



Pressure



Which shoe puts more pressure on the ground?



# Pressure

- Pressure measures the force acting on one unit of area
- Pressure is measured in  $\text{N/m}^2$  also called Pascals (Pa)
- Pressure =  $\frac{\text{Force}}{\text{Area}}$

- If a force of 1200 N acts on a rectangular area of 4 m<sup>2</sup>, what is the pressure on this area?

- Pressure =  $\frac{\text{Force}}{\text{Area}}$

$$\text{Force} = 1200 \text{ N}$$

$$\text{Area} = 4 \text{ m}^2$$

- Pressure =  $\frac{\text{Force}}{\text{Area}}$

- Pressure =  $\frac{1200 \text{ N}}{4 \text{ m}^2}$

- Pressure =  $300 \text{ N/m}^2$

- If a force of 600N acts on a rectangular area of length 3m and width 2m, what is the pressure on this area?

- Pressure =  $\frac{\text{Force}}{\text{Area}}$


$$\text{Force} = 600 \text{ N}$$

$$\text{Area} = 3\text{m} \times 2\text{m} = 6\text{m}^2$$

- Pressure =  $\frac{\text{Force}}{\text{Area}}$

- Pressure =  $\frac{600 \text{ N}}{6 \text{ m}^2}$

- Pressure =  $100 \text{ N/m}^2$

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- A block of mass 5kg has a base of 5 m and width 2 m. What is the pressure on the base.

- Pressure =  $\frac{\text{Force}}{\text{Area}}$



$$\text{Force} = ?$$

$$\text{Force} = \text{mass} \times \text{gravity}$$

$$\text{Force} = 5 \text{ kg} \times 10 \text{ m/s}^2$$

$$\text{Force} = 50 \text{ N}$$

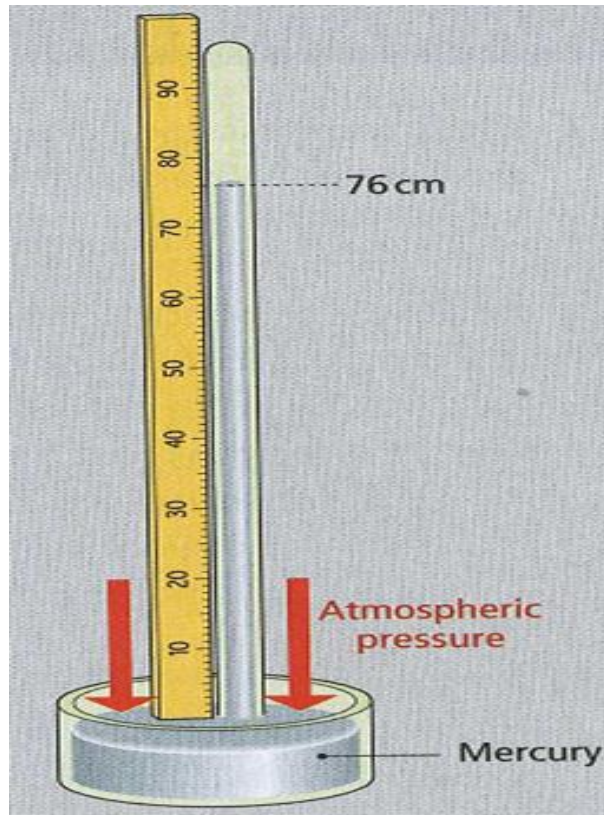
$$\text{Area} = 5 \text{ m} \times 2 \text{ m} = 10 \text{ m}^2$$

