MUSICAL INSTRUMENTS IN THE

ROMAN WORLD

Mary Angela Wardle

Thesis submitted for the degree of
Doctor of Philosophy in the
Faculty of Arts

Vol. 1

University of London
Institute of Archaeology

September 1981.
ABSTRACT OF THESIS

Recent studies have clearly shown that the musical life of the Romans was active and varied. This work is a survey of the musical instruments played in the Roman world, broadly defined as the Empire at its greatest extent. The instruments, classified generally as wind (woodwind), the organ, brass strings and percussion, including drums, are studied individually. The history of each instrument is traced together with its form structure and development. Playing techniques are examined where relevant and the musical role of the instrument assessed. A descriptive catalogue gives details of surviving instruments and a selective list of pictorial representations, although comprehensive lists have been attempted for instruments which are infrequently illustrated.

Material, which includes relevant literary and epigraphic evidence, has been gathered from as wide a sphere as possible in an attempt to assess the extent of regional variations and developments until the fourth and fifth centuries AD. Interpretation of the monumental record however presents a considerable problem as the distribution and popularity of particular art forms are often reflected more clearly than is the presence of a particular instrument. Similarly, the archaeological record is very scanty and one has to rely perhaps too heavily on a small number of surviving fragments that may not be typical. Despite this, however, besides providing information about the instruments themselves, the survey gives some idea of the musical activity within the Roman world and of the many influences that contributed to that activity.
## TABLE OF CONTENTS

### VOL. I.

| Abstract of Thesis               | 2 |
| Table of Contents                | 3 |
| List of figures in the text      | 7 |
| Index of Plates                  | 9 |
| Introduction                     | 12 |

### Part I Wind Instruments

- Ch.1 General Classification and Acoustics...
- Ch.2. The Tibia
  - The History of the Aulos and Tibia...
  - The Pipes in Etruria...
  - The Tibia in Roman Life...
  - The Structure of the Tibia:...
    - Materials...
    - Fingerholes and Keywork...
    - The Reed...
    - Holmos and Hypholmion...
  - The Capistrum...
- Double Piping Technique...
- Types of Tibiae...
- The Phrygian Pipe...
- Notes...
- Ch.3. The Single Pipe...
- Notes...
- Ch.4. The Transverse Flute...
- Notes...
- Ch.5. Panpipes...
- Notes...
Ch. 6. Simple Pipes and Whistles

Notes

Ch. 7. The Bagpipe

Notes

PART II. The Organ

Ch. 8. History of the Organ

The Mechanism of the Hydraulic Organ

The Bellows Organ

Notes

PART III. Brass Instruments

Ch. 9. Historical Summary

Ch. 10 The Tuba

Ch. 11 The Cornu

Ch. 12 The Lituus

Ch. 13 The Bucina

Notes to Chapters 9-13

PART IV. Stringed Instruments

Ch. 14 The Lyre

Ch. 15 The Cithara

The Plectrum

Playing Techniques

The Role of the Lyre and Cithara

Notes to Chapters 14, 15.

Ch. 16 The Harp

Notes

Ch. 17 The Lute

Notes
PART V Instruments of Percussion

Ch. 18 Cymbals
  Notes
  330
  335

Ch. 19 Clappers
  Notes
  337
  342

Ch. 20 The Scabellum
  Notes
  344
  348

Ch. 21 Bells
  Notes
  354
  357

Ch. 22 Tuned Metal Bowls
  359

Ch. 23 The Sistrum
  363

Ch. 24 The Rattle - crepitaculum
  367

Ch. 25 The Drum
  Notes
  369
  375
<table>
<thead>
<tr>
<th>CATALOGUE</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surviving Pipes</td>
<td>3</td>
</tr>
<tr>
<td>Representations of the Tibia</td>
<td>17</td>
</tr>
<tr>
<td>The Single Pipe</td>
<td>35</td>
</tr>
<tr>
<td>The Flute</td>
<td>36</td>
</tr>
<tr>
<td>Panpipes</td>
<td>41</td>
</tr>
<tr>
<td>Bagpipes</td>
<td>52</td>
</tr>
<tr>
<td>Organs – Hydraulic</td>
<td>55</td>
</tr>
<tr>
<td>Bellows</td>
<td>72</td>
</tr>
<tr>
<td>Brass Instruments</td>
<td>78</td>
</tr>
<tr>
<td>Lyres</td>
<td>100</td>
</tr>
<tr>
<td>Citharases</td>
<td>110</td>
</tr>
<tr>
<td>Lutes</td>
<td>119</td>
</tr>
<tr>
<td>Cymbals</td>
<td>133</td>
</tr>
<tr>
<td>Clappers</td>
<td>138</td>
</tr>
<tr>
<td>The Scabellum</td>
<td>142</td>
</tr>
<tr>
<td>Bells</td>
<td>147</td>
</tr>
<tr>
<td>Metal bowls used as chimes</td>
<td>152</td>
</tr>
<tr>
<td>The sistrum</td>
<td>153</td>
</tr>
<tr>
<td>Rattles</td>
<td>154</td>
</tr>
<tr>
<td>Drums</td>
<td>155</td>
</tr>
<tr>
<td>Abbreviations used in text</td>
<td>161</td>
</tr>
<tr>
<td>Select bibliography of ancient authors</td>
<td>163</td>
</tr>
<tr>
<td>Bibliography</td>
<td>165</td>
</tr>
<tr>
<td>Plates</td>
<td>179</td>
</tr>
<tr>
<td>Index of Plates</td>
<td>239</td>
</tr>
<tr>
<td>Fig</td>
<td>Description</td>
</tr>
<tr>
<td>-----</td>
<td>----------------------------------------------</td>
</tr>
<tr>
<td>1.</td>
<td>Tibia No.18. Phrygian Pipes, Rome</td>
</tr>
<tr>
<td>2.</td>
<td>Tibia No.19. Phrygian Pipes, Naples</td>
</tr>
<tr>
<td>3.</td>
<td>Tibia No.20. Phrygian Pipes, Rome</td>
</tr>
<tr>
<td>4.</td>
<td>Tibia No.25. Intaglio, Chichester</td>
</tr>
<tr>
<td>5.</td>
<td>Reeds, Brussels</td>
</tr>
<tr>
<td>6.</td>
<td>Single Reed – diagram</td>
</tr>
<tr>
<td>7.</td>
<td>Flute No.7. Sarcophagus, Rome</td>
</tr>
<tr>
<td>8.</td>
<td>Flute No.8. Sarcophagus, Dresden</td>
</tr>
<tr>
<td>9.</td>
<td>Panpipes Nos 1 and 2.</td>
</tr>
<tr>
<td>10.</td>
<td>Panpipes No.4. Bronze Object, Camerton</td>
</tr>
<tr>
<td>11.</td>
<td>Bone Pipe, Nicopolis, Greece</td>
</tr>
<tr>
<td>12.</td>
<td>Bagpipe No.1. Figurine, Alexandria</td>
</tr>
<tr>
<td>13.</td>
<td>The mechanism of a simple organ</td>
</tr>
<tr>
<td>15.</td>
<td>Brass No.45. Lituus, Bonn</td>
</tr>
<tr>
<td>16.</td>
<td>Lyre No. 7. Seville</td>
</tr>
<tr>
<td>17.</td>
<td>Cithera No.16. Hamah, Syria</td>
</tr>
<tr>
<td>18.</td>
<td>Lute No.6. Paris</td>
</tr>
<tr>
<td>19.</td>
<td>Lute No.23. Arles</td>
</tr>
<tr>
<td>20.</td>
<td>Lute No.18. Rome</td>
</tr>
<tr>
<td>22.</td>
<td>Lute No.17. Rome</td>
</tr>
<tr>
<td>23.</td>
<td>Lute No.23. Arles – diagram</td>
</tr>
<tr>
<td>24.</td>
<td>Lute No.32. Rome</td>
</tr>
<tr>
<td>Fig</td>
<td>Object Description</td>
</tr>
<tr>
<td>-----</td>
<td>--------------------</td>
</tr>
<tr>
<td>25.</td>
<td>Lute No.31. Rome</td>
</tr>
<tr>
<td>26.</td>
<td>Lute No.33. Paris</td>
</tr>
<tr>
<td>27.</td>
<td>Lute No.34. Agrigento</td>
</tr>
<tr>
<td>29.</td>
<td>Scabellum No.3. Florence</td>
</tr>
<tr>
<td>30.</td>
<td>Scabellum No.1. Rome</td>
</tr>
<tr>
<td>31.</td>
<td>Scabellum No.7. Hama</td>
</tr>
<tr>
<td>32.</td>
<td>Bells Nos. 1, 2, 3 and 4</td>
</tr>
<tr>
<td>33.</td>
<td>Bells Nos. 5 and 6</td>
</tr>
<tr>
<td>34.</td>
<td>Bells Nos. 7 and 11</td>
</tr>
<tr>
<td>35.</td>
<td>Bells Nos. 9 and 10</td>
</tr>
<tr>
<td>36.</td>
<td>Bells Nos. 12 and 13</td>
</tr>
<tr>
<td>37.</td>
<td>Bell No.14.</td>
</tr>
<tr>
<td>38.</td>
<td>Sistrum No.1.</td>
</tr>
<tr>
<td>39.</td>
<td>Sistrum No.2.</td>
</tr>
</tbody>
</table>
INDEX OF PLATES

PLATE

1. Surviving Pipes No.1. Pompeii
2. Surviving Pipes No.2. Pompeii
3. Surviving Pipes No.3. The Maenad Pipes
4. Surviving Pipes No.8. The Elgin Pipes
5. Tibia No.2. Lyre No.1. Tarquinia
6. Tibia No.8. Altar relief, Rome
7. Tibia No.10. Brass No.20. Amiernum relief
8. Tibia No.11. Lyre No.11. Rome
11. Tibia No.15. Bass relief, Pompeii
12. Tibia No.16. Drums 9, Paris
15. Tibia No.23. Cithara No.12., sarcophagus, Rome
16. Tibia No.23. Detail
17. Tibia No.27. Lyre No.2., Ash Chest, British Museum
18. Bacchic sarcophagus, Rome
19. Tibia No.34. Cithara No.12, British Museum
20. Tibia No.34. Detail
21. Statue of Midas, British Museum
22. Flute No.2. Perugia
23. Flute No.5. Mosaic, Corinth
24. Flute No.6. Altar of Amemptus
25. Panpipe No.5. Shakenoak
26. Panpipe No.5. Shakenoak
27. Panpipe No.6. Cologne
28. Panpipe No.10. Dionysus mosaic, Cologne
29. Panpipe No.10. Clappers No.6. Drums No.8., Rome
30. Panpipe No.10. Detail
31. Panpipe No.15. Satyr, Naples
32. Panpipe No.15. Detail
33. Panpipe No.16. Tomb of Publicius, Cologne
34. Panpipe No.23. Mildenhall platter
36. Panpipes - relief from Ravenna
37. Panpipes, ash chest, Museo Archeologico Ravenna, No.208.
38. Organ No.1. Brass No.33 Nennig - mosaic
40. Organ No.3. Brass No.12. - mosaic, Zliten
41. Organ No.16. Figurine, Carthage BM
42. Organ No.16.
43. Organ No.19. Figurine, Paris
44. Organ No.23. sarcophagus, Arles
45. Organ No.24. graffito, Rome
46. Organ No.34. Obelisk of Theodosius, Istanbul
47. Organ No.35. Obelisk of Theodosius, Istanbul
48. Brass No.16. Andes tombstone, Mainz
49. Brass No.16 Andes detail, Mainz
50. Brass No.34. Cornu, Pompeii.
51. Brass No.36. Mouthpiece, British Museum
52. Brass No.36. Mouthpieces, British Museum
53. Brass No.49. Madrid
54. Campanian Bronze figurine with salpinx, British Museum
55. Brass No.50. Tombstone of Surue, Istanbul
56. Brass No.50. detail
57. Lyre No.3. Painting, Pompeii, Villa of the Mysteries
58. Lyre No.4. Painting, Pompeii
59. Lyre No.6. Relief, Istanbul
60. Lyre No.9. Orpheus mosaic, Sparta
61. Lyre No.8. Altar of Ahenobarbus
62. Lyre No.10. Statue of Mercury, Merida
63. Lyre No.13. Mosaic of the Muses, Trier
64. Lyre No.17. Corbridge Lainx, British Museum
65. Lyre No.18. Mosaic, Piazza Armerina
66. Cithara No.1. Apollo, House of Vetii, Pompeii
67. Cithara No.4. Sarcophagus, Istanbul
68. Cithara No.6. Apollo Citharoedus, Istanbul
69. Cithara No.6. Detail
70. Cithara No.7. Apollo, citharoedus, British Museum
71. Cithara No.7. Detail
72. Cithara No.8. Apollo, Rome
73. Cithara No.9. Reconstruction, Brussels
74. Cithara No.10. Sarcophagus, Paris
75. Cithara No.11. (Tibia No.34) Sarcophagus, British Museum
76. Cithara No.12. (Tibia 23) Sarcophagus, Rome
77. Cithara No.12. Detail
79. Cithara No.15. Lute, No.23. Arles
80. Lute No.2. Eros figurine, British Museum
81. Lute No.4. figurine, British Museum
83. Lute No.29. Merida
84. Lute No.35. Relief, Paris
85. Lute No.36. Sarcophagus, Ravenna
86. Cymbals No.2. British Museum
87. Cymbals No.1. Sistra Nos 1–3, Naples
88. Cymbals No.1. Naples
89. Instruments in Bacchic thiasos, Oceanus dish, Mildenhall Treasure
   British Museum
91. Clappers No.5. British Museum
92. Clappers No.7. Mosaic, Trier
93. Clappers No.7. Mosaic, Trier
94. Clappers No.8. Mosaic, Carthage, British Museum
95. Bells No.3, 10. British Museum
96. Bell No.5, 8. British Museum
97. Bell No.6. British Museum
98. Tulip-shaped bells, British Museum
99. Tulip-shaped bells, British Museum
100. Bell, R.G.M. Cologne No.4129
101. Bells, Cologne
102. Bells, Cologne
103. Bells, Cologne
104. Bells, Cologne
105. Sistrum Nos.1–3 Naples.
106. Sistrum. Mosaic, Trier
ACKNOWLEDGEMENTS

I should like to express my thanks to all who have helped me in the production of this work - to my supervisor Mark Hassall and staff of the Institute, to Dr. John Landels for initial advice and encouragement, and for the kindness shown to me by the authorities at the British Schools of Athens and Rome and by the staff of many museums. A generous grant from the Central Research Fund made possible travel to many places that I would not otherwise have been able to visit. Finally I should like to thank my typist Margaret Webb and above all my family for their patient support.
Introduction

The musical life of the Romans, as has been clearly demonstrated by a number of recent studies, notably those of Gunther Wille (1963, 1967, 1977) and Gunter Fleischhauer (1964), was lively and varied. The theory of music and much of its practice may have been adopted from Greece but the Romans, as a race, can now no longer be accused of being unmusical.

Ancient musical instruments have been the subject of general studies such as those of Curt Sachs and Friedrich Behn and more recent research has centred on specific instruments, mostly Greek. Earlier studies too tended to concentrate on the Greek evidence.

It was felt that a survey of the instruments played in the Roman world, defined broadly as the Empire at its greatest extent, would be of use. Accordingly I have traced the history of each instrument and described form and structure, together with the technique of playing and its role. I have attempted to trace any developments in structure, technique and usage throughout the Roman period until the fourth and fifth centuries AD.

Archaeological material has been drawn from as wide a sphere as possible, although the monumental evidence is inevitably weighted towards Italy. The descriptive catalogue lists archaeological evidence in the form of any surviving instruments and selected representation. Pipes for example are so frequently depicted that only a representative sample can be given, but for less common instruments, such as the organ, I have summarised all the available iconographic evidence.

The interpretation of the monumental record presents problems. Some instruments are apparently seen more frequently in specific areas or at certain times, but this may have more to do with the distribution of an art form than with the popularity or distribution of a particular instrument. For example, similar sarcophagi found in different provinces
might prove to have come from the same Italian or Eastern Mediterranean workshop, or to have been made by workman trained in the same school, and the interpretation of the often symbolic instruments seen in such context is difficult. 'Copybook' designs abound on mosaics but it is sometimes profitable to note how a native or an unskilled craftsman has misrepresented an (often traditional) instrument. Artists are not musicologists and were not attempting to provide a pictorial record of instruments. One can assume however that in most cases they would have portrayed a recognisable instrument, although many of the clearest representations of 'Roman' instruments are seen on paintings, sculpture and mosaics derived from Hellenistic or earlier originals. In a study of instruments used in the Roman Empire one has obviously to rely heavily on earlier Greek evidence but in the development of music as in other artistic fields, many traditions contributed. Most of the instruments were adopted from Greece as was music theory, but music is not a static art form and both it and the instruments were subject to change and development. The Romans themselves acknowledged their debt to Etnuria, particularly in their playing of brass instruments and invading armies and other contacts brought back new instruments and influences from the east.

The selection and evaluation of literary evidence should also be considered. Ancient writers on music are generally concerned with music theory rather than with technical descriptions of instruments. Authors writing in the Roman period, such as Aristides Quintilianus or Alypius, often given valuable information about earlier Greek theory, but give little direct evidence about the music of their day. Compilations, such as that of Athenaeus in the third century AD often provide information about obsolete instruments which even he did not understand.

Theorists and other authors writing in Latin, such as Varro, Vitruvius, Augustine, Martianus Capella and Boethius are similarly generally unconcerned with the technicalities of instruments and instrumental technique or else assume their reader's knowledge of the
subject. One has to be cautious also in accepting poetic statements too literally, particularly when they describe the sound of an instrument.

Useful information about instruments and particularly about their usage is given incidentally and specifically in many works.

A survey of the instruments, and who played them, besides providing information about the instruments themselves gives some picture of musical activity in the Empire, although one probably cannot speak of a homogenous music of the 'Roman world'. The Empire was a mixture of peoples of differing cultural backgrounds and musical tradition. Certain instruments however were, or became, familiar in all provinces. The *tibia/aulos* and *lyre/cithara* were already known in areas of Greek colonisation and trade but they were taken to places outside this sphere. *Tibiae*, of a type, have been found near Nijmegen and they and other classical instruments are clearly represented in Roman art in all areas. Pipes were played in the official worship of Rome and the towns of the Empire employed pipes for the same purpose.
In arranging the material I have not followed the Hornbostel/Sachs classification (1961) according to which the instruments of percussion, idiophones should be placed first and strings, chordophones last. I have chosen to discuss wind instruments of all types first. They hold a more important place and discussion of their role presents a fuller picture of Roman musical activity than do the instruments of percussion.

Catalogue numbers in the text refer to the instrument under discussion in that chapter unless otherwise stated.

When giving the pitch of a note I have followed the convention that middle C is 0', making the octave above C", c"; the one below, C.
NOTES

1. Bibliography for specific instruments is given in the relevant chapter.

2. Practically all such references can be found in All's monumental work *Musica Romane*, 1967.

3. Nijmegen (Mook) Tibiae (Surviving Pipes No.7)
   Suovetaurilia Scotland - scene on a distance slab from Bridgeness at the eastern end of the Antonine Wall - Mid second century AD. Toynbee, 1962, No 97, pl.102.
Wind Instruments

All wind instruments, or aerophones consist of a resonator, a column of air which is enclosed in a tube, and a generator, which makes the air vibrate to produce a note, its pitch being dependent upon the length of the air column. Wind instruments are classified according to their generators which are of three types, reed, as in oboes and clarinets, lip reed, as in brass instruments, and free air reeds which are flutes.

In its simplest form a reed blown pipe is a length of reed either pinched at one end, or with a vibrating tongue cut from its body. The aulos and tibia belong to this family but reed and body were always separate components. In all cases the flow of air through the pipe is regulated by the reed mouthpiece which opens and closes as the player blows. As the pressure waves pass down the pipe the air column vibrates and a note is produced.

The principle for lip reed instruments is exactly the same but the place of the reed is taken by the player's lips, which are supported in a funnel or cup-shaped mouthpiece. The musician blows into the tube, allowing the lips to vibrate freely. Modern brass instruments are of this type and are the equivalent of the Roman tuba and cornu.

The third category, to which the flute belongs is the free air reed. The player's breath is directed on to the sharp edge of a mouthhole cut in the body of the pipe, the lips often being aided by an embouchure guide. As the breath strikes the edge, eddies of air known as edge tones are set up.
on each side. The speed at which these oscillate and consequently the pitch of the note is regulated by the vibration of the column of air in the tube. There are different types of flute, including for example the end blown flute, where the player blows down the whole tube, which is held vertically, and the side blown flute where the mouthpiece is cut into the side and the pipe is held transversely, like the modern orchestral instrument. Others are end blown but the breath is directed by means of a wooden block or fipple against the edge of a hole cut in the side. This is the fipple flute of which the modern recorder is an example. It was known in a simple form in prehistory but appears not to have been used in the music of Greece and Rome.

The pitch of all wind instruments is regulated by the length of the air column, which is altered by means of fingerholes bored along the tube. The effective length of a pipe stops at the first open hole, so the fewer the number of holes stopped at the top of a pipe, the shorter is the air column and the higher the pitch of a note. Different notes are also obtained on many instruments by cross fingering.

Certain general characteristics of pipes are important for the study of all wind instruments. One concerns the pitch of stopped pipes. When a pipe is 'stopped', that is closed at the end, it produces a note one octave lower than an open pipe of the same length. If the pipe is then bored with fingerholes which are left open it acts as an open pipe, as the effective resonant length stops at the first open hole, which effectively cuts the tube off at this point. However any reed pipe with a cylindrical bore will act as a closed
pipe, irrespective of the type of reed used, or the existence of fingerholes. For pipes with conical bores the type of reed used, i.e. single or double is of more importance. The question of the type of reed and even more basically the type of bore has obvious relevance for the study of the tibia and these are discussed below.
Chapter 2
The Tibia

The pipe is perhaps the most ubiquitous instrument in the Roman world and its frequent appearance in the archaeological and literary record emphasises its importance in the music of the peoples of the Roman Empire. Pipes are shown in Roman art of all periods and the nature of the material from which they were made has ensured the survival of a sufficient number of instruments to tell us a considerable amount about their construction. Unfortunately all is not as simple as this might suggest. Many of the illustrations in various media, although showing the occasions upon which the pipes were played, are not sufficiently detailed to be of much value. Few illustrations are as useful as those of the aulos on Greek vase paintings, and even with these one has to take into account the possibilities of artistic licence, inaccuracy, and some degree of stylization. A large number of instruments appear on Roman sarcophagi, but these are often very stylized, and most of the more detailed Roman paintings are copies of Greek originals. While several of the surviving pipes are securely dated to the Roman period, many are fragmentary and pose as many questions as they solve. In addition these instruments cannot be truly representative of ancient pipes the majority of which were probably always made of perishable materials such as reed. Indeed the perishable nature and consequent non-survival of the reed mouthpiece is a major problem in the study of the aulos and tibia. This extremely fragile part of the instrument fundamentally affects its performance and while it is possible to make certain deductions about the nature of the reed, some questions are unanswerable.
Inevitably any study of the Roman *tibia* has to draw on evidence, particularly literary evidence, concerning the Greek *aulos*. Essentially it is the same instrument, although certain developments are apparent during the Hellenistic and Roman periods. There are some problems in assessing the value of written evidence. Many of the references to the instrument in Latin literature are poetical and are often vague in the extreme. Some of the accounts in the writings of musical theorists are unclear as many traditions were handed down incomplete from an earlier age and it is often difficult to decide to which period in musical history they refer.

Technical terms are frequently unexplained when authors assume their readers' knowledge of the subject, and with a musical theory so different from our own, the precise meanings of some important terms are still debated. These difficulties apply generally to the study of Greek and Roman music, but certain aspects are emphasised when specific questions are asked about a particular instrument.

Most studies of the instrument concentrate on the *aulos*. The most important literature includes the study by A.A. Howard, 'The Aulos or Tibia' (1893), in which he discusses four pipes from Pompeii, now in Naples, and others in the British Museum together with a considerable amount of literary evidence. Kathleen Schlesinger's 'Greek *Aulos*', (1939) is a detailed study of the behaviour of wind instruments of many kinds, but her interpretation of the Greek 'modes' and 'aulos scales' is based on an ingenious but highly controversial hypothesis. Briefly this maintains that the fingerholes on the *aulos* were always bored at equidistant intervals, although the distances between the holes varied from pipe to pipe, a practise which
apparently exists to-day in the manufacture of some primitive instruments. The scales, or modes, which had unequal intervals therefore varied according to the distance between the holes and the number of sections into which the pipe was divided. The theory is now generally discredited for various reasons and perhaps demonstrates the dangers of excessive reliance on comparative musicology. Pipes with equidistant fingerholes certainly exist but their existence cannot be taken as the starting point of a theory. However, if one suspects that a particular construction or technique was used it is encouraging to be able to point to its use in a similar situation, and to say that it was at least possible, always remembering that the circumstances of Graeco-Roman civilisation were unique.

Nicolas Bodley (1946) describes and discusses some auloi dating from the first century BC found at Meroe in the Sudan. He is also concerned with more general aspects of the instrument and follows Miss Schlesinger's theory which he describes briefly. It is, however, possible to argue with some of his conclusions and to suggest alternative reconstructions for some fragments. The matter is discussed in greater detail below.

There is an important article by Reinach in Daremberg and Saglio (sv. tibia), and numerous references to the tibia in G. Wille 'Musica Romana' (1967), although Dr. Wille is more concerned with the use of the instrument than with its construction. The instrument is well illustrated and briefly discussed by Fleischhauer (1964 : passim).

A most detailed work on the subject is the as yet unpublished doctoral thesis of J.G. Landels, (Hull 1961)
'Ancient Greek Instruments of the Woodwind Family'. This is chiefly about the classical Greek aulos, its history, development and its position in Greek life, but Dr. Landels also discusses other members of what we would call the woodwind family, single pipes, flutes, the syrinx etc. The same author has also written articles about surviving pipes and fragments, which are cited in the notes and bibliography.

The most recent account of the aulos by Heinz Becker (1966) raises interesting and often controversial points about various aspects of the instrument, particularly concerning the nature of the reed.

I shall summarise the history of the pipes, including the evidence from Greece, but will concentrate on its history and development in the Roman period. Inevitably there is considerable overlapping and the question must be raised as to whether there is any positive Roman influence on the development of the pipes or whether one is only discussing the natural development of the Greek aulos in the coincidental period of the Roman Republic and Empire. Certainly there was change in the form and use of the instrument after the fifth century BC, widespread changes that may not be due solely to the radical musical 'revolution' at the end of that century. Such developments must reflect alterations in musical style and practise, which it would be natural to expect over a period of several hundred years. Even if one insists that 'Roman' music was always Greek music, the Greeks of the Roman world were not those of fifth or even fourth century Athens and many influences were at work in the intervening centuries.
History of the Aulos and Tibia - Summary.

The aulos had an extremely long history in the Middle East and Eastern Mediterranean. Its introduction to Greece is shrouded in myth, but there is a persistent tradition upheld by both Greek and Roman authors that it came originally from the east. This is quite feasible as pairs of pipes (or geminated pipes), presumably reed blown, appear throughout the Middle East in the civilisations of Mesopotamia, Syria and Egypt. It is likely that the pipes came to Greece from several sources, each of which might have had a characteristic style and the idea of different styles of music coming from different places seems to have been preserved in the naming of the harmonia of classical Greek music. The various myths about Olympos, Marsyas and Athena may represent stages in this historical development, the contest between Marsyas and Athena, perhaps as Dr. Landels suggests, preserving the memory of a struggle between rival cults. The aulos was associated with religious cults, including the more exotic ones from very early times, an association that was later continued in all forms of religious ceremony in Rome.

The aulos in a recognisable form and under that name, which means literally a tube or pipe, was established in Greece by the eighth century BC and possibly earlier. It was a popular instrument throughout the heyday of Greek civilisation and was played on many and varied occasions. There were contests for aulos players, auletes, at the great games and festivals held in honour of the gods. At such music festivals there were categories for the solo aulos, or the aulos accompanying the voice, the nomos auletikos and
the nomos aulodikos. Aulos music naturally accompanied dramatic and choral works in which the elements of poetry music and dance were combined, the pipes often taking a subordinate role. Pipe music also accompanied the events of the pentathlon in Olympia and it was also used to assist some forms of work, helping for example to keep rowers in time on board ship. The Spartans had pipers to encourage the troops and keep them in step on the march but they seem to have been the only Greeks to have done this. In religious celebrations the aulos became especially associated with the ritual of the cults of Dionysos and Cybele.

In daily life pipes were played at family festivals and ceremonies such as weddings and funerals, and at dinner parties and symposia, on the latter occasions usually by hetairae. Tuition on the pipes was not universal as, for various reasons, the lyre was preferred as the instrument for a gentleman's education, some musical skill being an essential requirement for an educated man.

There was some philosophical prejudice against the aulos, largely on account of its associations with orgiastic cults and the somewhat disreputable or doubtful reputations of many professional players, factors which only strengthen the impression of its popularity among people in general. The great virtuoso musicians were of course exceptions and were highly honoured. Plato, a conservative, writing at a time of musical change and experimentation, objected to the aulos as a polyharmonic instrument, on which it was possible to play in many styles or harmonia, at a time when the ethical effect of music was considered important.
The Pipes in Etruria

The aulos first appeared on the Italian mainland in the Greek cities of the south and in the area controlled by the Etruscans. Whatever opinion one holds as to the origins of Etruscan civilisation, one has to accept that at some stage, even if the Etruscan peoples did not migrate from the Near East, they were influenced by eastern culture, and the debt of the Etruscan cities to Greek civilisation is also manifest in many ways.

Consequently it is not surprising to discover that most Etruscan musical instruments are identical to those of the Greeks, as for example the lyre, pipes and castanets and their musical traditions are likely to have been drawn from the same eastern sources. There is however a difference in emphasis, particularly in the Etruscan use of 'brass' instruments. As skilled metal workers their bronze trumpets were famous in Greece and their love of trumpets and horns passed to the Romans.

We are particularly concerned here with the tibia, the importance of which can be judged from the frequency of its appearance on Etruscan monuments and also from literary evidence. Ancient writers such as Athenaeus (IV,154a) attest the popularity of the double pipes in Etruria and there was an ancient tradition that the instrument was brought from Lydia by the Etruscans and was subsequently introduced to the Romans. The ancient acceptance of a Lydian origin for the Etruscans has long been questioned and direct importation of the instrument by migrating Etruscans seems most unlikely. However, in music, as in other intellectual and artistic fields, the Etruscans were
greatly influenced by the culture of the Greek cities of Asia Minor. Pallottino suggests plausibly that the Etruscans adopted the aspects of Greek music with which they had most cultural affinity, perhaps preferring the modes and systems described as Lydian and Phrygian. The matter can only be speculative but an examination of the pipes illustrated in Etruscan art may yield a little more information.

The Etruscan instrument, like the Greek aulos, was played as a pair of equal and divergent reed blown pipes, sometimes with the aid of a mouthband, as shown on a funerary relief from Chiusi, dating from the fifth century BC, (No.1). When the instrument is shown in more detail, as on the wall painting from the Tomba dei Leopardi, (No.2) where it is played with the lyre, the various components are clearly visible - the pipe itself, the reeds, which are held in the player's mouth, and perhaps the hypholmion and the holmos, sections near the mouthpiece which are known by their Greek names and which are described below. On this and on other detailed illustrations, each pipe terminates in a small flaring bell. There is some indication of this on the Chiusi relief, although it is not so clear. It would be interesting if it could be shown that this flaring end was a peculiarly Etruscan trait, or that it occurred only on a particular type of pipe. Although the specific names and forms of several pipes are known none has this particular feature and illustrations of pipes with bells are not confined to Etruscan art. A fragment of an Attic red figure vase showing an aulos with a small bell predates the Tarquinian painting by about ten years, but auloi of the same period also appear as
cylindrical pipes without bells. In fact there seems to be a greater proportion of bells on Etruscan pipes at a time when most Greek pipes were shown without, but there is insufficient evidence to conclude that it was a specific type of pipe of eastern origin. Acoustically a small bell would have little effect on the tone of the instrument and the bells illustrated are of insufficient size for the instruments to be classified as hornpipes.

Some Etruscan illustrations appear to show pipes with expanding or conical bores. If the existence of conical pipes could be proved it would be of considerable acoustic significance as the bore of a reed instrument affects the harmonic series and is of greater importance than the reed in determining the type of instrument. The pipes played in a wedding procession on the fragment of an urn from Chiusi appear to be conical, although this could be an illusion created by the portrayal of exaggeratedly flaring bells, (No. 3). The representations of pipes with the most obviously conical bores are all sculpted and in some cases, as for example a second century frieze showing Odysseus and the Sirens, in the Ashmolean Museum, the conical effect may be due to the difficulty of carving a cylindrical pipe. None of the instruments on this frieze is shown in any detail. Most Greek illustrations of the cylindrical aulos are on vase paintings, a medium which allows more scope for accurate draughtsmanship. Similarly paintings of the Etruscan pipes generally show cylindrical tubes with small bells. The bores of all surviving pipes, none of them Etruscan, are cylindrical. If conical pipes existed at this time, they could not have been made of the material mentioned most
frequently by Greek authors, namely reed. Alternative materials would be bone, ivory or metal, all of which are known to have been used for pipes at various times, (see below). The bell shown on many Etruscan pipes would also have been of a material other than reed, probably bone or ivory.

The contexts in which the Etruscan tibia was played are interesting in light of later Roman usage. It appears at funeral feasts, often in duet with the lyre, as seen in the painting from the Tomba dei Leopardi, and was presumably played also at the banquets of the living. The urn from Chiusi shows a piper leading a wedding procession and the pipes appear in scenes of sacrifice and in public processions, often with other instruments, such as the tuba and the lyre as seen on an urn in Florence. A sarcophagus from Caere shows it in procession with a lyre and cornu (horn). The tibia also had an important role in the dance, as indicated by the many illustrations. A sixth century black figure vase found in an Etruscan context at Vulci shows boxers fighting to the sound of the tibia, and the Etruscans' reputation for playing music to assist daily pursuits is demonstrated by the sight of a piper playing in a cooking scene from the Tomba Golini at Orvieto.
The Tibia in Roman Life

The double pipes were probably played more than any other instrument in the Roman world, in both public and private contexts. In public they are to the fore on ceremonial occasions, being especially important in religious worship. The earliest pipers to play in such ceremonies in Rome were traditionally Etruscans and the word subulo meaning a piper, derived from the Etruscan suplu is used by several Latin authors.\(^\text{13}\)

The importance of the music of the tibia at sacrifices is illustrated by a possibly apocryphal anecdote narrated by Livy, which relates to the year 312 or 313 BC. Apparently the tibicines, when forbidden to hold a feast in the temple of Jupiter, refused to work and left Rome for Tibur, leaving no one to pipe at official sacrifices and therefore holding up state business. They were returned to Rome after being tricked by the Tiburtines who made them drunk and carried them back insensible. Livy here makes a somewhat acid comment on the drinking habits of pipers in general, a prejudice that is found elsewhere in the works of Latin writers.\(^\text{15}\) Eventually the dispute was settled by negotiation which resulted in the restoration of the musicians' privileges and the establishment of the Lesser Quinquatrus on June 13th, a festival of the guild of pipers. There are numerous inscriptions which refer to this guild, the collegium tibicinum.\(^\text{16}\)

Tibicines were present at sacrifices such as that recorded by Cicero at the founding of the colony of Capua in 83 BC, and the music seems to have been so important a part of the ceremony, that if the piper stopped playing the
ritual was rendered invalid. It has been suggested that the music was necessary to drown any ill omened sounds and Pliny refers to a musician playing to prevent other words from being heard. 17

The state pipers were based at Rome, but each town also had its official musicians. The Lex Coloniae Genetivae Juliae, the municipal charter of Urso (Osuna) in Spain, includes tibicines among the men serving the duovirs and aediles in various capacities. They were employed to pipe at sacrifices, but probably also accompanied the magistrates on public and official appearances. They were among the lowest paid of the public servants, receiving 300 sesterces, the same rate as a copyist, while a lictor received 600, a personal servant 700 and a scribe 1200 sesterces. 18

Apart from references to the tibia in official state worship, there are numerous allusions to its place in the rites of other cults particularly the more orgiastic ones that became so popular in Rome. Other instruments are also mentioned by poets or portrayed in art but pipes of various types are predominant in the Bacchic thiasos and the rites of Cybele. 19

The literary accounts are well confirmed by the monumental evidence. Sacrifices are a common subject for relief sculpture and invariably have some form of musical accompaniment, usually played on tibiae. A few examples will suffice to demonstrate its role.
An Augustan altar from Bologna shows a togate and veiled priest at an altar accompanied by a tibicen, (No.4). In a more exalted context a tibicen is present at the suovetaurilia depicted on the Arch of Constantine in Rome, in the series of reliefs which show Marcus Aurelius celebrating his victories over the Germans and Sarmatians in AD 176, (No.5). A relief in the Palazzo dei Conservatori shows the same Emperor making another sacrifice, (No.6). The sculpture is damaged but it is certain that the figure to the right of the altar should be playing the usual double tibiae and not a single conical pipe as is now restored. In a similar fashion Trajan is shown sacrificing at the Danube, (No.7) and yet another scene of public worship appears on an altar in Rome depicting a sacrifice conducted by the viocomagistri, (No.8, 9). In all cases the tibicen stands behind the altar and is obviously playing during the ceremony. The piper on the Roman altar would undoubtedly belong to the collegium tibicinum Romanorum.

Pipes were also played at private religious ceremonies. A wall painting from a lararium in Pompeii shows the Genus familiaris holding a patera over an altar, while opposite him a musician plays the Phrygian pipes and beats time with a scabellum. A slave brings forward a pig for sacrifice and the group is flanked by two household Lares, (No.9).

More personal celebrations and ceremonies, such as weddings and funerals were also performed to the accompaniment of the pipes. According to Cicero laws regulating the conduct of funerals restricted the number of pipers who accompanied the mourning songs to ten.20
Pipers taking part in a funeral procession can be seen on a relief of the late first century BC from Amaturnum, (No. 10), The tibicines walk in front of the bier and are also accompanied by players of the horn and lituus. There are other examples of the tibia in funerary contexts and it also features prominently in the symbolic mythological scenes which are frequently seen on sarcophagi of imperial date, (No. 11), pl. 6).

It is also included in other mythological scenes, often carried by the Muse Euterpe, as on the Monnus mosaic from Trier and on a fourth century octagonal mosaic depicting the Muses from Arroniz (Navarra), now in Madrid, (Nos. 12, 13). In both examples Euterpe is instructing the legendary musician Hyagnis.

In daily life the music of the tibia was also heard in the theatre, at public or private recitals, in the street and in the home. It is known that plays, and in particular the comedies of Plautus and Terence had specially composed musical accompaniments, although the precise nature of this music, whether it was entirely Greek in style, or whether it combined traditional Roman elements, is a controversial question. The didascaliae and Donatus' commentaries to the plays of Terence record that the composer of the music was Flaccus, the slave of Claudius, and that it was performed on tibiae, the type of tibia being indicated in each case. 22

There are some famous illustrations of the tibia in the theatre, as for example the mosaic panel showing the rehearsal of a Greek Satyr play from the House of the Tragic Poet in Pompeii, (No. 14, pl. 10). The richly dressed
musician plays a pair of double pipes which are particularly long, while two actors practice dance steps. Another scene from New Comedy taken from an original Greek painting and reproduced at Pompeii and at Stabiae as a mosaic and a wall painting, shows a group of street musicians, a woman (tibicina) with double pipes, and two male dancers, one clashing cymbals, the other beating a frame drum. The group is completed by a dwarf. A tibicina appears in a comic scene in bas-relief also from Pompeii, dating from the end of the second century BC, (No.15, Pl.11).

A travelling musician from another part of the Roman world can be seen on a terracotta statuette from Syria, now in the Louvre, (No.16) Pl.12. The piper and her companion, who plays a drum, are riding a camel and may be two of the famous Syrian ambubiae.24

Music festivals, such as that organised by Domitian in honour of Jupiter Capitolinus, continued to attract virtuoso musicians.25 A sedate concert scene appears on a wall painting from Herculaneum, showing a duet between tibia and cithara, (No.17), while a larger group of female musicians appears on a third century mosaic from Mariamin in Syria. In this example the tibia is played with the organ, cithara and percussion instruments, (Organs No.36).
The Structure of the Tibia.

The development of Roman wind instruments was influenced in several ways, by the Greek and Etruscan aulos and by pipes from the Near East with, for example, the introduction of the Phrygian pipes in the third century BC. I shall not attempt to give a detailed analysis of the early development of the Greek aulos which is discussed in some of the works already cited, but any description of the tibia and explanation of the nature and function of its component parts will necessitate reference to earlier instruments.

There are various archaeological sources of information about the tibia which it is convenient to summarise here. Additional bibliography and precise measurements, where available, are given in the catalogue.

Roman period.

1.) Four pipes from Pompeii, found in 1867, and described by Howard (1893). They are housed in Naples Museum, inv. nos. 76891 - 4. They are all of different sizes and may be from an instrument maker's workshop.

There are several more pipes from various areas of Pompeii which are also stored in Naples Museum, some of them on display. They are of similar construction to the four pipes described by Howard, but as they are mostly in poor condition it was not possible to make a detailed examination. Pl.1,2.

2.) Fragments of auloi from a tomb at Heraclea in the Sudan, outside the boundaries of the Empire, believed to date from the late first century BC, are described by Bodley, (1946). It has not been possible to reconstruct a complete instrument from the numerous fragments, but they are very informative
about the structure of pipes and raise several interesting problems. It should be noted that Bodley accepted Schlesinger's theories about aulos scales and the nature of the reed and based his reconstructions on these principles, which cannot now be accepted.

Additional fragments from the same area are described by Southgate, (1915, 12-21).

3.) The 'Maenad Pipes', apparently found in Italy, and formerly in the Castellani Collection and now in the British Museum, (84-4-9.5 and 6). The pipes are made of wood and bronze but are unusual in that each has a raised and inclined hole decorated with the bust of a Maenad, near its upper end. The instruments are discussed at length in the chapter concerning the transverse flute and the 'plagiaulos'. Pl. 3

4.) Fragments of bronze tibiae in the Museo Diocesano, Cortona. The best examples are Nos. 1497, 1 and 3. Some similar fragments are not numbered. No instrument is complete and the date and exact provenance are unknown.

5.) Instruments in the Antiquarium Forense, Rome including four fragments from the Pozzo Republicana, Inv. no. 1663, and a bone pipe, which is burnt, from the Bagni di Nerone - 13cm.

6.) Fragments of pipes in Damascus, published in Les Annales Archeologiques Arabes Syriennes, 1972, XXII, Pl. 31. These are of bone and ivory encased in bronze.
7.) Tibiae from Nook. Two pipes, made from the bones of a griffon vulture are discussed by Rimmer, (1976, 42-46). The pipes are 25.5 and 26 cm in length and each has six frontal fingerholes, similarly spaced. They are apparently a pair and the wear marks on each pipe are different. 26

In addition the following auloi of earlier date are of considerable importance:

8.) The 'Elgin Auloi', British Museum. This pair of pipes dating between the fourth and first centuries BC, was found in a tomb near Athens and formed part of the Elgin Collection. They are made of sycamore wood and measure 35 and 31.2 cm., in length. Each has five fingerholes and a dorsal thumbhole and while the bores are very slightly conical they act as cylindrical pipes and overblow the twelfth harmonic. Pl. 4

9.) The 'Reading Aulos' of unknown provenance, described by J.G. Landels, (1968, p.231) dated as not earlier than the fourth century BC. Dr. Landels sees the structure of this instrument as a transitional stage between simple bone or wooden auloi and the complex Pompeian pipes.


11.) Aulos fragments from different contexts in the Athenian Agora, dating between the fifth and first centuries BC, published by Dr. Landels, (1964, p.392).
12.) Bone aulos fragments of various dates between the fifth and first centuries BC from Corinth, now stored in Corinth Archaeological Museum. The best examples are MF 9045, MF 9229 and MF 11555.

13.) Bone aulos fragments from Lindos, published by C. Blinkenberg, 1931, 154 ff. Inv Nos. 448-451 and 453-454. Some sections of these pipes are well preserved but no complete instrument has been restored.

Similar bone fragments have been found at numerous sites in Greece and Asia Minor. In 'Perachora' (Oxford 1962) T.J. Dunbabin lists several examples.

This list of instruments does not claim to be exhaustive, but includes those which, however unsatisfactorily, offer most information. Contemporary illustrative material is referred to in the text, and is listed in the catalogue under 'Representations of Tibiae'.
Materials.

In its simplest form a reed pipe can be made from a single length of reed which is either pinched together at the top, or has a vibrating tongue cut in the tube near the top. Vergil may use the word *avena* to indicate such a pipe, made of oatstraw although elsewhere the word apparently means 'syrinx'. Such pipes, known technically as idioglots, may well have survived as folk instruments as they do to-day, but always had the disadvantage that when the vibrating reed wore out, the entire pipe had to be discarded. This problem was solved for the aulos by making the reed, the generator, separate from the body of the pipe and from these simple beginnings the instrument developed into a complex structure.

Surviving fragments show that pipes of the Roman period could be made of bone, ivory or wood, with an outer casing of bronze. Instruments from Meroe, Cortona and the Maenad pipes are constructed from these materials and the Pompeian pipes have inner tubes of bone, with some sections made from ivory, bronze casing and in some cases silver fittings. These materials, which are of course those most likely to survive, are all mentioned by ancient authors. Vergil and Athenaeus both mention ivory while Horace refers to the use of metal, *(orichalco vincita - AP 202)*, literally 'brass', although this may be for 'keywork' rather than the body of the pipe.

Ancient sources also mention bone, a material which is suggested by the actual Latin word for the pipe, *tibia*. However, all the prehistoric bone pipes that have been found are flutes of various kinds and bone is not the natural material for a reed blown instrument. Athenaeus (IV 182 E) quoting
Juba and Pollux (IV 75) record the tradition that pipes made from deer bone were invented by the Thebans but it is unlikely that any reed blown pipe made from such material would, without skilled manufacture, act like the classical aulos or tibia because of the natural taper of the bone. Athenaeus uses the word aulos, but it is possible that the Theban instrument was some other type of pipe, perhaps a flute. 29

With advances in technology that made it possible to fit short sections of bone together with airtight joints, at the same time eliminating the natural irregularities of the bore, the advantages of the material are apparent. Bone is far more durable than reed and was widely available, in some places more so than suitable wood. It was also a cheaper material than ivory which although, with the expansion of trade routes in Hellenistic and Roman times was more widely available in the west, would always have been expensive. Expense would often have been a minor consideration, but for every Ismenias who could afford to pay a vast sum, there must have been hundreds of more humble performers who merely required a tolerably reliable instrument. 29 Bone auloi, made of several short sections jointed together are relatively common in Greece, with examples from many sites, including Athens, Sparta and Corinth. Bone is used for the inner tubes of the Pompeian pipes and there is a bone pipe in the Antiquarium Forense in Rome, which may be of Roman date. 30 When pipes are made of bone with a casing of bronze, the joints in the sections of bone and bronze are staggered to give greater strength.
Natural unjointed bird bone was also used for pipes, but complete examples are rare. The pair of tibiae from Mook in the Netherlands, (No.7), which are of Roman date are made from the elbow bone of a griffon vulture. Bird bone pipes of various dates are found throughout Europe, the Avar pipes from Hungary, which date from the eighth century AD, being among the most famous. Such pipes are difficult to date unless found in a stratified context. One from the Wallbrook site at the Bank of England now in the Museum of London which has three fingerholes and a vent hole is apparently of Roman date, while a very similar pipe said to be of mediaeval date is in the same museum. Not all such pipes are reed blown and in some cases the mouthpiece is too badly damaged for a positive identification of the nature of the generator. This is the problem with a pipe from Dura Europus in Syria, on the other side of the empire, which is made from the polished femur of a shore bird. The use of bird bone for pipes was recorded in antiquity - Pollux states that the Scythians played on such instruments.32

It is likely that in the Roman period pipes were still sometimes made from materials described in connection with earlier instruments. In districts where suitable reed was available it is natural to suppose that the bodies of simple tibiae would still have been made of this perishable material. The ἀλόμοσ mentioned by Greek authors is apparently the reed 'Arundo donax' which is still used for the generators of modern woodwind instruments. As has been seen Vergil may refer to the early idioglot reed pipe while Athenaeus (182D) records a reed pipe called the Tityrine (τῖτυρινος) by the Doriens of Italy, drawing on Artemidorus a follower
of Aristophanes for his information. The existence of the simple reed pipe was at least remembered and recorded in Roman times and undoubtedly still existed in some parts of the Empire.\textsuperscript{33}

Athenaeus and others also discuss the 'lotus', a hollow stemmed plant from North Africa (Libya), which was used particularly by the Alexandrians. Pollux (IV, 71) lists all the names of the different types of reed and also the other materials including horn, which was however, probably only regularly used for the bell of the Phrygian aulos. Another material which one would expect to find in use, and not only for the lining of metal pipes, such as the Maenad pipes, is wood. Chance has preserved only one set of wooden pipes from classical antiquity, the so called Elgin Auloi, which are made of sycamore. They can hardly have been unique.\textsuperscript{34}

Boxwood is mentioned frequently in connection with the tibia and the syrinx, and a syrinx made of this wood has been preserved at Alesia. It is extremely interesting that this material has been singled out, as box was most important in the making of western woodwind instruments from mediaeval times until this century. It has now been superseded because of the scarcity of the best Turkish boxwood and the availability of tropical hardwoods. English box which has a very curly grain is less suitable.
Like the Greek aulos the tibia is usually shown with a cylindrical bore (cavernae), the apparent conicity of some sculpted instruments probably being due to artistic error. The more frequent occurrence of conical pipes in Etruscan illustrations has already been mentioned. The bores of all surviving Greek and Roman pipes are effectively cylindrical.

Apart from the distinctive Phrygian pipe, the tibia is usually shown without a bell. However among the fragments from Meroe, which date from the late first century BC are several bells. These are all made in the same way, of ivory or bone encased in bronze. The bore expands regularly externally, but is cylindrical internally, widening in a single step.

One of the fragments from the Athenian agora, found in a domestic deposit dating from the late first century BC or early first century AD, is similar. The bell is made of bone or ivory and the condition of the external surface suggests that it may have been covered in metal. However in this example the internal bore expands regularly from 1.85 to 2.9cm. Bells may have been more common on the more elaborate instruments seen from Hellenistic times but the archaeological evidence is too random and the iconographical evidence unhelpful on this point.
Fingerholes and Keywork

Fingerholes were bored along the length of the pipe with a drill. It is logical to suppose that the number of holes increased with the musical and technical demands made upon the instrument. Obviously on a simple pipe the greatest number of holes that can be covered by one hand is five, including the thumbhole, and illustrations often show the little finger supporting the pipe from underneath, and not covering a hole, (No.2). According to Varro, quoted by Acro in the scholion to Horace A.P 202, the early tibia had only four holes. The tradition is upheld by Pollux (IV,90) who credits the fifth century musician Diodorus of Thebes, with increasing the number of holes from four. Of the surviving complete instruments, the Elgin pipes, which seem to be a pair, each have six holes, the lowest in each case being a vent hole, while the Reading aulos has four fingerholes and a thumbhole.

Placing the fingerholes accurately required skill, but it was known that pitch could be adjusted by altering the size of a hole.36

As pipes increased in size and complexity it became possible by increasing the number of holes to obtain a greater tonal range and to play more than one 'scale' on each pipe. However as the fingers of each hand could stop a maximum of only five holes at one time, extra holes had to be closed mechanically. Archaeological evidence has demonstrated the existence of simple 'keywork' that could otherwise only have been guessed at from rather schematic illustrations and disputed texts. Such mechanism exists on the pipes from Pompeii, Meroe and on the 'Maenad' instruments and it appears on illustrations from the Hellenistic period onwards, but not
apparently earlier. It seems fitting that such developments should be made at this time when musical style became more elaborate and more was demanded of both the instrument and the performer at least at a virtuoso level.

'Keywork' is a convenient but somewhat inadequate term to apply to the mechanism on ancient instruments. Modern keywork, as on the flute or oboe, enables the player to open and close holes in any combination during performance to obtain an extended range of notes. Ancient mechanism meant that pipes could be made with a greater number of holes (tibia multifora), and that the holes in excess of the number that could be covered by the fingers were closed before the performance, thus enabling the player to select different scale patterns. This mechanism was simply an advance on the primitive method, which is still practised, of stopping unwanted holes with wax. The instrument was fitted with metal collars or sleeves, each perforated with a hole that corresponded to one in the body of the pipe. Each collar had a knob or lever soldered to it and could be rotated around the pipe so that the hole was open or shut. It seems most likely that the holes were pre-set before performance so that the number of notes available at one time would still have been limited but the total range was extended. However, performances by virtuoso performers were apparently impressive and it is quite possible that such a musician with a well constructed instrument might have been able to turn the sleeves while playing.

With such a system there are two possibilities as to the movement of the metal collars, either that they slid along the pipe, or turned around it. The latter seems more likely,
especially in view of the existence among the Meroe fragments of unperforated rings, apparently intended as spacers to prevent any movement up or down the pipe.\footnote{38}

The Meroe pipes are probably the earliest surviving instruments to include rotating collars in their construction. One fragment (Pl.III,3) is typical. It consists of a cylindrical ivory tube with a bore 1.00cm in diameter. A bronze sleeve fits over it and over this are two unperforated spacer bands, 0.35 and 1.00cm in width with a rotating sleeve, 3.7cm in length between them. The sleeve is pierced with a fingerhole and a knob is soldered to it. This 'three layer' construction is found on several of the Meroe fragments where the inner tube is sometimes of wood and on the Pompeian pipes, where the rotating collars are sometimes made of silver. These instruments which have up to fifteen holes demonstrate admirably the necessity of employing this simple mechanism, which can only work effectively on an instrument with a cylindrical bore.

The collars are sometimes indicated on illustrations by carved or painted horizontal lines that divide the pipes into sections too short to be lengths of tubing. These can be seen clearly on the Phrygian pipes which are shown among the attributes of a priest of Cybele and on a tibia carved on a sarcophagus in the Louvre, (No.18),\footnote{39} fig. 1

More striking are the short lateral projections set at right angles to the bore of the pipes which are frequently portrayed from the first to the fourth centuries AD, particularly on illustrations of the Phrygian pipes. These include an instrument on a relief from Naples showing dancing Maenads, a Maenad's pipe on a sarcophagus from the Catacomb...
Fig. 1
Tibia No. 18.
Phrygian pipes, Rome
Palazzo dei Conservatori.

Fig. 2
Tibia No. 20.
Phrygian pipes,
sarcophagus relief,
Rome.

Fig. 3
Tibia No. 19.
Phrygian pipes.
Naples 6684.
of Praetexta, and an instrument on the Dionysus mosaic in Cologne, all of which are discussed in more detail in connection with the Phrygian pipe, (Nos. 19, 20, 21). To summarise, the Naples relief shows an instrument with T-shaped projections. The Praetexta instrument has a series of projections towards the lower end of each pipe, four on the right and six on the left (horned) pipe. The 'projections' are clearly carved as hollow tubes and rotating collars are also indicated.

Of the five projections on the instrument on the Dionysus mosaic, three are T shaped, the others straight - T T T. The player's fingers are touching the first of the straight tubes. Any similar arrangement on the straight left hand pipe is obscured by the Maenad's arm and hand.

