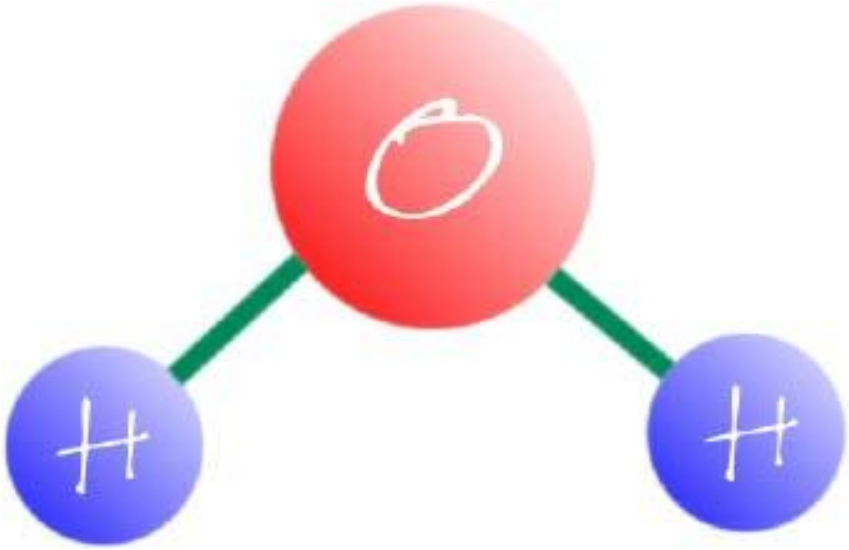
Water is important because:

- Most organisms have high water content (75 - 95%).
- Many organisms live in water.
- Most chemical reactions of life take place in water.

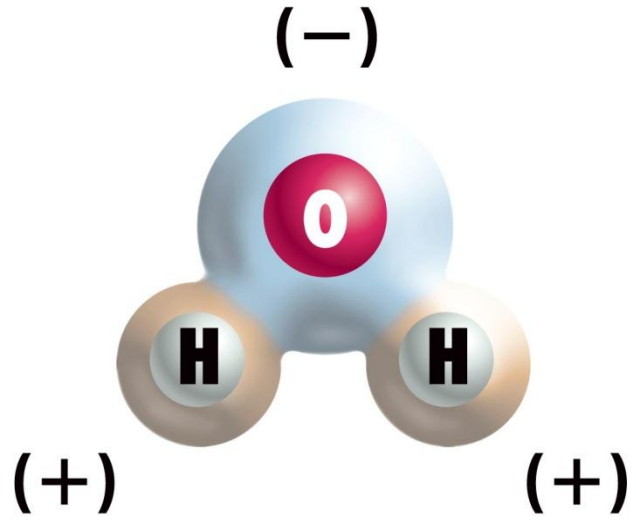
Water Structure

- A water molecule consists of 2 hydrogen and 1 oxygen atom, hence…H2O.
- Electrons are *shared* through <u>covalent</u> bonding between the 3 atoms.



Water molecules are polar

- The e are shared unequally, creating an unequal distribution of charge.
- The oxygen atom has more protons so it attracts the shared electrons more of the time
  - The hydrogen's have a partial positive charge
  - The oxygen has a partial negative charge



