2001-2004

EARTH'S CLIMATE REGULATOR

The correlation between atmospheric concentrations of greenhouse gases (particularly carbon dioxide) and the recent trend of rising average temperatures on Earth's surface has been the focus of considerable scientific and political concern. What is often overlooked in this brouhaha is that water (in the form of clouds and atmospheric vapor) is one of the most important regulators of planetary temperatures. As a result of water's ability to store heat energy and to absorb much of the Earth's outgoing radiation (i.e., the source of greenhouse heat), water is the only planetary substance that can either exacerbate or ameliorate global warming on a short-term basis. Moreover, it is the oceans (not the continents) that control most of the flux of carbon dioxide between the atmosphere and the planet's surface. So, could global warming represent just another manifestation of our many water challenges.

ELECTRIFIED CLOUDS

Most people readily associate the torrential rains of thunderstorms with the familiar lightning bolts that electrically connect massive clouds with the planet's surface. Although liquid water is the stuff that most often falls to the ground, ice crystals located in the tops of the thunderhead clouds are primarily responsible for lightning and Earth's so-called "global electric circuit." Thousands of meters above the ground surface, water-coated ice crystals collide with one another to generate the static electricity that is discharged in the form of lightning. Meteorologists have recently discovered that, in addition to the familiar cloud-to-ground lightning, there is another type of lightning that shoots upward and connects the cloud tops to the atmosphere's uppermost reaches (where electrically-charged solar particles are stored). Ice serves as an important generator of the electricity that links our globe and, perhaps, that connects Sun and Earth.

A SOUND ENVIRONMENT

While most of us recognize the oceans as the largest ecosystem on Earth, fewer of us realize that this massive realm (containing 97% of the planetary water) is also full of sound. This sound is created by sources as diverse as underwater volcanoes, sliding tectonic plates, singing whales, and droning ship propellers. Moreover, the mix of sounds detected in the ocean differs as a function of location and depth, owing to the peculiar way that sound bounces around the oceanic depths (often confining itself to discrete channels). The physical properties of seawater (e.g., temperature and salinity), along with the seafloor topography, serve to fine-tune the oceanic symphony. So, who's listening? Well, most marine creatures rely more on sound or subtle vibration than they do on vision because seawater transmits pressure waves more efficiently than light waves. We landlubbers still have a lot to learn about this symphony.

UNDERWATER MUSIC

Perhaps the most enchanting and frequently recorded of all ocean sounds are the complex songs of the humpback whale. Despite decades of research, scientists are still puzzling over the purpose of and the message underlying the songs. In fact, we are not even sure how the whales, which lack any vocal cords, produce their sounds. Their tendency to sing near seamounts (a favorite hub for their winter breeding grounds) has prompted whale researcher Roger Payne to ask whether they may be broadcasting their message across vast expanses of ocean. Humpback songs evolve from year to year as their composers add and delete complex musical phrases. Their songs are often compared to human music, as well as to sounds made by other animals or the Earth. Recently, the sonic well being of all marine creatures has been questioned with regard to extremely loud noises produced by controversial human activities.

DNA's SECRET INGREDIENT

Considering the recent interest in genetic engineering, it is worth noting that the structure and functioning of the DNA molecule is dependent on water. Millions of water molecules link themselves together into a network that envelops the DNA crystal, permitting it to fold and maintain a 3-D helical configuration that is absolutely essential to its storing and transmitting the codes for biological organisms. Besides this so-called hydrating water, there is another type of water that is situated within the tiny nooks and crannies of the DNA molecule itself. This integral water is characterized by physical properties that are quite different from those of water that we recognize as part of our everyday world. Moreover, this unusual type of water bridges or "glues together" the more familiar components of a DNA molecule (e.g., bases, strands). Some naturalists claim that water essentially mediates biology's genetic code.

