AMAZING WATER

DR. FRED YARGER

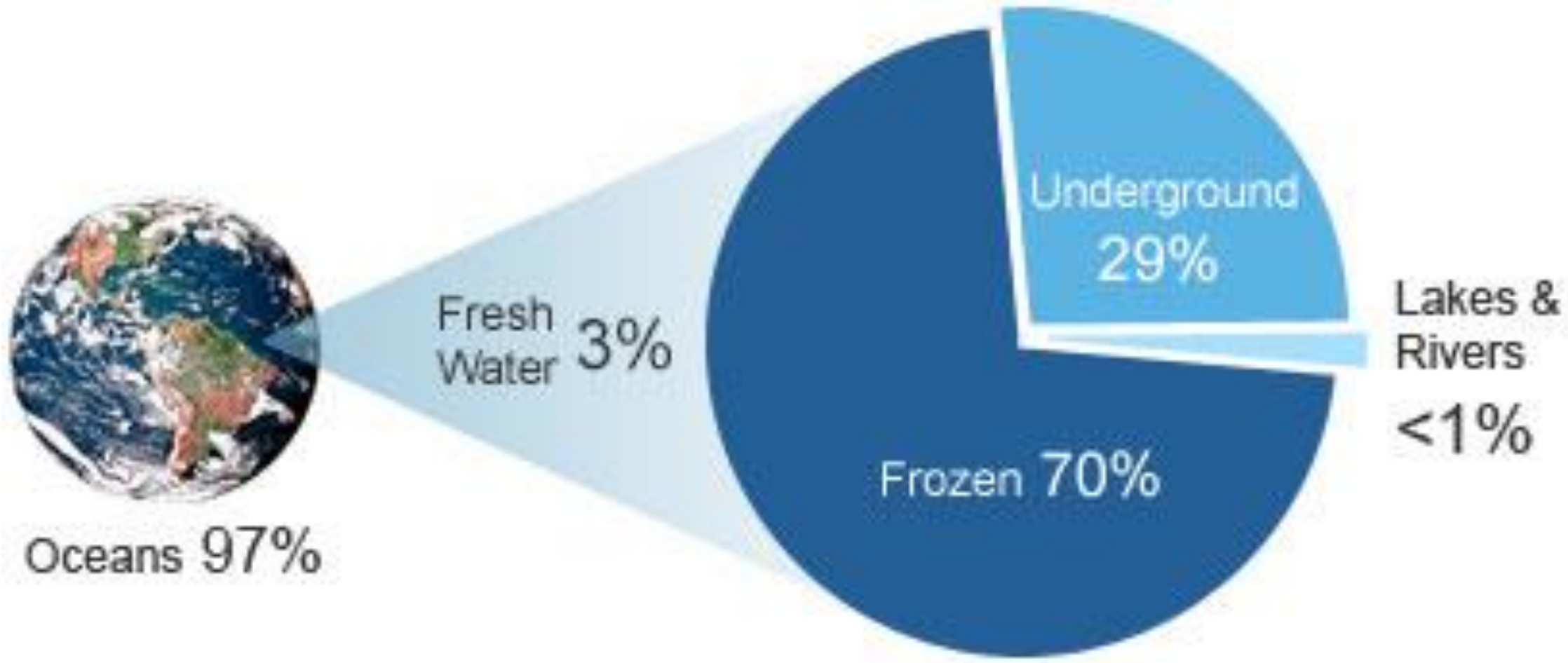
6th GRADE STEAM BLOCK

- Water Purification Projects
  - Must know what's really in the water
  - Consider how long & at what cost to remove
  - Think about alternative uses
- Water Transport Projects
  - How much, how far, obstacles

STEAM BLOCK (cont.)