These 'lateral projections' or side tubes are not confined to illustrations of the Phrygian pipes. Representations of 'equal' pipes with these features include the instruments on a second century mosaic showing a sacrificial scene from Ostia, the Monnus mosaic at Trier, a fourth century arcaded sarcophagus shown in the Muses in the Museo del Terme, Rome, on the Arroniz mosaic in Madrid, and on the Sirens mosaic from Carthage, in the British Museum, (Nos. 22, 12, 23, 13, 24). The degree of detail on these examples varies considerably and it should be stressed that the list is highly selective, but all illustrations show several projecting side tubes. On the Trier mosaic all are straight, with five on each pipe. The other mosaics show either T-shaped projections or a combination of T-shaped and straight tubes. On the Madrid mosaic three T or mushroom shaped tubes are shown and there are traces of up to three more. The
Fig. 4. Tibia No. 25.
Sketch of an intaglio from Chichester.
Not to scale.
body of the pipe is divided into bands of yellow and grey, which may represent tuning rings. The pipes on the Ostia mosaic each have one T-shaped projection and the undamaged right hand pipe has three more straight ones. As preserved, the right hand pipe of the Siren's mosaic has six straight, and the left hand pipe, four straight and two T-shaped projections. In each case the side tubes or projections are all in the same plane, usually in line with the fingerholes. The instrument on the Rome sarcophagus is unusual in showing six short hollow tubes on the side of each pipe, at an angle of 90° to the fingerholes. There are ten fingerholes on each pipe but all are spaced 'artistically' rather than realistically, (Pl. 15).

An illustration of a tibia with side tubes has recently been found in Britain, on an engraved gem from Chapel Street, Chichester. According to Dr Martin Henig this is of Italian workmanship and dates from the first century BC/AD. It shows Marsyas seated before his tibia which is conventionally but clearly drawn. The bulbs or holmoi (qv) are seen near the top of the pipe, with the reeds shown very diagrammatically above. On the lower half of each pipe are five T-shaped tubes, (No.25), Fig. 4.

There are several possibilities as to the exact nature and function of these 'lateral projections'. In some cases they may be no more than the knobs (κεφαλαία) which facilitated the rotation of the perforated sleeves. Such knobs exist on some of the fragmentary pipes from Merco, (Bodley, 1946, p.237, Pl. IV,10, V,5,6,7,8), and some of the sleeves on the Pompeian pipes may originally have been fitted with them.
On some illustrations, particularly those mentioned above, the projections are obviously more than knobs, and in some instances are shown to be hollow tubes, as on the Praetexta and Mattei sarcophagi, although the intention of the artist is not always so clear, (Nos. 20, 23). Such examples, where the hole in the centre of the tube is carefully shown are generally of third century date or later, but this may represent a sculptural style or technique rather than any stage in the development of the instrument. These sculptures are in any case very conventional and stylized in many respects.

On the other illustrations the projections are shown as straight, mushroom, or T-shaped. This might support a theory that they were plugs inserted into ordinary fingerholes as an alternative to the rotating sleeve keywork. In his discussion of the Phrygian pipes Baines (1954, p. 203) suggests that they were used for pre-setting a drone. Undoubtedly this would work but as a general explanation it is unsatisfactory, particularly where, as on the Madrid and Praetexta illustrations rotating sleeves are apparently shown in addition to the tubes or pegs, or where as on the Cologne mosaic both straight and T-shaped tubes appear together. It is possible that in the latter case, all the tubes are hollow and some are open while others have been stopped with plugs, pre-set before the performance. One effect of a side tube is that it increases the effective resonant length of the air column and so flattens the pitch of a note. However, if the tube was immovable the same pitch effect could be obtained simply by boring an ordinary hole in a different position or by altering its size. If the tube was set upon a rotating
sleeve this could have to be perforated with another hole that could be positioned over the fingerhole for 'normal' use and one might expect to find some illustrations with the side tubes set at different angles, although such realism would destroy symmetry. Bands are sometimes shown but there is no sign of an extra hole and no conclusive evidence for it.

Howard, (1893,p.11) makes the interesting suggestion that Proclus refers to the existence of such a second hole in rotating sleeve. The passage claims that three sounds could be emitted by each fingerhole (τρυπήματα) on the aulos and more if the παρατρυπήματα were open. The word παρατρυπήματα might indicate a second hole in the sleeve, but as this is its only occurrence any such explanation is purely conjectural, and alternative interpretations can be made.

If the tubes were set upon rotating sleeves this would refute the theory that the mushroom or T-shaped projections represent closed tubes, as the player would only have to turn the sleeve to close the hole. The developed tibia was obviously a complex structure and it is possible that more than one system was used. Technically it would be quite feasible to have a rotating sleeve with both a fingerhole and a short tube, or just the tube, but it is also possible that less complicated instruments existed on which either hollow tubes or solid plugs were inserted into the fingerholes when required. For convenience such plugs may have been fastened to the instrument with strings or thongs although these are never shown. Becker, (1966, p.139f, Abb.56) draws an interesting comparison with the Egyptian seddadah,
citing the sarcophagus from the Catacomb of Praetextat as evidence that the tubes were hollow. A photograph of the seddah shows a short hollow plug inserted into a fingerhole. The plug is attached to the pipe with thread which is wound around its top giving it a curiously mushroom like appearance.

Alternatively the hollow tubes may have been fixed permanently to the pipes and stopped either with the fingers or with plugs. In this case the purpose would be its special tone (see below).

Any form of side projection, even a simple knob, was a notable visual feature of the instrument and as such would have been shown by an artist, but one cannot expect total accuracy of representation, as is made very obvious by the unlikely symmetry of their positioning. Different systems which appear outwardly similar may have been confused.

The addition of a side tube to a pipe has an interesting acoustical effect. It increases the length of the resonant air column and flattens the pitch of the note slightly, but it also affects the tone considerably as the acoustic impedance is increased. This would give to the instrument a bassoon-like quality, a deep booming sound. I feel that one cannot dismiss out of hand illustrative material which might suggest that side tubes were connected to rotating sleeves, or claim as Miss Marcuse does that side tubes were always placed in tone holes below the fingerholes, but in view of the considerable acoustic effect it would make sense to provide an instrument with fixed hollow tubes to produce this tonal quality. One need not necessarily assume that they were set on rotating bands or even that it was possible to remove them, although obviously a pipe would be even more
versatile if either of these systems were used. In view of the acoustic effect of side tubes it is possible that they were employed as much for their interesting tonal quality as for any lowering of pitch — although ancient writers are silent on this point.

The only existing side tubes, those on the Maenad pipes and on some of the Meroe auloi cannot be compared with those shown on the monumental evidence. The of the Meroe pipes are apparently designed to reduce an awkward stretch for the fingers, (Bedley, 1946, p.231, Pl.V.9). The raised inclined holes on the Maenad pipes, if intended as fingerholes actually increase the stretch and these are discussed elsewhere.

There is one further piece of archaeological evidence concerning keywork, which poses fresh problems. This is the existence among the Meroe fragments of a section of bronze tube to which is attached a lever, 33.3cm in length. At the end of the lever is a spherical knob, and as reconstructed it appears to have moved axially to open and close a vent hole near the bell. If so this is a surprisingly modern looking piece of keywork, (and there are also three other levers among the collection, although these are not attached to tubes.) There is however some doubt about the reconstruction of this section and Landels (1960 (Nott88) would prefer to see it as a speaker key, i.e., opening a hole at the top of the instrument rather than near the bell. The pieces are too fragmentary for a positive reconstruction but the importance of this fragment seems to lie in the evidence it affords about the existence of lever type key mechanism which is otherwise unparalleled in art or literature.
The literary evidence for both the kerata and side tubes is both limited and rather ambiguous. There is one late passage that apparently refers to the rotating sleeves and their appendages, in Arcadius De Accentibus (p.188, ed. Barker). Although it is possible that Horace (AP 202), is thinking of keywork mechanism, it is just as likely that he is only referring to the use of metal as a material for the tibia, contrasting instruments of his time with simple reed pipes of the past.

Arcadius is more specific although not entirely clear. He refers to certain κέρατα or βομβυκες which were moved 'up and down' or 'inwards and outwards' in order to open or close the fingerholes. He then discusses the invention of accents, which when turned inwards or outwards indicated that the breath should be 'opened or closed'.

We have therefore two words κέρας and βομβυξ, (keras and bombyx). The kerata are thought to be the knobs attached, probably soldered, to the rotating sleeves. These have been found on some of the Meroe pipes and are sometimes illustrated although it is often difficult to distinguish them from side tubes. The literal meaning of κέρας is 'horn' and the word is used of many objects made of or shaped like a horn. One meaning given by LSJ, referring to its use by Aristotle, H.A. 551b.10, is the antennae of the silkworm's grub. This is an interesting use of the word particularly as the word βομβυξ can mean silkworm, but it may be too specialised to be of significance.

The βομβυκες may also have been knobs or levers, the side tubes or even the rotating sleeves themselves (with
attached antennae?) which might give the appearance of a silkworm, but this is not made clear. If the word is also used of a deep toned pipe this may support the theory that the βηγυβήκεισ were side tubes because of the acoustical effect of such appendages discussed above.

The question of the direction in which the kerata and bombykes moved is puzzling. ἀνω καὶ κάτω 'up and down' could suggest that they slid up and down the tube to open or close the fingerholes, but in the light of the archaeological evidence for spacer bands this seems unlikely. If one considers the normal playing position of the tibia, as shown in the illustrations, with the knobs or other projections rising vertically, the natural movement of these levers would be around the pipe but basically in an 'up and down' movement:

If the knobs were mounted on the outside of the pipes, the rotation of the sleeve would bring them inwards or outwards, ἐνδοῦ τε καὶ ἐξω, (taking the centre as the space between the two pipes).
The Mouthpiece

The Reed.

There are some controversial questions about the type of reed used and as no aulos or tibia reeds have survived the pictorial evidence is of especial importance. Unfortunately there is a further difficulty as most of the instruments shown in any detail are being blown and the reeds are therefore concealed inside the player's mouth. Some early researchers, as for example Gevaert, assumed that the aulos had a single beating reed, but this seems to have been largely on the grounds that the reed of the modern cylindrically bored clarinet is single while the bore of the double reeded oboe is conical. In fact no such conclusion can be drawn from these unrelated modern instruments and an example of a cylindrical pipe with a double reed actually exists to-day as the Japanese hichiriki, which is a single pipe with two thumbholes. Many musicologists now accept that the aulos and tibia were sounded with a double reed similar to those used on the oboe or bassoon, the pipe therefore having some similarity to the hichiriki.

There are also dissenting opinions, but it should perhaps be remembered that the bore of the instrument is of more acoustic importance than the type of reed. The qualities of the different reeds are discussed below.

Sculptural representations of delicate reeds are unreliable but the best of them, in the Roman period, indicate a shape consistent with their being double rather than single reeds. The illustration of the Phrygian pipes on the relief of the priest of Cybele is a rare example showing the entire mouthpiece (No. 18, Fig 3) The right hand (straight) pipe ends in a trapezoidal section somewhat similar to the frontal view of a bassoon reed. The top
of the left hand pipe is slightly damaged but appears to be similar. 47

The only place in which any ancient reeds have survived is Egypt and two examples dating from Ptolemaic times are now in the Brussels Conservatoire Museum,48,49. They are both double reeds made from the whole 'cane' with the top flattened by being held in a clamp, the marks of which can be seen on the larger reed. Each reed also has a 'waist' which was probably formed by the placing of a ligature on the growing plant. These long stemmed reeds were inserted directly into pipes of an unknown type. They could have been made for double or single pipes manufactured from any of a variety of possible materials.

Greek vase paintings are often more detailed than illustrations in Roman art, but again, although the general outline of the reed, when shown, suggests that it was double, this cannot be conclusive. 49

Becker draws attention to an Etruscan painting from the Tomba Francesca Giustiani which, he claims shows a pair of single beating reeds. He cites this in support of a theory, based upon a reinterpretation of Theophrastus' account, that the Greek aulos was usually played with a single reed, but could also be played with a double reed. 50 The painting, although indistinct can indeed be interpreted as showing two reeds, each with a single beating tongue, down cut so that the opening is towards the top of the mouthpiece. I have however some doubts as to how much reliance should be placed on this apparently unique piece of evidence. If it does purport to show two single reeds there is a serious inaccuracy as the (female) player's mouth should cover the
reed tongues and not simply grip the ends of the reeds as on an oboe. The corollary of this argument is of course that it will never be possible to identify a single reed when shown in use as the vital evidence will always be concealed in the player's mouth. Artistic inaccuracy may in this case be helpful or very misleading. It is hard to judge but, on the left hand pipe the 'tongue' may simply be a heavy outline to the reed, although the one on the right hand pipe is harder to explain away. Becker in fact draws attention to the unrealistic features of the painting but accepts it as evidence.

The literary evidence is at first sight more encouraging. Pliny gives a long account (NH XVI 65-66) of the reeds from which pipes were made, but this is basically a sometimes confused paraphrase of Theophrastus' passage (IV xi 1-9). Theophrastus begins by describing the different types of reed and their growth habits. Modern oboe 'cane' is the reed Arundo donax which now grows particularly well in the south of France and it is likely that the same or a similar reed was used in antiquity. Theophrastus states that the best reed came from Lake Copais (Orchomenos) and indeed Arundo donax grows there to-day although the soil conditions are unlike those in France, and in the sixteenth century it is reported to have been grown abundantly in southern Italy. The basic requirement of Theophrastus' reed seems to have been sufficient water. He discusses the particular characteristics of those suitable for mouthpieces. Pliny's account of these is basically the same, although when he mentions the 'modern' preference for silver instruments he seems to imply that the 'female' and 'eunuch' reeds were used
for the bodies of pipes, while Theophrastus states specifically that these made the best mouthpieces.

(.Lenota — τα ζευγη).

Correct harvesting and seasoning of the reed was then, as now, important. Until about 350BC, the time of the piper Antigenidas, reeds were cut in September and were seasoned for several years, even then needing much 'playing in'. After this time they were cut earlier, in June or July, were kept for three years and required less preparation, presumably as they spoke more easily. Theophrastus records that the change was necessitated by an alteration in the style of playing, an early simple style giving way in the mid fourth century to a more elaborate one. He also notes different properties of the actual reeds of the early type:

...... συμμείν δε το στοιχ των γλυττων

meaning that the opening of the reed tongues was well closed, but of the later ones, which needed little preliminary 'playing in' ...... κατασματια των γλυττων ἰπχεῖν.

These statements have caused considerable problems, especially the meaning of κατασματια . The arguments are complex and are not necessarily relevant to later Roman practice, but the most likely explanation involves a change from a 'closed' to a more 'open' reed. It is possible however that Theophrastus is referring to a modification of the instrument itself and not merely a stylistic change. Pliny simply records the new ornate style.

(postquam varietas accessit et cæntus quoque luxuria aportiomibus earum lingulis ed flectendos sonos)

After harvesting, the reeds were left to mature during the winter with the rind on. This was stripped off in the
In the spring and the reed was scraped and put in the sun. Later, in the summer, the reed was cut into sections, each the length of one internode, about six to nine inches, and the pieces were left outside for further seasoning.

Two reeds, one for each of a pair of pipes were made from each section, the lower part towards the root being used for the left and the upper part towards the tip for the right hand pipe. It was important that both reeds should be made from the same section so that the quality of each would be comparable, and the opening (στόμιον) of the reed tongue was made towards the point at which the reed was cut, thus for a double reed:

If the reeds were of the single beating type, as some believe, the opening of the tongue could still be made towards the cut, as Theophrastus states, but the cut end of the reeds would of course have to be blocked:

Theophrastus also makes the general point that the best sections of reed are those from the middle of the plant, while the lengths towards the top make soft mouthpieces and those towards the root hard ones.

Pliny summarises all this, but in a sometimes confused form. For example in the last paragraph he says that it
was believed that only a mouthpiece cut from the same reed as the pipe was suitable. He ends with a note on the different materials, boxwood, lotus, bone and silver, that were used in his day.

There is no more contemporary information about the manufacture of the reed. There are several ways of making a double reed. The most simple method is to flatten a tubular reed, as shown in the Ptolemaic examples cited above. Baines considers that Theophrastus' reeds were of this type but they cannot however have been made in exactly the same way, as Theophrastus makes no mention of putting a ligature on the growing plant. I assume that it is possible to clamp the seasoned and scraped reed into shape after it has been soaked (although Theophrastus does not refer to this either).

Alternatively the reed can be split, the ends scraped and the two halves bound together securely.

In the making of a modern oboe reed a strip of cane twice the length of the finished reed is scraped and bent in half and the ends are bound together. The folded end is cut to form the mouth and the blades are scraped to the desired thickness. The lower end is reinforced with a staple, a short conical brass tube, but there is no evidence for the existence of the latter before the sixteenth century, and there is no suggestion that it was used in antiquity. Instead reeds were of the long stemmed variety. The modern technique has evolved after centuries of development of western wind instruments and in spite of the often sophisticated technology of the ancient world, one of the simpler methods of reed making seems more likely.53

In the manufacture of a single reed the upper end of the
Fig. 5 Ptolemaic reeds in Brussels Conservatoire Museum.

Fig. 6 Single Reeds.
tubular reed is blocked. (Wax would have been a suitable material in antiquity.) A tongue is then cut in the side of the reed, either with the opening towards the top (upcut) or towards the bottom (downcut), 'arghool' fashion. In each case the cut at the end of the tongue can be made at a slight angle to ensure that it closes completely. (see diagram, Fig. 6).

Technically a double reed offers greater flexibility than a single reed. According to Baines the tone quality of each is comparable but a double reed gives a player more control over pitch and dynamics and facilitates overblowing, although it should be noted that there is no direct evidence for the use of this technique. The amount of control is greater even with the ancient practise of taking the reed directly into the mouth. A modern oboe player takes only the upper part of the reed into his mouth, and grips it firmly.

There seems to be no basic difficulty in identifying Theophrastus' reed as a double reed. Although some of the words he uses are ambiguous a double reed seems implicit in the choice of the word ἔρυγη. Moreover the very structure of the aulos/tibia makes a double reed more likely. As it consisted of two separate pipes, these could be drawn apart, raised or lowered, movements which affected the embouchure and this mobility would have been important factor in pitch control, especially with a double reed. It is interesting that modern folk instruments that are played in pairs, for example the zummara, are fixed parallel pipes with single reeds which are taken entirely into the mouth.

Some passages concerning the reed in the de audibilibus which are also quoted by later authors should be mentioned. Aristotle indicates that the reeds were taken into the mouth
and were not enclosed in an air chamber as in the mediaeval krumhorn. The passage refers to the importance of soaking reeds so that they are wet and smooth. An instrument would in any case become wet with use but it is interesting that a modern oboist or clarinettist moistens his reed before playing, to make it pliable.

At 804a (cf Porphyrius p. 252) there is a reference to pressing on or squeezing the reeds to make the sound sharper (higher in pitch) and 'thinner'. A late source, Festus indicates that the reeds were held between the teeth. As Howard points out one of the most important ways of controlling pitch is by altering the pressure and position of the lips on the reed and this is applicable to a double rather than a single reed.

Considering the contradictory descriptions of the sound of the Roman tibia (harsh, strident, soft, sweet etc.), Marcuse (1975; 658) has suggested that both double and single reeds were in use and that differences in tone were in part at least due to this. This possibility must be considered but there is no positive evidence to support it. The quality of the reed is whether it was hard or soft may have had as much influence on the tone, and certainly the size of the pipe would affect its pitch. These factors alone could account for the different descriptions. The iconographical and literary evidence is inconclusive. (Similarly it is impossible to prove or disprove the existence of a pipe with a conical bore, a feature that would have a considerable effect on the sound of the instrument), having in fact more acoustic importance than the nature of the reed.) The double reed has certain
advantages over the single and although one cannot be sure that ancient players exploited these, the evidence does not, at least, rule out that possibility.
Holmos and Hypholmion.

Near the mouthpiece of the tibia were two sections which are not always clearly identified by contemporary writers (eg. Pollux, IV, 70). The two parts appear in varying forms, but generally in less detail in Roman than in Greek art. As the best preserved instruments those from Pompeii are unquestionably of Roman date. I shall describe their mouthpiece sections, comparing them with those of other surviving pipes and relate them to pictorial and literary evidence.

On each of the four Pompeian pipes described by Howard (1893; 48) and on others in the Naples Archaeological Museum is a pear shaped bulb or barrel of ivory about three to four cms. in length and of a slightly wider diameter than the body of the pipe. Despite the external variations in the diameter of the section, the internal bore of the pipe remains constant. Into this is inserted the reed holder, a tube about 3.5cms. long which expands externally flaring towards the top of the pipe.

Two 'bulbs' were found among the pipes from Meroe. One is decorated with a band of silver foil and is 71cms in length with a maximum width of 1.5cms and a bore of 0.7cms diameter. At the end is a short cylindrical section of tube, included in the given length and the top part of this has four grooves, possibly as is suggested by Bodley, for lapping to ensure a secure fit with the next section. The bulbs could not be identified with any particular instrument among the many fragments and no flaring tubes were found.56

More simply constructed than the Pompeii or Meroe instruments as it has no 'keywork' mechanism is the Reading
aulos which Landels (1968; 238) considers to be not earlier than the fourth century BC and probably considerably later than this. This dating is based upon examination of the pipe and comparison with others as its provenance is not known, but it is likely to be somewhat earlier than the Pompeian or Meroe pipes. There is considerable difficulty in dating instruments which have no archaeological context, and as simple and complex pipes would have co-existed it is easier to give a terminus post quem than a terminus ante quem.

The bulb and reed socket of the Reading aulos are well preserved. The latter which is 6.7 cms long with a diameter at the top of 2.5 cms, is made of bone or ivory covered with badly preserved silver foil. Below this is a section of cylindrical tube originally covered with bronze, and a wooden pear-shaped bulb 4 cms long with an external diameter of 3.5 cms on which traces of metal remain. Immediately below it is a metal 'stem' with ridged decoration, again covered in silver. An inner tube of wood runs throughout the bulb and socket and the internal diameter of the pipe again remains constant (ca 9 mm) with slight expansion at the top. The ornamentation of the Pompeian, Meroe and Reading pipes show that whatever its function, the upper section of the tibia was treated as a decorative feature.

The bulbs described above are considerably larger than those on the earlier Elgin auloi, or on the pipes generally shown on Greek vase paintings. Larger bulbs often appear on illustrations of the first to third centuries AD and seem to be a characteristic feature of later pipes. This may be due partially to stylization of design. When working in a difficult medium, as for example the green plasma
of the Chichester gem (No. 25), the artist has chosen to emphasise the features, in this case the side tubes and bulbs that make Marsyas' instrument instantly recognisable as a tibia. Similarly the sculpted bulbs of pipes, particularly on sarcophagi, may be overemphasised. However, all evidence suggests that they were an important visual feature of the instrument and the admittedly limited archaeological evidence may indicate an increase in size in Hellenistic and Roman times. Another consistent feature of later illustrations is that each pipe has only one bulb or barrel. The auloi of the vase paintings often have two.

The bulb does not affect the sound of the pipe and has no acoustic function. It has been suggested that the addition of extra bulb sections on the aulos would lengthen the pipe and so alter its pitch but there is no Roman evidence for this practice. It appears therefore to be purely decorative, an assumption that is perhaps justified by the embellishment of the surviving bulbs. Although a large bulb might help to protect the reed from damage when the instrument was laid down, this would be better performed by the flared section of tube above it. A comparison with similar features on later instruments may be of use here as for example, the 'bulbular' swelling of the middle joint of the eighteenth century oboe which complemented the baluster at the top of the upper joint. Both these decorative features strengthened and thickened the tube in places where splitting was likely to occur. It is possible that the bulb of the tibia served a similar purpose but it must be seen primarily as decoration.

There are several possibilities about the function of the flaring end of the tibia, which exists on some of the
surviving instruments (above), but is not always shown on illustrations. Undoubtedly it would help to protect the reed when the pipe was laid on a flat surface but this does not seem to have been its prime purpose. I very much like Dr Landel's suggestion (1968; 234; 1962; 360) that it may have been a form of pirouette or tudel. This can be seen to-day on certain shawms, particularly those from Catalonia.

The reed is placed in a staple on which is mounted a thick wooden cylinder, the pirouette. This is slightly recessed on its upper surface and the player rests his lips against it, thus avoiding undue fatigue of the embouchure, or lip muscles, while still retaining ability to grip and control the reed like a modern oboist. This technique is of particular value when a strong reed is used. I am not suggesting that the tibia reed was mounted on a staple, for which there is no ancient evidence, but considering its shape, there is a strong probability that the flared end was a type of pirouette, and if, as is likely the reed was arundo donax, this form of support is suitable. Arundo donax, which may also have been used for sixteenth century shawms is basically a hard reed requiring firm lip control, and such support is helpful for skilled professional playing.

There is however a basic difference between the pirouette of the shawm and the top of Pompeian pipes, in that the top of the latter is not recessed in the same way. The flatter surface would still give support to the lips although the degree of control would not be as great for a shawmist who although appearing to take the entire reed into his mouth in fact curls his lips back round it. A further practical point is that the tibia was played as a double pipe and it would
seem easier to rest the lips against two flat surfaces.

Eastern shawms often have a flat metal disc, sometimes a coin pierced with a central hole against which the player presses his lips, thus taking the entire reed into his mouth which becomes a wind chamber. There is little control over the behaviour of the reed which for this system has to be soft, like the soft rush or maize of the modern zurnah. I have found no evidence for this type of pirouette in the Roman period, although Becker suggests that the phorbeia or capistrum was used in this way. The subject is discussed in greater detail below – see capistrum.
Literary evidence for the mouthpiece of the tibia.

Among the various components of the mouthpiece of the tibia, but carefully distinguished from the actual reed, are the δόμος and δυσυλίον. Neither is described in any detail. Pollux (IV 70) states that the hypholmion was a stand for the holmos, while Hesychius merely describes it as part of the aulos near the mouth. Other parts of the mouthpiece are easily identifiable and it is reasonable to apply these terms to the otherwise un-named bulb and flaring tube section above it. There is however in the absence of clear statements by ancient writers about their form and function, some disagreement among modern scholars as to which part is which.

The word δόμος means literally a round stone, hence any cylindrical or bowl shaped object (LSJ) and often means a 'mortar'. This could well be applied to the pear shaped bulb of the aulos or tibia.

The word δυσυλίον has been the subject of some controversy. It is used in the sense of a support or stand for the holmos and is described by Hesychius as:

\[ \text{μέρος τοῦ ἀυλῶν πρὸς τῷ στόματι.} \]

ie. a part of the aulos near the mouth. 62

Howard describes the holmos as the bulb and the hypholmion as the flaring tube. This interpretation which I accept has been followed by several scholars, notably Landels (1961; 196). Some earlier writers had totally different conclusions. For example Von Jan who thought that the aulos had a single reed described the holmos as a mouthpiece of the clarinet type, with the hypholmion as the reed.

Other writers of this century interpret the holmos and hypholmion as bulb and reed socket but describe the hypholmion
as the bulb and the holmos as the socket. This satisfies interpretation of the hypholmion as a stand for the holmos but seems to ignore the other meanings of the word holmos. Function is however more important than nomenclature and is unaltered whatever the parts are called.

To summarise:

1. The bulb and flaring tube appear to have been called respectively \( \delta \lambda \mu \varsigma \) and \( \upsilon \phi o \lambda \mu \iota o \nu \). There are no equivalent words in Latin.

2. Acoustically, apart from forming part of the air column which determines pitch, these sections had no effect. They may have had some practical use in strengthening and protecting a delicate part of the instrument and the top of the hypholmion may have supported the lips as a pirouette. It is not always shown on illustrations, although it is often difficult to judge when the instrument is in the player's mouth, and it may have been an aid used chiefly by professional musicians at concerts and other public performances.
The Capistrum (φορβεῖα)

. Many illustrations show tibia and aulos players wearing a mouthband, the Greek φορβεῖα. This band which was made of leather fitted over the mouth where it was at its widest point and was tied at the back of the head. It was slit over the mouth for the admission of the reeds. An additional strap is sometimes shown, usually on Greek vase paintings, stretching over the head from a point just in front of the ear. Although there is apparently a Latin word for this device, 'capistrum', this word is usually the equivalent of φορβεῖα in its meaning of 'halter', particularly in an agricultural context and the mouthband is more often shown in classical Greek than in Hellenistic and Roman contexts.

The tibicines on the wall painting of a concert scene from Herculaneum and on the satyr play mosaic from Pompeii, both designs adapted from Hellenistic originals, have bulging cheeks above their single band capistra (Nos.17,14). The mouthbands are clearly unsuccessful in preventing the facial contortion which Plutarch claims that they were designed to control, a tradition which goes back to the myth of Athena and the invention of the aulos. It is, incidentally, not good practice for players of modern reed instruments to allow their cheeks to bulge but they do not need artificial aids to prevent this. One cannot be sure that some artistic license may not be involved as a piper blowing hard with bulging cheeks obviously makes a dramatic picture, but if the artist recorded what he actually saw it is necessary to consider the possibility of a specialised breathing technique. If the bulging eyes and cheeks can be taken as evidence of the technique of nasal inhalation by which air is inhaled through the nose held in a reservoir in the mouth then exhaled through the mouth, the
mouthband or cheek strap would have given only a little protection against these physical hazards and it is possible that it was not so intended, or perhaps that it was only an incidental function. There are numerous examples of players with blown out cheeks who are not wearing a mouthband, particularly in Roman contexts. If nasal inhalation was employed the band would assist by giving regular pressure to the cheeks.

Howard suggests that the mouthband was used to hold the two pipes in the player's mouth, thus leaving the hands free to open and close fingerholes. The Pompeian satyr-play mosaic shows the tibia reeds fitting into two holes in the band. Both it and the Herculaneum painting are unusually clear in showing these slits, as front views are rare. This may however again be only an incidental function as illustrations indicate that many auletes and tibicines managed to support two pipes quite adequately without the aid of a mouthband. Furthermore the very examples which Howard cites as needing this aid - pipes with many fingerholes and rotating sleeves are those with which a mouthband is never shown. These complex pipes generally appear on illustrations dating between the first century BC and the fourth century AD. The majority of the illustrations of the phorbeia are on Greek vase paintings of the 6th and 5th centuries BC, and the decline of its frequency of depiction may indicate a decline in the use of the mouthband in late Hellenistic and Roman times, although the Pompeian artists would be unlikely to reproduce something that would not be recognised. The fact that Greek vase paintings are generally more detailed than Roman sculptures, paintings and mosaics cannot be cited as evidence that mouthbands could not
be shown clearly in the latter mediums. The fifth century funerary relief from Chiusi (No.1) demonstrates that the Etruscans knew and used the phorbeia, and the Pompeian evidence demonstrates that later painters and mosaicists too were prepared to show it. Most Roman illustrations however show the *tibia* in rather different contexts than those of the Greek paintings and before suggesting further reasons for the phorbeia's existence one should examine more closely the occasions upon which it was used.

In Greek art it is worn chiefly by musicians, probably often professional musicians, in competitive scenes. There is no comparable series of illustrations in Roman art, but the Pompeian illustrations provide evidence for its use in the theatre and at recitals and it is significant that it is again worn by professional performers. Becker (1966;126) claims that it was not worn by women and this is certainly the case in the entertainment scenes, particularly those showing drinking parties where female pipers appear most often and where their talents were often presumably not primarily musical. Many illustrations of the Roman period show the *tibia* in mythological scenes and scenes of revelry where one would not expect to find virtuoso players.71

There is a strong possibility which is consistent with the evidence given above that, like the **hypholmion**, the mouth band acted as a lip support or pirouette. Ancient literary evidence is not specific about its function, but does not contradict this theory, which is suggested by Landels.72

Becker, (1966;128) sees the mouth band as the forerunner of the eastern type of pirouette as used on the *zurna* and *zurla*. This is a flat metal disc with a hole pierced in the centre.
The reed, mounted on a staple is taken directly into the mouth, which becomes an air chamber and the lips are pressed tightly against the pirouette. The player's cheeks bulge above it. Becker (p.128 Abb.49) also shows a modern Javanese player of the tarompret, wearing a mouthband similar to one of the ancient design, which has the same function as the pirouette of the zurla.

However, a modern zurnah reed is made from soft reed or rush and as it is allowed to vibrate freely inside the mouth, the player has little control over its behaviour. A hard reed would behave most unpredictably if held in this way as it needs firm control. If Becker's theory is correct the reed used must have been softer than the arundo donax which is now generally thought to have been the reed of the aulos.

I find it more reasonable to assume that the phorbeia was primarily a support for the lips used as an embouchure control, but that wearing it, it remained possible to grip and control the reed to some extent and that its use was necessary because of the hardness of the reed. It is likely that professional virtuoso players used a strong open reed. The phorbeia would also provide support in other ways and be of particular value if the piper was playing for a long time. This practical use seems to make more sense than theories that it was intended "to strengthen blowing by concentration" (Michaelides, 1978;253). The idea of embouchure control could however be consistent with a statement that it helped to 'regulate the blowing', presumably by helping to maintain constant pressure.

If the phorbeia was a pirouette one has to consider whether it had the same function as the hypholmion and if so
whether the two were used together. It is usually impossible to see the mouthpieces of pipes in detail even on Greek vase paintings which show some variation in design. The flaring end is not shown as clearly as on the Pompeian pipes and when the reed is actually in the player's mouth it is not possible to see whether the hypholmion was ever used with the phorbeia.

There are apparently no illustrations of the phorbeia after the first century AD and if it was a pirouette this function may have been taken over by the hypholmion, assuming that this was the name of the flared end. If this has been correctly identified, it was not an invention of the Roman period, as the word ψφολμίον occurs in the literature of the fifth century BC, (see note 62) but the flared tube does seem to be a feature of the later surviving instruments. The phorbeia generally appears to have been an aid used by professional and virtuoso players who would need extra support for long periods of playing with strong reeds using difficult techniques. It is noteworthy that such players are rarely shown in Roman art - most representations of tibia players being in processions, at sacrifices and at entertainments where such subtleties were not required. Music festivals and competitions continued in the Imperial world but were not the subject of commemorative art. It is interesting to note that there are very few literary references to the phorbeia from any period and that although the word capistrum is often given as the Latin equivalent of φορβεία, (and it certainly is in other meanings of the word, for example, 'halter') I can find no examples of its use in a musical context.73

In conclusion, the mouthband was widely known by the Greeks (witness the illustrations), but may always have been
used chiefly by professional and virtuoso performers. Evidence for its use in Roman times particularly during Imperial times is even more scanty. Possibly this was due to technical improvements on the tibia or to playing techniques that made it superfluous, or simply that virtuoso performers are infrequently portrayed. 74
Double piping technique.

A striking feature of ancient reed blown pipes is that they were, according to illustrations, consistently played in pairs. This is a highly foreign concept to those familiar only with western classical music but in fact geminated (or twin) pipes feature prominently in the folk music of east and west. There are several possibilities as to how the pipes sounded together, all paralleled by musical practice at some time, but there are no unequivocal statements by ancient writers. Technically there is no practical difficulty in sounding two reed instruments simultaneously, whether the reed is single or double and they do not, as has been suggested in the past, need a 'yoked' mouthpiece.75

Howard, (1893; 43ff) considered three possibilities, that the pipes

1. played in unison
2. were doubled at the octave
3. played a melody with an accompaniment.

In addition the possibilities of either a simple or an articulated drone should be investigated.

The theory that a single melodic line was produced, using different notes from each pipe, can I think, be discounted. Certainly by the first century BC when pipes had a considerable range due to the large number of holes and the development of rotating tuning sleeves, there would be no need to use two pipes to obtain a complete scale and double pipes must have been employed for some special musical effect.

I see no basic reason why more than one method should not have been employed. Individual pipers may have had different styles and it is inconceivable that experimentation should not have been carried out over so long a period of
time. The very silence of ancient writers may however be significant. Obviously the practice of double piping was taken very much for granted and may not have been thought to contain anything of particular musical interest.

1. Unison pipes

The playing of pipes in unison would seem to be extremely suitable for the massed pipe bands favoured by the Romans for processions and at various spectacles. The subtleties of any accompaniment would surely be lost under these conditions. It seems to us a less attractive and interesting method for a solo performer. Howard (1893; 43) notes the difficulty of playing both pipes in tune, but with a double reed it is possible to control the pitch to a considerable extent, and any slight beating effect caused by dissonance could be musically exciting.

The middle eastern zumara is an example of paired pipes played in unison, but, unlike the tibia, these pipes which have single reeds are fixed in a parallel position. The hands are placed one above the other with each finger covering the holes of both pipes. The aulos and tibia were of course divergent, an arrangement that survives, according to Baines in some double flageolets played in unison but not in modern folk reed pipes.76

There is no literary evidence that can without question be interpreted as referring to this method of playing. Many illustrations, of Roman date, and earlier, show the player's hands placed symmetrically on the pipes, as if the same note was being produced on each, but one cannot judge
whether this reflects musical practice or is only an artistic convention. It is also difficult to decide when pipes are shown as apparently of differing length, whether this is an attempt to achieve perspective in drawing or sculpture, or an indication that the pipes were indeed of different size, for which there is some literary evidence, (Nos. 11, 17), p. 8, 13.

The 'unison' theory depends of course on the pipes being identically bored. Again, illustrations frequently show the fingerholes in the same position on each pipe, as for example on the Satyr play mosaic (No. 14), p. 10. Here the fingerholes are in the same position on each pipe but are not placed realistically. The archaeological record is too scanty to help on this point as it has not been possible to identify with certainty any one pair of pipes dating from Hellenistic or Roman times. The Heroe instruments, for example, are too fragmentary. No two Pompeian pipes, although of similar size and pitch range are identical and the Maenad pipes are in a different category.

The other possibilities involve some form of polyphony or at least an assumption that the two pipes sounded different notes simultaneously.

2. There is no evidence that doubling at the octave was normal practice. As noted above pipes are usually shown about the same size, certainly with no difference that would indicate the difference of an octave in pitch. Alternatively the holes would be bored asymmetrically, and as in the case of the unison theory illustrations do not provide sufficient evidence.

The existence of the instrument the μαράδις αἰλός that could according to Tryphon (ap. Athen 63 e) produce a
high and a low note simultaneously, might support the doubling theory, especially as the verb 'μαζί δὲ ἔστην' usually applied to the cithara or to choral music can mean 'to sing or play in octaves'. There is however some confusion in Athenaeus' work about the nature of the magadis, even some doubt as to whether it was a wind or a stringed instrument. At best it seems to have been an obscure instrument and it may have been obsolete by the time of Athenaeus' compilation.

3. Some Roman evidence suggests not only that the pipes were not played in unison but that one pipe sounded a true accompaniment. The structure of certain pipes supports the proposition that different notes were produced simultaneously. It is debatable whether one pipe of the Phrygian tibia was longer than the other, with only a statement by Servius and some pictorial evidence to suggest this, but the presence of a horn bell on one pipe would affect its tonal quality to some extent. It is unlikely that the difference between the two pipes was exploited. The pipes on the sarcophagus in the Catacomb of Praetextatus (No. 20) are typical of the later Roman period. The straight sections of each pipe are of approximately equal length, but the left pipe is made considerably longer by the addition of a bell. The hands are not placed symmetrically and the left pipe has more side tubes than the right, but as the holes are not realistically positioned the evidence is of questionable value.8

Fig. 3

In addition some 'ordinary' tibiae are shown with pipes of differing length. On both the Bacchic sarcophagus and the concert scene from Herculaneum the left hand pipe of each pair is slightly longer than the right. The difference is
however not so marked that one can be sure that it is intentional. Pollux (IV 80) states that γαμήλιον αὐλημα the ἀπτιαλ aulema, an aulos solo was played on two pipes one of which was longer than the other and there are references to the 'tibiae impares' in the commentaries to the plays of Terence.79 One would expect these to be pipes of different length.

The most positive, and frequently discussed, statement is by Varro (de Rep I, 2. 15-16);

'Certe inquit Fundanius, aliut pastio et aliut agri cultura, sed adfinis et ut dextra tibia alia quam sinistra, ita ut tamen sit quodam modo coniuncta, quod est altera eiusdem carminis modorum incentiva, altera succentiva.'

Stock rearing and agriculture are compared to the right and left hand pipes as being different but related to one another, just as one pipe plays the melody of a song and the other accompanies it.

Varro does not say whether the tibiae are 'pares' or 'impares' nor whether he is referring to general practice, although the homely comparison suggests that the allusion to the playing of a melody and its accompaniment would be widely appreciated. Varro equates the tibia dextra with incentiva as playing the melody and the sinistra, left, with succentiva the accompaniment or support, but it is not clear whether his terminology bears any relationship to the tibia dextra mentioned in connection with the plays of Terence. It is interesting that Theophrastus writing much earlier (HN IV, 11,7) says that the softer reed taken from the part of the plant furthest from the root was used for the right hand pipe and that nearer the root for the left. It was however important that both reeds should be cut from the same section of reed and the difference may not have been great.
If one assumes with Varro that each pipe had a different function, (and this does not imply that they were physically different), it is necessary to consider their relationship. It is of course possible that the pipes spoke separately and that one answered the other, but this seems to obviate the need for two pipes and is most unlikely.

Howard accepts Varro's statement literally and supports the idea of a melody and accompaniment. Although he does not hazard a guess as to the exact type of accompaniment, he believed that polyphonic music existed in Greek and Roman times. Unfortunately there is little independent evidence to support this. As Landels points out (1961; 171)

\[ \Phi \alpha \lambda \iota \varphi \theta \varepsilon \nu \iota \alpha \iota \omega \] , in the context of Plutarch (de Mus. 29. 1141c) is a reference not to polyphony as Howard may have thought (1893; 44) but to the increased range of the aulos.

Howard also quotes Apuleius (Flor. 3, 11) as giving Hyagnis credit for being the first to play upon two pipes and sounding two notes which 'harmonized'. Historically the statement is of little value but it does seem to be evidence for some sort of accompaniment which I hesitate to call either harmony or polyphony.

Howard claims that the accompaniment was higher than the melody, being in modern terms a descant, and that it was always played on the pipe held in the left hand. His evidence is chiefly a statement by Ps. Aristotle (Corp. XIX 12, 918b) concerning the lyre. It is true that this form of accompaniment is still employed in the music of the Greek Orthodox Church and was a feature of early Christian music, but it is dangerous to draw parallels from this to earlier Roman practice on the limited evidence available.
4. Sachs (1940; 140) interprets Varro’s *incentiva* and *succentiva* as referring to a melody and a drone, taking parallels from Egypt and the modern orient, but he stresses the dangers of generalisation. A drone can be a highly sophisticated effect especially when achieved by means of nasal inhalation as in the east and Mediaeval and modern bagpipers create the same effect with the aid of a bag. The possible use of nasal inhalation in the ancient world, which is suggested (but not approved) by the bulging cheeks of some players, is not however evidence of a drone.

If one pipe was regularly used as a drone one might expect to see some difference in its structure, a greater length for example or fewer fingerholes. Again, however, the iconographic evidence is inconclusive.

It has been suggested that the lever on one of the Meroe *auloi* is evidence of a drone. The lever, which is 33.3cms long is attached by two bronze loops to a piece of bronze tubing without any holes, 13.1cms in length, and Bodley considers that it must belong to a pipe so long (72cms) that it can only be a drone. Four other levers were found among the Meroe fragments. However Dr Landels casts serious doubt upon Bodley’s reconstruction which is based largely on acceptance of Miss Schlesinger’s controversial theories about the development of the Greek modes. I have not been able to examine the pipes but from the photographs it seems impossible, given the state of the fragments to be absolutely certain to which end of the instrument this section should fit. Obviously the lever is a device for enabling a player to reach an otherwise awkwardly placed or inaccessible hole and given the length of plain tubing this must have been at one end of the pipe, but it
might equally be a hole at the upper end (possibly even a speaker hole), as a vent hole near the bell.

Incidentally, Bodley suggests that the lever was shifted axially to open and close the hole and it does not seem to have been sprung and pressed down as are the keys on a modern wind instrument. If so the lever might have been easier to move during a performance than a rotating sleeve and this may represent an advance on this type of 'keywork'. This possibility does not however help in explaining the length of plain tube between the hole worked by the lever mechanism and the next one. Unfortunately the Meroë instruments which date from about 15BC are the only evidence for such mechanism, which is not shown on any extant illustrations. It would be tempting to see it as one of the technical developments of the Hellenistic/Roman period but this is perhaps stretching the evidence too far. The finding of musical instruments is so infrequent that it is impossible to tell whether levers were common features of pipes at the time or only a local development.

The evidence for a simple drone rests therefore on a particular interpretation of Varro's statement and on comparative musicology, which is unsatisfactory.

5. Dr Landels has suggested the attractive possibility of an 'articulated drone'. On modern folk pipes, briefly, four or five notes are available on each pipe, the upper notes of one overlapping with the lower notes of the other. The melody moves from one pipe to the other as the pitch ascends and descends, while the other pipe sounds a drone on one of the overlapping notes.

This compound drone arrangement is found on some folk
instruments. Baines cites in particular the now extinct Basque hornpipe and the Yugoslavian diple. The latter is rather different from the tibia, as it is a hornpipe with two bores drilled in one piece of wood. One pipe has three holes giving notes a, b, c, and the other has six holes giving b tog. As the reeds cannot be tongued grace notes are obtained as in bagpiping by putting down two or three fingers on the lower holes, and releasing them quickly.81

One problem is that this technique again requires two pipes of different length and as discussed before, pictorial evidence is inconclusive. Howard (1893; 47) suggested some sort of compound drone technique for the 'unequal' Phrygian pipes, claiming that if an accompaniment was played on the 'longer' left hand pipe it would at times fall below the melody. He thought therefore that when this happened the left pipe sounded a drone. It is interesting that although these pipes may have been classed as 'unequal' in no case is the difference in length as marked as on modern folk instruments, such as the launedda which, with its three pipes, two chanters and a drone, plays a mixture of drone and polyphony.

On most illustrations however the pipes appear to be 'pares', but this does not preclude the possibility of their being bored to play an overlapping scale. We do not know which if any of the Pompeian pipes should be paired, but a somewhat extended overlapping scale is not impossible.

The evidence on all counts is therefore unsatisfactory. Certain methods seem to be more unlikely than others, for example doubling at the octave and the playing of a single drone note. It is very tempting to follow Baines (1957; 201)
and imagine an intricate mixture of drone and polyphony as exists in the Mediterranean to-day, ('in the old Greek area'). Famous virtuosi must have earned their reputations. If true accompaniment existed however, it must surely have been on a limited scale. One cannot imagine anything similar to western counterpoint or the type of accompaniment that was the first step towards harmony, a concept that was not developed until the middle ages. Unison playing was possible on equal pipes perhaps combined with some limited 'harmony' at cadences possibly the playing of an interval such as a third, fourth or fifth. The structure of 'unequal' pipes implies some accompaniment or drone and the possibility of a compound drone technique is attractive but cannot be proved.

Many classes of pipers played the tibia, from the pipers at funerals, and the musicians at feasts to the famous professionals who competed at the great festivals. All, according to the illustrations had double pipes, but one cannot expect their standard of play or their technique to have been equal. It is reasonable to suppose that the virtuoso players would attempt far more than their humbler colleagues.
The technique of nasal inhalation

This technique, common among players of the Orient but rare in the West, can be considered here as it bears some relevance to the question of the mouthband. It involves breathing in through the nose, simultaneously exhaling through the mouth, thereby playing the instrument, while sufficient air to supply the reed is held in the cheeks. The technique is that used by glass blowers. The musical effect is similar to that produced by a bagpipe, - a continuous flow of sound without pauses for breath, an effect not generally desirable in modern wind music.

There is no reference to any such technique in connection with the tibia, but there may be a clue in that players are often shown with bulging cheeks. This always makes a dramatic picture but may be of more significance. A modern oboist or clarinettist who does not make use of the technique, does not inflate his cheeks. Players with greatly inflated cheeks often wear a capistrum, as on the Pompeian satyr play mosaic, (No. 14), Pl.10. The restraining band may have been more necessary if nasal inhalation was employed because of the greater strain on the cheek muscles. It is possible that that technique was only used by virtuoso players. It may not have been necessary for the average 'dancing girl' who would also have suffered the 'disfigurement of Athene'. Continuous sound production might also have been unnecessary for bands of massed pipers such as those seen in funeral processions. However, even mythological creatures are often shown with bulging cheeks, as are the centaurs on a Bacchic sarcophagus in Rome, (No. 11), Pl.8. The pipers on the Amiternum relief, (No. 10) are also blowing vigorously with puffed cheeks. If the technique was
generally employed, and there is no basic difficulty in acquiring its mastery, this might help to explain the apparent scarcity of the bagpipe. Increased use of the bagpipe in the Roman period, if this could be proved, might point to some decline in the technique. It is interesting that Nero is mentioned among famous bagpipers. An enthusiastic musician, he was obviously attracted by novel and unusual instruments, but it is reasonable to suppose that he may not have had the opportunity, or the desire, to master the techniques of double piping.
Types of Tibiae.

Several types of tibiae are mentioned in Greek and Roman literature but it is possible to identify only a few of these in the monumental and archaeological record.

The major classification seems to be one of pitch and therefore of size. The chief Greek sources for the names of pipes are Pollux and Athenaeus who draw on the writings of Aristoxenus. Athenaeus' classes are \( \pi\rho\theta\epsilon\nu\iota \), \( \pi\omicron\delta\iota\kappa \), \( \kappa\iota\theta\varphi\iota\sigma\tau\eta\rho\iota \), \( \tau\epsilon\lambda\varepsilon\iota \), \( \upsilon\pi\epsilon\tau\varepsilon\lambda\varepsilon\iota \), the word \( \lambda\nu\delta\rho\varepsilon\iota \) being substituted for the last two at IV,79, listed in descending order of pitch, covering a range of over three octaves. The first three categories may have been known collectively as \( \alpha\mu\lambda\omicron \) \( \gamma\nu\nu\alpha\kappa\varepsilon\tau\omicron \) and the last two as \( \alpha\mu\lambda\omicron \lambda\nu\delta\rho\varepsilon\omicron \).

If so this explains the apparent inconsistency in Athenaeus' text.

Earlier references are to ethnic names, the inference being that the pipe played only one harmonia or scale system. The pitch classification belongs to a later period when pipes were more advanced and several harmonia could be obtained from one instrument, the musician Pronomus being credited with first achieving this feat. Early instruments may have been bored for only one harmonia but this does not apply to later Greek pipes and certainly not to the Roman tibia in its developed form. Some ethnic names were however preserved in the Roman period, the most important being the Phrygian pipes which are discussed below. They had apparently lost any connection with the Phrygian harmonia and were structurally different from other tibiae.
Servius (ad Aen. IX, 615) in a passage which may be drawn from Varro, cites only two major classes of tibiae, the Phrygian, which were impares and the Serranae which were peres. This raises the question as to whether all Phrygian pipes were in fact 'unequal', i.e. whether one pipe was longer than the other, an observation that is not always borne out by the iconographical evidence, and also whether all unequal pipes were called 'Phrygian'. Unfortunately Servius is the only authority for this classification and the value of this statement is also discussed below.

Another category, mentioned in Donatus' commentaries to the plays of Terence are the Lydian pipes, which are apparently the same as the (tibiae) duae dextrae. They are mentioned earlier by Pindar and there are several Roman references, including one by Horace, to these pipes, the only others to preserve an 'ethnic' name at such a late period. It is unlikely that in Hellenistic and later times this meant that they were only bored to play in the Lydian harmonia and one is tempted to suggest that like the Phrygian pipes they had some distinctive physical characteristic. One might also expect the instrument to possess particular musical characteristic, but authorities are silent on this point.

Although Athenaeus and Pollux wrote during the Imperial Roman period, most of their information about the different instruments is drawn from earlier works. Consequently many of the names (and the instruments themselves) may have become obsolete by their time. There are in fact no equivalent Latin words for the various types, but this does
not necessarily imply that they no longer existed. Greek remained the 'language of music'. Musical notation itself was derived from the Greek alphabet and most of the surviving major treatises are in that language. This may be chance, but it is likely that as in other artistic fields many of its practitioners were Greek.

It is however possible to suggest tentative identification of some of Athenaeus and Pollux' instruments among the iconographic record of the Greek and Hellenistic periods and a review of the Roman evidence is also of value.

Of the five major pitch categories, the pipe that can be most easily identified is the κιθαριστηριος, if that name in fact indicates that it was played with the cithara and presumably had a similar pitch range. There are numerous illustrations of cithara and aulos duets on Greek vase paintings which show pipes about 35cms (14 ins) in length. This is also the approximate size of auloi played in competitive scenes, taking the dimensions from the size of the figures. Many of the pipes played in Bacchic scenes appear to be about this length.

A difficulty occurs with the later evidence. The pipes in the concert scene from Herculaneum (No. 17) are, to judge from the scale of the figures about 90cms (three feet) long, the maximum length practicable without advanced keywork such as that used on the modern bassoon. Using Aristoxenus' classification, the longest pipes should be the σπερταλειδι, used to accompany men's voices. Pipes of this length would have had a lowest note of about low G. It should be noted however that the cithara is of a larger and heavier type than those generally shown in vase
paintings, and it may have been found necessary to accompany such stringed instruments which presumably had a lower pitch, with the larger and lower pitched pipes.

The surviving Pompeian pipes which are about 55cm. long may be classed as 'teleios', with a range of at least two octaves and a lowest note of about $f^\sharp$.

Smaller tibiae are not so readily identifiable. The pipes in some funerary reliefs appear to be quite short and therefore high pitched (No.10), and some specific names have been preserved in addition to those noted by Aristoxenus. The milvina tibia had a high clear tone and the gingrinae, apparently Phoenician in origin and associated with the worship of Adonis were also small, high pitched and plaintive. 88

In addition to the pitch categories pipes were also referred to generally according to the materials from which they were made and their form, for example, whether single or double, 'many holed', half-holed' and so on. 89
The Phrygian Pipes

Notable on illustrations of the Roman period and especially those dating from Imperial times is a distinctive form of the tibia consisting of two pipes of unequal length, the slightly longer left hand pipe terminating in an upturned conical bell which would, certainly originally, have been made of horn. These pipes were at first associated particularly with the worship of the goddess Cybele and may have been brought to Rome with the official introduction of her cult in 204 BC.

Literary references and archaeological evidence for this instrument are numerous and attest its popularity over several centuries. Some references are purely descriptive, others refer to the contexts in which it was played and often to its sound.

Many authors mention directly or indirectly, the horned end, although opinions differ as to whether one or both pipes had this attachment. The best illustrations always indicate one 'horned' pipe, although this is not consistently on the left or on the right. Pollux (Onom. IV 74) specifically mentions two horn bells, but as Baines (1960, p 57) points out, he is here describing a series of regional instruments and in view of the considerable amount of pictorial evidence it is not likely that the Roman Phrygian pipes had two horns. Musically it is quite feasible to have only one horn, thus making the contrast in tone between the two pipes greater, although acoustically the effect of the horn is not as marked as might have been expected. Apart from Pollux' statement, there is evidence for the apparent use of pipes with two horn bells in a painting on an Iberian vase fragment from Valencia of a woman with divergent double
pipes each with a serrated bell.\textsuperscript{92}

With its horn bell the Phrygian pipe could be classified as a hornpipe. The earliest illustration of such an instrument is on a sarcophagus of LMIII date from Hagia Triada.\textsuperscript{93} The painting is damaged but a reconstruction of the left pipe with a curving bell seems certain. It is impossible to trace the subsequent history of the pipe whose true home appears to be Asia Minor - the traditions of its origin being preserved in its name.

