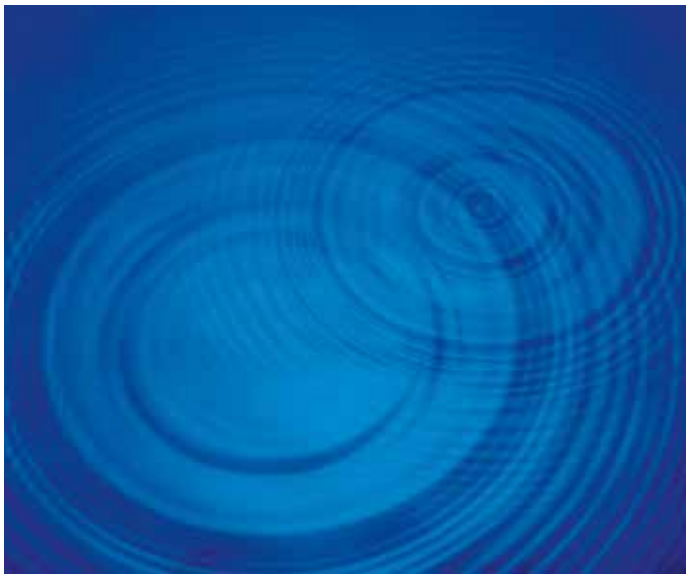
4 Sound spreads out

Sound spreads quite slowly in all directions, so the farther we are from a sound, the longer it takes to reach us and the quieter it seems.

To understand how sound spreads out, imagine throwing a pebble in a pond. It sends out ripples that make ever larger circles (Picture 1). You can imagine the ripples as sound. The ripples are highest near where the pebble was dropped, but as they spread out they become lower. It is the same with sound: the more the sound spreads out, the quieter it gets. We can make a diagram to show this (Picture 2). The sound is loudest near the loudspeaker, where the sound is made. This is because the energy is still very concentrated. But as the waves spread out, so does the sound. Eventually, the energy in the sound will be so low that the ear cannot detect it.



▲ **(Picture 1) Sound spreads out from a source just like ripples on a pond.**

How fast does sound spread out?

It takes several seconds for the sound caused by a flash of lightning to reach us as a clap of thunder. From this we can tell that sound moves much more slowly than light.

The speed at which sound travels depends on what it is travelling through. In air, it travels about 330 metres per second, but it is faster in water (where sound moves at nearly 1,500 metres per second) and even faster still in steel (a whopping 5,000 metres per second).

Find the speed of sound

You can use clapping to work out the speed of sound. Simply stand 100 metres away from a tall wall and clap (Picture 3). Change the rate of clapping until the sound bounced back from each clap matches with your next clap. The sound has now travelled 200m between claps. Now get someone to measure how many seconds it takes for you to make 10 claps at this rate. Divide this time by ten to find the time between each clap. The speed of sound is 200 divided by the time between claps. Check your answer against the value for the speed of sound given on this page.

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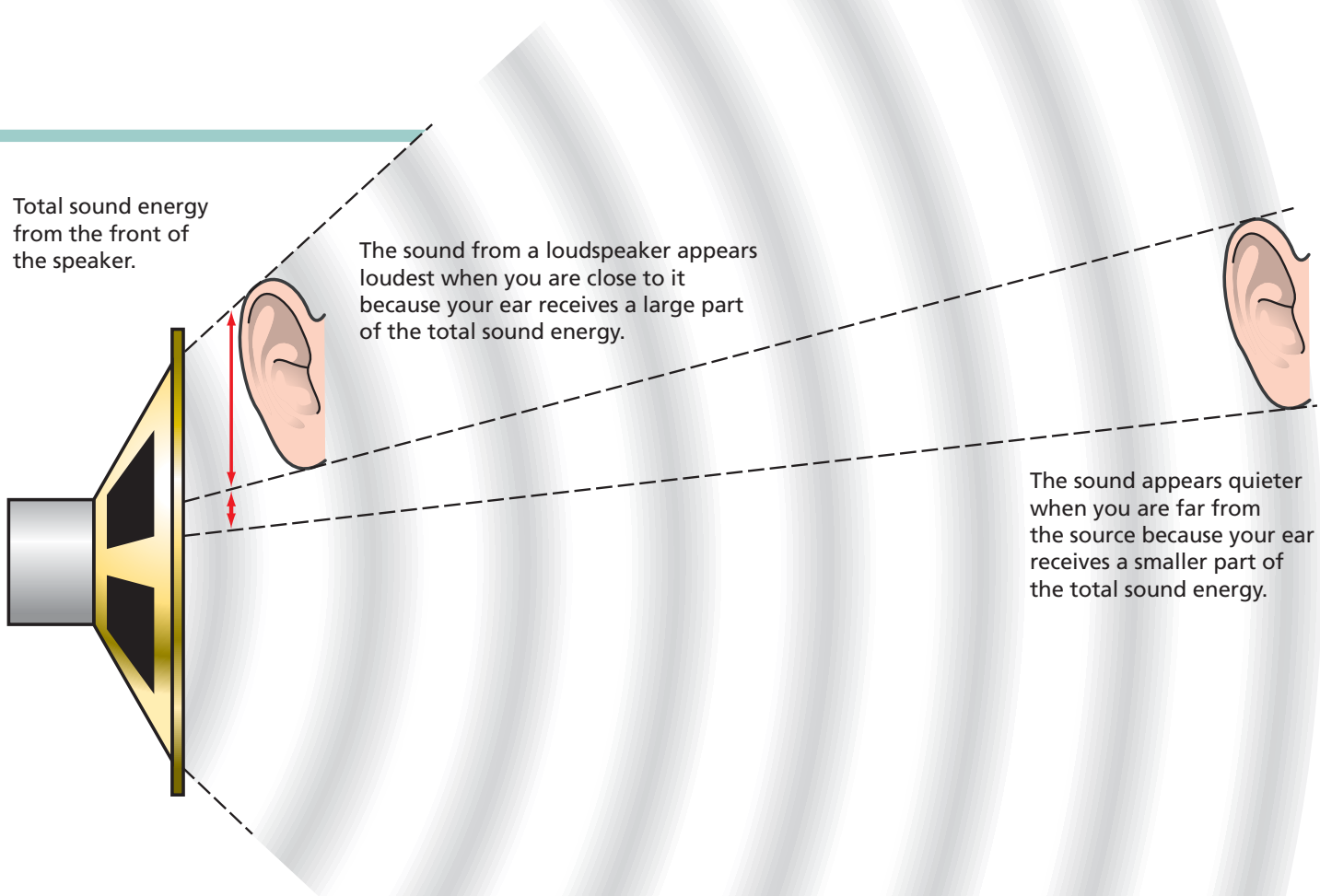

▲ **(Picture 2) Sound spreads out from a source such as a loudspeaker. The closer you are to the source, the more of the sound energy given out by the speaker reaches your ears and the louder it sounds.**

Summary

- **Because sounds spread out from a source, the energy of the sound also spreads out, so sounds get fainter the further away from them you are.**
- **Sound travels more slowly than light.**
- **Sound travels fastest in solids, less quickly in liquids, and slowest of all in air.**

▼ **(Picture 3) The time it takes for a clap to bounce from a wall and back to your ears allows you to find the speed of sound.**

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