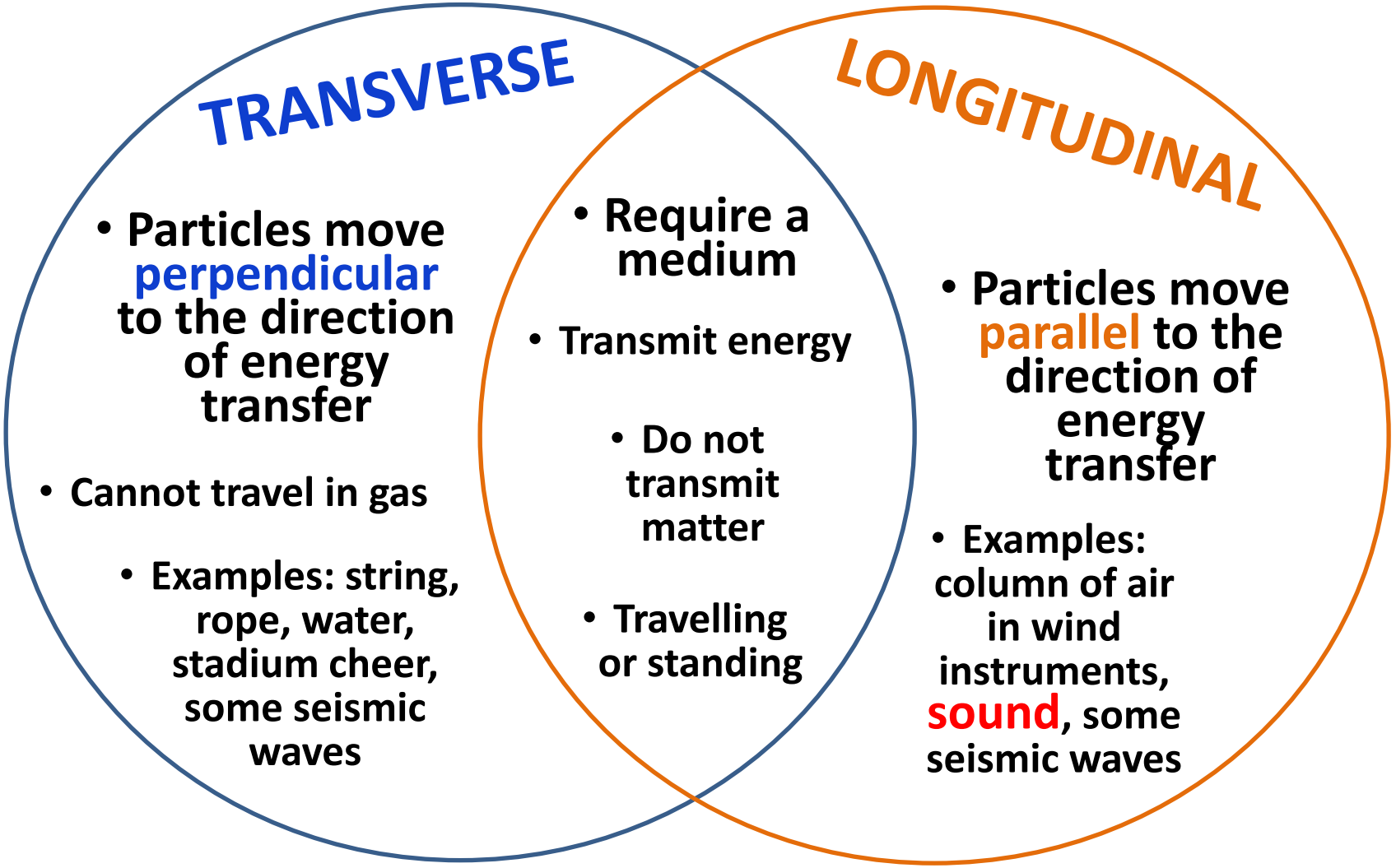
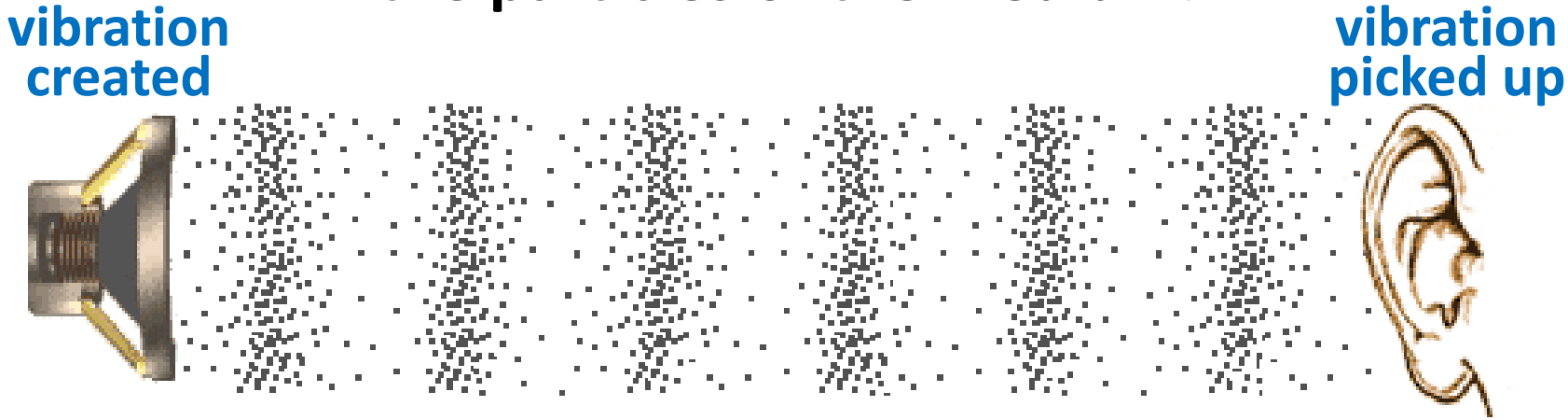
Mechanical Waves Summary