In Greek the instrument is the \textit{αὐλὸς ἔλωμος} (Ath.IV 176). The Roman name was often the tibia Berecynthia, a reference to Mt. Berecynthus near the River Sangarius in Phrygia and hence an adjective denoting connection with the rites of Cybele. The word used in this way occurs only rarely in Greek. It is used for example by Sophocles and is included in the works of the fifth century lexicographer Hesychius, who also mentions the instrument under the entry \textit{ἐγκεραυλής}. The word ceraules is used of the 'hornpiper' and the pipe is often specifically called 'Phrygian'.\textsuperscript{94} In view of the pipe's connection with the Phrygian cult of Cybele, the epithet 'Phrygian' probably refers only to its origins, but it may also mean that it was designed to play in the Phrygian harmonia or 'mode'. It is quite likely that the early inhabitants of Phrygia played in a distinctive way that was adopted in Greece as a particular harmonia or style but the Phrygian pipes do not seem to have been popular in Greece - never appearing on Greek vase paintings - and by the time of their introduction to Rome in Hellenistic times when the very significance of the harmonia may have been changed, any link must long since have been broken. Certainly the descriptions of the Phrygian
harmonia of the fifth century BC seem to bear little relationship to the orgiastic music which might have been expected to accompany the rites of Cybele in the third century. In any case it is unlikely that any particular style of music was played on the Roman Phrygian pipes, to judge from the differing contexts in which they are found. The instrument must have been distinguished rather by its appearance and sound - the name Phrygian, among others, probably remained a convenient description and a reminder of its traditional origin.

The Phrygian pipes were made of the same materials as the 'ordinary' tibia, materials which are sometimes mentioned specifically, for example, bone, reed, lotus and very frequently, box (buxus). It is possible that the word buxus does not always denote the material from which the instrument was made. Like the ubiquitous Greek ᾠδήματος it is often used for the instrument itself. By itself it does not mean 'Phrygian pipe', but is often so qualified, (Ov. Pont. 1,1.45). Presumably Phrygian pipes of the Roman period would, like the Pompeian pipes, also be made of wood or bone and metal, particularly those, which, with side tubes or keywork were obviously complex structures.

There is a little more information from ancient writers that may help one to decide whether the Phrygian pipe differed from other pipes in other ways apart from the horn. It is difficult to understand its great popularity if this were all, because of the somewhat limited acoustic effect of a relatively small horn. The greatest effect is on the lowest notes of the pipe where it can improve the quality (tone colour) and radiation as the resistive part of the radiation
Porphyrius, (ad Ptolemy I) says somewhat obscurely that the pipes were of the same length as the 'Greek' but had a narrower bore. A narrow bore accords with other statements that the instrument was deep toned. The reference to the length of the pipes may simply mean that they were not markedly longer than other types and it is not clear whether Porphyrius is only making reference to the straight part of the pipe or if he includes the horn.

Serviue's note on Aeneid IX, (615-20) has often been quoted as proof that one pipe was longer than the other. In the scholiae Servius contrasts the Phrygian pipes, 'quaet impares sunt et inaequales habent cavernas' with the Serranae 'quae sunt pares et aequales habent cavernas'.

At face value therefore Servius means that the pipes of the Phrygian tibia differed in both length and diameter of bore. Servius is the only literary authority for this 'imparity' and although he relies heavily on Varro he is a late author (ca 390). As the pipes were so popular and are frequently alluded to it is surprising that earlier writers do not mention it and that the poets do not mention, for example, the 'tibiae impares'. In illustrations of the instrument the straight parts of the pipes are approximately of equal length, but one pipe is made longer by the addition of the horn. This difference is however never marked or emphasised, despite the often considerable detail of some representations. Granted that because of the horn the pipes could be said to be 'unequal' one has to consider whether the tibiae impares mentioned elsewhere as accompanying Roman dramatic performances were Phrygian pipes, and if this is
indeed another name for them. Howard who takes this view surmises therefore that the *tibiae impares* of the scholia to Terence's *Heautontimoroumentos* and the Phormio are Phrygian pipes. He goes further in accepting Hesychius' statement that the curved (i.e. horned) pipe was held in the left hand, despite the inconclusive nature of the pictorial evidence and cites this in explanation of the fact that two right hand pipes are mentioned in the didascaliae, but never two left hand pipes. Howard's interpretations of the passages involved seems plausible but appears to rest too heavily on Servius' single statement about the unequal pipes. Might there have been another instrument with pipes of unequal length?

It is known from other sources that the aulos, or *tibia*, was used to accompany Hellenistic and Roman drama, particularly comedy, but illustrations usually show the 'ordinary' version of the instrument (Nos. 14, 29). There is no positive evidence that can identify the *tibiae impares* of the comedies with the Phrygian pipes. If the latter were used for this purpose it would appear to be a Roman innovation, as they seem not to have been popular in Greece, and the whole question of any 'Roman' originality in the music of drama is highly speculative.

Whether or not they were ever actually called 'impares', Servius' note continues with more information about the construction of the Phrygian pipes. Quoting Varro he states that the right hand Phrygian pipe had one hole, foramen, and the left had two, of which one gave a low and the other a high note. This could make sense as it stands and would again indicate that the lower note was produced by the left hand and therefore longer pipe, but if this was the total number of holes on the instrument its range would be somewhat limited.
and it is hard to see how the pipes could play popular, not to say orgiastic music. Dr Landels suggests that *foramen* could be used in another sense here, not as a 'fingerhole' but as a vent hole or possibly octave key, perhaps indicating that different registers were available. In another context Howard interprets the *foramina* of Quintilian as 'speaker holes' to raise the pitch by the production of harmonics. There is therefore some difficulty in interpreting Servius' statement. There is no pictorial evidence to support such a limited number of fingerholes, although if the horned pipe sounded a drone, which is by no means certain, fewer holes would be acceptable.

Frequently illustrated are side tubes which are described below and discussed more fully in the chapter on keywork. They are also shown on the *tibia* but appear more frequently on pictures of the Phrygian pipe in early Imperial times. The acoustic effect of side tubes is a deepening of the tone, and in combination with a narrow bore this may have contributed to the characteristic sound. There are several descriptions of the pipes' tone which make use of adjectives such as *horridus* and *raucus*. Even allowing for poetic license this suggests a powerful and strident sound.
Archaeological evidence for the Phrygian pipe.

No surviving fragments of tibiae can be identified as belonging to Phrygian pipes but there is much pictorial evidence particularly from Italy, mostly dating from the first three centuries AD.

A relief of the second century from Lanuvium, now in the Palazzo dei Conservatori Rome, shows the instrument in its original context, as an attribute of the cult of Cybele (No.18). The relief shows one of her priests with various symbolic objects, including cymbals and a tympanum. The two pipes which are somewhat simplified with no fingerholes, are shown separately. The shorter pipe is straight with horizontal lines carved on it, probably indicating joints or tuning bands. The reed socket is carved clearly and from its shape appears to be of the double oboe type. The left hand pipe is similar although with more incised lines, but ends in a large flaring upturned bell.

According to pictorial evidence, the Phrygian pipes were also associated with other orgiastic cult music, notably that of Dionysus. A Bacchic relief of a triumphant Dionysus (No.30) shows a tympanum, cymbals and a pair of Phrygian pipes played by a satyr who also beats a scabello with his left foot. The pipes are not very detailed - the left is conventionally hooked and tuning rings and fingerholes are indicated on both. Unusually the right hand pipe appears to have a conical bore, but I feel that such sculptural evidence is not of sufficient detail to postulate an important change from a cylindrical to a conically bored pipe. The hands are placed opposite each other, but are not very realistically portrayed; this applies in particular to the right hand which is held at an awkward
The importance of the illustration is chiefly for the context in which it shows the pipe.

More detailed is a relief from Naples, of Dionysus and two Maenads, one dancing with cymbals held aloft, the other playing Phrygian pipes, both pointing upwards (No.19). Each pipe has a narrow cylindrical bore, the left ending in a bell and protruding from both pipes are T-shaped projections all pointing upwards.

The later sarcophagus from the Catacombe of Praetextatus (mid third century AD) shows another Maenad blowing detailed Phrygian pipes (No.20). The outstanding feature of this illustration is the series of side tubes placed towards the lower end of each pipe. These are not the mushroom shaped pegs or straight projections of other illustrations, but appear to be hollow as they are clearly carved, with a central hollow and a slight lip or rim around the top of the tube, which in proportion to the general size of the pipe would have been about 3cms in length. Unusually the side tubes are placed towards the bottom of the pipes, four on the right and six on the horned left hand pipe. Turning rings and spacer bands are indicated by incised horizontal lines beside the tubes, but all tubes are in the same plane. Fingerholes are shown, most unrealistically above them, four on the left and three on the right hand pipe - the stretch would be impossibly large. The hands of the player are placed opposite each other although the fingers of each are not in the same position, but no attempt is being made to cover any of the fingerholes.

Long heavy pipes very similar to the above, with exceptionally large holmoi are played by a Maenad on a sarcophagus in the Vatican cemetery, but these have no side tubes.
Illustrations of the Phrygian pipes in a Bacchic context are not confined to Italy. The late second century Dionysus mosaic from Cologne has a scene sometimes referred to as the 'satyr family' (No.2). A dancing Maenad plays Phrygian pipes, the various components of which are shown by tesseræ of contrasting colours. The horned pipe, here played by her right hand (although the perspective is a little odd) has five upright projections coloured brown in contrast to the yellow of the pipe. Three are T shaped while the alternate ones are straight - TTT. A similar arrangement on the other pipe is partially obscured by the player's hands, but the fingers are not shown to be covering any of the holes. The left hand is curled around the shorter pipe and the index finger of the right hand is apparently resting against the side of one of the straight projections, perhaps pushing it.

Side projections, whether tubes or levers are illustrated frequently but not exclusively on Phrygian pipes and the various theories about their nature and function are discussed elsewhere.

Phrygian pipes also appear in Bacchic designs from other countries, as for example on a mosaic from Cordoba in Spain, where they are played by one of eight figures placed around a central motif of a chariot with centaurs (No.31).

A second mosaic from Cordoba, (No.32) with a central motif of the wolf and twins, includes in its design a reclining figure holding a pipe in each hand, but in this case both pipes which are shown very diagrammatically are curved at the end, suggesting that each has a horn bell end. This may simply be a misinterpretation of a copy book design, but it may be significant that in Iberia there was apparently a traditional divergent double pipe with two horns. This
appears on the vase fragment referred to above (note 92), possibly of the first century BC found near Valencia. A woman plays a divergent double pipe, each pipe terminating in a jagged flaring bell. Decoration on the sherd apparently shows Punic or Cypriot influence. (Later hornpipes, notably the Welsh pibcorn, sometimes have a serrated or 'open jawed' bell, which as Baines notes recalls the animal headed bells of the Iron Age Celtic carnyx.)

Returning to the 'classic' Phrygian pipe in Italy, according to the monumental evidence it was also played at sacrifices, as for example on a relief from the Villa Albani, Rome of a sacrifice, probably to Cybele, again demonstrating its association with the eastern cult, (No.33).

It is however seen in a traditionally Roman setting, at a far less exotic sacrifice to the Lares on a Pompeian wall painting (No. 9). The longer hooked pipe which has lateral projections is held in the player's right hand. He also plays a scabellum. Phrygian pipes are also in evidence at a funerary feast on a sarcophagus in the Vatican. Standing behind a seated cithara player is the piper with a pair of rather roughly carved instruments, the longer curved pipe held in his right hand.

In happier mood a satyr plays the Phrygian pipes (the illustration also includes a scabellum), while two other satyrs tread grapes. Again the longer hooked pipe is played with the right hand.

Despite the last three examples it is generally assumed that the longer horned pipe was held in the left hand and the better and more detailed illustrations in fact show this. There are numerous pictures of the instrument testifying to its popularity which is also suggested by the frequent literary
allusions. I have attempted to pick out the best of the illustrations or those showing it in different contexts, but a complete list would be impracticable. Generally the pictorial evidence reinforces the poetic tradition that links the music of the Phrygian pipes with the worship of Cybele and of Bacchus, but also indicates their wider application.
1. The problems of reconstructing Greek auloi are discussed by Landels, 1981, (World Archaeology, 12,3; p.298.)

2. Plato, Republic 399B-400C discusses the general role of music in his ideal society, emphasising the ethical importance of certain harmoniai and rhythms.

Illustrations depicting the aulos in various roles can be found in Wegner, 1963, passim, especially Abb.17,p.38; Abb.36,p.64; Abb.42,p.70; also Wegner, 1949, p.89-150.

3. Current theories about Etruscan origins are summarized by Pallottino, 1975, The Etruscans, p.64ff, with full bibliography.


5. Pallottino, 1975, p.156.


The Merse fragments (first century BC) include a bell section; also, Fragment from the Athenian Agora, Landels, 1964.

Examples of Greek auloi without bells, include a red figure amphora - BM E 270, CVA B.Mus. III lc, Pl.8, 2d, ca. 480 BC. = Wegner, 1963, Abb.10, p.32.

7. Jannot, 1974, L'Aulos etrusque, L'Antiquite Classique, 43, p.118-142, accepts the existence of the conical pipe as featured in Etruscan art and notes that the type is usually seen in dance scenes, (p.131), but does not claim that it is an exclusively 'Etruscan' instrument. He does not discuss the acoustic properties and musical significance of a conically bored instrument.


Other illustrations which apparently show a conical pipe include: Jannot, 1974, no.60, pl. IV,7, (BM. D, 16c); ib. no.84, pl. III,5; chuisi, sarcophagus 2273.


12. Tomba Golini, Orvieto, Fleischhauer, 1964, Abb.11,p.56.
13. Etruscan pipers at Rome - Vergil Georgics II, 193, and Servius' note EBUR.
   subulo - Varro LL, 7,3,35.
   Festus, p.309,
   Ennius Sat. 65.

14. Livy IX, 30,5. See also Ovid Fasti VI, 669; Plutarch aetiae Romae, 55.

15. eg. Martial XIV,64.

16. Inscriptions relating to the collegium tibicinum include;
   CIL VI, 1054, 2191, 2584, 3696, 3877, 3877a.
   eg. CIL VI, 2191 - collegium tibicinum et fidicinum qui sacris publicis praesto sunt.

   Pipers at sacrifice - Cicero de Haruspicum responso 23,
   Pliny, NH, XIII, 10.


Such pipers are also referred to by Cicero, de. Sen. 13,44.

19. (a) References to pipers at the rites of Cybele include;
   Hor. Carm. 3, 19, 18.
   Lucr. De re. nat. 4, 551f, 542-546.
   Ovid, Fasti, 4,181-186.
   Ovid, Pont., I, 1, 37-40 and 45.
   Plut. Mor. 759B.
   Verg. Aen. 9, 617-20.

   (b) Pipers in Bacchic rites,
   Tibullus, 2,1, 83-87.
   Verg. Aen. 11, 736 ff.

   In most cases these references to music in the rites of Cybele and Bacchus specifically mention the tibia Berezynthia or Phrygian pipes.


21. In Bacchic scenes the Phrygian pipes (qv.) are usually shown, eg. Naples MN 6684.


23. Pompeii, 'Dioscurides' mosaic, Street Musicians, MN. 9985,
   Drums No.1. Also reproduced as a painting at Stabiae, MN. 90.30.


26. The pipe in the Pitt Rivers Museum has long been thought to be part of a double tibia - see, Rimmer, 1976, p.44. The single pipe, length 25.1 cm. is made of six sections of lathe turned bone, with exterior ornamental rings. At the upper end is a barrel (a holmos) and at the other a slightly flaring bell. Four frontal fingerholes are spaced about 3.6 cm. apart. A small lateral hole on the left side of the pipe may be a speaker hole. Two more near the edge of the barrel on either side of the pipe may have been used for fixing the reed.

The pipe is of unknown provenance however and the external decoration is unlike any seen in illustrations or on any surviving pipe. It may be of Roman date but the form is insufficiently characteristic for a definite conclusion to be drawn.

27. It is possible that Vergil's avena, (originally an oatstraw monaulos) was used in this sense, but the word can also mean syrinx - see Verg. Ecl. I, 2, and Smith, P.L., 1970, TAPA Vol. 101, p.497-510.

28. Ivory; Vergil Georg. II, 195; Athenaeus, 182 E. Metal; Horace, A.P., 202 ff; Pliny, NH XVI, 66, suggests that the whole instrument was of silver; Pollux, IV, 71.

Bone; Athenaeus, 182 E.

29. Bone was used for whistles and fipple flutes in prehistoric times, some instruments being quite sophisticated, e.g. the Iron Age pipe from Malham Tarn, Raistrick, Spaul and Todd, 1952, GSI, 1952, Nov. V, p.28. Also Megaw, V., 1960, Penny Whistle in Prehistory, Ant. 1960, p. 1 ff.

30. Pliny NH, XVI, 66, Ismenias was a virtuoso aulete and composer of the fourth century BC. Pliny records that his pipes were bought in Corinth and cost the astonishing sum of four talents - also, Lucian, adv. ind.; 5.

31. Bone auloi - see, Landels 1963 and 1964 (The Brauron Aulos and Bone auloi from the Agora.)

Also Corinth Museum, Inv. No. MF 9045 - a fragment showing the construction of the joint, with two fingerholes and a thumbhole; MF 9229, and MF 1738 - a section of bell.

32. Pollux, IV, 76.

Bird bone pipes are known from London, (Mus. of London, (L.47/3, 114, 026).


Athenaeus, 182 D.
Pollux, IV. 77.
In these examples the word buxus refers specifically to the Phrygian pipes. The name of this common material appears to have been used synonymously for this instrument, but it is not used for the classical aulos.

See also Pollux, IV, 71, who lists all the materials from which auloi were made, including wood.

It is interesting that box should be singled out. Box, buxus sempivirens was in the eighteenth and nineteenth centuries the most favoured wood for smaller musical instruments, being hard, light and resonant, but it is very susceptible to atmospheric change. The best boxwood came from Spain, Italy, and Turkey, on the Black Sea coast.

For placing of fingerholes also, Ps. Arist. Problems XIX, 23

Ptolmy, Harm. ch. 12. During, p. 66, 1, 28 ff.

for Proclus, Comm. on Alcib. p. 197, ed. Creuzer.

I am grateful to Dr. Martin Henig and to Mr. David Neal for bringing this object to my attention.

Marcuse, 1975, p. 658, considers that side tubes were hollow plugs used solely for their acoustic effect, and that they were attached to tone holes placed below the fingerholes.


A single reed is suggested by von Jan, 1884, 'clarinet type'; Schlesinger, 1939, who proposed a change from a double to a single reed in the mid fourth century BC; Bodley, 1946, who accepts Schlesinger's theories; Becker, 1966 suggests that the reed was usually single but that the double reed was known. His conclusions are followed by Marcuse, 1975, p.658. Michaelides, 1978, summarises all theories but draws no conclusion.

47.) Illustrations of the tibia showing a probable double reed include the Etruscan tomb painting from the Tomba dei Leopardi, (No.2), and the Monnus mosaic from Trier, (No.12).

48.) Baines, 1957, p.192, fig. 41.


50.) Becker, 1966, p.58-9, Abb 8. The wall painting is from the Tomba Francesca Giustiani; Theophrastus, NN IV, 1-9; Pliny, NN XVI 65-66.

51.) Arundo donax - Bate, 1975, p.20-21.

52.) Antigenidas - a late fifth/fourth century aulète and composer from Thebes. Plut. 1138B, ch.21; Athen IV, 131B.


54.) Aristotle de audibilibus 802 b, 18.


56.) Bodley, 1946, p.224, pl.VIII.

57.) Bulbs (holmoi) on Greek vase paintings:

   BM E270, (ca. 480BC.) CVA Br. Mus. III,1,c. Pl.8 3d.,

   BM E271 (440 BC.), CVA BM II 1c, Pl.11, land 2.
   Berlin, Staatliche Museen, F 226, CVA Berlin, Bd.2,
       p.12, Pl.55; Wegner, 1963, Abb. 53,54, p.84.

   Munich, Staatliche Antikensammlung, 2646, (J 371),
58.) Chichester gem, First century AD, No.25.
Sarcophagus, Museo del Terme, Second century, No.11.
Sarcophagus, Catacomb of Praetexta, Third century, No.20.
Sarcophagus, Museo del Terme, Third century, No.25 - a
sarcophagus in the Townley collection of the British
Museum is almost identical to this example.

59.) Schlesinger, 1939, p.71 identifies the bulb as the
hypholmion and suggests that it concealed a single reed
mouthpiece with the cup shaped holmos above.

60.) Landelis, 1968, p.234; 1961, p.36. The Catalanian shawm
is discussed by Baines, 1962, p.114.


62.) Howard, 1893, p.28, Pollux, X, 114, Hesychius, sv.
and there are two other references both of the fifth century BC -
hypholmion - Pherecrates, 242.
holmos - Eupolis 267, Kock, Comic Attic Frag. vol.1, p.331,
Gr. 267,
but these add little, other than demonstrating that the words
were known in the fifth century.

63.) Bodley, 1946, p.224; Becker, 1966, p.63; Michaelides,

64.) Wegner, 1949, p.52, suggests that the hypholmion was the
top of the body into which the bulb fitted, thus satisfying
the statement that the hypholmion was a stand for the holmos.
In his thesis, (1961) Dr Landelis draws attention to a passage
in Ptolemy, (Harm 1.3; During, p.8, 1, 25) where the acoustic
behaviour of a reed and a voice are compared. This suggests
that experiments were made from τὸ πλήττων, which
is earlier identified with the hypholmion and the obvious
place from which to make such experiments is the end of the
air column, i.e. at the base of the reed. The implication is
that the reed was fitted into the hypholmion. A reed socket
is often shown above the bulb and exists in this form on the
Pompeian pipes.

It should be noted however that on many illustrations
the components at the top of the pipe are not clearly shown
and that one is forced to rely, perhaps too heavily on the
small number of surviving pipes.

65.) Vase paintings of phorbeia, all showing the additional
strap over the head - BM E 270; Berlin F 2262, see note 65,
Naples Mus, Nas. Stg. 225, Beazley AR p.263, No.25;

66.) capistrum used in the sense of 'halter' etc.:
Vergil, Georgic II, 188; 399.
Ovid Met. X, 125.
Petronius, Sat. 47
Juvenal VI 43 uses the word with the meaning of a matrimonial
halter. It is equated with phorbeia in a musical sense by
Howard, 1893, p.29; Sachs 1940, p.138; Scott, 1957, p.407.
Suidas gives κεφιστομίον and καπίστρον as equivalents of
phorbeia.
67.) Representations of the phorbeia: (a) Greek - see note 65; (b) Etruscan - Chiusi relief, No.1; (c) Hellenistic/Roman - concert scene Herculaneum, No. 17; Satyr play mosaic, Pompeii, No.14.

68.) Plutarch Mor. II, 456 b-c. Athena was said to have flung the instrument aside on catching sight of the reflection of her bulging cheeks and eyes.


70.) Howard, 1893, p.29. This interpretation is now given by LSJ (suppl), quoting Schol. Aristophanes Vespae 582.

71.) Becker, 1966, p.126, claims that no female players are depicted wearing the capistrum. Reinach (D&S av. tibia) gives a few possible examples of female pipers with the phorbeia, eg. BM Cat. III E 520 1, a Greek vase painting, but such illustrations are very rare and I have found none for the Roman period.

In general terms one would not expect to see virtuosi in scenes of Bacchic revelry. In daily life the music at sacrifices and in processions for which many professional musicians were employed often by towns, need not have been elaborate, nor necessarily performed to a high standard.

72.) Landels, (1961, p.42) suggests that the mouthband was an aid to embouchure control, having a frontal slot that squeezed the lips together. The tightness of the embouchure could be altered by moving the head. He also makes the suggestion (1968, p.234), that the phorbeia could be an alternative to the hypholmion. This attractive theory presupposes that the phorbeia had a slot over the mouth. The Pompeian illustrations show two small holes rather than a slit but there is not enough pictorial evidence to settle this point.

73.) The word phorbeia (φορβεία) was still known to later writers, eg. Plutarch, II, 456b, also Hesychius and Suidas, but their rather obscure statements suggest that its purpose was not entirely clear.

74.) Greek salpinx players are often shown with a phorbeia. As this is a lip reed instrument there is no question of a hypholmion being used simultaneously, but this is not conclusive evidence that the hypholmion and phorbeia could not be used together on the tibia as the two instruments were so different. The hole in the mouthband used with the salpinx must have been quite large to allow the free vibration of the lips, while the holes in the phorbeia used with the tibia, were as suggested by the Pompeian mosaic quite small, only allowing for the passage of the reeds. (Alternatively the hole could have been larger in order to squeeze the lips together). The phorbeia of the salpinx, while supporting the
lips and cheeks and helping to prevent fatigue must have restricted the number of harmonics available and prevented flexibility of embouchure. It is not shown with the Roman *tuba* and other lip reed instruments.

75.) A single joined or 'yoked' mouthpiece was considered and rejected by Howard, 1893, p.27.

76.) Baines, 1957, p.196 discusses the zummara.

77.) Illustrations showing hands placed symmetrically on pipes of equal length:
- Etruscan - Chiusi relief, No.3; Wall painting from the Tomba Golini, Fleischhauer, 1964, Abb. 11, p.36.
- Roman - Cinerary urn, British Museum, No.27; Altar, No.4; Syrian terracotta No.16 and Drums No.10; terra sigillata of M. Perennius, No.29.
- Pipes of equal length, which do not have the musician's hands in a playing position - No.2, No.12, No.23.

78.) Phrygian pipes - Servius *ad Aen*.IX, 615-20.
- Illustrations that show the left pipe as longer because of the addition of a bell - eg. Nos. 9 and 19. Howard, 1893, p.47 noted two examples on sarcophagi where the horned pipe had a greater number of holes than the straight pipe, Lateran Museum No. 751, Louvre, No.300.

- *Tibiae impares* - didascaliae to *Heautontimourumenos*
  "   " Phormio.
- *Tibiae pares* - Donatus - Eunuchus - t. dextra et sinistra.
  didascaliae - Eunuchus - *tibie duabus* : dextris

80.) Bodley, 1946, p.253m Pl. VI, 1.

81.) The technique is explained by Baines, 1957, p.157.

82.) Pollux *Onom.* IV, 74: Athenaeus IV, 76; XIV, 634.

83.) This type of nomenclature is sometimes used for later instruments. The types of launedda include the mediana pipia (boy-girl pipe) and the *fiudi* (widow).

84.) Pausanias IX 12,4; Athenaeus XIV 631 E.

85.) Pronomus of Thebes was a virtuoso musician of the fifth century BC, the teacher of Alcibiades. Pausanias IX, 12,5-6; Athenaeus IV 184 D.

- The names of other pipes, eg. the *Libyan aulos* Athenaeus XIV 618c date from an earlier period. The names Tyrrhenian, Theban, Thrai, Thracian, Boestian and Cretan are also known.
87.) Dr. Landels (1961, 57) suggests tentatively that the Lydian aulos may have had a small bell, as seen on many illustrations, particularly those from Etruria.

88.) miliinae - genus tibiae acutissimi soni - Paul ex Festus p. 123 Mull. (ca AD 150); Solinus 5, 19; 
gingrinae - Solinus 5, 19; Paul ex Fest. p. 95. 
- Athenaeus IV 174; Pollux IV, 76.

89.) Michaelides, 1978, p. 44 lists the various names for the pipes used in Greek literature - including descriptive epithets.

90.) Horn is mentioned as a material for the aulos by Pollux IV, 71; Athenaeus IV, 151 D-E.

91.) References to the horn on the Phrygian pipe include:
Ovid Pont. I, 1, 39 - cornu tibicen adunco
Ovid Fasti 4, 189-190 ... adunco.
Ovid Fasti 4, 191, protinus inflexo Berecynthia tibia cornu/ flabit...

Tibullus, 2, 1, 86 ... curvo.
Verg. Aen 11, 736 ... curva tibia.
Athenaeus IV, 185.

92.) Baines, 1960, p. 58.

93.) Behn, 1954, pl. 112, fig. 96, p. 71.

94.) Athenaeus IV, 176.
Berecynthian - Horace, Carm. 3, 19, 8 and scholia.
- Ovid Fasti 4, 181
- Sophocles fr. 515.

Ceraules - Apuleius Flor, 3, 17.

Phrygian Tibullus, 2, 1, 86.
Athenaeus IV 176 equates the auloi elumoi with the Phrygian pipes and at 177A quotes Juba as saying that they were invented by the Phrygians.

Vergil's reference to the tibia Bacchi Aen. 11, 736, indicates the Phrygian pipe.

95.) Materials. Reed - Catullus LXIII, 22; lotus Ovid Fasti 4, 190; buxus - Ovid Pont. I, 1, 45; Verg. Aen. 9, 619.
Bone and metal would also have been used.

96.) Nederveen, 1969, p. 56.

97.) Porphyry ad Ptolemy I, During 1949, p.
Athenaeus IV, 185.

98.) Howard, 1893, p. 37,
didascalia ad Heat. 6ff, Phormio, 7ff.

99.) However much one would like to see some native Italian element in the music that accompanied, for example the plays of Plautus, there is at present no conclusive evidence. The Plautine cantica raise considerable problems which are better studied by a linguist.
100.) Howard, 1893, p.34; Quintilian. I,11.6.

101.) Sound of the Phrygian pipe. Athenaeus IV, 185; Catullus Carm 64, 261-264; Claud. 2,263; Ovid Fasti 4,189; Val Fl. 2, 582.

102.) Toynbee, J.M.C. and Ward Perkins, J.B., 1956, The Shrine of St Peter

103.) Sachs, C., 1928, Die Musik der Antike, No.33, p.25.
Chapter 3

The Single Pipe

The single reed blown pipe, which was held vertically, is mentioned in Greek and Roman literature, but seems to have been of minor importance. In Greek this is the monaulos (μοναυλος) which is carefully distinguished from the (παγονυλος) by Athenaeus (IV 174e) and also by Pliny (NH VII,204). It may be significant that Pliny refers to the single pipe as the monaulus and similarly Martial (XIV 64) mentions the monaulos, a direct transcription from the Greek, suggesting that there was no specific Latin word for the instrument. The term monaulos suggests simply a single aulos in other words a single reed blown pipe, but the instrument was probably more distinctive than that. As it could be played with both hands it could have had more fingerholes than the double aulos and may often have been longer.

The first archaeological evidence for the existence of such a pipe comes from Hellenistic Egypt, where the single end blown flute had been played since the third millennium BC. In the Brussels Conservatoire Museum is a cylindrically bored pipe of about the first century BC with ten fingerholes, including two thumb holes. In the same museum there are two double reeds of the Ptolemaic period, but there is no evidence about the pipes to which they would have been attached. There is no literary evidence about the type of reed used for the monaulos or any statement that it had a reed at all.

There are however the usual conflicting explanations of the instrument's origin. Pollux declares the single pipe to be a Phrygian invention, while Athenaeus claims it for his native Egypt, attributing it to Osiris. Ulpian, comparing...
its sound unfavourably with that of the hydraulis, indicates that it was very popular among the Alexandrians, an unsurprising statement if the single pipe in various forms had been played in Egypt for so long. Having established its popularity in Egypt Athenaeus quotes several authors including Sophocles to argue that it was also known in Greece. The literary illusions are however few and are generally obscure. The instrument was probably known in Greece, especially from the Hellenistic period when there was greater contact with Egypt and the east. The idea of playing only one pipe would seem to be an obvious one but the sound produced would hardly be as interesting and vibrant as that of the double pipes, however they were sounded, and may not have been as popular.

Athenaeus wrote during the second century AD but seems to reflect a Hellenistic tradition. Contemporary Latin references and references in the writings of Greek authors of the Roman period to the single pipe, as distinct from the tibia obliqua or plagiaulos, are few.

Illustrative material is even rarer. Many sculptures purporting to show the single pipe are restored, some completely fancifully. Howard (1893: 13), lists those that he considered authentic and many which were restored, but even some of his "reliable" examples are open to doubt. A typical example of an incorrect restoration occurs on a sacrificial scene from a triumphal arch in the Palazzo dei Conservatori, Rome, (Tibia No. 6). This shows a tibicen playing a single pipe with a conical bore and a distinct flare at the bell end. The instrument is completely restored and originally the sculpture would certainly have been of a normal double tibia.
A single pipe is shown on a wall painting of an Isisic ceremony from Herculaneum (No. 1). A musician in the foreground is playing a long pipe, fingering it with both hands, and apparently blowing into the end. The instrument may be held slightly to the right but even allowing for difficulties of perspective this does not seem to be a transverse flute. Unfortunately there is nothing to indicate whether it was reed blown or played as a vertical flute. Either way would have been possible, particularly in view of the Egyptian associations of this scene, although the rather puffed cheeks of the musician might suggest that the pipe is reed blown. The sacrifice is also accompanied by the rattling of sistra and the chanting or singing of the congregation.

It is sometimes claimed that the instrument played by a satyr on octagonal field (c) of the third century Dionysus mosaic from Cologne, is a monaulos (Tibia No. 2). The scene also shows a Maenad with a three stringed lyre. On closer inspection there are certain features which cast doubts on this. The pipe is played with both hands but these are not placed one above the other along the length of the pipe. Instead the little finger of the left hand overlaps the middle finger of the right, almost as if allowing for an attempt at perspective drawing their hands are in fact side by side, each fingering a separate pipe. This would of course be a far more usual arrangement in such a scene. It is perhaps unfair to pick out details of a mosaic to support a theory, but the 'pipe' is outlined in a dark colour and its end is represented by two tesseræ that are not quite in line. This it could be argued is intended to represent the ends of two parallel pipes. However the position of the arms and hands is perhaps a more convincing point and that the typical playing position of the
instrument which is slanted upwards slightly suggests that it is the ubiquitous double tibia.

From Roman Britain comes a curiosity, in the form of the Silchester 'flute girl' (No.2). This bronze statuette which shows a blend of classical and Celtic elements is of a girl dressed in a stylized Greek peplos, holding a single pipe with three projections. These may all be intended to represent fingerholes but the top one could be a flute mouthpiece. However as the instrument is held diagonally across the girl's body, well away from her mouth its playing position can only be conjectured. It may have been a transverse flute, or it may equally be based on the idea of a classical instrument which the artist had never seen.

There are so few details about the monaulos that it is difficult to say whether it had any specific musical role. Pollux says that the Egyptians played it to accompany wedding hymns and the Carians, dirges. Poseidonius includes it as an instrument of revelry and Martial would probably have agreed. If it was simply a single aulos its tone would have been less vibrant and exciting than that of the double pipe; and if a vertical flute the same observations would apply. On some occasions where instruments are depicted one suspects that the quantity rather than the quality of the sound was more important. A soft flute would hardly drown any inauspicious sounds at a sacrifice or excite a crowd. Hence a single pipe might be shown only rarely but may have been played more often on more intimate occasions.
Notes.

1. Pollux IV, 75; Athenaeus IV, 175 E – quoting Sophocles, Thamyres, TGF 182.


3. Pollux, IV 73; Poseidonius, PHG III, 253; Martial XIV,63,1.
Chapter 4

The Transverse Flute - and the side blown reed pipe.

The flute in its various forms is a very ancient instrument popular among many primitive communities, but although the principle of this free air reed instrument was known to the Romans and Greeks, particularly from their associations with Egypt, it was not apparently widely played. There are only passing references to it in the musical literature and only a few illustrations that can with confidence be described as flutes. The interpretation of much of the archaeological evidence is controversial and besides describing in detail the few pieces that show the flute, it will also be necessary to mention several where such an interpretation can no longer be accepted.

In Egypt where the flute had been known for centuries it appears in early illustrations to have been end blown, held vertically in the manner of the modern day, played in North Africa and elsewhere, or at a slight angle, but not at all like the transverse flute of the modern orchestra.

The cross flute does not appear in pre-Hellenistic Greek art, but from Alexandria comes a terracotta figurine playing a single pipe, positioned horizontally to the player's right, without a reed, although there does appear to be a projecting mouthpiece, similar to that on some later sculptures. Hickmann, (1952; 108) interprets this as a cross flute, blown not at the end but a few inches down the pipe, although it also has the tuning rings more generally associated with reed pipes, (No.1).

The clearest earliest undisputed illustration in Italy is a relief from the Hypogeum of the Volumni, an Etruscan tomb near Perugia, dating from the late second or early first century BC (No.2).

The musician whose head and shoulders
are shown is playing a short transverse pipe held to his right, while both his hands stop fingerholes. There also appears to be a small block left between the instrument and the musician's lips, although the details of the carving are in general not very clear. A sculptor might leave a bridge in such a position to strengthen relief work, but in this example which is in low relief this would seem to be unnecessary. I feel that the angle at which the pipe is held makes it unlikely that this is a reed mouthpiece, which would have been most awkward to play. The most attractive possibility, assuming that the sculptor has not merely left in the block by mistake, is that it is an attempt to show a raised mouth hole or embouchure guide, a lip rest to aid the player. An earlier ash chest from Volterra shows a single pipe held transversely but the details are not so clear (No.3).

An apparently similar raised mouthpiece exists on a side blown flute from a tomb at Halicarnassus, discovered by Newton, and now in the British Museum (No.4). The instrument which is in several sections has been 'reconstructed' on a piece of cane, and its total length is 30cms. The upper part, consisting of three jointed sections is of bone or ivory, to a length of 16.5cms. Below this the pipe is covered with bronze, but it is extremely fragmentary. All the four finger-holes are in this section. I have some doubts as to whether the two halves actually belong to the same instrument, although there seems to be no fundamental objection to an ivory mouthpiece on a bronze tube, but the highly fragile and damaged state of this example makes it impossible to be certain. It is in any case the mouthpiece which is of most interest. The first section is six cms. in length and is damaged at the upper end. Near this end is a raised block, 1.3cm. high,
with a shaped mouthhole, 0.7cm. in diameter bored through its centre. The hole is bevelled and undercut on one side and is lower at the front and back than at the sides. This pipe can certainly be accepted as a transverse flute. Its provenance was Halicarnassus - its date is unfortunately less certain. Bronze pipes of similar construction to the lower part have been found dating from the last century BC and the first century AD though they may have existed earlier. If the two sections do belong to the same pipe, and certainly if as seems likely being found together, they are contemporary, the ivory mouthpiece too might date from the last centuries. Such dating is of course tentative.

A mosaic from a Roman villa in Corinth, dating from the second century AD, clearly shows a transverse flute, played by a herdsman in a pastoral scene (No. 5, Pl. 23). The player has the pursed lips of a flautist and blows across a hole placed near the end of the pipe, which is, unusually, held to his left. The fingers of both hands are covering fingerholes, one of which is visible between his upper (right) hand and the mouth-hole. Fingerholes and mouth-hole are in the same plane and there is no raised embouchure guide. The pipe is quite long, assuming the player is of average size, about 45 to 50 cms.

The altar of Amemptus in the Louvre shows a lyre playing Centaur and tibia-playing Centaures with figures of Eros and Psyche on their respective backs (No. 6, Pl. 24). Eros is blowing into the side of a transverse pipe, held to the right. There is no sign of any mouthpiece, but the sculpture is not very detailed. As Amemptus was a freedman of Livia it dates from the first century AD, not earlier than the reign of Tiberius.

Other evidence is less satisfactory. A.A. Howard cites
a terminal of Pan or Midas, found at Civita Lavinia, and dating from the first or second century, as an illustration of a flute. The figure is playing on a pipe, held transversely which is connected to his mouth by a short stem, but this is longer than a simple embouchure guide. However, the statue is greatly restored, the restoration including sections of the pipe and the whole of the mouthpiece and consequently cannot be relied upon as evidence.²

Similarly a Pompeian wall painting of a banquet scene with winged putti, includes a seated male figure with a flute, held to his left.³ There is some doubt about the authenticity of and extent of the restoration of this painting, which cannot therefore be relied upon.

In addition, there are several later Roman sarcophagi showing large transverse pipes each with a clearly carved mouth-piece set at right angles to the main bore. I shall describe these in greater detail below and also consider the question of their being flutes or reed blown instruments. (Nos.7-9).

Despite the unsatisfactory nature of much of this evidence several pieces, notably the Etruscan relief and the mosaic from Corinth, point to the existence of the flute in Roman times. It would be most surprising if the flute were not known in view of its existence in Egypt, but from the general paucity of illustrations it cannot have been a very popular instrument. The mellow tone of the flute is most unlike that of the more powerful reed blown tibia and less suited to the public occasions where that instrument was supreme. The illustrations of the flute in mythological and pastoral settings may well be significant.

This impression is to a great extent borne out by the
literary evidence. The Latin name for the transverse flute is apparently the *tibia obliqua*, the equivalent of the Greek *πλαγιαυλός*. Servius also gives the *vasca tibia* as the counterpart of the plagiaulos, and this word also occurs earlier in the writings of Solinus, who gives a list of tibiae very similar to that found in Athenaeus. The exact meaning of the word 'vasca tibia' is however not clear, and it is even possible as LS suggest, that *vascam* may be an error for 'vastam'. There appears to be some confusion in Servius' note as Vergil has mentioned the curva tibia, a phrase that surely refers to the curved bell of the Phrygian pipes, rather than the plagiaulos or *tibia obliqua*, which is never shown curved.

Most of the literature concerning the transverse pipe is in Greek and refers to the plagiaulos. According to Athenaeus (IV, 175e,f) the flute (\(\phi\omegaτιγ\)) came from Egypt and was the invention of Osiris and elsewhere (IV,178) quoting Juba, he is careful to distinguish between the monaulos and the plagiaulos. Pliny records its invention by Midas in Phrygia and Pollux' version is that the plagiaulos, made of lotus wood, originated with the Libyans. As with other members of the woodwind family its origins were obscure but there was a persistent tradition that it came from the east or from Egypt, and also direct evidence of its presence in the Roman world of the second century AD, with an Egyptian connection. Apuleius (Met. XI,9) describes the flautists of Serapis, adding the useful information that the flute (*obliquum calamum*) was played 'ad aurea porrectum dexteram', just as the modern flute is held, a feature borne out in several illustrations. It is likely that the flute was played in the traditional music of the more exotic eastern cults rather
than in 'Roman' music.

The transverse flute is mentioned in a pastoral context by Longus where various types of pipe, including Pan pipes, reed pipes and the flute (πιαγιαυλός) are hung in a cave as the shepherds' offerings to the nymphs.7

There is no direct description of the tibia obliqua, or plagiaulos. Its name and Apuleius' statement suggest strongly that it was held transversely but the main question is whether the instrument was ever a transversely held reed pipe rather than a flute. I have already discussed the relief from Perugia and consider that it does not show a reed. Similarly the Midas statue in the British Museum is too greatly restored for a valid judgement.

There are however two surviving pipes in the British Museum, the so called Maenad pipes which have been the subject of some controversy and have in the past been held to prove the existence of a side blown reed pipe, whether or not this was called the tibia obliqua. The history of these pipes is somewhat obscure. They were apparently found in Italy and were exhibited in Milan in 1881. From there they found their way to the British Museum as part of the Castellani Collection.

The pipes, which were first discussed by Howard have an inner tube of wood, which survives in an extremely fragmentary condition, covered with bronze, with tuning rings as on the pipes from Pompeii and Hercou. The bottom hole of pipe 3b is partially covered by the outer ring of bronze, as if the ring has shifted slightly and two layers of bronze can be seen clearly, although they are badly damaged. Near the upper end of each pipe is a decorative bust of a Maenad, from which the pipes take their popular name, and this is pierced with a hole
slanting towards the lower end of the pipe. Pipe no. (3b) 6, has five fingerholes and a thumbhole in addition to the slanting hole. No. 3a has only five fingerholes, although the bronze is very corroded on the underside at the point at which a thumbhole might be expected. Howard, in 1893, stated that although one pipe was damaged, the other (3b) was closed at the upper end, and basing his conclusions about the function of the 'Maenad hole' on this premise surmised that a reed mouthpiece was inserted into this slanting hole which is very slightly conical. He would like to see the pipes used as a pair as the arrangement of holes differs slightly and questions the necessity of tuning bands on pipes with so few holes unless they were played simultaneously. However, to make this possible some sort of yoked mouthpiece would have to be inserted and for this there is absolutely no evidence. There is some controversial monumental evidence, which I shall consider later, for a mouthpiece inserted into the side of a pipe and Howard finally concludes that this is how the Maenad pipes were played, separately with a reed inserted into each slanting tube. This leaves unresolved the problem of the tuning bands. Even if x-ray examination were to reveal more fingerholes under the badly corroded sections of tube the maximum number possible in that length of tube would easily be covered by the fingers of both hands. The possibility of closing selected holes mechanically might however ease some otherwise awkward stretches. There is no sign on the surface of the pipes of any extra holes, but x-ray examination might at least reveal internal details of the pipes' construction.

Kathleen Schlesinger (1939; 79) follows Howard's theories but there is some confusion when she includes the Halicarnassus
flute with her account of the Maenad pipes.

Nicholas Bodley has a very different interpretation, at first sight an attractive theory. He queries Howard's statement that the ends of the pipes were closed and rejecting the theory that there was any transverse instrument with a reed mouthpiece, correctly dismissing the restored Midas statue, asserts that the Maenad pipes were played as a pair in the normal position for the upright tibia or aulos. The slanting tube is therefore explained simply as another fingerhole. Bodley bases these conclusions on the existence of similar slanting tubes on some of the pipes found at Meroe in the Sudan. One in particular has an inclined tube just below traces of an ivory holmos or bulb, the hole sloping towards the upper end of the pipe. This can certainly be interpreted as a fingerhole and its position may have reduced the stretch between the first two holes on the instrument. The Maenad tube however slants the other way and would actually have increased the distance between the two holes. Two other pipes from Meroe have inclined tubes which, as reconstructed, slope towards the bottom of the tubes but the reconstructions are too uncertain for any conclusions to be drawn.

If the inclined Maenad tube was a fingerhole, allowance would have to be made when positioning it for the slight increase in the length of the total air column and the consequent flattening of the note. It seems to be fixed in one position and the band on which it is set does not seem to have been movable.

Bodley's theory that the Maenad pipes were played as normal auloi has been generally accepted, but unfortunately there is a serious problem. His theory is ultimately based
upon a rejection of Howard's description of one of the pipes (3b) as being closed at the upper end, without, apparently, a physical examination of the evidence. On examination there is no doubt that the end of one pipe is closed, by a disc of bronze, incised with concentric circles. Although this is slightly at the edge, it appears to be contemporary with the rest of the pipe, an integral part of its construction. The top of the other pipe is too damaged to yield any information. If, after all, the ends of the Maenad pipes were closed we have to return to the possibility that the slanting holes were holders for reeds. This is still, as Howard found, not altogether satisfactory. As Bodley points out (1946;232) with such a reed mouthpiece, the pipe would have to be held in a most awkward position, particularly as the slanting mouthpiece and the fingerholes would be in the same plane, and in playing, the holes would incline towards the player's body, a difficult position for fingering, especially for the right hand. Perhaps this is why the rotating sleeves were necessary, to help eliminate this difficulty.

One should perhaps also consider the possibility that the inclined tubes were blown into directly, and were simply flute mouthpieces. This would make sense when the pictorial evidence is considered, but these holes are rather roughly made, and the edge does not seem to be sharp enough for the easy production of edge tones. Also, there is, in this case no apparent reason for the hole to be at a slant. On balance it looks far more like a holder or socket than anything else, and surely could only therefore be intended for a reed.

The date of the Maenad pipes is unknown. All one can say is that pipes of similar construction have been found
dating from the last century BC or the first century AD, but methods of pipe making probably changed little over a long period and the date might well be later.

If we have to accept that the Maenad pipes could have been played with a reed, there is a further problem of terminology. The *tibia obliqua* or plagiaulos may have been a transverse flute. Could the same word be used for a reed blown pipe and the name simply refer to the position in which it was held? As has been mentioned, Servius equates the *tibia vasca* with the plagiaulos, but he gives no further information about it. If Servius is correct there are therefore two Latin names for the transverse pipe.

The Maenad pipes are the only instruments yet discovered with the oblique hole on a complete pipe, but there is some later Roman evidence for a side blown single pipe, namely a series of carvings on sarcophagi.

A sarcophagus dating from the third century AD now in the Vatican shows a *thiasos* of *putti* and was perhaps intended for a child (No.7). The figures play several instruments, including pan-pipes, lyre, cymbals and a single transverse pipe. The head of the central figure has been left blank and would eventually have been carved as a portrait of the deceased. The single pipe is played by a figure on the extreme right of the group. It is apparently jointed in the middle and has a decorative ring at each end. It is held obliquely and there is a mouthpiece inserted into the pipe about a handspan from the top. The most important question is the nature of this mouthpiece. It appears to be an integral part of the design as the position of the pipe and the style of the whole piece precludes its being due to
Fig. 7
Flute No. 7.

Fig. 8
Flute No. 8.
Sarcophagus relief. Dresden.
sculptural error, or the necessity of strengthening the work by joining the pipe to the player's mouth. It could therefore represent either a reed or an embouchure guide for a flute. The instrument looks rather large for a flute, although it may be argued that it only appears large because it is being played by a child sized figure. However all the other instruments on the sarcophagus are of a size appropriate to the scale of the performers. The mouthpiece looks a little large for an embouchure guide, but the sculpture cannot be regarded as sufficiently detailed for this to be conclusive. For example, the hands are in an unrealistic position - one is above the mouthpiece, and no fingerholes are shown.

Another instrument which is a little more detailed is again played by a putto, seated this time, a sarcophagus of the second half of the third century AD the Dresden Sculpturensammlung (No.8). The sarcophagus shows the common Bacchic thiasos with satyrs, maenads and Pan, with their characteristic instruments. A seated youth plays a transverse pipe which is very large in relation to his size. The pipe is slightly conical but judging from the style of the carving this is probably not significant. There are decorative rings at each end and some sort of bell may be indicated at the bottom. Three fingerholes are shown but the player's hands are not covering them, instead being placed in the apparently conventional position shown in the previous example, with the right hand curled round over the pipe and the left supporting it from underneath at the top. The player's lips are over the edge of the projecting mouthpiece which slopes back slightly towards the top of the
instrument, and here the sculptor seems to be indicating an embouchure guide rather than a reed, that is if he was intentionally showing anything and not just a conventional representation or stock pattern of an instrument.

A third example of this type of pipe is in the Museum at Taormina in Sicily (No.9). This is again shown on a child's sarcophagus showing a Bacchic thiasos and dates from the third century. No fingerholes are shown in this rather schematic rendering and the hands are curled round the pipe with the fingers bunched together. In this case the upper, left, hand is placed below the projecting mouthpiece, which is longer than on the other illustrations, long enough to be a reed as on a bassoon, but there are no clear details.

The monumental evidence is therefore inconclusive. In most cases the mouthpieces could well be embouchure guides for flutes and the possibility that the Maenad pipes were blown as flutes should be considered.

However, there is insufficient evidence to enable one to state categorically that no side blown reed pipe ever existed.9
Notes

1. Copies exist in the Vatican, the Museo Nazionale, Rome, and in the Louvre of a statue by Lysippos depicting a young satyr playing what is apparently a flute, Bieber, 1955, fig. 86. The instrument is a single pipe held transversely and there is some indication of a mouthpiece but this is not raised. (Rome Museo Nazionale delle Terme 351; Wegner 1963, Abb. 28, p.56).

A statue of a satyr playing the flute is in the Fitzwilliam Museum, Cambridge, (GR 2 1850). It is of Proconnesian marble and is an early Imperial copy of a late fourth century original, perhaps influenced by the Pan of Skopas. The pipe which is not restored is held transversely and the mouthpiece projects vertically a little way from the upper end. This may be either a raised mouthhole or a reed. Sachs, 1942, 141 mentions a cross flute illustrated on a coin issued by the town of Pania in Syria.


4. Servius ad Aen. 11, 737; Solinus, 5.19; Athenaeus IV, 174F-175C.

5. V. Tran Tam Tinh, 1967, Le tibicen magno Serapi, Revue archeologique n.s.1; 101-112, suggests that the instrument played by the priests of Serapis (obliquum calamum. Apul.Met. XI,9) was in fact a curved instrument.

6. Pliny NH VII, 204; Pollux IV,74.

7. Longus Daphnis and Chloe, 1,4.


9. The existence of such an instrument is accepted in one of the most recent works of Greek Music - Michaelides, 1978, p.258 - plagiaulos.
The Panpipe

The panpipe is of great antiquity and as a folk instrument has been found in Europe, Asia, South America and Melanesia. Its most famous modern survival is the Roumanian naiu, an instrument with many pipes which has recently been popularised and on which a considerable degree of virtuosity is possible. Fragments of pipes of various kinds survive from prehistoric times in Europe and Western Asia and although none has been identified as a component of a panpipe, Joan Rimmer (1969; 44) may well be correct in suggesting that it may have been established as a pastoral instrument by the Neolithic stage.

Although undoubtedly in existence in pre-Hellenic times the panpipe (flute) or syrinx, was regarded by the Greeks as a native instrument, its origins shrouded in myth. Traditionally it was associated with the Arcadian god Pan, and the story of his pursuit of the nymph Syrinx and her transformation into a bundle of reeds which were subsequently made into a set of pipes, is preserved in the works of Ovid and Longus.¹

There is little evidence in ancient literature for the origins and development of the panpipe. It is mentioned early by Homer and Hesiod and there are many other references by Greek and Roman authors which unfortunately give no evidence for either chronology or structure. However, Plutarch implies that the syrinx had a long history and Pollux suggests that it was widely distributed, recording its existence among the Celts.²

Outside the Mediterranean area fragments of a syrinx dated to the later La Tene period were found at Klein Kühnau
near Dessau. They belonged to an instrument with five pipes of unequal length which were stopped at the lower end. Panpipes are also shown on *situlae* of the La Tène period.\(^3\) They appear very frequently in the art of Greece, Etruria and Rome, often depicted in little detail, but sometimes with marked difference in form, and a few surviving instruments may point to the existence of some local types.

**Structure**

Panpipes are made from several tuned tubes, usually stopped at their lower ends, which are joined together in either raft or bundle form, although in Greece and Rome only the more familiar raft form was used. The player blows across the open top of the pipes in the manner of a vertical flute.

Traditionally the pipes were made of reed, a material certainly used for later 'folk' instruments. Reeds of the *gramineae* family, which belong among the grasses, have a culm or stem formed of several cylindrical tubes of unequal length, closed at the joints or nodes by solid tissue. Pliny mentions a species called *syringias* which he claims was particularly useful for *fistulae* because it was *totius concavus*, and contained no flesh or pithy material. This may simply mean that the tube was hollow but could imply that there were no blockages at the nodes.\(^4\)

Other Latin writers, mostly poets, refer to the material from which the pipes were made, often using it as a synonym for the instrument itself, thus for example *calamus*, the equivalent of the Greek *καλάμος*, *canna*, and *cicuta*, which is hemlock, a hollow stemmed plant. The
words harundo, meaning anything made of reed or cane, fistula, and avena are also used in the sense of shepherd's pipe or panpipe, particularly in poetry. Fistula, a pipe is also used in the sense of a reed pipe or panpipe in prose works.\(^5\)

Poetical references cannot be taken too literally, but the general use of the various words for reed, and the inclusion of the word for hemlock, suggests that, as might be expected for a pastoral instrument, any convenient hollow stemmed plant or reed was used.