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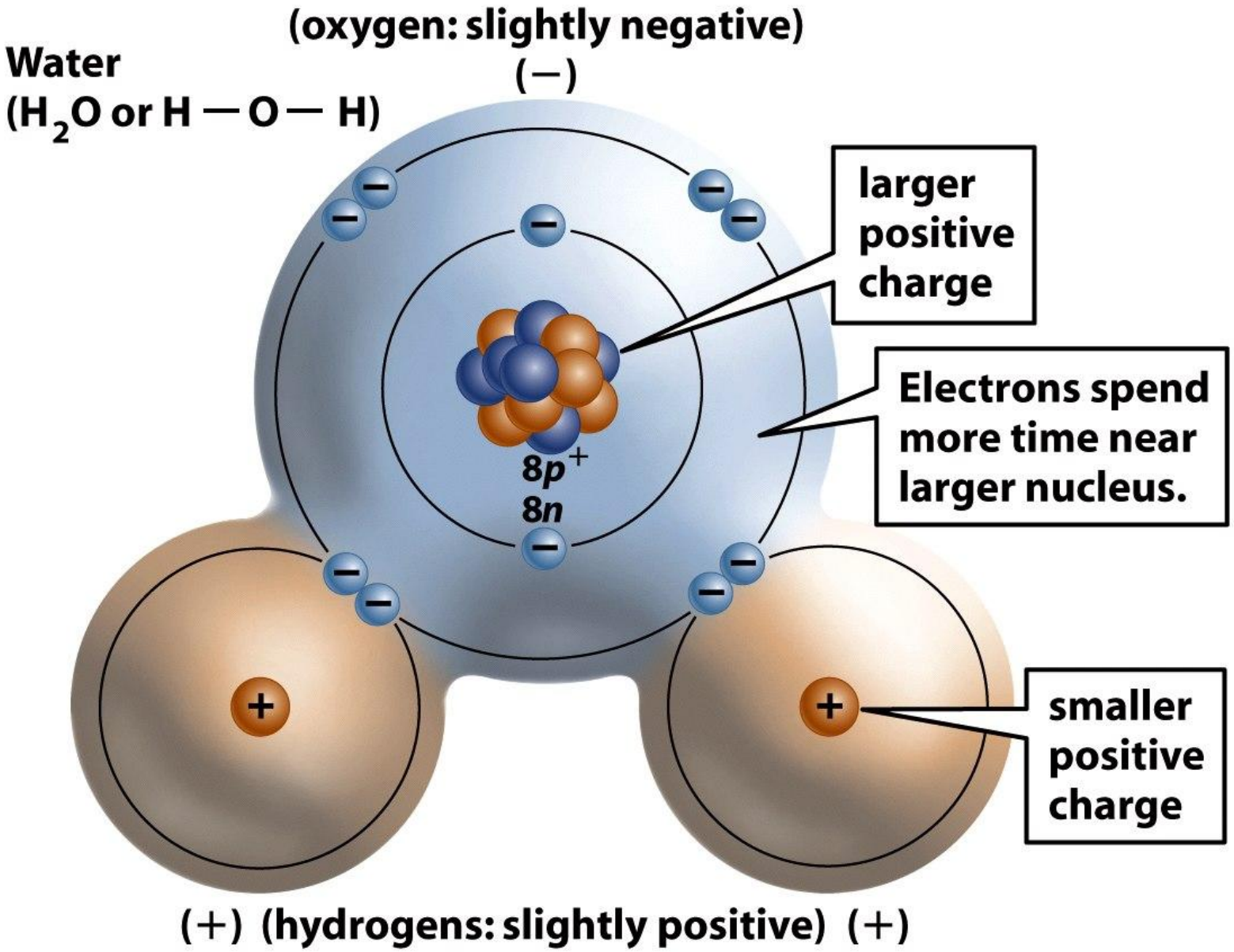
Polar covalent bonding



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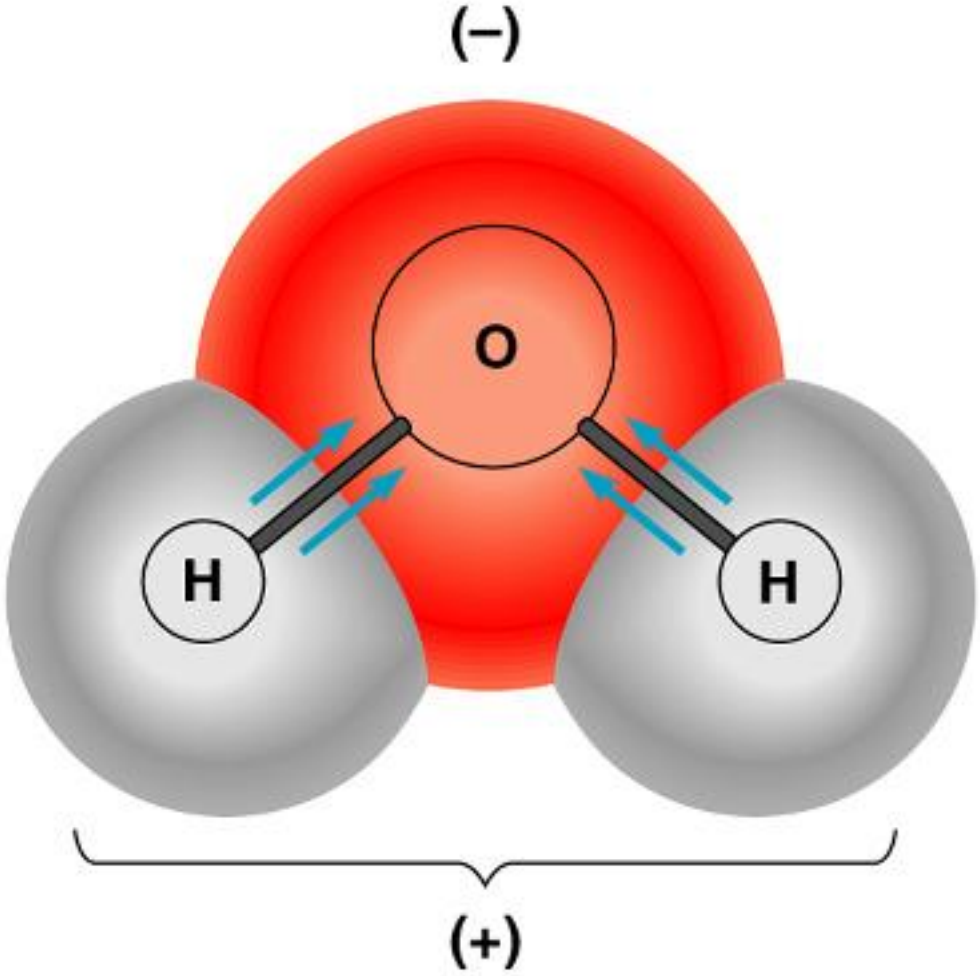

