The polarity of water molecules results in hydrogen bonding.

"Water is so common that it is easy to overlook the fact that it is an exceptional substance with many extraordinary qualities. Following the theme of emergent properties, we can trace water's unique behavior to the structure and interactions of its molecules." (p. 46)

"The properties of water arise from attractions between these **polar molecules**. The attraction is electrical; the slightly positive hydrogen of one molecule is attracted to the slightly negative oxygen of a nearby molecule. The two molecules are thus held together by a hydrogen bond (Figure 3.2). Although the arrangement of molecules in a sample of liquid water is constantly changing, at any given moment, many of the molecules are linked by multiple hydrogen bonds." (p.47)

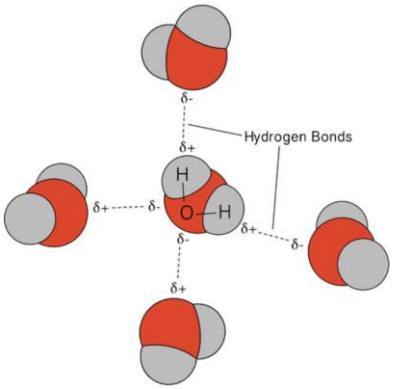


Figure 3.2 Hydrogen bonds between water molecules. The charged regions of a polar water molecule are attracted to oppositely charged parts of neighboring molecules. Each molecule can hydrogen–bond to multiple partners, and these associations are constantly changing. At any instant in liquid water at 37ºC (human body temperature), about 15% of the molecules are bonded to four partners in short–lived clusters.

Bozeman Biology, Water's Life Supporting Properties : http://www.youtube.com/watch?v=ZScEgE55XTM

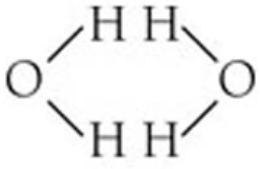
Four emergent properties of water contribute to Earth's fitness for life

"We will examine four of water's properties that contribute to the suitability of Earth as an environment for life. These are water's cohesive behavior, its ability to moderate temperature, its expansion upon freezing, and its versatility as a solvent." (p. 47)

Concept Check 3.1

1. What is electronegativity, and how does it affect interactions between water molecules? [See page 39 and Figure 2.13.]

2. Why is it unlikely that two neighboring water molecules would be arranged like this?



What If?

What would be the effect on the properties of the water molecule if oxygen and hydrogen had equal electronegativities?

Advanced Biology: Chapter 3, *"Water & the Fitness of the Environment"*

Complete the table below. Explain how the polarity of water molecules results in the life-supporting property of water.

Life-supporting property of water	***Description of the property***	***How the property aids organisms***	***Adaptations that take advantage of water's life-supporting property***
Adhesion/Cohesion → Surface tension			
High specific heat			
High heat of vaporization			

Advanced Biology: Chapter 3, *"Water & the Fitness of the Environment"*

Life-supporting property of water	***Description of the property***	***How the property aids organisms***	***Adaptations that take advantage of water's life-supporting property***
Lower density as a solid			
Versatile solvent			