More durable materials were also employed. Calpurnius Siculus mentions boxwood, and panpipes of Roman date made from this wood have been found, (Nos. 1,2), although only in the provinces.\(^6\) Instruments made of bronze and pottery also exist and are discussed below, (Nos. 3 - 6). There are several references to an ivory pipe, fistula eburneola, apparently similar to the panpipe, which was used by C. Gracchus, but this is unlikely to have been a common material.\(^7\)

Reed pipes were joined together with wax and according to Pollux (IV, 69), linen thread was also used. Some illustrations on Greek vases show threads crossing over the pipes and conventional representations in Roman art have horizontal bands which may be cords or perhaps strips of bronze, holding the pipes in position.\(^8\) (Nos.18,19). Longus, (II, 35) describes the decorative bronze fastening on Philetas' instrument. Wooden or pottery pipes, as found at Alesia Barbing Kreuzhof, and Shakenoak were made in one piece (Nos.1-3).

The number of pipes and the size of the panpipe varies considerably on the illustrations. Of the surviving examples,
the Alesia syrinx, which originally had eight pipes is 111mm high by 77mm wide, while the Shakenoak pipe with seven pipes is 124mm by 96mm. Iconographic evidence of Hellenistic and Roman times shows instruments that were apparently considerably larger than this. An ash chest of the third century BC from Volterra (No. 8), which bears the relief of a banqueting scene, shows a panpipe with about nine pipes, which is as wide as the chest of the player, perhaps about thirty centimetres. An instrument that could, from the scale of the figures, have a maximum height of about thirty centimetres, is seen on the Obelisk of Theodosius in Istanbul and a syrinx on the Dionysus mosaic in Köln is of similar size, (Nos.9,10), pl.28. Most illustrations however show smaller instruments and for an instrument that is almost always shown in a mythological context, one cannot expect too much accuracy of scale or other detail.9

The number of pipes on illustrations and surviving instruments varies, from about four to about fourteen. According to some ancient sources seven was the traditional number and there may be a parallel with the number of strings on the early lyre. Other writers give the number nine.10 There is obviously no deliberate attempt in pastoral poetry to describe the panpipe in accurate musicological terms and most references are to a simple instrument with few pipes, the type that is often shown in mythological scenes in Roman art, as for example the small six pipe syrinx carried in a Bacchic procession of putti escorting Eros and Psyche on a third century sarcophagus from Rome, (No.11).

In general, iconographic evidence suggests that the number of pipes increased with the size of the instrument
from Hellenistic times, but as noted above, small pipes are still shown in Roman art of the third and fourth centuries AD. Greek vase paintings show a number of pipes varying from five to nine. Examples of later illustrations of larger instruments include the marble sculpture of a satyr in Naples, a copy of a Hellenistic piece, which depicts a syrinx with eleven pipes, the monument of Poblicius in Cologne which also shows one with ten or twelve pipes, and instruments on the Mildenhall treasure (Nos. 15,16,23),31,32,33,34,8 Such numbers of pipes are not unparalleled - the Roumanian naih has twenty six. It is possible that the desire to play larger syrinxes speeded the development of the organ, traditionally invented by Ktesibios in the third century BC. However on Roman illustrations instruments with about five, six or seven pipes are always more common, (Nos. 11 - 14). There is no consistent number and the number of pipes does not seem to correspond with what is known of the Greek scale systems or harmonia.11

According to the rather limited archaeological evidence the pipes of a syrinx were all of the same diameter, and it is reasonable to assume that reeds of similar diameter were selected for the manufacture of reed panpipes. Practically this arrangement facilitates playing as the embouchure is the same for each pipe. Given equal diameters, the pipes were tuned by varying the length of the resonant air column and they were either cut to different lengths or pipes of equal length were filled to different levels with wax. The method used obviously affects the form of the panpipe and several types are depicted. Early Greek illustrations, of the sixth and fifth centuries BC show a
rectangular form. Panpipes from the mid fourth century BC onwards are usually 'stepped', with pipes of unequal length, giving the appearance of a bird's wing described by Pollux, (IV, 69), and the form also appears earlier, as on an Etruscan situla of the sixth century BC from Certosa, (No. 17). A third type is a syrinx which has bass pipes of equal length and a larger number of short pipes graded in size, (No. 18), the possible musical significance of which is discussed below. Ancient authors sometimes refer to the 'unequal reeds', therefore suggesting that the pipes were of unequal length, although this could simply refer to the length of the air column.13

The differences in form may be of more significance than a simple change of design due to fashion and certain musical considerations should be investigated. One basic question is whether or not the pipes of the syrinx were always stopped, that is closed at the lower end. Acoustically this makes some difference to their tone and range. If a pipe with a cylindrical bore is open it acts as a half wave resonator and when overblown produces a note one octave higher than the fundamental. If stopped it acts as a quarter wave resonator and gives a note one octave lower than that produced by an open pipe of the same length. When overblown it sounds the twelfth, not the octave. In addition an open pipe has a clear bright tone as its notes contain both odd and even harmonics, while the stopped pipe produces only the odd harmonics and has a duller tone, although the sound is very pure.

Before considering the archaeological evidence on this point certain clues from literature can be summarised,
although they are in some cases, confusing. \textsuperscript{14} Ps. Aristotle in the Problems, (XIX, 23 = 919b) using the word \textit{syrinx}, discusses the fact that the note from a hole half way down a pipe is one octave higher than that produced by the whole pipe, because the resonant length is halved. The pipe that he has in mind must be open because if stopped the note from the hole would be two octaves higher than that produced by the whole pipe, as the piercing of a hole effectively 'opens' a pipe at that point. It is possible that the word \textit{syrinx} is used in the sense of any pipe, and does not here mean specifically 'panpipe'. Later in the same paragraph reference is made to tuning \textit{\xi\upsilon\omicron\omicron\omicron\pi\nu\omicron\varsigma} by filling them to the required level with wax. This must refer to the panpipe and obviously from the method of tuning, the pipes must have been stopped. It may be of significance that in the first case 'syrinx' is used in the singular, while in the second it is plural.

A description of the \textit{syrinx} in Longus' \textit{Daphnis and Chloe} may suggest that the pipes were open, but the reference is primarily literary and is not a technical account. \textsuperscript{15}

Practical experimentation suggests that it is easier to produce a good note from a stopped pipe than from an open one, and obviously on rectangular instruments where all pipes are of the same length, they must be stopped. The surviving pipes which are made of wood or pottery are also stopped. Illustrations give no clue about the instruments that have pipes of unequal length, but if there was already a tradition of using stopped pipes this practice may well have continued, and the deeper tone of stopped pipes may have been more attractive. Practically it is probably easier to fill a
pipe with wax to the correct level than to work out the precise relationship of lengths for open pipes and to cut them accurately. The apparent change from pipes of equal length to pipes of unequal length may have had a practical significance. The latter type of instrument would weigh less, possibly an important consideration if the number of pipes was increased.

The third type of panpipe, with two or more longer pipes and a series of shorter graded ones, raises further problems. No examples of this type have been found, but it is often illustrated, for example on the Bacchic sarcophagus in the Vatican museum, (No. 18), where the instrument has two long pipes of equal length and three shorter ones of unequal length, and on the funeral monument of Publcius at Cologne (No. 16) where the instrument has five long pipes and six shorter ones. One cannot expect great accuracy of representation in such examples but the large number of illustrations points to the existence of a type of 'stepped' panpipe in late Hellenistic and Roman times. The long pipes, which must be stopped, would extend the bass range of the instrument. It is not possible to calculate the probable intervals accurately from the illustrations, but it is possible that the gap at the lower end of the 'scale' could be filled by overblowing the bass pipes. Dr Landels (1961) has made the interesting suggestion that the shape of the instrument might indicate an exploitation of the different qualities of stopped and open pipes. If the shorter pipes were open they would produce a brilliant tone which would contrast with the deep bass notes. The stopped pipes would produce low notes without being unmanageably long. There is
however no definite evidence that the short pipes were open and musically the gap between trebles and bass pipes would be very great if they were. The arrangement of pipes is not in fact shown consistently. On many illustrations the short pipes are of equal length while the bass pipes are unequal. Sculptures in Naples and Rome of a Satyr with the child Dionysus shows this form, but the arrangement may be due to the whim of the artist, or to convention, (Nos.15,19). The panpipes illustrated on the fourth century Mildenhall treasure are also of this type (No.23). However, even if all pipes were stopped, with the use of overblowing, the arrangement might extend the range of the instrument without increasing the number of pipes, and there would still be a contrast between high and low notes. It would also be easier to play an instrument with either all open, or all stopped pipes.

Certain surviving instruments are particularly interesting because they demonstrate the existence of another type of syrinx. One from Alesia, (Mont Auzois, No. 1) now has seven pipes hollowed out of a single piece of boxwood. It is rectangular in shape with a triangular section cut away at the bottom left corner. The maximum height of the instrument is 115mm. and its maximum surviving width is 77mm. It is 11mm. thick at the top tapering to 6mm.

The back of the instrument is smooth, and slightly convex, but the front, the side facing away from the player is decorated with incised parallel lines and concentric semi-circles. The groups of straight lines are in the same position as the fastening bands shown on illustrations of panpipes which are made from several separate pipes. The decoration is incomplete on the left (treble) side, which is
Fig. 9

Panpipes Nos. 1 and 2.
The decorated faces of the Alesia and Barbing-Kreuzhof instruments.

Fig. 10

Panpipes No. 4.
Bronze object from Court C.
damaged and there appears to have been another pipe on this side making a total of eight. At the bottom of the instrument is a round hole through which passed a cord or thong for carrying it, usually suspended round the neck.

The pipes are all of equal diameter, 9mm. at the top. They are drilled into the block of wood and are cylindrical in section each tapering to a point at its lower end. Drilling the pipes would have been a skilled job, but presumably if they were made too long, the tuning could have been corrected with wax. The lengths of the seven surviving pipes are 71; 63; 55; 50.5; 43; 39 and 35.5mm. and the missing one would have been about 31.5mm. The distance between each pipe is about 2mm. The instrument was played by French flautists who obtained the notes d', e', f', b', c'', d''. There is a marked slope at the top of the pipes from the smooth to the decorated face and it is apparently easier to play with the lips against the smooth face. The decorated side is slightly convex and although the curve of the instrument seems to follow the natural curve of the lips, this is probably due to the warping of the wood, the pipes originally being in a straight line.

From associated finds the syrinx appears to date from the late second or third century AD. Of similar date is another wooden syrinx which was found with various metal objects at Barbing-Kreuzhof, near Regensburg in Bavaria (No. 2). It is not in such good condition as the Alesia example and only four pipes survive. The material is boxwood (buxus sempervirens) and the maximum dimensions 100mm. by 45mm., the thickness of the instrument tapering from 10mm. to 6mm. The holes which may have been bored
with a hot iron are cylindrical, being 8.5mm. in diameter and their lengths are 65; 57; 41; and 47mm., giving the notes f', g', a', c''', although it has apparently not been played. The back of the instrument is smooth, but the front, facing away from the player is again decorated with incised parallel lines and concentric semi-circles. This appears to be a traditional form of embellishment, and may be a feature of this type of panpipe. It is also seen on certain sculpted instruments in the museum of St. Germaine, where there are three busts of children playing panpipes of the same shape as the Alesia example, (Nos. 20,24,22). These are rectangular with the lower right corner (facing) cut off at 45 to 60 degrees. The outline of six or seven pipes is shown on each instrument which is held with the treble pipes on the player's left. Reinach, (1907; 180) suggests that this is a special type of Gallo-Roman syrinx, but possibly with a wider distribution in the Celtic world. Certainly the type does not appear in Roman art in Italy or the eastern Mediterranean, but the Barbing-Kreuzhof instrument demonstrates its existence in a northern frontier province. Interestingly a panpipe dating from the ninth century, also made of boxwood, recently found at the Coppergate site in York, appears to be very similar in form, perhaps demonstrating the continuation of a tradition.

Reinach also suggested that because of its small size and because the St Germaine sculptures are of children, the Alesia panpipe may have belonged to a child. In fact all surviving panpipes of Roman date are quite small. Such finds are very rare and the likelihood of their all being 'toy' instruments is remote.
Other materials for panpipes, more durable than the traditional reeds include bronze and pottery. A small instrument found at Agen on the Garonne was of bronze and was 64mm. wide, (No. 3).

Two bronze objects from Pompeii have sometimes been described as syrinxes (Nos. 24, 25). The first is a heavy bronze plaque, 39cm. long by 32cm. high and 2.5cm. thick, which supports eleven bronze pipes. It is decorated on the front with three temple facades each with a triangular pediment, which indicates which way up the instrument should be placed. The pipes, which are soldered to the upper edge of the plaque, with the longest on the right (facing), vary in length from 25.5cm. to 11cm. The internal diameter of each pipe is about 9.8mm. and the bronze is about 4mm. thick. The shortest pipe is attached half way along the plaque and there were, presumably, more pipes decreasing in height towards the left. Three pipes, the second, fifth and sixth from the treble end, have a vertical rectangular slit about 9cm. from the lower end. This is 17mm. long and 1.5mm. wide, and is apparently a deliberate cut, being somewhat similar to the hole in a modern flue pipe. Whatever its precise function, it appears to indicate that the pipes were intended for musical use and were not merely decorative, although it is odd that only three pipes have this feature.

The other Pompeian instrument is smaller, but very similar in shape, its bronze plaque measuring 35cm. by 9cm. When discovered in 1877 nine pipes were soldered to the upper edge but these are now lost.

Although the instruments were originally identified as syrinxes, they are certainly not conventional panpipes,
being in the first place, far too heavy. They are also obviously intended to be played with the pipes pointing upwards, and it would be impossible to play pipes in this position in the usual manner. It has been suggested that the instruments are organs, but there is no trace of wind chest, keyboard or blowing mechanism. Archaeological and conservation techniques were not good in the nineteenth century, as is emphasised by the loss of the pipes belonging to the second instrument, but although mechanism may have perished or been unrecognised, one might have hoped for a little more positive evidence. There are no archaeological or pictorial parallels for an organ of this type. The possibility remains that the objects are some kind of musical automata, perhaps mechanically blown syrinxes. Such an instrument would require a simpler mechanism than an organ, but it too may have been unrecognised in excavation.

Another curiosity, also made of bronze, comes from Britain, (No.494). The instrument described as the mouthpiece of a musical instrument, 'not unlike a modern mouth organ' was found at Camerton in Somerset, and is dated by its stratigraphical context to between AD250 and 380. It consists of two flat plates of tinned bronze, originally in one piece but broken along the line of at least ten circular holes. Into each hole was apparently inserted a small pipe. Three of these survive, made of sheet bronze bent round to form a tube. The instrument is broken at both ends and a marginal line along one long side indicates that it may have been attached to or inserted into another part. A longer piece of bronze tubing which may be associated with the instrument could be a longer pipe.
There appears, from the section drawing, to be no means of blowing the pipes from below, and they are in any case not flue pipes. They were, if blown, therefore blown from above, but the irregularity caused by the differing lengths of the pipes, which have their bases and not, (like conventional panpipes), their tops, level, would present problems to the player. The pipes are also quite widely spaced.

The object remains a puzzle. It is apparently a musical instrument related to the syrinx although the form is unparalleled.

A set of panpipes made of pottery was found on a villa site at Shakenoak in Oxfordshire and dates from about AD200 (No. 5). The instrument is made of red-brown baked clay and when complete had at least seven and perhaps eight pipes. Its maximum surviving dimensions are 124 by 96mm. and the lengths of the pipes are 105; 102; 97; 86; 84; 7; and 67mm. They are 7 to 8mm. in diameter, spaced 3 to 5mm. apart and are cylindrical at the top and for most of the bore but have tapering ends. It is possible to play some notes: 102mm - b', 97mm - c'', 86mm - a flat c ' and 84mm c ''. Over these four pipes at least the scale ascends approximately in semitones, chromatically, unlike any known ancient 'scale'. The two shortest pipes may have sounded d'' and d ''. When overblown the pipes apparently sounded about a seventh or an octave higher. This suggests that the taper at the bottom of each pipe is sufficiently marked for it to be 'conical' and act as an open pipe when overblown. Stopped cylindrical pipes would sound a twelfth above the fundamental.

The mouthpiece of this rectangular instrument is well
worn and on its bevelled edges are scratched the names CATAVACVS and BELLICIN.

A second pottery syrinx comes from the Rhineland, (No.6). Its exact provenance is unknown, but it is now on display in the Romisch-Germanisches Museum in Cologne, where it is said to be of Roman date. It is made from a cream clay fabric, is complete and in good condition and its maximum dimensions are 100mm. in height by 165mm. in width. The eight pipes are however of a far more sophisticated design than the Shakenoak pipes, as each has an individual mouthpiece of the flageolet type, which would make it easier to play. The whistle mouthpiece has been found on pipes dating from prehistoric times and this feature does not preclude the instrument from being of Roman date. No other examples are known but panpipes are in any case very rarely found, although the whistle mouthpiece does not seem to be in the classical tradition and may have been a feature of northern Europe. However in the museum storeroom are some models of horns which are made of a similar cream clay fabric and which were also originally in the Niessen Collection and are said to be of mediaeval date. As the Cologne panpipe is unprovenanced, some doubt must be cast upon its date.

Similarly, an illustration on a terracotta fragment from Rheinzabern is difficult to interpret, (No.7; Organs No.31). The object, originally published as a tile stamp, may be a mould, and bears the impression of a syrinx like instrument with thirteen pipes, bordered with a trellis pattern and bearing the inverted inscription POTITALUSFE. Perrot, (1975;105) suggests that it represents an organ with a pneumatic wind chest. If so the inscription is the wrong way up. When inverted, the illustration could well be that of a large syrinx.
The technique of playing the syrinx.

Acoustically the syrinx is one of the free 'air reed' type of instruments like the modern flute. As discussed previously the note and its quality is affected by the bore of the pipe, its length, and whether it is open or stopped.

There are no precise details of the technique of playing the syrinx, but the characteristic embouchure - the 'bunched-up' mouth is sometimes described. The pipes are held vertically in front of the mouth, so that the lower lip rests against the edge and the upper lip is pursed above the lower leaving a narrow slit between the lips. The breath stream is therefore directed across the open end and strikes the further edge.

It is important that the playing position is correct. If the instrument is held obliquely the jet of air strikes the wall of the pipe inside and the note will vary depending upon the angle formed by the breath stream and the pipe wall. The player also has little control as the chin is lowered and the muscles controlling the glottis are relaxed. It becomes difficult to overblow and the note produced is often flat. It may be for this reason that Ptolemy (Harm. I, 8) regards wind instruments as unsuitable for experiments, because they are subject to fluctuations in pitch, according to the technique of the player, but if the correct embouchure was used the syrinx would have had a stable pitch and could have been used as a pitch standard. It is possible that the embouchure was deliberately altered by some players in order to flatten notes, by covering part of the pipe opening with the lip. A vibrato effect can also be obtained on panpipes, and it should also be possible to obtain a greater range of
notes by overblowing the octave or the twelfth.

Most illustrations show the pipes fixed in a straight raft formation, which means that the instrument has to be moved manually so that the player can reach different notes. This is particularly noticeable on the Etruscan situla from Certosa, (No.17) where the musician is blowing the treble pipes, also on the Dionysus mosaic in Cologne and on the Obelisk of Theodosius, (Nos. 9 and 10). If the line of the pipes is curved slightly, as on the Roumanian panpipes, it is possible to reach individual pipes by moving the head. However, ancient illustrations do not show such a curve and the slight lateral curve in the Alesia syrinx, (No.1) seems to be due to the warping of the wood.
The panpipe is thought of chiefly in a pastoral context, as the instrument of herdsmen and shepherds and it was of course the characteristic attribute of Pan. It is also illustrated as an instrument of revelry in numerous scenes of Bacchic celebration, together with the tibia, Phrygian pipes, lyre and various percussion instruments, and it may have had some connection with the rites of Cybele, being illustrated on dedicatory inscriptions from Rome. Horace refers to the fistula with other instruments in a secular, albeit poetic, revel and there are illustrations of the panpipe, often played with other instruments, which might reflect a more general role in daily life. The Theodosian obelisk in Istanbul shows circus scenes with an orchestra comprising the panpipes, tibia and two organs, (No.9) while a diptych in Verona shows jugglers and singers performing to the music of organ and panpipes in a similar setting, (Organs No.15). The instrument is also played by the itinerant street musicians shown on a series of terracotta figurines from Alexandria, (Bagpipes, Nos.1-3), and a funerary inscription in Cologne records the existence of a real fistula player. These examples cover a time span from the first century BC to the sixth century AD.

The panpipe seems therefore to have had a wider application and was not just a rustic instrument, although it is as a folk instrument that it has survived. It seems never to have been an important solo instrument, although it is possible to achieve a great degree of virtuosity on modern panpipes.
Notes.

1. Ovid, Met. I, 705-710; Longus, Daphnis and Chloe, II, 34.

2. Homer, Il XVIII, 526; Plutarch Mor. 961; Pollux IV 77.


4. Pliny, NH XVI, 164.

5. There are many words for the panpipe, eg.

avena Calp. Sic. Ecl. III,60; IV 85; IV 149.
(stem) Martial VIII, 3.
stalk) Ovid Met. I, 677; Tr. V,10,25.
Prop. II, 82,75.
Tib. III, 4,71; II,1,53.
Vergil Ecl. 1,2; X 50; Dirae 7. At Ecl. 1,2, the word avena may mean 'Oaten pipe' rather than syrinx, see Tibia Note 27.

calamus
(reed) Cat. Carm. 63, 22.
Lucr. IV, 590; V, 1380.
Ovid Met. II, 161.
Prop. III, 17,34; IV, 1,24.
Vergil Ecl. II,32, II,84; V, 2V,48.

canna Calp. Sic. Ecl. IV, 45.
(reed) Ovid Met. II, 682; XI, 171.

cicuta Calp. Sic. Ecl. IV, 201
(hemlock)Lucr. V, 1382.
Optat. Syrinx (12), 3.
Vergil Ecl. II,36; V.85.

harundo
(reed, cane) Ovid Met. I,684; I, 707; VI, 382; XI, 154.
Prop. II,34,67; IV,7,25.

stipula
(reed) Pliny NH. XXXVII, 10,67.
Vergil Ecl. III,27.

fistula
Claud. Carm. 24, 282.
Horace, Carm. III, 19, 18-20; IV, 1, 20-24; 12, 10.
Ovid Met. XIII, 784.
Pliny, NH XVI, 164.


8. Greek vases paintings - eg. CVA Italy, XVIII, IV/D/v pl.201. Vergil, Eccl. II,26 and Martial XIV, 64 both refer to the pipes as compacta.

9. Panpipes are most frequently illustrated on Bacchic reliefs on sarcophagi and their representation is usually schematic, Nos. 11-14. See also pipes played by Pan (Pl. 36 ) from Ravenna.


11. The most complete account of the Greek scale systems is given by Aristides Quintilianus, who lived later than Cicero, but who follows Aristoxenian theoretical principles. Panpipes could of course be tuned to any scale system.


13. 'unequal reeds' Vergil Eccl. II,36; Optat. Syrinx (12)3 - dispersibus.

14. The question is discussed at length by Landels, 1961. I summarise the evidence here,

15. Longus, II, 35. On the other hand a reference by Theo Smyrnaeus (p.60 Hiller) to an experiment conducted with two pipes, one twice the length of the other may imply that the pipes were stopped.


17. Vergil Eccl. II,34, Lucretius V, 1407 'unco percurrere labro'.


19. The syrinx is illustrated with other cult objects on altars consecrated to Cybele. Dessaue ILS 4114,4143,4152,4153.


21. CIL XIII 8355 Funerary inscription of Sidonius and Xantias (RGM Koln Inv. no. 2912) Second or third century AD. Sidonius was apparently a fistula player. Klar, 1981, p.316.

22. A passage in Aristotle (Poetics 1447a 23) could be read as evidence that the syrinx was played as a solo instrument, but Aristotle may be referring to a famous aulos solo. In any case the evidence cannot be applied directly to later Roman practice.
There is another group of pipes, which would hardly warrant the name monaulos, although instruments belonging to it were undoubtedly played singly. These are the simple pipes or whistles, sometimes found on Roman excavations whose form changed little from the Iron Age until mediaeval times. There are records of such pipes from excavations as far apart as North Britain and Syria and the music played on them would reflect the folk traditions of the particular area, or of the people then living in that area.

Simple bone pipes are common from even earlier periods and Megaw (1960) has discussed some of these hitherto neglected instruments from prehistoric and later times. Nearer our period, a well published pipe made from the tibia of a sheep, probably dating from the Iron Age, was found in a barrow on Malham Moor in Yorkshire. It is 12 cm. long with an effective playing length of 8.5 cm. with two fingerholes and a blow hole on the anterior surface and a thumbhole on the reverse. The proximal end (top) is shaped for ease of blowing and the fingerholes were pierced and enlarged with a rimer, the area around them being flattened so that the fingers could cover them more effectively. In his musical analysis of the pipe Eric Todd notes that a fipple or pug was restored. This type of pipe does not exist in the classical tradition of Greek and Roman music, but has been common in the instruments of many primitive communities. Todd has examined marks on the mouthpiece and has concluded that the player held the pipe between his teeth, using one hand to finger the
Fig. 11
Bone pipe from Nicopolis, Greece.
Scale 1:1.
holes. Five notes could be sounded, two of which are very close together, the main ones being $c^{iv}$, $c^{iv}$, $d^{iv}$, and $f^{iv}$. Todd compares this sequence with several other scales as expressed by the Savart scale and would like to see some correlation with the Greek Pythagorean scale. The correlation is however not exact and I feel that although it might be chronologically possible, he goes too far in surmising Greek influence. The positioning of fingerholes in bone pipes must always have been to some extent experimental. Natural bone pipes do not have regular or uniform bores, both essential factors in the accurate prediction of the positioning of fingerholes. Tuning could be adjusted by enlarging a hole and we cannot tell to what extent such techniques as partially covering the holes and overblowing (where applicable) were used. Few bone pipes survive complete or have been subject to such detailed analysis as the Malham instrument but one feels that there must always have been variation in their tuning.

Such pipes made from natural materials occur widely and come from all periods. An incomplete bone pipe from the town of Nicopolis in Greece and possibly dates from Roman times (fig. 11). It is broken but the surviving length is 19.5 cms, with five holes on the anterior surface and possibly the trace of a sixth hole. There is no thumbhole. As both ends of the bone are broken it is not possible to determine the original length of the instrument or attempt an accurate reconstruction.

Unfortunately many pipes now in museums were excavated some time ago and in cases where the provenance is known
the date frequently is not. For example a fragmentary pipe from Knap Hill camp, with at least two fingerholes, excavated in 1908, could date from either period between the late Neolithic and Roman times, although considering the associated finds a Roman date seems more likely. Several bone pipes from the Rhineland which are apparently of Roman date, are illustrated by Behn. Two of them have six holes and block and duet mouthpieces.

Many bone objects found in a Roman context are in an extremely fragmentary condition and are incorrectly interpreted. Typical is a small worked bone tube from Ware and now in Hertford Museum. This is squared off and decorated with concentric circles on all four sides. The bore is irregular but approximately cylindrical. The surviving length is 8.5cm. with traces of a hole at one end (broken) although this may be entirely accidental. The other end which is also damaged shows signs of having been smoothed and finished off. Although the object was interpreted as a pipe on excavation, it is certainly a bone handle. I would be happier about calling it a pipe if any hole had survived complete. In the past many cylindrical bone or ivory tubes with or without holes were often described as pipes or parts of tibiae or auloi and many of these have subsequently proved to be hinges for such articles as boxes or cupboards.

There are several (genuine) small bone pipes from London, probably from the Walbrook area, in the British Museum. The best preserved of these, Inv. no. 82,3-21,7, has two fingerholes and a blowhole. Similarly the Museum of London possesses two pipes, of which one, of
bone from the Thames, is damaged but has four holes.\(^6\)

Megaw makes the interesting observation that it is only from the period of Roman settlement onwards that pipes are found in domestic as opposed to funerary contexts, although surely this had more to do with changes in primitive beliefs in the power and function of music than in the music itself. The type of music that could have been played on small pipes or whistles would always have been limited.

One of the pipes in the Museum of London, found on the Wallbrook site at the Bank of England, has three fingerholes and a vent hole and is made of bird bone, a relatively common material.\(^7\) There is a very similar pipe in the mediaeval section of the same museum but that does not necessarily mean that one has been dated incorrectly as bird bone pipes are found throughout Europe in many contexts, some of the most famous being the Avar pipes from Hungary which date from the 8th century.\(^8\)

From the other side of the Roman empire, from Dura Europus, in Syria comes part of a bone pipe made out of the polished femur of a shore bird. It is 8.5cm. long and one side is flattened with holes made in it. These are very roughly cut, with a knife, the lowest one being approximately circular, the next rectangular, and there has been no attempt to smooth the edges. The next hole which is damaged has only one straight edge surviving and the mouthpiece has not been preserved. The holes are not equally spaced, the distance between the upper surviving hole and the next being 3.1cm. and between the next two 2.35cm.\(^9\)
This is necessarily only a sample of the types of whistles and pipes to be found in Roman contexts. Such pipes are far from the tradition of classical Greek and Roman instruments, but undoubtedly had some place in music making at a popular level.
Notes.


5.) Ware, 1974, 3 F 295 C 7.


7.) Museum of London, Reg. No. 247/3; 14026; A.5894. Megaw, 1960, p. 10 cites a pipe found near Lincoln in 1884 which is made from the tibia of a crane or other bird. It is 23.2 cm. long, with four fingerholes and a blow hole, but the date is again uncertain.


The bagpipe, which is found among the folk instruments of many communities belongs to the class of reed instruments. Its basic principle is that air is fed to the reed, or reeds, from a bag, which is inflated either by the piper through a wooden blowpipe, or by bellows. A simple non-return valve of leather prevents air escaping from the bag.

The bag, especially in primitive pipes, is often the whole skin of an animal, usually a sheep or goat, although examples made of calf, pig and dog are known. The hindquarters are removed and the end tied off, the skin often being turned to put the fastening on the inside. The neck and foreleg openings are similarly fastened or used for the pipes, which can either be tied in directly, or, on more elaborate instruments, fitted into stocks, short wooden sockets which are permanently fixed to the bag. The bag is often uncured and has to be dressed with fat or oil, or soaked in brine to keep it airtight.

The pipes can be made of various materials. The short blowpipe is usually of wood or bone, often bird bone. The main pipe or chanter which usually has fingerholes can be of cane, bone, wood or metal. Its reed which is usually double, but on primitive instruments can be of the single beating type, is not visible but is concealed inside the bag or chanter stock. Bagpipes can have as many as eight pipes, but most examples have two or three and frequently a drone as well.

In his very comprehensive study of the bagpipe Anthony Baines has pointed out that the common type of reed pipe
known in the Mediterranean area possesses many of the qualities that are now associated with bagpiping.\(^1\) Two or more pipes sound simultaneously. Nasal inhalation is often employed to produce a continuous sound and articulation is produced by gracing, the art of deft fingerwork. The sound produced by double reed pipes is similar to that of a primitive bagpipe and was known long before the bag idea is first recorded. It would seem a logical step to produce a similar noise with less effort.

Evidence for the use of the bagpipe in classical Greece is very tenuous. In the *Lysistrata*, Aristophanes makes a reference to taking up "the bladders", but this could well be understood as "wind instruments", although the word, \(φούσκαλλις\) is unusual in this context.\(^2\)

Another controversial reference occurs in *Acharnians* (862ff). This can be interpreted literally as indicating a bagpipe made from a dogskin with a blow-pipe in one end and a bone chanter in the other. This is not impossible but, as Dr. Landels has noted, the neck opening of the animal is generally used for the main stock and the blow-pipe is always at the same end as this chanter stock, usually in one of the forelegs. The arrangement suggested by a literal interpretation of the text would be unusual, and Aristophanes may, instead, be making a joke on a well known song title.\(^3\)

The earliest indisputable literary references to the bagpipe come from the first and second centuries A.D. Suetonius describes the emperor Nero vowing that if his life was spared he would perform as a 'utricularius', besides playing other instruments.\(^4\) The word utricularius
is not common and apparently means a bagpiper in this context. Nero's interest in unusual instruments was well known. Dio Chrysostom also writes of his bagpiping and describes him as playing the aulos "both with his mouth and also with the armpit, a bag being thrown under it". This is obviously a description of a bagpipe, an instrument which Dio cannot apparently name. He also finds it necessary to give a reason for its use, namely that its player should "escape the disfigurement of Athene" probably the swollen cheeks that would result from the blowing of reed instruments with nasal inhalation, to provide a continuous sound.

In an epigram Martial uses a Latinized Greek word, 'ascaules', (ἀσκελύλην), for the bagpipes, perhaps an indication that the instrument had recently been introduced to Rome from the Greek speaking east, where in fact the earliest iconographic evidence occurs.

The word 'ασκελύλην' also occurs several times in a text of the second century A.D. where it is mentioned with funeral pipes.

The opening lines of Virgil's Copa have been interpreted by some authorities as referring to bagpiping but it seems more likely that line 1 refers to crotalum, line 2.

Copa Surisca, caput Graeca redimita mitella,
Crispum sub crotalo docta movere latus,
Ebria famosa saltat lasciva taberna,
Ad cubitum raucos excutiens calamos.

Finally, later words for the bagpipe, for example, sampogna and zanfona are not helpful in determining its
Fig. 1. Bagpipes No. 1
Terracotta figurine, Alexandria.
name in antiquity. It is possible that the medieval and later names are derived from the Latin *symphonia*, but this word was not connected with any particular instrument in the Graeco-Roman world.⁹

The earliest iconographic evidence for the bagpipe is a late Hellenistic terracotta figurine, probably of the first century B.C. from Alexandria, now in the Berlin Staatliche Museum, (No. 1). It represents a seated man who holds a syrinx in his left hand. Under his left arm he supports an inflated bag from which comes a cylindrical pipe which he holds in his right hand. With his right foot he beats time on the *scabellum* and he is accompanied by a dwarf playing the cymbals. Originally the whole apparatus was thought to represent a primitive bellows organ, but among other objections this would mean that the pipes of the syrinx would have to be fitted with whistle heads or reeds and there is no sign of these.¹⁰ It is certain that the foot-clapper, syrinx and bag represent separate instruments and that a simple drone-producing bagpipe is shown. It is possible that some means of inflating the bag is obscured by the syrinx or by the musician's clothing and it may have been part of the dwarf's duties to re-inflate the bag. However even if the music had to stop while the bag was being blown up, a sheepskin or goatskin bag holds enough air to last for quite a long time. There are twentieth century Indian parallels for this type of playing. Anthony Baines (p. 65) cites the example of the player of a nose flute, who, while accompanying himself with a drone produced by a similar bagpipe, had to interrupt his flute melody while the bag was re-inflated.¹¹
There are several other terracotta figurines from Egypt. Hickmann (1961), shows two other solo musicians, both playing the bagpipe and the syrinx, and both wearing the Phrygian cap, (nos. 2 and 3). It is interesting that these figurines are all from Egypt, and at least one is from Alexandria a city famous for its musicians and for musical experimentation in Hellenistic times.

The bagpipes all appear to consist of a bag with a simple drone. They were used to accompany the voice or some instrument, from the pictorial evidence, usually the pan-pipes, and it is far more likely that the instrument evolved for this purpose rather than for the alleged reason that musicians were concerned about their appearance. The small quantity of iconographic evidence shows the bagpipe to have been associated particularly with low class itinerant street musicians, and Martial mentions it in a derogatory sense.

An engraved gem from the Ionides collection shows the bagpipe in another context, but again in combination with the syrinx (no. 4). It shows a satyr sitting beside a tree from which hang his syrinx and bagpipe. This is apparently a more elaborate instrument than those played by the street musicians, with two chanters, a drone and a blow pipe. Unlike the simple drone instruments it would not be possible to play it and the syrinx simultaneously.

There is one possible example of a bagpipe from Roman Britain, (not the often cited Richborough bronze which dates from the seventeenth century), but on a Roman altar of local limestone from Gloucester, excavated in 1961 and identified by Toynbee (1964) as bearing a
carving of Attis (no.5); the god, who wears a Phrygian cap holds a syrinx in his right hand and a large oval object in the crook of his left arm, which was originally thought to be a pine cone or pomegranate. However, F. Collinson has suggested that this could be a rudimentary bagpipe. He has observed that the lower part of the oval object is broken and may have been rounded, like a bag, and also notes a small collar-like feature at the top of the 'bag' perhaps intended to represent a stock. There is no trace of a pipe but it is likely that the individual pipes of the syrinx were originally painted, and if so a bagpipe pipe may also have been painted. However no trace of paint survives.

Collinson's theory is attractive, but as he points out it is not possible to identify this positively as a bagpipe, or to deny this possibility. There is some resemblance between the Gloucester figure and the Hellenistic terracottas and the combination of syrinx and bagpipe is interesting. However, I know of no other instance of Attis playing anything that could be interpreted as a bagpipe.

In conclusion, the bagpipe was certainly played in Hellenistic times, chiefly as the instrument of low grade musicians and it was known in Rome in the first century A.D. To judge from the negative evidence it did not achieve general popularity, but seems to have remained a curiosity.

There may be several reasons for this. It was already possible to produce a similar noise on the traditional tibia, which was a less cumbersome instrument to
manipulate. Also, the hydraulic and later the bellows organ produced a similar but presumably louder noise and was generally more versatile. This instrument achieved great popularity and it is possible that with the tibia and hydraulis already in general use, the bagpipe could not compete, except in a few specialised areas.
Bagpipes

Notes

1.) Baines, A., 1960, Bagpipes, p.60.
2.) Aristophanes, Lysistrata, 1245.
4.) Suetonius, Nero, LIV.
5.) Dio Chrysostom, Orat. LXXXI 9; 381.
6.) Martial, I,3,8.
7.) Papyrus dated AD 131-132 - Petropoulos, 1939, Papyri Societas Archaeologiae Atheniensis, 43 v.
9.) Procopius De Bello Gothico, II, 23,27. This sixth century reference is sometimes cited as evidence that the Roman infantry used the bagpipe, but it seems far more likely that Procopius is describing a warhorn made of wood and leather which is contrasted with the bronze trumpet (Baines, 1960, p.68). In any event Procopius is making a recommendation rather than describing actual practice.
10.) Sachs, 1940, p.143, considers the terracotta to show an organ; Scott, 1957, p.414 identified a bagpipe and foot clapper.
11.) Baines, 1960, p.65.
12.) Hickmann, 1961, Abb. 57, 59, p. 94.
Chapter 8

The Organ

There are several books and articles on the early history of the organ which has undergone continuous development from classical antiquity until the present day. Most of the publications concentrate on the best preserved instrument, a third century bellows organ from Aquincum, (No.28). The fullest account of all early organs is given by Jean Perrot in his book 'The Organ' which is a publication of his doctoral thesis covering the instrument's history to the thirteenth century. As Perrot has conveniently collected all the early references to the organ, I shall only summarise its early development here, with the addition of such evidence as has come to light since 1965 and offer alternative interpretations where applicable.

All literary sources agree that the organ was invented in the third century BC by Ktesibios, an Alexandrian engineer.¹ Musically, an organ is an instrument with at least one rank of sounding pipes, a wind chest in which to store air, some form of mechanical blower and a keyboard to direct the air into selected pipes. Ktesibios' organ seems to have had these components. The air pressure system in his organ was regulated by water and the instrument was accordingly known as the hydraulis. There are several variations in nomenclature - the Latin term is hydraulus - and the name 'water organ' was apparently used indiscriminately even after the development and widespread use of the bellows, or pneumatic organ.² For example, the bellows organ from Aquincum is identified as a hydra, incidentally
a rare use of this form of the word hydraulis.

Little is known of the development of the organ in Hellenistic times, but unlike other musical automata which were popular for a short while, it became accepted as a serious musical instrument. By 90 BC it had achieved a place at the musical festival at Delphi, where the Cretan musician Antipatros, who was participating at the special invitation of the Delphic archons was victorious in a contest which lasted for two days. Therefore, a hundred and fifty years after its invention the organ was well enough established to merit a place at Delphi. Audiences were accustomed to, and obviously enjoyed, its sound and a number of virtuoso performers travelled the Greek world.

The first Latin reference to the organ is given by Cicero where he lists his music as one of the finest pleasures of life compared with others, such as a dish of sturgeon. Cicero is rejecting the ideas of Epicurus, but shows his awareness of the organ, which he may have encountered in Greece.

The organ was obviously far more complicated than the other musical instruments of the Hellenistic world, and some of its popularity may have been due both to its novelty and its mechanical complexity. It attracted a considerable amount of literature in the Roman period, though many of the accounts of its mechanism, such as that given by Athenaeus are confused and are apparently not entirely understood by their authors. The best descriptions are those given by Hero of Alexandria in the Pneumatica and by Vitruvius in the De Architectura. There is some doubt about the date of Hero's writing,
but even if, as is now thought, he wrote in the first century AD, and not during the Hellenistic period, this does not alter the fact that the instrument that he describes is a simple version, with one pump, very possibly similar to Ktesibios' original invention. Hero is apparently drawing on an earlier source, perhaps Ktesibios' Commentaries whose consultation Vitruvius recommends (X,7), and it is likely that, primarily interested in the mechanical principles, he is giving an account of Ktesibios' own work. Vitruvius although presumably also using the Commentaries describes a more complicated organ with two pumps and adds details that suggest familiarity with the instrument of his time.

Before discussing the mechanism of the hydraulis, I shall discuss its use in the Roman Empire, drawing on evidence taken from both literary and archaeological sources. Apart from the Aquincum organ the archaeological evidence is mostly pictorial. The instrument is shown on mosaics, sculptural reliefs, terracotta figurines, graffiti, and on some contorniate medallions. Several inscriptions also refer to specific organists.

The organ appears to have had a wide distribution in the empire, where it was played by a variety of musicians of differing social standing, in many different situations. Most people would have heard it in the amphitheatre where it was played solo or with a group of 'brass' instruments to accompany events. A mosaic of the second century from a villa at Nennig near Trier shows an organist and cornicen awaiting the signal to play (No.1). Other panels in this mosaic show different aspects of amphitheatre entertainment.
such as gladiatorial combat and *venatio*. Similarly a large mosaic from the villa at Dar Buk Ammra near Zliten, which is now in Tripoli Museum, and dates from the late first century AD, shows two groups, each comprising an organ, a tuba and two cornua, both 'orchestras' accompanying gladiatorial combat (Nos. 2 & 3). In this example the organist in each group is a woman. The fact that the organ was used to accompany such noisy events indicates that it was a powerful instrument, easily audible above the roar of the crowd, and indeed these amphitheatre instruments are of considerable size. The Nennig organ which is quite detailed is about 2m in height, taking the organist as a scale, and its width is about 80 to 90cms. The Zliten organs appear to be slightly smaller, about 1.80m high.

Further pictorial evidence to attest the organ's role in the amphitheatre comes from Rome where a graffito was found on the wall of a villa under the basilica of San Sebastiano on the Via Appia (No. 4). This is only a rough sketch but it shows the organ with *tuba* and *cornu*. Nearby two gladiators are fighting. This illustration, one of the few that shows the pump handles being worked by two people, dates from the late second or early third century AD.

Several illustrations exist on pottery or on vessels of other materials which are easily dated. *Venatio* scenes and gladiators in action decorate a small bronze vessel of the late second century, apparently found at Rheims and now in Paris (No. 5). The organ is placed between two groups of fighters. There is a similar scene on a pottery vase found near Roskilde, in the
Nationalmuseet Copenhagen (No. 6). This vase is of a later date, certainly not earlier than the third century and thought by some scholars to be as late as the fourth century. Jean Perrot has also identified an organ, probably from a gladiatorial scene, on a fragment of pottery from Lezoux, in the museum at St. Germain, which dates from the late second or early third century, (No. 7).

A hydraulic organ also appears on a funerary monument from Tatarevo in Bulgaria, seen above the figures of gladiators. This stele dates from the early third century AD, (No. 8).

The iconographical evidence for the organ as an instrument of the amphitheatre covers therefore a long period of time and is drawn from a wide geographical area, the significance of which I shall discuss below. Evidence about the amphitheatre organ is not however confined to illustrations. Petronius in the Satyricon compares the man at Trimalchio's feast who is carving the meat in time to music, with the gladiator fighting to the accompaniment of the organ (hydraulis). In this case a specific type of gladiator is mentioned, the essedarius who fought from a chariot. The archaeological evidence suggests that it was not only the essedarius who had a musical accompaniment, but this literary reference confirms the impression that the organ was not only used for interval music. Its inclusion in so many illustrations shows that it immediately conjured up the noise and atmosphere of the amphitheatre.

The organ was also played at other gatherings, for example, as is recorded in the literary evidence, in the
theatre. The poem Aetna which appears to have been written in the first century AD, perhaps by Lucilius, describes what can only be a hydraulic organ such as were played in great theatres. The instrument is described as dome-shaped (cortina) and its mechanism is mentioned briefly as a stream of compressed air being 'propelled' by the water below.

Suetonius also refers to the organ in a theatrical context, when Nero after the revolt of Vindex in AD 68 showed his friends organs of a new type which he proposed to exhibit in the theatre. It is possible that the emperor had brought this instrument from Greece, but its novel qualities are not described. It is tempting to imagine that the new invention may have been that of pneumatic action, but this is mere speculation as there is no direct evidence for a bellows organ at this time, a point which I shall expand below.

Illustrations showing the organ in a theatre as opposed to an amphitheatre are rare. A terracotta medallion from Orange, (No.9), now in the museum at Saint Germain shows two figures, one in a long robe, holding a thyrsus in one hand and brandishing a theatrical mask in the other, and the other smaller but also robed holding a scroll and a palm branch, perhaps awarding the prize to a successful actor. Between the two figures is a small organ, with a deep wind chest supporting seven pipes, sharply graded in height. The wind chest rests on a rectangular box or plinth which may be the water cistern, although there is no sign of pumps or levers, not that there is room to show these on the medallion. Alternatively
it may be a bellows organ which was known by this time, the late second or early third century AD. There is no positive evidence to indicate which of these suppositions is correct, I am not convinced by Degering's argument in favour of its being a pneumatic organ simply because of the large size of the wind chest relative to that of the cistern — it is not a detailed illustration. 12 Similarly Perrot's argument (1971, p. 94), that it is a hydraulis because a pneumatic organ would not have been sufficiently powerful can also be criticised. Surely not all Graeco-Roman theatres were of 'vast proportions' and the acoustics of ancient theatres are excellent. An instrument capable of producing the maximum amount of noise would certainly have been required in the amphitheatre, but it may have been possible to manage with a less powerful sound in the theatre. Certainly the portability of a pneumatic organ would have been an advantage. In the absence of further detail the point cannot be settled conclusively, but it should be remembered that the representation of water cisterns varies considerably, often being dependent upon the size and shape of the monument and the nature of the overall design. In this case the design is more balanced artistically with a narrow 'cistern' than it would have been with one the same width as the wind chest, and it could not have been made taller without either crowding the figures or breaking the wreath that surrounds the medallion. The instrument is shown to summon up the atmosphere of the theatre and the details cannot perhaps be interpreted too literally.

A third century moulded pottery fragment from Rome (No. 10) is further evidence for the playing of the organ
in theatre or odeon. A togate figure stands in front of double doors while behind him is a hydraulic organ with its organist.

Certain bronze medallions struck during the fourth century AD to commemorate games in the amphitheatre usually carry a scene connected with the games, and sometimes show an organ. On the obverse the medallions usually portray the head of an emperor, often not a contemporary ruler but one with strong connections with the circus theatre or amphitheatre, for example Nero or Caracalla. I have listed four examples in the catalogue, (Nos. 11 - 14), two showing the head of Nero and two that of Caracalla. No.11, a Nero contorniate is typical in illustrating a large and powerful hydraulic organ with a figure on the left that may be the organist. The inscription, LAURENTI NICA is a wish that he should be victorious, perhaps in a music festival and the prominence of the organ on these medallions suggests that they may have been issued in connection with musical contests.

A mosaic found at Mariamin, near Hama, in Syria depicts a group of female musicians that could perhaps have been found in a small odeon although they could equally well be playing at a private gathering, (No.36). The organ is seen here with a cithara, tiba and percussion instruments and is providing the music for a dancer with castanets or small cymbals. In this instance there is no doubt that it is a bellows organ as it rests on a table and a bellows is shown in the foreground. It is interesting to note that the size of the pipes relative to the height of the player, is about the same as for an
average hydraulic organ, and a well-built pneumatic organ with large bellows and efficient regulator could have been as powerful as the hydraulic organ. I shall discuss the Mariamin organ in more detail when tracing the development of the bellows organ.

The organ continued to be popular during the later Roman empire and became particularly important in the east. It was an ideal instrument for the circus. The obelisk of Theodosius the Great, erected in 390 shows two large bellows organs which are played in concert with the syrinx and tibia at various circus events in the Hippodrome, presided over by the emperor (Nos.34, 35, P1.44,47). There is no trace of a water cistern on either of these organs but each has a tube leading from the wind chest to large bellows which are operated by small figures, probably children. The hydraulic organ was still known. A diptych from Verona, dating from 517, shows the emperor Anastasius I at celebrations in the circus which include horse racing, illustrated by two horses with their jockeys and musical entertainment represented by five children and two adults who are apparently singing, a juggler, syrinx player, and an organist with his hydraulic organ (No.15). The instrument seems to have been as popular at the circus as in the amphitheatre.

The organ had an important role at the Byzantine court as an instrument of ceremonials, in processions, and in the Imperial Palace itself. Obviously an instrument played in a procession had to be comparatively small with a pneumatic action, but those played at receptions and banquets could be left in position permanently and many
were undoubtedly of great size. An Arab writer of the
ninth century describes a large pneumatic organ with
sixty pipes, elaborately ornamented with gold. 13

The luxurious instruments of the Byzantine court
were obviously rare, but at an earlier period the organ
was a familiar and popular sight in many parts of the
empire. A measure of its popularity can be gauged from
the existence of a series of ornamental terracotta lamps
produced at Carthage in the second century AD, examples
of which are now in the British Museum, in Carthage and
in Copenhagen, (Nos.16, 17, 18). They were probably
ornaments or souvenirs, perhaps of the amphitheatre, rather
than utilitarian objects.

The organ was also played as a solo instrument,
as we have already seen at music festivals, but also on
less public occasions, as in the weavers' clubhouse in
Aquincum, and also undoubtedly in some private houses,
probably the more wealthy ones. Even some emperors, Nero,
Elagabalus, and Alexander Severus are said to have included
the organ among their repertoire of instruments. 14 Other
less distinguished organists are known to us by name, the
distribution of this largely epigraphic evidence
emphasising the wide geographical distribution of the
instrument.

Of considerable interest is the tomb of Aelia
Sabina found at Aquincum and dating from the end of the
fourth century, long after the destruction of the weavers'
organ, but showing continuity of interest in the instrument
in this area. The inscription set up by her husband
T. Aelius Justus, described as an hydraularius salamarius
to the Second Legion Adiutrix states that Sabina aged twenty five gave public performances on the organ and also played stringed instruments.\textsuperscript{15} Obviously in this part of the Empire and at this date it was quite proper for a respectable young woman to give such musical entertainments. T. Aelius Justus is the only military organist known to us by name and indeed this is the only reference that I have found to the existence of such a post. However, gladiatorial shows were undoubtedly popular among the troops and some legions are thought to have employed their own gladiators, so it is not surprising that an organist should also be appointed. He is unlikely however to have ranked with the cornicen, tubicen or bucinator whose existence is often noted and who gave tactical signals on the battlefield.

A surprising number of organists recorded in the inscriptions and portrayed on sarcophagi and other archaeological evidence are women. It was certainly not unusual to find a women playing the organ, even in the amphitheatre as can be seen on the mosaic from Zliten. The mosaic from Mariamín also shows a group of female musicians, including an organist. There was a long tradition for this as Thais, the wife of Ktesibios was reputed to have been the first organist,\textsuperscript{16} and what is probably the oldest representation of an organ, on a terracotta figurine from Alexandria, is played by a woman (No. 19)\textsuperscript{5:3.43)

One complication in the iconography of the organ is that in some cases it may have had eschatological significance and it is therefore difficult to decide
whether its presence on a funerary monument implies that the deceased was a musician or whether it is only a symbol of joys in the next world, particularly when it appears with what is apparently Christian symbolism. In cases where several instruments are shown as on the stele in Autun, (No.20), or where it has a prominent position as on the uninscribed sarcophagus from Arles (No.21), or on Aphrodisia's stele, (No.22), or where the inscription refers specifically to the dead person as a musician, we can accept its presence at face value, but there must be doubt in some instances, as for example, the sarcophagus in the St. Maximin basilica in Var, which depicts the raising of Tabitha and dates from the fourth century (No.32) or perhaps the organ shown schematically on the stele of Gentilla (No.29). From Arles comes the sarcophagus of Julia Tyrannia (No.23). Her hydraulic organ appears with a syrinx, a small tree and an animal that may be a sheep, symbols suggesting that this may have been a Christian sarcophagus. The names of Julia's father in law and husband, Autarcus and Laurentius apparently occur frequently on Christian inscriptions but there is not really enough evidence to state positively that she was a Christian. However even if the presence of the organ on some funerary monuments must be regarded as symbolic rather than a statement of personal musicianship it must have been recognisable as an instrument to the casual observer and the widespread distribution of such monuments again points to the fact that it was known over a great part of the empire.

The individual players of the organ were as varied as
its geographical distribution ranging from emperors to entertainers in the amphitheatre, both male and female and including famous virtuosi. The organ seems to have enjoyed a better reputation than most instruments, despite its early associations with amphitheatre entertainments and it was possible for respectable young women to play and even to give public recitals and for this to be remembered with pride on their tombstones.

Admittedly the only evidence that we have for this comes from the provinces, but it is true that the organ achieved a place in Christian symbolism at a time when other instruments with centuries of philosophical prejudice behind them or strong associations with pagan cults, for example, the tibia, the tympanon and cymbals, were not considered to be 'respectable'. The organ was always an instrument of ceremonial, whether that of the amphitheatre and circus or later of the Byzantine court, where the elaborate ritual of Imperial life is described by Constantius Porphyrogenitus. However its role if any in Christian ceremony is debatable.\(^{17}\)

I have referred to the wide geographical distribution of the organ and it is perhaps necessary to study this in greater detail. It is tempting to make generalised statements about it but the nature and extent of the evidence about the organ should be borne in mind. The organ is shown on monuments far less frequently than other musical instruments and the total number of known representations is about forty, for the entire empire. There is also a substantial body of literary evidence both among the works of writers on general subjects and
those of the musical theorists. It is reasonable to assume that some of these works would have been read in some of the areas from which we have no archaeological or epigraphic evidence, (although the distribution of books would always have been limited).

Thus the evidence is scattered, coming from Italy itself, from the eastern half of the empire including Egypt, where it originated, from Greece, where all the evidence is literary or epigraphic, and the Balkans, from North Africa, from the areas of modern France and Germany and the northern provinces, where it was probably introduced by the army although as is shown by the organ belonging to the Aquincum weavers, it was by no means confined to that body. There is no direct archaeological evidence for its existence in either Britain or Spain. This may simply be fortuitous as there seems to be no reason for the exclusion of these provinces. At all times the organ would have remained a luxury instrument as it required great skill for successful manufacture, but there was no lack of wealthy communities in either Britain or Spain, or of army units which may have employed organists.

