They were also made of other materials which include pottery and a single block of wood with pipes bored or drilled: during the middle ages the latter form was more often used. The classical number of pipes is seven according to Virgil and Ovid, although there is evidence that some panpipes were made with up to thirteen holes. As a folk instrument, the panpipes can be found in Europe, Asia, South America and elsewhere. Among the most famous modern survivals are those from South America and the Rumanian *naiu* with twenty-six pipes, on which *virtuosi* have achieved a technical and expressive mastery.

### Discovering the panpipes

The London pipes were found during excavations conducted by the Department of Urban Archaeology in advance of imminent redevelopment on the Thames Exchange (TQ 3245 8075) site

5. Remnant *op cit* fn 3, 35.

6. G. Milne *Timber Building Techniques in London, AD 900-1400*, LAMAS Spec Pap no 15 (1990) 42-63.

7. Provisional dating kindly provided by Ian Tyers, MoLAS.

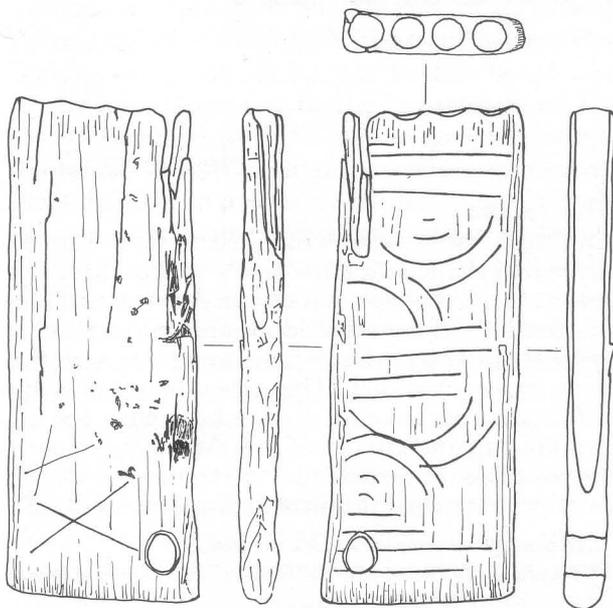


Fig. 2: the panpipes from the Thames Exchange site, London.

in 1989. This 4000 sq metre site lies at the NE corner of Southwark Bridge and south of Upper Thames Street. The controlled excavation of a 70m x 11m (230ft x 36ft) area on the east of the site took place between August 1988 and March 1989 while ground works were monitored from January 1988 until September 1989<sup>6</sup>. A Roman quay was traced for 35m (115ft) E-W in the north of the site, and dendrochronological samples from it showed that timbers felled between AD 201 to 237<sup>7</sup> had been incorporated in it. To the south a long sequence of waterfront development was recorded, including over thirty medieval riverfront structures, erected during the reclamation of the area from the Thames.

The panpipes came from the foreshore formed after the Roman quay (context no 1108) had been dismantled in antiquity, in a deposit of well-compacted grey-brown clay with straw-like twigs matted together (context no 1767). Above it was the first layer which physically sealed the dismantled Roman quay (context no 1764), a sandy foreshore deposit 0.2m (8in) thick containing pottery provisionally dated to 850-1000 AD. This and the succeeding layers were themselves sealed by an embankment dated by dendrochronology to the AD 950. The panpipes therefore came from a context which had formed sometime after cAD 200, but before cAD 900: they might therefore be either Roman or Saxon in date.

### The London *syrix*

This set of panpipes is sub-rectangular, up to 118mm (4.6in) tall and 45-46mm (1.8in) wide. At the top the instrument is 10mm (0.4in) thick, tapering to 9mm at the base. One edge is damaged, showing that it is an incomplete instrument, but the reconstruction

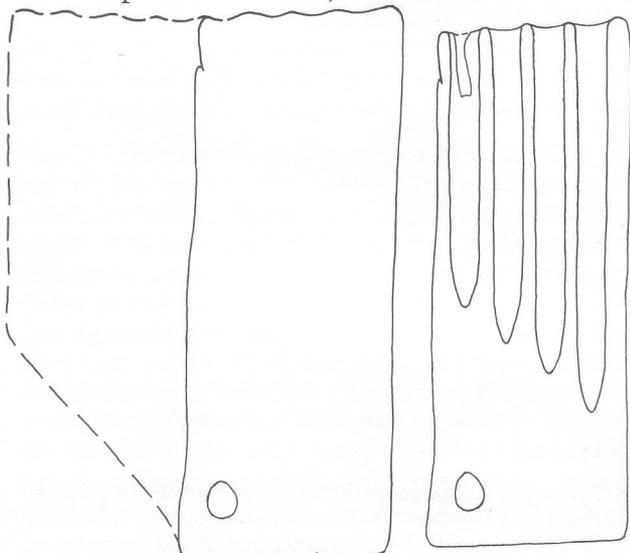


Fig. 3: (left) the London panpipes: outline reconstruction. (right) the London panpipes: drawing of X-ray showing shape and length of pipes.