THE STRANGEST ICE

The ice that forms on Earth is known as "hexagonal" ice, which creates predictable and familiar crystals. However, there is another type of ice that is formed exclusively in outer space and that has no definable crystalline structure. This unstructured form of solid water is known as "amorphous" ice, which is very strange because solids are, by definition, crystalline. So, what's the deal with this bizarre ice or so-called glassy water? It appears that amorphous ice is formed from water molecules present in outer space where temperatures dip below -260 degrees Celsius. Recently, two NASA scientists hypothesized that amorphous ice is able to flow (not unlike liquid water), permitting gases trapped in the ice to combine with one another and form simple organic molecules. The scientists surmise that these simple molecules, when transported to Earth by cosmic water, may represent the precursors to biological life.

OCEAN MEMORIES

Moving silently within the cold abyssal depths of the world's oceans is a massive "river" of water that is known (scientifically) as the thermohaline circulation, denoting that it is driven by temperature and salinity differences in seawater. This global conveyor belt is not truly a river, but instead consists of seawater and a series of large-scale vortices (i.e., gyres) that are contributed by all of the world's oceans. According to some oceanographers, this oceanic conveyor belt also transports temperature signals from polar to tropical regions, where the planet's climate regime is ultimately regulated. In addition to transporting signals that induce climate change, seawater is able to retain a planetary history or memory of climate change that spans hundreds of years. Interestingly, many ancient insights proclaim that water is able "to remember" as a result of its travels through Earth's body and even through the stars.

BIRTHING A STAR

During summer, the amount of water vapor in air, as measured by the relative humidity, becomes very apparent to many of us. In addition to its myriad roles here on Earth, water vapor is believed by astrophysicists to play a critical role in our galaxy. As massive interstellar clouds of dust and gas are gravitationally compressed into newborn stars, it appears that water acts as a kind of midwife. As the interstellar cloud is compressed, it heats up as a result of shock waves that also act to create water molecules from the cloud's hydrogen and oxygen atoms. The newly created water vapor (along with hydrogen gas) then cools the heated cloud, permitting it to be compressed into a star. The amount of water in interstellar space increases dramatically during the star birthing process, and some of this water ends up on the newborn star's planetoids. Hence, much of the water on Earth may have been used to birth our Sun.

WATER'S GEOMETRY (part 1)

While most of us are familiar with the six-pointed geometry of snowflakes, the fact that liquid water also produces a variety of 3-D geometries is not widely known. These liquid water geometries exist only on the molecular scale, which is billions of times smaller than the scale of snowflakes. Scientists have used sophisticated X-ray technology to discover that liquid water molecules bond with, or connect to, their four nearest neighbors in order to create 3-sided pyramids known as a tetrahedra. Moreover, it appears that water molecules are constantly "changing-out" their bonding partners, so that the water tetrahedra are re-created as many as a trillion times per second! Research suggests that water's frantically creating and destroying these molecular pyramids underlies its ability to behave as a liquid (albeit a strange one) and yet retain some of the molecular structure of a solid (ice).

WATER'S GEOMETRY (part 2)

So, liquid water can create geometric (and necessarily ephemeral) structures using its component molecules. Besides the 3-sided pyramid (tetrahedron), water also creates a more spherical 12-faced geometry known as a dodecahedron. The dodecahedron, which closely resembles a soccer ball, is composed of twenty water molecules and is used to contain or envelop a wide variety of substances that are dissolved in water (e.g., oxygen). Recently, a British scientist proposed that liquid water also creates an icosahedron, which is a 20-faced rounded geometry that is composed of almost 300 molecules. Definitely representing a molecular-scale geometry (composed entirely of water molecules), this icosahedral "cluster" is enormous compared to the individual tetrahedra that comprise it. It is interesting to note that many ancient cultures associated an icosahedron with the elemental substance of water.

NETWORK COMPLEXITY

The discovery that liquid water is best described as a complex network of interconnected molecules is one that has completely changed the thinking about how it may function. Systems theorists have postulated that relatively simple dynamic networks can account for a wide range of complex behaviors due, in large part, to rules that govern the switching of connections between elements. In water's network, the elements are represented by water molecules and the connections by hydrogen bonds, which are a magnetic type of linkage. These bonds are switched so rapidly (up to a trillion times per second) that scientists cannot even begin to decipher the governing rules. Nonetheless, theorists maintain that these kinds of systems are able to self-organize and to interact with their environment without the need for "programming" in a conventional sense. What can complexity theory tell us about water's network and how it functions?

