Fingers of the Ocean

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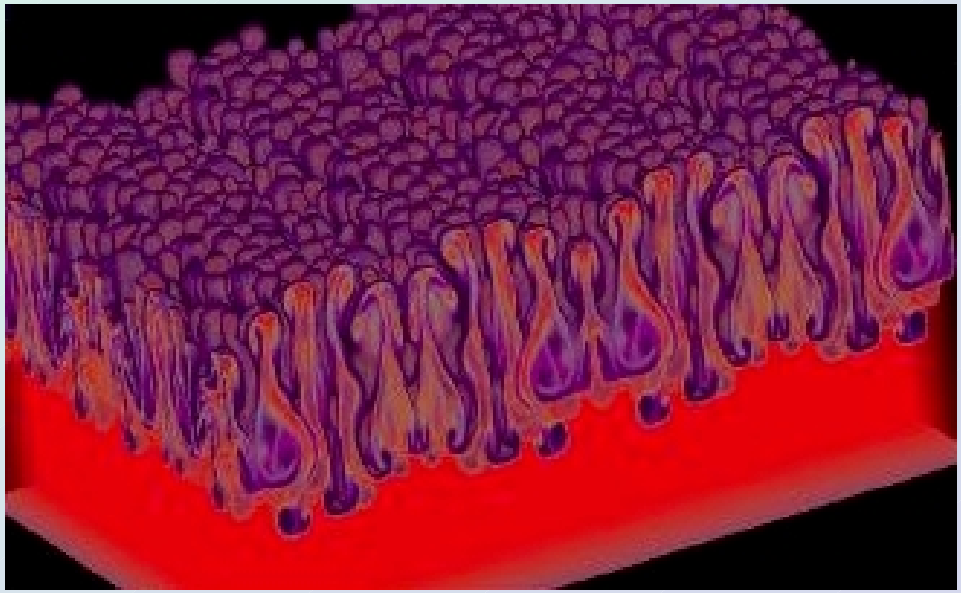

First experiment: Ink is dropped into water

The drop of ink will spread out to be a circle.

The bigger drop is faster

$$F = k \cdot \rho \cdot v^2 \cdot A$$

$$F = \rho \cdot V \cdot g$$

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$$\rho_{ink} \cdot V \cdot g = \rho_{water} \cdot V \cdot g + k \cdot \rho_{water} \cdot v^2 \cdot A$$

$$v = \sqrt{\frac{(\rho_{ink} - \rho_{water}) \cdot g}{k\rho_{water}} \cdot \frac{V}{A}} = \sqrt{const \cdot \frac{V}{A}}$$

$$V = r^3 \cdot const$$

$$A = r^2 \cdot const$$

$$\frac{V}{A} = r \cdot const$$

$$v = \sqrt{r} \cdot const$$

In a lake, water is below the air.

Any ripple in the surface will cause waves, which will die out.

What would happen, is the air would be below?

While falling, the water could not keep its shape.

Ripples in the surface will grow.

Second experiment:

Fill a glass completely, put a card on it, and turn it around.

The water and card will stay there.

The water is kept in the glass by the atmospheric pressure.

