



Phoenix Mars Mission



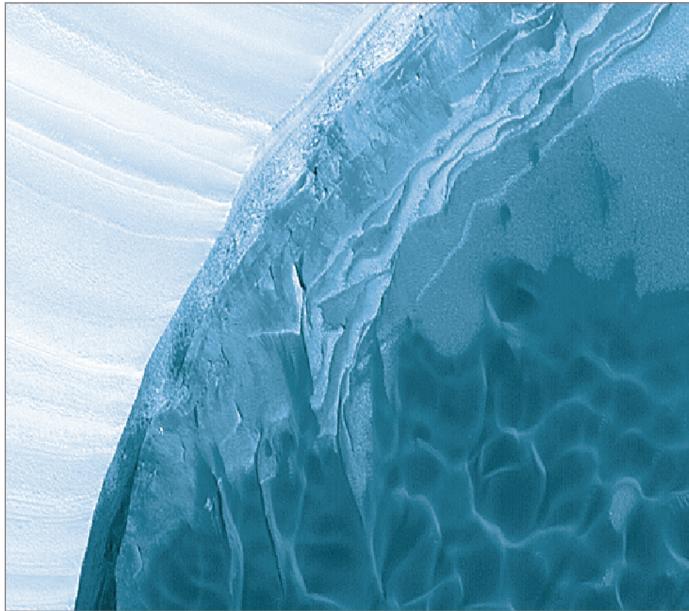
Why is liquid water important for life?

Life, as we understand it, requires liquid water. But why? The answer lies in the nature of the molecule itself.

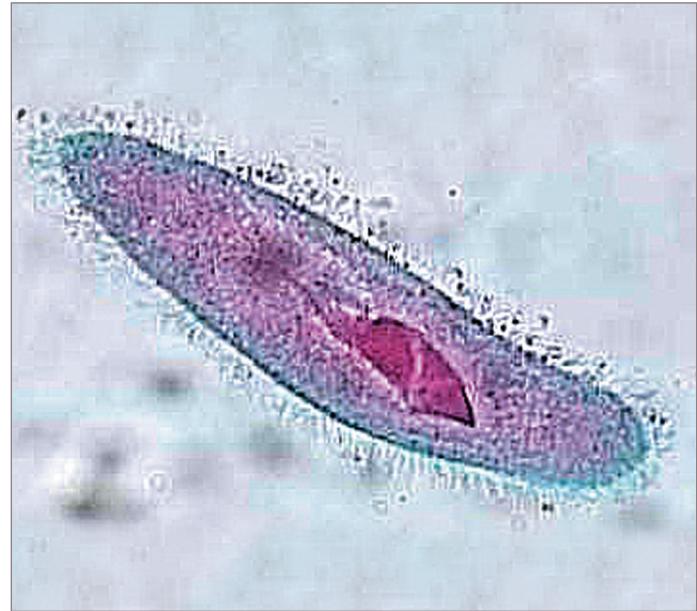
First, water must be in a liquid form to allow for transport of chemicals into and out of cells. Water vapor and water ice do not have nearly the same ability to transfer substances as liquid water does. **Second**, proteins act as catalysts within cells and require liquid water for proper function.

<< Water droplets on leaves aboard the apparent weightless environment of the International Space Station.

Image Credit: NASA/JSC/Petit



▲ Erosion of water ice layers near the north pole of Mars and genesis of nearby sand dunes. *Image Credit: NASA/JPL/MSSS*



▲ A single-celled paramecium, with stained nuclei and cilia, is made mostly of water. *Image Credit: NASA/GSFC*



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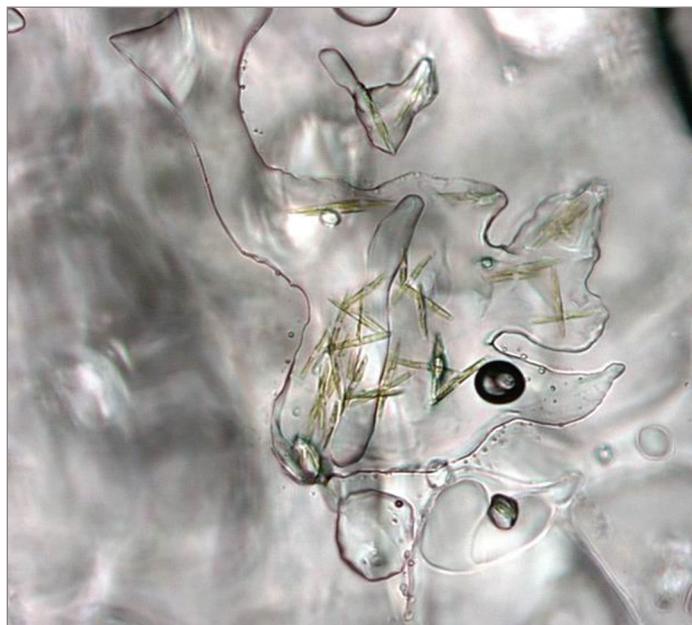


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Lunar and Planetary
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Third, water has a few unique properties compared to other liquids that make it essential for life. (A) Water remains liquid over a wide temperature range, permitting life to survive in climate and weather changes. (B) In an opposite sense, liquid water has a high capacity to hold energy, moderating weather and climate. (C) Unlike almost all other molecules, water floats when it freezes. This insulates the water below, which remains liquid and supports life...



▲ Single-celled algae dangling from an upper ice layer into seawater and providing an important component of the arctic marine food web. *Image Credit: NOAA/Univ. of Wash./Krembs*

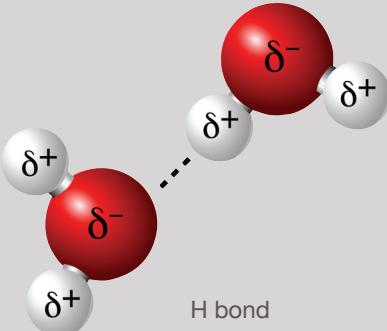


▲ As seen from NASA's Terra satellite, Earth is a planet with an abundance of liquid water critical for a life-supporting climate.

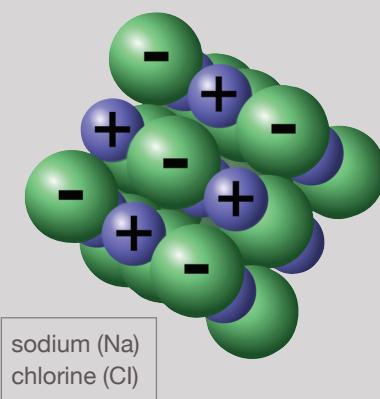
Image Credit: NASA/JPL

...And finally, (D) water molecules are “polar,” with a slightly negative side and a slightly positive side. Each end of the water molecule attracts other electrically charged particles. These polar substances, like sugar and salt that are essential for living cells, will dissolve easily in water, while non-polar molecules, such as oils and lipids making up cell membranes, are very difficult to dissolve.

Hydrogen bonding between water molecules



NaCl crystal structure



NaCl in water