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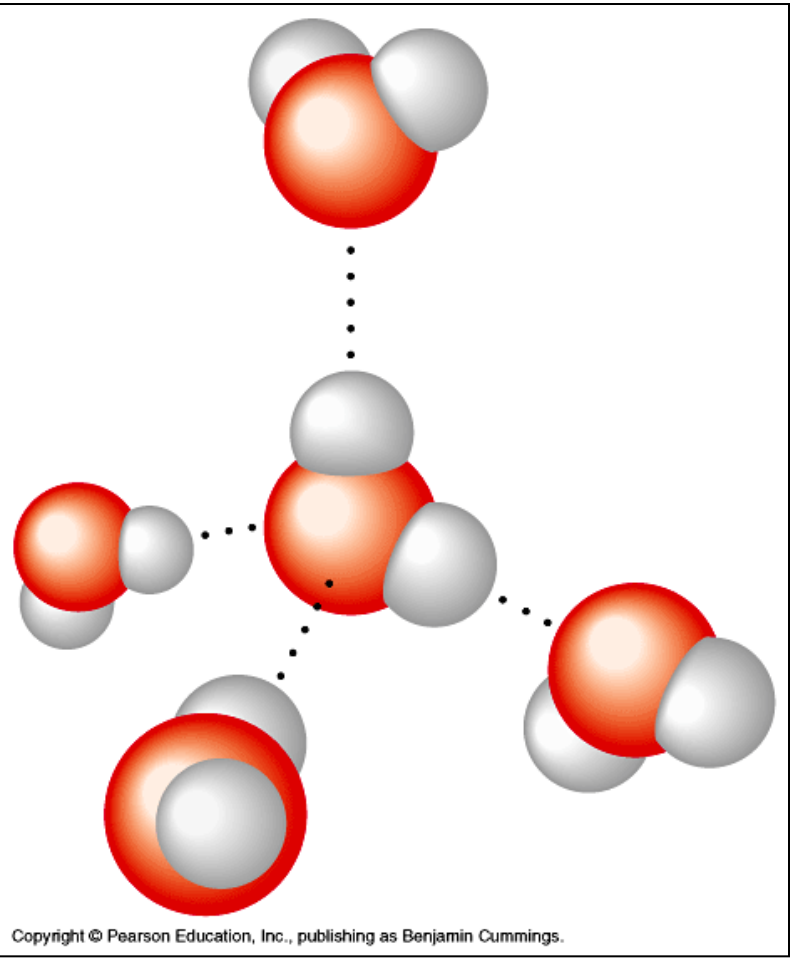
Water molecule can form hydrogen bonds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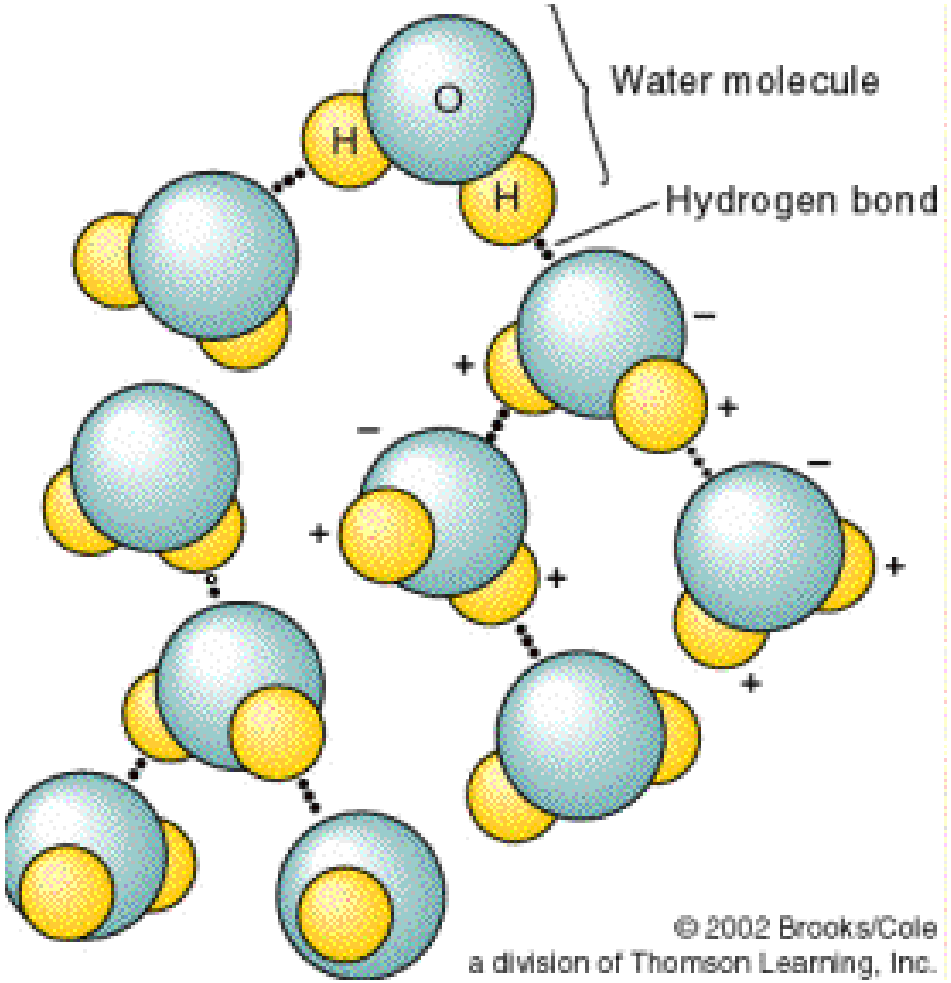
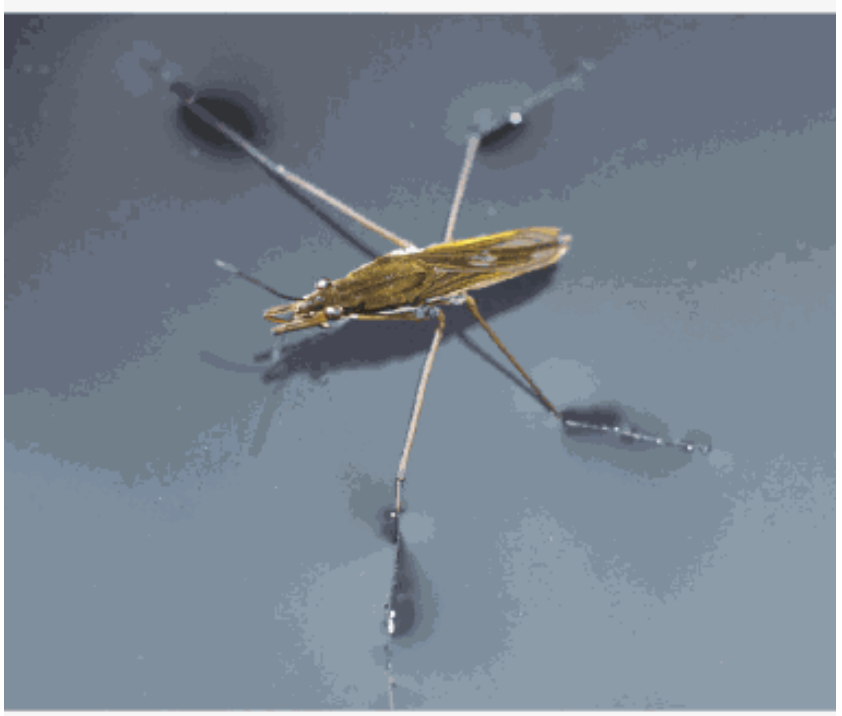
- Partly positive hydrogen atoms of one water molecule are attracted to the partially negative oxygen of another water molecule
- The bonds are made and broken quickly as the molecules move, however the large numbers of bonds contribute to the stability of water

