Wonder

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Earth's Early Atmosphere and the Origins of Water

As an environmental scientist, I have a passion for studying the Earth and solving environmental problems. The planet itself is fascinating: it's a large oblate, spheroid heat engine that's transferring energy from the equator to the poles, and hurdling around the sun at over 65,000 miles per hour. There are hundreds of energy-transferring processes, atmospheric processes, oceanic processes, geologic processes, occurring at any given moment. The start of the Earth is assumed to have begun six billion years ago (when it was just a ball of rock). It is assumed that continental plates began crashing into each other which opening the Earth's interior to space. This resulted in an outgassing of hydrogen, helium and water vapor which created a primitive atmosphere that was quite acidic. It is hypothesized that offgasing alone from geologic features could not be responsible for the vast amount of water on Earth. Some suggest that comets collided with Earth and brought over water, methane and other chemical elements. Since Earth was very warm back then, the water from the comets probably evaporated immediately making the air very thick. The Earth's silicate geology can sequester vast amounts of carbon dioxide when the rock is weathered by converting the carbon dioxide gas to bicarbonate acid ions.

Many scientists assume the geology (as determined by the carbonate-silicate cycle) caught up with the atmosphere and removed much of the atmospheric carbon over millions of years. The Earth cooled and water condensed out of the atmosphere forming our oceans. Later green algae and other small bacterium started photosynthesizing and producing oxygen. A cool experiment from the mid-twentieth century was the Miller-Urey experiment; the first of its kind to reenact this scenario. They took inorganic compounds like methane, ammonia, hydrogen and water vapor and were able to form over twenty essential amino acids by using an electric spark as the major input of energy. Amino acids are the building blocks of proteins which in turn are the building blocks of many organisms.

The Source of Life

Water as we know it is the source of all life. A nice parallel is to describe Jesus and his love as fountains of living water (Jeremiah 17:13). When we give ourselves to Christ we are baptized in water. When we bless anything in the Church it is sprinkled with water. Since biblical times then we can see that water has been held as something sacred. Water is one of the most intriguing compounds on Earth and it covers nearly 71% of Earth's surface. While water may seem abundant, you may be surprised to find out that only 1% of the water on Earth is fresh water, and most of it is tied up in glaciers. Water can be easily contaminated by animal waste, road salts and sands or non-source pollutants like agricultural fertilizers. Large amounts of nitrogen can contribute to eutrophication resulting in the formation of large algal blooms that suffocate the biota. If there's enough road salt in your drinking water it has the potential to trigger heart attacks. Clearly we must take proactive steps to protect water contamination.

Your Campus Water Use

Let's consider conservation in addition to contamination. Where does your campus get its water? How much water does your campus use? The average college student will probably use a large amount of water each day, whether directly or indirectly. It takes water and energy to cook food, to run power plants, to run lab equipment, to bathe etc. The majority of your campuses probably get their water from ground water well fields. These wells may be close or far away to campus, but as you can imagine it takes a lot of energy to operate a pump. Depending on your geographic location, ground water must be pumped up from a few to thousands of feet underground (the deeper the groundwater table, the more energy needed to get it out of the ground). Once it's pumped up the water must then be pumped to campus and treated with a little bit of residual chlorine or ozone and then it's ready to drink. If your campus drinking water comes from a reservoir then even more treatments are necessary. Surface waters are open to the atmosphere and runoff so more treatments are necessary to ensure the water is safe to drink. Unlike ground water, surface-derived drinking water must go through large settling tanks and filtering apparatuses. Both sources of drinking water get a little bit of fluoride and residual chlorine, ozone or ultraviolet treatment to prevent contamination.

Personal Water Conservation

It's important to conserve because natural groundwater recharge rates are so slow, and precipitation can be unusual. As global average temperature changes so does pressure thereby altering precipitation regimes and the availability of water. Here are some things you can do around campus to save water:

- Instead of dropping a tissue in the toilet, place it in the trash can.
- Gentlemen, turn off the faucet when you shave
- Shorten your shower by a minute or two everyday and save 150 gallons of water a month. Also, by shortening a shower you are lowering the amount of energy that's needed to heat the water.
- Turn off the water when brushing your teeth and save 25 gallons a month.
- When washing your hands, don't let the water run while you lather.
- Only do laundry when you have a full load to do (ask a friend to combine loads if you don't have enough to fill the washer)

Sources for water conservation tidbits: wateruseitwisely.com and ecohusky.uconn.edu.

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Discussion Questions:

How would you rate your water-use? Is it something you think about? Could you improve it in anyway? Are the Author's suggestions useful? Doable?

How do we recognize water's special place in creation in the life of the Church? What are some occasions where we use/bless water? Why at those times?