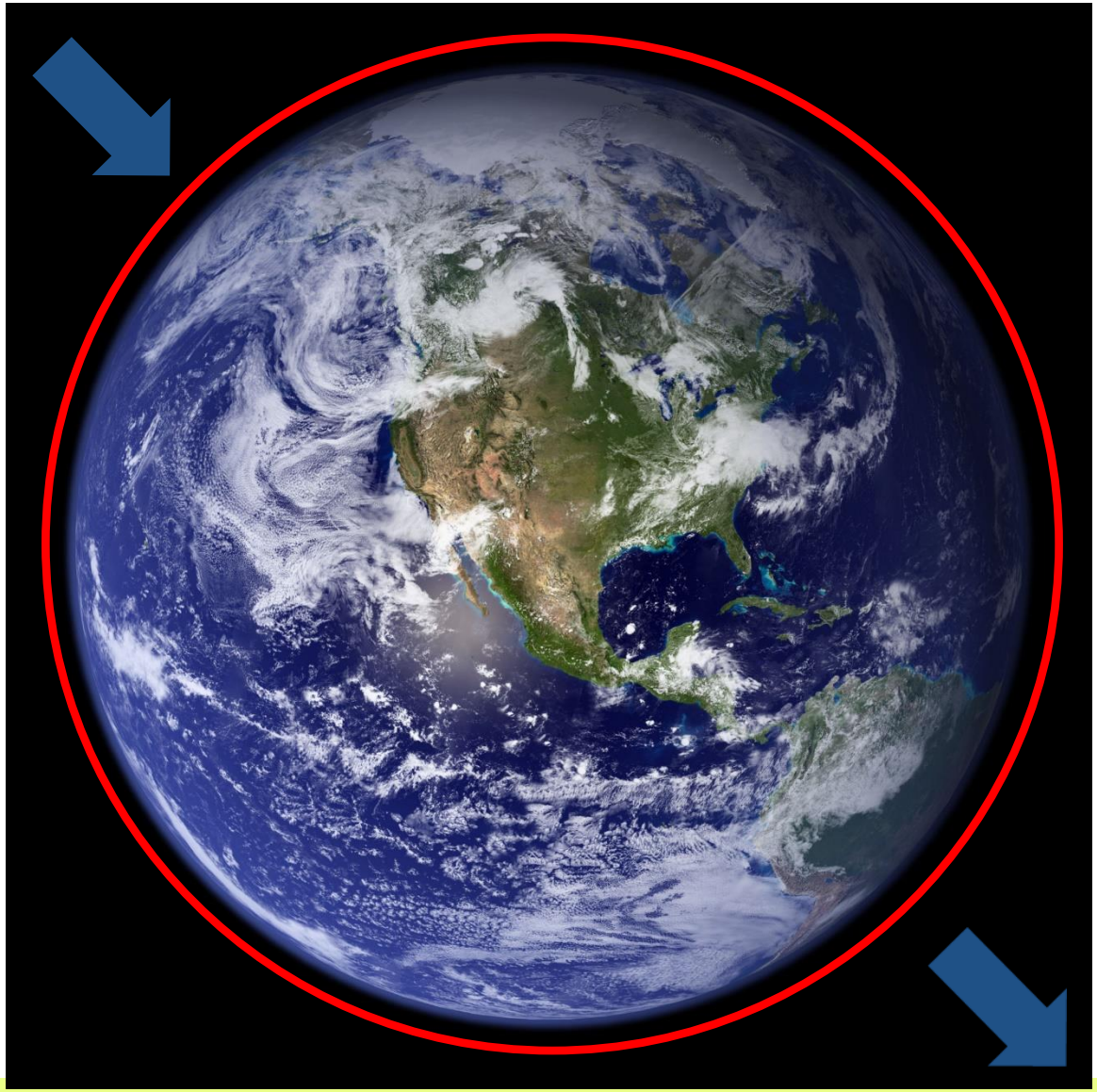
- Key Concepts for Water Purification Projects
  - ~70% of Earth's surface covered by oceans
  - ~97% of water on Earth is seawater
  - Only about 3% of Earth's water is potable
    - <1% is accessible
  - Total amount of water on Earth is constant

STEAM BLOCK (cont.)



STEAM BLOCK (cont.)