drawing (Fig. 3) shows its probable original shape. The panpipes have been smoothed on both flat sides. The front of the instrument, away from the player, is decorated with incised parallel lines, which are in the same position as fastening bands shown on illustrations of panpipes made from several separate pipes, and concentric circles. The 1mm-wide shallow lines are partially worn away and would have been made by the tip of a rounded knife cutting down twice making a "V" shape. The back is plain, apart from two incised crossed lines, one slightly larger and more definite than the other, perhaps a maker's or owner's mark (Fig. 2). Near the base of the instrument is a round hole through which a cord or thong could be passed for carrying the pipes, perhaps around the neck. The lower edge is straight, as is the completely intact side edge, but the upper edge undulates where the openings of the pipes are.

This set was made from a plank cleft or sawn from a boxwood log at least 100mm (4in) in diameter, from which the pipes would have been drilled possibly with a spoon bit drill, according to Damian Goodburn, the MoLAS Timber Specialist. This would have been a skilled job, but it has been suggested that if the pipes were cut too long, the tuning could have been corrected by inserting wax into the hole. Since boxwood (*Buxus sempervirens*) is so hard, dense and close-grained, it allows such closely-spaced holes to be made into its end grain<sup>8</sup>: the four surviving pipes are only 3mm (0.12in) apart. The diameter towards the top is about 7mm (3in) and about 1mm at the bottom. There is a slight lip at the top of each of the pipes. The depths of the surviving pipes, after cleaning and X-ray, proved to be 64mm, 72.5mm, 80.5mm and 90.5mm (2.5in, 2.8in, 3.2in, 3.6in). These measurements were used to determine the notes which could have been played on them. The acetone/rosin conservation method used would not have distorted the instrument in any way, since wood which has undergone this treatment is dimensionally stable<sup>9</sup>.

8. C. Morris 'The Boxwood Syrinx from 16-22 Coppergate' unpublished draft of report to be published in *The Archaeology of York* vol 17/13 (1993).

The side nearest the round hole is clearly damaged but the remains of a fifth pipe some 52mm (2.0in) long can be seen, shown by the curved mark on the side. Study of the tree rings on the base of the pipes (see Fig. 4) showed that the break in the instrument corresponds to what would have been the centre of the log that the plank was cut from, so it is possible that there could have been more than one extra pipe, possibly as many as seven or eight.

### Tuning the panpipes

The next stage of study was to determine what notes would have been played on the pipes. Two methods can be used to achieve this, of which the first and simplest is to play the pipe and compare the note sounded by ear, by comparison with tuning forks or another instrument known to be in tune, or by reference to someone with perfect pitch. The problems with this technique is that the instrument may now be distorted or truncated, or it could be under or overblown by the archaeologist, and therefore made to produce a note sharper or flatter than it was initially designed for. An additional problem is that chemical conservation treatment given to the instrument, even if it left the *syrinx* dimensionally stable, would render it unpleasant to play. For the London pipes a new method was adopted which involved using a mathematical formula to calculate the frequency of the intended notes thus:

$$2f = (2n-1)C/2L$$

where L = length of pipe in mm; C = velocity of sound in air ( $3.3 \times 10^3 \text{ mms}^{-1}$ ); f = frequency in Hz. Although n = any integer (since the pipes can vibrate at frequencies of any given value of n), in this calculation, n = 1, since the main note will be that of the lowest frequency, using the least energy. The results are calculated in Hz and can then be compared with Table 1, which facilitates the identification of the note played by each individual pipe and also the interval between the notes played by all the pipes. Using the formula, the

9. H. Ganiaris 'Examination and Treatment of a Wooden Writing Tablet from London' *The Conservator* 14 (1990) 3.

note	A	B	C	D	E	F	G	A
f in Hz	854	960	1024	1152	1280	1364	1536	1708
musical interval	9/8	16/15	9/8	10/9	16/15	9/8	10/9	
tone	major	semi major	major	minor	semi major	major	minor	

Table 1: to show the notes, frequencies and musical intervals in the same broad range as the frequencies of the London *syrinx*.

	length in mm	calculated frequency in Hz	suggested note
1st pipe	90.5	912	Bb
2nd pipe	80.5	1025	C
3rd pipe	72.5	1138	D
4th pipe	64.0	1289	E
5th pipe	52.0?	1587	G?