What is SOUND?

- **Sound is a travelling longitudinal mechanical wave, that results from the back-and-forth vibration of the particles of the medium.**



- **Sound waves consist of areas of high and low pressure and therefore can be regarded as pressure waves:**
  - **"*compressions*" correspond to *higher pressure***
  - **"expansions" or "*rarefactions*" correspond to *lower pressure***

How to describe sound?

Loud/Soft

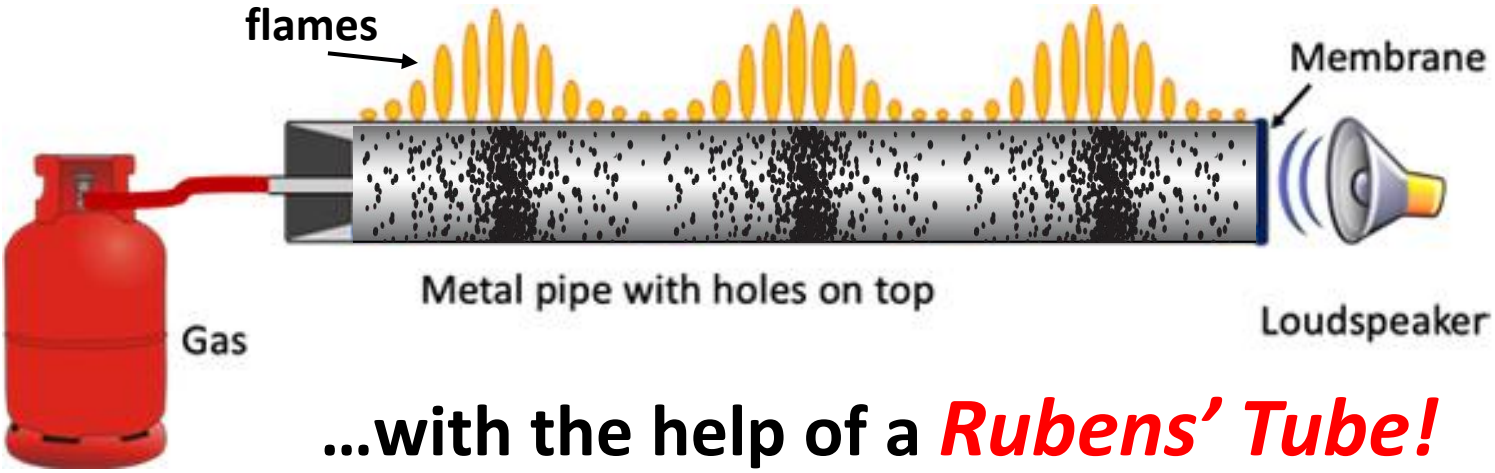
High/Low

Amplitude

Speed

Frequency

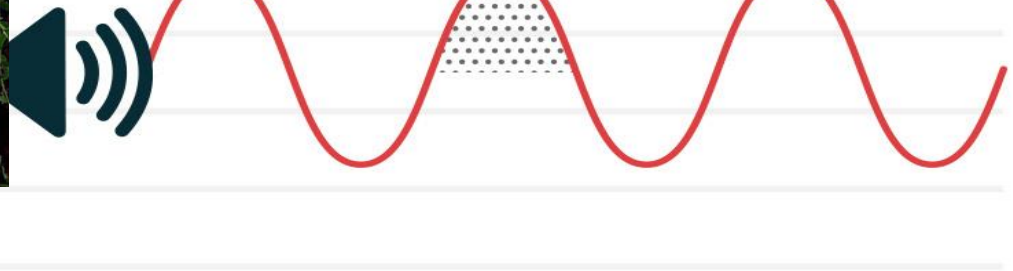
We *hear* sound, but we also can *visualize* sound waves…



