Floating Slinky

The University of Manchester

You will need:

- A slinky
- A mobile phone or video camera
- **An adult to help you**

What to do

1. **Work safely**: Make sure there is lots of free space around you in all directions.
2. Hold the slinky up and away from yourself at arms length. Do not climb on anything! Let the coils dangle.
3. Ask your adult to film you with the camera set to its highest frame rate.
4. Let the slinky fall to the ground.
5. Ask your adult to slow down the video as much as possible and watch the slinky fall.

If you don't have a suitable camera, watch our video to see what happens!

Did you know?

The compression wave moving down the slinky is an example of a *longitudinal* wave. In longitudinal waves the oscillations, or vibrations, occur in the same direction as the wave travels. Sound waves in air are longitudinal: the air particles alternately bunch together and stretch apart. Another type of wave is a *transverse* wave, where the movements are at right angles to the direction of travel. Ripples in water are transverse waves.

What is going on?

The slinky appears to defy gravity. The bottom remains suspended in mid-air until the coils have fully collapsed.

Before it is dropped, the forces acting on the suspended slinky are in equilibrium. The downwards pull of gravity is balanced by the upwards pull of the tension in the coils.

When the slinky is released, the coils collapse downwards from the top in a *compression wave*. The bottom remains motionless until the compression wave reaches it. At this point the slinky falls.

What we do

We are a research group at the University of Manchester. We use mathematics to model and test the properties of materials and waves. Examples of our research include understanding and reducing noise; modelling the behaviour of ligaments and tendons; and the design of *metamaterials*: special materials with extraordinary properties.

Mathematics of Waves and Materials