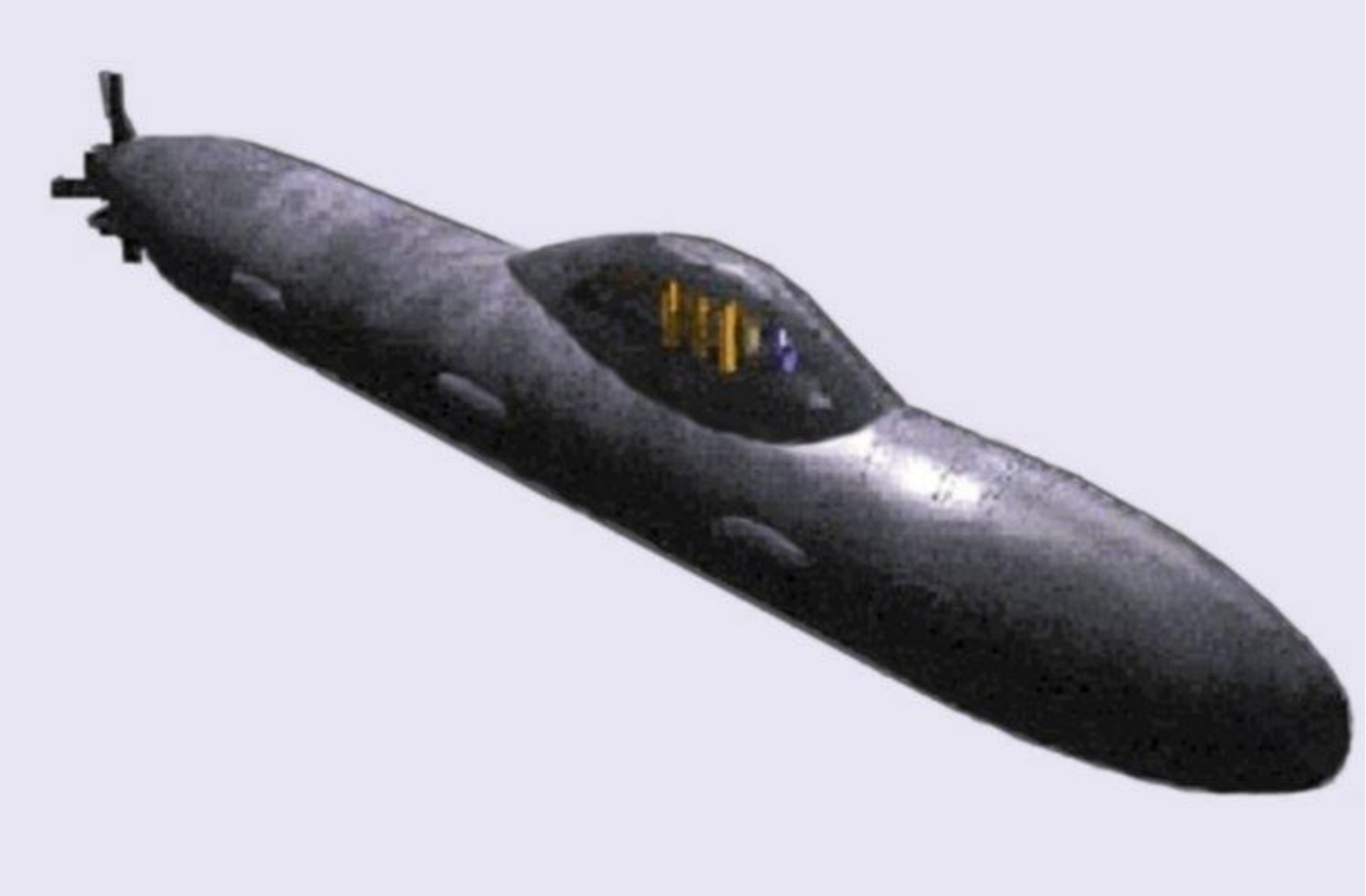
Bell Ringer

1. Where is most of the land ice on Earth located?
2. Where is most of the land ice melting right now?
3. Why is it important to study rising oceans?

