

3.12.1.5: Other Musical Instruments

There are many older instruments which only exist in museums today such as the shawm, viol, cornophone and crumhorn. Others, like the Hurdy Gurdy, have been around since the 11th century and still exist but are rarely heard. The following web sites describe various antique instruments and have sound samples for some of them: [Renaissance Instruments](#), [Guide to Medieval and Renaissance Instruments](#), [Edinburgh University Collection of Musical Instruments](#), [Zzounds renaissance instruments](#).

Musicians continue to make new instruments and modify older ones.

Video/audio examples:

- YouTube performance of a [Hurdy Gurdy](#).
- YouTube of the [Stroh violin](#).
- The [Tromba-marina](#) is an interesting instrument popular in the 18th century.
- YouTube of the [wine glass harmonica](#).
- YouTube of [several unusual instruments](#) and a web page of [a few more unusual instruments](#).
- Wikipedia on the Jew's harp.
- [Chinese singing fountain bowl](#) YouTube.
- [Tibetan singing bowl](#) YouTube. [One with water](#).
- Here is a web site that discusses how to create and play a [pitch-bending accordion](#).
- Aeolian percussion instruments at the [Harmonic Fields](#).
- The Hang is a relatively new instrument similar to a steel drum but played by striking it with the hand. [YouTube of a Hang being played](#).
- The [Theremin](#) is an interesting instrument that uses electrical capacitance to change an electronic circuit to make sound. The performer does not actually touch the instrument as seen in these YouTube videos: [one](#), [two](#).
- Here are a series of [Ted talks about unusual instruments and performances](#).
- If you ever thought of making a unique instrument that never existed before you might want to take a look at the Experimental Instruments web site for ideas.

Summary

Percussion instruments tend to have overtones that are not harmonic (not multiples of the fundamental). If the anharmonicities are strong enough the sound is perceived as noise, not a pitch. Under certain circumstances the anharmonic overtones can be damped or tuned so that there are enough harmonics to cause the instrument to have a perceived pitch. This can happen with harmonics of a real fundamental frequency and also when the harmonics are multiples of a missing fundamental that isn't a vibrational mode of the instruments.

Questions on Percussion Instruments:

1. What are the two main categories of percussion instruments?
2. How are the vibrational modes of a drum head similar to those of a string and how are they different?
3. Why do you need two numbers to specify the vibrational mode of a drum head but only one number for a string?
4. Describe the first few modes of a square membrane, clamped at the edge.
5. Describe the first few modes of a circular membrane, clamped at the edge. How are they different from the square case?
6. Why does striking a circular drum at the center sound different from striking it off center?
7. Draw the (5, 0) and (5, 1) modes for the body of a cylindrical drum head.
8. What is the difference between instruments that make a perceptible pitch and those that do not?
9. Why don't most drums have a specific pitch?
10. Drums are membranes stretched over a body. What would happen if there was no body to the drum (just a fixed circle holding the membrane)?
11. Why does a timpani drum have a perceived note but a snare drum does not?
12. How does the tension of the membrane change the vibrational modes of a drum head?
13. How do you change the pitch of a timpani drum?
14. Why does the tabla play a perceived note but a snare drum does not?
15. How does the thickness of a drum head modify its sound?
16. What is the purpose of the snare on a snare drum?

17. What are some differences between the vibrational modes of a string and of a rod that is free at both ends?
18. Draw the 5th mode of a rod with one end fixed.
19. Which mode is emphasized by suspending a bar from the points one quarter and three quarters along its length? Explain.
20. What is different about a xylophone and a vibraphone that make them sound different?
21. What effect does different decay rates for various overtones of a percussion instrument have on the perceived pitch?
22. When playing a xylophone, why might it initially sound harsh before it smoothens out?
23. What is the purpose of resonance tubes below the bars of a vibraphone and marimba?
24. What is the purpose of trimming the bottom side of a marimba bar?
25. Why is the strike tone of a chime not the same as the perceived tone (Hint: Review the section in the perception chapter on virtual pitch.)?
26. What is a gamelan?
27. In class and in the book you saw some pictures of holograms of ancient Chinese bells. Explain what the holograms showed.
28. What is a Theremin and how does it work?
29. What is different about the vibrational modes of a cylindrical cymbal and a cylindrical drum head?
30. Define anharmonic.

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