$$\text{Pressure} = \frac{\text{Force}}{\text{Area}}$$

$$\text{Pressure} = \frac{50 \text{ N}}{10 \text{ m}^2} = 5 \text{ N/m}^2$$

# Measuring Pressure

- We can measure pressure using a barometer



- An altimeter measures pressure and altitude in aircraft



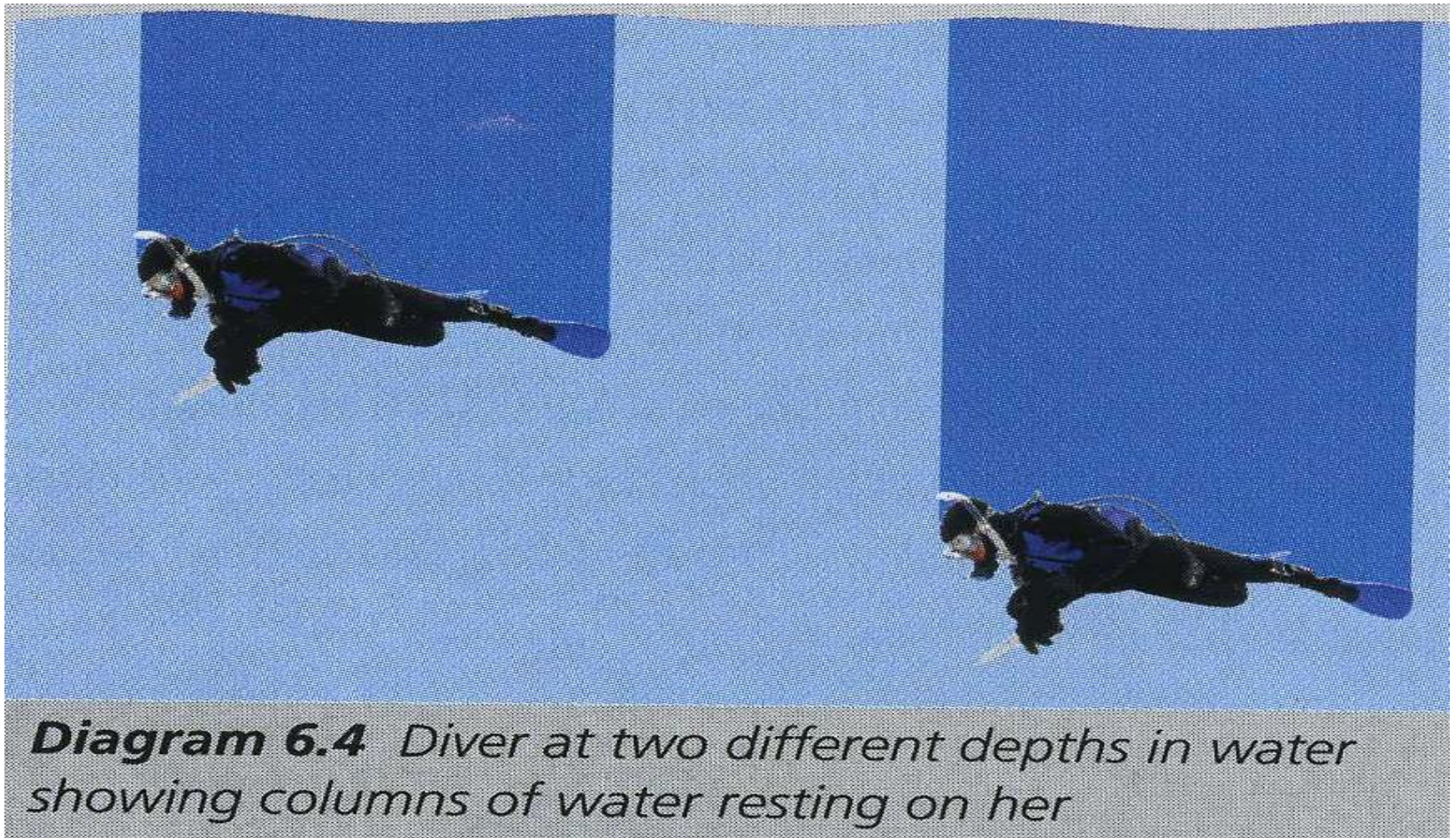
# Which would hurt more?

- If the spire fell on you at the bottom or if it fell on you at the top?