Water demos

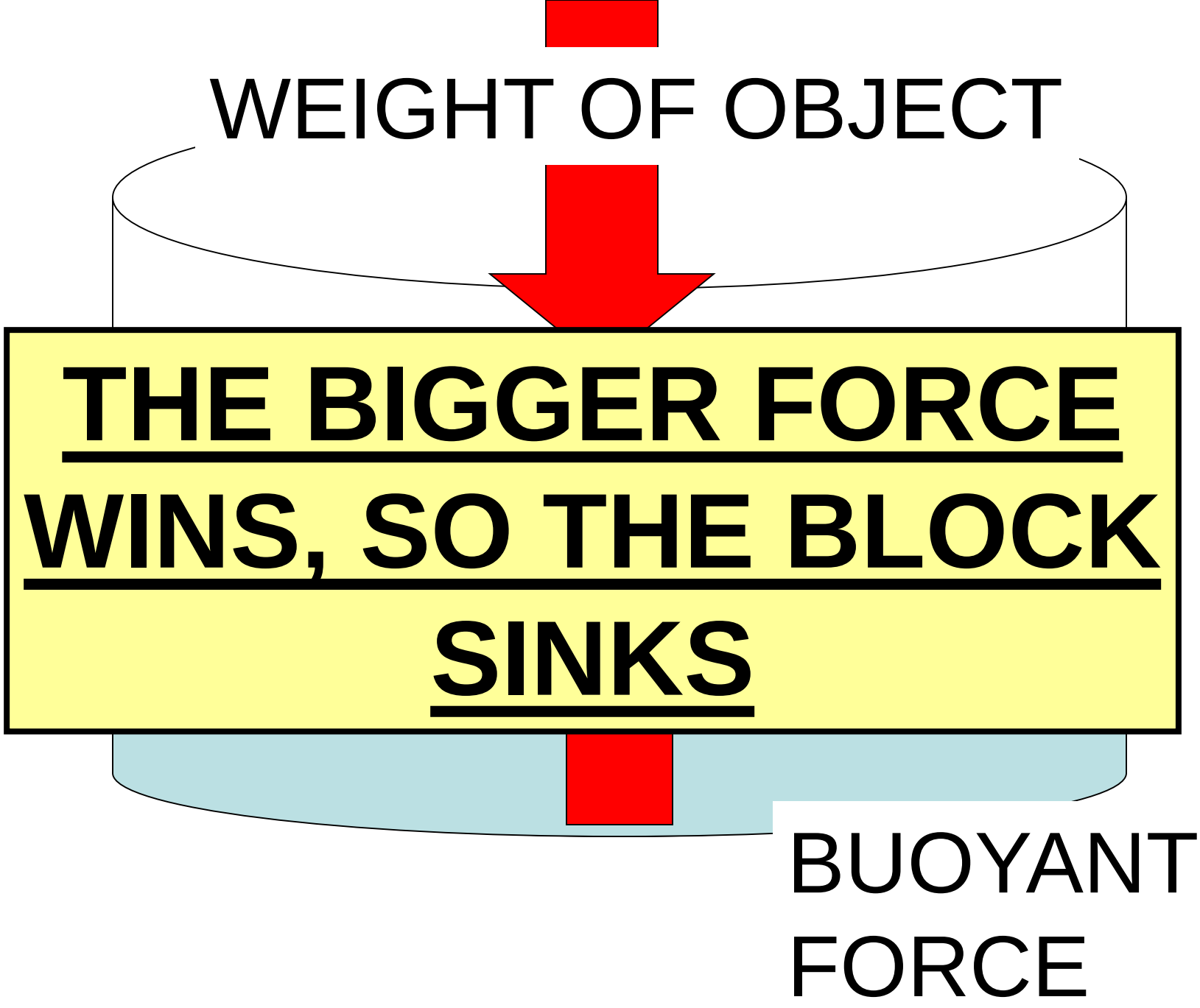
Salt Water Lab

DENSITY & BUOYANCY

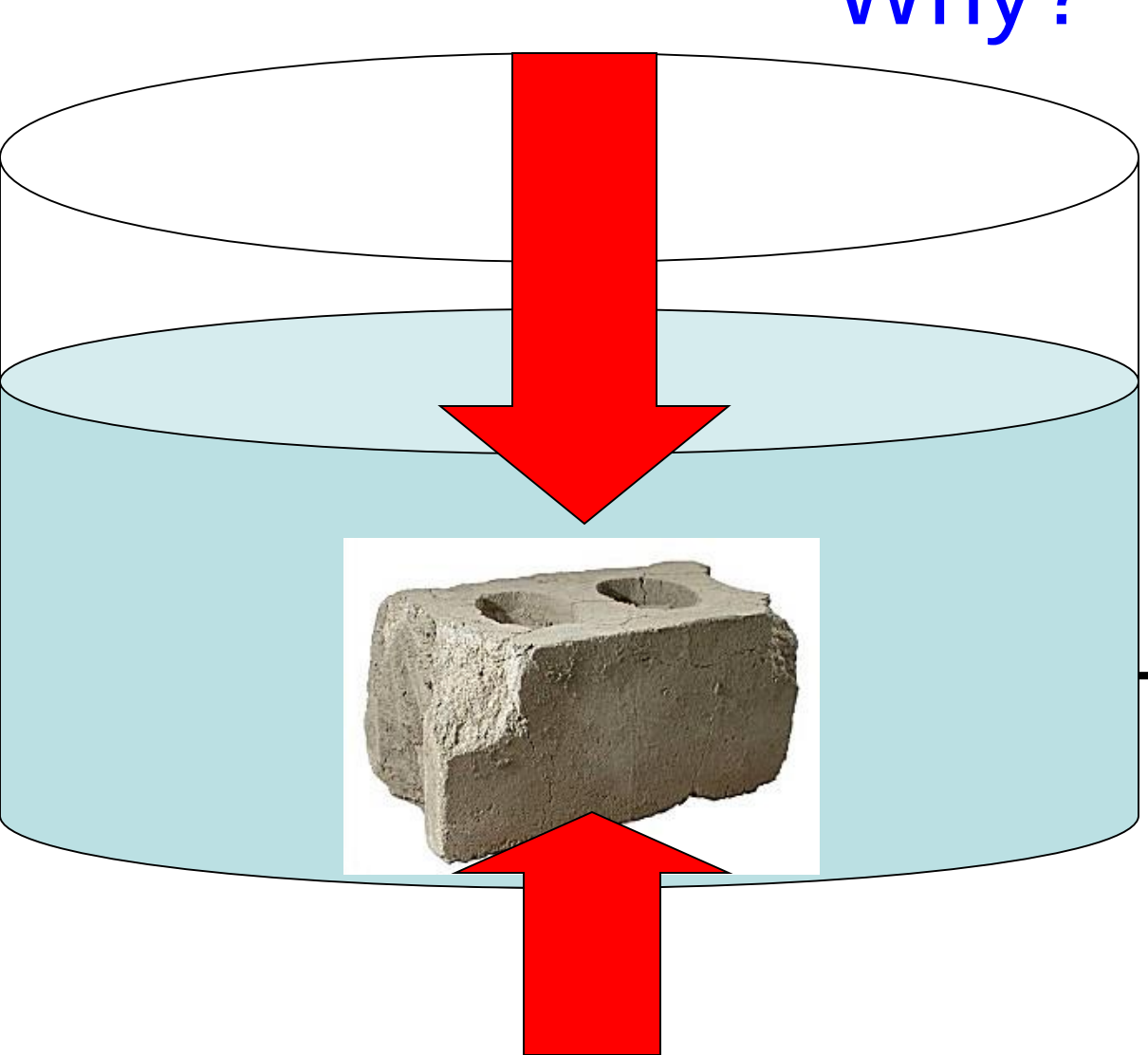


BUOYANCY

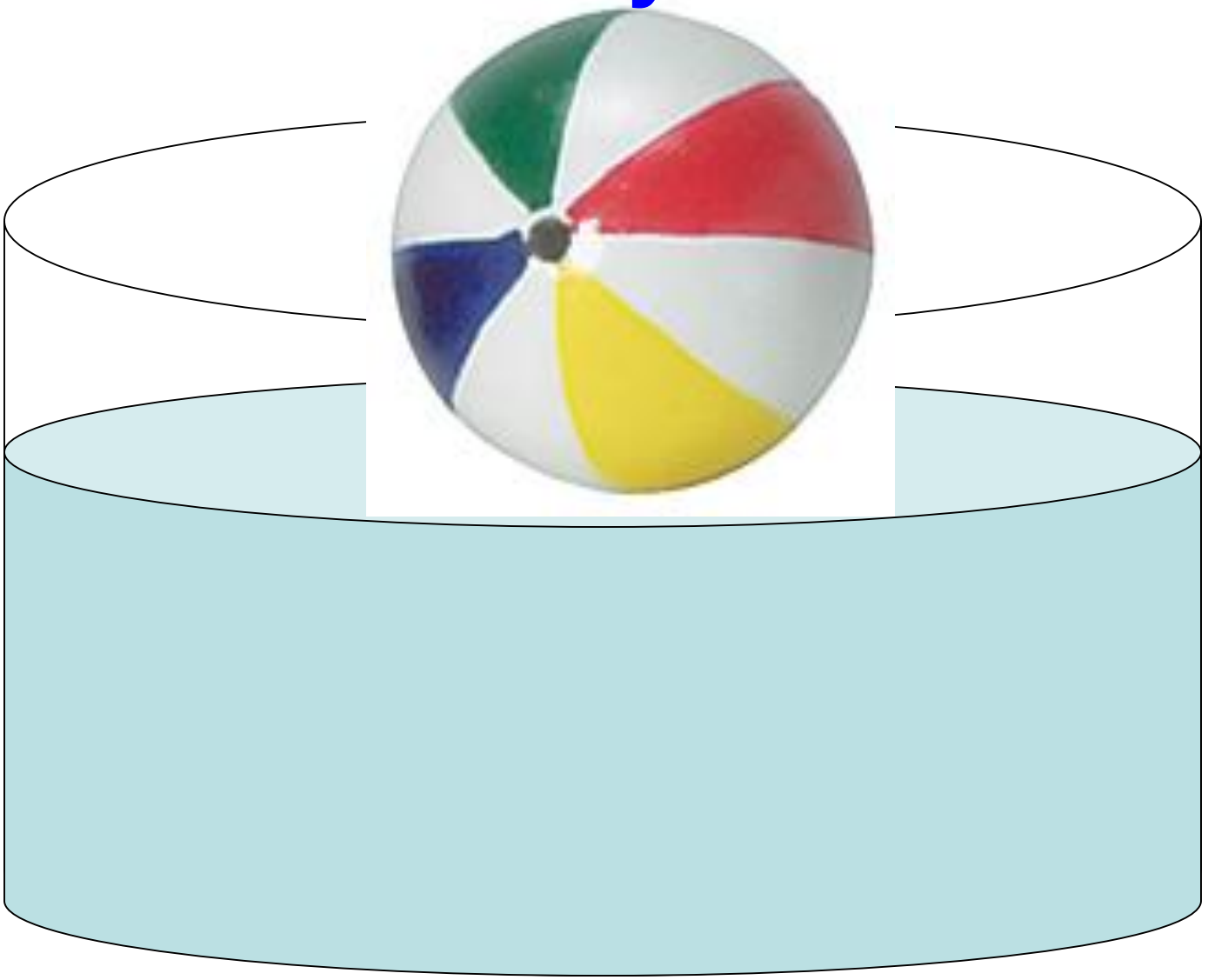
- BUOYANCY = the ability to float in a fluid.
- Examples of fluids = water, air