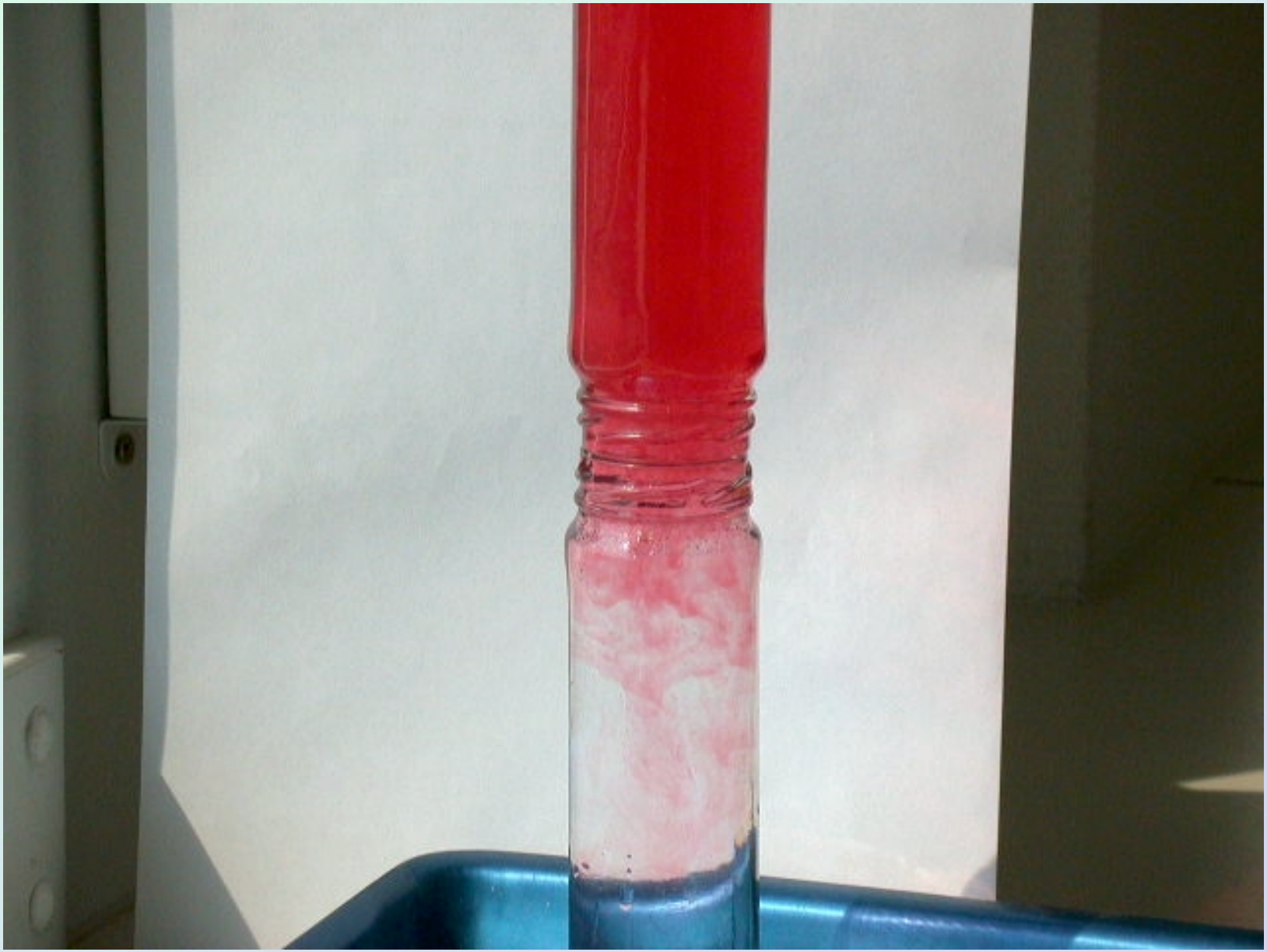
The card prevents ripples from forming.

If a denser liquid is below a lighter liquid, nothing will happen.

When a river flows into the ocean, it will not mix, because the salty, denser water is beneath.

The cooling water of a nuclear power plant must be cooled down to just 4-5 degrees warmer than the river it is taken from, and even so it will not mix for 50km.

When a denser liquid is above a lighter liquid, it is called Rayleigh-Taylor instability.










Strange, finger-like shapes will form.

Cells.

In case of large density difference, spikes will form, in case of small temperature difference bubbles will form.

Bubbles and spikes will be connected by curtains.

Mushroom shaped objects.

This will also occur if warm water is below cold water, or salt water is over fresh water.

