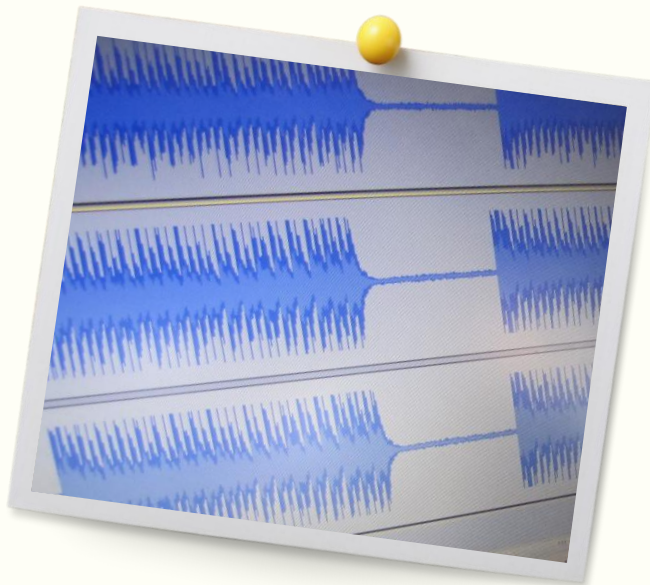


Making Waves

*Acoustic engineering
and sound control*



Making Waves

Tomorrow's Engineers

What do you need to know?

Organisers' notes

This activity will give students a better understanding of how sound is reflected and absorbed and how acoustic engineers work to give us a good experience of sound in buildings, vehicles, at festivals and more.

Guidance

Before beginning the activity:

- Play the **Making Waves video** with **Acoustic Engineer Arthur Lewis-Nunes**: <http://youtu.be/VnfUOIlcSPs>
- If you don't have internet access, you can describe to students how sound is reflected or absorbed when it strikes a surface
- Give examples of surfaces which are good sound reflectors and good sound absorbers.
- Explain how an understanding of how sound is reflected or absorbed is key to the design of new buildings

Discussion topics

- How can sound be a nuisance?
- How can the loudness of sound be controlled, for example in a noisy workplace or at a concert?
- Which materials are good reflectors and which are good absorbers of sound?

Get Involved

Further reading and resources

Making Waves is based on an activity developed for the Nuffield Foundation Practical Work for Learning project: www.nuffieldfoundation.org/practicalscience. Visit their site for more examples of science lessons which use a careers-linked approach to practical work. The site also offers lots of useful guidance on making the most of practical work in your lessons.

Tomorrow's Engineers

An acoustic engineer is part of the film & TV crew. [Do our Whose Crew Are You?](http://www.whosecrewareyou.com) quiz to find out which crew you're in: www.tomorrowsengineers.org.uk/whosecrewareyou

Watch the video presented by **Arthur Lewis-Nunes, an acoustic engineer at Max Fordham**: <http://youtu.be/VnfUOIlcSPs>. There are many more engineering careers videos on our YouTube channel: <http://www.youtube.com/tomorrowsengineers>

Find out more about careers in engineering

Tomorrow's Engineers provides engineering careers materials for young people aged 11-14, and other resources for teachers.

For more information visit the Tomorrow's Engineers website.



For details of all routes into engineering go to www.tomorrowsengineers.org.uk

Making Waves

Tomorrow's Engineers

Are you ready for an engineering challenge?

Sound Control

You are working as an acoustic engineer for **Sound Designs**, a company who work with architects to make sure sound travels well, or can be controlled, in a new building.

Your task

Your company has been given the task of designing a new school hall for Little Town Academy. The hall will be used for plays, assemblies and musical performances.

Your task is to test different types of materials to see which ones are best at absorbing and reflecting sound.

Get involved

When sound waves reach a surface they can be absorbed, reflected or scattered (or a combination of these) depending on the type of surface.

There are many occupations in which people work with sound. In some jobs, people measure sound levels (such as environmental officers), while sound and acoustic engineers work to control the absorption and reflection of sound.

These engineers play a vital role in our everyday lives, from ensuring that audiences at concerts and festivals have a good experience of the music, to reducing engine noise for aircraft passengers. They also keep people's hearing healthy by keeping sound at safe levels, and much more.

Sound and acoustic engineers and designers work in a number of different sectors including aerospace engineering, architectural acoustic design, loudspeaker design, sonar systems, speech recognition, mobile telephone design and vehicle noise control - wherever sound is important!



Find out how you can become an engineer

If you have enjoyed this activity and would like to find out more about careers in engineering Tomorrow's Engineers can help...

To learn more visit the Tomorrow's Engineers website.



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Making Waves

Tomorrow's
Engineers

Activity Materials List

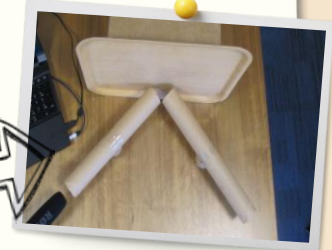
- A microphone connected to a computer equipped with sound recording and editing software such as Audacity (free to download) or Pro Tools.
- A wooden board (approximately 60cm x 40cm)
- A selection of materials (such as carpet, card, foil, bubble wrap)
- Blu-tack or double-sided tape
- 2 cardboard wrapping tubes (approx 50cm in length)
- Sellotape
- 1 large barrier (e.g. carpet, wooden board)



Instructions

First, set up your equipment:

- Stand the wooden board upright on a table.
- Create feet for your two tubes so they can both stand horizontally at the same height – cut short identical lengths off each cardboard tube and tape these to the longer length tubes.
- Place the tubes at 45° to the board. The tube ends should be close to the board so sound can travel down one tube, bounce off the surface and travel along the other to the microphone.
- Position the microphone at the open end of one tube.



Next, collect some data about the acoustic properties of the board:

- Get a friend to hold the barrier between the microphone and your source of sound and remember to keep background noise to a minimum.
- Start recording with the computer sound software. Make a sound for about 10-20 seconds next to the non-microphone tube. (You could use your mobile phone ringtone as any change in sound level is more easily observed if the sound you record is a level, constant volume.)
- Observe the sound waves on the screen and write down the maximum amplitudes of the sound.



Finally, collect some data about the acoustic properties of a range of materials:

- Cover the wooden board with a different material. Make the same sound next to the microphone and record and observe the sound waves on the screen.
- Compare the sound waves for each material. Is it a reflective or absorbent material? How much sound has been reflected down the tubes?



Follow on activities

- Use your results to put the different materials in order, from best reflector to best absorber.
- How reliable are your results? How could you make them more reliable?
- Of the materials you investigated, which would you choose to design a school hall, and why?
- Which of the materials would be most suitable for use in a cinema? What about an outdoor festival?



For details of all routes into engineering go to www.tomorrowsengineers.org.uk