- BUOYANT FORCE = the upward force that acts on a submerged object.
  - It acts opposite of gravity

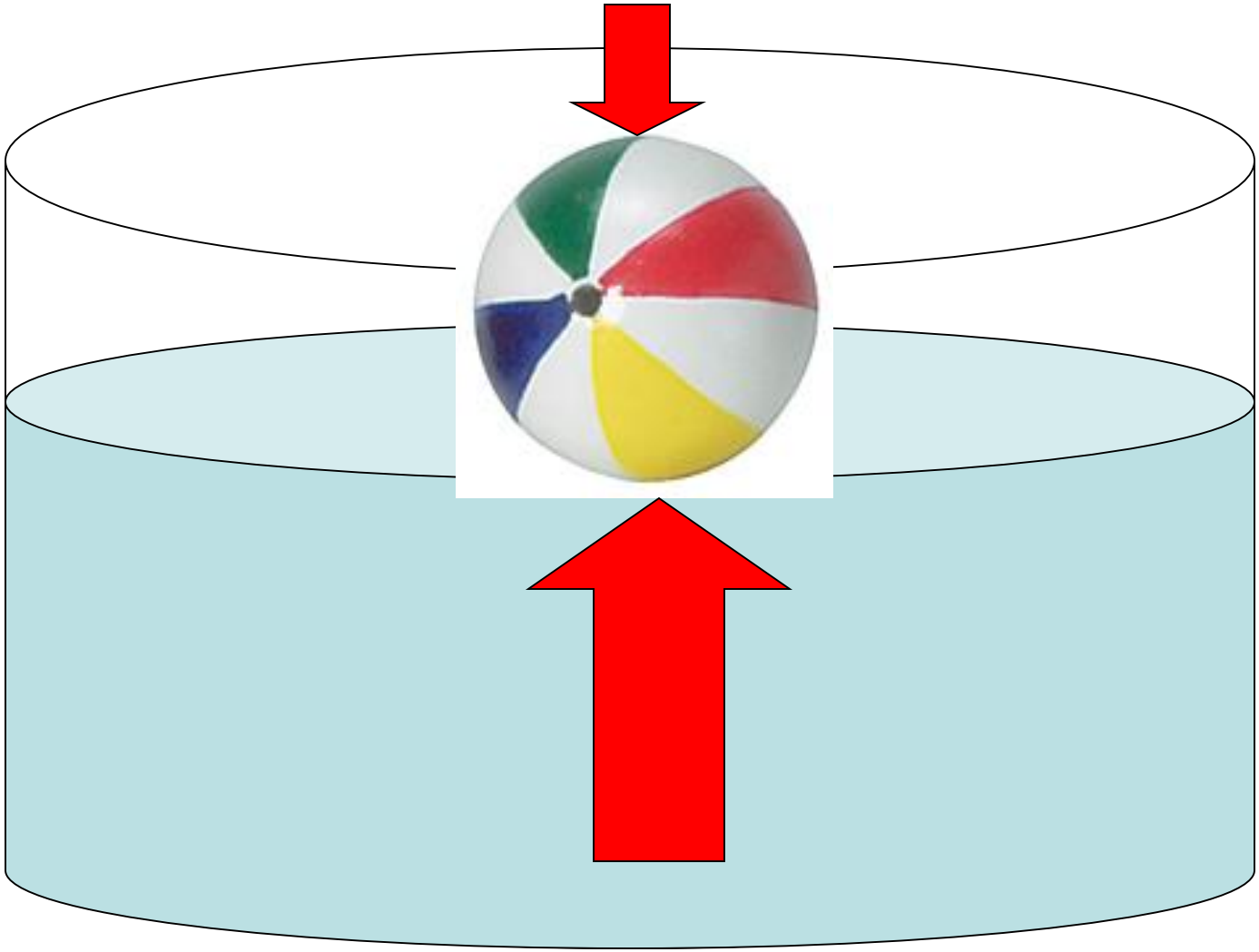

WEIGHT OF OBJECT
THE BIGGER FORCE WINS, SO THE BLOCK SINKS
BUOYANT FORCE

Which one is easier to pick up? Why?



This beach ball floats. Why?