The organ was therefore illustrated in many parts of the empire, but it may be going too far to say that it was well known in all these and in other places. The evidence extends over a long period of time, in the west, from the first century BC until the collapse of the western empire, after which no organs were built until they were re-introduced from the east in the eighth century. In the east there is continuity of development
from the third century BC and the organ flourished in the eastern half of the Roman empire especially in the Byzantine period, being fully exploited by many emperors who took an interest in the instrument and saw its potential as a symbol of majesty. At a less exalted level thousands of people would have seen it in the amphitheatre, or later, in processions but might not have been familiar with it at closer quarters. Certainly anyone designing a tombstone would not have put on it an unknown instrument, whether or not it was symbolic, but there was obviously some confusion about its mechanism, even in the mind of an educated person such as Athenaeus. The actual number of organs in existence at any time was probably comparatively small but the occasions on which the instrument was played, its complicated and exotic nature, and its exciting sound ensured its popularity.

The mechanism of the hydraulic organ.

The clearest accounts of this complicated mechanism are given by Vitruvius and Hero of Alexandria, and many of the features that they describe can be recognised in the archaeological evidence - external features from the illustrations of the organ and internal parts from the surviving wind chest of the instrument found at Aquincum.

The basic mechanical problem involved is the distribution of air to the pipes at constant pressure. A bronze water cistern, the ara, stood on a firm base and in it was placed a hemispherical or funnel-shaped air vessel, the pnigeus. This rested on lugs or short feet (taxilli), which allowed the water to circulate around it freely. Air was forced into the pnigeus by means of piston
pumps, one in Hero's organ, but two in that of Vitruvius, working alternately. The metal pump cylinders (modioli) were placed one on either side of the cistern, each attached to a frame, shaped according to Vitruvius, like a ladder. The pistons (fundii), were sheathed in leather to prevent air leaks and were operated by a simple crankshaft, (vectis).

The air entered the cylinders through cup-shaped valves (cymbala) which closed when the piston stopped moving down. Vitruvius describes an instrument on which the bronze counterweights to these valves were in the shape of dolphins (delphini), which moved up and down as the pumps worked. When the piston was raised the air was forced through more valves (fistulae) in to the pnigeus where it displaced the water, which therefore rose higher in the cistern. The weight of the displaced water compressed the air in the pnigeus and this pressurised air eventually passed to the pipes. From the pnigeus it entered the wind chest (canon musicus), a complicated arrangement requiring great accuracy and care in manufacture to prevent air leaks and consequent loss of pressure. The air entered separate compartments (canales), which ran lengthwise along the chest, one for each rank of pipes, entry to the canales being controlled by a valve worked by an iron handle. The pipes were mounted on a board (the pinax or tabula summa), which was set above the wind chest with the sliders, plinthides, between it and the channels. The sliders were perforated with holes which corresponded to the ends of the pipes and the holes in the pinax and top of the wind chest. Iron springs were attached
Fig. 13 The mechanism of a simple organ with one pump.

When the piston is lowered air enters the cylinder through the valve on the left. It is then forced through the tube and a second valve into the pneuus where it displaces the water and enters the wind chest under pressure. When the key is pressed the slider moves forward and the hole is positioned under the pipe which then sounds.

The flue pipe. Air under pressure is forced through slit A and is projected against the edge of the upper lip, producing pulses which make the pipe sound.

The design of the pipes in the front rank of the Aquincum organ.
to the sliders and were also connected with the keys on the manual, so that when a key was pressed, the slider, which normally blocked the foot of the pipe, moved forward until all the holes were in line, thus allowing air to rush into the pipe which produced a note. When released, the key sprang back into its original position, as can be seen on the diagram reconstructed from Hero's description. The sliders and indeed all moving parts were greased to facilitate their movement and to make the apparatus airtight. Vitruvius adds that rings were fixed on the top board around the holes which allowed the passage of air from the wind chest and into these the feet of the organ pipes were fitted.

Vitruvius draws a vivid picture of the organ working. The levers are raised, the piston rods draw down the pistons in the cylinders, the dolphin valves open and the cylinders are filled with air. The piston rods are then forced up and the valves close, forcing the air through the connecting tubes into the pnigeus, and thence to the wind chest. The compressed air flows through a valve and fills the channels. When the keys are pressed the sliders move backwards and forwards allowing different pipes to sound.

Pictorial evidence illustrates many of the components described by Vitruvius. The pipes, water cistern and pumps are the features most commonly emphasised by artists. The water cistern is often hexagonal as on the mosaic from Nennig, (No.1) which shows the pumps mounted on the sides, but no levers or crankshafts, also on the sarcophagus from Arles (No.21), the organ of Aphrodisis (No.22), the sarcophagus of Julia Tyrrania (No.23), and on the
particularly detailed ornamental lamps from Carthage. There are several of these terracotta models, produced in North Africa, perhaps as novelties or souvenirs, during the second century AD, and examples can be found in the British Museum, in Copenhagen and in the Lavigerie Museum, Carthage (Nos. 16, 18, 17). The latter instrument, with its hexagonal cistern flanked by two cylinder pumps supported by upright bars, rests on a solid rectangular base. Above the cistern is the wind chest stamped with the name POSSESSORIS, the lamp's maker. It supports three ranks of eighteen pipes, the longest at the front of the instrument. They are graded in length with the trebles on the organist's right, all held in place with a slanting cross bar decorated at each end with roundels. Near the bottom of the pipe and all at the same level is a row of diamond shaped holes very similar to the lips of modern flue pipes. Two more ranks are shown on the reverse, above the manual, which has eighteen keys, set in line with the pipes. The tops of these pipes are not in a regular line but allowing for this probable artistic inaccuracy, one rank is about half the height of the longest pipes, perhaps indicating an octave stop and the other is two thirds the length of the first rank, perhaps a fifth stop.

The model of the organist who is standing on a plinth is broken and seems to be too large in relation to the organ - his hands would have been well above the keys apparently. However as the organist was modelled later and added to the finished organ, this is only a minor point. On a similar lamp in the British Museum the separately modelled musician is seated at the instrument.
The two holes on the front of the wind chest are not part of the organ but are wick holders, although whether the object was ever intended for serious use as a lamp is another question.

A lamp in the Copenhagen Museum (No. 18), shows similar features although it is damaged having lost part of its cistern, one pump and its base. The example in the British Museum is better preserved and is very similar to the Carthaginian model, with three ranks of eighteen pipes, but the manual is not shown as clearly, (No. 16).

The shape of the water cistern would not affect the working of the organ and besides being hexagonal it is sometimes shown as rectangular, for example on the mosaic from Zliten, (Nos. 2 & 3), sometimes cylindrical as on the monument raised by Rusticus from Rome, (No. 24). Illustrations are frequently so greatly simplified that the pumps are not shown – of the Zliten organs only one has pumps. Pump handles are even more rare and only very occasionally are figures actually working them. A graffito from a villa under the basilica of S. Sebastian in Rome (No. 4) shows two such figures holding the pump handles but the drawing is probably not realistic as both handles are at the same level, when they would have been working alternately. Apart from this the drawing, which can probably be dated to the late second or early third century is a conventional illustration of an organ with about twelve pipes which is playing in concert with a tuba and cornu to accompany fighting gladiators. Figures working the pump handles can also be seen on the diptych of 517 in Verona (No. 15), on the third or fourth century
uninscribed sarcophagus from Arles (No.21), on an engraved sardonyx dating from the third century AD in the British Museum (No.25), and on a medallion of Valentinian III in Paris (No.26). The latter example which dates from about the mid fifth century AD shows an organ of an unusual type, with a cylindrical water cistern than is wider than it is deep. The pumps are rather long and narrow and the long handles are held realistically by two small figures in different positions - one is nearly upright, the other is at an angle. The twelve pipes are particularly tall and only vary in height a little with the trebles to the right of the organist, whose head reaches only about half way up the instrument. On most organs and on all the early ones the organist's head appears over the top of the pipes although it should be remembered that in some cases at least the musician is standing on a plinth or is seated on a high stool. However even allowing for this, the organ on this medallion is rather larger than those on the other illustrations and it is interesting as Perrot mentions, that this is the era when Ammianus Marcellinus was writing about lyres as large as chariots and colossal hydraulic organs. Above the organ is an inscription PLACEAS PETRI - probably referring to a contemporary organist.

The British Museum gem, (No.25) shows the organ pumps in some detail. Each is clearly formed of two parts, a cylinder above and a piston below. A pipe links the cylinder to the wind chest and below each piston is a rod attached to a lever, each held by a youth. One boy holds his lever at its highest position balancing the other
which is at its lowest point, indicating that the pumps worked alternately to maintain constant pressure. Such pumps are well known in the Roman world and had many applications.\textsuperscript{20}

In the pictorial evidence the wind chest is generally shown very schematically, usually as a shallow rectangular box, often elaborately decorated. Occasionally there is greater detail as on the Rusticus organ, (No.24), which is drawn at a slight angle, allowing a side view of the rectangular wind chest. In front it appears to slant a little, although this may be a trick of perspective. The back is box-like and from it protrude five levers, which may be register keys.

The number of pipes shown on the pictorial evidence varies considerably, usually from seven to eighteen in each rank, although the Nennig organ shows the impossibly large number of twenty eight. A fragment of a terracotta organ from Tarsus, now in the Louvre shows fourteen or fifteen pipes (No.27), but the norm is seven to ten pipes. The pipes on each rank are usually of the same diameter and height of each pipe varies. Sometimes the pipes slope steeply but in other illustrations the slope is very little indicating little variation in pitch between the treble and bass pipes. The evidence is probably not clear enough to enable us to reach firm conclusions about the compass of the individual organs but it is likely that generally this was not large. The Carthaginian organs have eighteen pipes in each rank but the difference in height between the treble and bass pipes is so little that the interval between each note cannot have been more than a semi-tone
and may have been as small as a quarter tone. Most other illustrations indicate similarly small intervals between notes but the only organ pipes that can actually be measured are those belonging to the small bellows organ found at Aquincum in the clubhouse of the Collegium Centonariorum, which was destroyed by fire. An inscription dates the presentation of the organ to the college to the year 228 (No.28). In the fire all the wooden parts perished but the metal linings to the wind chest, its four channels and thirteen sliders, some of the key mechanism and of course, the pipes of which there were fifty two, set in four ranks of thirteen. The wind chest measures 27cm by 8cm and its mechanism corresponds admirably with that described by Vitruvius. The four channels in the wind chest are partitioned off by thin strips of bronze, sealed at the top by a thick rectangle of bronze. Underneath the channels are closed by bronze plates, two to each channel with a space of about 6cm left free in the middle for a slider, which controlled the flow of air to the pipes. The slider, which ran inside bronze casing, and which replaced the inlet valves, epitonia, on Vitruvius' organ, had a rectangular slit in the middle, and had a shank about 15cms long soldered to it so that it could be moved easily. Three of these shanks are engraved with the numerals II, III, and IIII, to indicate the rank of pipes to which they belonged, and all passed through holes in the outer wall of the wind chest. The bronze sheet which formed the roof of the four channels was pierced with four sets of thirteen holes and on the upper surface of the sheet were small bronze strips running from
front to back between each group of four holes, thus dividing the surface into thirteen compartments with four holes in each. In these compartments run thirteen sliders, one for each key on the manual. Each slider has four holes to match those on the top of the channels and each slider is numbered with the highest number thirteen (XIII) on the left. Above the sliders was the top board, the tabula summa which was perforated with fifty two holes to match those below and into these were set the feet of the pipes. The sliders were connected with spring mechanism to the keys on the manual so that when a key was pressed the slider moved forward so that its holes were in line with the ends of the pipes and the air entered whichever pipe was open, this being dependent upon the position of the other slider stops in the four channels below.

All fifty two pipes survived, in various stages of preservation, and are made of cast bronze. The detailed literature on this organ gives an analysis of the metal. Each pipe consisted of a body and a foot and all were flue pipes. The pipes of three ranks were stopped with wooden plugs which could be pushed into the tubes to alter the tuning. In the first rank of stopped pipes the length of the body of the pipes varies from 13.7cm to 24.1cm while the external diameter varies from 0.9cm to 1.1cm; in the second rank, length varies from 17.8cm to 32.5cm and the diameter from 1.1cm to 1.4cm; and in the third rank, the pipes are in too poor a state of preservation to enable accurate measurements to be taken, but the diameter is between 1.3cm to 1.7cm. Perrot has calculated
that the compass of the first two ranks would have been about or a little under an octave, as the longest pipe in each case is nearly twice the length of the shortest. However it is impossible to be certain about the tuning of these pipes as we cannot guess what difference the tuning plugs at the top made. It is possible that the plugs could be used to give the tunings of the different 'harmonia' but it is odd that the first three ranks should be so easy to adjust while the fourth rank had open pipes. One consequence of the stopped pipes is of course that the notes obtained from them would be one octave lower than the notes from an open pipe of identical length. This may have been an advantage on this rather small organ which would otherwise have had a thin high tone. The pipes of the fourth rank are open and the lips of these pipes are of a different shape. It is probable that they gave a contrast in timbre, perhaps being of a generally higher pitch. The pipes could be tuned to some extent by means of a metal band around the top which could presumably be slid up or down the pipe, thus altering its length. The lip and foot of the pipes are of an unusual type (Fig. 13.), but as the angle at which the air strikes the lip and the shape of the mouthpiece are of acoustical importance (as they affect the harmonic series produced), this presumably contributing to the distinctive timbre of these pipes.

One further comment about the Aquincum organ should be made. Some publications assume that this was a hydraulic organ because of the word 'hydra' in the dedicatory inscription, but in fact as the original
publisher Nagy noted, there was no trace of any hydraulic mechanism. It is inconceivable that as so much else has survived, the water cistern, pumps, and pneumatic which would have been largely of metal, should have perished. It is far more likely that the air was supplied by wooden and leather bellows which naturally were destroyed. A few small fragments of wood were found among the remains and on analysis proved to be pine, from the lower part of the wind chest, and oak, forming the plugs stopping the pipes. The keys were of elm and another piece of elm may possibly have belonged to the bellows but cannot with certainty be identified. The Aquincum organ was a small instrument but it seems to have been too large to be portable.

It is the most illuminating piece of evidence that we have concerning the nature of organ pipes but even this is incomplete. It upholds the impression gained from the iconographic evidence that the intervals between notes were small and that the compass of most instruments was not large. However the literary evidence points to great differences of tone colour or timbre between different notes of the organ, more than could be obtained if all pipes were flue pipes, and some works refer to the pipes as auloi, perhaps implying that they were reeds, which have an entirely different sound, being generally more noisy. While many illustrations definitely show flue pipes, the mouths of which are visible, it is less easy to indicate reeds, whose pitch depends upon the length of the vibrating tongue inside the pipe. It is likely that early organs made great use of reed pipes and they would have been more suited to use in the amphitheatre than the
mellower flue pipes, although the latter are shown on amphitheatre organs. There is no reason why a developed organ could not have had both types for tonal contrast, but the evidence is inconclusive.

The Bellows Organ

On first consideration the idea of sounding a set of pipes with air supplied directly from bellows seems more attractive than the complicated arrangement found in the hydraulic organ, but there is no literary reference to a pneumatic organ until its inclusion in Pollux' list of instruments in the second century AD, and archaeological evidence is scanty until an even later time. There is more than one possible explanation for this. The bellows organ may have co-existed with the hydraulic from the beginning of that instrument's history but may simply have attracted little attention beside its more spectacular relation. On the other hand one cannot merely attach a set of bellows to a series of pipes and expect a good musical sound as there is the problem of maintaining constant pressure, without which the notes will die away as the bellows are re-inflated. Consequently the bellows organ must always have been equipped with an air reservoir and regulator and although technologically this was quite feasible, there is no positive evidence that it existed. There is an argument in favour of an early bellows organ if one accepts the use of the bagpipes at this time. The evidence for this is reviewed elsewhere but the essential problem is similar, although on a smaller scale. Air leaks would always have been a serious problem in the pneumatic organ and as this problem
would increase with the size of the instrument, early organs, if they existed are likely to have been of a small size and perhaps to have been confined to use in private houses where they would not attract public notice. It is possible that size was an important factor in the development of the bellows organ as the hydraulis would have been too large for most houses, however palatial. The bellows organ had the obvious advantage of being easily portable and with improved mechanism could even rival the hydraulis, which it eventually supplanted.

The first reference to the bellows organ is in Pollux (Onomasticon) where he lists among other wind instruments the Tyrrhenian aulos, which from his description of it as an inverted syrinx fed with air from below, is an organ. Two types are mentioned, the larger, which is more powerful being the hydraulis and the smaller, a pneumatic organ.

References to this type of organ remain scarce. Perrot makes such of the poem 'Organon' by Optatianus Porfyrius which although undoubtedly describing a hydraulis, is set out in the shape of what is apparently a simple bellows organ. This is one of a series of poems set out in the shape of their subjects, respectively a Pythian altar, a syrinx and an organ and all dedicated to the emperor Constantine who had banished Porfyrius in 324. Perrot, (p.57) suggests that the poem is shaped like a bellows organ because it was by this time more familiar than the hydraulis, but I am not sure how much can in fact be read into this. The addition of verses in the form of water cistern and pumps would have complicated Porfyrius'
task considerably and it is in fact possible to interpret
the design as a simplified organ without specifying the
type.

There is less controversy about the next reference in
an epigram written by the Emperor Julian (332–363),\textsuperscript{24} which
makes no mention of water but instead describes the air
rushing from a bag of bull hide, which must be either the
bellows or an air reservoir which is filled by bellows.

The author of the Epithalamium Laurentii who seems to
have been a contemporary of Claudian (fl. c.400) apparently
describes an organ with hydraulic compression but which is
fed by bellows. Such an instrument is not mentioned else-
where in Latin or Greek literature but is described in
a later Arabic text, which apparently drew on Greek sources.\textsuperscript{26}

St Augustine refers to a large instrument which was
fed by bellows, while pointing out that the word organum
was used as a generic name for musical instruments and was
not often used as the name of one specific instrument,
i.e., the organ, although the word is used of the organ
in other contexts. It is possible that the word hydraulis
as used by late authors does not in fact specify the water
organ, as the word seems to have been used indiscriminately
for both types. Sometimes the word organum is used in a
context where it must mean 'organ' and not simply 'a
musical instrument', as for example, SHA Elagabalus 32,
(organo modulatus est) but here the type of organ is not
stated.

There is an interesting comment in a letter written
at Antioch by Bishop Theodoret of Cyrrhus between AD 431
and 437, that the bellows of an organ, which is compared
in a complicated metaphor, with the tongue, were worked with the feet.\textsuperscript{28}

Some authors are careful to explain the role of the water in the hydraulis which was obviously still known in Byzantine times, but the bellows organ eventually supplanted it completely by early mediaeval times, and it is reasonable to suppose that with advances in the techniques of manufacture the problems of constructing the bellows organ were gradually resolved. This development took place over a period of several hundred years and it is not therefore surprising that there should be a confusion or lack of distinction between the two types.

The iconographic and archaeological evidence for the bellows organ is similarly scattered and scanty, but some illustrations show it in considerable detail.

The earliest archaeological evidence is the Aquincum organ, the wind chest of which I have already discussed in connection with Vitruvius' description of the hydraulis. The great difference between this organ dating from 228, and accounts of earlier models is that nothing was found to suggest that it had any sort of water chest, pumps or pneus. Such objects would have been substantial and being made of metal, one would expect them to survive the fire, particularly as other small components were found intact. Bellows, which would have been largely of leather and wood could not have been preserved. When first excavated the organ was presumed to be hydraulic, but this now seems most unlikely, and on negative evidence, admittedly, the Aquincum organ can be considered to be pneumatic.
Some of the earliest pictorial evidence collected by Perrot, none of it earlier than the third century, is a little unclear. A graffito with a Christian inscription - *Gentilla in pace* - from a cemetery near Ostia shows an organ with sixteen pipes, slightly graded in length, supported by two uprights, each decorated with a scroll or circular motif at the top and joined by a sloping bar in the middle of which is a rectangular plaque (No. 29). The pipes are set into a small rectangular wind chest, but there is no sign of a cistern, or alternatively of any form of blowing mechanism. It is likely that this is a conventional and simplified drawing of an organ, an instrument that is often found on Christian funerary monuments, but the graffito is otherwise uninformative about its mechanism, although the absence of a water cistern, which is easy to draw, is suggestive.

Another instrument on a funeral stele, probably of a musician, from Autun is similarly undetailed (No. 20). The musician plays a single pipe, in itself interesting, and on his left there is an instrument with seven pipes, or two lateral supports and five pipes), resting on a pedestal. The instrument can probably be interpreted as a small organ, as the pipes are apparently set into a small wind chest. There is however no sign of any pumping mechanism or bellows.

A glass vessel from Naples of the third century AD, engraved with a Bacchic scene is also thought to show a small pneumatic organ (No. 30). The instrument rests on the ground and has between twenty five and thirty pipes graded in length held by a cross bar and supported on a very shallow
wind chest. Again, no further details are shown, apart from a strap attached to it, and it may simply be a large syrinx. The number of pipes shown is unlikely for either organ or syrinx.

I have mentioned the Rheinzabern terracotta in connection with the syrinx. I should stress that the interpretation of this piece is controversial, but there is a possibility that it represents an organ, although no details are shown, (No.31).

Perrot has suggested that the Constantinian sarcophagus in the basilica of St Maximin, Var, (No.32) may show a bellows organ but as the instrument in question is squeezed into the corner of a scene showing the raising of Tabitha, again a Christian subject, and has neither pumps nor bellows the argument must be inconclusive. It may equally well be a hydraulic organ.

An organ is shown with other instruments on one of the mosaics in the villa at Piazza Armerina, Sicily, which may have belonged to Maximian (286-305) (No.33). It has between seven and nine pipes and a wind chest but there is no sign of either pumps or a water cistern. In the absence of conclusive detail it is impossible to be certain but it appears to represent a small portable organ. The date of the mosaics has been disputed but a span from the late third to the early fourth century seems most likely.

The possibility that the Orange medallion shows a pneumatic organ has already been discussed, (No.9).

The two remaining pieces of evidence are indisputably illustrations of the bellows organ. The obelisk of Theodosius in Constantinople, dedicated in 390 shows
various circus activities attended by the Imperial family and court. There are two groups of musicians, each with an organ played in concert with the tibia and syrinx, providing music for dancing girls with percussion instruments, hand clappers and castanets, (Nos.34,35), Pl.49, 47. The two organs are placed respectively at the left and right of the composition. On the left hand organ the eight pipes slope gently from left to right, with the trebles on the player's right (No.35). The organist himself appears to the left of the instrument and the maximum height of the organ, judging from his stature is about five feet. Below the pipes is a wind chest and the whole apparatus rests on a plinth, or small table, definitely not a water cistern. On the left two small figures stand on a flat, apparently oval, object which is connected to the wind chest by a tube – perhaps some sort of bellows, probably made of leather.

The organ on the right of the scene (No.34) is essentially the same but it has more pipes, (ten or eleven) and the trebles are on the player's left. The organist and the two figures standing on the bellows are shown on the right of the instrument. This discrepancy between the illustrations is probably due to the sculptor's desire for a balanced design, but it does emphasise the dangers of relying solely on the artist's impression.

Technically it seems unlikely that a bellows organ as shown would be very efficient. Without a regulator there would be a total loss of air to the pipes as the bellows were reinflated. It is of course possible that the sculptor has greatly simplified what he actually saw.
Two figures are shown on the bellows and it is possible that this represents not one but two sets of bellows which could be worked alternately. Such double bellows could practicably be placed on either side of the organ, or alternatively, one on each side. Either arrangement would increase the efficiency of the action, but the sound would still tend to die away, if, as is highly likely, there were air leaks in the instrument. Perrot has suggested that what we see on these organs is not after all the bellows but a regulator designed to maintain the air pressure. This would have been a leather bag filled with air from bellows which are not shown and the air would be forced into the wind chest by the weight of the organist's assistants. However the same effect could be achieved merely by putting a heavy weight onto the regulator. There is also a statement by Theodoret that the bellows were worked with the feet\(^2\) and it seems on balance more likely that the artist has intended to show the bellows rather than the regulator in this case, although in order to work with any efficiency the bellows organ must have possessed a regulator.

It is moreover interesting that precisely the same arrangement is shown on the most detailed illustration of the bellows organ yet found - on the mosaic dating from the late third century AD from Mariamin in Syria, (No.36). The organ, which is about one metre high is definitely not a *hydraulis* as it stands on a table which is covered with a decorative cloth and there is no sign of water cistern or pumps. Instead, on the left are two *putti* working what is apparently a foot pump or bellows
placed on the ground. The grouping is identical to that on
the obelisk but the oval air cushion is shown in more detail.
It stands on short feet and is constructed from more than
one piece, indicated on the mosaic by different colours.
The feet of the two putti are attached to four rectangular
blocks on the top of the cushion – probably made of wood,
while the body of the cushion was of leather. Both putti
have their weight on the right leg while the left is bent
at the knee. No connecting tube is shown leading to the
organ but the organist’s dress obscures the design at this
point. The apparatus is obviously intended to represent
the mechanism of a pneumatic organ and is apparently what
the spectator normally saw. However in this case too the
bellows mechanism cannot have been as simple as is
suggested by the illustration as the sound produced would
be intermittent. Again there is the possibility as
suggested by Perrot in the case of the Theodosian obelisk
that the air cushion is a reservoir in which the air is
compressed by the weight of the putti and that the actual
blowing mechanism is out of sight, and possibly operated
by the organist herself. I think that we have to accept
that these illustrations are intended to show organs with
pneumatic action. No illustration could be expected to
show the mechanism in complete detail and it
seems more likely that an artist would try to represent
sets of bellows rather than regulators or compressors.

Apart from being the earliest illustration of a
bellows organ yet found, the Mariamn mosaic is also
interesting for other reasons. Much of its detail is
exceptionally clear although the illustration as a whole
suffers from certain errors of perspective. The pipes are held in position by an elaborate metal framework and there are nineteen pipes in the front rank facing the audience, all cylindrical and of equal height, and apparently open at the top and without the open lips which are characteristic of flue pipes. Behind them are three more ranks of pipes graded in height but all are much shorter than the first rank.

A total of four ranks is quite possible on the analogy of the Aquincum organ, but the design is somewhat clumsy here and the mosaicist may simply be indicating more pipes behind the front rank without specifying the number. It is odd that the pipes of the front rank are all of equal height as all other illustrations show pipes graded however slight the angle of slope may be. This may be artistic error or license particularly bearing in mind the awkward perspective of the metal framework. Dr Duchesne-Guillemin who has published the Mariamin mosaic comments on these pipes suggesting that the tops were plugged with wooden stoppers to alter the length of the air column of each, as on some of the Aquincum pipes. The mosaic shows however quite clearly that the pipes were open at the top and if stopped it would be necessary for the plugs to reach the top of the tubes in order to adjust the tuning. Another objection to this theory is the fact that the mouthholes are not shown and as these would be indispensable if the pipes were stopped Dr. Duchesne-Guillemin suggests that these faced the player and were therefore not visible to the audience. This is of course possible but many illustrations clearly show
the lips facing the audience. Unfortunately back views of the organ are extremely rare. The other possibility, assuming that the artist has not simply made a mistake in showing the pipes of equal length is that they are not flue but reed pipes when the pitch is determined not only by the length of the air column but also by the length of the vibrating tongue, which on modern organs is made of metal. Modern reed organ pipes are made both conical and cylindrical depending upon the type of sound that is required. In a cylindrical pipe like a clarinet only the odd numbered harmonics are reinforced by resonance and in conical pipes, like the oboe and trumpet odd and even harmonics are equally reinforced. On this analogy reed pipes on an ancient organ could be of either shape and may in fact have been more likely to be cylindrical, in imitation of the tibia. Whether it is likely that reed pipes which are more noisy than flue pipes would have been used on an organ of this size is another question. I see no basic objection to this particularly if one accepts that, on the evidence of this mosaic the organ was played with the tibia, a reed blown instrument.

Without the relative heights of the pipes as a guide it is impossible to make any more than a guess about their compass - nineteen notes arranged diatonically would give a gamut of two octaves and four notes, or arranged chromatically, one octave and seven semitones. A chromatic scale would give more scope for modulation in our sense of the word and would presumably have been more flexible for the scales of that period, although the total compass seems rather small. One can probably discount the possibility
of notes smaller than a semitone at this time.

The other eight pipes are even more puzzling—they are apparently slightly conical, a feature that I have not noted on other representations of the instruments, but this may be adding an unnecessary complication. Their grouping and size appears to be arbitrary. I have already noted that a total of four ranks of pipes may be indicated but the instrument is rather narrow and Dr Duchesne-Guillemin may well be right in assuming that there were only two ranks.

The wind chest and the keyboard mechanism which is not shown is likely to have been similar to that described by Vitruvius and found in the Aquincum organ.
1.) The invention of the organ - Vitruvius, De Arch. X,7; IX,8; Athenaeus, IV,75; Pliny NH, VII,125.

2.) Name of the organ:
   - Hero of Alexandria, Pneumatica, I,42.
   - Athenaeus, IV,75.
   - Nicomachus, Enchiridion, IV,20.
   - Bellermann's Anonymous.

organum hydraulicum - Pliny, NH,VII,125, (but perhaps used here generally in the sense of hydraulic machines rather than organs).
   - Suetonius, Nero, XLI.
   - Tertullian, De Anima, XIV.
   - Ammianus Marcellinus, Historia, I, xiv, 18.
   - Sidonius Apollinaris, Epist. II, Ad Agricolam.


4.) Cicero, Tusq, III, xvili, 43-4.

5.) Athenaeus, IV,75.

6.) Hero, Pneumatica, I,42; Vitruvius, De Arch. I,8.

7.) Perrot, 1971, p.20-22, Hero, I,42. The date of Hero's writing has been much disputed. LSJ tentatively suggest the late second or early first century BC, but some authorities put it as late as the second century AD. Recent scholarship places Hero in the second half of the first century AD. Landels, 1978, Engineering in the Ancient World, p.201, summarises the evidence. The important point is that although Hero may have written after Vitruvius the organ that he describes is a simpler and probably earlier type than the Vitruvian model.

8.) There is some doubt as to the date of the Nemnig mosaic. Perrot, 1971, p.23 gives a Hadrianic date for the villa, but Parlasca, 1959, p.35 considers that the mosaic dates from the third century. The villa was excavated in the nineteenth century and many questions remain unanswered, - a date of the early third century seems to be the most likely - see also Wightman, E., 1970, Roman Trier and the Treveri, London, p.147.
9.) Petronius, Satyricon, 36

10.) Aetna, I,295-297. The poem was attributed by its MS and doubtfully by Donatus to Virgil, but may not be by him. Lucilius, the friend of Seneca, has been suggested as author.

11.) Suetonius, Nero, XII, 2.

12.) Behn, 1954, p.116, Taf.65,Abb.149, also describes this instrument as a pneumatic organ, but does not give reasons for this interpretation. The illustration is a drawing, not a photograph.


14.) Nero - Suetonius, Nero XLI,54; Elagabalus - SHA (Lampridius) Elagab. 32,8; Alexander Severus - SHA Al. Sev. 27,9.

15.) CIL III, 1051; T Ael(ius) Justus hydraularius salarinarus leg(ionis) II ad(iutricis) coniugi faciendum curavit.

16.) Athenaeus, IV,75.

17.) It is certain that at times the organ appears on Christian tombstones as an eschatological motif. However, its role, if any in Christian ceremony is debatable. Wellesz, (1961,p.106ff) assumes that the organ was played in Byzantine churches, a practice not tolerated in the Greek church to-day. In view of the general opposition to all instrumental music by early Christian writers, especially St. John Chrysostom, it must be doubted if this was the case. The organ remained in Byzantium a symbol of secular Imperial power and detailed descriptions of its position in Imperial ceremonies and rituals are given by Constantine Porphyrogenitus in the De Ceremonius.

18.) Vitruvius, De Arch. X,8; Hero, Pneum. I,42.

19.) Ammianus Marcellinus, Historia, XIV,18.

20.) Roman pumps - There is a fine complete bronze pump in the Museo Arqueologico de Madrid found in the mine of Sotiel-Coronada in Valverde (Suelva). This is a double action pump similar to that of Ktesibios, described by Vitruvius, X,7, with a total height of 95cm. A similar pump from Bolsena, which is not in such good condition is in the British Museum. - Archaeologia 55, 1896, p.234.

21.) For example, Galpin, Groves Dictionary of Music and Musicians, art. 'Hydraulis'. This article has now been revised, New Grove, 1980.
22.) Hero, Pneum. I, 42; Julian, Anth. Pal. IX, 365; Simplicius of Cilicia, In Phys., IV, 8. In Greek 'aulos' is perhaps a more natural word for 'pipe' than 'syrinx'. Authors who write in Latin usually refer to the pipes as fistulee, Vitruvius, I, 8; Cassiodorus, Exp. in psalm., CL. Tertullian, De Anima, XIV refers to the pipes as tibiae, - tot acies tibiarum.

23.) Pollux, Onomasticon, IV, 69-70.


26.) The organ is described in the Arabic texts which have come to us under the name of Muristus. The identity of Muristus is unresolved, as is the exact date of the work, which appears to be a compilation of earlier Greek writings. The description of the instrument appears to derive from Ktesibios' original. The problem is discussed by Perrot, 1971, p.189ff.

27.) St. Augustine, Ps. CL, 7.

Brass Instruments - Historical Summary

Brass instruments which are sounded by vibration of the player's lips have a long history in the Middle East, notably in Egypt, where two trumpets, one of silver and one of bronze were found in the tomb of Tutankhamen. Trumpets are frequently depicted in Egyptian art in military and ceremonial contexts from the fifteenth century BC, and it is likely that they were known in Mesopotamia from Early Dynastic times during the third millennium BC.¹

The development of these instruments from prototypes of other materials such as wood or horn must of course have taken many thousands of years, (Baines, 1976;56ff).

Egyptian trumpets are certainly the best documented.² The Tutankhamen trumpets are short, 58.2cms and 49.4cms in length with slightly conical bores and short flared bells. They are made of sheet metal brazed on the longitudinal seam and each contained a removable wooden core or stopper. The mouthpiece is simple, the end being cushioned by the attachment of an outer ferrule with a rolled edge, forming a metal ring as found today on some Indian trumpets (Baines, 1976;56), a design that limits the range of notes available. Acoustically a mouthpiece is superfluous as it is possible, using the lips as vibrators to obtain a note from any tube if its bore is of a suitable size. The mouthpiece however affords a coupling between the tube and the player's lips making it easier to blow, but more importantly it affects the embouchure, the position of the lips. Far more can be achieved with a modern embouchure than with most of those used in antiquity as suggested by the illustrations,
although later mouthpieces, as will be shown, were more sophisticated, some being very similar to modern examples.

The trumpet continued to be used in the same form in Egypt, possibly into Roman times if, as has been suggested by Baines and Marcuse, the very similar instrument in the Louvre, is of Roman date.\(^3\) It is made of bronze, again of sheet metal and is 54cms long with a conical bore and a flaring bell. Trials on a facsimile yielded two notes. Plutarch (Moralia) likens the sound of the Egyptian trumpet to the bray of the despised donkey. If so this indicates that playing techniques were not advanced.

The Greek salpinx, which was probably related to Egyptian types held only a minor position in Greek musical life. An instrument thought to date from the fifth century BC and said to be the only surviving example is now in the Museum of Fine Arts, Boston.\(^4\) At 158cms (about five foot) it is much longer than the Egyptian trumpets and it is made of thirteen sections of ivory strengthened at the joints with decorative bronze rings, with a flaring bronze bell. There is no separate mouthpiece and as the bore would have been too narrow to be applied directly to the lips, the tube is coned slightly within the thickness of the wall to give a diameter large enough for comfortable playing. The lowest note obtainable on a replica is F or G. This instrument however, is much longer than those illustrated by Greek figurines or on vase paintings. In addition such illustrations usually show a cylindrical and not a flaring bell. As Baines points out the shape is more like that of the Roman tuba and its suggested provenance may not be reliable. It has been claimed that the instrument came from
Olympia but there is apparently no archaeological evidence to support the suggested date. The integral mouthpiece does not however seem to be a Roman feature.

Two black figure plates in the British Museum illustrate the salpinx more reliably and also show something of the technique of blowing it. The first, BM inv. No. B591 shows an archer in oriental dress blowing a trumpet through a mouthband or support known as a Phoësia, made of leather. A similar plate shows a figure in ordinary military dress. The first, BM inv. No. B591 shows an archer in oriental dress blowing a trumpet through a mouthband or support known as a Phoësia, made of leather. A similar plate shows a figure in ordinary military dress. In this example the phorbeia is clearly fastened at the back of the head at the base of the helmet. It had a hole in the front enabling the lips to vibrate and gave support to the player's cheeks which were under pressure. It should be noted that brass players of today, like the modern oboe player, do not require this support. Aeschylus' description of the salpinx in the Eumenides as διατορός or 'yelling' strengthened the impression that players were interested in the amount of noise they could produce rather than its quality. It is also interesting that Aeschylus refers to the Etruscan trumpet.

Verrall points out that the salpinx often appears in military history on the opposing side and it seems not to have been generally popular in Greece, although later it appears on some Macedonian coins.

Brass instruments had an ancient tradition in the north too and were in some respects developed further than in the east. The Bronze Age lur, of northern Europe, found chiefly in Denmark, was a curved horn with a conical bore made from two cast sections of pipe, with a flat disc attached to the end instead of a bell. The mouthpiece
which was similar to that of a trombone was cast with the shorter section. When assembled the S-shaped tube was twisted so that the disc pointed forward and the instruments are often found in pairs with their bores twisted in opposite directions, similar to a pair of animal horns. Mammoth tusks have been suggested as a prototype. The length of excavated lurrs varies from 160cms to 225cms.

The interesting point about the lur is the similarity of its cup-shaped mouthpiece to Roman and later types. It is far in advance of contemporary eastern instruments. Lurr are dated broadly from the tenth to the sixth century BC.

Bronze Age horns have also been found in Ireland. Some have hooked bells with a straight body; some are end blown, others are apparently side blown. More significant is the Celtic carnyx, a development from the early combination of tube and horn. The cylindrical bronze tube was surmounted by a boar's head with gaping jaws and an elaborate crest. When played it was held vertically, as is shown on the Gundestrup cauldron. It appears on Belgic coins in Britain, those of Tasciovanus and Epillus, and occasionally in Roman art, for example on the Triumphal Arch of Orange, and on Trajan's column. A carnyx was found in Britain, in the River Witham in Lincolnshire, but has been lost. Other examples are discussed by Piggot, (1959). The word carnyx occurs late in the works of the lexicographers as καρνυξ Eustathius and καρντον Hesychius, where it is described as a trumpet with an animal bell or mouth used by the Celts and Galatians. Polybius (i1,29 6.) and Diodorus Siculus (v, 30), both refer to the trumpets used by 'barbarians' but do not use the word carnyx.
The carnyx was therefore known to the world of the Roman Republic and early empire. Piggott has suggested (1959,24) that as its shape is so similar to the classic lituus with the addition of an animal head, it may have been derived in late La Tène times from a Roman source. This does not seem to me to follow. Both instruments could equally well have developed separately from the composite horn.

Brass Instruments in Roman Life

In marked contrast to Greek sources, Roman literature and iconography gives abundant evidence of the use of brass instruments. In antiquity the Etruscans were credited with the invention of trumpets and horns, and they were obviously important in Etruscan life, featuring in military processions and funerary scenes. There are several different accounts of their origins. According to one the trumpet was invented by the eponymous hero Tyrrhenus, but other sources credit Maleus, the Etruscan prince of Regisvilla, Vetulonia and Pisa. The Etruscans did not of course 'invent' brass, or rather 'bronze' instruments, which as has been shown had a long history of development in the east and in northern Europe, but the persistent tradition suggests that Rome adopted the war instruments of Etruria together with aspects of military organisation.

The tuba, cornu and bucina were primarily military instruments with clearly defined functions, even if some of these are now unclear. In its early stages the increasingly complex organisation of the army necessitated the introduction of standards to relay orders. Instruments were used to draw the soldiers' attention to these standards
and later to sound the signals themselves. A Trajanic relief shows cornicines, horn players and a tube player, who wear distinctive animal headed headresses, in the thick of battle close to the standard bearers apparently all playing at the same time, which would be unlikely as it is probable that the different instruments were used to sound distinctive calls. It should be remembered that this is likely to be a somewhat idealised portrayal of the Roman army in battle.

There is some information about the instruments used to give signals. Vegetius writing in the fourth century AD records the tuba, cornu and bucina, of which the first two were important for relaying tactical commands. The tuba sounded the advance and retreat, while as seen in illustrations the cornu was associated with the standards (signa). Horn players sounded the classicum, the call to assemble, also used as a fanfare on ceremonial occasions. Procopius states that in its early days the army had only two calls, but there are numerous references to the instruments' presence in battle and their use in various strategems. The bucina was used in camp to sound the hours of the night for the watches and was apparently also blown before battle. It may also have had a part on the classicum.

It has sometimes been assumed that the cornu and tuba were regularly used by the infantry while the bucina was a cavalry instrument. In fact several inscriptions record the presence of tubicines in cavalry units and the tombstone of cavalryman Flavius Attius from Gerulata depicts a cornu, (No. 30). The full list of bucinatores recorded by ' inscription which is given by Speidel (1976, 156ff) shows
that they belonged to many types of unit including the legions, *alae*, *vigiles* and the fleet.

Ps. Acro in a scholion on a passage from Horace's first Ode, mentions a fourth instrument, the *lituus*, which he associates with the cavalry, while, he states, the shorter and lower pitched *tuba* was used by the infantry. Although mentioned occasionally, the *lituus* is not however shown in military contexts and no military *l icines* are known from inscriptions, but possible examples of the instrument have been found in the Rhineland.

Livy records the enrolment of *cornicines* and *tubicines* in the fifth and lowest order of the sixth century Servian organisation of the army. Numerous inscriptions record the presence of brass players, *senatores* in the Imperial army, and they ranked as *principales*. Some were classed as *immunes*.

Two inscriptions from Lambaesis, which date from the early third century AD provide information about the organisation of the clubs of *tubicines* and *cornicines* in the Third Legion Augusta. The *anularium* paid to a veteran *cornicen* on discharge was five hundred denarii, which seems to have represented one year's pay, on the rate given to an ordinary ranker. *CIL VIII*, 2564 classes *cornicines* as *duplicani* in receipt of double the private's pay, thus showing that they were eligible for promotion. In a comparison of the status of the different musicians, the *tubicen* and *cornicen*, who gave tactical battle signals ranked above the *bucinator*.

Brass instruments held an important place in religious and state ceremonial. *Cornua* and a *lituus* appear with *tibiae* in a funeral procession on the relief from Amiternum (No. 20) and there are numerous literary references to the
playing of 'brass' at funerals. At one extreme, Seneca, writing ironically in the Apocolocyntosis describes the blare of trumpets and horns at the supposed obsequies of Claudius, and more modestly in the works of poets like Propertius there are references to the tuba's sound at less exalted ceremonies. Indeed the tuba in particular became so closely associated with funerary rites that Petronius in the Satyricon wrote of 'sending for the trumpeters' as a way of alluding to death. Elsewhere in the same work is the account of Trimalchio's horn players sounding a 'dead march', which incidentally, alerted the local fire brigade.

Gellius, quoting Ateius Capito says that the lituus and tuba players who appeared at funerals were known as siticines and also that they played on a special kind of trumpet (tuba). There are epigraphic references to aeneatores in these contexts, to guilds of brass players (collegia aeneatorum) and also to the official trumpeters of Rome, (tubicines sacrorum populi Romae). The tubilustrium, an ancient festival involving the purification of the sacred trumpets was held on the 23rd March and 23rd May. The official trumpeters participated in great state festivals and ceremonies, playing, for example, at important state sacrifices. An altar frieze of the mid first century AD, now in the Vatican, shows such a sacrificial procession with three tubicines marching in front of the animals, blowing their instruments which are held high, (No.1). A tuba and three cornua appear at a suovetaurilia on Trajan's Column, the musicians on this occasion belonging to the army, but again participating in a religious ceremony (No.2).
Trumpeters also played at military triumphs, as is shown on a relief panel from an arch, depicting the triumph of Marcus Aurelius, (No.5).

In contrasting mood brass instruments were especially popular in the amphitheatre. The mosaics from Zliten in North Africa show the tuba and cornu in ensemble with an organ and the Nennig mosaic illustrates a cornu with an organ, making an exciting noise to accompany the action. Statius mentions the tuba giving the starting signal in the arena and Juvenal is scathing about the rise to fortune of former itinerant amphitheatre horn players, who went on to stage their own gladiatorial shows. The tuba also gave signals in the circus as can be seen on a mosaic from the villa at Piazza Armerina, where a trumpeter plays at the chariot race.

It is unlikely that much subtlety would be required of the music played by the tuba in the amphitheatre and circus, but perhaps the instrument was sometimes enjoyed for its musical qualities. The general and consul, L. Norbanus Flaccus is reported to have played the tuba for pleasure, and practised daily.
The Tuba

The **tuba** was a straight trumpet about 120cms, or three to four feet in length, with a regularly expanding bore and a flaring bell. I use the term 'trumpet' although in to-day's terminology this describes an instrument with a cylindrical bore which reflects its development from a prototype of wood or cane, while the conically bored horns have as their ancestors natural animal horns. As Bate (1966, 83) points out, there seems in early antiquity to have been little or no distinction between cylindrical and tapered tubes. However, in assigning particular roles to different instruments the Romans must have appreciated some difference in tonal quality. In general a sharper, harsher sound is made by a mainly cylindrical trumpet, when compared with that of a horn, although the tone is modified by the bell. Some representations, as for example those on the Zliten mosaic, (No. 7), indicate a mainly cylindrical bore but illustrations are not consistent. The **tuba** was the Roman equivalent of the Greek salpinx and may have had a common ancestry, although there were important differences particularly in the design of the mouthpiece and the bell. Both cultures, as has been seen, described trumpets as 'Etruscan'.

Military tombstones, which are especially detailed in matters of uniform and equipment show the **tuba** as a straight trumpet with an expanding bore. The illustration on the tombstone of Aurelius Salvianus, **tubicen** of Legio XI Claudia from Chersonese is typical, (No. 3) Salvianus holds his trumpet which has a narrow, almost cylindrical tube at the top which gradually flares into an elongated bell, giving the overall impression of a conical bore. It is possible that trumpets
with cylindrical bores may be bucinae, the evidence for which is discussed below.

A rare surviving tuba from Zsambek in Hungary is made of bronze and is in one piece (No. 4), but some illustrations suggest that instruments were also made of short sections which were joined together. The tombstone of M. Praeconius Iucundus (No. 5) shows an instrument which is apparently in three pieces, while that of Sibbaeus from Mainz (No. 6) has two sections. The monument of C. Valerius from Carnuntum (No. 7) depicts an object which may be a tuba in two pieces with a conical cover over the mouthpiece, very similar to one shown on the tombstone of C. Vetienus Urbicus from Koln (No. 8). This was identified by Behn, (1954, 141) as a 'drum-major's' staff but the Carnuntum evidence strengthens the possibility of its being a mouthpiece cover.

The Vatican altar frieze (No. 1), showing tubicines in a sacrificial procession illustrates the method in which the tuba was played. The instruments are held so that they point upwards and are supported by the musicians' right hands. The players' cheeks are inflated. A similar pose is held by the tubicen on the relief panel showing the triumph of Marcus Aurelius (No. 9). He supports the mouthpiece of the instrument with his left hand while his right grasps the tube about half way up and his cheeks are very puffed out. A military trumpeter plays an instrument with an apparently cylindrical bore on a relief of a suovetaurilia from the Arch of Constantine, (No. 10), again using the same technique. Tubicines playing for a sacrifice on Trajan's Column have some assistance in holding up their long instruments, (No. 11). A strap is attached to each tuba, near the end of its gently flaring bell and this is grasped in the player's left hand which also
supports the middle of the instrument. His right hand holds the tube near the mouthpiece. There are other illustrations of the tuba which show this strap.39

Some tubae appear, from the illustrations, to be longer than the standard military instruments, as for example those shown on the Zliten mosaics. These seem, using the figures as an indication of scale to be about 140cms. or over four feet in length, and are drawn with very narrow cylindrical bores flaring out sharply at the bottom to give a distinctive bell. A tuba found in the temple of Mars at Klein-Winterheim in Rheinhessen has been reconstructed as 180cms. in length, (No. 13). Because of its great size and considerable weight Behn suggested that it may have been a votive instrument. The surviving length was 137cms, but the upper end with the mouthpiece is broken. The instrument is made from a sheet of bronze with a longitudinal seam and the bore expands regularly into the remains of a flanged bell at the end. It is an odd and unparalleled example and it is probably unwise to draw too many conclusions from it.

A distinctive 'Gallo-Roman' tuba may also have existed. Examples have been found in the Loire region and are preserved in the museums of Orleans and Saumur (Nos. 14,15). The instruments are about 160cms. in length and are made of bronze, in detachable sections which are decorated at the joints. The mouthpiece socket of the Orleans tuba is especially elaborate, but the mouthpiece which is inserted into it is very small. These slender instruments appear, apart from their decoration to be similar to the large models illustrated in amphitheatre and circus scenes.

When compared with illustrations the surviving trumpets are therefore all of unusual type. However many mouthpieces
of 'lip-reed' instruments have survived. These were cast separately from the main tube of the instrument and may have been detachable. Some would certainly have belonged to tubae but it is difficult to decide which, and although those fixed to the tuba may have been cup shaped and smaller than the mouthpieces of horns, in the absence of any that are still attached to an instrument it is impossible to be certain. There is more certainty about cornu pieces and the question is discussed further in connection with that instrument. S. Marcuse claims that detachable mouthpieces were made of bone but I can find no conclusive archaeological evidence to support this theory. 40

There are many contemporary descriptions of the sound of the tuba, most suggesting that it was loud and penetrating, - a good reason for its importance in battle. Pollux mentions it as one of the instruments used to give tactical signals on the battlefield but nothing is known of their nature. 41 In a description of the tuba's sound:

'at tuba terribili sonitu taratantara dixit',

Ennius implies that notes were 'tongued'. 42 Signals must have varied in rhythm and probably also in pitch. It is likely that the instrument's capabilities were exploited as far as the primitive embouchure, implied by tubicines inflated cheeks, would allow, but this may have admitted only the first two or three natural sounds and the sheer volume of noise produced was probably the most important consideration.

If the evidence of certain tombstones from Germany can be accepted a folded trumpet may also have been known in the Roman world, but the interpretation of this evidence is controversial. Behn discusses two illustrations of such instruments, one from Mainz, on the tombstone of Andes, a cavalryman, and one on a
relief from Remagen, now in Bonn, (Nos. 16, 17). He identifies the instrument as a **bucina** and is followed in this by M. Klar but there is no conclusive evidence for this theory. The folded arrangement would transform a long and unwieldy trumpet into an easily held instrument, perhaps suitable for use on horseback, and it is known from inscriptions that the **bucina** was sometimes used in the cavalry, but recent evidence suggests that the **bucina** was a straight trumpet. Folding the tube of a trumpet or horn makes no appreciative difference to its sound, but obviously makes it easier to handle.

The most usual arrangement for folding a trumpet, evolved since the middle ages, is for two primary bends or bows to unite three lengths of straight tubing which are called, for convenience, the mouthpipe, the middlepipe and the bellpipe.

Gradually the bows were made narrower, to form a narrow zigzag and eventually the pipes were overlapped to make a more compact instrument. On the natural trumpet the mouthpiece usually extended beyond the upper bow.

The illustration of the instrument on the Andes monument presents a problem, being unplayable in the form shown. The tube is folded back on itself so that unless the mouthpiece
was angled sharply backwards, the mouthpiece would not be accessible to the lips. In fact the perspective on Roman illustrations is often distorted and it is possible that mouthpiece could have been at an angle to the middlepipe.

In an article on the mediaeval trumpet Besseler illustrates a folded trumpet with the mouthpiece below the upper bow but arranged so as to be playable. Behn however proposed a different solution, suggesting that there was a joint in the middlepipe so that the mouthpiece could be swivelled out for playing. Technically such an arrangement is quite possible but there is no illustration of an instrument being played in this manner.
Across the Andes instrument is what appears to be strut or stay between the mouthpipe and the right hand pipe (middlepipe). It is very interesting to see this feature, as, on the mediaeval trumpet stays were not developed until the sixteenth century. On the Bonn monument which shows a trumpet with the mouthpipe in a similar position, the stay apparently extends across the whole instrument, thus locking it into an unplayable position. The illustration may not be reliable and there are insufficient examples to judge it, but this raises the possibility that the instrument is neither tuba nor bucina but a cornu, the strut representing the familiar cross bar on that instrument. Similarly the instrument on the Andes monument may be a cornu shown diagrammatically to fit into a restricted space. The 'spike' at the lower end of the Remagen instrument is unusual and as there is much room on this fragmentary monument restrictions of space cannot account for the shape of the instrument.

Each instrument has a cup shaped mouthpiece. It is possible therefore that it is a form of cavalry trumpet or bugle, but probably not the bucina, or alternatively the cornu, which is known to have been played in the cavalry (No. 30). It is very tempting to see it as a folded trumpet, perhaps of a particular Rhineland type, but the inconographic evidence is too scanty for firm conclusions to be drawn.
The Cornu

The cornu, a coiled horn is probably the most frequently illustrated 'brass' instrument on Roman monuments, and several complete specimens and many fragments survive. It was one of the instruments adopted from the Etruscans who were said to have invented it, although it was also recognised that the ox-horn was the prototype of the metal horn. The Etruscan form of the horn is certainly previously unknown, although its cup-shaped mouthpiece shows some similarity to that of the lur, which may have been known to the peoples of north and central Italy through trade contacts.

An Etruscan horn can be seen with the lituus on a late fourth century painting from Orvieto, (No. 18). It appears as a wide bored horn, curved into a three quarter circle with a cross bar or strut by which it was supported by the right hand and shoulder. A relief on an ash chest from Volterra, (No. 19), which dates from the late third early second century BC, shows musicians in a sacrificial procession - two horn players, a tibia player and a lyre player. One of the horns is semi-circular, with a cross grip. There is no pronounced bore, just a gradual but considerable expansion of the bore, and the end points forward over the player's head. The cornua on the late first century BC relief from Amiternum are similar, perhaps a little more elliptical than circular, with the bell end pointing in the same direction, (No. 20). A horn in the Villa Giulia Museum in Rome is of like form, although it is dated much earlier, being said to have come from an Etruscan tomb, (No. 21), Fig. 14.

In the British Museum there are several complete bronze horns and fragments of horns which were purchased in the
Fig. 14
Brass Instruments No. 21.
Sketch of the cornu in the Villa Giulia.

Fig. 15
Brass Instruments No. 45.
Sketch of the "lituus" in Bonn.

