Plan and Purpose: The Water Cycle

YSO, 2 Iyyar 5785, Oraysa

The water cycle, also known as the hydrologic cycle, is the continuous **directed** movement of water on, above, and below the surface of the Earth. This cycle has no beginning or end and involves water in all its forms: liquid (rivers, lakes, oceans), solid (ice, snow), and gas (water vapor in the atmosphere).

Taanis 9b

תַּנְיָא, רַבִּי אֱלִיעֶזֶר אוֹמֵר: כָּל הָעוֹלָם כּוּלּוֹ מִמֵּימֵי אוֹקְיָינוֹס הוּא שׁוֹתֶה, שֶׁנֶּאֱמַר: ״וְאֵד יַעֲלֶה מִן הָאָרֶץ וְהִשְׁקָה אֶת כָּל פְּנֵי הָאֲדָמָה״. אָמַר לוֹ רַבִּי יְהוֹשֻׁעַ: וַהֲלֹא מֵימֵי אוֹקְיָינוֹס מְלוּחִין הֵן! אָמַר לוֹ: מִתְמַתְּקִין בֶּעָבִים.

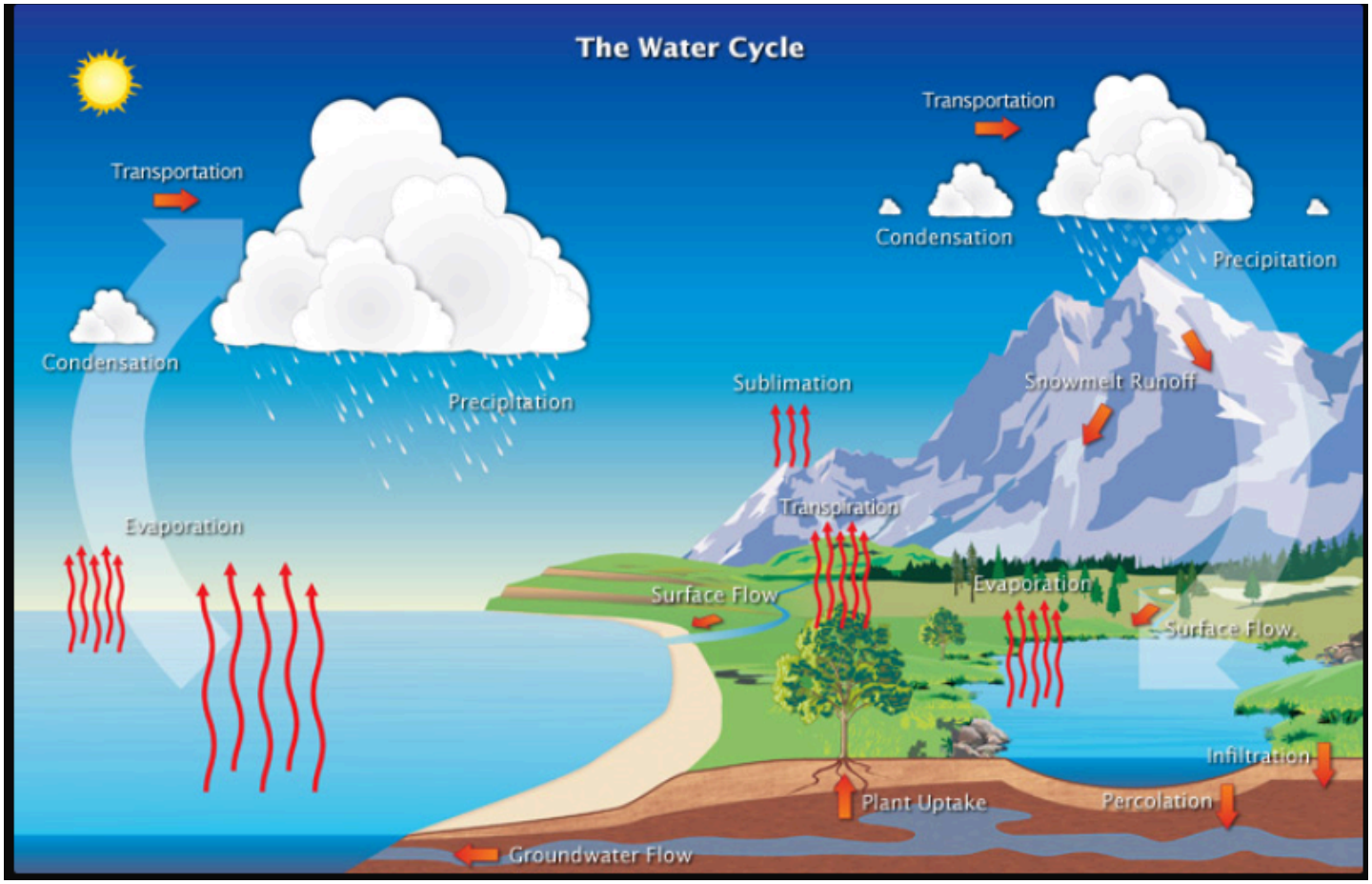
The Gemara discusses the source of rain. It **is taught** in a *baraisa* **that Rabbi Eliezer says: The entire world drinks from the waters of the ocean** i.e., evaporated ocean water is the source of rain. **As it is stated: "And there went up a mist from the earth and watered the whole face of the ground"** (Genesis 2:6). **Rabbi Yehoshua said to him: But the waters of the ocean are salty,** whereas rainwater is sweet. Rabbi Eliezer **said to** Rabbi Yehoshua: The waters **are sweetened in the clouds,** before they fall to the earth. ...