# Pressure in a liquid increases with depth



**Diagram 6.4** Diver at two different depths in water showing columns of water resting on her

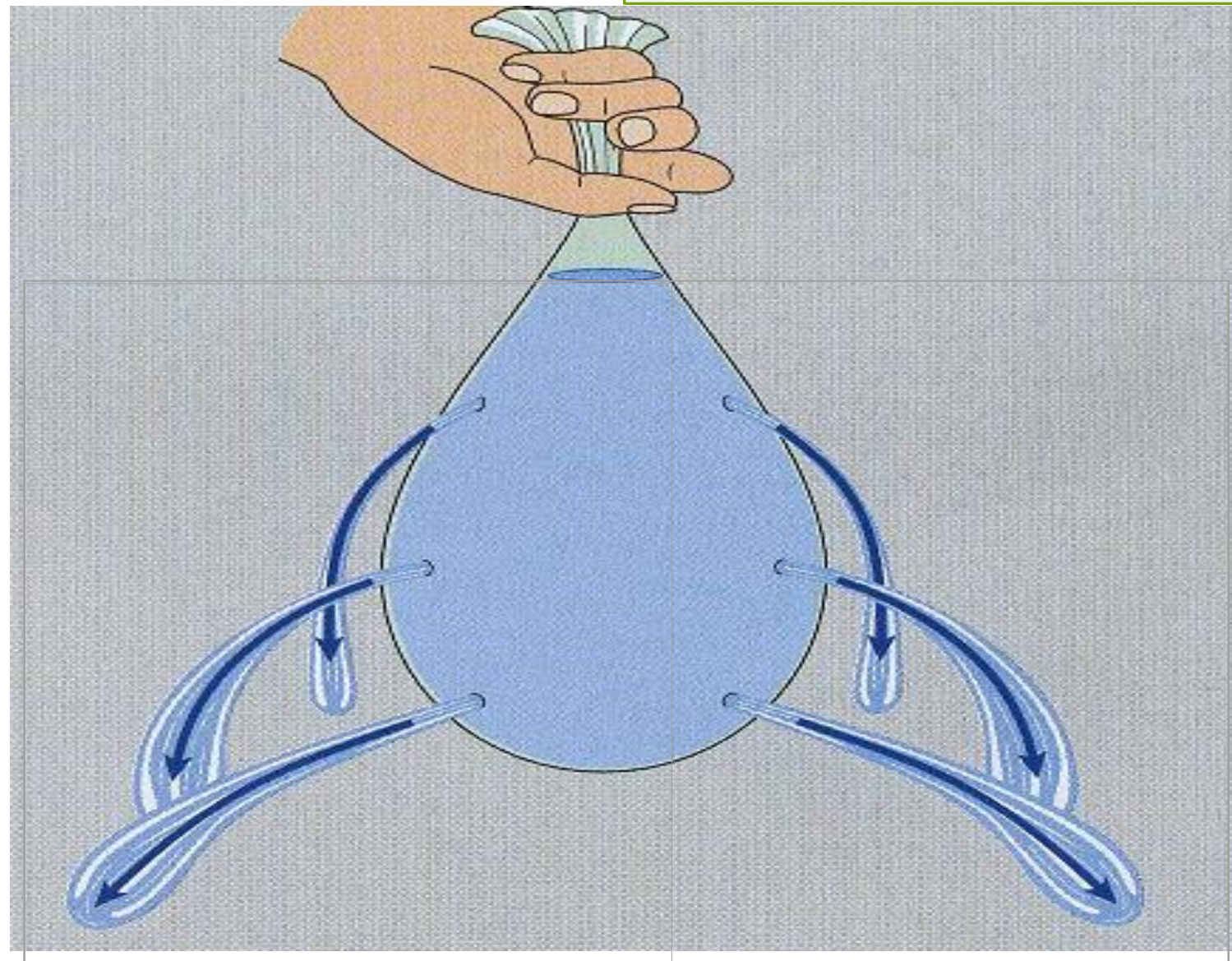
# Connection between pressure and depth in a liquid


- The pressure on top of the diver comes from the weight of water above the diver. Thus, the pressure increases with the depth.

# Pressure and depth

- ◉ Get a plastic bag and fill with water.
- ◉ Make holes all over the bag.
- ◉ What happens?





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- All the holes will start leaking water, but the water will run out faster at the bottom.
  - This shows that the pressure is greatest at the bottom, because the weight of the water acting on the bag is the greatest here.

