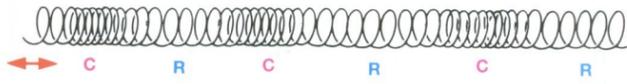


How do the vibrations travel to your ear?

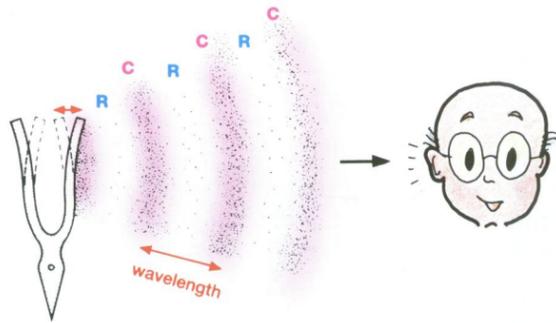
Experiment 29.5

Stretch a long 'slinky' spring along a smooth bench and vibrate one end to and fro along the length of the spring, to send a longitudinal wave down the spring (see page 174 again).



If you look closely at the spring you can see that, at any instant, some parts of the spring are pushed closer together (**compression**) and some parts are pulled farther apart (**decompression** or **rarefaction**).

It is the same with a sound wave in air. In some places the **molecules** of air are pushed together at a slightly higher pressure (compression) and in some places the molecules are farther apart at a slightly lower pressure (rarefaction).



These compressions and rarefactions shoot out across the room to your ear, travelling at the speed of sound. Molecules of air do not travel across the room – they just vibrate to and fro.

The **wavelength** of the sound is the distance between two successive compressions (or rarefactions).

For sound waves, like all other waves (page 175),

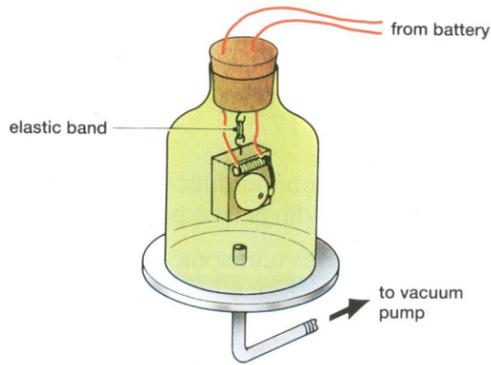
speed	=	frequency	×	wavelength
(m/s)		(Hz)		(m)

What happens if there are no molecules?

Experiment 29.6

Hang an electric bell inside a jar connected to a vacuum pump. Switch on the bell. Can you hear it?

Start the pump to take the air molecules out of the jar. What happens to the sound of the bell?



Sound cannot travel through a vacuum, because there are no molecules to pass on the vibrations. Why can't we hear the sound of the explosions on the Sun?