שֶׁנֶּאֱמַר: ״עֹשֶׂה גְדֹלוֹת וְאֵין חֵקֶר״, וּכְתִיב: ״הַנּוֹתֵן מָטָר עַל פְּנֵי אָרֶץ״, וּכְתִיב לְהַלָּן: ״הֲלוֹא יָדַעְתָּ אִם לֹא שָׁמַעְתָּ אֱלֹהֵי עוֹלָם ה׳ אֵין חֵקֶר לְתְבוּנָתוֹ״, וּכְתִיב: ״מֵכִין הָרִים בְּכֹחוֹ וְגוֹ׳״.

As it is stated, with regard to the creation of the world: **"Who does great things past finding out"** (Job 9:10), **and** as an example of this **it is written: "Who gives rain upon the earth"** (Job 5:9–10). **And it is written below: "Have you not known? Have you not heard that the everlasting G-d, the Lord,** the Creator of the ends of the earth, does not faint and is not weary; **His discernment is past finding out"** (Isaiah 40:28). The repetition of "past finding out" indicates that rainfall is as wondrous as the creation of the world. The Gemara adds: **And it is written** in a psalm that deals with rainfall: **"Who by Your strength sets fast the mountains;** Who is girded about with might" (Psalms 65:7).

The remarkable thing about **water** is the interlocking qualities of its unusual chemistry, and how that makes it ideally suited for the many roles it plays in making life on Earth possible. It is a "universal solvent," with just the right viscosity for the circulatory system, with its vital ability to effect body cooling by evaporation, and on and on. No creature benefits more from these qualities than humans do. Let that sink in. What about the fact that frozen water floats rather than sinks? Life as we know it would be impossible otherwise. On a planetary level, it drives the tectonic and water cycles, those "two great cogs that work together," as Michael Denton puts it [see below]. All a lucky coincidence, you say?

No. The many diverse capacities of water need not have been as they are. That these are all brought together just so provides among the most powerful pointers to intelligent design.



- **Oceans**: Hold about 97% of Earth's water, are the main source of evaporation, and receive most of the precipitation.
- **Rivers**: Transport precipitation runoff from land back to the oceans, completing the cycle.
- **Rain**: Is the most common form of precipitation, returning water from the atmosphere to the surface.

The Water Cycle

1. **Evaporation:**

The Sun heats water in oceans, rivers, and lakes, causing it to change from liquid into water vapor-a process called **evaporation**. This water vapor rises into the air and begins to cool.

2. **Cloud Formation:**

As the water vapor cools, it condenses into tiny droplets that group together to form **clouds**.

3. **Wind Movement:**

The wind blows these clouds from the ocean towards the land.

4. **Precipitation:**

When the droplets in the clouds become heavy enough, they fall to the ground as **rain** (or sometimes snow, sleet, or hail). The rain waters trees, crops, and other plants, supporting life on land.

5. **Runoff and Collection:**

The rainwater flows over the ground and collects in rivers and streams, which carry it back to the ocean. This intellgetly designed cycle then continues again.

A Mechanism for Filtering the Salt

Clouds filter out the salt from seawater through the process of evaporation. When the Sun heats the ocean, **only the water molecules evaporate and rise into the atmosphere,** leaving the dissolved salts and other minerals behind in the sea. This is because salt (mainly sodium chloride) has a much higher boiling point than water and does not evaporate at the temperatures found in nature. As a result, the water vapor that forms clouds is fresh, not salty. When this vapor condenses and falls as rain, it is also fresh water. This "natural separation" [**intelligently designed with plan and pupose**] of salt from water during evaporation is the same principle used in some desalination technologies, such as distillation, to produce fresh water from seawater as developed in Israel [which also required **plan and purpose**].