NO WATER COMES IN FROM SPACE



NO WATER GOES OUT INTO SPACE

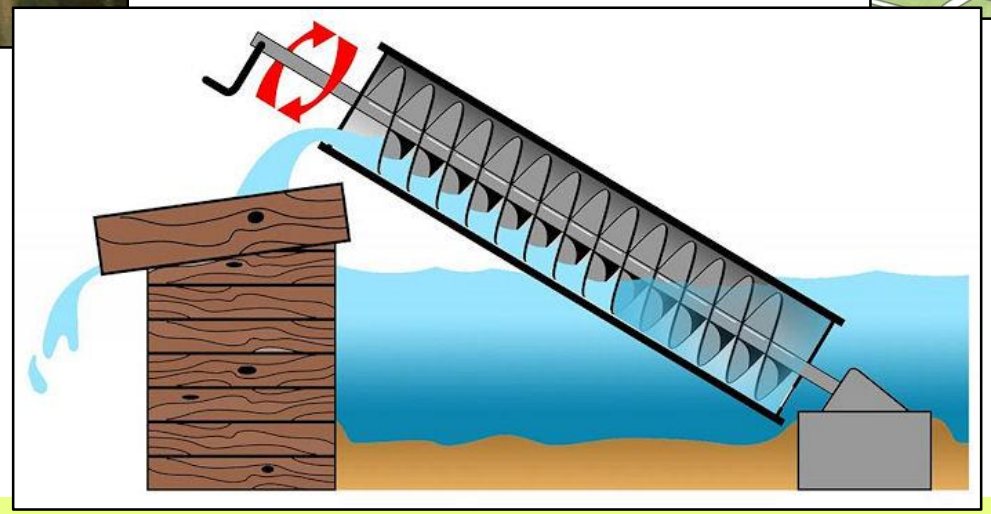
STEAM BLOCK (cont.)

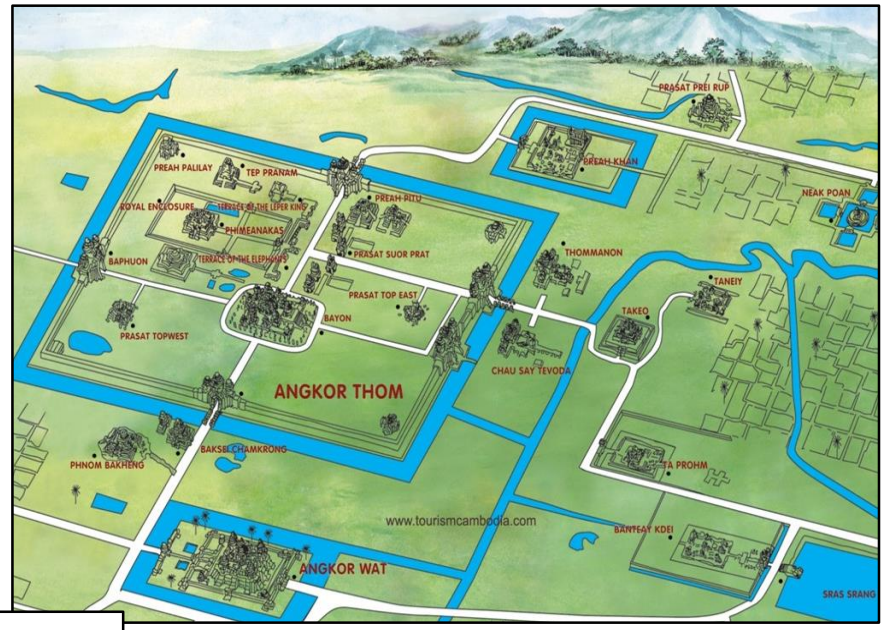
- Key Concepts for Water Transport Projects
  - An age-old problem; you're not the first to try & find a solution
  - Scaling-up is difficult

STEAM BLOCK (cont.)