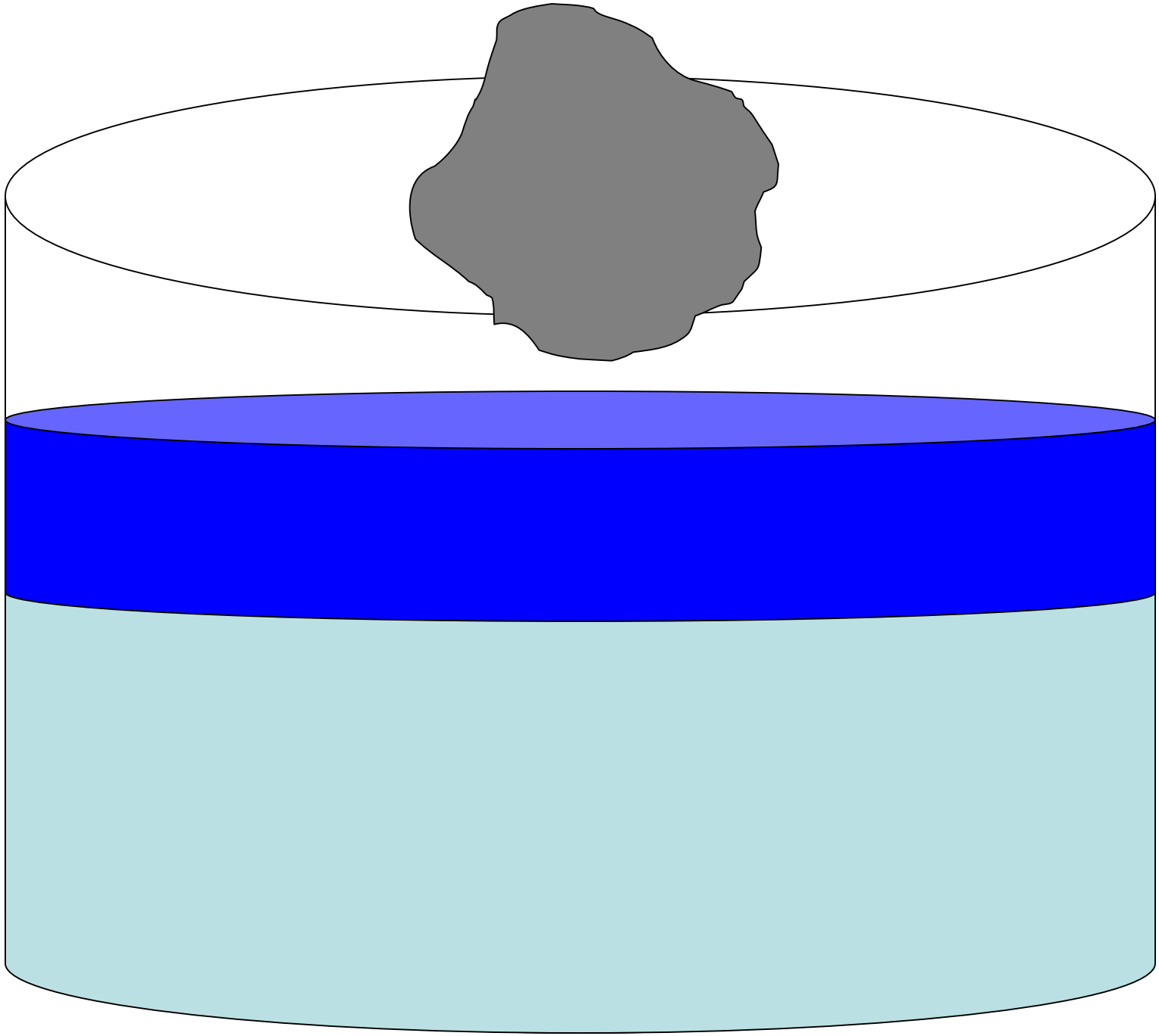




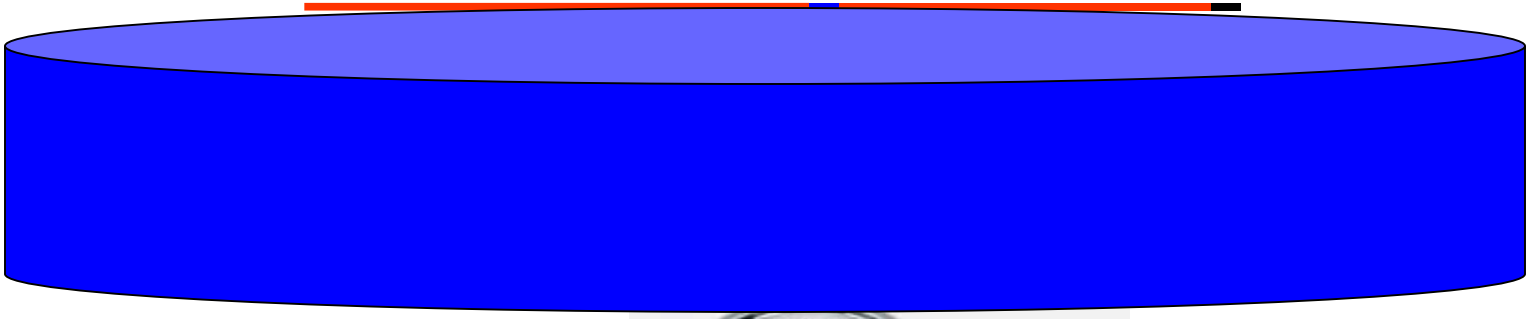
Because the Buoyant Force is greater than the weight of the ball.

ARCHIMEDES' PRINCIPLE

The buoyant force acting on a submerged object is equal to the weight of the fluid the object displaces.



ARCHIMEDES' PRINCIPLE states that the WEIGHT of the amount of water displaced is equal to the BUOYANT FORCE.