The water cycle is essential for replenishing freshwater supplies, supporting plant and animal life, shaping Earth's surface, and regulating the climate through the exchange of heat during evaporation and condensation. The water cycle is a never-ending **directed** process powered by the Sun, moving water from the oceans into the atmosphere (evaporation), forming clouds (condensation), returning it to the surface as rain (precipitation), and channeling it back to the oceans via rivers and runoff-repeating the process endlessly.

Fomation of Clouds

Clouds are visible clusters of tiny water droplets or ice crystals suspended in the atmosphere. They form when **water vapor**—an invisible gas—cools and condenses onto microscopic particles such as dust, pollen, or salt, known as **condensation nuclei**. This condensation occurs as rising moist air cools to its **dew point**—the temperature at which air becomes saturated and can no longer hold all its water vapor—causing the excess to condense into droplets or ice crystals.

Rain develops when these droplets grow large enough to fall, typically by one of two processes. In warmer clouds (above freezing), droplets collide and merge (coalescence), gradually becoming heavy enough to overcome air resistance and fall as rain. In colder clouds (below freezing), **ice crystals** grow by absorbing moisture from surrounding **supercooled water droplets**. These crystals may melt into raindrops as they fall through warmer air or remain frozen and reach the ground as snow or hail. In either case, **precipitation**—any form of water, liquid or solid, that falls from clouds and reaches the ground—occurs when particles become too heavy for updrafts to support, and gravity pulls them earthward.

The Majority of the Human Body consists of Water

What do we need to survive? Air? Water? Food? Water (liquid H_2O) is of major importance to all living things; in some organisms, up to 90% of their body weight comes from water. About 60% of the human adult body is water.

According to Mitchell and others (1945), the brain and heart are composed of 73% water, and the lungs are about 83% water. The skin contains 64% water, muscles and kidneys are 79%, and even the bones are watery: 31%.

Each day humans must consume a certain amount of water to survive. Generally, an adult male needs about 3 liters (3.2 quarts) per day while an adult female needs about 2.2 liters (2.3 quarts) per day. All of the water a person needs does not have to come from drinking liquids, as some of this water is contained in the food we eat.

Water serves a number of essential functions to keep us all going

- A vital nutrient to the life of every cell, acts first as a building material.
- It regulates our internal body temperature by sweating and respiration
- The carbohydrates and proteins that our bodies use as food are metabolized and transported by water in the bloodstream;
- It assists in flushing waste mainly through urination
- acts as a shock absorber for brain, spinal cord, and fetus
- forms saliva
- lubricates joints

The unique qualities and proerties of water such as its density, heat capacity, surface tension make it into a universal solvent so important and basic to life. The cells in our bodies are full of water. The excellent ability of water to dissolve so many substances allows our cells to use valuable nutrients, minerals, and chemicals in biological processes. Water's "stickiness" (surface tesnion) plays a part in our body's ability to transport these materials all through ourselves. The carbohydrates and proteins that our bodies use as food are metabolized and transported by water in the bloodstream. No less important is the ability of water to transport waste material out of our bodies.

Nature's Destiny, Michael Denton

> In this exciting book, Michael Denton details science's relentless progress toward an unexpected conclusion-that the universe was intentionally designed for human beings. From the laws of physics to chemistry to biology, from the properties of water to the characteristics of fire, he shows the goal of the cosmos to be human life. The scientific and theological consequences of this study are immense.
> MICHAEL BEHE, AUTHOR OF DARWIN'S BLACK BOX

Michael Denton is a Senior Fellow at the Discover Institute’s Center for Science and Culture. He earned a Ph.D. in biochemistry from King’s College and is the author of multiple books, including *Evolution: A Theory in Crisis.*

In *Nature's Destiny,* Michael Denton marshals a stunning range of biological, chemical, and physical evidence to answer systematically a simple question: Could life elsewhere in the universe be significantly different from life on Earth? Must it rely on carbon, water, DNA, amino acids, and proteins? Could there be an alternative to DNA, or could DNA be constructed out of different components?

Life is highly constrained by the laws of nature. If, for example, the ratio between strong and weak chemical bonds had not been precisely what it is, **if the thermal properties of water were not precisely what they are**, if the atmosphere of the Earth had not had just the right properties to filter out harmful radiation, then a flourishing biosphere such as exists on Earth would be impossible.

The following is a quote from the Preface: (Free Press, 2002).