Table 2: the notes of the London *syrinx* shown here were calculated using the formula discussed above: even though the 5th pipe was broken, it proved possible to suggest a note for it.

notes for the London panpipes were calculated as shown in Table 2.

### British parallels

#### Coppergate

Since the Thames Exchange panpipes came from a deposit with a wide date range, attempts were made to determine when they were actually made by comparison with similar sets. Unfortunately boxwood panpipes are very rare: only three others are known from north-west Europe. The only comparable instrument from Britain is from the Coppergate site in York<sup>10</sup>, which has been studied by Carole Morris<sup>11</sup>. This *syrinx* is also incomplete, but its surviving dimensions are 97mm x 61mm x 12mm (3.8in x 2.4in x 0.5in). It was probably broken then discarded in a pit containing material dated from between the late 10th and the mid-11th century. Morris has described it as '... a fine, expensive instrument made by a craftsman using a specially selected piece of wood'<sup>12</sup>. The four surviving pipes were bored into the end grain of the instrument using a very sharp auger bit with a rounded, coni-

10. R. Hall *The Viking Dig* (1984).

11. Morris *op cit* fn 8.

12. Morris *op cit* fn 8, 1.

cal end (unlike the London set) and parallel sides. The diameter of each pipe is 8mm (0.3in) and they are spaced 2mm apart. The broken edge is split through a fifth pipe, showing the complete set was longer. The set of panpipes is sub-rectangular in shape but would have been more trapezoidal originally since there would have been an extension for the missing shorter pipes. It has been smoothed on both flat faces which also had incised crosses which may be for decoration, or a maker's or owner's mark. After cleaning, a five-note scale running from top A to top E could still be sounded<sup>13</sup> in which the C, D and E of the York set correspond to the same notes in the London instrument.

#### Shakenoak

A pottery *syrinx* of Roman date was found at Shakenoak Farm, Oxfordshire<sup>14</sup>. It is made of red-brown baked clay upon which the names CATAVACUS and BELLICIN are scratched. The remains of seven pipes with conical ends survive, four of which are whole, but when complete this *syrinx* may have had eight pipes. It has maximum surviving dimensions of 124mm by 96mm (4.9in by 3.8in). The pipes are between 7 and 8mm (about 0.3in) in diameter, and are spaced between 3 and 5mm (0.2in) apart. The pipes are cylindrical for most of their length, but have tapering ends. The lengths of the pipes are 105mm, 102mm, 97mm, 86mm, 84mm, 71mm and 67mm (4.1in, 4.0in, 3.8in, 3.4in, 3.1in, 2.8in, 2.6in). Notes obtained from the second, third, fourth and fifth pipes by blowing were: Bb, C, a flat C<sup>#</sup>, and C<sup>#</sup> respectively. These notes seem to be rather high for the lengths of their pipes, which implies that they may have been overblown. According to new calculations made using the formula discussed above, the seven notes for this instrument would have been G, G<sup>#</sup>, A, B, C, D and D<sup>#</sup>.

