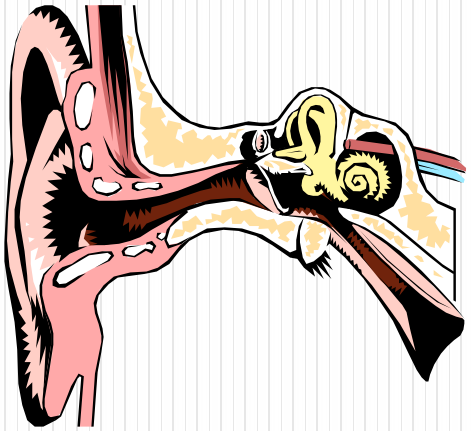
Chapter 13: Sound waves



What makes Sound?

1. Vibration: back and forth motion
   a. There can not be sound if there is not any vibration (ex. Vacuum)
   b. Most vibrations are too fast for you to see.
   c. Vibrations require energy—sound is a form of energy.

How does Sound Travel?

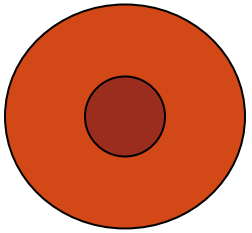
2. When something vibrates molecules in the air crowd together, then spread apart, causing sound waves to travel away from the vibrating object

Speeds of Sounds in Various Media

TABLE 17.1
Speeds of Sound in Various Media

Medium	v (m/s)
Gases	
Hydrogen (0°C)	1 286
Helium (0°C)	972
Air (20°C)	343
Air (0°C)	331
Oxygen (0°C)	317
Liquids at 25°C	
Glycerol	1 904
Sea water	1 533
Water	1 493
Mercury	1 450
Kerosene	1 324
Methyl alcohol	1 143
Carbon tetrachloride	926
Solids	
Diamond	12 000
Pyrex glass	5 640
Iron	5 130
Aluminum	5 100
Brass	4 700
Copper	3 560
Gold	3 240
Lucite	2 680
Lead	1 322
Rubber	1 600

1. Sound Waves



Sound vibrations occur in waves that go out in every direction like a circle.

1. Sound waves are created by repeated patterns of molecules spreading apart and squeezing together.

Characteristics of Sound Waves

- Sound waves that the average human can hear, called audible sound waves, have frequencies between 20 and 20,000 Hz.
- Sound frequencies less than 20 Hz are called infrasonic waves, and those above 20,000 Hz are called ultrasonic

