Structure of the Earth: teacher demonstrating seismic evidence for the core

Learning objectives:

- **S waves** cannot travel through liquids and that this is used to form the hypothesis that **outer core** is liquid

Timing: 10 minutes

Health and safety: Take care with water on an overhead projector near electrical sources

Apparatus:

- large transparent bowl (Pyrex™ oven dish)
- glass beaker full of sand
- overhead projector (OHP)
- short ruler

Place the Pyrex™ dish half full of water on the OHP and project the image onto a screen. Place the ruler on end at the edge of the dish and tap to generate waves. Observe the waves on the screen. Place the beaker of sand in centre of the Pyrex dish. Generate waves as before and observe the '**shadow zone**' where waves cannot travel through the beaker (best observed through almost closed eyes). This represents the shadow zone seen at the surface of the Earth where **S waves** fail to travel through the liquid core. As S waves are **shear waves** they require a solid medium for transmission. The shadow zone is evidence that the outer core is liquid.

Hint: It is worth practising this in advance as this demonstration not easy to set up.

N.B. In reality you get refraction of waves due to variation in density and elastic moduli of Earth with depth. This causes seismic waves to have gently curved paths.

Outcome:

This is another piece of evidence for the nature of the Earth's interior from which we hypothesise that the Earth has a liquid outer core.