

Visualizing Sound Vibrations

A U3A Bendigo Learning About Your Technology Discussion Paper

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Reference: *Frederick J Ample, the History of Audio and Sound Measurement.pdf*

For millennia, sound was considered too elusive a phenomenon to be studied. The ancient Greeks recognised that when strings or columns of air were vibrated, sounds were produced and that harmonious sounds resulted if strings or air columns with lengths related by simple whole number ratios were vibrated together. The vibrations were too fast to be observed or measured. Only in comparatively recent times was the relationship between vibration frequency and the pitch of the sound recognised. Subsequent research discovered ways of recording and visualizing sound and eventually, in the last few decades, ways of recording sound digitally.

1711—John Shore invented the Pitch Fork, an instrument that vibrated at a fixed frequency.

1807—Thomas Young coated a rotating glass cylinder with lamp-black, pushed a pin through a flexible diaphragm and shouted into the diaphragm to produce a trace generated by the vibrations. In 1877, Edison turned this into the Phonograph.

1834—Felix Savart rotated toothed wheels at known speeds to demonstrate that specific tones were associated with specific frequencies.

1857—Jules Lissajous arranged two pitchforks at right angles and shone a light on the tine of one fork so that it was reflected onto a tine of the second and observed the looping curve produced by the spot of light. The curve closed when the two frequencies were related by a rational ratio. Easily recognisable curves were generated when the two frequencies were related by simple whole number ratios.

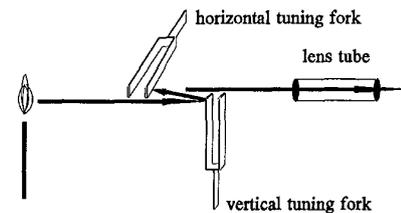
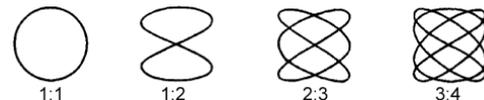
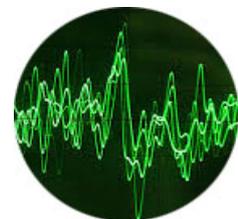


Figure 3. The original mechanical oscilloscope, developed by Jules Lissajous (1857).

1876—Thomas Edison and Emile Berliner independently invented the carbon microphone which generated an oscillating electrical voltage that corresponded to the sound vibrating the diaphragm.

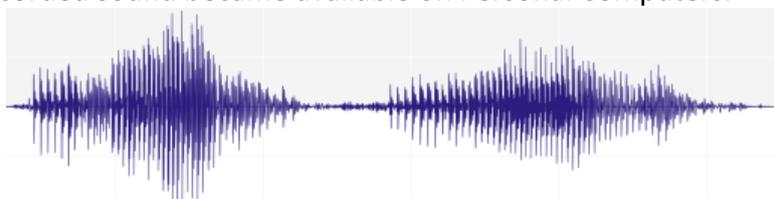


1931—V. K. Zworykin invented a permanently sealed, high-vacuum cathode ray tube, a stable and reproducible component that allowed the production of oscilloscopes that could be used outside the laboratory. Making sounds near a connected microphone generated voltage fluctuations that produced a visible image of the sound wave on a phosphorescent screen.



1977—Sony produced the first commercially available digital sound recorder.

1990s—Inexpensive digital audio recording software with visual waveform representation of the recorded sound became available on Personal Computers.



The waveform for "Hello, how are you" recorded via audio recording software running on a PC