

# Nehru Science Centre

SOUND AND HEARING



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We live in an ocean of vibration and we perceive sound through the varied manifestations of vibration. When we see the movement of a bird's wing and hear a flapping sound, or hear the clangs of bell, we become aware of a relationship between

Sound is the message from a distance. Observe how our ears receive sound vibrations from a source and transmit through nerve cells along the auditory nerve to the brain where they are decoded and perceived.

string or the diaphragm in a loud speaker, makes sound as they vibrate in air. What symmetric patterns are obtained when a sand sprinkled metal plate is made to vibrate by a bow stroked along its edge?



create a music artificially by sound synthesis. Watch how a cricket makes sound and a gramophone reproduces music. Play with the microprocessor based game to enhance your knowledge. It is all a learning experience through fun.

## HOW DO WE HEAR?

vibration and sound. The soft murmur of rivulet and chirping of birds, and the loud noise of a city with bangs and shrills tells on our hearing organ, the ear, in some way.



How sound travels?  
Sound is a push that passes through the medium in the way a ripple passes through water or a squeeze travels the length of a slinky. Like light, sound is created by motion and carry motion to other places.

Vibrating sound sources produce pulsating waves which can be described by the number of pulses sent out in a second. This number of vibrations per second are known as frequency or hertz. What is the frequency of your voice? Observe in the



NO AIR  
NO  
SOUND



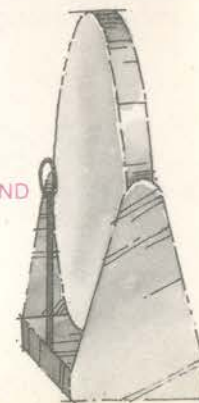
Like light, sound is reflected, bounced and diffracted. Observe how your whisper travel to the remote end of the hall by two dish type reflectors. Reflected sound can also be guided. The Echo Tube guides sound waves back to their source by means of multiple reflections off the tube walls. Observe the interference and diffraction of sound waves as demonstrated by ripples in the water tank.

How does one produce beat and resonate sound?



Sound vibrations are transmitted from a source to our ears through a medium. The medium can be a solid, liquid, or gas. But what happens on the Moon, void of air? How do the cosmonauts converse there? One would find that here, without travelling to the Moon.

And finally how much do we hear. The sound of a



How is sound generated?  
Pluck or bow a string,  
blow a horn or flute, beat  
a drum or cymbals, play  
musical instruments or



oscilloscope and read it in the counter.

How sound travels in air,  
in water, or in solids?  
Human vocal chords or a



instruments. In Rig Veda, for example, one finds mention of the Veena, the Vanshi (flute) and the Damaru. Different instruments produce different sounds

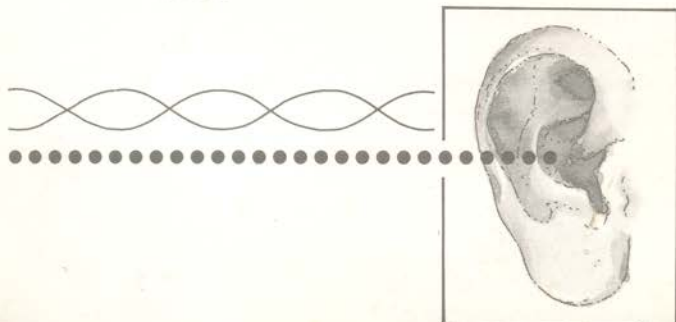


LISTEN  
WHEN  
YOU  
TALK

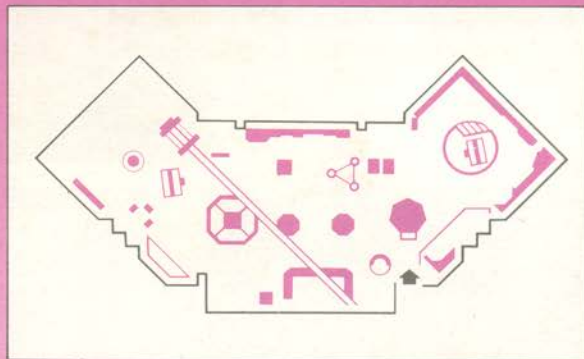
conchshell, or whistle or sitar tells us the frequency of its vibration. Little do we hear below the hum of a bee or above the whistle of a robin. The sound at ultrasonic levels remain in-audible to our ears, but industries use it very effectively.

Music in India has reference dating back to the vedic age (2000 to 1000 B.C.), which specifically mentions a number of musical

depending on the material from which they are made, their shape and how they are played. The medium in these instruments can be set into vibration to produce musical sound in various ways. It may be moved by a breath of air or it may be bowed, plucked, struck, rubbed or shaken. The Indian musical art is unique in conception, design and approach.



## SOUND AND HEARING



## WHAT TO SEE

- 1 How do we hear?
- 2 How Sound travels?
- 3 Sound of Music
- 4 Mix to make Music
- 5 No Air no Sound
- 6 Listen when you talk
- 7 Expanding waves
- 8 How they make Sound?
- 9 Sympathetic Pendulums
- 10 Music of India

AND MANY MORE



## NEHRU SCIENCE CENTRE

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