

Everyday experimenting
for primary schools:
How strong is
an eggshell?



What happens if you drop an egg onto a hard surface?

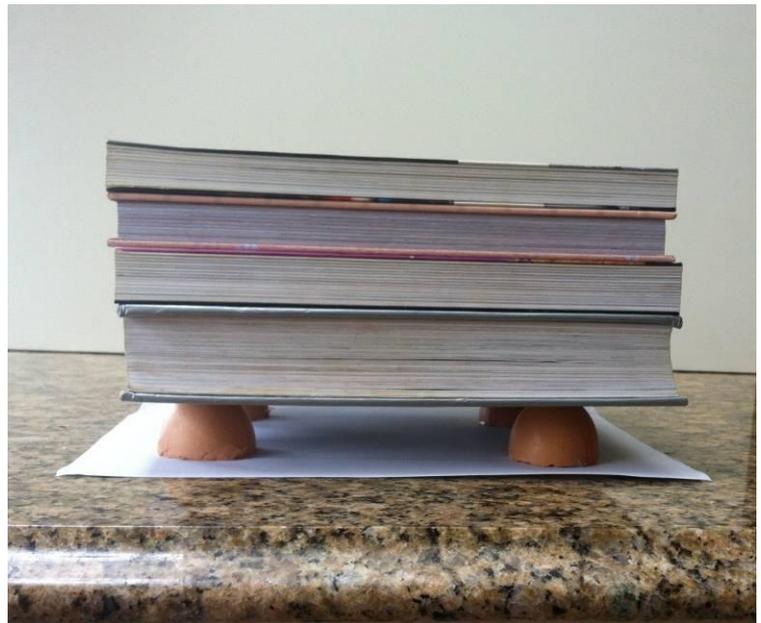
That's right, the shell breaks. Is an eggshell always this fragile? Let's investigate.

What you need

- 4 raw eggs (same size)
- Pencil
- Glass
- Scissors
- Sheet of A4 paper
- Ruler
- Heavy books

What you do

1. Using the pencil, draw a line around the widest part of one of the eggs.
2. Crack the pointed part of the egg. Pour the contents into a glass (you could use these eggs to make a nice healthy omelette).
3. Carefully break off the pieces of the eggshell down to near the pencilled line. Use a scissors to nip off the shell near the line. Try and keep the rim of the shell as even as possible.



4. Repeat steps 1 to 3 with the other 3 eggs.
5. Draw a rectangle on a sheet of paper (about 18 cm by 12 cm).
6. Place one of the egg shells on each corner of the rectangle, with the cut edges facing down, as shown.
7. Carefully place a heavy book on top of the eggshells as shown.

What happens?

The eggs do not crack.

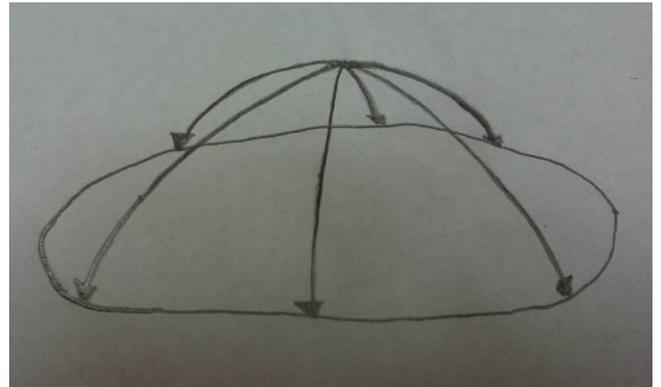
Why?

The halved egg shells under the books are dome shaped. As you can see from the diagram below, a dome is like a number of small arches arranged in a circle.

An arch is strong because its shape evenly spreads the weight on top of it. The weight of the books acting downwards is balanced by the strength of the dome-shaped eggshells. The weight of the books is spread evenly along the curve of the eggshells as shown below.

Note

Arch bridges date back to ancient times, when they were constructed from stone or bricks. Arch bridges are also found in Ireland, for example the famous Ha'penny Bridge (Liffey Bridge) in central Dublin.



More activities

For more activities related to shapes their strength and construction, see <http://www.primaryscience.ie>: in the activities section of the website, look up 1. "Design a Bridge" and 2. "Amazing Triangles".