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CAN SPINOFFS FROM SPACE PROVIDE WATER FOR A THIRSTY WORLD?

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ABSTRACT

This analysis of the origin of our water supply system illustrates the seriousness and complexity of our present water problems which will require all the technology acquired by space-age scientists and engineers to solve. It is intended to show that present water depends as much on water vapor in the atmosphere as on that below the crust of the earth. Spinoffs from the space program should be put to use to overcome water pollution and develop prototypes for desalting, reclaiming and recycling water.

THE QUESTION

Water is second only to the air we breathe; it is essential for man's survival on planet Earth. The world's supply of about 326 million cubic miles of water is not going to be used up but only because nature has been recycling it for millions of years. Less than one percent is available as fresh water (18). Man can no longer afford the once-through-and-out use of potable water. Exercising the right of free choice, people do not always live where the water is—and this is particularly true right here in Florida. Can spinoffs from space provide clean water for tomorrow's world? The answer is shrouded in the mystery surrounding the origin of water.

HISTORY OF WATER

Where did we get our water? The story of water is mingled with the history of the universe. When our world was very young, it was wrapped in a great water-vapor blanket which served as a shield around the planet causing uniformly warm temperature. During the antediluvian era, a large percentage of the sun's incoming radiant energy was absorbed, retained, and distributed over the earth, inhibiting the atmospheric circulation so that climates were warm and friendly—without violent wind storms (1).

The hydrologic cycle is nature's own method of recycling water. Perhaps, it was the world's first life support system. During eons of time the hot sun boiled off billions of gallons of water, leaving the salt behind in a calm and briny sea, and lifted the pure water vapor into an unpolluted sky.

Today, we do not have that great water blanket in the sky; it is only a thin sheet blanket of water vapor. "If all the water in our present atmosphere were suddenly precipitated, it would only suffice to cover the ground to an average depth of less than two inches" (6).

What happened? The water came down, was trapped, and forced deep into the earth. We must allow the experts to unravel the origin of our present existing water supply which depends on the environment both above and below the crust of the earth. The world's total water has remained relatively constant since the beginning of recorded scientific measurement indicating that at some time the hydrologic cycle did not work and much of the enormous water vapor of the earlier atmosphere descended as rain and was not lifted back into the sky (17). There is no such thing as "new" water. The world has to make do with what it has (7).

Believers in uniformity and evolution account for all past changes in existing physical processes. There is no more genuine scientific proof for this assumption than for the catastrophe and supernaturalism of a devastating one-time Great Flood (17).

A civil engineer, a professor of Old Testament history and interpretations, and others in the fields of hydraulics, hydrology, and geomorphology conclude that the flood attained its maximum depth after the first forty days and continued
to maintain this level for an additional 110 days covering "all the high mountains under all the heavens" (17).

The only available standard to measure this theory of our water supply is the mountains. If the flood had not covered the mountains by at least a depth of fifteen cubits, the ark could not have floated over them during the five months the water "prevailed" upon the earth (17).

Geological implications in the first recorded event of the flood indicate that "on the same day were all the fountains of the deep broken up." Translation of this ancient word "deep" has the primary meaning of:

- deep, of subterranean waters
- sea
- primeval ocean

There can be little question that the reference was to the "great deep" of oceanic depths and underground reservoirs of the antediluvian world (17).

Hydrologists and geologists presume the ocean basins were fractured and lifted up sufficiently to pour waters over the continents at the same time waters poured down through the "windows of heaven" during the deluge (4). While the rains came down, the process of evaporation and evapotranspiration could not operate to return water to the sky. Thus, a major portion of the great water-vapor blanket was trapped and stored in and on the earth percolating downward to create a great network of underground water which was pure and undefiled until man came along and despoiled it with the flush toilet and the soapsud frenzy.

Franz Delitzsch interprets the geological phenomena by stating that it was by a cooperation of subterranean and celestial forces which broke through all restraints that the deluge was brought to pass (5).

According to the account of the flood in the ancient scriptures, the breaking up of the deep continued for five months. Such a vast and prolonged upheaval does not support a theory that the flood was a period of local, torrential rains in some part of the Near East which could not have stopped the hydrologic cycle. Rather, it lends support to a universal geographical upheaval in conjunction with a one-time deluge as the origin of the present relatively abundant world water supply.