Not to scale.
nineteenth century in Italy (Nos. 22-26). The most complete
e
don example, (No. 23), which is thought to have come from
Campania, is 119cms. in length and is made in four sections,
a mouthpiece and three others, which may originally have
been detachable, but are now corroded. The bore expands
regularly from 0.5cms. at the throat of the mouthpiece to
about 8cms. at the bell end, but the bell does not flare.
The sections of tubing have a longitudinal seam and the
joints are reinforced with bronze rings. The tube curves
gently although not as much as the cornua on the monuments.
There is no sign of a hand grip, but the instrument is very
corroded in places and if it was of wood, would have been
unlikely to survive. The instruments may be a type of
cornu, most probably an early form related to Etruscan
examples. Bate however considers that the horns are kinds
of bucina.47

The cornua shown on various military monuments of
Imperial times are of a different type, with a narrower
tube, curved into a nearly full circle, or G-shape, so that
the bell which is more pronounced, projects forward,
actually over the player's head. The hand grip is often
highly decorated. Such cornua are shown on Trajan's Column in
a marching scene, (No. 27), at a sacrifice, (No. 2), and on
a scene illustrating the crossing of the Danube, (No. 28).
Here, large cornua are shown. Each has an extended hand grip
with pelta shaped ends which project beyond the curve of
the tube. The cornua on the Adamklissi monument (No. 29),
are of the same type, apparently the standard military
cornu from the first century AD. The tombstone of Flavius
Attius, (No. 30) shows the instrument of a cornicen in a
cavalry unit. Fragments of a cornu were found at Ovilava in Austria, (No.31), comprising two sections of narrow bronze tubing with a conical bore and a distinctive bell with a wide flange which is not shown on contemporary illustrations. Fragments of a similar cornu were also found at Virunum, (No.32).

Like the tuba, cornua were made in different sizes. Those played in the amphitheatre, as illustrated by the Zliten and Nennig mosaics appear to have been larger than the military type, (Nos.12,33). This impression is confirmed by the discovery of large horns from Pompeii, now in Naples Museum, (No.34). The tube length of one example is 330cms or 11 foot. The mouthpiece is apparently detachable and fits on to the conical tube. When playing, the cornicen usually rested the cross bar on his shoulder, supporting it with his left hand and held the mouthpiece to his mouth with the right hand.

Because of the existence of some complete instruments a little more is known of cornu than of tuba mouthpieces. Uncertainties remain however, but before discussing these some note should be made of the components of a mouthpiece and the acoustic effect of different designs. The bore of a mouthpiece has three parts, the cup, the throat, or opening at the base of the cup and the tube or back-bore of the shank which connects with the body of the instrument. The shape of a mouthpiece affects the tone of an instrument but its acoustic function is not yet fully understood. Briefly the overtones in the instrument's standing wave are affected by the profile of the mouthpiece. For example, a mouthpiece in which the walls meet the throat at a sharp angle encourages the production of strong overtones, giving...
a 'bright' sound. If the throat is rounded the sound is 'darker' and more mellow as the overtones are weaker. In horns to-day a conical cup with a well rounded throat contributes to a smooth sound while the sharp edged throat of a trumpet, with a shallow cup aids brilliance.

The position for ancient mouthpieces is less clear and Roman mouthpieces show some variation in shape. Those attached to the horns in the British Museum, (Nos.22,23,24), which fit onto, not into, the body tube are wide and shallow, with a narrow back bore that continues the throat dimension for five centimetres then opens out. The design tends to limit the available range of notes, which would be further reduced by the embouchure shown on the monuments.

Behn shows a series of examples with long shanks and rounded cups, which he suggests, on Pompeian evidence belonged to cornua. He ascribes other mouthpieces which are generally more funnel-shaped to the tuba or bucina, but cannot specify which. On modern analogy this is surprising as one would expect a rounded cup to have been more suitable for a trumpet, and indeed Baines claims that the tuba mouthpiece had a rounded cup and was of medium width. Perhaps one should not look for consistency at a time when acoustic science was not developed.

The mouthpiece from Waldmossingen, (No.35) is comparatively wide and may be from a cornu, as is the mouthpiece in the British Museum, (No.36). This very fine example may date from the first century AD. Its cup is nearly hemispherical and the rim is rolled on the inside to form a cushion. The shank is 16.8cms. long with a conical backbore. There are three decorative bands on the outside.
of the shank, which fitted over the end of the body tube. A mouthpiece from Vetera, (No.37) which is also thought to belong to a cornu has a very shallow, almost funnel-shaped cup, and one from Neuss, (No.38) which has an everted rim is more likely to belong to a tuba or bucina. The everted rim might support the lips better than a cushioned one.

Several mouthpieces of 'trumpets' have been found in Britain. One from Great Chesterford is interesting as it may have been inserted into instead of over the body tube, (No.39). There are two faint lines encircling the external surface and the bottom part of the shank is very smooth. The mouthpiece which is very roughly made is wide and shallow. It is described as a trumpet mouthpiece but could equally well have come from a cornu. A mouthpiece from Verulamium, (No.40) is similar but the cup is deeper than the Great Chesterford example and might produce a better tone.

Other examples in Britain include those from Water Newton, Lydney Park and Castlecary on the Antonine Wall. All could belong to either cornu or tuba, although if the tuba was played with a rounded mouthpiece the latter seems more likely, (Nos.41,42,43).

A common feature on all cornu/tuba mouthpieces is the steeply angled throat which would assist a brilliant or shrill tone. The sound of the cornu is sometimes described as a threatening rumble and it may have been deeper than the strident tuba.
Chapter 12

The Lituus

The *lituus* was a hooked trumpet consisting of a narrow bronze tube expanding at the end to form an upward turning bell, in the shape of a capital J. It represents the trumpet in its true cylindro-conical form and was derived from a composite instrument made of a straight tube of wood or cane with a cow or goat horn attached to the end as a bell. The word *lituus* was also used for the similarly shaped wand of the augurs.

The *lituus* was an important instrument in Etruria, being used particularly in religious ceremonies and it can be seen on several wall paintings. On a painting, from the Tomba dei Rilievi, Cerveteri, the mouthpiece of one instrument is shown in a contrasting colour, red, to that of the tube, which is yellow, perhaps an indication of a detachable mouthpiece. The *lituus* can also be seen with a horn on the wall painting from Orvieto which dates from the fourth century BC, (No.18). One of the finest surviving examples of a *lituus* found at Cerveteri (Caere) may be of similar date, (No.44). This instrument, which is now in the Vatican Museum is 1.60m. in length and consists of a tapering straight tube made from two sections of bronze sheeting with longitudinal seams, and a hooked bronze bell. The mouthpiece has not survived. The *lituus* on the Amiternum relief, which demonstrates the Roman use of the instrument in funeral processions, appears to be of approximately the same size and type. (No.20), Pl.7.

Acre, (schol. Hor. Carm. I,1.23) compares the *lituus* and the *tuba*, saying that the former was longer than the
latter but its sound was acutus, while the sound of the
tuba was gravis. One would have expected the longer
instrument to have the deeper sound, so this might indicate
that the first note produced by the lituus was the octave
harmonic, as is the case with many brass instruments, while
the shorter tuba sounded the fundamental. Other
descriptions of the lituus indicate that its sound was
shrill and strident. Acro, a late source is also alone
in stating that the lituus was used by the cavalry while the
tuba was an instrument of the infantry. If Acro is thinking
of the long lituus described above, it would seem to be a
most unwieldy instrument for a horseman to carry and the
lituus in this form is never shown on illustrations of the
Roman army. It is however sometimes mentioned in military
contexts and an incident in AD 272 links it with the standards
and the cornu. A funerary inscription also indirectly
associates the lituus and the cornu as it records the name
of M. Iulius Victor, a member of the college of lituus and
horn players, but this inscription is not military. Apuleius refers to the lituus sounding the advance, but
this is in a comic context.

Several instruments which are usually described as
lituus have been found in the Rhineland. The finest example
found in the Rhine near Dusseldorf, and now in Bonn Museum,
is a horn about 74 cm. long, (No. 45). It is made of copper
alloy in two pieces joined with longitudinal seams and the
tube expands regularly, terminating in an upturned elliptical
bell. The integral mouthpiece is rather conical or funnel-
shaped, with a rounded throat and is 11 mm. deep. The
instrument has two small rings attached to strengthening bands, which are slinging eyes, making it easier to carry, particularly on horseback. It is in playable condition and produces six harmonics, the second third and fourth being the strongest.

Similar horns have been found in the River Main at Russelsheim and at Wiesbaden, (Nos. 46, 47). They differ considerably from the Etruscan and Republican lituus, being shorter, far shorter even than the tuba. The bore expands more steadily, curving more gently into the upturned bell. This seems to tally with Festus' description of the lituus as a 'genus bucinae incurvae' and the identification of the Rhineland instruments as litui was based on such descriptions. The deviations from the 'classic' form may not be of great significance. The date of the Rhineland instruments is not known and they may have been developed from the early lituus. They are certainly of a more practical shape while retaining a lituoid appearance.

Horns of this shape are known elsewhere. An instrument washed up on the island of Goere in the Netherlands in the seventeenth century was originally identified as a Roman lituus, but Joan Rimmer now considers that it is probably post AD 1000. It is 67.5cm in length and made of cast, not of sheet, bronze with an integral funnel-shaped mouthpiece and two slinging eyes as on the Roman examples. Unlike the Roman horns the hooked bell is octagonal in section. Other lituoid horns of mediaeval and later date are also known in the Netherlands.
A recent find in Poland, which has not yet been fully published is described by Malinowski as either a Roman lituus or a Celtic carnyx. Like the German horns it was dredged from a river, the River Nogat, near Malborg and it bears a striking similarity to the Dusseldorf lituus, except for the shape of the bell, which is circular at the end rather than elliptical. The provenance of the instrument does not preclude its being of Roman date but detailed study will be necessary for its positive identification.
Chapter 13

The Bucina

The form of the bucina has posed many problems. Inscriptions record the presence of bucinares, apparently camp 'buglers' in many types of unit, but until recently no suitably inscribed illustration of the instrument was known.58

The instrument is mentioned by Vegetius, in an account of the signals used by the Roman army, but in this well known passage there is some confusion between the bucina and the cornu. The latter is described as the horn of a wild bull tipped with silver, while the bronze bucina was a horn bent into a circle;

Epitoma III,5,20.59

Semivocalia sunt quae per tubam aut cornu aut bucina dantur; tuba quae directa est appellatur; bucina quae in semet aereo circulo flectitur; cornu quod ex uris agrestibus, argento nexum, temperatum arte spirituque canentis flatus emittit auditum.

As the identification of the cornu used in the Roman army is secure it is strange that Vegetius should describe what is obviously an archaic instrument. One possibility is that the words cornu and bucina have been transposed and that the bucina was a natural horn, perhaps, as Bate suggests, taking the form of a tapering tube without a bell.60 A horn like this which is about the same size as the lituus from the Rhine, but which is curved throughout its length can be seen in Madrid, (No.49). It is said to have come from Serrano. Anthony Baines has suggested that the Rhineland instruments may be bucinae particularly as they are shaped more like natural horns than Etruscan litui.61
The word *bucina* is not always used in military contexts. It is often used of the herdsman's instrument, presumably a natural horn. Terminology is often confused - Virgil uses the words *cornu recurvo* and *bucina* when describing a single bugle call. 62 The *bucina* of the Tritons was a conch trumpet. 63 In Roman literature therefore the word is frequently used imprecisely to convey the general sense of a 'signal horn'. One might expect military terminology, especially on funerary inscriptions, to be more exact. Another candidate for the *bucina* is the folded trumpet, (if such it is), which is unidentified by name, (Nos.16,17). 64 The pictorial evidence is however severely limited, both geographically and numerically and the alternative suggestion, that the instruments are *cornua* should be considered. The identification of the *bucina* with either the folded 'trumpet' or the Rhineland instruments depends to some extent on the assumption that it was primarily a cavalry instrument. While *bucinatores* are known to have served in cavalry units, there is evidence that they also served in many other types of unit, including the fleet, and there is some evidence for the presence of *cornicines* and *tubicines* in the cavalry. (see note 22,23,44).

Another possibility is raised by the discovery of the tombstone of Aurelius Surus at Byzantium, dated to AD 213, (No.50),265 Surus, who is described as a *bucinator* of the First Legion Adiutrix and is shown in military uniform, holds a spear, the *hasta* in his right hand, and in his left a long straight trumpet with a cylindrical tube, flaring to a bell at the end. The mouthpiece end is broken. This is, presumably, his *bucina* and if so it is the only known
representation of the instrument.

A *bucina* with a straight body does not of course accord with the usually accepted reading of Vegetius, III, 5, given above. In his discussion of the Surus monument Speidel suggests that if the punctuation of the tenth century Codex Palatinus is adopted, the problem is resolved:

Semivocalia sunt quae per tubam aut cornu aut bucinam dantur; tuba quae directa est appellatur *bucina*; quae in semet aereo circulo flectitur (appellatur) cornu quod ex uris agrestibus argento nexum temperatum arte spirituque canentis flatus emitit auditum. 65

The *bucina* is therefore described as a straight trumpet (*tuba*) and the cornu as a curved instrument, with an account of its derivation. The reading is dependent upon the interpretation of the word *tuba* as a trumpet or 'brass instrument' in both a specific and a general sense and although all three instruments are mentioned as giving 'semivocal' signals, the *tuba* is not described.

Festus' description of the *lituus* as a 'genus bucinae incurvae' might imply that the *bucina* was normally straight, but the word *bucina* is probably used in a general sense.

The proposed identification of the *bucina* as a straight trumpet raises the question of the differences between it and the *tuba*. As far as can be judged from illustrations, the *tuba*, as has already been discussed, had an expanding bore. It is of course impossible to be dogmatic on the evidence of one relief, but Surus' instrument has a narrow cylindrical bore, which flares out only at the bell. A cylindrically bored instrument should have a sharper, more shrill tone, but it is difficult to judge the probable differences in sound from the rather stereotyped literary references, especially as the same terms are often applied to more than
one instrument. There are various references to the harsh and terrible sound of the bucina but no precise descriptions. A comparison between the lengths of the tuba and bucina is not really possible on the strength of one relief - they appear to be similar.

Speidel's argument, that the tuba differed from the bucina in being made of several short sections is not convincing. Some illustrations certainly suggest that tubae could be made in detachable sections but others show no divisions, (Nos. 4-7). Surus' trumpet is apparently made in one piece but this does not prove that all instruments of this type were similarly constructed.

Some of the 'brass' instruments on historical reliefs which have always been recognised as tubae have remarkably narrow cylindrical bores, with flaring bells, and in the light of the evidence from Byzantium the possibility that these are bucinae should be considered. Examples can be seen on Trajan's Column, and on the Aurelian panels in the Palazzo dei Conservatori and on the Arch of Constantine, (Nos.2,11,9,10). These are scenes of sacrifice and ceremonial at which the emperor is present. Speidel points out that it was on such occasions that the classicum was sounded. Such reliefs are very exact in style and detailed in matters of dress and equipment. (It is of course possible that the tuba was not always as conical as some of the tombstones suggest.)

The trumpets on the Zliten mosaic are also cylindrical, although one cannot expect such accuracy of detail in this medium. However the only brass instruments mentioned in connection with the amphitheatre are the tuba and the cornu. Sidonius refers to the blowing of a bucina in the circus at
the start of a chariot race, but this is played by a

tubicen. Undoubtedly a tubicen would be able to blow a
bucina but the word bucina may be used in a non-specific
sense. 68

Military tombstones are a generally reliable source
of evidence and it is tempting to conclude from the
illustration on the Byzantine monument that the military
bucina was a straight trumpet. This is however the only
available support for this theory which also depends upon
a reading of Vegetius' text that has not in the past been
accepted, although interpretation of the generally accepted
reading necessitates the assumption that either Vegetius or
a copyist has made a mistake.

Against the military evidence a persistent literary
tradition suggests that the pastoral bucina was a natural
horn. It is certainly possible that the military bucina
was a different instrument.
Notes

1.) Rimmer, 1969, p.29-30. For the early history of brass instruments, see also Bate, 1966, p.86ff; Baines, 1976, esp. p.56f.

2.) Hickmann, H., 1946, La Trompette dans L'Egypt ancienne, Cairo, discusses, among other topics the mouthpieces of Egyptian trumpets. The Tutankhamun trumpets produced the 4th., 5th., 6th., and 8th. harmonics when played with a modern mouthpiece, but only two notes in their natural state - a warning against testing and judging ancient instruments with modern aids or playing techniques.

3.) Baines, 1976, p.54; Marcuse, 1977, p.786; Musee du Louvre – N 909. I have seen this instrument in the Louvre but am not sure of its date. It is shorter than a Roman tuba, as shown on iconographic evidence, but may well represent a local tradition.

4.) Ivory salpinx, Boston Museum, Bate, 1966, p. 94; Baines, 1976, p.64.


6.) Aeschylus Eumenides, 567; Sophocles Ajax, 17.

7.) Verall, JHS V, 76H.


9.) Coles, J., 1963, Irish Bronze Age Horns ... PPS, 29, p.326-356. For illustration see also Behn, 1954, Taf. 85, Abb. 94.

10.) The carnyx; illustrated on the Gundestrup cauldron, Behn, 1954, Taf.84, Abb. 192; on Belgic coins, Allen, D., 1958, PPS. 24, p.44, pl.1, 1-5. Piggot, S., 1959; Ant. J., p.19-32, discusses in particular the carnyxes found in Britain and gives a detailed account of their history. In a Roman context the carnyx appears on the Arch of Tiberius, Orange, Reinach, Rep ... p.203, no.10.
11.) Ancient references to the carnyx; Eustathius, Schol. 1139, 36-7; Resychius, glossed as \( \mu \alpha \rho \nu \alpha \).  

12.) Athenaeus, 184A; Strabo V, 220.  


14.) Tyrrenus-Pausanias, II, 21. The reference is to Tyrsenos and his Lydian wife but represents the same tradition. Silius Italicus, V, 12. Servius ad Aen. I, vi, 7. 

Maleus - Lactant ad Statius, Thek. IV, 224. 

Vetulonia - Silius Italicus, VII, 488. 

Pisa - Pliny, HN, VII, 201.  

15.) Aristides Quintiliannus De Musica, 62, 6f. (Winnington-Ingram), 2,6, p.71 (Mb).  


17.) Vegetius, Epitoma institutorum rei militaris, II, 22.  

18.) Isid. Origines 18, 45; Livy 5, 47, 7; Veg. 2, 22; Fiebiger RE III 2629, s.v. classicum.  

19.) Procopius, Bell. Goth. vi, 23. 

Frontinus, Strat. i, 5, 17. 

Sallust, Bell. Jug. 93, 8 H.  

20.) Polybios 6, 35, 12. 

See Speidel N, 1976, Eagle Bearer and Trumpeter, Bonner Jahrbücher 176; p.153, n. 95, 96. (Verg. Aen. 11, 474; Sil. 5, 224).  

21.) Vegetius Epitoma, II, 22 - but 'bucinatores' may here be used in the general sense of 'brass player'. Higinus Ide Mun. Castra 21. 

Speidel, 1976, 154 n. 103, 104.  


23.) Speidel, 1976, p.150, n. 93. 

CIL VI 31147, 31149, 31151, 3176, 32797. 

If the instrument on the 'Andes' tombstone is interpreted as a cornu (see discussion) it is a further example of a cornicen in the cavalry. The Trajanic relief - note 16, shows cornu and tuba players in what is apparently a cavalry action, but this is an idealized battle picture.

25.) Livy, I, 43, 7.

26.) Musicians in the army, e.g.,
Tubicen - CIL III, 782; 4483; X, 7884.
Cornicen - CIL VI, 2379; 2405; 2627; 2752; VIII, 2557; 2962; X, 217.
Bucinator - CIL III, 6180; 8522; VI 3179, 1057. -
immunis - IGL Syr 1371.

27.) CIL VIII, 20507; 2557, = ILS 2354, 9096. For a full discussion of these inscriptions see Carcopino, J., 1925-6, Reglements des colleges de musiciens militaires, Atti iv, p.217ff. The first dealing with the association of cornicines is dated to AD 203. The annularium paid to a cornicen and the comparative rates of pay in the Severan army are discussed by Brunt, P., 1950, Pay and Superannuation in the Roman Army, PBSR, XVIII, esp. p.57.

28.) CILVIII, 2564.

29.) Seneca Apocolocyntosis, 12,1.

30.) Propertius, Carm, II,7,12; IV,11,9.
Horace, Sat. I, 6. 42.
Servius, ad Aen, 11, 192.
On musical instruments at funerals, Wille, 1967, p.70ff.

31.) Petronius Satyricon 129, 7 - licet ad tubicines mittas.
78, 6 - 'the fire brigade incident'.

32.) Gellius, Noctes Atticae, 20,2,1, quoting Cato Orat.69 and Aetius Capito (fr,7H.9B ). On siticines, also Nonius, De compendiosa doctrina, p.77; Wille, 1967, p.72.

33.) Aeneatores, - CIL VI, 32323,88.
Collegii aeneatorum - CIL VI, 10220; 10221; X, 5173, 5415.
Tubicines sacrorum - eg. CIL IX, 3609, X, 5393; 6101.
Varro, LL, V, 24, 117.

34.) Tubilustrium, Ovid Fasti, 5,725ff; Varro, LL,VI,3,14.

35.) Statius Silvae, 3,1, 139f.
Juvenal Sat.,3,34f.


37.) Dio Cassius LVII, 18, 3. L. Norbanus Flaccus was consul in AD19. Dio, writing in Greek, uses the word σαλπιγγίς.
38.) In addition to the military tombstones cited in the text tubae also appear on the monuments of Ubasus, tubicen of cohors Lusitanorum in Austis, Sardinia, CIL X 7884; Valerius, tubicen of Leg. XV Apoll. from Schloss Petronell, cf. Behn, 1912, 36. CIL III 14355, from Scarbantia also shows a tuba with a lituus. Gabler, 1970, 59ff.

39.) For example a mosaic in Lyons, Arch. Ztg. 1858, Taf. 113, Behn, 1912, 36.

40.) Marcuse, 1977, 788. The OCD also states that Greek and Roman brass instruments had bone mouthpieces. Hickmann (1966 - art. Trompeteninstrumente, MGG 13, p. 774, abb. 14) illustrates an instrument in the Museo Teatrale alla Scala, Milan, (No. 177), which is described as a Roman tuba. The body of the trumpet is of bronze and has a markedly concoidal bore. Inserted into the top is a cylinder of bone, described as a bone mouthpiece, but this is unlike any trumpet mouthpiece that I have seen. I have however been unable to examine this instrument.

41.) Pollux Onomasticon IV, 85.

42.) Ennius Annals 140.


   CIL III 3352. titulum p(osuit) Fl (avius) Rufinus eq(ues)
   buc(inator) coh(ortis) euisidem h(eres) ex t(estamento)

The bucina was not, as has sometimes been suggested specifically a 'cavalry instrument', Behn, 1912, 44; Wille, 1967, 99; Klar, 1971, 315. Speidel, 1976, 156ff lists bucinatores in many different units and also notes that tubicines and cornicines are known to have served in cavalry units, p. 150.


46.) Varro, L. L. L. V, 24, 117.

47.) Bate, 1966, 97.

48.) Behn, 1912, 44, Abb. 13 illustrates several trumpet and horn mouthpieces. Baines, 1976, 61, and Table 3, compares the dimensions of ancient and modern mouthpieces of different instruments.

49.) Horace, Carm. 2, 1, 17 ff 'minax murmure'. Vergil Aen. 8, 1. Literary references to the sounds of instruments should however be regarded with caution - many standard phrases occur and there is much 'poetic licence.'
50.) Behn, 1954, p.133, Taf. 73, Abb.169. 
Weigert, 1954, MGG, Etrurien, 1598, 1602.

51.) Silius Italicus, XIII, 146;
Ennius, Ann. 530 - 'acutus';
Lucan, 1., 236 - 'stridor litium clangorqve tubarum'.

52.) SHA Aurelian XXXI, 7.
Also, Cicero Rep. II, 22, 40; Juvenal Sat. XIV, 198;
Ovid, Fasti III, 216; Silius Italicus, XIV, 10; - all 
mention the lituus when using military metaphors. For 
further examples, Wille, 1967, p.79 and note 39.

53.) CIL VI, 33999, = ILS 4968, M. Iulius Victor ex collegio 
liticinum cornicinum.

54.) Apuleius Met. 59

55.) Festus, p.103; Seneca Oed. 732 ff.; Wille, 1967, p.79, 
n.39;

56.) Rimmer, J., 1981, An archaeo-organological survey of the 
Netherlands, World Archaeology, 12, no.3, p.241, pl. 4a.

57.) Malinowski, T., 1981, Archaeology and Musical Instruments 
in Poland, World Archaeology, 12, no.3, p.269, pl.10.

The instrument is to be studied by Dr. W. Kaminski of the 
Museum of Musical Instruments in Poznan. According to 
Malinowski Dr. Kaminski at present favours its identification 
as a carnyx.

58.) Speidel, 1976, p.156 lists all bucinator known from 
inscriptions. The bucinator ranked as a principalis but is 
listed below the tubicen and cornicen - CIL VIII 2564. A 
detachment of seventy five men included a tubicen and cornicen 
but no bucinator, CIL III 7449, AD 155. Speidel, p.154, cites 
a papyrus of AD 239, P. Dur 39 = Fink, Records 50, listing the 
ine men on watch at the standards of cohorte XX Palmyrenorum. 
Included among the men with special functions, such as the 
centurion, standard bearers and priest, is a bucinator, who 
would have sounded routine (and other) signals.

59.) This reading of Vegetius III, 5, 20 is generally accepted, 
Lang, 1885 - for example by Behn, 1912, p.36; 1954, p.140, 
Wille, 1967, p.88, Klar, 1971, 301 f, also Domaszewski, RE 
III 986, sv. bucina.

The cornu is called aes curvum Veg. II, 7.

60.) Bate, 1966, p.97.

61.) Baines, 1976, p.66.


64.) See note 43. Also Wille, 1967, p. 82. Speidel, 1976, p. 150 suggests that the instruments shown on the Andes tombstone and the Remagen stone are cornua.


67.) Speidel, 1976, p. 154 - see note 21 - the evidence is not conclusive.

Stringed Instruments

Stringed instruments, or chordophones, held a position of honour in the musical life of Greece and Rome, but as illustrations in Roman art tend to be stereotyped and do not adequately reflect their place, I shall discuss the structure of the instruments before discussing their role.

The most important chordophones belonged to the lyre family and had a variable number of vertically strung strings of equal length. Instruments of this group have a body or sound box which supports two arms joined at the top by a cross bar. The strings are attached to the base of the sound box, run over a bridge and are fastened to the cross bar where they can be tuned by tension. In some cases strings are attached directly to the bridge, which doubles as a tail piece, but it is important that they always run parallel to the surface of the sound box, not at an angle to it as on the harp.

There are three major types of lyre, the box lyre, which has a rectangular sound box, the bowl lyre, which has a round body and symmetrical arms and the one piece lyre, in which arms and cross bar are cut from the same piece of wood as the resonator. Box lyres are extremely ancient, elaborate examples appearing at Sumer in the third millennium BC.¹

The Greeks played two basic types, which were also known in the Roman world, the tortoiseshell lyra, a small bowl lyre, the instrument of the amateur, and the kithara (Lat. cithara), a larger box lyre, played by professional musicians.²
Chapter 14

The Lyre

The tortoiseshell form of the lyre first appeared in Greece in the late geometric period and it was regarded by later Greeks as an indigenous instrument. According to ancient authorities the instrument invented by Hermes was made from the shell of a tortoise over which oxhide was stretched. Its arms were made of horn; the cross bar or yoke of wood and the seven strings of sheep gut. The earliest account is preserved in one of the seventh century Homeric Hymns but writers of the second century AD describe what is essentially the same instrument in similar terms. Lucian and Philostratus are however describing mythological instruments and their accounts do not prove that the lyre in this form was still in common use.

Helen Roberts' account of her reconstruction of a Greek lyre (1981; 1974) has shed valuable light on the practical construction of the instrument and explains many of the features seen on the numerous illustrations in Greek art, particularly Attic vase painting.

The type of tortoise used seems to have been the large Testudo marginata which grows up to 30cm in length and is very common in Greece. Pausanias (VIII, 54, 7) states that it was found on Mount Parthenius in Arcadia. If the tortoiseshell lyre was used in Italy and the west at a later date shells could have been imported from Greece or perhaps from the Black Sea or India where large varieties also exist. Fragments of tortoiseshell sound boxes can be seen, sometimes with questionable reconstructions, in the museums of London, Reggio and Argos.
The fifth century BC Reggio shell is the most complete, being about 30cm in length, but the so-called Elgin lyre in the British Museum found near Athens, also has arms and a cross bar made of sycamore wood. Wood is obviously a more practical and easily worked material than horn and seems to have been in general use from the fifth century BC. Philostratus, describing Amphion's lyre, (Imago I, 10) says that boxwood was used and we have archaeological evidence for the use of sycamore which is a hard wood, easy to work and which is used in musical instrument making to-day. Theophrastus (VII, 6) states that Kermes oak, a much harder wood, was used for the cross bars of lyres. Technologically there is no reason why the whole instrument should not have been made of wood, as has often been suggested. Resonators made of simple wooden bowls are common on African lyres to-day. The use of wood rather than shell might explain the odd appearance of some 'square' lyres in Roman art, which are discussed below, although the classic lyre may have gone out of use by that time (Nos. 18, 19).

The wooden arms may have been bent into shape by steaming, a technique that was, according to Theophrastus (V, 7, 6) known to the Greeks. They could alternatively have been carved. The arms of the Elgin lyre are flat with rounded edges and are widest at their central part, narrowing towards their ends. The maximum thickness of each arm was at the cross bar which was held in a bracket. Arms shown on vase paintings are of a similar shape, although they are sometimes decorated, and the brackets can often be seen. The cylindrical cross bar was lathe turned and was slotted so that it fitted into the brackets
on the arms.

The carapace was mounted upside down, a ledge situated below the exit for the head making a convenient base for the arms which were glued in, then pegged together, (Roberts, 1981; 304). In the Reading reconstruction it was also found necessary to insert a cross piece made of horn across the centre of the shell to brace it, thus preventing distortion when the strings were tensioned. The brace was pegged to the arms.

The skin covering the resonator was traditionally made of oxhide, but any suitable skin could have been used. Rawhide may have been used for early instruments, but tanned hide was certainly used later, and the methods of preparing the skin may well have been the same hand processes involved in preparing drumheads to-day. The wet skin was stretched over the shell and was either pegged to the body or stitched into position, being laced round the edge.

Lyre fittings, the bridge and tailpiece, were made of a hard wood or ivory. The bridge (magas) is mentioned by Lucian and Philostratus and appears on Greek paintings as a narrow strip, sometimes with vertical lines at either end, which probably represent its feet. Illustrations of the Roman period tend to be less clear, (L. Nos. 4, 9, 11). The tailpiece is represented as a straight line or as a rectangular block. In the Reading reconstruction the cylindrical tail piece was attached with gut to a peg driven through the base of the arms inside the sound box, a procedure which necessitated the drilling of holes in the tortoiseshell at points where the Reggio shell has perforations. Philostratus states that the
lower ends of the strings below the bridge were attached to knobs.

The tuning mechanism of the lyre evolved from the use of greasy rolls of oxhide to a more sophisticated system of tuning pegs or levers, seen in Greek art from the sixth century BC, a form of which is the normal arrangement shown on illustrations of Roman date. Such levers also appear much earlier on one of the Sumerian lyres and are still used to-day on the Ethiopian bagana. 10

The string is attached to the lever, being either inserted through a hole at its end or simply tied around the end. It is then wound around the lever and cross bar so that when the lever is rotated around the bar the string is tightened or loosened. The pegs are never inserted into the cross bar. Illustrations tend to be unrealistic in showing all the levers in the same position, a lyre in actual use with its strings tuned to different pitches would have levers at all angles. This would however upset the symmetry of the design. Similar mechanism can clearly be seen on illustrations of Roman date, as for example the painting of Chiron and Achilles (L. No. 4) a neo-Attic relief from Istanbul (L. No. 6) and Orpheus mosaics from Sparta and Germany (L. Nos. 9, 14), but there may be differences from the earlier system, which are discussed below.

It is interesting that one of the materials that was anciently used for lyre strings is still employed by modern string makers. "Well twisted sheep gut" is mentioned by Homer (Od. XXI, 407), in the Homeric Hymn to Hermes, (l. 47) and by Pollux (who also mentions flax,
It is likely that ancient methods of string making differed little from those used in the middle ages. A fourteenth century MS describes how the sheep gut was soaked in water or lye until any remains of flesh had separated from the fibrous intestinal membrane. After further soaking in lye or red wine it was partially dried and while still damp, two three or four lengths were twisted together to make a string of the requisite strength. The finished string was stretched and allowed to dry slowly.

Bachmann (1969,81) points out that there are many similarities with modern methods. Gut is soaked in a solution of potash, or, especially in Italy a mixture of water and red wine lees. It is divided lengthwise mechanically and from six to thirteen strands are twisted together, dried, stretched, polished, and are finally treated with sulphur, which besides eliminating any unpleasant smell blanches and strengthens the string. In modern string making Yorkshire lamb is regarded as being of high quality.

The importance of skilled string making was appreciated in antiquity and it was realised that strings should be of uniform thickness, and made of the same number of equally twisted strands, if they were to produce the same note.12

Traditionally the lyre had seven strings and Terpander was said to have made it heptachordal in the seventh century BC. This tradition was preserved until a late period. Macrobius, writing at about AD 400 states that Apollo's lyre had seven strings.
The number of strings on the *cithara* was increased to eight, some writers attributing this addition to Pythagoras, and was further increased in the fifth century to twelve although the literary evidence as to who was responsible is confused. The musicians Phrynis and Timotheas were traditionally involved.¹³

The number of strings usually shown on lyres is in fact seven but there are exceptions. In general lyres illustrated from the Hellenistic periods onwards are more likely to have a greater number of strings although instruments with only a few strings are shown at all periods.

The pictorial evidence for the detailed reconstruction of the Greek lyre comes chiefly from Attic vase paintings, but many of the same features appear on illustrations from other areas and from later periods.

The classical lyre appears also in Etruscan art, as seen on a painting in the Tomba dei Leopardi, where it appears with the *tibia* in a funerary banquet, (No.1). The illustration is finely detailed and the shape of the shell body clearly seen. The curving arms appear to be made of wood and painted decoration might indicate an inlay. They rise from a realistic position within the belly of the instrument the skin of which is suggested by a light colour. The bridge and tail piece are clearly shown and tuning levers are indicated by dots or rings on the cross bar.

The classical lyre was about 24 to 30 inches in length. Some instruments from the fourth century onwards are more elongated and although the classical form is still
shown on the essentially Greek vase paintings of south Italy, there are certain variations. In some examples there are decorative discs at the ends of the cross bar, and the arms have an 'S' curve, in the form of a natural horn, features that are seen on many Roman representations of the instrument.

The lyre on the Pompeian painting of Chiron and Achilles has these features, as does Silenus' instrument on a painting from the Villa of the Mysteries (L. Nos 3 & 4), pl. 57. Chiron's instrument is made from tortoiseshell and the slender arms are clearly of horn, as indicated by the spiral decoration and the characteristic curve. The ornamental discs at the ends of the cross bar and the large number of strings, at least ten, are features seen on Hellenistic and later illustrations. Because of the numerous strings, the pegs are more compact and Roberts, (1974) has suggested that a new method of tuning is indicated, and that each peg or lever, which slopes downwards below the lower edge of the cross bar consisted of an upper and a lower part, the string being threaded through a hole at the end of the lower section. In fact, as drawn, the strings appear to continue to the cross bar rather than to the ends of the pegs, although on other illustrations of Roman date, many of which show similar tuning devices, the strings are attached to the pegs in this manner, as on a second century Orpheus mosaic from Sparta (L. No.9), pl. 60.

The instrument has no bridge, again a feature generally lacking on illustrations of the Roman period.
The tail piece or string holder is however larger than those shown on classical Greek instruments and is placed further up the instrument, often so improbably far up that the strings would not run over the resonator, as on a sarcophagus depicting Marine centaurs. (L. No.11).

If the later lyre had no bridge, the tail piece would have to be raised sufficiently to hold the strings clear of the table, thus serving a double purpose. A horizontal line at the base of the string holder on Chiron's lyre might indicate feet or one raised side, or alternatively some method of attachment to the frame. Dr. Roberts also suggests that the tail piece was no longer secured with gut. This implies that the sound box was covered with wood so that the string holder could be firmly attached as on the modern guitar. It does not seem easy to attach a wooden table to an irregular tortoiseshell sound box, so one presupposes that the resonator was also made of wood. The string holder of the cithara at this period appears as a rectangular block and the device seen on so many Roman illustrations may be another feature taken from the cithara, which may have been a more familiar instrument. Chiron's instrument may in fact provide more information about the cithara than about the contemporary lyre and I hesitate in accepting its design totally. The lyre is seen in a mythological, not a realistic context, and it is essentially a traditional instrument with a shell body and arms of horn, when as has been seen, wooden armed lyres were in daily use in Greece from the fifth century BC.
The arms rise improbably from the side of the shell, this unlikely construction of the body contrasting with the apparently more realistic treatment of the lyre fittings and strings.

A fragment of a sculpted lyre from Arles may also indicate that the strings could be attached directly to the table. A section of the round sound box can be seen and the strings appear to be wound around pins or pegs that are fastened to its surface. There is however no bridge on the small fragment and this method of securing the strings would not, as illustrated, raise them sufficiently above the resonator.

The tortoiseshell body and spiral horn arms are consistent features of Hellenistic and Roman representations of the lyre and the instrument is only seen in mythological settings, in scenes of Bacchic revelry, especially on sarcophagi, for example (L. Nos. 11,12), as an attribute of Mercury or Apollo (L. Nos. 7,10,17) or of the Muses (L. Nos. 13,14; C. 12, pl.63) and on many mosaics depicting Orpheus (L. Nos. 9,15,16,18,19; pl.60). On a rare occasion where the Roman instrument is seen in a realistic setting, in a sacrificial procession on the altar of Ahenobarbus, where it is played with the tibia, it is unclear whether a lyre (fides) or a cithara is shown, (L. No.8; pl.64). In fact the words cithara and lyra seem to have been used synonymously for the Roman instrument.

It is difficult to be certain about the practicalities of the spiral horn arms shown on so many illustrations.
The instrument on a late second century sarcophagus from Rome (L. No.11, pl.8) is typical. The spiral arms rise from the sound box which has a rounded base, and project over and beyond the cross bar where three pegs are indicated. The cross bar on an instrument seen as an attribute of Mercury in Me.lida, is perched almost at the top of the spiral arms (No.10). A second century Orpheus mosaic from a villa at Sparta is more detailed (L. No.9, pl.6o). The round sound box supports twisted arms, the spirals indicated by horizontal bands. Eight strings are fastened to a holder at the base of the box — again there is no bridge — and are attached at the lower end of long tuning levers which slope down from the cross bar.

In those illustrations there is never any indication of the method of fastening the cross bar to the arms. If horn was ever used it could simply have been lashed, as on some Islamic instruments, but it seems very likely that these illustrations, widespread throughout the Roman world depict mythological or traditional rather than realistic lyres, albeit with some features taken from contemporary stringed instruments. Some illustrations, particularly those on the Orpheus mosaics are so diagrammatic or unusual that the traditional nature of the lyre seems to have been misunderstood by the artist. The mosaic depicting Arion from Piazza Armerina, (L. No.18; pl.65) shows an elongated instrument with curving spiral horn arms but a rectangular sound box more like that of a cithara. It appears as if the artist has attempted to show the traditional instrument but has given it a more familiar body. The cross bar terminates in decorative
discs and tuning levers are shown in a block sloping from the underside of the bar, with seven strings attached to them.

Similarly a third century Orpheus mosaic from Uthina, North Africa (L. No.19) shows an instrument with a stylized circular tortoiseshell sound box superimposed on a square cithara-like base. It has the solid arms of a lyre although they appear to curve forwards in the manner of later citharæ (see below).

Some illustrations of earlier date show an elongated lyre - with a wooden body, which seems to be a compromise between the lyra and the heavier cithara. The instrument held by a woman in a painting from Stabiae has a small rectangular sound-box curved from top to bottom and rising to a central point, (No. 5). The long slender arms follow the curve of the body and support a cross bar which is decorated with discs. There are only five strings. The sound-box is decorated with spots and may represent a stylized shell but in a painting of this quality this seems unlikely.

The design of this painting is however likely to have been copied from a Hellenistic original. A similar elongated lyre with a square, apparently vaulted sound-box appears on a fourth century krater in Naples. Like the Stabiae example it is clearly a lyre rather than a cithara as it has solid arms, but the name of this type of lyre is uncertain.

Some of the lyres seen in later Roman art are similarly elongated as for example those carried by Muses
in third century mosaics from Trier (L. No.13; pl.43), but with a few exceptions, as the Arion mosaic already cited, the resonators (where shown) are clearly intended to be of shell. (L. No.19 - Uthina mosaic). Even Arion's instrument has arms of horn. Although lyres with wooden sound-boxes and long (or short) arms are quite feasible practically, illustrations therefore still portray the traditional type.

Some instruments, obviously intended to represent lyra are very square, for example that shown on the Cirencester Orpheus mosaic which dates from the fourth century AD (L. No.15). The Corbridge Lanx which is of similar date, but of Mediterranean workmanship, depicts a squarish instrument but the arms, which are slightly pointed and curved are clearly shown as horn. (L. No.17; pl.4). The lyre on the Orpheus mosaic from the Brading villa, which may be executed by a foreign artist is of a far more classical shape with round-based sound-box and curving arms, (L. No.16), showing that the traditional form persisted, at least in artistic contexts. 18
The Cithara

The cithara, which the Romans adopted from the Greeks, is frequently depicted in Roman art. However, as is the position for the lyre, some of the clearest illustrations are those in paintings that derive from Greek originals. Similarly the many statues of Apollo citharoedus are usually copies of Hellenistic representations and such statues have frequently been extensively restored, often, and especially during the Renaissance, with considerable imagination. Examples of such fanciful restorations can be seen in Behn's illustrations of 'Roman' citharas of the Imperial period, (1954, Taf. 48, Abb. 115).

However, certain forms recur, particularly on sarcophagi of the third and fourth centuries AD, some recalling those seen in Hellenistic statuary - and it is perhaps possible to detect some basic developments. Although the subjects of such sarcophagi are stock themes, as for example, the Muses, and they were obviously mass-produced, one can assume that the instruments, as other details suggest, bore at least some resemblance to those in everyday use.

The classical Greek kithara, the instrument of the professional musician, had a large trapezoidal wooden sound-box set on a flat triangular base. The middle of the sound-box rose to a central peak while the back was vaulted or arched, with a central spine. The hollow arms were a continuation of the sound-box, carrying on the line of its divergent sides before curving inwards. The inner edges of the arms were often elaborately carved. Above the arms rose two vertical pieces of wood that held
the cross bar in position in a bracket. The cross bar is usually shown with a disc at either end. Scroll decoration below the cross bar is a consistent feature of good illustrations and may hide dovetail joints between the arms and the vertical sections. Roberts (1974) suggests that separate cross-grained sections of wood may have been used for the junction of the arm tips with the vertical pieces, to provide added strength. There is no direct evidence for the type of wood that was used for the cithara, but pine, box and sycamore, materials used by modern instrument makers, were available. The strings were fastened to a tail piece at the projecting base of the instrument, ran over a bridge, which is often shown with feet, and were attached to tuning levers identical to those used on the lyre.

These features can be seen most clearly on Attic vase paintings.20

The same type of cithara is indicated in its essential details in Hellenistic and Roman art. The triangular base is shown on the fourth century relief from Mantinea, where the instrument is played by a Muse. Terracotta figurines are often very detailed and sometimes, as on one from Myrina in the Louvre show back views of the instrument, with the arching and central spine.21

The Pompeian wall painting of Apollo citharoedus from the House of the Vettii shows a cithara of classic type (C. No. 1; pl.66). There are however some differences. It has no bridge and the strings are fastened to a large rectangular holder at the base of the instrument. It is hard to tell whether this is
elevated, but if not the side arms must curve forward so that the strings clear the surface of the sound-box. Citharas with forward curving arms appear in the fourth century BC but they are of a different form (see below). The pegs are much longer than those seen in classical illustrations and appear to have a knob at each end, but as usual all are seen unrealistically in the same plane. The greater part of each peg slopes downwards from the underside of the cross bar. The string seems to be attached to the end nearest the bar, and is presumably also wound round the bar, so that a movement of the other end of the lever would tension it.

A cithara held by a seated woman on a painting from Boscoreale is very elongated but is probably basically of the same form. The back view is seen and the arching and triangular base is clearly indicated.²²

Instruments of classic shape can be seen on illustrations in other media, as on an Arretine bowl made by M. Perennius found at Xanten, and second century sarcophagus reliefs from Thessaloniki and Rome (C.No.3;4, pl. 67). The arched back and central rib can be seen on the painting of a concert given by a tibicen, citharista and singer or reciter from Herculaneum, a copy of a Hellenistic design, (C. No.2, ). The cithara is however of different shape, having a square frame with pillar-like arms, although these are rather slender. They also appear to curve forward. As they do not curve inwards there is more room on the cross bar for the numerous strings (at least ten) and their tuning
levers, the round ends of eight of which can be seen above the cross bar. The cross bar is, unusually, placed on top of the arms and details of the rather heavy superstructure are not clear. The square frame and forward curving arms are features that appear on citharas from the late fourth century BC.

It is possible that in showing a vaulted back with a square frame the artist has confused the two types of instrument - the position of the cross bar does not inspire confidence.

The new form of cithara had straight pillar-like arms which curved forward over a large sound-box. The top edge of the sound-box still rose to a central peak but its back was curved from top to bottom following the line of the arms and was no longer vaulted. The instrument had a rectangular base. On its front, covering the lower half of the sound-box was a large rectangular box which was probably part of the resonator and to which the strings were anchored. A bridge was unnecessary provided that the cross bar projected sufficiently. The instrument was quite cumbersome and in illustrations is often supported on a pillar, besides being strapped to the player's body.

The type is frequently seen on Roman representations of Apollo citharoedus, which are copies of Hellenistic originals (C. Nos. 6, 7, 8, 9; pl. 29-73). The Apollo from Miletus (C. No. 6; pl. 69) has an elaborate instrument which is richly decorated. Professional instruments were often inlaid or even jewel-studded. The cithara, which rests on a pedestal, has a rectangular base, on
which there is a rectangular sound-box. The arms rise behind this and curve forward, narrowing slightly then widening just below the cross bar. The back section of the sound-box rises to a central peak and the back of the instrument curves smoothly but is not vaulted. The cross bar is heavy and has discs at its ends. Five pegs project on each side. Sculpted pegs are usually represented as if they were inserted through the cross bar, but this is probably due to the medium and there is no reason to suppose that they are anything but the usual levers. Apollo's right hand, holding a plectrum is raised above his head, as if he is about to strike the strings. His broken left hand is behind the instrument.

The cithara, and the pose of the god, on a statue from Cyrene in the British Museum (C. No.7; pl.70) are very similar to the Miletus example, although the instrument's arms diverge slightly. The back however, shows signs of a slight arching, but the base is rectangular. The instrument has been mended, and most of the cross bar is missing. One of the many other reproductions of the type can be seen in the Capitoline Museum, Rome, (C. No.8; pl.71).

A statue of Apollo citharoedus in the Vatican (C. No. 9) shows the god crowned with laurel and dressed in flowing robes. His instrument, which has been greatly restored, is strapped to his body over the right shoulder. One of the arms of the cithara is adorned with the figure of Marsyas and a replica of this instrument, illustrating the general type is in the Instrument Museum of the Brussels Conservatoire, (Pl. 73).
The cithara with square sound box and forward curving arms is frequently depicted on sarcophagi of the third century AD, in the hands of Apollo, the Muses and Orpheus. Although sarcophagus designs tended to be stereotyped, the form of the instrument was presumably a familiar one. The instrument is always seen from the side, as on a sarcophagus in the Louvre which depicts Apollo and Marsyas, (C. No.10; pl. 74). The cithara which is strapped over the god's right shoulder has square arms, with studded decoration, which curve back, then forwards over the projecting rectangular front of the sound-box, which appears as on other representations to consist of the two parts - a lower section which follows the front curve of the arm and an upper section which squares the box off. The end of the cross bar can be seen and Apollo is adjusting one of the very long tuning levers, shown on each side of the yoke.

A sarcophagus from Italy in the British Museum, of third or fourth century date, shows a similar instrument in the hands of a Muse, (C. No.11; pl. 75). Again the arm curves away from a rectangular two-piece sound-box, then forward so that the cross bar, and therefore the strings, overhang the box.

The lower part of another cithara is shown on a similar colonnaded 'Muses' sarcophagus in Rome (No.12; pl. 76), but in this example rectangular slots cut into the lower part of the sound-box may indicate a string holder, or possibly sound holes. The back of this instrument has a marked reverse S curve, but its upper part is broken.
A consistent feature appears on a marble group portraying Orpheus and the animals at Sabratha. Again a side view shows a rectangular arched sound-box with curving arms, although unless the strings were attached to the lower edge of the very long tuning levers, they would not clear the sound-box as the cross bar does not overhang sufficiently. This is however, probably artistic inaccuracy.

Illustrations of this date, third to fourth century AD do not show only instruments of the square form. A sarcophagus depicting the wedding of Cupid and Psyche portrays a small instrument that could be either a lyre or the form of the cithara with outward curving sides, (C. No. 14; pl.78).

A sarcophagus relief from Arles shows a large cithara of more classical shape, together with a lute and an organ, instruments that are less frequently portrayed (C.No.15; pl.79). The cithara has a large solid body with curved arms, but the cross bar is placed on top of the arms in an improbable fashion. Three tuning levers are indicated on the underside of the cross bar and a rectangular block on the table may represent a bridge or more probably a string holder. The sculpture certainly represents a cithara but certain features are misunderstood or carelessly carved.

The drawing of the cithara on the mosaic from Mariamin depicting female musicians in concert is far more exact, but the portrayal of the instrument raises certain problems, (C. No. 16 ) Fig.8. The instrument is seen
Fig. 14 - Lyre No. 7, Seville.

Fig. 17 - Cithara No. 16, Hama.
from the back and the sound-box and right arm (facing) are identical to those seen on the classic cithara. It has a solid base, a vaulted back rising to a peak that is ornamented with a knob, and an arm that curves outwards with the slope of the sides, then inwards, then rises to support the cross bar. The curve of the left arm is however entirely different, and it is decorated with a triangle, not seen on the other side. Its function with the sound-box is obscured by the arm of a girl who plays chiming bowls, but the instrument as portrayed appears to have asymmetrical arms. Dr. Duchesne-Guillemin (1940, 1975), accepts this asymmetry as the detail on the mosaic generally is so exact, and cites other possible examples. However, in most cases, as for example the cithara played by Apollo in the Vatican (No. 9) where only one arm has a figure of Marsyas, the asymmetry is only a matter of decoration.

I have some hesitation in accepting the design as it stands, despite the excellence of the mosaic - the organ shows some features that are not entirely realistic. The asymmetry of the arms of this cithara does not seem to serve any musical purpose as the strings are all of the same length and the inward curving left arm would only have had the effect of restricting the length of the cross bar.

The pegs shown on this cithara are unusually detailed, and are shown as thin sticks, sloping down from the cross bar with circles near their lower ends. They immediately bring to mind bone pegs found with the
bronze cover of a lyre at Kertch, (Pantikapaion),
which are described by Behn (1954, Taf. 51, Abb. 117c). 24
Each peg consists of a cylindrical shaft with a hole
drilled through its end, which expands into a pear-shaped
swelling and terminates in a square sectioned shank. There
is a groove between the square sectioned end and the pear-
shaped section of peg. It is likely that these pegs
were inserted into the cross-bar of their instrument and
not pivoted around it, but it is not clear whether they
actually turned. The string was obviously threaded
through the hole in the end of the peg, but if the square
end was inserted into the yoke the peg could not turn.
The string may have been wound around the enlarged portion
of the peg and held by pressure.

Dr. Duchesne-Guillemin postulates some such arrangement
for the Hama instrument, suggesting that the pegs are
inserted into the cross bar and that the string is wound
round the enlarged circular section of the peg. If so
this would explain why the strings appear to be attached
to the ends of the pegs and not to the cross bar. Other
illustrations of Roman date, as for example the Orpheus
mosaic from Sparta (L. No. 9) also show strings running from
the lower ends of the pegs, but the evidence is too slight
for this to be taken as an indication of this new method
of tuning, which does not appear to be as compact as the
old system of tuning levers.
The Plectrum

The plectrum (pecten) was an essential piece of equipment for the cithara player and it appears on the earliest illustrations of the lyre and cithara. Plectra are shown in a variety of forms but the end which swept across the strings was pointed. The plectrum on a fifth century painting by the Brygos painter is typical of those used on the Greek kithara. It is pointed at one end and rounded at the other and is held firmly, the player's hand curled around the centre of the shaft. A cord hangs from the lower end of the plectrum and is fastened to the outside arm of the instrument. The tops of Greek plectra are sometimes notched or hooked.

Plectra illustrated in Roman art are sometimes quite elaborate. That held by the female player in the concert scene from Herculaneum (C. No.2) is slender with a pointed upper and a forked lower end. The musician's hand is curled round the shaft quite loosely with the thumb on one side and the fingers on the other, and she appears to have finished sweeping the plectrum across the strings. Control of the implement could obviously be exercised by the fingers. Chiron, who instructs Achilles on another painting from Herculaneum has a similarly 'delicate' hold, rather like that used on a modern violin bow, (L.No.4; pl.58). His plectrum is a slender rod.

A later sarcophagus relief from Rome shows a characteristic form, with a knob at the upper end and an arrow shaped point, (L. No.11; pl.8). The player's hand clutches the narrower central shaft of the implement.

The plectrum held by a Muse on an arcaded sarcophagus in the British Museum, (C. No. 14; pl.78) is similarly
heavy. Again it is slender in the middle with a heavy point at one end and a knob at the other. The Muse grasps the centre with extended index finger, but she appears to be adjusting the tuning levers rather than preparing to strike the strings.

The plectrum was made of any hard material, hard wood, ivory, horn or metal being obvious candidates, and the maker of plectra had, according to Pollux a specific name - plectropoeas.26
Playing Techniques.

The techniques of playing Greek instruments of the lyre family have been extensively investigated by Dr Roberts (1974; 1980), who draws on evidence from Greek vase paintings and literature to demonstrate convincingly the use of such practices as the production of harmonics and the damping of the strings, (katalepsis). These and other techniques are obviously applicable to all forms of lyre and were certainly used on the Roman cithara. 'Roman' stringed instruments were in any case introduced from Greece and many of the musicians at Rome in Republican and Imperial times were Greek.

Unfortunately there is no series of illustrations in Roman art that is as extensive and detailed as those on Greek vase painting of the fifth and sixth centuries BC. The South Italian Apulian vases of the fourth century are still an essentially Greek art form, and Roman paintings which apparently demonstrate musical techniques are often copies of Hellenistic and Roman originals. Most representations of the lyre and cithara are sculpted or shown on mosaics, and while the instruments are often shown in some detail playing positions cannot be represented as accurately as on Greek vase paintings. However even in mythological scenes where the traditional possibly obsolete tortoiseshell lyre is often shown, some consistent features emerge.

The instrument, lyre or cithara is always plucked or otherwise fingered with the left hand and the right hand always holds a plectrum. The terms for plucking with the left hand and using a plectrum with the right were
respectively *intus canere* (Greek - phallaein) and *foris canere* (kruo). These terms are given by Cicero when describing the virtuosity of the *Aspendius citharieta* who apparently played with the left hand alone and are explained by the scholiast:

Cic *Veur.* II, 1, 20, 53.

illum Aspendium citharietam, de quo semepe audistis id quod est Graecis hominibus in proverbio, quem omnia intus canere dicebant, sustulit et in intimis suis aedibus posuit, ut etiam illum ipsum suo artificio superasse videatur.


When the *cithara* accompanied the voice the plectrum was in fact only used in the prelude, interlude and epilogue, so that the left hand alone was used in the vocal sections, where the accompaniment was presumably less elaborate.