Roman Aqueduct

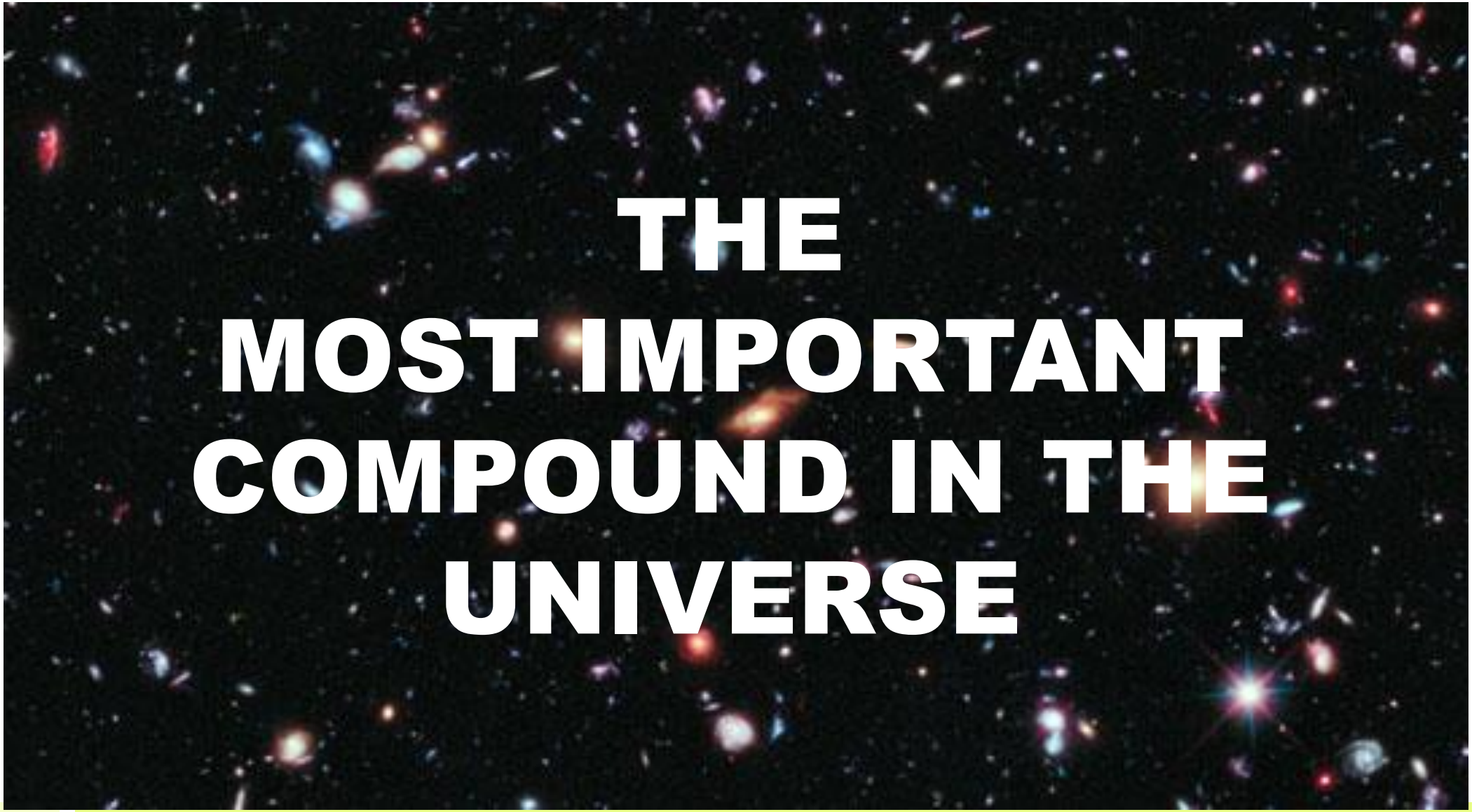
Archimedes' Screw



