

# SOUND1

WAVELENGTH  
PERIOD



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SOUND ART





Sound (from the Latin *sonum*) is the sensation given by the vibration of an oscillating body. Our ears along with our brain, collect these vibrations that occur and interpret them as sounds.

A sound in order to exist needs:

**a source**, that creates vibrations, such as a drum

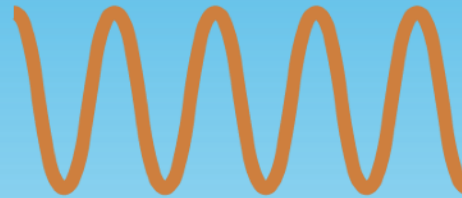
**an elastic medium** that waves travel through, such as air

our **receiver** such as our auditory system that acts as a transducer and converts these waves into electrical signals that our brains process.

SOURCE



WAVE



AUDITORY  
SYSTEM



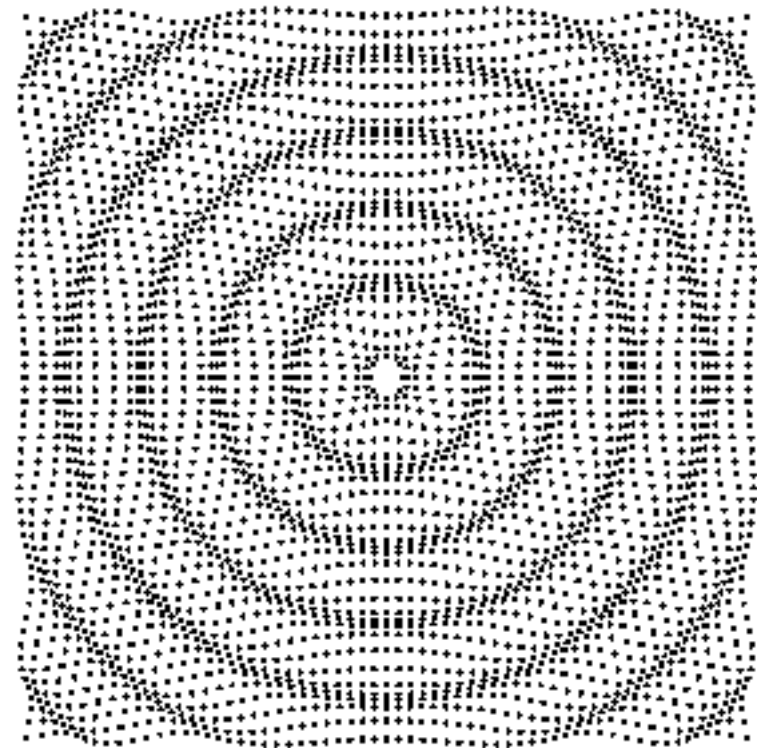
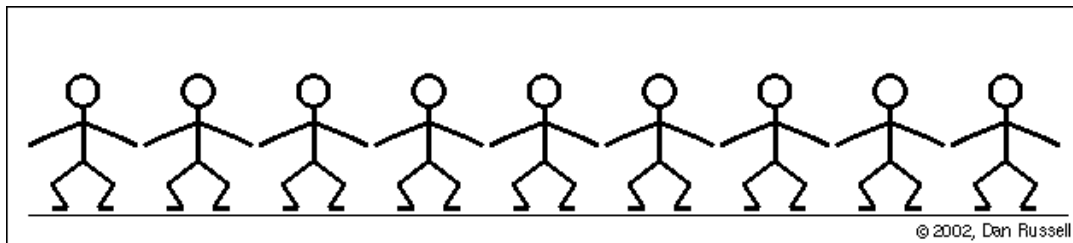
PATH