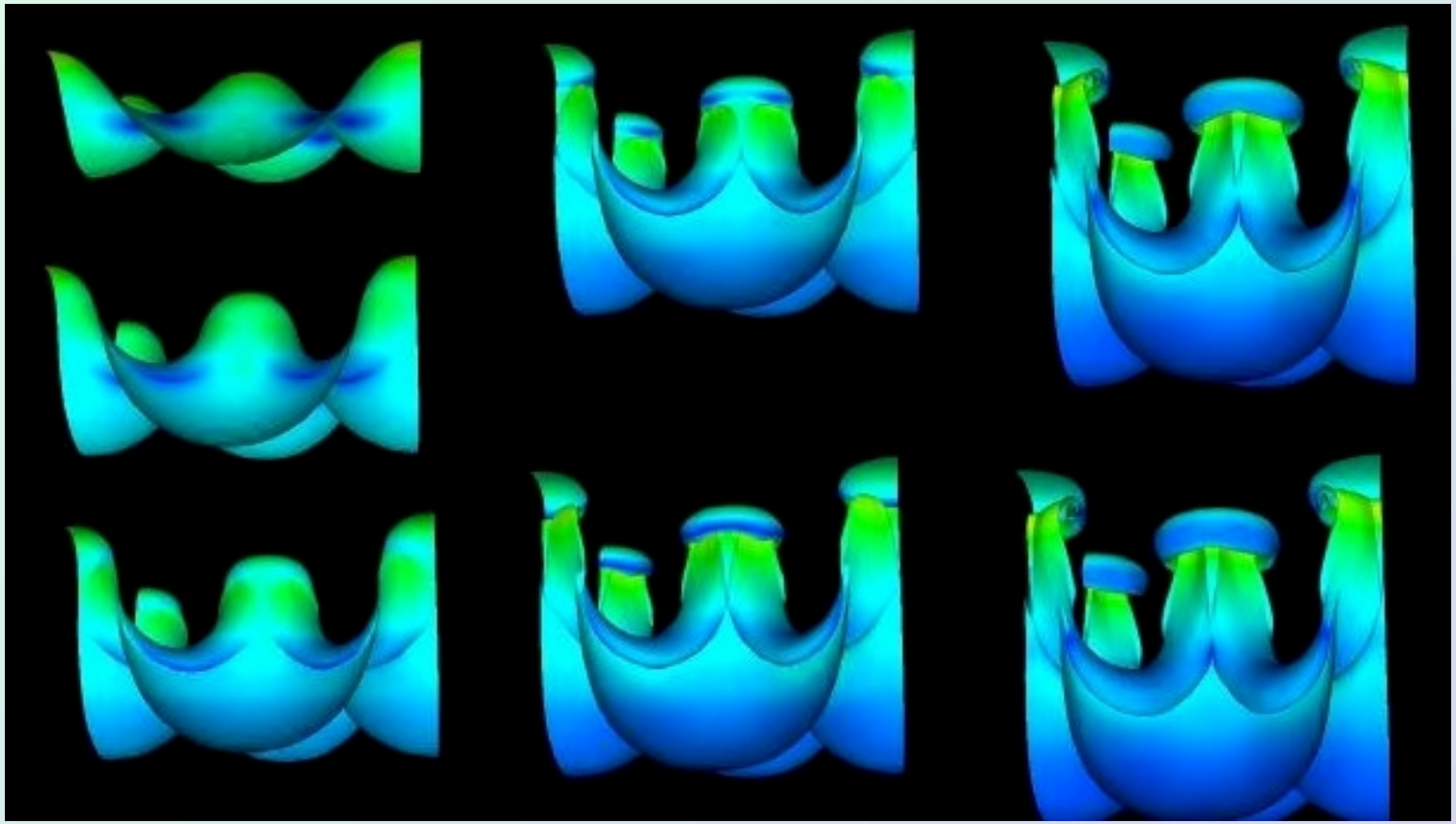
On the top of oceans, water will evaporate, causing the top layer to be heavier.



The growth of ripples:

$$y = \eta(t)\cos kx$$

$$\ddot{\eta}(t) = \left(g\left(\frac{\rho_1 - \rho_2}{\rho_1 + \rho_2}\right)k - \left(\frac{\sigma}{\rho_1 + \rho_2}\right)k^3 \right)\eta(t)$$



This picture is coloured according to the speed.

Thank you for your kind attention!