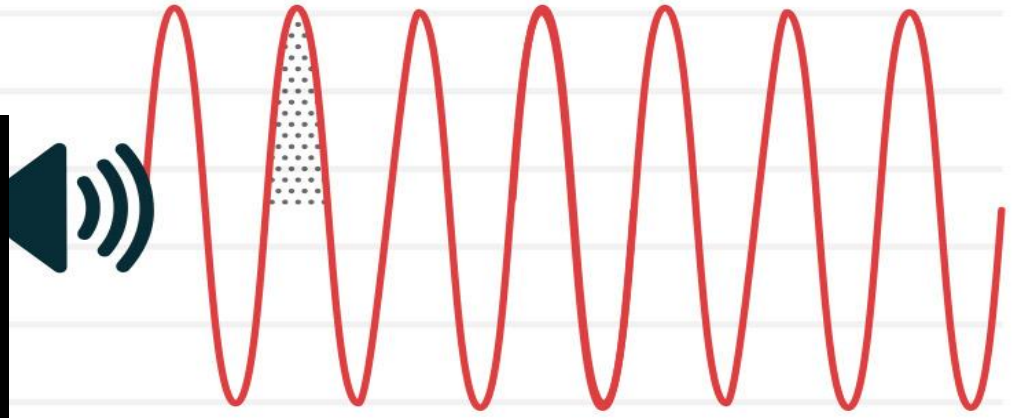
…with the help of a *Rubens' Tube!*

Sound waves: Pitch

Low Frequency = Low Pitch

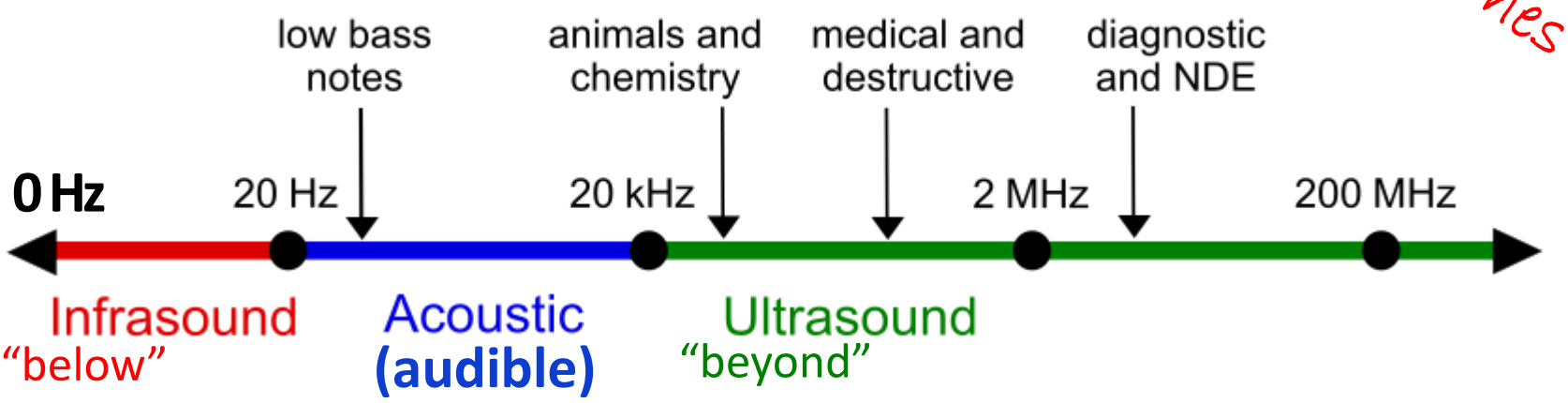


High Frequency = High Pitch

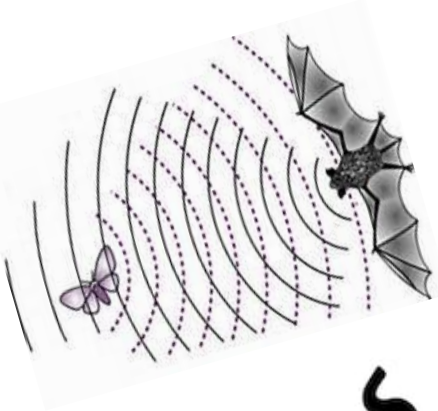


Sound waves spectrum

all possible pitches



- **Humans can hear sound waves that have frequencies between about 20 Hz and 20 kHz.**
- **Sound waves above 20 kHz are known as ultrasound.** Animals such as bats and porpoises use ultrasound for locating prey and obstacles.
- **Sound waves below 20 Hz are known as infrasound.** Whales, elephants and other animals can detect infrasound and use it to communicate.



Natural sounds: fun facts