Cohesion

- Hydrogen bonding *between water molecules* produces high **cohesion**



- Cohesion of water molecules along a surface produces **surface tension**
  - Fishing spiders and water striders rely on surface tension to move across the surface of ponds



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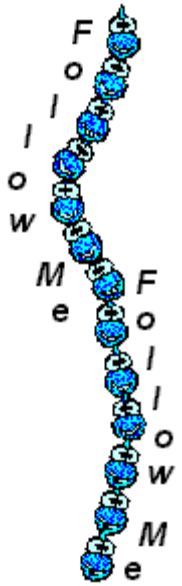
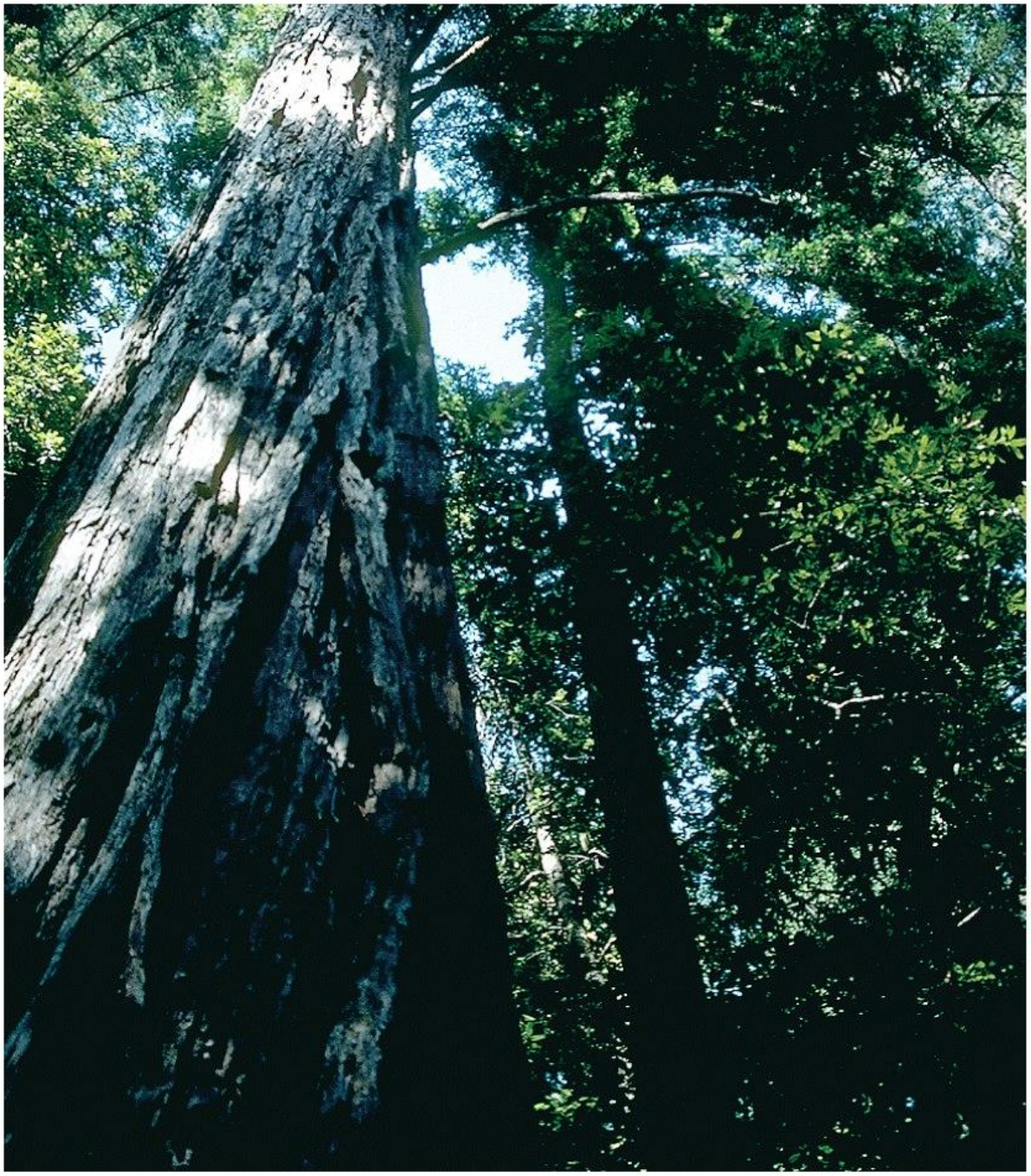
Adhesion

- Water molecules sticking to NON-WATER polar or charged surfaces in the property called **adhesion**
  - Adhesion helps water climb up the thin tubes of plants to the leaves



- Cohesion and adhesion work together to causes capillary action.





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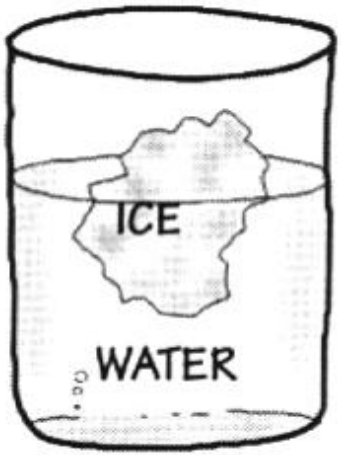
- Water cohesion and adhesion explain how water molecules can form a chain in delivering moisture to the top of a tree