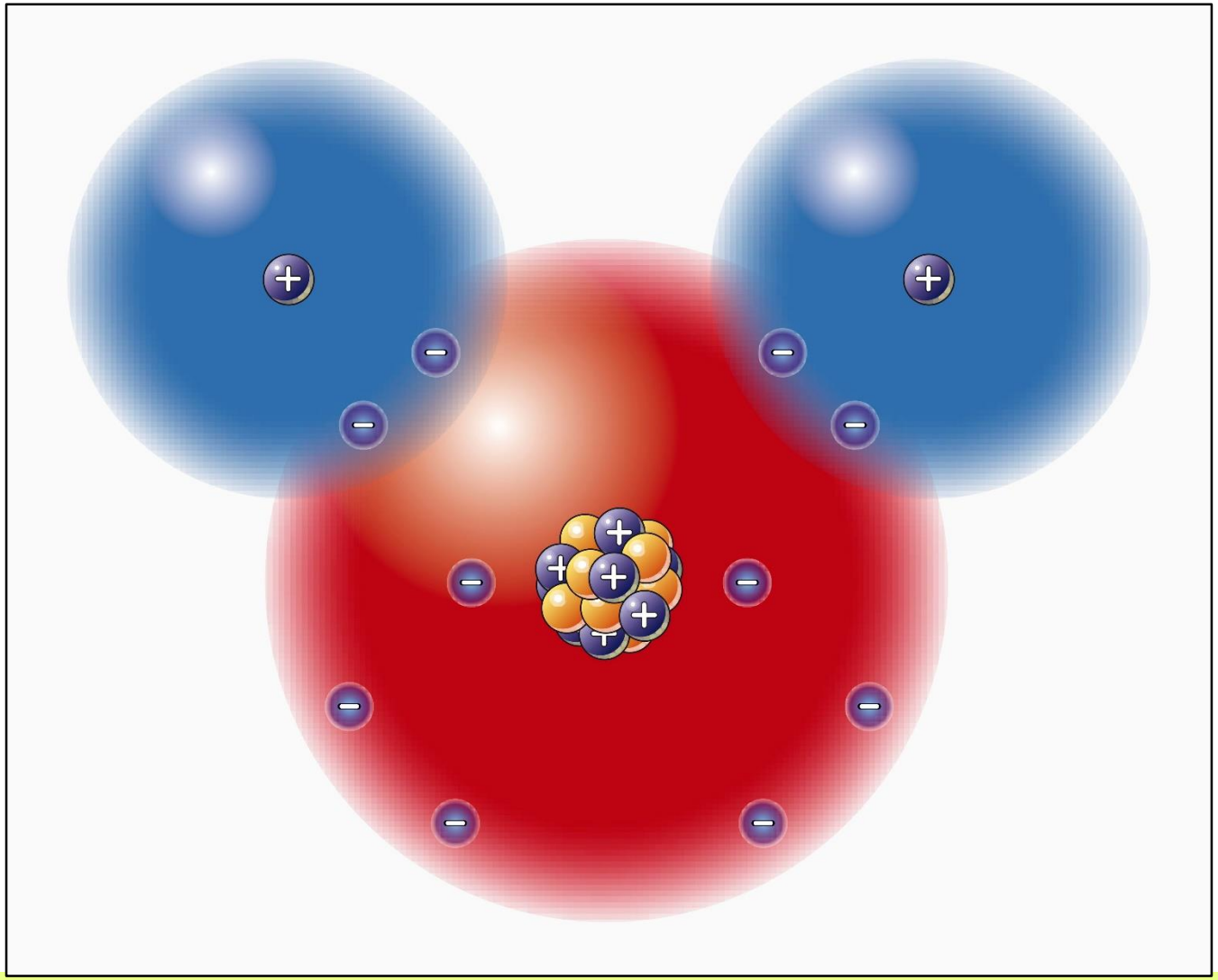


Khmer Canals

WATER (H_2O)