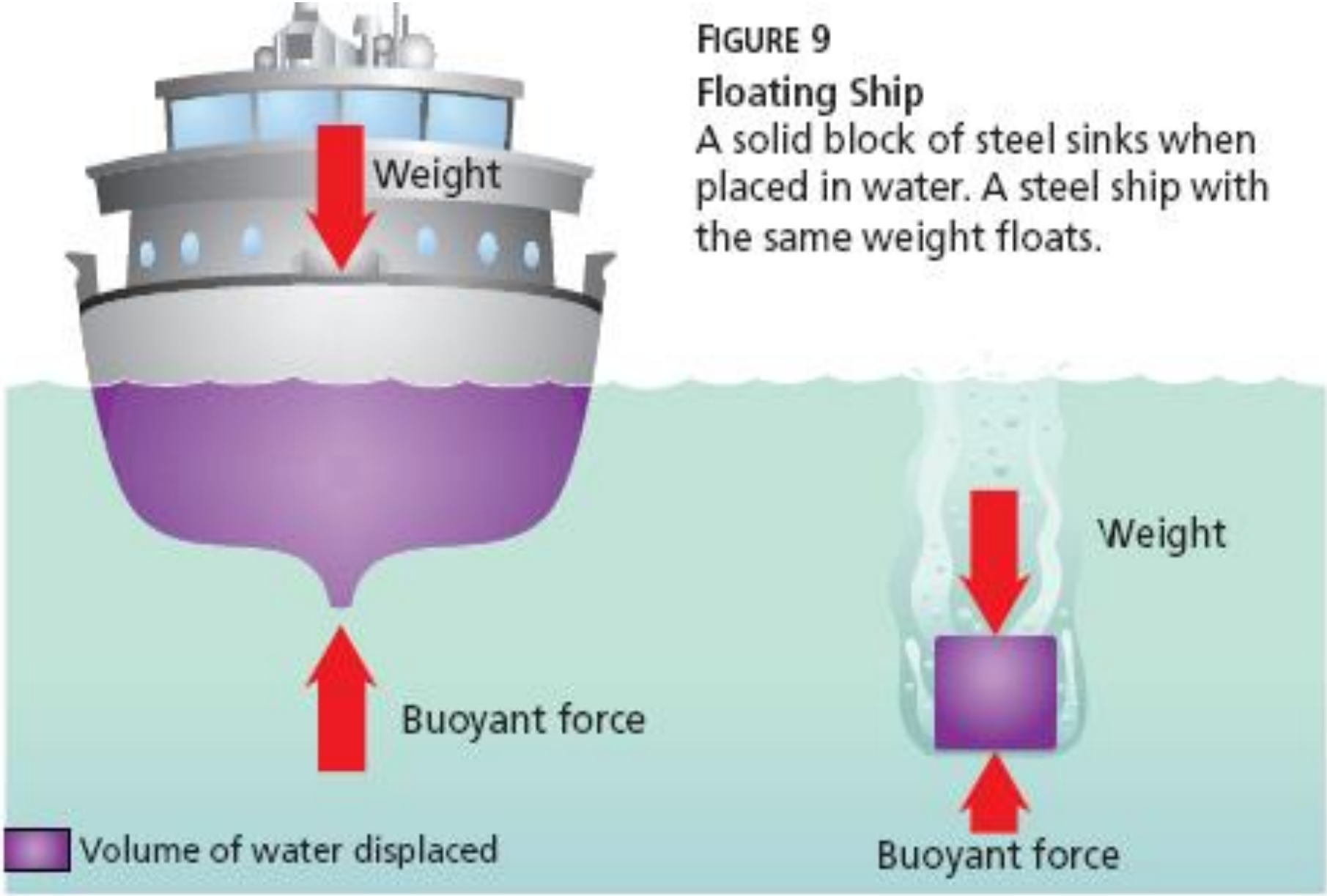
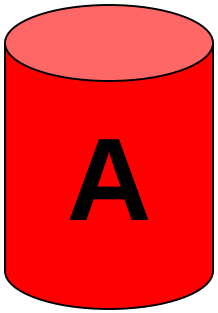


FIGURE 9

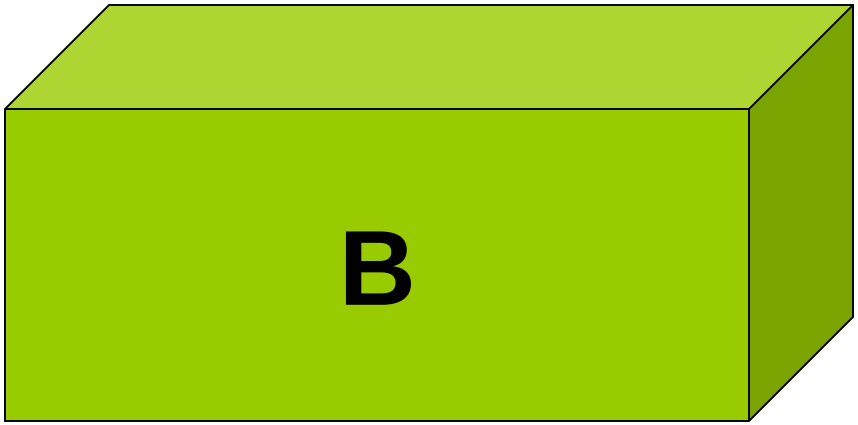
Floating Ship

A solid block of steel sinks when placed in water. A steel ship with the same weight floats.

Mass = 90 kg



Mass = 90 kg



WHICH ONE IS MORE LIKELY TO FLOAT?

DENSITY

DOESN'T DENSITY HAVE SOMETHING TO DO WITH IF SOMETHING SINKS OR FLOATS?

DENSITY

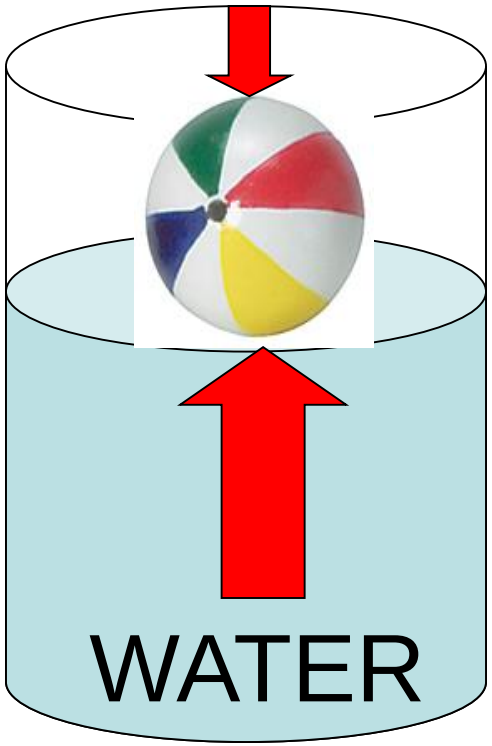
$d = m / v$

DENSITY OF WATER = 1 g/cm^3

- If the object has a higher density, it sinks.
- If the object has a lower density, it floats.
- if the object has the same density, it flinks (floats in the middle of the water).

DENSITY & BUOYANCY

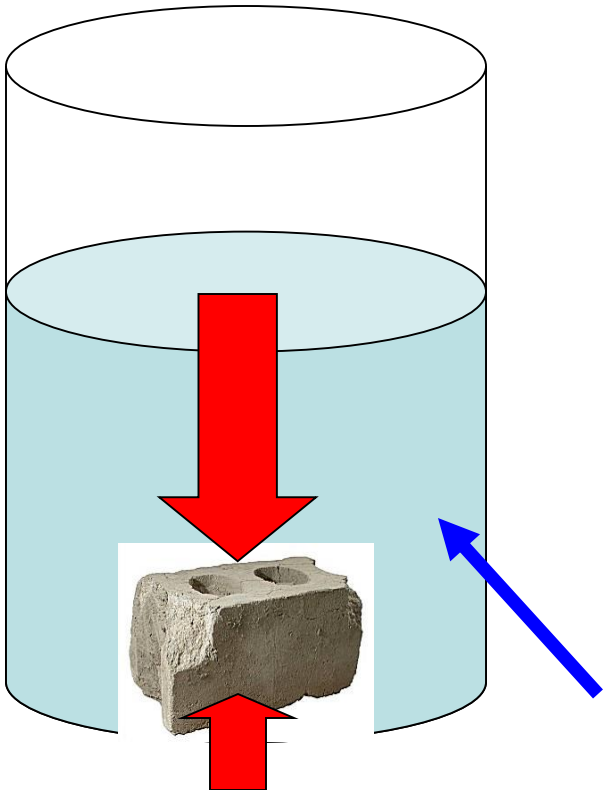
- Having a lower density than water means that the beach ball's buoyant force is higher than the weight of the beach ball.