ELASTIC MEDIUM

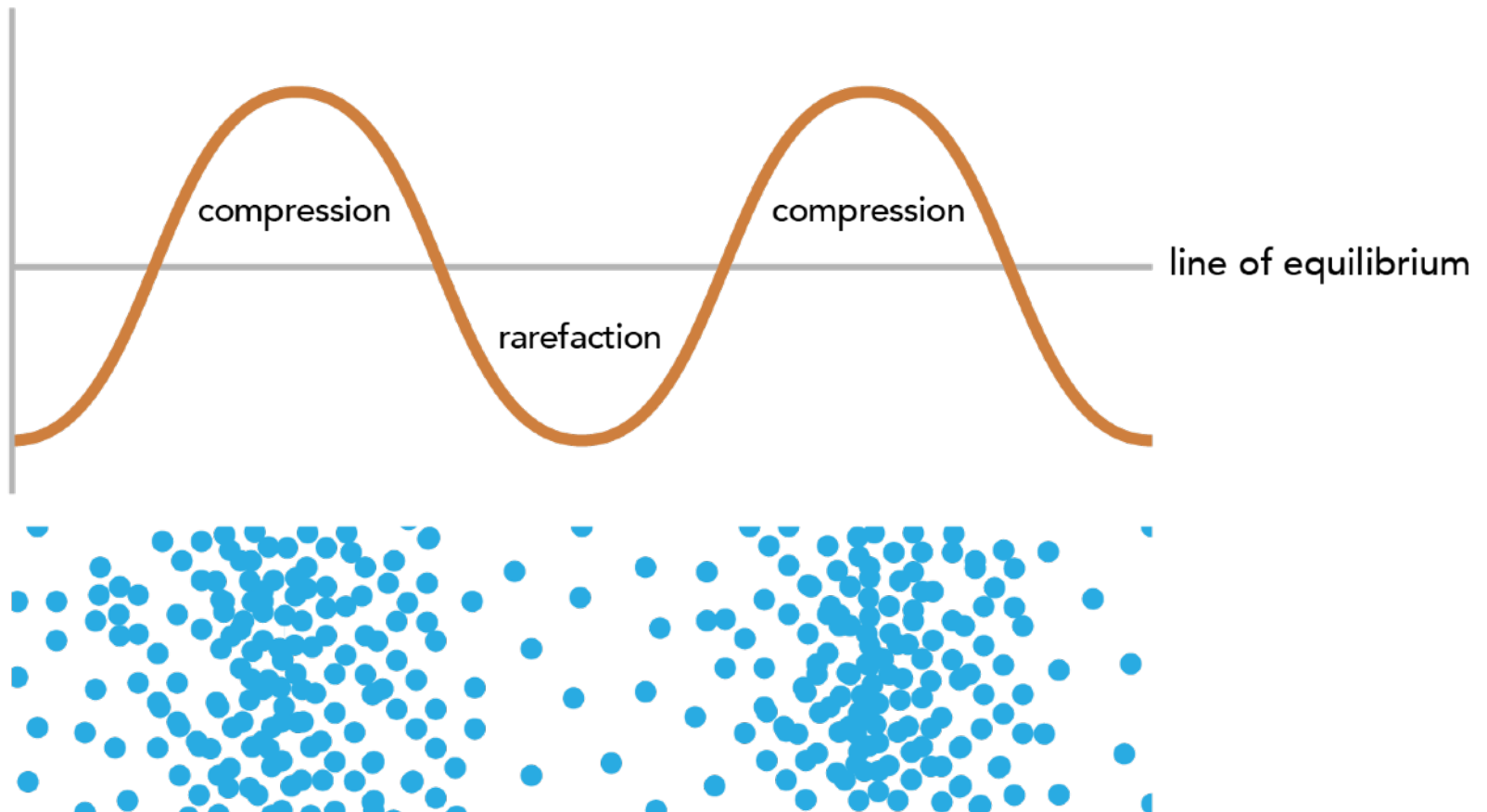


The **elastic medium**, is made up of many particles that are close together. The **vibrating body** transmits its vibrations to them by pushing the particles closer together: compression. Since it is an elastic medium, the molecules return to their original position, and in doing so, they move away: rarefaction. This happens cyclically and stops when we return to silence.

**Sound is thus an energy  
that propagates in time  
and space in the form of a  
wave.**



The **wave** we see in the representations is a description of what is happening in the air.