Cicero implies that the proverbial *Aspendius citharieta* played everything, including the florid instrumental sections, with the left hand, a remarkable feat when one considers the techniques likely to have been involved, and probably only carried out for the sake of virtuosity.

In Greek vase painting the player's left hand is often damping the vibration of the strings to cut off the sound after striking them with the plectrum. The hand is either spread out over all the strings, or alternatively selected strings are pressed. It is possible that such
a position can be seen in the outstretched hand of the cithara player on the wall painting from Herculaneum (C. No. 2), although the painting is damaged at this point.

Quintilian (1,12,3) refers to the action of the left hand in plucking, stopping and releasing the strings, while the right ran over them, presumably with the plectrum. This seems to refer to the action of damping. He also states that these actions are performed while the musician is singing. This apparent use of the plectrum while the artist is singing is contrary to classic Greek practice, but traditions may well have changed by the first century AD and Quintilian is in any case not making a specifically musical point.

It is highly probable that ancient lyre and cithara players made use of harmonics, higher notes accompanying the fundamental. Any vibrating body possesses elasticity and inertia, and in the case of a vibrating string there is maximum displacement in the middle, (antinode), but none at the fixed ends (nodes). If a finger is placed lightly in the middle, the string is divided into two loops and the note produced is the first harmonic, one octave above the fundamental. This process is referred to by Ps. Aristotle. Other harmonics are produced by touching the string at other places, for example to sound the second harmonic an octave and a fifth, or the third, two octaves above the fundamental. The intervals of the harmonic series get smaller as it ascends.

Besides extending the range of an instrument, notes sounded in this manner have a particular tonal quality,
quite different from that of an open string or one stopped against a fingerboard. The technique seems to have been developed early in the history of the instrument, being one of the achievements ascribed to Lysander of Sicyon who lived in the sixth century and was traditionally the first virtuoso citharist.\textsuperscript{30}

Dr Roberts has identified the production of the octave harmonic on illustrations as early as the sixth century BC.,\textsuperscript{31} and it is likely that the second harmonic was also used. There are no illustrations of Roman date that are sufficiently detailed to demonstrate the use of this technique. Arion, on the Piazza Armerina mosaic has bent fingers, which could be stopping strings in this way, but it is unlikely that the artist intended to illustrate any particular technique, particularly in a difficult medium. However, one can be certain that virtuoso and professional musicians continued to employ such techniques. Variations in tone can also be obtained by plucking with different parts of the finger, plucking with bare fingers, or with the plectrum, although the latter is always shown in the right hand. Notes could obviously be sounded individually or in a rippling series. Players often appear to have completed such a sweep across the strings.

Cicero's comments on the Aspendius citharista suggest that technique was very advanced, and that soloists were honoured for their virtuosity. It certainly would have been extremely difficult, for example, to sound harmonics with one hand and it would not have been possible in this instance to use a plectrum. One should not forget however that the left hand was, at least in classical
Greek music, used alone in vocal passages. The Aspendius musician's virtuosity apparently lay in his ability to perform the whole work in this manner, but he was certainly exceptional.

It is often assumed that the pitch of lyre and cithara strings could be altered by stopping, or shortening, them to raise the pitch and indeed this was one of the basic assumptions behind the theory that the seven stringed Greek lyre was pentatonically tuned, that is, that it had a gapped accordatura, without semitones. Despite convincing arguments against this theory it is still accepted in some quarters.\textsuperscript{32}

The whole question of the tuning of the cithara is very vexed and there is little hard evidence. As the Greek modes were basically octave scales the basic problem was the sounding of a diatonic, chromatic or enharmonic octave scale on an instrument with seven strings. One solution appeared to be a gapped accordatura, (Sachs suggested the notes E, G, A, B, D, in various combinations), with the addition of the missing notes by the stopping of strings with finger pressure either below the cross bar or above the bridge, both areas being accessible to the right hand. The left hand could not reach the bridge and its movement may have been restricted by the band which supported the instrument and is usually shown around it. The problem of 'infilling' notes may seem to be less acute for the many stringed instruments seen in late classical, Hellenistic and Roman times and amply attested by ancient authors,\textsuperscript{33} although exponents of the pentatonic theory proposed that additional strings were
not used to supply the missing diatonic intervals, but duplicated existing notes in a higher octave, thus extending the range. There is evidence to disprove this, but the possibilities of this form of stopping are still of interest as a general technique. Dr Robert's experiments with reconstructed instruments (1980; 49-50) have confirmed the practicality of stopping the string at the cross bar to raise the pitch by as much as a tone, but clear evidence on vase paintings, for the use of such a technique is however lacking.

Gombosi's postulation of a koto technique to raise the pitch of the strings - that is pressing with the plectrum between the bridge and the tail piece to increase their tension has been effectively disproved. Instruments of Roman date often, as has been stated appear to have no bridge. This may of course be due to artistic error, but if the forward curvature of the arms eliminated the necessity for a bridge and an enlarged tail piece served a double purpose, a koto technique would be even less likely.

There is therefore no definite evidence for finger stopping at the cross bar. Players are more likely to be seen tuning their instruments as on sarcophagi in Paris and the British Museum (C. Nos. 10, 11) and some extra notes could be supplied by the production of harmonics. However, such stopping would appear to be a relatively easy technique to acquire and one cannot assume that it was never used, particularly by virtuoso players who had many tricks. Their job was made a little easier by a slight change in playing position. Earlier Greek lyres and citharas were supported by a band round the player's
left wrist, that might restrict the visibility of the left hand. Hellenistic statues and Roman copies, particularly of Apollo citharoedus usually show the instrument supported on a pedestal and often slung on to the player's right shoulder with a strap, thus allowing complete mobility of both hands. (Nos. 6, 7, 8). The posture may have been general for large instruments and Silenus' smaller lyre also rests on a pillar in the Pompeian painting (L. No. 3). The elaborate *cithara* seen on the third century concert scene from Mariamin also rests on a table (C. No. 16).
Greek stringed instruments were introduced to many parts of the ancient world in the areas of Greek expansion and colonisation and the lyre/cithara was regarded at Rome as a Greek instrument, in contrast to the tibia which although the equivalent of the aulos was thought of as a 'national' instrument.

The lyre, using the term generically, had a long history of use on the Italian mainland. It was played in the cities of Magna Graecia and appears in various forms in Etruscan art. The cradle cithara for example appears in a funeral procession on a relief from chiusi dating from the late sixth century BC, contemporary with illustrations of the same form in Greece. A small cithara or lyre is shown with panpipes and flute in a banqueting scene on a third century ash chest from Volterra (Panpipes No.8). The classic tortoise-shell lyra can be seen on a fifth century painting from the Tomba dei Leopardi (L.No.1.) where played with the tibia.

The lyre, fides, and cithara are distinguished in Roman terminology and the word lyra is also used, often in poetic contexts, of the traditional seven stringed tortoise-shell lyre invented by Hermes. In fact the words lyra and cithara often seem to be used indiscriminately.

The instrument, presumably classed as fides on the Altar of Ahenobarbus (L.No.8), is certainly not a traditional lyra but neither is it a large concert cithara. It is likely to have been a lyre with a wooden sound box and arms, lighter in construction than the cithara but more scientifically constructed and more resonant than the lyra. It is impossible to judge from such representations whether it had hollow arms that were a continuation of the sound box, but it is probable that on a simple instrument the arms would have been solid as on a lyra.

As has been seen in the discussion of lyre and cithara forms most illustrations of the instruments appear in mythological or symbolic contexts which give little clue to the role of the stringed instruments in Roman society and do not adequately reflect their importance.
As in Etruria, the lyre had a role in Roman religious ceremonial. A lyre player (fidićen) and a tibicen lead a sacrificial procession to a tomb on a funerary relief in the British Museum (L.No.271.I1t3). Similarly the instrument is played with a tibia on the Alter of Ahenobarbus which dates from the first century BC. Later representations usually show the tibia alone in such scenes but Porphyrian notes that the lyre and tibia were still used together in worship in the third century. The official musicians of Rome were organised into collegia and inscriptions of late Republican date record the existence of the collegium tibicinum et fidićinum. The college may have been reorganised as the collegium symphoniacorum, broadly meaning college of musicians, by the Lex Julia of Augustus. Members of the college took part in State festivals such as the Ludi Romani, held in September.

Traditional lyres are seen on Bacchic sarcophagi although the instruments favoured at the celebration of ecstatic rites were pipes and percussion.

Cicero records the playing of the lyre at official banquets and there is ample literary evidence for the playing of music at or after dinner. Musicians employed by rich households to provide such musical entertainment often included citharoëdi.

Lucan paints a lively picture of a noisy drinking party "when some are playing the pipes, others singing and others beating tune to the lyre or cithara." (Verac Historia II, 5.) More soberly, Pliny records how he listened to music after dinner.

The cithara is sometimes, as on the painting from Herculaneum (No.2) seen at a musical recital. Greek poetry was regularly set to music, but the extent to which Latin lyric poetry was sung rather than recited is debated. It is quite possible that the Odes of Horace, for example were intended to be sung and that Horace himself was a musician. Pliny says that his own verses (hexameter) were set to the lyre or cithara by Greeks (Ep VII, 4.8)
The mosaic from Hama (C.No.16) shows a cithara in concert with other instruments. The instrument was also played in the theatre where Pylades may have added the lyre and cithara to the music of the mime at the time of the early Empire. The lyre is seen as an attribute of a mime on a sixth century ivory relief from Nier.45

The importance of the study of music, which would have included the study of a stringed instrument in the education of an orator is discussed by Quintilian, who gives a lengthy account of its history. Vitruvius also considers it an essential part of architectural training.46 Instrumental teaching as a part of general education had a long tradition in Greece, where, in classical times, the lyre was the favoured instrument of the amateur musician. There were specialist music teachers and teaching seems to have been largely imitative and practical. It is not certain to what extent the two alphabetical systems of notation, vocal and instrumental, preserved in the writings of Alypius, were actually used, except by musical theorists. The number of surviving fragments of Greek text with notation is small, and pupils in Greek illustrations usually appear to be learning aurally.47 A papyrus of 13 BC recording the apprenticeship of a slave to an aulete to learn certain specified accompaniment from memory suggests that this training too was aural.48

The role of music in a general education may not have been as extensive in Hellenistic times when musical style became more elaborate, instruments larger and technique, perhaps more difficult. The cithara was certainly regarded as a difficult instrument, Cicero remarking that those who could not become singers to the cithara (citharoedi) became singers to the pipe (auloedi), (Mur 13,29) A singer was expected to play his own accompaniment. However, it is likely that in Quintilican’s day the children of good families received musical education, which was not reserved only for professional musicians and courtesans, who received it in such schools as that mentioned by Plautus and from the numerous teachers deplored by Seneca.
A Pompeian painting of late Augustan date has been interpreted as a 'music lesson' in progress. On the left is a teacher, a bearded man wearing a long coat of the pedagogue, holding a large lyra, which rests on a pedestal. The instrument is clearly represented with a large tortoiseshell body, curving arms of horn and eight strings. The musician plucks with his left hand and his right, which holds the usual plectrum is adjusting one of the long tuning levers which slope from the cross bar. A woman stands on the right holding a papyrus roll which is lettered in Greek and in the centre is a young boy who watches the musician. All the figures are wreathed and the scene appears to be allegorical, perhaps the personification of the arts of music and poetry. It should be noted that the traditional lyra is seen in this allegorical context.

A similar instrument is seen in the painting of Chimon and Achilles (L.No.4). A painting from Herculaneum in the British Museum may show a more realistic scene. The woman pupil plays a cithara, apparently by this time not the sole preserve of men and Maenads.

Women are frequently shown with stringed instruments on sarcophagi. These are obviously symbolic their association with women may be of significance. Some women are known from their tombstones to have been skilled musicians.

Some music teachers are known by name. Horace mentions Tigellius Hermogenes who ran a school and Terpnus, the teacher of Nero, was a famous virtuoso.

The cithara was the instrument par excellence of the virtuosi who played at the great festivals, which were held throughout the Greek world, in an unbroken tradition until late Roman times. Nero the Imperial amateur, who seems to have taken his art very seriously is known to have competed in Greece (Suet.Nero 23). In AD 86 Domitain, on the occasion of the rebuilding of the temple on the Capitol, reinstated the Capitoline Games which were then held every five years until the fifth century. Musical classes were held in choral and solo singing
to the *cithara* and solo *cithara* playing (*psilocitharistae*).

The traditional Greek repertoire was enlarged in early Imperial times
by the introduction of dramatic monodies (*cantica tragica*). 56

At the highest level *cithara* playing could be extremely lucrative,
as suggested by Martial (V.56). The citharode Anaxenor was well
rewarded by M.Antony, as was Menocrates by Nero. The musicians Terpnus
and Diodorus were given 200,000 sesterces by Vespasian at the games
held to celebrate the re-opening of the theatre of Marcellus. Such
virtuosi may in the later empire have played the lyres 'as big as chariots'
noted by Ammian (14.6.8.) Apollo, whose instrument was the cithara,
is often represented wearing the flowing robes of the citharoede,
crowned with laurel (C.No.9.)

Other players were less exalted and funerary inscription record
the names of more humble players. 58

Musicians travelled to towns throughout the empire, where most
large towns had theatres, especially in the east, either singly or in
companies. Records exist of such troupes in Syria and Egypt but their
existence need not be doubted elsewhere. 54
Notes.

1.) Rimmer, 1969, p. 13 ff. The lyre already had a long history - the Sumerian lyres are already well developed.

2.) The Greeks also played the barbitos, a bass lyre with long arms and the 'cradle - kithara' a lighter box lyre, but these became obsolete and are certainly not seen in Hellenistic and Roman contexts. The early development of the lyre / cithara and the routes by which it came to Greece are controversial questions. Duchesne-Guillemin, 1935, Sur L'origine Asiatique de la cithare grecque, Ant. Cl. IV, suggested a Sumerian origin of the early Greek cithara, but the development is likely to have been through Cretan and Mycenaean instruments, (Roberts, 1974).

3.) Homeric Hymn to Hermes I, 31-53; Lucian Dial Deorum 7, 4; Philostratus Imagines I 10.

4.) Sycamore is often used today in the making of cellos.


6.) Lyres and citharas have been catalogued separately but as they are discussed together in some part of this chapter I have prefaced the catalogue numbers in the text with 'L' or 'C' as appropriate.

7.) For example BM E 172 - red figure vase - Roberts 1980, fig. 38.

8.) Dr. Roberts suggests that 'donax hypolyrios' literally 'the reed which went under the lyre' - (Sophocles frag. 36 and Aristophanes Frges. 231) refers to this brace which was later made of horn or bone. The removal of the reed was apparently disastrous as would indeed be the case if the entire sound box buckled under the tension of the strings.

9.) BM E 172, F 298, Roberts, 1930, figs. 38, 41. Lucian Dial Deorum, 7, 4; Philostratus Imag. I, 10.


14.) Behn 1954, Taf. 53, Abb. 120. The fragment is from Arles, Esperandieu, 1907 -Receuil ...

15.) Wille 1967, p. 212; Klar 1981, p. 317. However despite the sometimes improbable illustrations of the lyre in Roman art, Pausanias' comment (VIII, 54, 7) implies that tortoiseshell lyres were still made in Greece at least, in the second century AD, despite the reluctance of the local people to allow strangers to catch the tortoises as they believed the reptiles were sacred to Pan. Presumably in places where the raw materials were still abundant, the form continued in use.


17.) Roberts, 1974, suggests that this may be called phoinix or spadix. Quintilian I, 10, 31; Polliux IV, 59; Athenaeus IV, 80; Nicomachus Ench. 4, p. 274. Examples of similar instruments - BM F 399; F 310.

18.) A fragment of ivory in Corinium Museum, Cirencester, which is said to be from a Roman lyre, may be a string holder for a musical instrument, but it is not a lyre. The object is 23.8 cm. long, with a flat base and is 0.4 cm. thick. Its sides which are 1.5 cm. in height are straight and its upper surface is curved, to a maximum height of 3.5 cm. Twenty-four holes are drilled into the top surface, curving so they exit at the back of the object. They are equally spaced, every 1 cm.

The front face of the object has incised decoration, marked in black, and the back face is smooth, except for 24 holes. The edges of the holes are slightly worn and were presumably intended for the attachment of strings of some kind.

There are far too many strings for this to be part of a lyre or cithara, but it could be a string holder for a multi-stringed lute of a much later period, although the method of its attachment to the sound board of an instrument is unclear.

The reconstruction in Corinium Museum is certainly incorrect as a replica of the object has been placed above the cross bar of a cithara/lyre like instrument. If it was any part of a lyre it would have to be either a bridge, or from the design of the holes, a string holder. The provenance of the object is not known and it does not appear to me to be of Roman date.

19.) Cicero de deorum nat II, 144 & 149.


23.) Orpheus and the beasts, Toynbee, JMC, Animals in Roman Life and Art, pl. 137. Sabratha Museum.

24.) Kertsch lyre cover, Behn, 1954, Taf. 50, Abb. 117 a-b, p. 85, 89. The bronze cover is in the shape of a tortoiseshell, with shell markings. The back is rivetted to two pieces on the front of the instrument that run down the long edges, leaving a rectangular section in the centre uncovered. The relief decoration on these sections, which is of a god and a winged female figure could from its style be late Hellenistic or Roman. There are sixteen bone pegs.


26.) Pollux VII, 154.
Ivory - Vergil AEn. VI, 647; Martial XIV 167.
Horn - Pollux IV, 60.

27.) Borthwick, 1959, Καταλόγος της Φυσικής της - a neglected term in Greek music - ca II, 23-29.

28.) The phrase intus canere was still used at a late date (4th C. AD) - Ambr psalm 1,12.

29.) Ps. Ar. Prob. XIX, 918a 37 - 918b 3 - He uses the word dialepsis.

30.) Philochorus ap Athenaeus XIV, 637 f - 638 a. The words magadis and syrigmos used here may refer to the production of harmonica.

31.) Roberts, 1980, p. 47, pl. 36. BM B 651 - Black figure vase.

32.) The theory of pentatonic tuning was suggested by C. Sachs, 1924, Zeitschrift fur Musikwissenschaft, VI, p.289-301; 1940, p. 132-3. It was accepted and elaborated by O. Gombosi, 1939, Die Tonarten und Stimmungen der antiken Musik, Copenhagen, p. 166 f. It was suggested that the notes were E G A B D although not necessarily in that order. Many scholars accepted the proposal but it was critically and convincingly re-examined by Winnington-Ingram, 1956, The Pentatonic tuning of the Greek Lyre: a theory re-examined, CQ (NS VI, Nos 3-4, p. 169-186).

The theory is still repeated in many general books on music and is also applied to Greek wind instruments.

33.) Usually when bemoaning 'new music'. Plutarch De Mus.
In a discussion of a passage in Cleonidas Isagoge - K. von Jan, Musica Scriptores Graeci p. 202; F. Levin suggests that the eleven stringed was tuned diatonically and that accidentals were produced by stopping in some way - thus:

\[
\begin{align*}
B & \quad C & \quad D & \quad E & \quad F & \quad G & \quad A & \quad B' & \quad C' & \quad D' & \quad E' \\
& & & & & & & & & & \\
\]

By means of stopping all six modes described by Aristides, which shared three enharmonic tetrachords, could be obtained.

The argument, which convincingly disproves the theory of pentatonic tuning is summarised by Roberts, 1980, note 44.

The cithara and lyre were held with the highest string nete, furthest away from the player and the lowest hypate nearest to him. (Nicomachus Ench 3). Earlier theories to the contrary are still sometimes repeated, (Michaelides 1978; 192). The strings were tuned to mese (Ps Aristotle Prob XIX, 20,36).


Wille, 1967; 212.

Porphy. ad. Horace Od I, 36, 1.

CIL VI 2191; 2192; CIL VI 2193; 4416 (symphoniacorum) Baudot, 1977, p.40; fidicines - see Thm, RE 12, p.2286

CIL Tusc VI, 2.4.; Quint I, 10, 20 see Wille 1964, 14S.

CIL VI 7286. For other musicians: Petr. Sat 28.5; 53,11-13; Augustus employed many entertainers - Suet.Aug LXXIV, 83; Juv.V.3.

Pliny Ep IX, 36, 4; IX 12,3.

Wille 1967; 235 ffprovides a copious bibliography on this thorny but important question, which he discusses.

Fleischhauer, 1964, Abb 66, p.120; Lucian de salt 63.

Quint. I V 9-33; Vitr.I

The fragments are listed by Pöhlmann, 1960 p.79 ff.


Marrou, 1956, ch.V


From the triclinium of the Imperial Villa, Pompeii, Mauri 1953, p.107-108.

Alternatively this could be a rare example of a player stopping a string at the cross bar, but the painting is too badly damaged for any such claim to be made with confidence.

Hinks,1933 (BM Cat) Pl.X.No.26. Other female citharists,C.Nos. 2, 16.

CIL III 10501 - Tombstone of Sabina - also the other female organists, (Organs.No.22, 23. )

Horace Sat I, 10, 90-91; Suet.Nero XX.1.

Suet Nero XI 3; Juveni Sat VII 228; Dio Cass 63, 9.4.

Strabo XIV, 1 41; Suet Nero XXX; Suet Vesp XIX,
58. e.g. CIL VI, 7286; 10123; 10140.

59. Immerwahr 1944, p.203 ff. records numerous graffiti left by travelling musicians at Dum-Europus in AD 250-256. Records of other entertainers, mostly low grade musicians, dancers and mimes exist from Egypt.
P Grenf.II 67. (dancers), P.Col.441; aulos music, P.Oxy III 519, 2nd century AD records the accounts from public games where money was expended for an actor, a Homeric rhapsodist and a dancer. P.Oxy 1050 is similar.
Chapter 16

The Harp

A harp is a stringed instrument in which the resonator, the sound box, is attached to an arched or angled rigid neck. It is plucked, like the lyre, but the varying number of strings are set at an angle to the sound box. There are three basic types, the bow or arched harp, the angle harp and the frame harp. The sound-box of the bow harp, which is usually hollowed out of wood and often covered with skin, is affixed to a rigid curved neck and the number of strings is limited. The type appears in Egypt and Sumer. The resonator and neck of the angle harp meet at an angle. This type which generally has more strings than the arched form was also known in Western Asia and eventually supplanted the bow harp. Frame harps have a pillar or third side between the resonator and the neck to counteract the strain of the strings.

The many stringed harp had no place in the formal music of classical Greece but was always a popular instrument in the Near and Middle East, and it is frequently depicted in the art of the late classical and Hellenistic periods. It is not often shown in Roman contexts but harpists and other musicians are known to have come to Rome in the second century BC. In a well known passage Livy notes the return of Manlius in 187 BC after his victories in Asia, when his troops brought back all kinds of eastern luxury including the harpists 'psaltriesambucistriaeque' who provided entertainment at dinner parties. Such a banquet scene is illustrated on an altar relief of the first or second century BC in Venice (Fleischhauer, 1964; Abb.56;10). Later Juvenal complains about the filth of the Syrian Orontes that poured into Rome, including its "chordas obliquae" and other instruments and their disreputable players. The angle harp is illustrated in Syria on a third century mosaic from Antioch.
The names of many stringed instruments are preserved, for example in compilation of Athenaeus, who lists, quoting Aristoxenus the phoenix, pectis, magadis, sambuca, iambuca, trigonon and enneachorda, (XIV, 636b) some of which are harps. Later, quoting Apollodorus of Athens, he mentions the psalterion which is equated with the magadis, the clepsiambos equated with the trigonon and all the enneachordon, which was apparently obsolete, (in the second century BC), (XIV 636f). There appears to have been some confusion over the names even in antiquity—witness the discussion on the nature of the magadis (XIV, 634 c-d).

Pollux (IV 59) lists psalterion, trigonon, sambuca and pectis as harps. Latin authors most frequently use the words sambuca and psalterium.

Whatever the terminology, both types of harp are represented in the pictorial record, although the bow harp is shown very rarely. One such illustration, on a wall painting from Stabiae shows a group of women, one of whom plays an elongated lyre and a small boat-shaped arched harp (L.No.5). The harp was traditionally a woman's instrument and may have had a place in amateur music making, in addition its role as an instrument of the courtesan. The Stabiae instrument is small and arched with only a few strings, four or five, which are apparently attached to a knob or knobs on the neck, although the details are unclear. This harp may have been the sambuca, which was apparently a high pitched instrument of Near Eastern origin and the nature of which has been a matter of some discussion.

Angle harps predominate in the artistic record, seen for example on terra sigillata, the altar relief from Venice and in numerous figurines of Hellenistic and later date, as for example those from Kharayeb. The terracottas show two types of vertical angular harp, one with three straight sides, (a), the other with a slightly rounded sound box, which is held on the outside away from the player, and parallel to the
musicians body... The types are however more clearly shown on the Greek vase paintings of South Italy. A fourth century amphora from Naples (Inv.81953) shows a curved sound box held against the player, which broadens slightly as it rises over the bass strings. There are ten strings fastened to a horizontal holder, perhaps by tuning levers similar to those used on the lyre and cithara. Naples Inv.No.81392 shows these more clearly. This instrument also has a carved or otherwise decorated sound box and there is no front pillar.

The other type, the three sided vertical angle harp, in which the sound box, which broadens in the middle, is held away from the player, can be seen on a fifth century red figure vase in New York. This may be the other form illustrated on the Hellenistic terracotta figurines, but there appear to be no clear illustrations of Roman date.

The harp was played with the bare hands without a plectrum. All techniques available to the lyre player would have been possible, but stopping (that technique was ever used on the lyre) would have been unnecessary, as there were more strings. Harmonics may still have been produced for their tonal effect, one does not however hear of virtuoso harpists although obviously skill was needed.

3. The condemnation of the instrument by Plato (Rep.VIII 399 c-d) and others however suggests that it had some popularity in Greece.

4. Livy XXXIX 6,8; Juvenal Sat III, 60-65. It is from Syria that there is evidence about groups of itinerant musicians – Immerwahr 1944 p.203 f – lyre Note 59.


6. Louy XXXIX, 68; Macr.Sat III, 14, 7; Lucilius 733 (sabuca).

7. Athen XIV 633 F; 634 a; Plautus ftichus 381; note 6 above; Suidas – sambuca; Aelian in Porph.ad. Ptol.Ham; (Dunlap p.34) equates it with the trigonon. For the nature of the instrument and its possible identification with the Stabiae illustration Landels, JHS 1966, p.75; Duchesne - Guillemin L'Antiquité Classique 1968; The arguments are discussed byRoberts 1974, ch.15. See also a painting from the house of the Famesina, Rome, Kinsky, 1929, p.17.Abb.3.

   b) Inv.285-287, angle harp with rounded body – pp36 ff.


11. Aristoxenes4p Athen XIV 635 b.
Chapter 17

The Lute

Instruments of the lute family, like lyres, have a varying number of strings of equal length but are distinguished from them in having fingerboards. The pitch of a note is obtained as on a violin or guitar by 'stopping' the strings with the fingers against the fingerboard. In Hellenistic and Roman times the lute appears in a simple form and, to judge from the paucity of illustrations compared with those of the lyre, it does not seem to have been as well known. Unlike the lyre and cithara it had no strong mythological connections, although it is sometimes shown with Eros. The Greek name for the lute appears to have been the pandoura (πανδοῦρα) and I shall refer to it by this name. The Latin spelling was pandura, but references to it are extremely rare in Latin literature and in Greek works of the Roman period, for example the writings of Athenaeus, the Greek form is used.

In the Hellenistic period the pandoura is most commonly depicted on terracotta figurines where it is shown as a sole instrument and is usually played by a woman or by Eros. The most important of these figurines are discussed by R. A. Higgins and R. P. Winnington-Ingram (1965,62-71). Roman examples too are almost exclusively played by women, but are usually shown on funerary monuments.
Like many other instruments the lute originated in the east, where fingerboard instruments can be traced pictorially to the third millennium BC on Sumerian reliefs. The instrument is shown with a very small body and long neck and would have had few strings. Similar instruments appear in the art of the Hittite, Assyrian and Achaemenid empires. In Egypt the lute, which appears from about 1500 BC, takes several forms and details of its construction are clearer than on earlier illustrations. The sound box is shown as short or long, oval or round and tomb paintings frequently depict its vaulted back. A tail-piece, to which the strings are fastened and sound holes in the belly are also sometimes indicated.

An early lute in Cairo Museum, cited by Hickmann (MGG 1960, sv Laute), is of a simple type. It has a long neck and a round body made of a tortoiseshell which is covered with skin. The skin appears to be perforated with sound holes.

A lute belonging to the musician Harmosis of the time of Queen Hatshepsut (1520-1484 BC), has an elongated wooden body and, again, a long neck. In both these examples the narrow piece of wood forming the neck extends over the sound box and is threaded slots in the skin covering the body shell. In the Pharaonic instrument it protrudes slightly beyond the lower end of the body. There is little information about the string fastening and tuning mechanism but on some reliefs strings are shown hanging from the top of the neck and they were probably wound round it over strips of leather or cloth. This simple apparatus could be turned round the neck to alter the tension of the strings. A bridge
would be necessary to raise the strings clear of the body of the instrument and also a string holder or tail piece, although on lutes which show a rod or knob protruding from the sound box the strings may have been attached to this. This is paralleled in the gesso, a lute type instrument made from a calabash which is played in the Celebes, (Panum, 1940, 203, fig.171).

Although lutes were relatively common in Asia and Egypt there are no examples of the instrument in Greek art before the fourth century BC, a time of increasing contact between Greece and the East, and most are later than this. It is interesting to note that of the terracotta figurines discussed by Higgins and Winnington-Ingram (1965), although all are Greek style and workmanship, few are from the mainland of Greece. Several come from Egypt, mostly from Alexandria, where the lute was already known, although it is shown on these works in Greek and not an Egyptian form. A notable exception is the fourth century relief from Mantinea (No.1) on which a pandoura is carried by a muse. This indicates some acceptance of and familiarity with the instrument. A Muse would be unlikely to play an unknown instrument or one with dubious associations. It is however surprising that if the pandoura was really well known there are not more illustrations of it, particularly on vase paintings. The Greek vase paintings of southern Italy are still a rich source of information about other musical instruments in the fourth century. The lute is occasionally shown in this medium. One of the examples of a pandoura cited by Winnington-Ingram (1965, 62) appears on a Campanian squat lekythos from Canosa (No.13).
Among the thirteen representations discussed, Professor Winnington-Ingram distinguishes two basic types of lute. I shall summarise their chief characteristics in order to compare them with later Roman instruments.

Type A, represented by the instrument on the Mantinea relief, is spade shaped with a clear distinction between the body and the neck, a feature which is characteristic of the true lute of the middle ages. The size of the neck relative to that of the body varies considerably, but generally it is about the same length or a little longer. In the Mantinea example the neck is twice as long as the body.

Type B is 'club-shaped' and there is no break in the line from body to neck, as illustrated by a terracotta figurine from Tanagra, now in the Louvre (No.6, Fig. 18). The widest part of the instrument is near the bottom of the sound box, but the sides then curve inwards to form a bluntish point, sometimes with a small projection at the end. It is possible that this knob had the function of the end button on the modern violin, providing a means of securing a tail-piece to which the strings were fastened before continuing over a bridge to the neck. Alternatively, as on some earlier Egyptian instruments, the strings may have been directly attached to the knob, in which case a bridge would still have been necessary to separate them as they passed over the belly of the instrument and to hold them clear of the table. On later instruments a string holder sometimes appears to be attached to the table which must therefore have been of wood and not of skin. This would however place
Fig. 13. Lutes No. 6. Tanagra figurine, Paris, Louvre.

Fig. 14. Lutes No. 23.
Lute on sarcophagus.
Arles, Musée Lapidaire.
a considerable strain on the instrument and may well be an example of inaccurate draughtsmanship. The knob which appears at the base of a lute held by Eros on a figurine in the Louvre (No. 7) may simply be a residual decorative feature and it does not appear on all instruments of this type, but it may have been functional and if so I suggest that it was used as a 'button'. A form of bridge or tail-piece is clearly indicated in some of the Greek examples in the British Museum and the Louvre (Nos. 2, 4 and 7) and in several Roman examples which are discussed below, (Pl. 80, 81).

There is no sign in the Hellenistic examples of any other fittings or accessories such as peg box or tuning pegs. Winnington-Ingram (1965, 64) suggests that the strings were ligatured as is the case with most early eastern lutes. Clear indications of peg boxes do not occur until the Sassanid period when they appear on Graeco-Persian work, but there is an illustration of pegs on a Roman sarcophagus from Arles (No. 23).

Similarly an indication of the number of strings is rare on Greek illustrations. The terracotta figurine of a girl with a lute in the British Museum (No. 4) has incised lines representing four or five strings. Traditionally, according to Pollux (Onom. IV, 60) the pandoura had three strings.

Medieval lutes and modern guitars which work on the same principle have fretted necks. There is no sign of any fretwork in the ancient pictures. However, as Farmer (1939, ) has pointed out, even in the middle ages, when lutes were certainly fretted, the iconography of the period frequently shows them without frets and often without strings.
Representations of Greek and Roman lutes are similarly undetailed so the absence of frets is not conclusive although a fretted instrument at this time seems unlikely. Technically however, it would not have been impossible.

The back of the instrument is rarely shown clearly. The figurine from Tanagra (No.6) shows the profile of the Type B instrument. It is well arched at the lower end, gradually narrowing towards the neck. Depth is also indicated in the rectangular lute on the Mantinea relief. A triangular section is shown at the lower end. This appears to represent a vaulted back with a central spine, similar to that shown on many citharas. The backs of lutes are shown more clearly on some Roman examples, but these are of a different type.

The Greek pandoura was made of wood. There is a report of the finding, in 1806, of an instrument in a tomb near Athens (Winnington-Ingram, 1965, 70). This apparently resembled a 'violin' or 'guitar' and was made of maple wood with sides of pine, incidentally, woods that are used in instrument making today. The instrument was much decayed and its shape was lost, but it was at least a foot long and half an inch thick at the edges. Unfortunately it subsequently decayed completely or was lost. The tomb, which also contained black glazed pottery, dated from the third or second century BC. The instrument sounds like some form of lute and quite possibly a pandoura.

Earlier lutes, on the Egyptian evidence, were made of wood or tortoiseshell with hide or parchment covering the top. This would be quite adequate when strings were fastened to a rod at the bottom of the instrument, but if they were fastened to a bridge or tail-piece that was directly
attached to the table, the latter would have to be of wood.\textsuperscript{5}

There is no completely conclusive evidence that the lute was in fact called the \textit{pandoura}, but it seems highly probable.

The instrument is mentioned, as it is illustrated, infrequently. There are scattered references in the Deipnosophistae of Athenaeus, where it is discussed with several other exotic instruments. Unfortunately the information is piecemeal and it is obviously not a common instrument. As in several other cases, the \textit{sages} are not well informed.

Euphorion who wrote in the third century BC is said to have mentioned the pandoura with other instruments (Athen. IV 182e).\textsuperscript{6} At 183f it is stated that Pythagoras "who wrote about the Red Sea" recorded that the Troglodytes made the pandoura out of the laurel (\textit{ἐνθένες}), which grew in the sea.\textsuperscript{7} It is mentioned once more by Protagorides of Cyzicus (second century BC - Athen. IV 176).

In the section about musical instruments, Pollux (\textit{Onomasticon} IV. 60ff) mentions a one stringed Arabian instrument, the monochord, and the \textit{trichordon}, "which the Assyrians call the Pandoura".\textsuperscript{8} As these instruments are mentioned together they probably worked on the same principle. The idea of a single stopped string was basic to Greek acoustical research and the monochord may have been in use from the time of Pythagoras.

In the Harmonicum Enchiridion, Nichomachus, who wrote in the second century AD, mentions the \textit{φανδουρος} (\textit{Harm. Ench.} 4, 243, 13), in one M.S. \textit{φανδουρος}, in connection with the monochord.\textsuperscript{9} This is not absolutely conclusive but it
strongly suggests that the pandoura was played as a lute, and the sources also stress its eastern origin, which is confirmed by the monumental evidence.

Later authors continue this tradition. According to Martianus Capella in the fifth century AD, the pandoura was an Egyptian invention (9 - 924). 'Lampridius' records that the emperor Elagabalus included the playing of the pandoura among his accomplishments. *(SHA Elag. Vita 32. 8)* Elagabalus was, of course, of Syrian origin and might be expected to favour eastern instruments.

Suidas adds little information. The word Πανδούρα is glossed as μαχαίρα κρεοκόπος in this entry and also under πέντες. The word μαχαίρα which is used in the sense of a chopper or cleaver may be some indication of the pandoura's curved profile. *(Winnington-Ingram 1965, 65 note 22)*.

Isidore of Seville (6th c. AD.) confuses the 'pandorus' with the pan-pipes or syrinx, the instrument of Pan, *(Orig. 3. 21.8.)*.

From the pictorial evidence it seems likely that the lute was introduced to Greece during the fourth century BC, possibly as a result of the conquests of Alexander and the consequent spread of Greek influence and acceptance of oriental ideas. The literary evidence, if the lute was indeed called the pandoura is consistent with this. The authors cited by Athenaeus all wrote in the third century BC or later.

However, Professor Winnington-Ingram argues that another possible name for the lute was the skindapsos *(σκινδαψος)*. Briefly summarised the evidence is as follows.

Pollux (IV, 59) lists stringed instruments beginning
with lyres and ending with the skindapsos, but there is no description of these instruments. It would be logical to mention lyres, harps and then lutes, but it cannot be deduced from this that the skindapsos was a lute, and it is not listed with the pandoura.

Athenaeus has more information, citing several authors of the Hellenistic period. In a list of instruments, Aristoxenous (ap. Athen. IV 182f) places the skindapsos between κλειψύκαος and το ἄννεξχροδον κυλούμενον, which may be varieties of harp. Again no conclusions can be drawn from this. Phillis (ap. Athen. XIV 636b) has a similar list.\textsuperscript{12}

Anaxilas (Luropoios fr. 267, Athen. IV 183b)\textsuperscript{13}, mentions various instruments including three types of lyre; barbitos, lyre and kithara, the pectis which may be a harp, and the trichordos, which may be a three stringed instrument or an epithet of one of the other instruments listed, although it is not clear which. The final instrument is the skindapsos and with lyres and harps already mentioned, it is quite likely that a member of the lute family would be included to complete the list. The order in which the instruments are listed does not seem to be significant. The pectis, a harp, is mentioned between the barbitos and the lyre and cithara, which are all types of lyre. It is also possible that, if the trichordos or more probably trichordon was a three stringed instrument in its own right, it too was a lute. All pictorial evidence points to the fact that ancient lutes had few strings and the pandoura traditionally had three.

Matron (ap. Athen. IV 183a)\textsuperscript{14} gives more information.
about the appearance of the *skindapsos*. It had four strings, a suitable number for a lute, but some small harps are shown with only a few strings, as for example, some Egyptian harps and the small boat shaped instrument on the painting from Stabiae in Naples, which may have been called a *sambuke*. Matron also mentions the *skindapsos* as the instrument of a woman, which is interesting as the lute is so frequently shown being played by women.

According to Theopompus (Athen. IV 183a) the *skindapsos* was large and 'lyre-like'. The text is corrupt so the material from which the instrument was made is unclear. 'οἴσυνον προμαλυο' may mean that it was made of willow. Another reading has 'ξυνον' for 'οίσυνον', literally, 'of beech wood'. Beech would in fact be a more suitable material for an instrument. This still leaves προμαλυο unresolved and it is perhaps more likely that only one type of wood is referred to, (i.e. willow).

No lyre of the Hellenistic period is shown with only four strings so if Matron is correct, the *skindapsos* though lyre-like, could not have been a lyre.

Aelian (N.A. xii 44) records that the *skindapsos* came from India where lutes were known at this time.

There is, however, no instrument illustrated at this period which can be described as large, lyre-like and with only four strings. Lutes, although possessing the requisite number of strings are always quite small and are easily carried. The Mantinea lute is larger and is shown with the same arched back as the cithara on the relief, but Type A lutes are not consistently larger than those of Type B, and the Mantinea instrument is an isolated example. It is
possible that Theopompus is merely distinguishing a large skindapsos, compared with other skindapsoi.

There is a basic difference among instruments of the lute family between those with long and those with short necks. Greek lutes all appear to be of the earlier narrow long neck type. Wider short necked lutes which appear in Persia from ca. 800 BC and in India during the first centuries AD, are quite distinct, so it is not possible to regard the pandoura and skindapsos as short and long necked lutes.

Some instruments which appear on late Roman sarcophagi (below) fit the descriptions of Matron and Theopompus quite well. These tall broad instruments are apparently plucked like lyres without stopping the strings. The difficulty here is that the word skindapsos is unknown in Latin literature in any form and there is no earlier monumental evidence for this instrument. It is obviously impossible to attribute a name cited in the fourth century BC to an instrument that is not illustrated until the third century AD.

If the skindapsos is a type of lute the literary evidence is consistent with its introduction in the late fourth century BC. Aristoxenus, Matron and Anaxilas lived in the fourth century but there is no certainty about the dates of their writing, although it is likely that Aristoxenus and Matron were contemporary with Alexander.
Lutes in Roman art are extremely rare and there is only one reference to the playing of the 'pandura' in the literature of the Imperial period (SHA Elagab. 32. 8). The instruments that are illustrated, mostly in the later empire, are frequently shown in greater detail than on the Greek terracotta figurines and there seems to be some difference in form. The difference between instruments with a body clearly separated from the neck, and the 'club-shaped' type can still be seen. The sound box of the former type is however round or pear shaped rather than 'spade-shaped' or rectangular.

This type appears earlier on a terracotta figurine from Damascus (No.14). It is of Syrian workmanship and is dated by Zahdi (1972, No.18) to the second century BC. Few details are shown, but the instrument has a very long neck, about five times as long as the body, which is rounded, narrowing at the lower end to a blunted point, and is quite distinctly separate from the neck. Four small dots on the table may be sound-holes, or may indicate the fastening of the table to the sound-box, or may merely be decorative. No strings are shown along the neck but lines on the body seem to indicate strings there.

The lute, which is played by a woman who wears a Phrygian cap, is held horizontally (in the Greek manner) and is plucked with the fingers of the right hand half way up the neck. The left hand which would finger the strings is broken. The instrument is apparently supported by a strap slung over the left shoulder. A lute of this type would have had rather a 'thin' sound because of the smallness of the sound-box which would contribute little
resonance. The notes produced could theoretically be quite low because of the length of the strings, but this would of course be dependent upon their tension. A similar lute appears on a terracotta from North Africa, (No.15). The instrument is again held by a woman and the back view is clearly shown. The sound box is round with a flat base and the arching of the back is indicated as bowl shaped.

A terracotta in the Musee de Bardo (No.16) shows the front view of a lute. The player of this instrument could be a man, but the top part of the figurine is missing. The neck of the lute is about three times as long as the round sound box. Four strings terminate at the junction of the neck and sound box, but this is organologically unlikely and is probably an artistic convention, particularly as some kind of bridge is shown on the sound box. The strings would either have been fastened to this or would have passed over it to be tied to a tail-piece or fastenings at the base of the instrument, but any such details are obscured by the player's hand which is in a plucking position over the table.

A bowl shaped sound box, larger than those of the eastern and African examples is seen on the sarcophagus of a musician in Arles, (No.23, fig. 19).

This lute is of an advanced type. The hemispherical body would have been highly resonant, and it is the same length as the neck. The illustration in Panum (1940, 211, fig. 183) is inaccurate in showing the line of the table continuing well beyond the bottom of the sound box. The carving does however show a line below the top of the sound box, which may indicate the fastening of a skin or parchment belly. As the lute is shown in profile there is no sign of
Fig. 20

Lutes No. 18. Sarcophagus relief, Rome, S. Crisogno.
any bridge, tail-piece or string fastening so this question cannot be resolved. The carving is damaged at the top of the neck but there appear to be three tuning pegs at right angles to the neck near the top, suggesting that the lute had three strings. The pegs are not held in a peg box as on a violin but are fitted directly into the neck. This illustration shows a tuning mechanism more clearly than any other Roman relief, but it may not be typical.

The sarcophagus also shows a large cithara, and an organ.

It is likely that similar tuning pegs are shown on a sarcophagus in the British Museum, depicting the wedding of Cupid and Psyche (No.21, fig.28). Psyche seated in a wicker chair plays a lute with a long fairly broad neck at the top of which are three prongs. This may be a diagrammatic way of indicating three pegs set at right angles to the neck.

The number of strings is not certain - three are apparently shown - but these are only carved on the middle section of the neck, ending above the sound box which is rounded. There is a bridge or tail-piece on the sound box and the player's right hand is plucking the strings at the top of the box. The left hand stops the strings at the top of the neck. The instrument is held upright at a slight angle away from the musician's body and is supported on her lap. A similar playing position is adopted in the following examples, except where otherwise stated. This posture differs from that usually shown on Greek terracottas, where the instrument is held horizontally.

Two more lutes with relatively small sound boxes and long necks are illustrated on a sarcophagus showing Nereids.
Fig. 21
Lutes No. 19. Lute players from a sarcophagus relief, Naples 6598.

Fig. 22 Lutes No. 17. Female lute player. Sarcophagus cover, Rome, Palazzo dei Conservatori.
and Centaurs in Naples (No.19, fig. 21), dated to the late third century AD. In the middle of the relief is a representation of a woman playing a lute. The woman represents the deceased and as her features are not clearly modelled it is likely that the sarcophagus was unused. Such sarcophagi were produced in a workshop and adapted for their prospective owner's use. Her instrument has a long neck, three times as long as the sound box which has curved sides and a flat base. Four strings are shown, fastened to a tail-piece near the top of the body. Two circles below this may represent sound holes although it would be more usual to find these either side of the strings. The method of securing the strings at the top of the neck is not obvious. A crescent at the top of the instrument may have some function connected with this, but is more likely to be decorative.

On each side of the deceased are nereids and centaurs, common funerary symbols. A Nereid on the left plays a lyre and one on the right the pandoura. This instrument is shown more diagrammatically. It too has a long neck topped by a crescent, and a distinct body, but this is very small and almost triangular in shape. Strings are only indicated on the neck but a tail-piece is clearly shown at the base of the sound box. It is interesting to note that the nereid is playing the instrument "back to front", with hands reversed, although in the usual position. Her right hand is fingering the strings while her left hand plucks them. This is technically possible but is more likely to be due to the artistic composition of the relief than to any musical observation by the sculptor. The sarcophagus may have been intended for a musician as has been suggested,
Possible arrangement of pegs, strings and a tail piece on the lute shown on the Arles sarcophagus.

Alternative arrangement with the addition of a bridge to raise string from table.

Fig. 23
(Marrou 1938 no.221), but the 'ready made' aspect of the half modelled head suggests an element of mass production. Possibly it was intended for an amateur musician and by the third century the lute may have become a popular instrument among respectable women. Alternatively the lute may have had a funerary significance, like the common design of Muses with musical instruments or it may simply have been a fashionable motif at the time. The lute theme was certainly popular but the instrument may not have been familiar enough always to have been interpreted correctly by artists, as I shall try to demonstrate below. The playing position of the Nereid is an example of this.

A similar sarcophagus, but in poor condition, from Rome is listed by Marrou (1938, no.222; Lute Cat. no.20).

The pandoura, as a symbol on funerary monuments is not only found in Italy. The Arles sarcophagus has already been discussed and there is a tombstone from Merida in Spain from the grave of the sixteen year old Lutatia Lupata, probably dating from the third century (No.29), p.83. The sculpture is rather rough but the instrument can be identified as the type with a long neck and a round body and probably four strings. The musician's hands are in the conventional position, but the lute is held in the manner of a modern guitar, more like the position on the Greek terracottas, than the upright pose on other Roman reliefs. This is the only portrayal of a lute that I have found in Spain.

Most examples however come from Italy and the instrument is not a common motif in the western provinces. A sarcophagus in the Palazzo dei Conservatori showing the hunt of
the Calydonian boar has a lid in the form of a couch on which a man and a woman, the deceased, recline. (No.17, fig.22). As on the Naples sarcophagus, the heads of the figures are blocked out but left unfinished and are according to H. Stuart Jones (1942, 99) ordinary workshop figures. The woman plays a lute with six strings. In profile it has a deep rounded sound box. It is significant that it is again the woman who plays the instrument. The sarcophagus was found on the Via Valeria between Tivoli and Vicovaro and dates from the first half of the third century.

Another long-necked round lute appears on a mid-third century sarcophagus from Tivoli, in the Villa Albani, Rome. (No.22. Marrou, no.220).

A final example of this type of lute is depicted in some detail on a sarcophagus in Rome, S. Crisogno (No.18, fig.20). There is only a little distinction between the neck and body but the instrument is certainly not 'club-shaped'. The body is pear-shaped with a flat base. There is a crescent at the top of the neck but the method of fastening the strings is not shown. At the other end they are fixed to a tail-piece on the sound box, and the ends of the strings are shown dangling below this.

I have listed other lutes, Nos. 24 - 29, of the same type, but which add little more information. All are played by women. Example no. 28, in Rome, Museo Torlonia, has a central design of a girl playing a lute behind which are two tragic masks, and may be the sarcophagus of a musician.

Several Roman lutes are shown with broad necks, the same width as the sound box without any distinction between the two. They are not however the same shape as the Greek
Fig. 24
Lutes No. 32
Lute player from a sarcophagus, Rome.

Fig. 25
Lutes No. 31
Lute player from the sarcophagus of P. Caecilianus Vallianus, Rome, Vatican.
club-shaped instruments on which the neck is quite narrow at the upper end.

The sarcophagus of P. Caecilius Vallianus in the Vatican (No. 31, fig. 25), depicts a funeral banquet at which the deceased reclines on a couch. To his left a female lute player sits in a wicker chair and in the background is a tibicen. The lute has a broad neck which narrows slightly towards the top, but there is no clear distinction between the neck and the body. In profile, as far as can be seen, the sound box is arched. Four strings are shown but the top of the neck is obscured by the musician's hand and the edge of the couch. The strings are secured at the base of the sound box, not apparently to a tail-piece but to fastenings directly attached to the table, represented by drill holes. There are two depressions to the left and right of the strings probably indicating sound holes.

The lute appears in a similar form on an early Christian sarcophagus in Rome (No. 32, fig. 24), of the second half of the third century. The deceased, a woman is in the centre of the relief with the Good Shepherd to the right. Two seated women, one playing a lyre and the other a lute are at left and right. The lute is rounded at the base and tapers gently to the top. Four strings are fixed to buttons or studs fastened to the table and the free ends dangle to the bottom of the instrument. Two pegs or some sort of fastenings are shown at the top of the neck, but these are diagrammatic and their exact form cannot be determined.

All the sarcophagi mentioned so far were made in the
Fig. 26. Lutes No. 33.
Lute from a sarcophagus relief.
Paris, Louvre.

Fig. 27. Lutes No. 34.
Lute from sarcophagus relief,
Agrigento.

Fig. 28. Lutes No. 21. Psyche with lute. Sarcophagus relief,
British Museum.
third century or later. Another from Ostia (No.30; Marrou no.205) is dated on the basis of the hair styles and an exceedingly fragmentary inscription to the late second century. The lute on this example is shown very schematically and is damaged on one side, but it appears to be of the broad necked type.

There is a final group of lutes which are usually grouped together, (Panum, 1940, 212). They are in the cathedral crypt at Agrigento, the Chiesa San Vittore, Ravenna and in the Louvre (Nos. 33-36), pl 84,85.

On the Agrigento sarcophagus, which is of Attic Marble and probably imported directly from Attica, and dates from the third century AD, Phaedra is attended by, among others, two women holding instruments which look like lutes with long, but rather wide necks. The sound box of each lute is rounded and bulges on each side of the neck. A large number of strings is shown. The basic difference from the pictures of the other lutes is in the method of playing. The instrument is cradled in the girl's left hand while the right hand plucks the strings half way up the neck, (No.34; fig.27).

Instruments on two sarcophagi in the Louvre are similar. One, (No.33; fig.26) dated circa AD 200, and again played by a woman, is very like the standard form of the Roman pandoura, with the strings shown only to the bottom of the neck. At the top are several zig-zag lines which may represent the string fastening. The playing method also differs from that usually employed for the lute in that a plectrum is used, held in the musician's right hand.

The other instrument, from Ravenna is of a different type and is unparalleled (No.36; pl 25). The "fingerboard"
or neck is very wide and is quite obviously separate from the hexagonal sound box. It would be extremely difficult to stop strings on such a wide fingerboard, but equally if this or any of the other instruments were played as lyres, the fingerboard would be in the way. Also, with the instrument held upright, only one hand would be available for plucking and with the lyre and cithara both hands were normally employed.

It is possible that the sculptors of these reliefs attempted to portray an instrument with which they were unfamiliar, and intending to show the pandoura they confused its method of playing with that of a lyre, which was well known. This would be a stronger argument if all the examples came from a limited area, but this does not appear to be the case. Also there are at least four examples of this instrument and when considered as a proportion of the limited number of lute representations, this may be significant. A 'lyre-type' lute would however have been an awkward instrument to play, as the fingerboard would have no function and would be in the way. The instrument would appear to have little musical potential. If the strings were not stopped it would be necessary to have more than on the usual lute, and with a correspondingly wide board behind them the instrument would have been unwieldy and impracticably heavy. Perhaps, if it did exist in this form, this explains the small number of illustrations. The 'lyre-lute' may simply have been shown on sarcophagi to suggest the idea of music in general and not of one instrument in particular.

This raises the question of the place of the fingerboard instrument in Roman life. It is only shown on funerary
monuments and not in scenes of everyday life, except perhaps in so far as funerary banquets represented feasts in life. Only where the actual figure of the deceased carries the instrument, or where many instruments are shown, as on the Arles sarcophagus, can one suggest that the tomb was that of a musician. In examples where the lute is played by a mythological figure or an attendant at a feast it seems to represent only the idea of music in the afterworld rather than to suggest anything about the interests of the dead person. It is however extremely unlikely that sculptors would choose to show an instrument that was totally unfamiliar to the public and the date of the monumental evidence may give an idea of the date of its introduction to the Roman world. It is probable that the lute was played in the east without a break from the Hellenistic period. It would indeed be surprising, considering the antiquity of the instrument in the east, if it were not, although one might expect more pictorial evidence.

Athenaeus wrote during the Imperial period, about AD 200, but he says little about the pandoura. His chief sources are Hellenistic authors but he is more interested in tracing the origins of the instrument than in describing its form, possibly because he expects his readers to be familiar with it. Nichomachus is similarly uninformative as is Pollux who also wrote in the second century AD.

The first, indeed the only unequivocal statement of its presence in Italy is the reference to Elagabalus (AD 218-222). The SHA was probably written in the second half of the fourth century, and is perhaps only good evidence for the time that it was actually written, but it is
interesting that the traditionally pandoura playing emperor lived at the beginning of the third century. Most of the sarcophagi can be dated to the third century or the late second century at the earliest, and there are no representations of the lute in the art of the Republic or early Empire in Italy. It is probable that Rome and Italy adopted the instrument, not directly from the Hellenistic world, but from the eastern part of the empire in the second century AD, and from the limited evidence available it does not appear to have had the popularity of other instruments in the west, even as a funerary symbol. I have found no illustrations of the lute in the northern provinces.