THE CHEMICAL COMPOUND WE CALL WATER



WHY IS WATER SO IMPORTANT

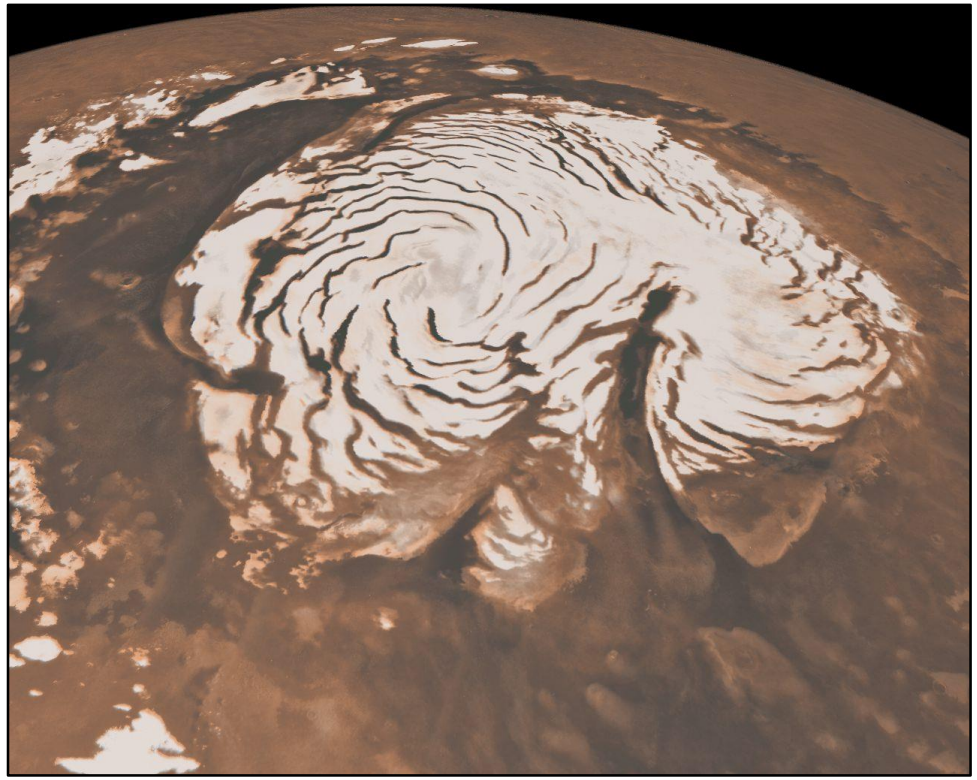
WHY IS WATER SO IMPORTANT?

1. It is the <u>one</u> compound we know of that appears to always be associated with life.

On Earth, water is found across the planet and life could not survive without it. However, our understanding of how Earth came to have its water and the extent of water beyond Earth, and beyond the Solar System, remains open to debate. Water in the interstellar medium (ISM) was first detected in the 1960s, and with missions growing increasingly sensitive to resolving spectral features, we are now beginning to see how widespread water can be in the universe, including planets, moons, stars, star-forming clouds, and the ISM. Composed of hydrogen and oxygen, two abundant elements in the universe, water has been mapped throughout the ISM. This science briefing will focus on two locations that are in the forefront of the search for water studies. NASA missions are searching for water in the ISM where new stars and planets form, as well as in the atmospheres of exoplanets. Understanding the presence and distribution of water through astronomical objects helps us understand the evolution of the universe.