> The aim of this book is, first, to present the scientific evidence for believing that the cosmos is uniquely fit for life as it exists on earth and for organisms of design and biology very similar to our own species, Homo sapiens, and second, to argue that this "unique fitness" of the laws of nature for life is entirely consistent with the older teleological religious concept of the cosmos as a specially designed whole, with life and mankind as its primary goal and purpose.
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> Although this is obviously a book with many theological implications, my initial intention was not specifically to develop an argument for design; however, as I researched more deeply into the topic and as the manuscript went through successive drafts, it became increasingly clear that the laws of nature were fine-tuned for life on earth to a remarkable degree and that the emerging picture provided powerful and self-evident support for the traditional anthropocentric teleological view of the cosmos. Thus, by the time the final draft was finished, the book had become in effect an essay in natural thcology in the spirit and tradition of William Paley's Natural Theology or the Bridgewater Treatises.
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> The basic thesis of the book, **that the cosmos is uniquely fit for human existence**, is of course not novel. For centuries before the birth of modern science, this thesis was one of the foundational axioms of medieval Christianity. More recently, it has begun to reemerge in various fields of science, most notably in physics and cosmology. Readers familiar with the views of physicists such as Freeman Dyson, Fred Hoyle, and Paul Davies will be aware that over the past few decades many physicists have pointed out that the existence of life in the cosmos is critically dependent on the laws and constants of physics having the precise values they do. The values are so critical that several well-known authors have argued that the cosmos gives every appearance of having been very finely adjusted or "prefabricated" for our existence.' As Paul Davies points out in his Accidental Universe: "If nature had opted for a slightly different set of numbers, the world would be a very different place. Probably we would not be here to see it." In his words: "The impression of design is overwhelming." Because of the perceived support for the traditional teleological worldview of the major religious traditions, the views of Davies and others have received wide publicity. ...
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> Contrary to Davies and others, I believe the evidence strongly suggests that the cosmos is uniquely fit for only one cype of biology —that which exists on earth-and that the phenomenon of life cannot be instantiated in any other exotic chemistry or class of material forms. Even more radically, I believe that there is a considerable amount of evidence for believing that the cosmos is uniquely fit for only one type of advanced intelligent life-beings of design and biology very similar to our own species, Homo sapiens.
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> I do not agree with Davies when he claims, "The physical species Homo sapiens may count for nothing. To defend the postulate that the cosmos is specifically fit for biological life as it exists on earth necessarily involves consideration of a vast number of natural laws, phenomena, and processes which are quite outside of the areas of physics and cosmology and pertain uniquely to the biological realm, phenomena such as the thermal properties of water, the characteristics of the carbon arom, the solubility of carbon dioxide, the self-assembling properties of proteins, the nature of the cell, and so forth. Although from the

> evidence of physics we may be able to infer that the cosmos is uniquely fit for chemistry, stars and planets, or even intelligent beings, we cannot infer that it is specifically fit for large, air-breathing terrestrial mammals. Only through biology can our unique type of carbon-based life and especially advanced forms like ourselves lay claim to a central place in the cosmic scheme.
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> This book is divided into two major parts. In Part 1, evidence is presented that the laws of nature are uniquely fit for the being or existence of the type of carbon-based life that exists on earth. The chapters in this section deal with evidence drawn from many areas of the biological sciences, from molecular biology to mammalian physiology. The physical and chemical properties of the fundamental constituents of the cell, such as water, carbon dioxide, the bicarbonate buffer, oxygen, DNA, proteins, the transitional metals, the cell membrane, etc., are systematically reviewed to show that the existence of carbon- and water-based cellular life depends critically on a number of remarkable adaptations in the propertics of many of life's basic constituents.
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> What isparticularly striking is that, in almost every case, each constituent appears to be the only available or unique candidate for its particular biological role and, further, gives every appearance of being ideally fit not in one or two but in all its physical and chemical characteristics. Also reviewed is evidence drawn from other areas of science that attests to the fitness of the earth's hydrosphere, the fitness of the electromagnetic radiation of the sun, and the fitness of the periodic table for the carbon-based type of life as it exists on earth. As the book also shows, the existence of some higher forms of life, such as large warm-blooded, air-breathing terrestrial vertebrates, are critically dependent on the properties of some of the basic constituents of life, **such as water**, carbon dioxide, and oxygen; in other words, not only are the laws of nature fit for the cell and for simple microbial life, but also for advanced complex organisms very like ourselves. ...
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> Another final point that perhaps should be clarified here at the outset is that I am using the term "anthropocentric" throughout the text in the generic sense. The cosmic "telos" I have in mind is advanced carbon-based humanlike or humanoid life. It is not specifically our own unique species Homo sapiens. At present, there is insufficient evidence to argue that the laws of nature are uniquely fit for every detail of human biology exactly as found in our own species today. However, I believe that the current evidence points strongly in this direction and that future scientific advances will confirm the absolute centrality of mankind in the cosmic scheme.
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> In the last analysis, the **teleological perspective** [plan and purpose] presented and defended here is good for science, because it renders scientific knowledge relevant to human existence. In the doctrine of final causation, science unites man and cosmos. The pursuit of scientific knowledge becomes no longer of merely practical value but also vital and central to the spiritual and intellectual life of man.
> —Michael J. Denton Dunedin, November 1996

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