SO THE BEACH BALL FLOATS.

DENSITY & BUOYANCY

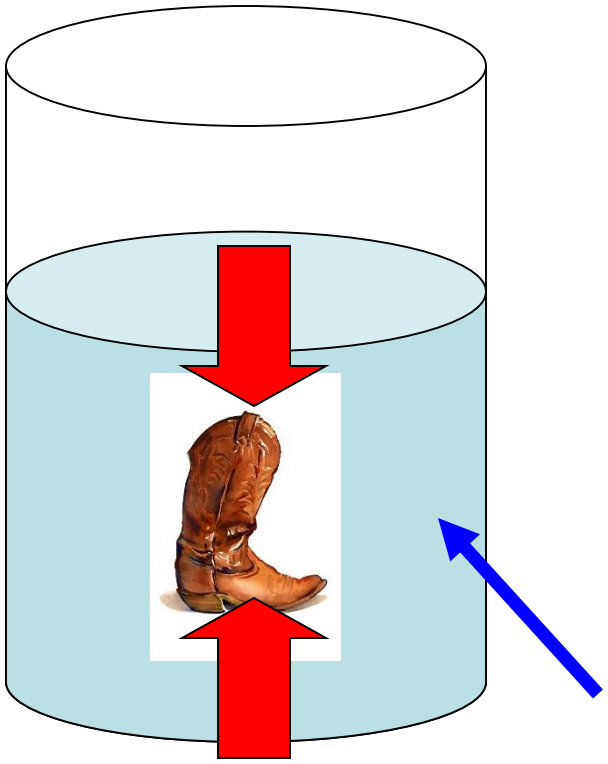
- Having a higher density than water means that the cinder block's buoyant force is lower than the weight of the cinder block.



SO THE CINDER BLOCK SINKS.

DENSITY & BUOYANCY

- Having the same density as water means that the boot's buoyant force is equal to the weight of the boot.



SO THE BOOT NEITHER SINKS NOR FLOATS, IT **FLINKS**

CHANGING DENSITY

You can change an object's density by:

1. Increasing/decreasing its mass
2. Increasing/decreasing its volume

$$d = \frac{m}{v}$$

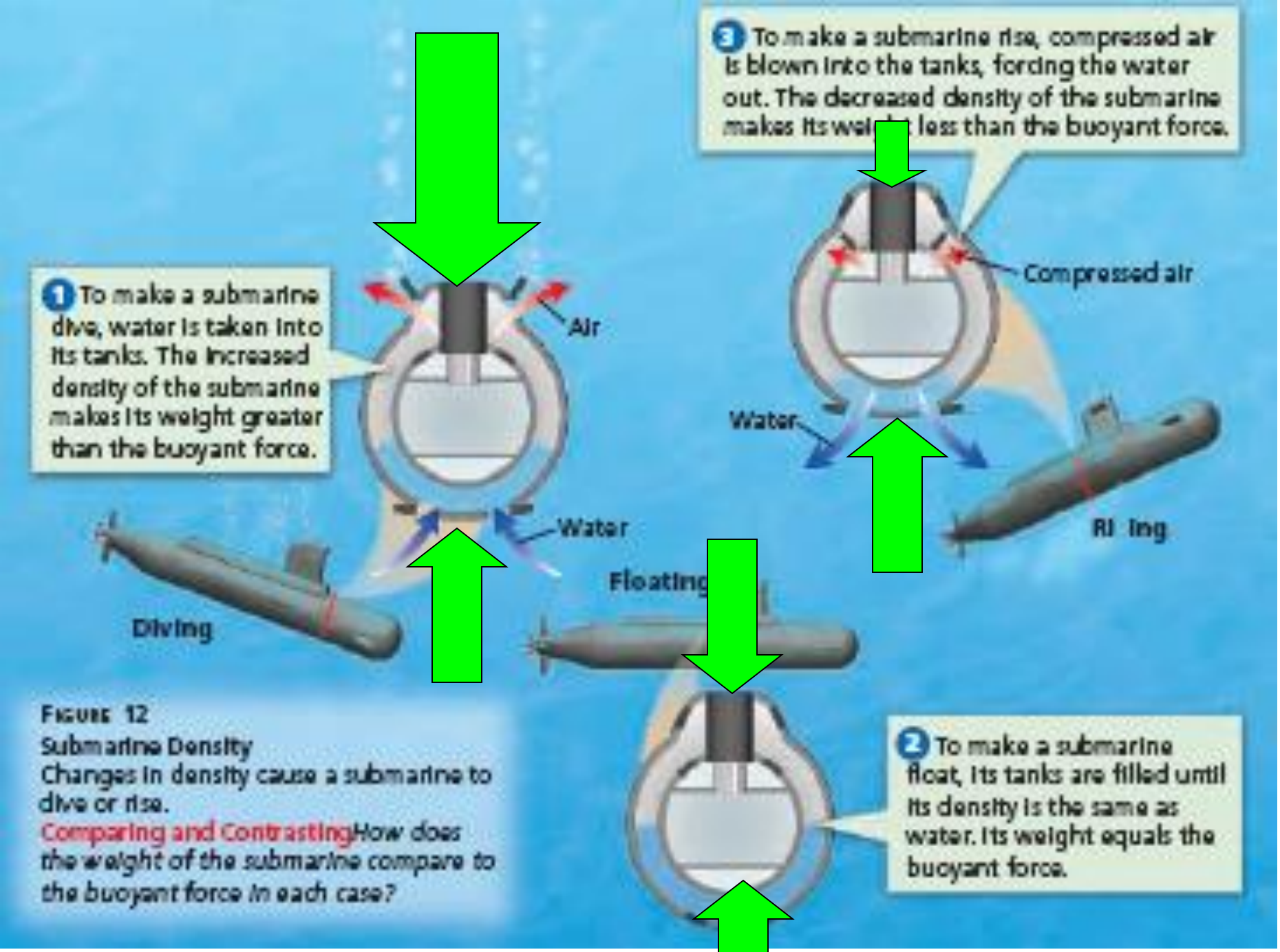


Figure 12
Submarine Density
Changes in density cause a submarine to dive or rise.
Comparing and Contrasting How does the weight of the submarine compare to the buoyant force in each case?