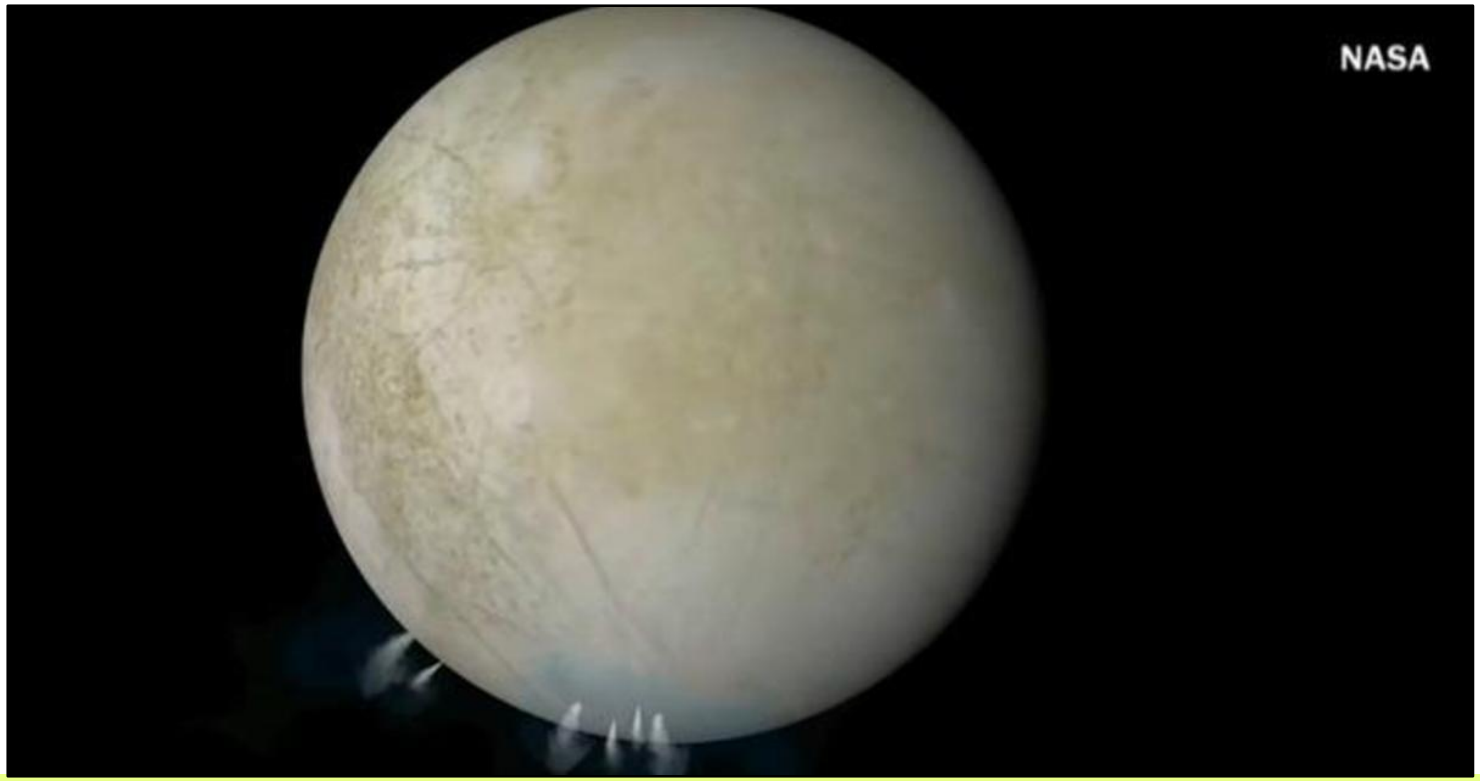
The search for water is one piece in our search for life, addressing one of NASA's big Astrophysics questions—Are we alone?—and several NASA missions have made strides to understand the origin, abundance, and location of water across the universe.

Abstract of 7 December 2017 NASA Presentation by Dr. Marcucci, Dr. Melnick, Dr. Zellem, & Dr. Mandell