The lute is exclusively played by women in Roman contexts. The only possible exception to this is the instrument on the uninscribed Arles sarcophagus, but as the other instruments, the cithara and organ, are often played by women, this could well be the tomb of a female musician. The lute is frequently played by women on Greek illustrations, but is also very often played by Eros, while on earlier (and later) eastern reliefs it is as frequently played by men as by women. In the east, therefore, it is not primarily a woman's instrument. Unlike some instruments played by women in the Roman empire the lute does not have any disreputable associations. The deceased on grave reliefs never play the tibia or percussion instruments, but are sometimes shown with the more respectable cithara. It is possible that the playing of a stringed instrument and particularly the pandoura formed part of the musical education of women in the later empire.

It may seem surprising that the lute was not more
fully developed in Roman times or played more frequently. It has greater musical possibilities than the lyre, which would have to be impossibly large to achieve the same tonal range as the lute. The answer must lie in the nature of Roman music, for which the cithara, with its comparatively few strings, was adequate.
Notes
1. Sachs, 1940, p.82; Rimmer, 1969, Pl. IVc.
2. Hickmann, 1960, NOC Laute, Cairo Cat. no. 69422.
3. ib. Cairo Cat. no. 69421.
4. The find was reported in Magasin Encyclopedique, 1807 ii, 363 ff; Dilettanti Society, Unedited Antiquities of Attica 4.
5. In the Arabian world however the wooden belly was not introduced until a late date. The pre Islamic lute, the misbar, had a skin table until the end of the sixth century AD when a lute that was made entirely of wood was introduced.
6. Athenaeus IV 182a.
   Εὐφορίων δὲ ἐπόδες ἐν τῇ περὶ νυμφών οἱ νῦν, φησίν, καλολέμενα νυκτίσται καὶ πανδούρισται καὶ σαμβυκισται κατὰ μὲν οὐδὲν χρῶνι ὀργάνα.
7. Athenaeus IV 183 f.
   Λυθυρίσας δὲ γέγραψαν περὶ τῆς Ἑράως Παλαίστρας τοῦ Τραγούλωνος φῆσι κατεγκέισθαι ἐν πανδούραν ἐκ τῆς ἐν τῇ Παλάστρῃ φυσιέναι δέσφας.
8. Pollux IV 60.
   -- μονοχρόνον δὲ, Ἀραβαὶ τὸ εὐρήμα, πρὸχορόν δὲ, ἐπερ λατινὶ πανδούραν ὅνιμαξαν, ἑκείναν οὕν τι καὶ τὸ εὐρήμα.
10. SHA Elagabalus 32 δὶς ipse cantavit, saltavit, ad tibias dixit, tuba cecinit, pandurisavit, organo modulatus est.
12. Athenaeus XIV 636b: καί φιλίς δὲ δὲ Δηλίος ἐν δευτέρῳ περὶ Μουρικῆς ἀκραίρην φῆς πεκτίδα χρυσόδιδο, λέγουσας ὅτι "φαινίκες, πεκτίδες, μαγείδες, εὐμύβαι, ἱμπαθή, τρίγυμα, κληφάμα, σκινδαψί, ἐνυδάχορα.
13. Athenaeus IV 183b.
   ἐγὼ δὲ τριχόρθον πεκτίδας καθάρας λύμας σκινδαψών ἐξηρτυούμεν.
14. Athenaeus IV 183a Mariam. Ἐριτὶ δὲ σκινδαψὸς τριχόρθος ὀργάνων, ὡς ὅ παρερίδος φῆς καταρνάν ἐν τούτῳ, ἀλλ' ἀπὸ πανδούρων κράμαζαν, ὅτι περ τετάνυστο σκινδαψὸς τριχόρθος ἀνιλακτίοιο γυναικὸς.
15. Athenaeus IV 183a, Théopompos μημονεύει αὕτω καὶ θεοπότης καὶ καλοφόνοις ἐποίη ἐν τὶς ἐπιγραφομένων Ἀρματίων.
   σκινδαψόν λυρείνα μὲν γέμαν κήρεσι πιάζον; οἰσίνον προμάλα τετυμένον αἰλήνενοίν, οἴσινον.
16. The Agrigento sarcophagus, which is unfinished on two sides is however of Attic marble and was probably imported directly to Agrigento in this unfinished state. The sides that were intended to be seen were then completed either by Greek craftsmen or by sculptors trained in the Attic tradition. The Louvre sarcophagus which shows a similar instrument is also an Attic type. See Ward Perkins 1956;14.
Percussion Instruments

Idiophones are constructed of resonant material which is made to sound in various ways, by percussion for example. They are the simplest of instruments and are among the most ancient. A sense of rhythm is a basic human quality and percussion instruments have been discovered on early prehistoric sites.

Rhythm was of great importance in Greek music and a rhythmical notation was developed, examples of which can be seen in the surviving musical fragments. Rhythm, and in particular, the rhythm of the dance, was emphasised by the use of percussion, but the instruments and the techniques of playing them remained relatively simple. They seem to have had more importance in Hellenistic and Roman music than in 'classical' Greek melody, and illustrations of the later periods show a greater variety.

Percussion idiophones are classified according to the method by which they are struck. Concussion idiophones are pairs of similar objects which are struck together, as for example, cymbals, clappers and the scabelum. Struck idiophones are pieces of sonorous material struck with a clapper or a stick, as are bells and the tuned metal bowls. Shaken idiophones are rattles of various types and other instruments can be stamped upon or scraped, but these do not occur in Roman contexts. In all cases sound is produced by the vibration of the actual body of the instrument.

Drums, which are often thought of as percussion instruments, are technically more advanced than idiophones
and are known as membranophones, but they have been included in this chapter as they served the same function as the other instruments.

Note


In Greek vocal music the rhythm was dependent upon the metre of the verse.
Chapter 18

Cymbals

The cymbal, an ancient percussion instrument of Asiatic origin, (cymbalum, κυμβαλον) featured in some forms of Greek and Roman music, particularly that associated with the ceremonies of certain cults, often of an ecstatic character. Such scenes are a common theme in Roman art, where the cymbals are also seen in secular contexts.

Cymbals, which are technically concussion idiophones, consist of two identical metal plates, each with a hemispherical central boss. They are usually of indefinite pitch and can vary in form. There are basically two types, one having a wide rim with a small boss, the other a narrow rim with a large boss. Methods of playing are adapted to suit the form of the instrument, rimless or narrow rimmed examples being held in a vertical position and struck horizontally, while broad rimmed cymbals are held in a horizontal position and are clashed with a vertical movement. In ancient times as now the centre of each cymbal was often pierced with a hole for the attachment of a handle, or for a chain or cord which linked a pair of cymbals. The central hole has no acoustical effect on the instrument as vibratory movement is greatest at the outer edge and practically nil at the centre. A cymbal can therefore be suspended without any loss of tone. The significance of the shape of the internal cavity formed when two cymbals are brought together depends upon the method of playing. It is acoustically important when the cymbals are played in the 'Turkish' manner, in which one is struck against the other with the arms moving in opposite directions. There are however several other methods of producing a sound, for example by striking the edges of the discs together, where
the size and shape of the central boss is of no significance.

The cymbal most commonly illustrated in the Roman art has a narrow rim with a relatively large boss and is about 10cms in diameter. Several examples survive, the form remaining unchanged over a considerable length of time.

The best known cymbals to have been found in a Roman context come from Pompeii, - a pair of bronze cymbals linked from their centres by a chain, (No. 1). Each is 11cm. in diameter with a large central boss and narrow rim which is rolled at the edge. They are very similar in form to a pair of cymbals from Greece, which are now in the British Museum and date from about 500 BC. These mould cast cymbals, each with a deep central cavity are also linked by a chain and are inscribed with the name of their owner, (No. 2). Cymbals from Elis, in New York, are also similar (No. 3).

Ancient cymbals survive in many of the world's museums but their provenance and/or date is often uncertain, as for example the four instruments from Cyprus in New York, (Nos. 4 - 7). These are slightly smaller than the previous examples, being about five to six cm. in diameter. Instruments in The Hague and Copenhagen are said to be Greek, while Hickmann cites many examples from Egypt. Several are of the narrow rimmed form and one is inscribed ΜΕΓΑΛΗ ΘΕΑ, demonstrating its associations with the worship of Cybele, (No. 8). Many cymbals of a similar type have been found in Syria. A bronze disc which is slightly concave, perforated in the centre and ornamented with concentric circles, from London Wall, was probably one of a pair of cymbals, (No. 9).

Larger 'plate-type' cymbals also existed. These are not readily identifiable in the iconography but examples have been found in Egypt, although the dating of many of these is insecure.
A pair of cymbals, now in the British Museum, which date from about 200BC are some 15cm. in diameter with a broad rim, and shallow boss, (No.10). Cymbals from Luxor in New York, which are said to be 'Graeco-Roman' are larger, about 20cm in diameter, with a wider rim relative to the size of the central boss, (No.11). All have the usual central hole. Hickmann cites several more instruments from Egypt, in the Cairo museums, which are apparently of the same period.6

Pictorial evidence shows the contexts in which the cymbal was played in the Roman world and also gives some indication of playing techniques. Cymbals are most frequently depicted in connection with the rites of Cybele and Bacchus. The relief of the Gallus in the Palazzo dei Conservatori shows the cymbals with other instruments and objects used in the worship of Cybele.7 Many of the numerous literary references, mostly poetical, couple the cymbals with the *tympanum* in these rites, and some authors like Lucretius, who writes of the 'hollow cymbals' *cymbala circum concava*', refer to their shape.8

Many illustrations illustrate both the instrument's form and its Bacchic associations. A marble statue of a satyr from Farnese, a copy of a Hellenistic bronze original, shows clearly the strap handle, which is threaded round the two middle fingers of the player's hand.9 A second century sarcophagus in portraying Bacchus in triumph shows a small pair of cymbals lying on the ground, linked by a strap or chain, (No.12). There are many other examples.10 A dancing Maenad on a relief in Rome holds a pair of bowl shaped cymbals, with the ends of the staples which were fastened through the central holes and to which the chain or handle was attached, clearly visible on the insides.11
In most illustrations the cymbals are held in a vertical position and clashed together: \( \uparrow \downarrow \). This playing method is shown on a relief of Bacchus and a dancing Maenad in Naples Museum, (No.13), where a Maenad clashes cymbals above her head.

In the 'Turkish' method the cymbals are brought together at an angle with the arms moving in opposite directions, thus:

\( \uparrow \downarrow \)

This method was probably used - it results in a resounding clash - and such movement is sometimes indicated in the pictorial evidence.\(^{12}\)

The Baccic. thiasos on the fourth century 'Oceanus' dish from the Mildenhall treasure includes a dancing Maenad with finely detailed cymbals. These are bowl shaped and rimless, with some exterior decoration and are held in a horizontal position,\(^{13}\) Pl.89.

This is, according to Hickmann, a recognised playing position, which can be used to achieve a tremolo effect.\(^{14}\) However, such bowl shaped cymbals have little sonority, certainly less than the modern disc cymbal. One cannot expect great subtlety of technique where the volume of sound and the exciting clash of bronze was more important than tone production. Also, an artist would have been more interested in producing a balanced composition than in illustrating techniques of playing.

Cymbals were played at the rites of other exotic cults. The Zenon Papyrus is a request for the engagement of a Phrygian aulos player, Petius, for a festival of Isis, together with another musician, Zenobius the Eunuch, who played the cymbals needed for dance music.\(^{15}\) A reference by Athenaeus (VIII,361)
may indicate a wider use later, perhaps for all religious festivals. It is mentioned here particularly in association with the very 'Roman' goddess Fortuna.

All the examples cited above are of cymbals played in cult contexts by mythical beings. Undoubtedly human worshippers used them in a similar manner, but the cymbals had a wider use in the world of secular music, although not ranking as an important musical instrument. Numerous works of art attest its role in the popular music played by entertainers or in emphasizing the rhythm of the dance. The second century BC 'Dioscurides' mosaic, a copy of a Hellenistic panel picture depicting the dance group of New Comedy, includes in the group a man dancing while playing small bowl shaped cymbals with narrow rims, (No. 14). The cymbals played by the female dancer on the Hama mosaic are even smaller, rather like modern Turkish finger cymbals, which are about four cm. in diameter, (No. 15). The handles which are threaded around the dancers' fingers were probably made of cord or leather thong. Modern finger cymbals have elastic.

Small cymbals or jingles were also attached to some tambours and a type of clapper which is discussed below.
Notes

1.) Rimmer, 1969, Pl.V, XXI, illustrates cymbals and portrayals of cymbals dating from the second millennium BC.

2.) Representations of cymbals are so common in certain contexts that no attempt has been made to compile a complete list. Surviving cymbals and a few selected illustrations are listed in the catalogue. References to other illustrations mentioned in the text are given below. For Greek and Roman cymbals in general see Darenberg and Saglio SV. Cymbalum.

3.) Sachs, 1940, p.122, notes that the two types of cymbal are played in Tibet, commenting that the distinction was general throughout Asia from an early period and that both types were known in mediaeval Europe.

4.) Blades, 1975, p.179. The cymbals in the Gemeente Museum and The Hague are about 10cm. in diameter and both these and the instruments in Copenhagen are similar to the examples in the British Museum.

5.) Hickmann, H., 1949, Cymbales et Crotales dans L'Egypte Ancienne, Annales du Service des Antiquites de L'Egypte, 49, p.457ff. cites several cymbals with deep bosses and narrow rims - Cairo Museum, nos.69253,a,b, diameter 9.2cm; 69254,a,b, - 9.5cm; 69255,a,b, - 8.2cm.

6.) Hickmann, 1949, p.451,III. Cairo Archaeological Museum, no.69251, a and b. Diameters 15.15cm.; 69252, a and b, 14.8cm. Cairo Coptic Museum, no. 45973, diameter 16cm; 4654 - 18.5cm; - 18.5cm. The instruments in the Coptic Museum are from El Minieh wal Chourafa. Similar instruments are in the Egyptian department of the Louvre in Paris - see Vandier, J., 1942, Les antiquites egyptiennes au Musee du Louvre, Paris, p.62. Cymbals in Syria - Damascus Museum nos. 6161 - 6168- each about 6.5cm. in diameter. Zahdi, B., 1972, no. 30 shows these as four pairs. They were purchased in Damascus.


8.) Lucretius, De re natura II,2,618ff. Apuleius, Met. VIII,24;IX,4; Athenaeus IX, 361e; Juvenal Sat IX,60; Ovid Fasti IV,213; Pliny NH V,1,6; Propertius Carm. III,17,36 Virgil, Georgica IV, 64. Cymbals mentioned in connection with the cult of Bacchus: Livy, XXXIX,8,8; XXXIX,10,17; Ovid Ars amatoria 1,537ff; Macrobius Satuiae I,18,5; Propertius Carm. III,18,5f. Wille, 1967 discusses music in the rites of Bacchus and Cybele, p.53-62.

9.) Satyr from Parnese, Naples Museum Inv. no. 6022.
10.) For example: Child's sarcophagus, Third century AD, Vatican Museum. Amelung, 1903 - 55, II, No.73a, Taf.19, pl.80; Fleischhauer, 1964, Abb.41, p.78. In this example of a Bacchic procession of youths and putti, one figure clashes a pair of cymbals in the Turkish manner, while another pair lie on the ground.


The grave stone of Marcinus, Bonn Museum, Inv. no. U99 = CIL XIII 12080, of the first century AD shows a dancing Maenad with cymbals in her raised hands.

11.) Rome, Villa Albani; Fleischhauer, 1964, Abb.45, p.82.

12.) Daremberg and Saglio, Cymbalum, fig.2425; Hickmann, 1949, p.474. Hickmann also cites Athenaeus IV, 164e as evidence of the use of the Turkish method.


14.) Hickmann, 1949, p.456, fig.20, illustrates different methods of playing the cymbals and discusses the tonal effects.

15.) Zenon Papyrus. P. Hibeh, p.200-201, 245BC.
Chapter 12

Clappers

Like cymbals, hand clappers (crotala \( \kappa \rho \omicron \tau \alpha \lambda \) ) are, in the illustrations, played almost exclusively by women, usually as a percussive instrument to accompany the dance, rather than in ensemble. They are well represented in the iconographical evidence throughout the classical period. For example clappers consisting of two straight pieces of wood or metal appear in the hands of a female dancer on a red figure vase of the fifth century BC in Copenhagen\(^1\). They are often depicted in Etruscan art, as on a bronze statuette also of the fifth century BC from Chiusi, (No. 1). The clappers, one held in each hand, each consist of two slightly concave branches of wood or metal. Similar clappers are shaken by a reclining crotalistria, the subject of a bronze figurine in Verona, (No.2) and by a dancer portrayed on the wall of the Tomba del Triclinio at Tarquinia, (No.3). This crotalistria leads a line of dancers, marking time with the hand clappers. Her distinctive costume of blue chiton and closely fitting dark red jacket has bells attached to its shoulders.

Dancers with hand clappers are a common theme for Hellenistic bronzes and reflect their everyday usage. A Roman copy of a Hellenistic bronze depicts, rarely, a youth dancing with crotals which are represented as two hollow plates of wood or metal, almost bell-like in form, (No.4). A grotesque female dancer with clappers from the wreck of the Mahdia and dating from the early first century BC may be a mime.\(^2\)

Clappers appear in similar contexts in Roman art. A late illustration on the Obelisk of Theodosius in Constantinople,
erected in AD 390, demonstrates continuity of use, or at least of depiction. Among various circus scenes a troupe of dancers is led by a woman with hand clappers. Music is provided by tibia, syrinx and organ. The exact form of the clappers is no longer clear because of the erosion of the surface of the monument but they are probably of the late type, discussed below.3

The word crotalum is often translated as "castanet" and crotalisistria as 'castanet dancer'. This is not entirely satisfactory as it suggests similarity with the Spanish castanet, which indeed has the same function but is a specific type of wooden clapper. If one remembers that the form of the ancient clapper or crotal was not identical to that of the Spanish castanet, the term 'castanet dancer' is convenient. The concave clapper shown on the Berlin bronze (No.4) approaches the Spanish type and Eustathius describes the instrument as being made of shell, wood or metal, while Propertius refers to 'hollow' boxwood.4 The small clappers played by one of the female musicians on the third century mosaic from Hama may be even more similar to the Spanish castanet, each apparently consisting of two small hemispherical plates joined by a cord and held in the dancer's palm. They may however be finger cymbals rather than castanets and small cymbals of a size suitable for such usage are known to have existed.5

To some extent hand clappers had the same function as the cymbal and most portrayals of religious rites in Roman art, for example on a sarcophagi show cymbals rather than crotals. An exception is the relief on a child's sarcophagus of the third century, in Rome, where the armorini escorting Eros and
Psyche play various instruments, the lyre, tibia, panpipes, drum and distinctive clappers, (No.6). In a Bacchic context crotalā are played by a Maenad on the Dionysus mosaic from Cologne. Although the panel is partly destroyed it can be seen that the dancer holds a pair in each hand. Clappers are clearly distinguished from cymbals in the literature, for example by Clement of Alexandria who lists κροταλά separately from cymbals. Similarly an Egyptian papyrus records a request for entertainers to play the drum, cymbals and crotals. This papyrus is dated to 245 BC but there are several more records of later date which refer to 'castanet dancers'. In particular, one dating from AD 206 is a request for the dancer Isidora and a companion to perform at a private festival in the village of Philadelphia. Similarly another papyrus of AD 237 records the engagement of two dancers from Arsinoe in the Fayyum for the celebration of a ten day festival in the village of Bacchias. The two contracts although of different dates are of a standard form, specifying the number of performers, the length of time for which they were engaged, their payment and transportation and any special conditions, such as the insurance of their professional wardrobe. The term κροταλιστρίς or κροταλιστρία is clearly a recognised name for a dancer, a word formed by the name of the instrument that was indispensable to her art. The papyri afford an interesting glimpse into the life of these itinerant entertainers.

A distinctive type of clapper appears in the first centuries AD. Illustrations, mostly dating from the third and fourth centuries show a pair of small cymbals, four to five cm. in
diameter, mounted on long wooden or metal handles, which are bound together at the base to form a hand grip. The cymbals would have been nailed or rivetted to the handles, and when shaken clashed together. Several of these cymbal-clappers, usually described as crotals, have been found in Egypt, the type being well illustrated by an example in the British Museum, dating from about AD 400, (No.5). Dancers with identical clappers are often portrayed, particularly on Egyptian textiles, but illustrations are by no means confined to Egypt. Clappers of this type appear in the hands of a youthful dancer on a third century sarcophagus in Rome, (No.6) while the dancers Crescentia and Eleni on the fourth century Leda mosaic from Trier each hold two pairs, one in each hand, (No.7). On the fourth century 'calendar' mosaic from Carthage, now in the British Museum, the figure of April is represented by a female dancer who carries a pair of clappers in her left hand - the right is missing. She wears an Egyptian style of dress, perhaps suggesting that this style of dancing had particular associations with that country, (No.8).

The earliest representation of the cymbal clapper appears to come from Egypt, from the site of Cheikh Zouede. A mosaic pavement which may be of Hadrianic date shows a Bacchic dance at which a Satyr brandishes a pair of sticks with small circles at their ends, probably representing cymbals. The 'Etruscan' figurine in the Caylus collection of the Louvre, cited by Daremberg and Saglio must be discounted as it is of uncertain provenance and date. All other Etruscan representations of the clapper show the simple form which was in general use in Greece. The sarcophagi in Rome indicate
that it was known in Italy during the latter half of the third century, and of similar date is the Hama mosaic which also illustrates clappers of this type. The place of its origin is however not known. The weight of evidence suggests Egypt, but this may be due to the chance survival of evidence there. The form of clapper had a long history subsequently, being known in Byzantium and appearing in mediaeval manuscripts.

Although more elaborate in construction than the earlier types the function of these clappers remained the same, and there seems to be no change in the name of the crotalum or its players. For example crotalistria or *κροταλίστρια* are mentioned in the papyri of the third century BC and the third century AD, by Virgil, Propertius, Juvenal, Clement of Alexandria and Macrobius. The clapper cymbals were certainly in existence by the time of Macrobius and probably considerably earlier. In Greek the word *κρεμμύλλον* is often met for *κροτάλλον*, but there is no evidence that it indicates a particular form.
Notes

1.) CVA Copenhagen, Musee National III 1, P1.155,2, (Denmark 157).
Music is provided by an aulos - the female dancer beats time with
hand clappers.

2.) Bronze figurine of a female dancer with clappers - Tunis,
Bardo Museum. Merlin, A., 1910, Statuettes de bronzes trouves
en mer pres de Mahdia, Monuments Piot, 18, pl.11, p.9f; see
also Richter, G.M.A., 1913, Grotesques and the Mime, AJA 17,p.149.

3.) Organs No.34 Bruns, 1935, p.67.


5.) Organs No. 36, Cymbals No. 15.
Duchesne-Guillemin, 1971, p.121; also Duchesne-Guillemin,M.,1975,
Etude complementaire de la mosaique de Hama et l'etude
preliminaire d'une mosaique inedite de Soueida. Atti dell'
Accademia Nazionale dei Lincei, 30, pp99-112. Dr Duchesne-Guillemin
considers that the type of hand clapper shown on the Hama mosaic
developed into the Andalucian castanet. Spanish dancers, notably
girls from Gades, were famous in Roman times, and would certainly
have used hand clappers, - Blumner, H., Die Romischen
Privataltertumer, p.412.

Mosaic at Cologne Cathedral. Cologne, 2 ed.

7.) Clement of Alexandria Paedagogus II,4,192.

8.) P.Eibe 54, p.200-201. 245 BC.

P. Grenfell II,67.
Westerman, W.L., 1924, The Castanet Dancers of Arsinoe,

10.) Hickmann, 1949, p.530f. illustrates several crotals
depicted on figurines and on textiles - fig. 56,57,58.

11.) This type of clapper can also be seen on another sarcophagus
in the Termes Museum, Inv. no. 876.

des Ant. de l'Egypte, XV. p.17, Pl.3.

13.) D & S fig. 1572, Crotalum.

14.) See note 5. The 'clapper cymbals' are clearly shown and
appear to be very similar to Egyptian examples.

15.) Propertius IV, 8,39; Virgil Copa 2; Juvenal Sat III, 62;
Clement of Alexandria, Paedagogus II, 4, 192; Macrobius Sat II, 10;
Priap. 26.

16.) Athenaeus XIV, 636 d,e. Hickmann, 1949: 536 suggests that ..
the small finger cymbals were called, κρυθαλα.
Fig. 29 Scabellum No. 3. Statue of a Satyr, Uffizi, Florence.

Fig. 30
Scabellum No. 1.
Sarcophagus relief,
Rome, Palazzo dei Conservatori.

Fig. 31
Scabellum No. 7.
Figurine, Mima
Saltatricula, Hama.
The scabellum was a clapper which was attached to the foot, thus enabling a performer to beat time while leaving his hands free to play a second instrument or to dance. It was known in Greece as the κρουπεζα and is referred to by Pollux, and by inference by Ps. Aristotle and Aelian.¹ Pickard-Cambridge (1968) suggests that in Greece the kroupeza was only used to give the first note in dramatic choruses.² This seems rather unlikely but it is certainly true that the scabellum became more popular and had a greater variety of use in Hellenistic and Roman times. Most of the references to and all the illustrations of the instrument belong to these periods. For example, Lucian records its use by an aulos player to beat time.³

The scabellum consisted of two pieces of wood or metal which were hinged together and bound onto the foot. Some illustrations, as on a mid second century A.D. sarcophagus in Rome (no. 1) depicting a Bacchic triumph, show a small pair of cymbals or plates, presumably of metal, mounted onto the wooden blocks. These would give a clear sharp noise when struck together and would probably facilitate playing. The satyr who plays the scabellum on this sarcophagus also has Phrygian pipes, a frequent combination of instruments.

Illustrations of the foot clapper are not common, but several are shown in such orgiastic dances. A Bacchic scene on the Casali Sarcophagus in the Ny Carlsberg, Copenhagen, originally from a grave on the Via Appia, and dated around AD 200, shows among other figures, a bacchante who blows the tibia and treads the scabellum (no. 2). A
sculpture in the Uffizi, Florence, dating from the third century BC shows another satyr with scabellum and cymbals this time (no. 3). The detail of the strap binding the instrument to the foot is particularly clear on this example and the small cymbals are also shown.

The scabellum is also seen in a religious context, on a wall painting from Pompeii (no. 4) where it is played by a tibicen at a sacrifice. The pipes in this case are Phrygian and the scabellum is shown as a large block below with a thinner block or plate above, but with little detail.

The instrument is also played by a tibicen on a marble relief of the mid first century AD from Castel S. Elia, north of Rome, which shows an acclamation (no. 5). Again, the scabellum is unmistakeable, but no details are clear.

The scabellum was frequently played by mimes and popular entertainers and would appear to have been a common instrument in daily life, particularly in the east. An early example is seen on a much discussed terracotta figurine from Alexandria, now in Berlin, depicting a street musician who also plays a syrinx and a primitive bagpipe (no. 6). The object under his left foot was originally thought by Sachs to be some sort of pumping mechanism for the pipe, but Scott (1957), has demonstrated that it is in fact a scabellum, although it is not shown in detail. These 'one-man bands' seem to have been popular in the east and there are several similar terracottas from Egypt, of a similar date, the first century BC.

A later bronze from Hama in Syria, circa AD 200, shows the scabellum on the foot of a female mime, published by
M. Bieber as a mima saltatricu [a (no.7). The dancer wears an elaborate costume to which are attached twenty two bells and she has the remains of clappers, probably crotal[a in her hands. Her right foot is bare, but on her left is a buskin, adorned with four bells, whose only purpose seems to be as a strap for a scabellum, indicated by a thickening of the sole of the buskin. This lively figure was a familiar sight in the east.

In the west the scabellum appears on the pottery of Marcus Perennius Tigranus in Gaul, where it is indicated schematically but clearly, among several other instruments, (no.8). 'Oxe' 1933 and an inn scene on a mosaic from the Temple of Diana on the Aventine, Rome, shows two tibicines with scabella accompanying a dancer, (no.9).

Representations of the scabellum are however comparatively rare, certainly not as frequent as those of other percussion instruments, but there is other evidence to show that the instrument was familiar in Italy, at least. There are several references in the literature of the empire. Suetonius mentions the 'crepitus scabellorum' in association with Caligula's theatrical exploits, and Cicero refers to it in connection with the mime.

There is another source of evidence that shows the scabellum to have been a familiar instrument. There are several inscriptions recording the existence of guilds of players of the scabellum - collegia scabillariorum, all from Italy. These inscriptions come from Puteoli, Corfinium, Meaunia, Spoletium, Ficoronzium and Praenestina. However the members of these guilds, which enjoyed a high reputation in the early empire may not have been literally
'players of the scabellum' only, and certainly would not include the itinerant musicians of the east. The scabillarii seem to have been musicians directly connected with the theatre and it is possible that the scabillarius was the musician who directed the orchestra or group of players accompanying the mime or pantomime, being marked out from the others by his scabellum, which could be heard above the sound of the pipes, other instruments, or voice. He would undoubtedly play another instrument simultaneously, generally the tibia, but the scabellum would mark him out as leader. The connection with the theatre explains the frequent occurrence of these collegia in Italy.
Scabellum

Notes

1.) Pollux, Onomaecicon, VII, 87; Ps. Aristotle, de Mundo, VI, 399a; Aelian, NA, XV, 5.


3.) Lucian, De Salt., XI, 63, 83.

4.) Sachs, 1940, p. 143, pl. VII, C.; Scott, J., 1957, p. 414; Other figurines showing 'one man bands' are illustrated by

5.) Bieber, M., 1939, Mima Saltatricula, AJA XLIII, 640ff - see also under 'Bells'.

6.) Suetonius, Caligula, LIV, 2.

7.) Cicero, Cael. 27, 65. Augustine, de Mus., III, 1.

8.) Puteoli, CIL I, 1, 1642; 1643; 1647.
Corfinium, CIL VI, 4, 11, 33191; 33194; CIL IX, 3188.
Meunia, CIL XI, 2, 1. 5054.
Spoletium, CIL XI, 2, 1. 4813.
Ficoromium, CIL VI, 2, 1046, 1047, 1048.
Praestinensis, CIL VI, 2, 6660.
Martium Milesium Sarazanium, CIL VI, 2, 1045.
Ameria, CIL XI, 4404.

9.) Pliny NH, II, 95, 209, refers to the use of the scabellum in such a group - 'in symphoniae cantu ad ictus modulantium pedum moventur.'

The use of the scabellum and the position of the scabillarii is discussed by Baudot, A., 1971, Musicians Romains de L'Antiquite, Montreal, p. 60-65 passim. See also Thederat ix and Navarre in Daremberg and Saglio, sv. scabellum iv, 1106 and pantomimus iv, 317.

Two further representations of the scabellum, which are not mentioned in the text, are of interest - Cat. nos. 10, 11.
Fig. 32  Bells No. 1, 2, 3, 4. Scale 1:1.
Fig. 33
Bells No. 5 and 6.
Scale 1:1.
Fig. 34  Bells No. 7 and 11 and BM Reg. 1916 7-51
Fig. 35 Bells No. 9 and 10. Scale 1:1.
Fig. 36. Bells No. 12 and 13. Fishbourne, (after Cunliffe, 1971, Scale 1:1).

Fig. 37. Bell No. 14, Wandsworth. Scale 1:2
Chapter 21

Bells

Bells, (tintinnabula), which are frequently found on Roman sites had a primarily utilitarian rather than a musical function. They were usually made of bronze, a material that does not ring as clearly as modern bell metal, with iron clappers.

There were several forms which were made in many sizes. The collection of bells in the British Museum includes examples of the various types - hemispherical, cylindrical, four-sided, conical and tulip shaped, with round or polygonal, usually hexagonal handles. Catalogue numbers 1 to 9 illustrate the forms, (fig.32-35). The clappers have in some cases been replaced, where the original iron has decayed. There were several methods of attaching the clapper. In some cases, for example No.7, it was suspended from a loop which was fastened to the top of the bell on the inside. In bell No.7 the loop is original but the clapper has been replaced. Alternatively two holes were made in the sides of the bell near the top, a wire was threaded through and fastened to the handle, and the clapper was suspended from this wire, (Nos.10,11). No.10 also has the polygonal handle often found on bells of the Roman period.

The provenance and precise date of most of the bells in the British Museum collection is uncertain, but bells found in archaeological contexts demonstrate their wide distribution and the long period of time during which the many forms existed side by side. For example, bells of the four sided and hemispherical forms with polygonal handles came from the first century levels at Fishbourne. (Nos.12, 13). The same type of hexagonal handle can be seen on a bell of the late third or early fourth century from Richborough. A four-sided bell, a form that is particularly common in the Roman period was found in a fourth century context at Verulamium. The other forms are also found throughout the empire and there are particularly good collections in the museums at Koln, Mainz and Bologna.

The waisted tulip form is also characteristic. A fine example was discovered recently on the foreshore of the Thames at Wandsworth, (No.14). Such finds are very difficult to date but comparison with other bells suggest that it is at least of Roman date, the angular handle being typical. There are many
parallels. A bell from Wroxeter, dated to the third century is of similar shape, although at about 6.5cm, a little smaller, and with a heavy loop handle. A more exact parallel comes from Kastell Hüfingen and one from Binnington Carr in Yorkshire may, from associated finds, date from the first century AD. This type of bell may have been used for animals and an example in Köln is exhibited on a bronze collar suitable for placing around the neck of a sheep. Small bells were also attached to animal harness.

Bells had various other uses. They were played in some forms of the dance, and were often attached to the dancer's costume, as on a wall painting from the Tomba del Triclinio. A bronze figurine from Hama in Syria, dating from AD200, and representing a mime saltatricula is discussed by M. Bieber. The dancer has a scabellum on her left foot, carries hand clappers and wears the distinctive dress of the mime, the centunculus, a costume made of many pieces, to which are attached twenty-two bells of spherical shape. Some bells in the British Museum are of a suitable size to be used in this way (No.15). The tradition of the mimic costume goes back to Etruria where the sixth century Tomba del Pulcinella has among the funeral dancers a masked harlequin figure called Phersu. In a Roman context Cicero refers to female mimes performing in interludes and exodia in the first century BC as does Aulus Gellius in the second century AD.

In Bacchic illustrations dancers sometimes wear bells which usually hang from bands around the chest, as shown on several sarcophagi in Sardinia and Rome. The figure on a sarcophagus from Ostia is typical, (Note 10,4). The mimic figure wears a short tunic and on the upper part of his body a harness from which nine bells are suspended. Hand bells are played on a third century Bacchic sarcophagus in Rome.

In such ritual contexts bells undoubtedly had some atropaic significance, and there is further evidence of this. It was customary to make a loud noise to avert evil during an eclipse of the moon and Juvenal implies that bells were included among the implements used to create this noise. Sets of bells
were hung in doorways as a protection against evil spirits. One such **tintinnabulum** comes from Pompeii, (No.16). This has five hemispherical bells with angular handles which are suspended from a winged phallus with the hind legs of a lion, itself a symbol of plenty and a deterrent to evil spirits. Suetonius refers to the hanging of bells in the Temple of Jupiter Tonans in Rome after Augustus had dreamed that Jupiter Capitolinus complained that the Thunderer was stealing his worshippers. Augustus replied that Tonans had been installed as a doorkeeper and accordingly hung bells from the gable of the new temple to make it look like a front door.15 Similarly Pliny describes the tomb of Porsena of Etruria, with bells hanging outside.16

Bells were used for other religious purposes. They are included among the various articles deemed necessary for a sacrifice to Jupiter and an inscribed bell dating from the second century AD found at Tarragona appears to have been used in connection with the Imperial Cult, (No.17). A hemispherical bell in Chester Museum is from the well of the goddess Coventina at Procolita. References to bells in association with religious practices are however far less common than references to other instruments.

In daily life bells were rung as signals, for example, to announce the opening and closure of markets and baths.18 As might be expected bells and rattles were also used as children's toys.19
Notes

1.) Bushe Fox, J.P. 1924, Richborough IV, Pl.LVI, p.271


3.) Bells are so commonly found on Roman sites that it is not possible to compile an exhaustive list. The collections in Mainz, Köln and Bologna are representative. See, Behrens, 1912, Neue Funde aus dem Kastell Mainz. MZ VII, p.88, Abb.4 - No.4, a foursided bell with an iron clapper, height 5.3cms., No.5, a foursided bell, height 7.00cms., No.6, a foursided bell, height 6.00cms., No.7, a foursided bell with feet at the corners, height 5.00cms., No.8, round or hemispherical form, height 4.4cms., No.9, tulip form, height 12.5cms. Also, Behn, 1954, Taf 67, Abb 155, illustrates bells in the Reichisches Germanisches Museum, Mainz. Köln Bologna.


6.) Köln Museum No.4129. See also 8984.

7.) Apuleius, Met. X; Lucian, Luc. 48.

8.) Duell, P. 1927, The Tomba del Triclinio, MAAR VI, p.9-68, esp.p.19ff Pl.2. Also Tomba del Pulcinella, Poulsen, Etruscan Tomb Painting, p.12, fig.4-6.


10.) Poulsen, F., 1922, Etruscan Tomb Paintings, Oxford, p.12, fig.4-6.

11.) Cicero, Phil II, 24,58; VIII, 9,26; Aulus Gellius Noctes Atticae I,5,3.

12.) Pesce, G., 1957, Sarcophagi Romani di Sardegna, 27f. Sarcophagi with dancers wearing bells include:
    1. Cagliari Museo Archeologico Nazionale, Inv. no.6137, Pesce, p.25, Pl.VIII, IX.
    3. Rome, Museo del Capitolino. Pesce, fig.15, Pl.XIV.
    4. Ostia Museum. Inv. no.1140. Pesce, fig.16,17,18, Pl.XV, XVI.

14.) Juvenal Sat. VI, 441. On the beating of bronze at eclipses also, Tibullus, I, 8,21f; Ovid Met IV, 333. Livy, XXVI 5,9; Tacitus Ann. I,28,1-3.

15.) Suetonius Aug. 91.

16.) Pliny NH XXXVI, 19,8.

17.) Plautus, Pseud.332.

18.) Martial, XIV, 163.

19.) Martianus Capella, 1,7.
The mosaic from Mariamin, near Hama, in Syria, shows several instruments which are being played together in concert, among them a series of bowls, which a female musician is beating with two sticks. The other instruments are a cithara, an organ, crotals and cymbals. The bowls, which are coloured yellow, are probably of metal, and bronze, or gilded bronze may be indicated. This percussion instrument is extremely unusual and I know of no other illustrations before this date, the late third century A.D. The acoustic principle involved was however known to the Pythagorean philosopher Hippasos of Metapontum. He measured the variation of sound produced when metal discs of varying thicknesses were hit and he also noted that the pitch of a note produced when a bowl containing water was struck altered with the amount of water in relation to the volume of air.

The bowls shown on the Hama mosaic are all about the same size, any variation being more easily attributable to the lack of skill of the mosaicist, rather than to any deliberate design, and in any case there is no obvious progression in size. They were, therefore, either of differing thicknesses or else were filled with differing volumes of water, so that each would sound a separate note.

The sticks with which they are struck are an interesting feature. I have already remarked, in connection with the drum, that sticks were not associated with the classical musical tradition, but seem to be an eastern feature, although there could hardly be any other practical
way of sounding these bowls. In order to achieve the maximum clarity the upper edge of the bowl would be hit, thus producing a bright cymbal-like sound.

There is one other illustration of a similar instrument, in the manuscript known as the Vienna Genesis, which is probably of Syrian origin and is dated to the fifth or sixth century A.D. (no.2). The illustration shows four bowls coloured grey, possibly representing silver, arranged in a row on a stand. Again they are being played with two sticks by a woman. In this case the bowls are accompanying the music of the tibia.

There is an apparent reference to this instrument in the writings of the Byzantine lexicographer, Suidas. He credits a certain Diocles with the invention of a chime of earthenware bowls which were struck with a wooden stick. The Diocles in question may not be, as Suidas thinks, the poet — another possible candidate is a scientist of the same name who lived in the first century A.D., although there can be no proof of this.

Sachs cites several parallels for this type of instrument, in the Chinese suspended chimes and in the sets of porcelain or metal cups which are arranged and played on the ground, found in the Malay archipelago and in India. There are no very early illustrations but it is quite feasible that such an instrument existed in India in the first centuries A.D. It is possible that although the principle of the instrument was known to the Mediterranean world its actual use may have been introduced through contacts with the east and Syria, the only part of the Roman empire where it is illustrated was certainly an
important trading centre on the routes to the east. However, whatever their origin bowl chimes do not appear to have been widely known.

Notes
1). Gerstinger, H., 1931, Die Wiener Genesis, Vienna, p.145, taf. 34.


3). Sachs, 1940, p.279.
Fig. 38 Sistrum No. 1.
Naples Museum 8777

Scale 1:2 approx.

Fig. 39 Sistrum No. 2.
Naples Museum 8776
The sistrum (σκιστρον) was a type of metal rattle (a shaken idiophone), which, in the Roman period, was particularly associated with the worship of Isis. It seems to have originated in the Pharaonic era in Egypt and is found in Mesopotamia from 2500 BC, where it took the form of a U-shaped spur with a handle, and loose cross bars. These rattled against the frame when shaken. In Egypt it had two, different, forms. The naos sistrum is only found in Egypt and represented a small temple, supported by a handle fashioned in the shape of Hathor's head.

The other type had a frame in the shape of a horse-shoe, with the closed end at the top. Holes were bored in the metal frame and the rattling wires were threaded through. During the periods of the Old and Middle Kingdoms jingling discs were slipped onto the wires, but these went out of use in the New Kingdom. On elaborate instruments various attributes of Isis, or even statuettes of the goddess were incorporated. The handle was often cast in the form of Bes, the god of healing.1

It was this horse-shoe type that was adopted in the Roman world with the spread of the cult of Isis. There are several complete sistra from Pompeii, both decorated and plain. Naples Inv no. 8777 is a typical example of a plain sistrum, with a cat on top and four rattling wires, bent over at the ends, one of which is now broken (no.1), fig. 38. No. 8776 (no.2) has a handle moulded in the form of Bes and Hathor, with the usual cat on the top of the frame and four cross wires. The Pompeian sistra are all of bronze and do
not have any jingles strung on the wires,\(^1\) (nos. 3 - 5).

Sistra were also made in other metals. A sistrum of gilded silver is listed at Nemi in an inventory of the treasure of Isis and Bubastis and Apuleius mentions bronze, silver and gold.\(^2\)

A marble relief in the Vatican (Belvedere) of the second half of the second century A.D. shows a sistrum carried in an Isiac procession.\(^3\)

A marble statue in Naples Museum shows Isis holding a sistrum.\(^4\) The instrument was so closely associated with Isis that it is often shown as the sole symbol of her cult. For example, a fourth century mosaic from Carthage which depicts the months and their various attributes, includes a sistrum among those for November.\(^5\) This is an allusion to the autumn festival of Isis at the beginning of the month. This instrument is shown open at the bottom.

\[\text{\(\uparrow\)}\]

Similarly, a lamp from Campania, on which are shown the symbols of all the gods of prosperity, has a sistrum to represent Isis.\(^6\)

The rattle appears to have had no musical function except in religious rites. The sound it produced would have been rather 'tinny' but impressive if many sistra were shaken simultaneously.

There are many literary references to its place in the
worship of Isis, but Vergil's reference to its use by Cleopatra as a war trumpet is sarcastic.
Notes.

1.) MGG - *sistrum*; Sachs, 1940, p. 89-90.
2.) D & S - *sistrum* p. 1355; Apuleius *Met.* XI, 10.
4.) Naples Museum Inv. No. 6372.
5.) Clappers No. 8; BM Cat. of mosaics, No. 29.
   Martial, XIV, 54.
8.) Vergil *Aen.* VIII, 696.
Chapter 24

The Rattle - Crepitaculum

Rattles, crepitacula are known to have existed but played little part in the music making of the Roman period. References to the crepitaculum usually mention it as a child's toy. Martianus Capella writes of rattles and bells that were used to lull children to sleep, and Quintilian refers to the instrument when describing the orator's trick of placing a series of short syllables together to produce a staccato effect, similar to the noise made by a child's rattle.¹

The most important rattle was of course the sistrum, described above. This had a specialized use, but the name crepitaculum is sometimes applied to the sistrum used in religious rites.² Several instruments in the Museum of London are certainly rattles, but may be a type of sistrum. They are made of iron and each has a flat body, of one of a variety of shapes, rectangular, triangular or 'paddle shaped', attached to a handle. In all cases the body is perforated with circular holes through which wires are threaded, and these would rattle when the instrument was shaken. A similar paddle shaped rattle found in the catacombs at Rome has bells attached to the wire rings. (Nos.1,2,3.)

Rattles were also made in less durable materials. Earthenware rattles in the form of birds have been found in Germany. These would have made attractive toys and similar instruments would surely have existed elsewhere in the Roman world.³
Notes

1.) Martianus Capella I,7; IX, 927.
    Quintilian, Orat. IX, 4,66.

2.) Martial XIV, 54.

3.) Klar, 1971, p.329
Bird shaped clay vessels which may have contained rattle
pellets have been found in Scandinavia and date from the
Iron Age. Lund, C., 1981, The Archaeomusicology of
Scandinavia, World Archaeology 12, 3, p.252.
Chapter 25

The Drum

The drum in its various forms is a very ancient instrument. Technically it is a membranophone and the sound is produced by the striking of a membrane usually made of hide or skin, which is stretched over a sound box or frame.

The tympanum (τύμπανον) was a shallow frame drum, a small portable tambour which is often illustrated in the decorative art of the Hellenistic and Roman periods. It consisted of a narrow circular frame made either of metal or, more probably, of wood, which would be lighter, over which the skin was stretched. On a modern tambourine which is of similar shape, the parchment head is nailed to the frame and Mesopotamian drum heads were nailed or glued.1 Greek and Roman drum heads may have been fastened in this way but illustrations suggest that they were sometimes tied with thongs or laces.2 One of the finest representations of an ancient drum, on one of the mosaics by Dioscorides, from Pompeii, shows tassels attached to the frame but these may be merely decorative, (No.1), Pl. 90.

One basic question about the tympanum is whether it was a double or a single headed drum. Most illustrations show the instrument too schematically to be of much value when this point is considered but Suidas' statement, that the tympanon was made 'from skins', has been cited as evidence that it was double headed.3 Although Suidas is a late source Curt Sachs held this view also pointing out that the handles, which are apparently attached to some drums shown on vase paintings of the fourth century BC, would be unnecessary if the instrument
clappers or bells rather than thongs. (No. 5).

An interesting and as far as I am aware, unparalleled discovery in Alsace indicates that the form of the tympanum may not always have been as it is conventionally shown on so many reliefs and paintings, (No. 6). Among several objects in a woman's grave found at Koenigshoffen, in an area used as an urban cemetery during the third century AD, was a wooden object adorned with four pairs of cymbals made of silvered bronze. This has been plausibly reconstructed as a square framed tambour. The frame was made from four pieces of wood which were nailed or tied together and the resonating membrane was wrapped around it and secured with thongs. As suggested by their position in the ground the small cymbals or jingles were fixed in pairs at each end of two of the rods forming the frame, so that they would clash as the instrument was beaten and shaken.

One might normally assume that the small cymbals, which are about five cm. in diameter were either played as finger cymbals or attached to the handles of clappers. However, their number and position in the ground makes both interpretations unlikely. It seems clear from the excavation evidence that there were traces of a rectangular frame and that the jingles were not arranged in a manner suitable for cymbal-clappers. As reconstructed the instrument would make a most satisfactory tambour, the ends of the frame without jingles acting as handles, so that the player could hold the instrument without touching the membrane. The find emphasises the likelihood that jingles were also fitted to the more common circular tambours.

The stick was not used until comparatively late in the history of the drum. The tympanum, often lifted high above
A Bacchic scene from Pompeii in marble intarsia shows a Maenad dancing in ecstasy, carrying a torch and a tympanum which is suspended by a single handle attached to the frame, (No. 2). Many illustrations do not however show any handles and in similar Bacchic scenes Maenads often hold drums by their frames, like tambourines.

The larger drum on the Dioscorides mosaic, a copy of a Hellenistic painting of street musicians, a dance group in New Comedy, is held horizontally with the player’s left hand grasping the edge of the instrument, the other tapping it from underneath. The mosaic is finely detailed and the artist has apparently shown a double headed instrument. The frame of the drum is shown in blue/grey tesserae with decorations, including two tassels, picked out in white. A narrow band of reddish brown runs along the upper edge of the frame and the underside of the instrument is of the same colour. This represents the drum-skin and its presence on both sides of the frame seems to indicate a double-head. Some doubt must remain however as one cannot expect complete accuracy of representation. It is possible that both types existed, but whether single or double headed the essential quality of the tympanum was that it was light framed and easy to carry in the dance.

Some illustrations show jingles attached to the frame of the tympanum as on a tambourine. Maenads on a wall painting from Pompeii and on a Bacchic sarcophagus in Rome play instruments of this type, (Nos. 3, 4). A stucco relief in the British Museum shows a putto holding a very stylized tympanum in his left hand. This has a long strap handle attached to its frame and six projections which may be small
the performer's head in dance scenes was usually struck with
the hand, as on the Pompeian wall painting, (No. 3). The
drum stick was however known in the early centuries AD in the
Middle East and in India where it may have originated. Suidas (Fr.1165) states that the drum (tympanon) was struck
'with wood', but he is writing several centuries after the
period in question and the stick may have been a more familiar
sight in his day.

Two reliefs of the third century AD, both in Rome, may
show drum sticks. A fragment in The Vatican Museum shows
draped figures carrying circular objects which they are beating
with sticks, (No. 7). These appear to be tamboura but as the
details are not very clear it is possible that they are some
form of clapper. A Bacchic sarcophagus in the Terme Museum
depicts a similar instrument played by a young reveller, (No.8,
pl.29,30). This is shown more clearly as a tympanum held in
the left hand, beaten with a stick held in the right.

Most illustrations of the tympanum show little detail but
are interesting for the context in which the instrument is
played. The Maenad dancing in a Bacchic procession is an
enduring artistic theme, from Greek vase paintings to Roman
sarcophagi and other reliefs. Such Bacchic scenes are found
throughout the empire and the tympanum is mentioned in
connection with Bacchic rites by many authors. 8

It was also associated with other cults, particularly that
of Cybele. The second century relief of a Gallus in Rome
includes a tympanum, hanging by a strap, with other ritual
objects used in the worship of the goddess. With the cymbals
the drum may have had a special function in the mysteries. 9
The tympanum is sometimes carved beside inscriptions which
refer to the cult and literary references as numerous. Lucian, describing a ceremony in honour of Cybele, emphasises the powerful effect of the music on its hearers, mentioning specifically the singing which was accompanied by pipes and drums, and Apuleius also includes tympana among the instruments played by a troupe of itinerant Cybele worshippers.

In secular contexts drums were played by entertainers of various grades. It is unusual to see the tympanum played by a man on the Dioscouri mosaic - in scenes of revelry the instrument is almost invariably carried by women. A drum of a different shape appears on a terracotta statuette from Syria, 'of Roman date', which is now in the Louvre, (No. 9). Two female musicians, one playing the tibia, the other a tambour ride on a camel, perhaps in a procession. The drum is deeper than those shown on Bacchic reliefs and appears to be a single headed cylindrical drum, perhaps made of earthenware, as are the pottery drums played in the East to-day. There is no sign of neck lacing or other means of fastening the skin to the body of the drum but the head overlaps the body. The musician beats the drum with her hands. A similar statuette in Damascus dates from the second century BC. (No. 10).

The girls may be two of the famous Syrian ambubaiae so called after the name of their instrument which was the equivalent of the tibia. These Syrian pipers, harpists and timbrel players were well known in Rome where they enjoyed a bad reputation. Juvenal protesting about the importation of Syrian vices into Rome, includes foreign tambours with the other outlandish instruments, pipes and harps. Syrian musicians also played the tympanum in its usual form. Another
figurine shows two girls again seated on a camel, playing shallow circular frame drums, (No. 11).

The drum had no place in Roman martial music nor is it shown with brass instruments in the amphitheatre or circus bands.\textsuperscript{13,14}.
Notes


2.) Modern African drums are commonly laced. Thongs which may be functional or purely decorative can be seen on many ancient representations of the tyx drum, as for example, on a Campanian red figure stamnos in Naples, (H 2419), dated 420 BC, Wegner, 1963, Abb.15, p.36; A tympanum portrayed with a sleeping Maenad in the House of the Citherist, Pompeii, Naples Museum, No. 112283, has dangling ribbons and loops which may represent lacing.

3.) Suidas, (ed. Adler), Fr. 1166.

4.) Sachs, 1940, p.148.

5.) A painting from the House of Epidius Sabinus, Pompeii, Naples, No. 27875, of the Delusion of Silenus, may show the back view of a tympanum, which is apparently single headed, and also has jingles attached to the frame.

6.) Objects which may be jingles are quite frequently shown on tambours in Bacchic scenes, for examples: Blades, 1970, p.177, 180 – a second century relief of the Triumph of Bacchus, in the Walters Art Gallery, Baltimore, which includes a tambour with three sets of jingles; sarcophagus no. 577, Vatican Museum, Sala a Groce Greque; a third century sarcophagus in the Vatican, Belvedere, Amelung, II, No.73a, Taf.19, p.180, Fleischauer 1964, Abb.41, p.78. In the last example, the instrument, played by a youth, is held by a strap. One jingle can clearly be seen on the left side.

7.) Sachs, 1940, p.158 discusses the Indian origin of the drum stick. Musicians on a relief of the first century AD at the temple of Sanchi in Central India carry drums suspended from their shoulders. Each drum is beaten on one head with two sticks.

8.) The Bacchic revel remained a popular decorative motif – witness its use in Britain in the fourth century AD, for example on the Brading mosaic, VCH Hampshire, 1900, Vol.1, fig.23; and on the Mildenhall silver, Toynbee, p.169, pl. 115. Pl. 79 Hesychius states that tympana were the drums played at Bacchic revels, and it is described at such rites, e.g. by Catullus *Carm. LIX*, 262; Ovid Met. II, 17; IV, 28, 391.

Fleischauer, 1964, Abb.47, p.84.
The role of the cymbal and tympanum in the mysteries of Cybele is discussed by Hepding, H., 1903, *Attis und sein Kult*, Religionsgeschicht-liche Versuche und Vorarbeiten I, Geissen; Ricker, p.128.

10.) ILS 4145 and 4152, examples of this type of inscription are both of the fourth century and come from Rome.
11.) Apuleius, Met. VIII, 30.
Other references to the drum in the worship of Cybele and
Attis include, Catullus, Carm. LXIII, 8; Lucretius, II, 618;
Verg. Aen. IX, 619. Tacitus, Hist. V, 5, describes the use
of the drum in Jewish religious ceremony.

12.) Juvenal, Sat. III, 62;
Ambubaiete - Horace, Sat. I, 2, 1; Nero Suet. 27; Petronius,
Sat. 74, 13.

13.) The historian Justinus notes that the drum was beaten
by the Parthians as a battle signal, in place of the tuba, 41, 2, 8.

14.) Sachs (1940, p. 148) has identified a form of bowl drum
which is shown on Apulian vases. It looks like the shallow
segment of a sphere or an upside down bowl, with the base cut
away. A skin is drawn over the top and curved sides and is
fastened with nails which are shown around the central area.
If this interpretation is correct the drum would be struck only
in the centre, where the skin covers the opening. According to
Sachs there are parallels in the Chinese pang ku and the South
Indian dasari tappattai, but that does not prove that the
Apulian instrument was of similar form. The type does not
appear on later Roman reliefs.