- Bats use **ultrasound** for hunting purposes…so many nocturnal insects have good ultrasonic hearing to help them escape being caught.
- *Tiger moth* can even produce ultrasound "clicks" itself!

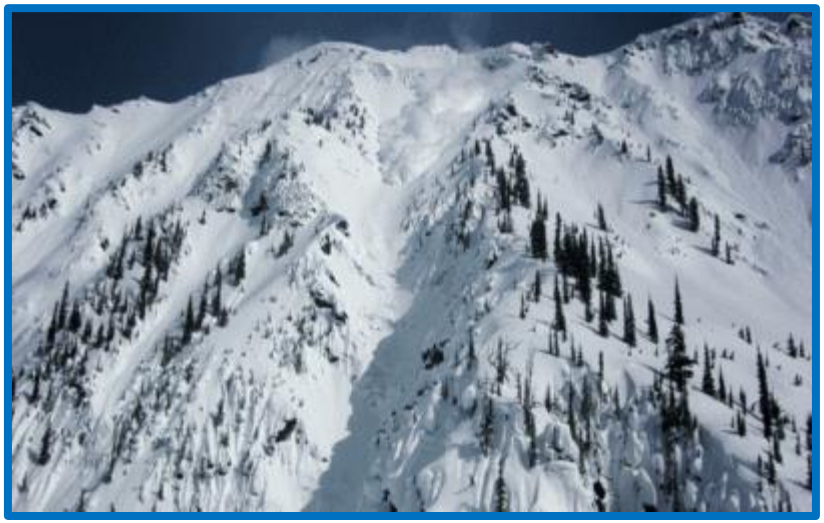
- Hearing range of many medium-sized mammals, including dogs, cats and deer, extends into the **ultrasound** range; however they are not able to produce ultrasound themselves.

- Among all animals, the lowest **infrasound** frequencies (~3 Hz) are produced by *Sumatran rhinos*.

Natural sounds: more facts

- The rumbling vocalizations of *elephants* extend well into infrasound range and, being extremely loud, are used for long-distance (up to 10 km or over 6 miles!) communication.