Polar Ice Cap on Mars

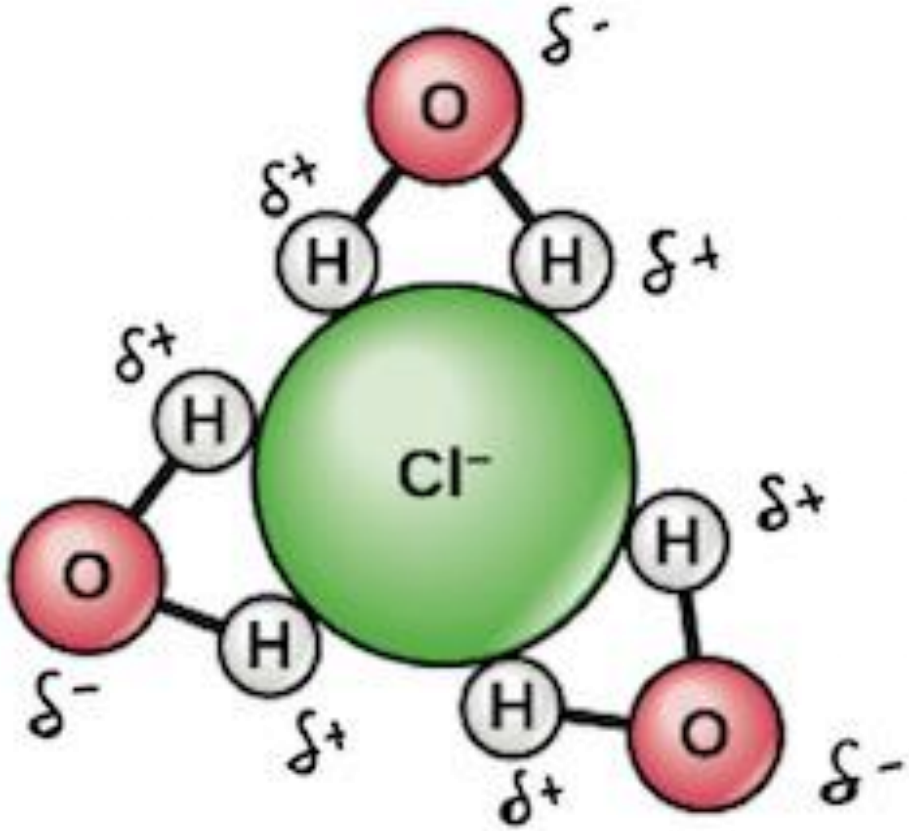
Water Plumes on Jupiter Moon Europa

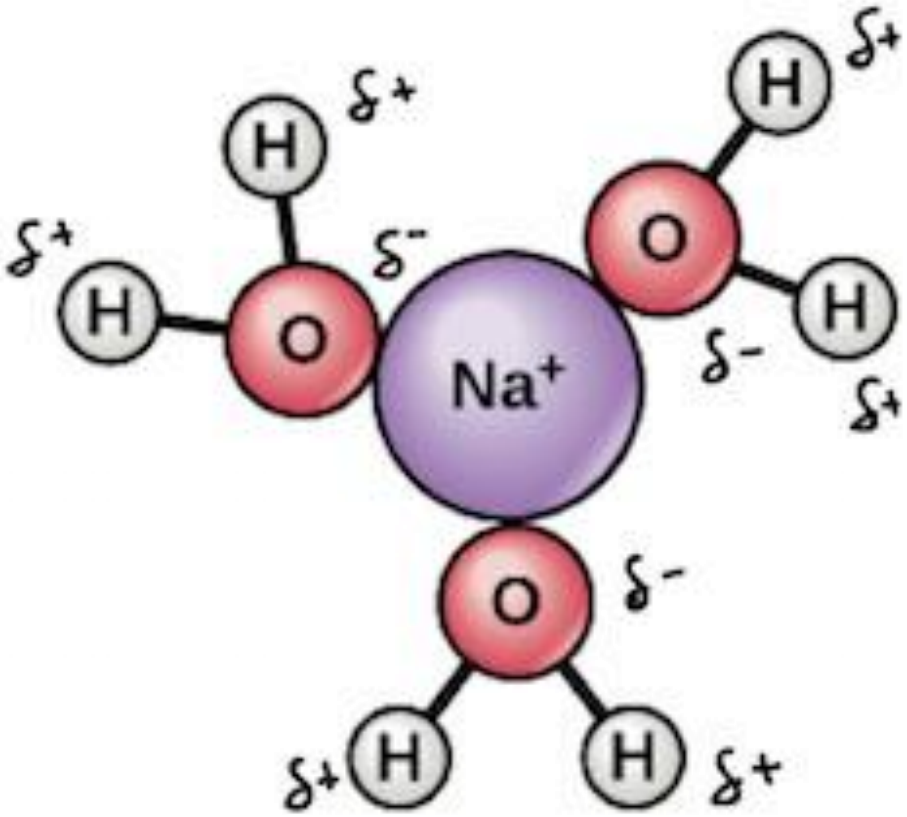


WHY IS WATER SO IMPORTANT?

1. It is the <u>one</u> compound we know of that appears to always be associated with life.
2. The water molecule does not "bond" chemically with other substances.

Water is called the "Universal Solvent."





Thus, “what” goes in can be taken out!

1. The water molecules remain intact but attach ionically to what is ionic materials.
2. Water molecules can adhere (cling to) substances not similar to water.

The water remains as water!