# Sound sources



**string** sent  
in vibration  
by friction



**string** beaten  
by hammer



**reed** sent  
into vibration  
by the air blown



**lips**  
of the performer



**cymbal** made of metal,  
beaten by wood sticks

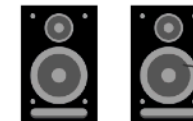
**membrane** (skin),  
beaten by wood sticks



**air column**  
sent into vibration  
from blown air



**vocal cords**



**cone** sent into  
vibration by an  
electrical signal



# Speed of sound

+ Density = +speed

+ Hot = +speed

One of the properties that describes an elastic medium is the speed of propagation (speed of sound)

In air at 20° C it's

**343 m/s**

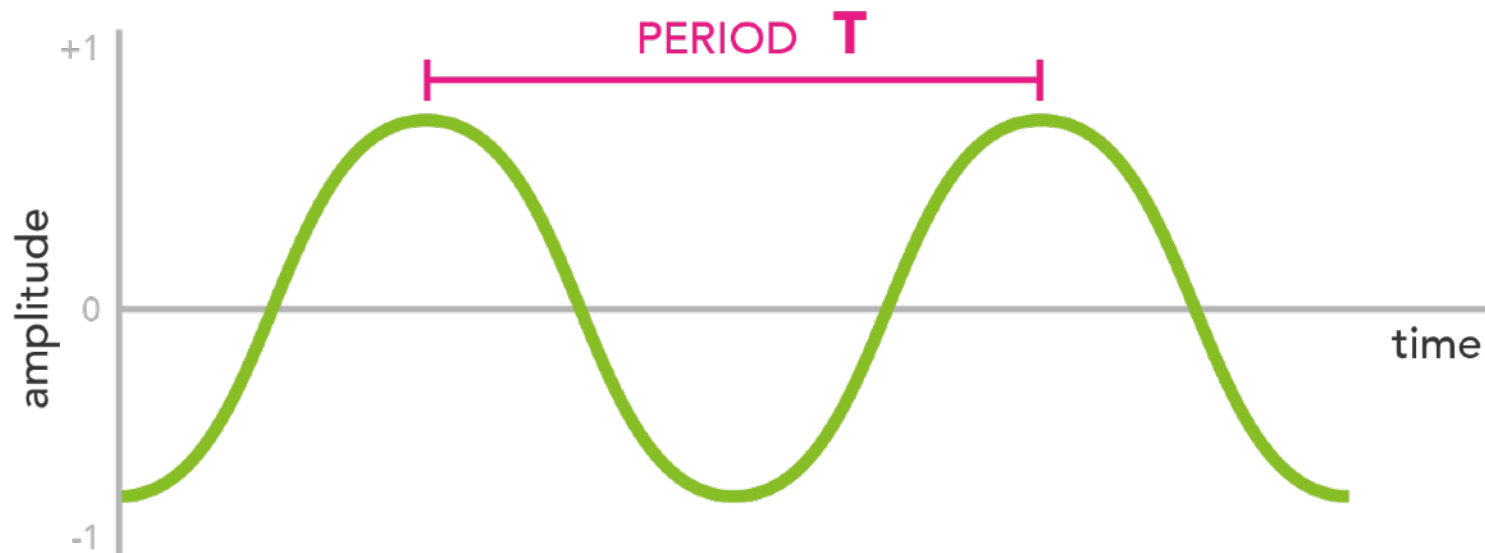
	temperature			elastic medium density
	0°C - 32°F	20°C - 68°F	80°C - 176°F	
<b>GAS</b>				
air	331	343	375	
helium	972	1007	1105	
<b>LIQUIDS</b>				
water	1403	1481	1555	
<b>SOLIDS</b>				
iron	*	4910	*	