Geologists and others who believe the flood may have been partial concede the earth crisis was universal and devastating. Mechanics of faults and folds have been duplicated in the laboratory on a very small scale by geologists attempting to prove fault thrusting (17).

A recent theory by Hubbert and Ruby, two outstanding geologists, explain the phenomena as internal fluid pressures in pores of the rock strata. However, a tremendous friction must be overcome if a thrust block is to slide (9). Terzaghi, probably the world's leading authority on soil mechanics, has shown that water definitely is not a lubricant on rock materials and its presence tends to increase the coefficient of friction. Even if we assume that such a large overthrust may have occurred, it would only have been physically possible at all during or soon after a deluge when soft strata and the great forces necessary for overthrusting were feasible during post-flood adjustments. Consider the snow-capped Swiss Matterhorn—it is supposed to have been thrust some thirty to sixty miles away over younger rocks and some believe that it was pushed all the way from Africa to Switzerland. It gives every geological outward appearance of having been deposited in its present position although some theorists maintain that subsequent erosion removed the evidence of continuity with its source. Examination of rock strata provides another link in the chain of events supporting the flood hypothesis. Fossils of once-living creatures give clear evidence of sudden burial by a catastrophe of some kind (17).

THE PRESENT WATER SYSTEM

Today, the world's supply system also includes water vapor in the atmosphere but to a lesser degree. The big all-encompassing water shield is gone. Although water vapor in the atmosphere still regulates the earth's temperature, the uniformly warm climate without storms does not exist. There is a constant battle of "fronts", both hot and cold, which are caused basically by atmospheric
circulations and temperature differentials between points of different latitudes and topographies (1). The hydrologic cycle recycles and violent tropical storms, hurricanes and typhoons redistribute water.

The "greenhouse effect" of the atmosphere controls the water supply on the surface of the earth. Water vapor in the atmosphere absorbs sunlight just as the glass in the greenhouse which raises the temperature and warms the plants. Water vapor tends to raise the temperature of the earth's surface below it. This surface and any object on it is constantly exchanging radiation with water vapor in the atmosphere (2). Reflected radiation in the tropics can raise the temperature of a white sidewalk to 135 degrees Fahrenheit at certain times of the year. Thus, the amount of evaporation and evapotranspiration, and the temperature of the surface of the earth is directly related to the amount and temperature of the water vapor in the upper atmosphere.

When man bends the sunlight with dust particles or contaminates the air with carbon dioxide, he is changing his water and weather patterns. Water vapor, ozone, and carbon dioxide are the three major constituents of the atmosphere. By far, the most important component is water vapor. Significant changes in the proportion of any one of the three can materially change our terrestrial climate. Man can destroy the conditions necessary to maintain physical and biological processes on earth if he tampers with the blanket-effect of the atmosphere which makes the sun's radiation useful to plants and people (17).

WATER AND WEATHER CONTROL

Can water distribution be controlled through changes in the climate? Climatologists state that the real cause of difference in the climate must be found in the variations of the output of solar radiation (8). However, a relatively minor change in the composition of the atmosphere can alter the heat absorbing and reflecting qualities of the atmosphere (17). This change has an impact on evaporation and evapotranspiration and ultimately, the water supply which is dependent on the amount of rain and the way in which it is returned to earth.

A gentle rain percolates downward into the aquifer replenishing potable water while a violent storm causes increased runoff. In the future, we may be able to assert some measure of control over weather and water patterns.

WATER PROBLEMS

Turbulence in the atmosphere moves clouds so there is absolutely no guarantee on rainfall or drought. We can predict, forecast, and observe trends but one sudden, unexpected tropical storm can dump tons of water on the thirsty Everglades or saturate an area already waterlogged by previous rain. When present facilities hit a peak load, measures to capture runoff are of no avail, and water eventually finds its way to the sea. Thus, potential drinking water for a city can be lost to salt on the wings of a single storm which deposits water capriciously (14).