# Pressure and depth

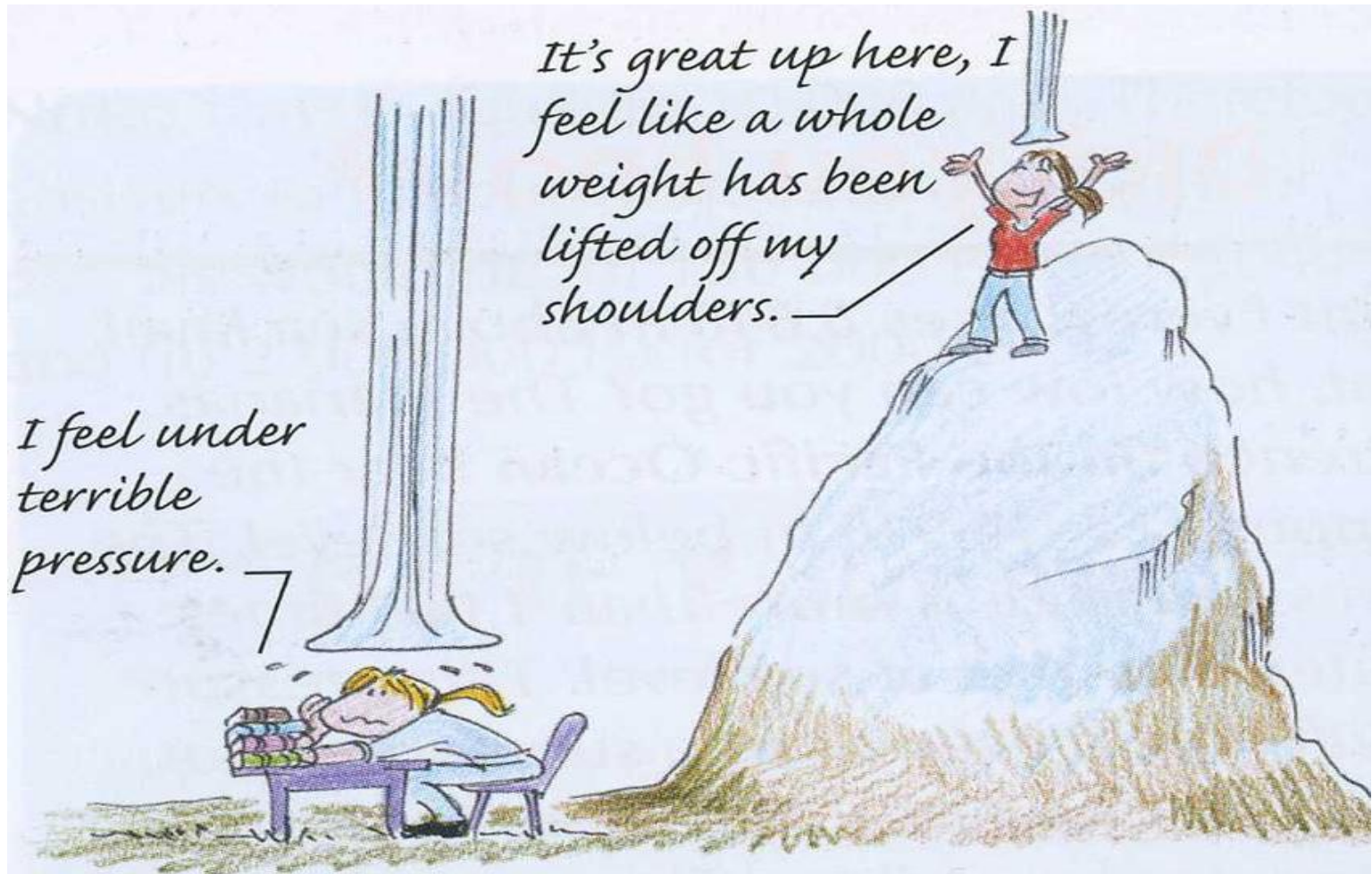
- In a dam, the walls at the bottom are thicker because the pressure is much larger.





# Atmospheric pressure

- ◉ Standing on the surface of the earth, we have a great weight of gases on top of us, just like a diver in water. The weight of these gases on a square metre of the earth is called atmospheric pressure.
- ◉ It is estimated that the total mass of air is around 500 million million tonnes!!!
- ◉ Around 1 tonne of air is exerting a pressure on your shoulders!
- ◉ We don't feel this because air inside us is exerting an equal pressure back!