13. Hall *op cit* fn 10, 116.

14. A. Brodrick, A. Hands & D Walker *Excavations at Shakenoak Farm near Wilcote, Oxon* (1973) 45.

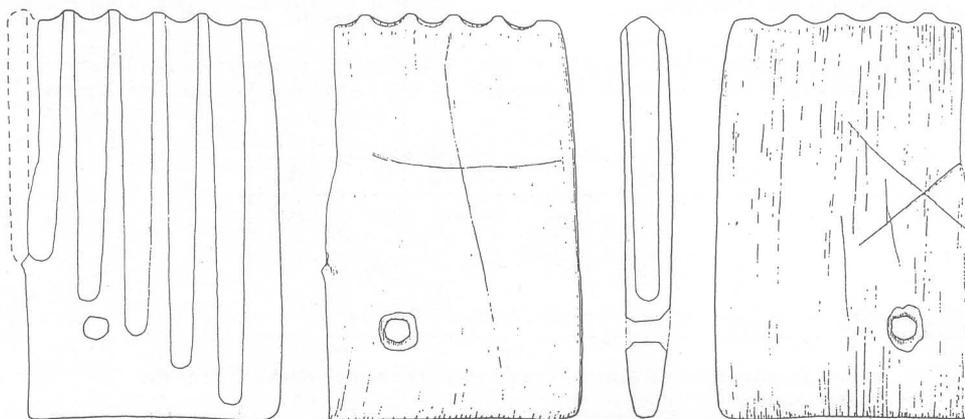


Fig. 4: medieval panpipes from 16-22 Coppergate, York. (after Hall 1984)

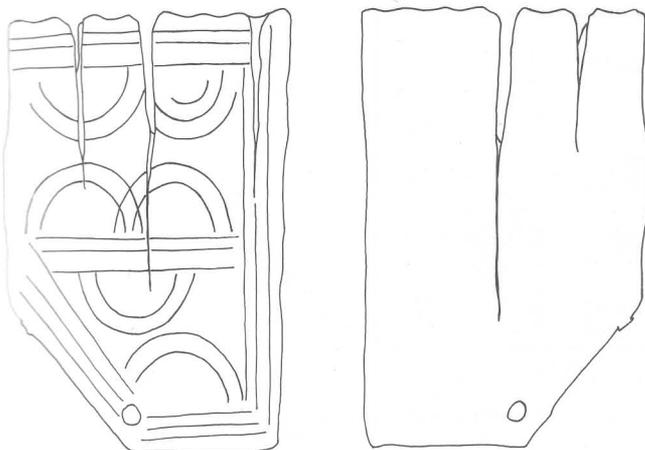


Fig. 5: Roman Panpipes from Alesia, France. (after Ulbert 1961)

## Continental parallels

### Alesia

A boxwood *syrinx* very similar to the Thames Exchange set was found in a 2nd to 3rd-century well in Alesia, Mount Auxois, in France<sup>15</sup>. The set is almost complete, having seven pipes, with evidence of an eighth. It is up to 115mm (4.5in) tall and 77mm (3.0in) wide, is 11mm (0.4in) thick at the top, tapering to 6mm (0.2in). The back is smooth and the front is decorated with incised parallel lines and concentric semi-circles. At the bottom of the instrument there is a round suspension hole. The pipes are 2mm apart, are all 9mm (0.35in) in diameter at the top and are drilled into the wood, tapering to a point at the lower end. The lengths of the surviving pipes of the Alesia set are 71mm, 63mm, 55mm, 50.5mm, 43.5mm, 39mm and 35.5mm (2.8in, 2.5in, 2.2in, 2.0in, 1.7in, 1.5in, 1.4in). The missing pipe would have been about 31.5mm (1.2in). The notes obtained from this instrument were determined by French flautists as D, E, F<sup>#</sup>, G, B, C and D. Calculations using the formula discussed above confirms those identifications.

### Barbing-Kreuzhof

Another set of panpipes dating to the late 2nd or 3rd century came from Barbing-Kreuzhof in Germany<sup>16</sup>. Only four pipes remain on this instrument, which is now up to 100mm (4.0in) tall and 45mm (1.8in) wide. In appearance it is very similar to both the Alesia and Thames Exchange pipes, since all three instrument are decorated by incised parallel lines and concentric semi-circles. In her study of

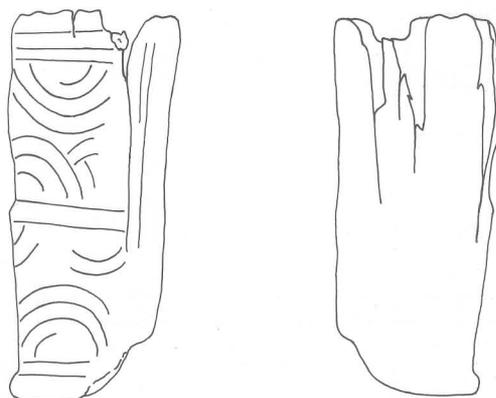


Fig. 6: Roman Panpipes from Barbing-Kreuzhof, Germany. (after Ulbert 1961)

Roman musical instruments, Dr Wardle has suggested that this may be a traditional form of embellishment for such items<sup>17</sup>. As the German instrument is damaged on both side edges, it could easily have had another longer pipe as well as two or three shorter pipes. Ulbert believes that as the Alesia and Barbing-Kreuzhof panpipes are so similar, that they may have come from the same workshop, which he believes to have been in Italy<sup>18</sup>.