Check out this link…

http://www.uni.edu/~iowawet/H2OProperties.html

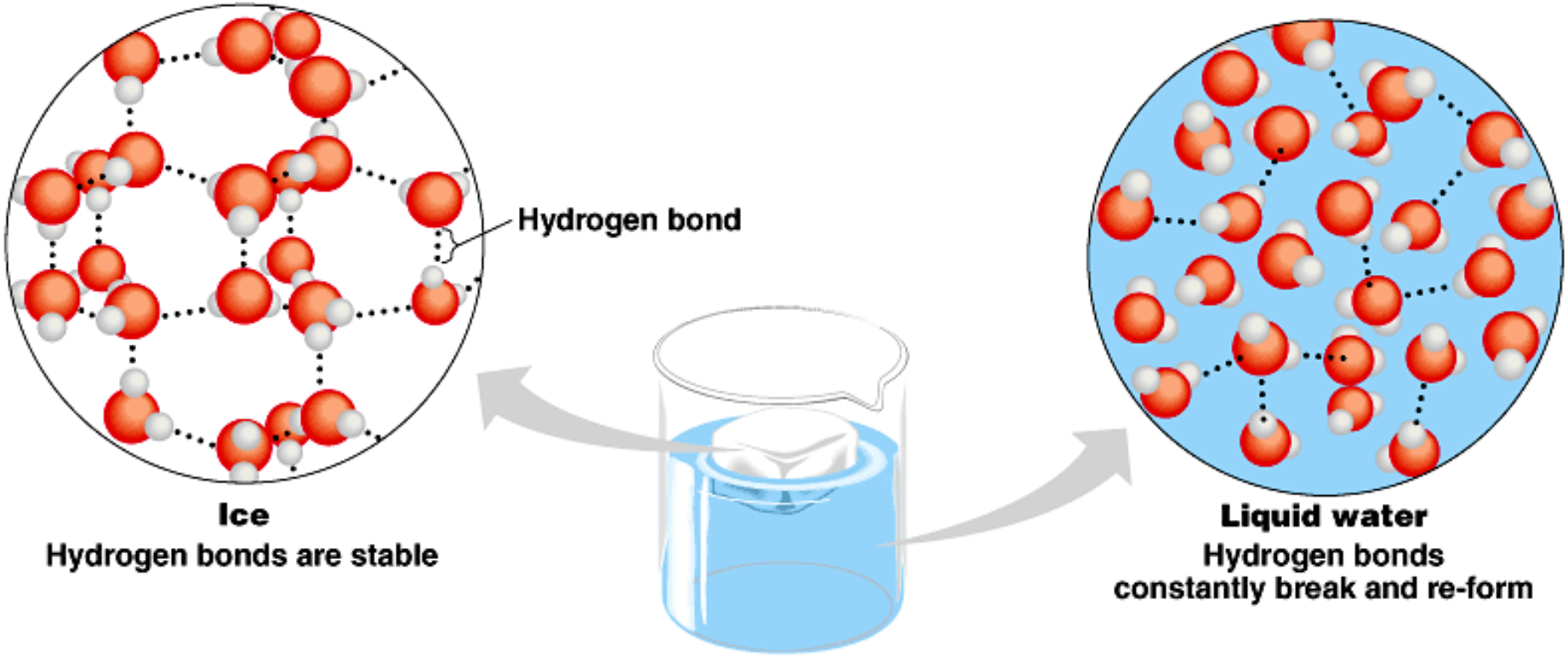
Ice Density



- Ice is unusual because it is *less dense* than liquid water *(most substances become denser when they solidify from a liquid)*

- Ice floats in liquid water

- Ponds and lakes freeze from the top down and never freeze completely to the bottom
  - Many plants and fish therefore are not frozen



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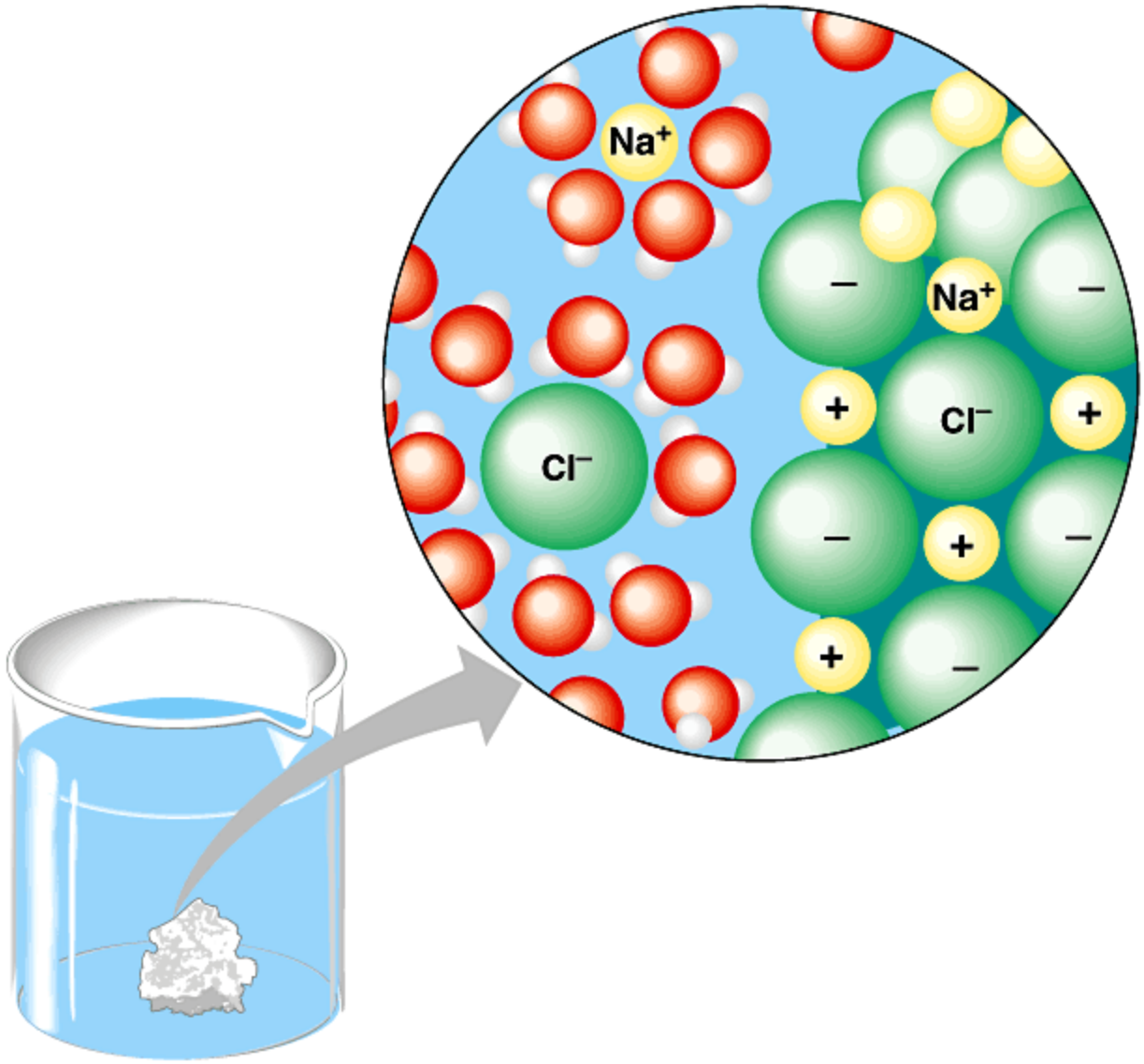
Solvent Properties