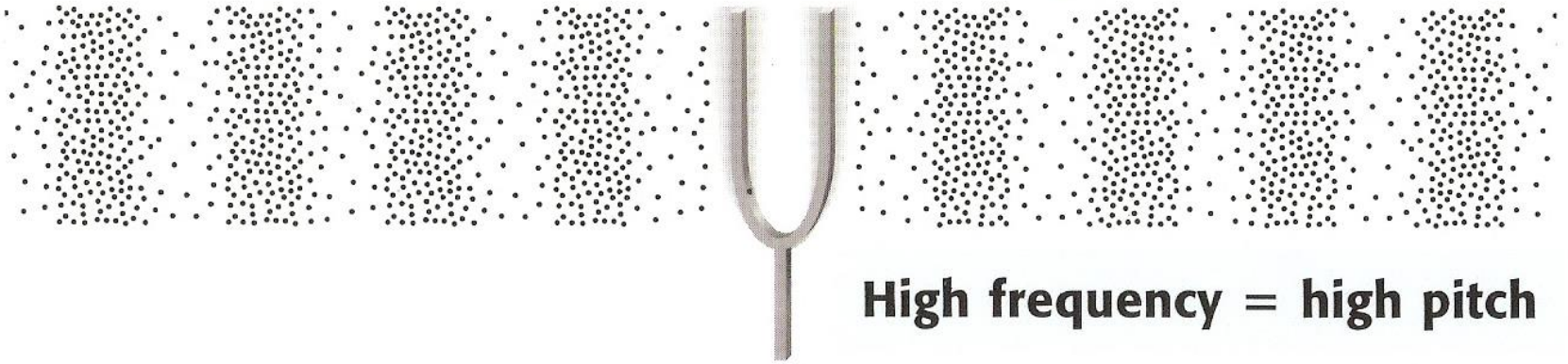
Baby Ultrasound Pictures

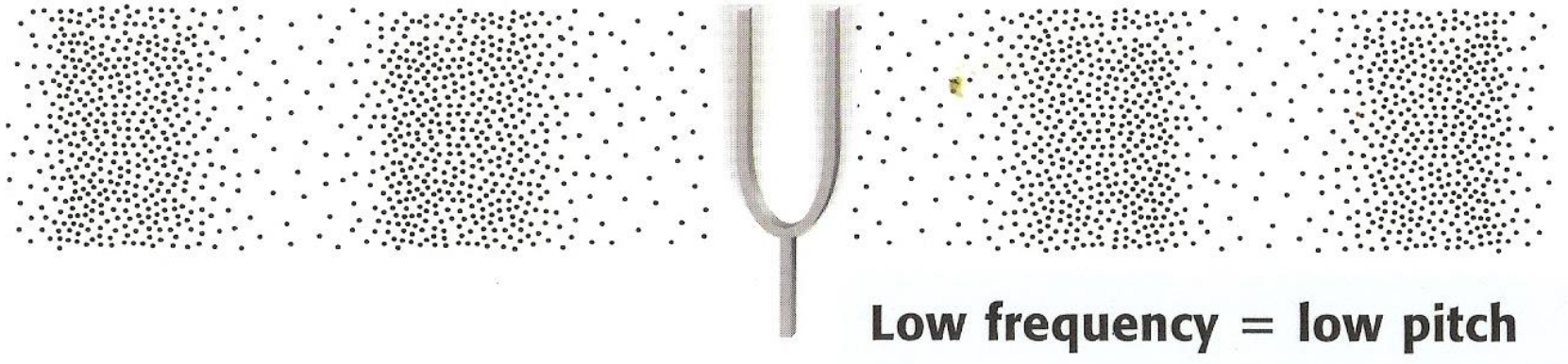
How do elephants communicate?

Frequency Determines Pitch

1. Pitch: how high or low a sound is
   a. The higher the pitch the more "squeezed" together the waves are
   b. The higher the pitch the higher the frequency
   c. The lower the pitch the lower the frequency
   d. **Remember: LONG and SLOW make LOW**