\* = differences in solids at temperature changes are negligible

# Cycle - Period

**Cycle:** the complete oscillation of the wave from one equilibrium point to another

**Period T:** the time it takes the wave to complete a cycle



period  $T = \frac{1}{f}$

stands for 1 second of time

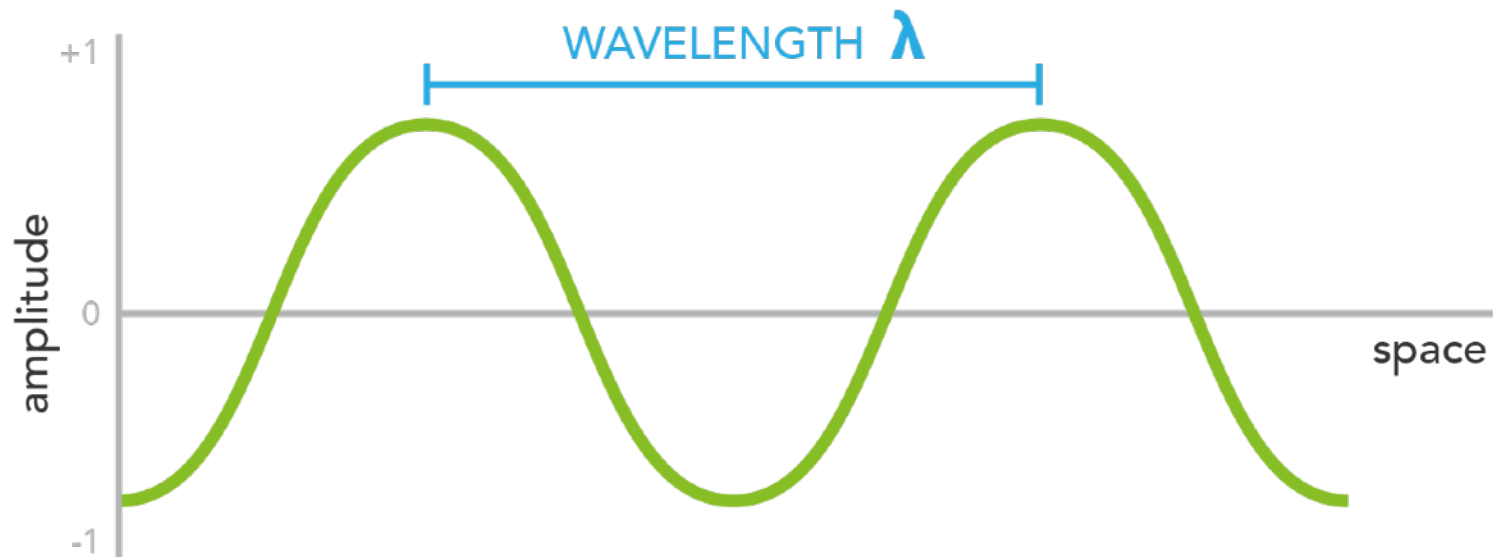
wave frequency



# Cycle - Wavelength

**Wavelength  $\lambda$**  (Lambda) :

is the distance in space occupied by one wave cycle

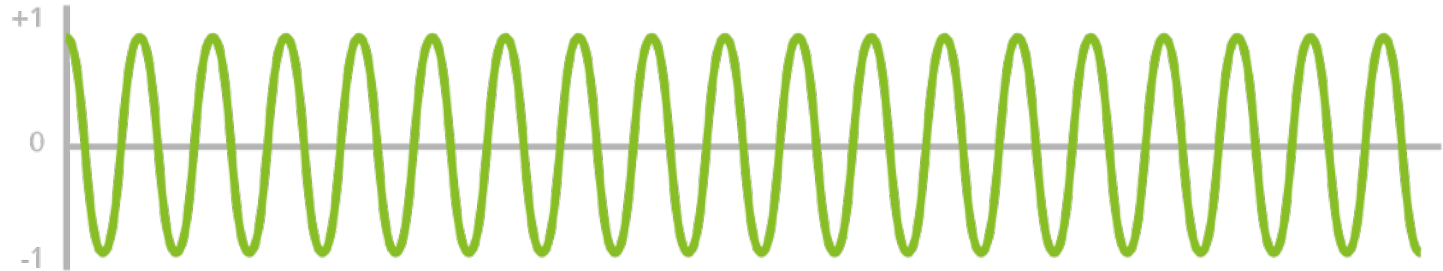


wavelength  $\lambda = \frac{v}{f}$

speed of sound in the given elastic medium

wave frequency

periodic wave



If a wave has a recognizable, repeating cycle, it is called a **periodic wave**

aperiodic wave



A wave is an **aperiodic wave** when there is no recognizable repeating cycle.



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