The holes for the Barbing-Kreuzhof panpipes are cylindrical with a diameter of 8.5mm (0.33in) at the top, with lengths 65mm, 57mm, 51mm and 47mm (2.6in, 2.2in, 2.0in, 1.85in). Although the instrument has apparently not been played, the notes suggested for these pipes are F, G, A, and C. Given the length of the pipes, these notes for this instrument seem too high. Using the formula for determining notes discussed above, the Barbing-Kreuzhof pipes have been calculated as E, F sharp, G sharp and A, which represents a very similar range to the Alesia *syrinx*.

## Discussion

The discovery of even a fragment of a small musical instrument such as the London *syrinx* has helped to resolve how such instruments may have been constructed and also provides some insight into the music played on it. The notes and tone of a reconstructed instrument add colour to our understanding of the culture it came from. As Graeme Lawson has suggested, '... the unique sound-colour and technical implications of a particular instru-

15. T. Reinach 'La Flute de Pan d'Alesia' *Pro Alesia* II, 12 (1907) 161-9; 180-5.

16. G. Ulbert 'Ein Romischer Brunenf und von Barbing-Kreuzhof' *Bayerisch Vorgeschichtsblätter* 26 (1961) 56-9.

17. A. Wardle *Roman Musical Instruments* unpublished Phd thesis for the University of London (1990) 147.

18. Ulbert *op cit* fn 16, 58.

<b>Roman syrinx</b>									
Thames Exchange		Bb	C	D	E	G			
Shakenoak	G	G#	A	B	C	D	D#		
Alesia				D	E	F#	G	B	C
Barbing- Kreuzhof					E	F#	G#	A	
<b>Medieval syrinx</b>									
York		A	B	C	D	E			

Table 3: comparison of the notes determined by calculation which may have been played on all four Roman and the one medieval panpipes discussed in this paper. The ranges of these panpipes are all within about 1.5 octaves, from the G in the second octave above Middle C to the D in the fourth octave above Middle C.

ment play a very major part in determining what was the character of its music'.<sup>19</sup>

It would seem that the panpipes from the Thames Exchange excavation are far closer to the 2nd-3rd-century instruments from Alesia and Barbing-Kreuzhof, as they clearly have the same decoration and the pipes have tapering, not conical, ends. It would therefore seem likely that the London *syrinx* is Roman. Instruments of a similar style can be seen in sculptures such as that in the museum at St. Germaine, France, which shows three children playing panpipes of a similar shape to the Alesia set (Fig. 1). The panpipes are rectangular with the lower right corner (facing) cut at between 45 and 60 degrees, and six or seven pipes are shown on each instrument. It has been suggested, in connection with the small Alesia *syrinx*, that it may have been a child's toy, but this seems unlikely since boxwood is rare and was usually used for luxury goods. In fact all surviving panpipes of Roman date are apparently quite small. It has also been suggested by Reinach<sup>20</sup> that the Alesia *syrinx* was a special type of Gallo-Roman panpipe with a possible wider distribution in the Celtic world. This is supported by the fact that this type does not seem to appear in Roman art in Italy or in the eastern Mediterranean, as Dr Wardle has shown, while the Barbing-Kreuzhof instrument demonstrates its existence in a northern frontier province<sup>21</sup>, as does the London *syrinx*, given that the Roman dating is accepted.

Although the balance of evidence is at present strongly in favour of a 3rd to 4th century date, it

should be mentioned that, as no 4th to 9th-century boxwood panpipes have yet been identified, the possibility of a later date for the London *syrinx* cannot be ruled out entirely. Although the York panpipes are significantly different in decoration and pipe manufacture, they are nevertheless very similar in general form and, perhaps more importantly, in tuning, as Table 3 shows: indeed, both the Roman and medieval pipes show a remarkable consistency with modern tuning. This suggests that, even if classical empires rise and fall, some forms of music may have survived.

### Acknowledgements

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19. G. Lawson & W. Lawson *Sounds of the Roman World: music from archaeology* 2 (1986) 3; notes accompanying cassette by Archaeologica Musica APX 862.

20. Reinach *op cit* fn 16, 180.

21. Wardle *op cit* fn 17, 147.