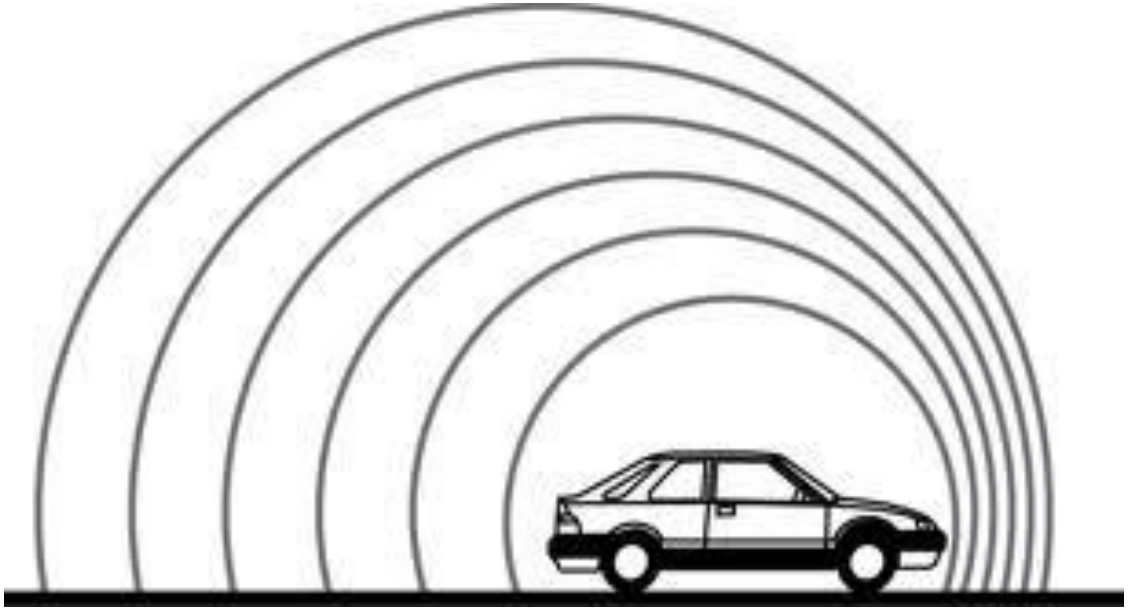
High vs. Low Pitch

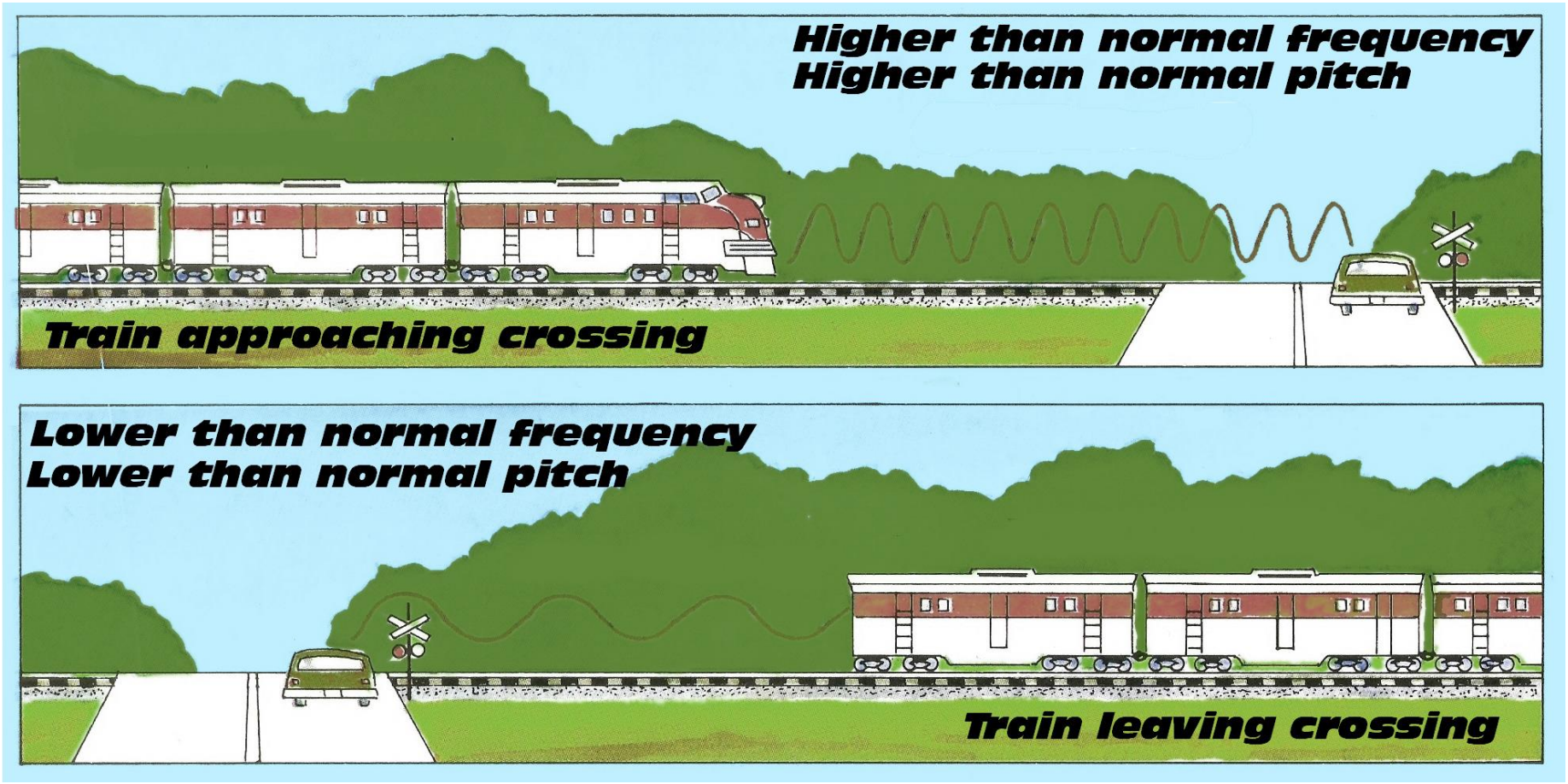




The Doppler Effect

- The pitch of a sound depends on the relative motion between the source of sound waves and the observer. (Change in frequency.)




Higher than normal frequency
Higher than normal pitch
Train approaching crossing
Lower than normal frequency
Lower than normal pitch
Train leaving crossing