- Water is an excellent **solvent**
  - A wide range of substances dissolve in water
  - Because it is a polar molecule, water is attracted to and can surround ions or polar molecules (such as sugars and amino acids), dissolving them



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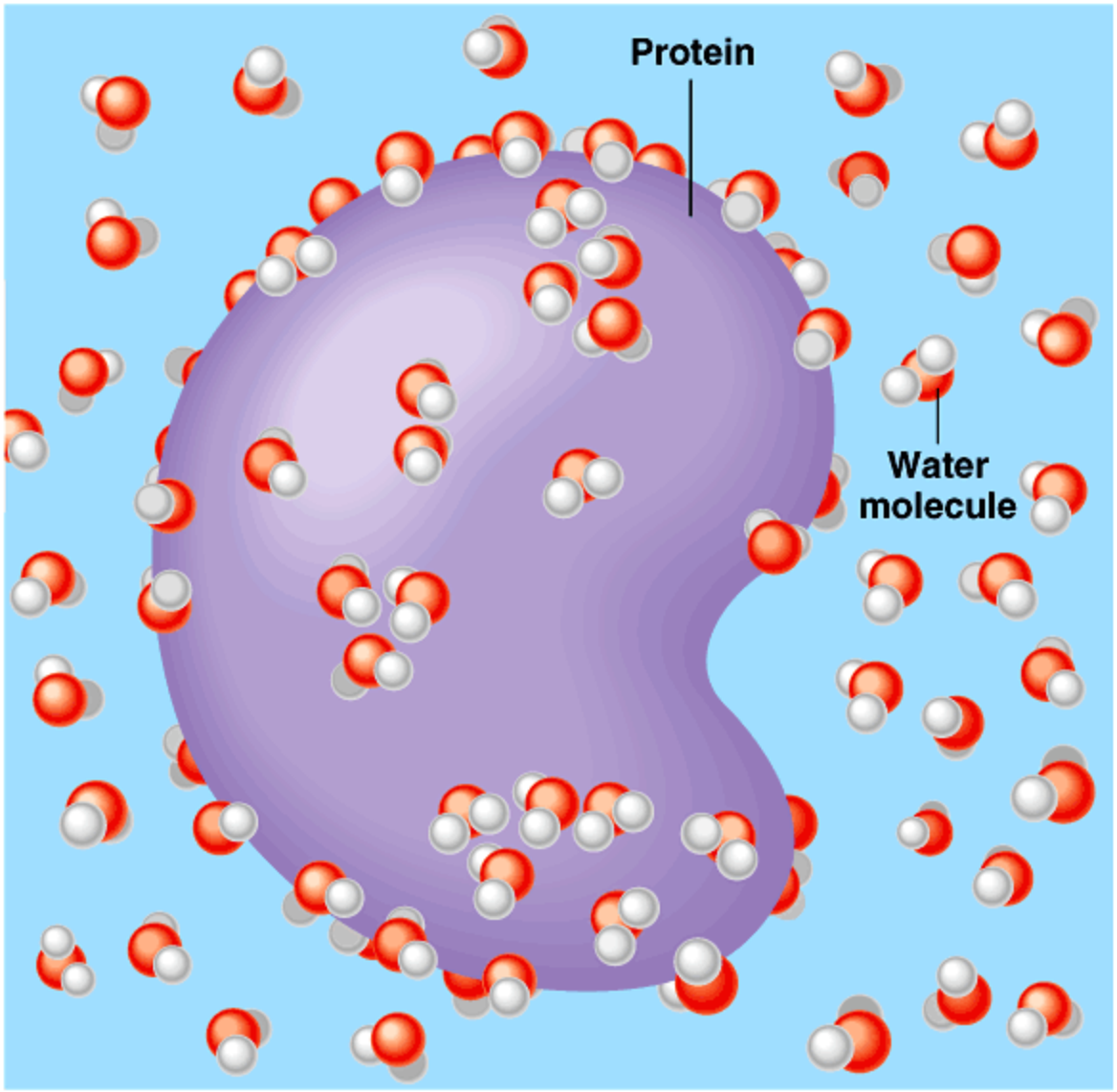