STRUCTURING WATER

As more is understood, or at least inferred, about the molecular structure of water's network, an obvious question arises as to the effects (if any) of structural changes on biological organisms. Because water is so fundamental to both the building and functioning of human bodies, it is not surprising that the purposeful structuring of drinking water has become commonplace. There are a plethora of structuring agents (e.g., gases, crystals, metals, powders, vortices, magnets, and even so-called pranic energies) that have been employed to produce "healthy" waters. Anecdotal accounts of the health benefits associated with drinking these waters are plentiful; however, scientific evaluations are rare. While clustered waters may constitute a better aqueous elixir than do purified waters, all biological molecules and surfaces ultimately restructure water according to their internal requirements once inside the body.

ENIGMATIC SEAWATER

Although it comprises 97% of the planetary water, seawater's molecular structure is less well understood than that of pure (non-saline) water. The salts, or ions, in seawater appear to affect water's network by forcing the molecules to surround the ions, thus minimizing electrical and structural "disruptions" to the network. The grouping of water molecules around salts is believed to create more static and predictable molecular geometries than those characterizing pure water—perhaps even creating a different type of network connectivity. Science maintains that seawater's major ions were introduced by the weathering of the planet's rocks and that the relative amounts of these ions have been constant for the last 600 million years. How the Earth has maintained seas of such constant salinity is not known, but oceanographers have identified a number of common processes that both contribute and extract salts.

SOLAR WATER

The Sun is certainly not a location that one would expect to find water; nonetheless, water definitely exists there and on other stars in our galaxy as well. Even water vapor cannot exist at temperatures approaching 6000 degrees (Celsius), which characterize the surface of the Sun; however, there are solar locations where the temperatures are a little less extreme. Astrophysicists have discovered that temperatures associated with so-called sunspots are cool enough to keep the water molecule from being torn apart into its component atomic and subatomic particles. So, what is water doing on the Sun? One answer is that water influences the electromagnetic (solar) radiation that escapes into interplanetary space, thus making the Sun and other stars appear more opaque than they would otherwise. There are other suspected functions of this "fire water" (i.e., very hot steam) that may be confirmed by scientists who study its spectral properties.

A LEGENDARY MEDIATOR

Whereas modern science has recently discovered that water mediates the transfer of energy and information between various components of the biosphere, geosphere, atmosphere, and cosmos, ancient understandings of water have identified water as a kind of universal mediator. Many ancient cultures proclaimed that water mediates the appearance of matter (i.e., physical forms) from the ultimate unmanifested source. Water's mediation was often attributed to is flow forms (e.g., whirlpools, ripples) or its rhythms (e.g., tides, sounds). Some ancient peoples considered water and the mysterious ether (representing both the unseen world and the source of life force energies) to be intimately connected, such that the former symbolizes the latter. The universality of water's mediation was based on an ancient understanding that everything in the material world ultimately enters and exits through water.

ETHERIC SYMBOLISM

Recent books authored by the Japanese photographer Maseru Emoto have captured the attention of readers and the media alike. His work includes microscopic photos of very different-looking ice crystals formed from waters that were reportedly exposed to various words and sounds. Emoto attributes his results to water's ability to reflect "Hado," which describes an energy that pervades all matter. The proposed relationship between life force or etheric energies and water has some very old roots. The ancient Hawaiians apparently used water to symbolize the pathways and transformations of "mana" (life force) that correspond to various aspects of humans. Similarly, many Christian traditions recognize so-called living water as the source of life provided by God. Finally, the Platonic solids that represent water (icosahedron) and aether (dodecahedron) are reciprocating geometries and related to matter (cube) via the renowned golden ratio.