# Can Crushing Experiment

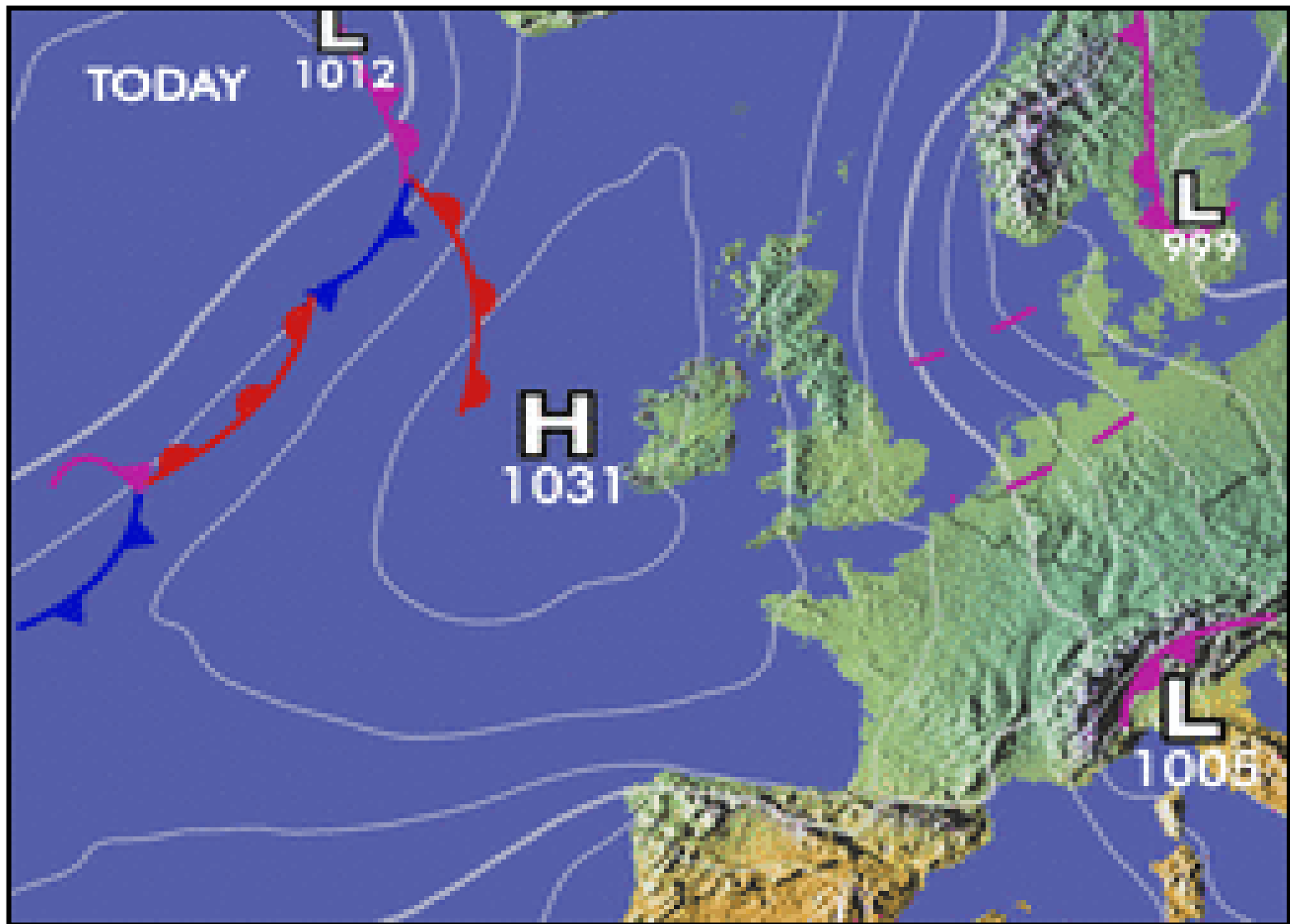
- When you take the air out of something, the pressure of the air in the atmosphere exerts a pressure but there is no equal pressure to exert back.
- The object is then crushed.



# Weather and Pressure

- High pressure H causes warm, dry weather
- Low Pressure L causes rain and wind
- Areas with the same pressure are drawn on a weather chart using lines called isobars





# Pressure on the boiling point of water

- At normal atmospheric pressure = water boils at 100 °C
- A pressure cooker holds onto steam during cooking and pressure begins to build up inside the cooker
- This increases pressure raises the boiling point of water to 120 °C
- Food cooks more quickly