AN OBJECT FLOATS

CAUSES:

- Weight is less than the buoyant force.
- Object is less dense than the fluid
- Object decreases its mass and becomes less dense than the fluid.
- Object increases its volume and becomes denser than the fluid.

AN OBJECT SINKS

CAUSES:

1. Weight is greater than the buoyant force.
2. Object is denser than the fluid
3. Object increases its mass and becomes denser than the fluid.
4. Object decreases its volume and becomes denser than the fluid.

SALT LAKES

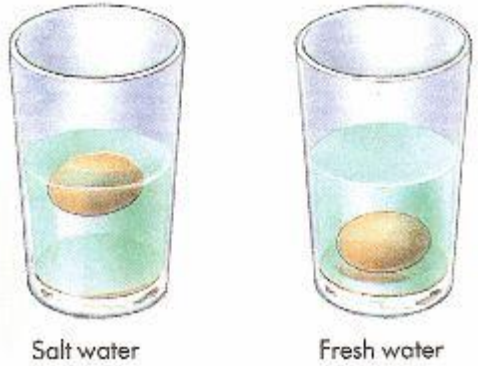
- https://www.youtube.com/watch?v=aTcyACmiaho

Salt Water Density vs. Fresh Water

- A cubic foot of salt water weighs (on average) 64.1 lbs, while a cubic foot of fresh water weighs only 62.4 lbs. The reason for the difference in weight is that salt water has salt dissolved in it.

Objects Are More Buoyant in Salt Water Because Salt Water Weighs More

- Recall that Archimedes' Principle states that the upward force on a submerged object is equal to the weight of the water that it displaces.
- Salt water weighs more than fresh water, so it exerts a greater upward force on a submerged object.
- An object that displaces a cubic foot of fresh water will experience an upward force of 62.4 lbs, whereas the same object in salt water will experience an upward force of 64.1 lbs.

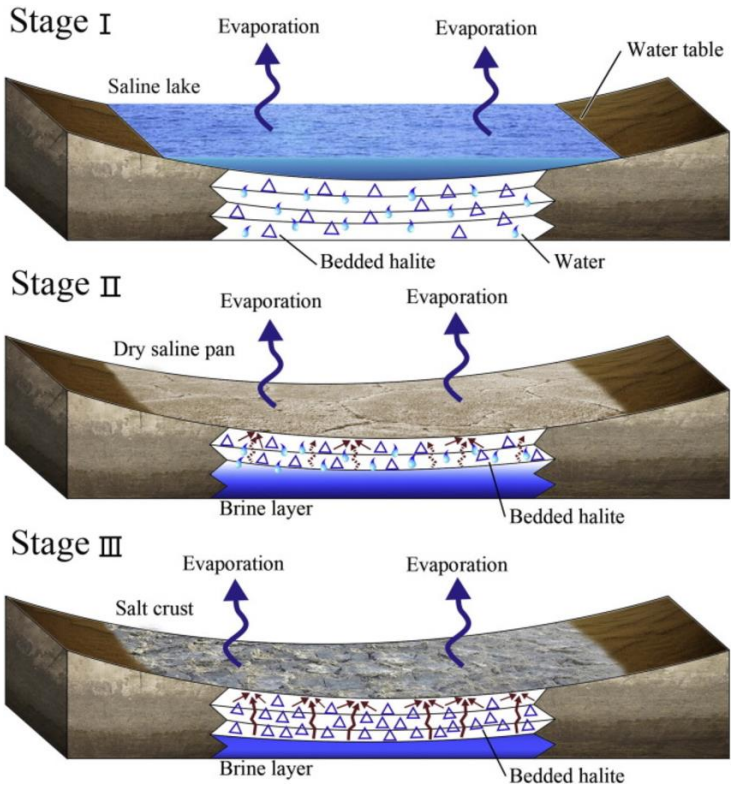


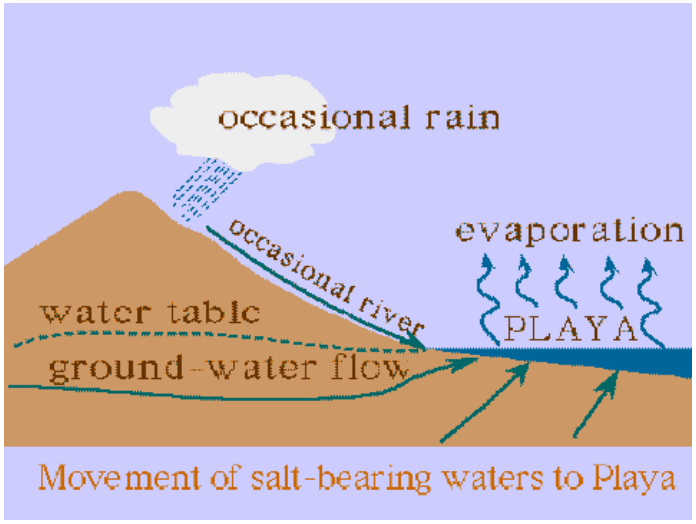
How are salt lakes formed?

- https://www.youtube.com/watch?v=RP7C8-qiRW0

How are salt lakes formed?

1. Water (containing lots of minerals) enters a basin.
2. The water evaporates, leaving the minerals (mostly salt) behind.
3. The overall amount of salt in the water increases over time.
4. Eventually the lake could completely dry, leaving salt flats.