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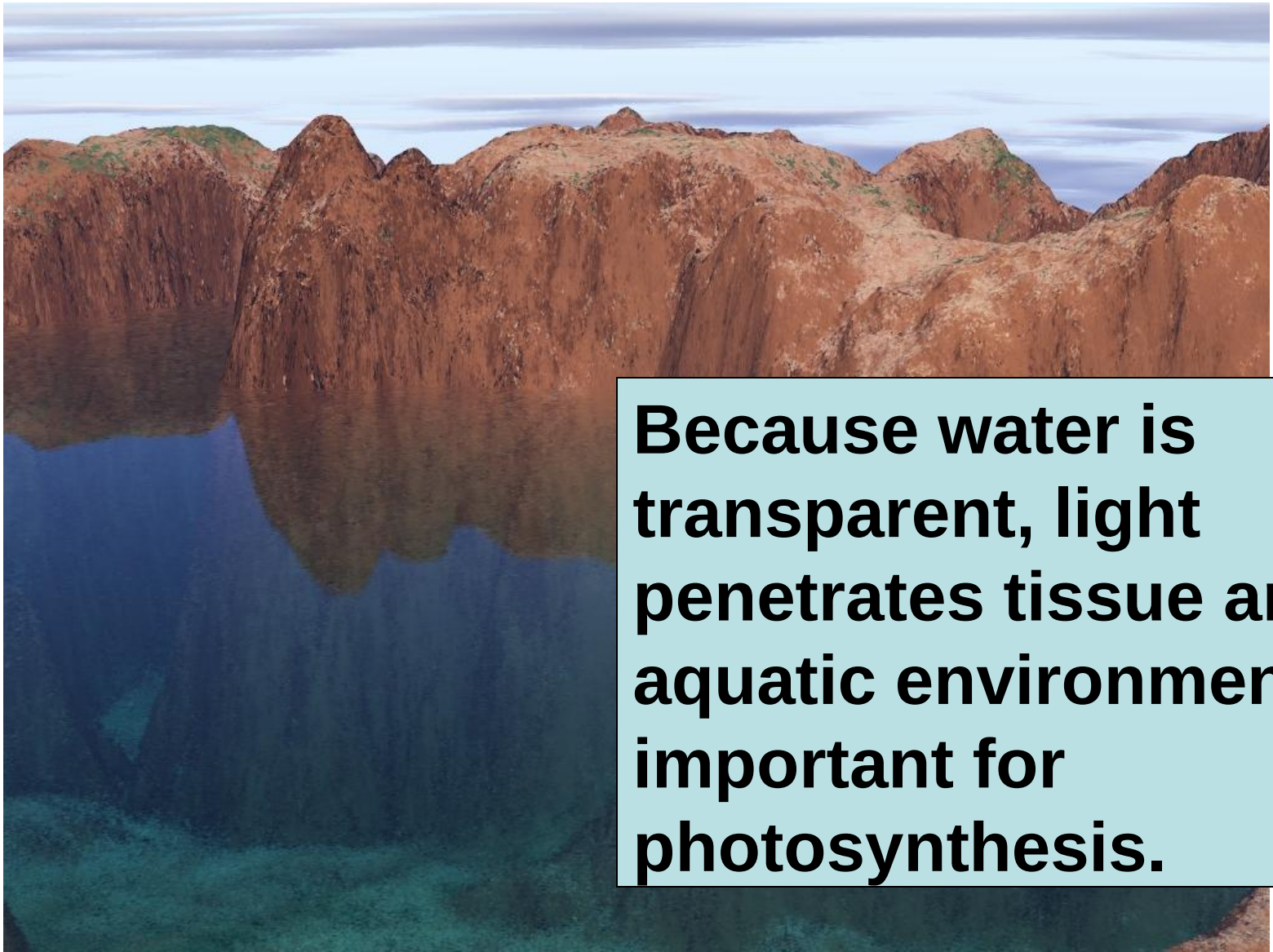
Thermal Properties

- Water moderates the effect of temperature change
  - Compared to other molecules, it takes a lot of energy to change the temperature of water …
  - So it heats up or cools down very slowly
  - This provides for a stable internal environment and habitat

Transparency



Because water is transparent, light penetrates tissue and aquatic environments, important for photosynthesis.

- Water is transparent simply because it does not absorb light in the visible spectrum, and all frequencies of coloured light are transmitted through.