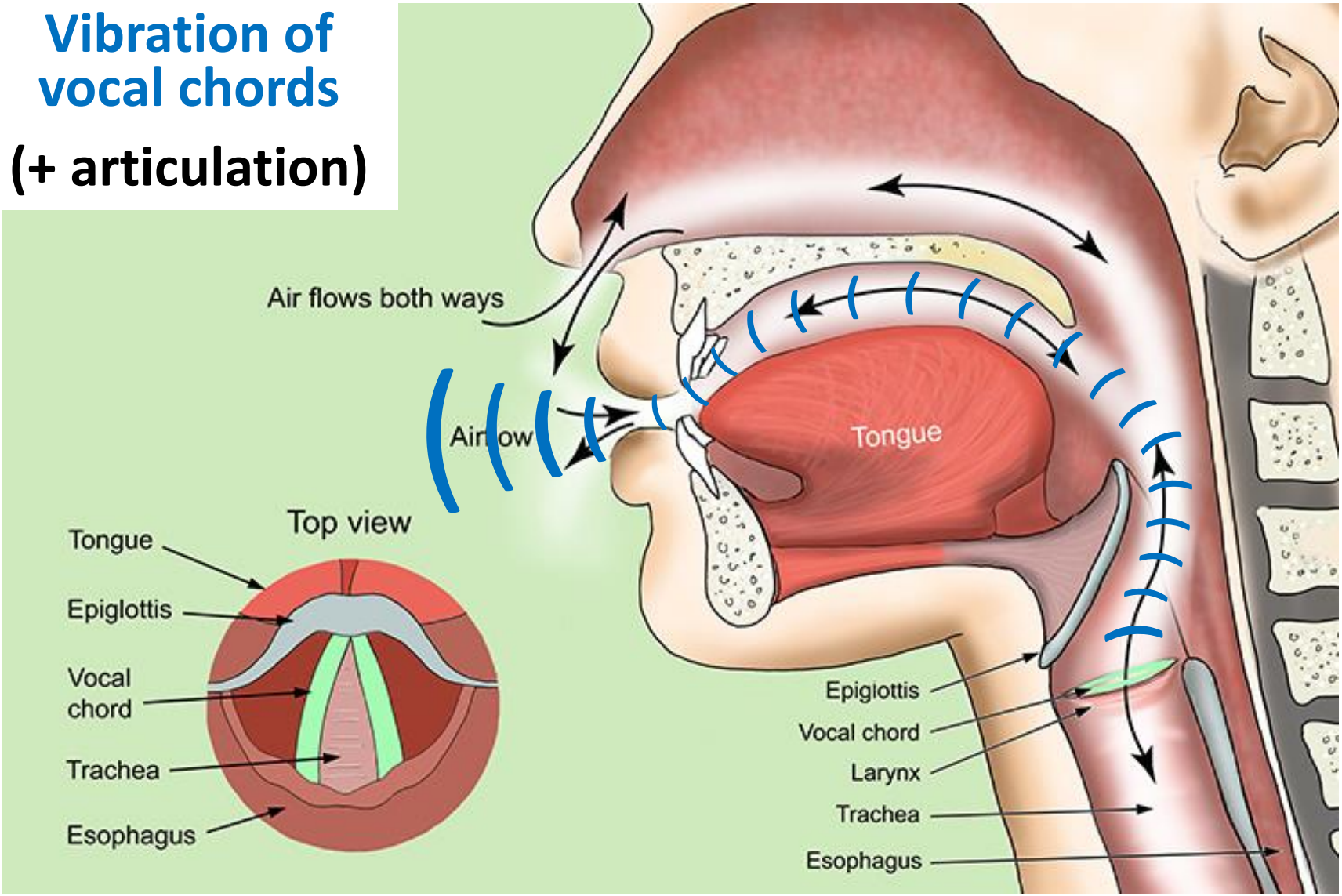
- Sources of infrasound in nature include volcanoes, avalanches, earthquakes, hurricanes, and meteorites.



How do humans create sound?

Vibration of vocal chords

(+ articulation)



How do we hear?