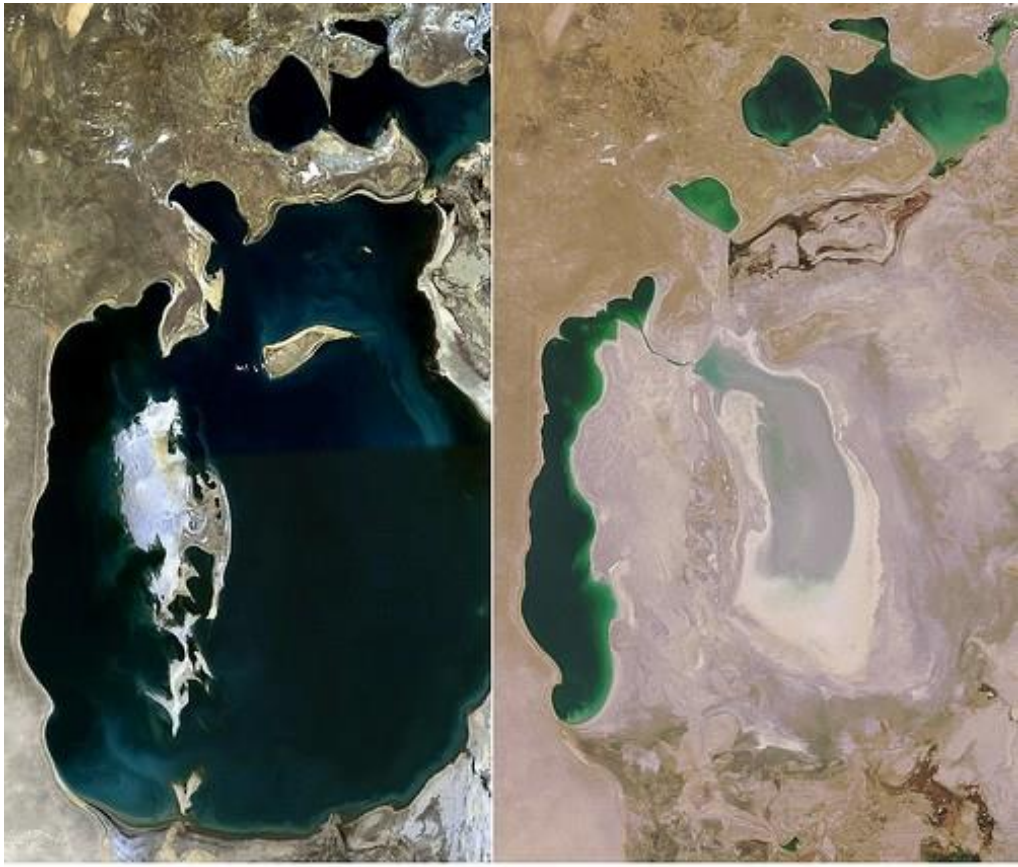


Worldwide salt lakes

- Great Salt Lake
- Largest salt lake in the western hemisphere
- 8th largest in the world
- Very few fish

Worldwide salt lakes

- South Aral Sea
- Once the fourth largest lake in the world.
- Only 10% its original size now.
- Due to poor water management by USSR and Russia
- USSR considered it to be a ‘mistake of nature’, so they diverted its river inlets to farmlands.
- Now the dry lake beds blow cancer causing toxins all over the area.



July - September, 1989 October 5, 2008

Worldwide salt lakes

- **Issyk Kul – Kyrgyzstan**
- Surrounded by snow capped mountains, but the lake doesn't freeze because of how salty it is.
- In 2007, archaeologists reportedly discovered the remains of a 2,500 year-old civilization at the bottom of the lake.

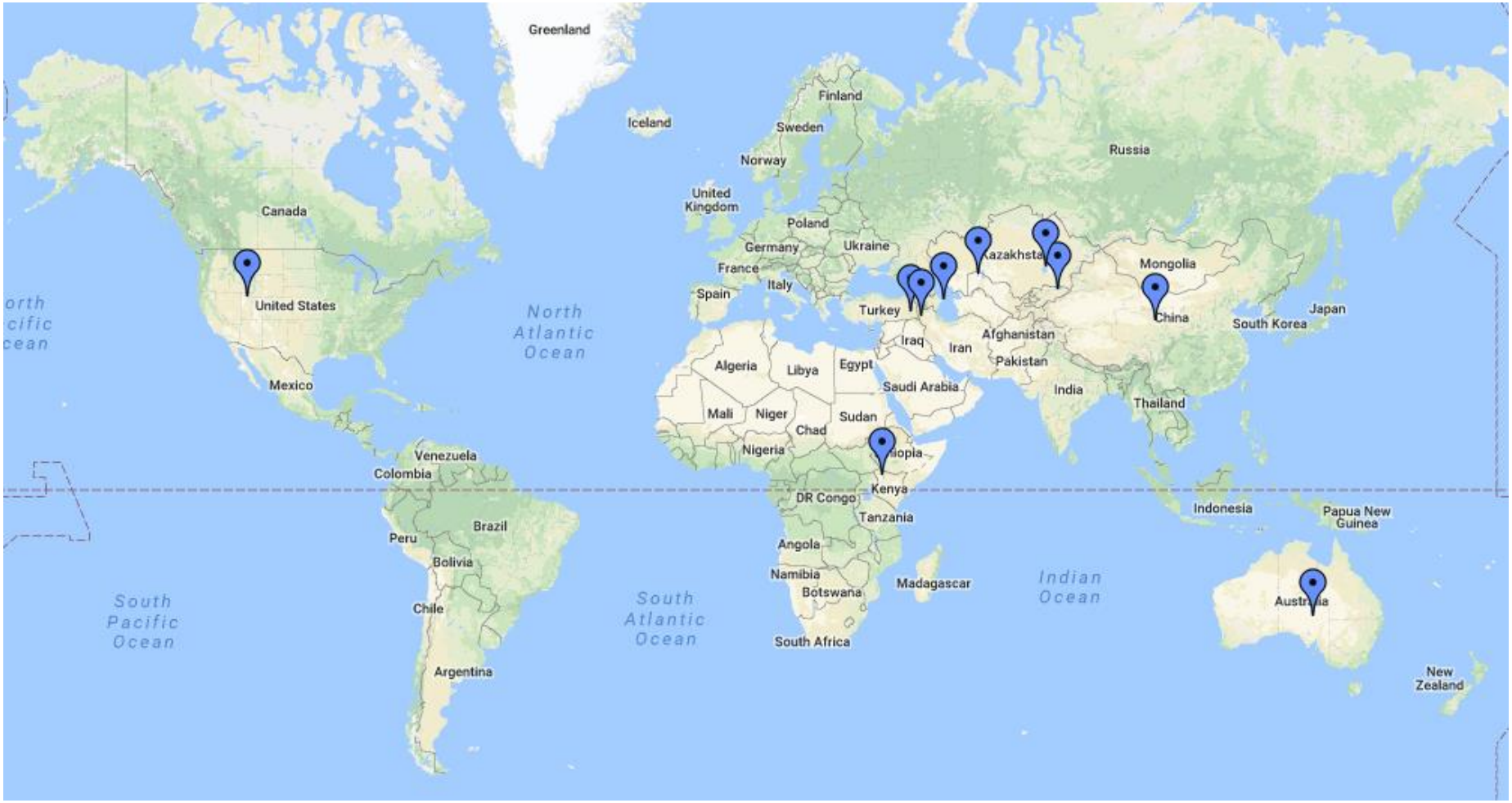
Worldwide salt lakes

- **Lake Turkana – Kenya and Ethiopia**
- Surrounded by barren volcanic beds.
- There's an active volcano in the middle of the lake.
- The hot, arid shores are lined with crocodiles, scorpions, and vipers.

Worldwide salt lakes

- **<u>Caspian Sea</u> – Russia, Turkmenistan, Iran, Kazakhstan, and Azerbaijan**
- <u>Largest salt lake AND the largest lake in the world.</u>
- Borders five countries.
- Debate about if it’s a ”lake” or a ”sea”.
- Rich in natural oil deposits.

Where do you find most salt lakes?



Bill Nye: Ocean Currents