Early Discoverers in Acoustics

Pythagoras

In the 6th century BCE, the ancient Greek philosopher Pythagoras wanted to know why some combinations of sounds seemed more beautiful than others. He found answers in the numerical ratios representing the harmonic sounds of vibrating strings. He observed that when the lengths of these strings are measured as ratios of integers (for example 2:3 and 3:4), the tones produced will be harmonious, and the smaller the integers the more harmonious the sounds.

Aristotle

Aristotle (384–322 BCE) understood that sound consisted of compressions and rarefactions of air which "falls upon and strikes the air which is next to it…", a very good expression of the nature of wave motion.

Vitruvius

In about 20 BCE, the Roman architect and engineer Vitruvius wrote a treatise on the acoustic properties of theaters including discussion of interference, echoes, and reverberation. This was the beginnings of architectural acoustics.

In Book V of his *De architectur (The Ten Books of Architecture)* Vitruvius describes sound as a wave comparable to a water wave extended to three dimensions, which, when interrupted by obstructions, would flow back and break up following waves. He described the ascending seats in ancient theaters as designed to prevent this deterioration of sound and also recommended bronze vessels of appropriate sizes be placed in theaters to resonate with the fourth, fifth and so on, up to the double octave, in order to resonate with the more desirable, harmonious notes.

Abū Rayhān al-Bīrūnī

During the Islamic Golden Age, Abū Rayhān al-Bīrūnī (973-1048) stated that the speed of sound was much slower than the speed of light.

Galileo (1564–1642)

The physical understanding of acoustical processes advanced rapidly during and after the Scientific Revolution. Mainly by Galileo Galilei Marin Mersenne (1588–1648), who each independently discovered the complete laws of vibrating strings (completing the work of the Pythagoreans 2000 from years earlier). Galileo wrote:

> *"Waves are produced by the vibrations of a sonorous body, which spread through the air, bringing to the tympanum of the ear a stimulus which the mind interprets as sound."*

Newton (1642–1727)

In his great book, *Principia*, written in 1687, Newton demonstrated the mathematical relationship for wave velocity in solids. This became the cornerstone of modern physical acoustics.