The Floridan Aquifer, replenished by rainfall in Georgia and southern Alabama, has been estimated to contain approximately 80,000 billion gallons of water. A progressive decline in quality threatens this source of potable water for central Florida. The salt intrusion ring around the entire coast of Florida extends inward approximately three to ten miles. Down-town wells in many cities have been lost to salt. Such mineralized water can be exceedingly harmful to people with a health problem. Municipal water should be safe for all of the people all of the time (14).

The lower section of the Floridan Aquifer is defined as the "Boulder Zone," a highly cavernous dolomite containing saline water. This lower part of the aquifer probably contains nonpotable water throughout the peninsula. When the freshwater level is reduced from overpumping during the dry season of the year, salty water moves upward into the freshwater aquifer pushing the diffusion zone toward the surface. Part of this upward movement of water is along fault zones. By relentlessly draining swamps and destroying nature's recharge areas in the wilderness, man is sowing the seeds of his own destruction. When the underground skeletons collapse, sinkholes breach the confining clay layer separating the
shallow aquifer from the Floridan Aquifer. Urban sprawl upsets the hydrological cycle and eventually changes rainfall patterns. Abnormal weather disturbs and redistributes the water supply. There is no guarantee of an annual rainfall for any one section of Florida. A severe drought in the Everglades forces the "mining" of the aquifer. When we withdraw water faster than it can be replaced, quality is sacrificed (14).

Water is a number one problem. More than 25 percent of all municipal water in the United States is substandard and will not pass Public Health standards. Water can carry crippling diseases such as poliomyelitis and hepatitis. Should we wait until 50,000 people are stricken before we stop fish kills, clean up our rivers and lakes, and build tertiary treatment plants? In 1969, Florida had the largest kill of 26.5 million fish in the nation due to pollution (10). Fish die when untreated industrial and municipal wastes enter a primary water source. Slow death from asphyxiation results from depletion of oxygen. Water unfit for fish to survive is water unfit to drink. When a man is thirsty, how much will he give for a glass of clean, safe water?

There is disagreement among the authorities but it has been predicted that the dirty animal called "man" has between forty and one hundred years on this planet unless he mends his life style to purify rather than pollute his water.

The United States has lost perhaps half of all the lakes it ever had and even Lake Erie is in its death throes. Probably, eighty percent of the nation's water supply now is taken from lakes and streams which also function as sewers (16). Even now, depletion of surface and underground waters cause fights over water rights which result in bloodshed and death. Water may soon dictate what we plant and what we eat (12).

Whenever the population of an area reaches the point where there is not enough drinking water to satisfy domestic needs, it is necessary to reclaim, reuse, recycle, or steal water from a less populated area. When this happens, water rights disintegrate into water fights, and the price rises to the ultimate user. Imported water is expensive even when it is legally available. Water does not stop at a political boundary when it is flowing 3,000 feet under the crust of the earth. When a man is thirsty, how much will he give for a glass of salt-free water?

Pollution of our streams and waterways is a crime against humanity. Slow death of fish from asphyxiation results from depletion of oxygen in lakes and streams. Algal bloom speeds up the process and quickens the kill. Once beautiful lakes die and become stinking mud holes. When this happens, birds fly away, dead fish disintegrate into slimy ooze on the bottom, and even alligators are forced to search for a new habitat.

FUTURE WATER

There are those who believe that our future water supply already exists at the poles since recent studies of the strata in both hemispheres prove that the relative positions of the poles and continents during the past 100 million years were the same as the present, and therefore, neither continental drift nor polar wanderings can explain the ice age (17). Extreme difficulties may be encountered if mass transit tugs try to tow an iceberg to where the most people live. The capability exists but transportation of water in this form is expensive with present technology. It may become practical in the foreseeable future.

SPACE SPINOFFS

Water for all of the world's thirsty cities may depend upon the knowledge which the astronauts have returned to planet Earth. Water and solar energy walk hand-in-hand on the path of man's survival because of the sun's interaction with water vapor in the upper atmosphere.

Increased knowledge of our solar system is a spinoff from space. There should be no unemployed space workers anywhere on earth. We need their knowledge of the universe. Water for all of the world's thirsty people may depend upon the life support systems the astronauts
used in their exploration and the scientific data which they returned to this planet. No one was waiting with a glass of water when they landed on the moon. Who is in a better position to help design a prototype water system for tomorrow's needs? Most waterworks facilities are hitting capacity particularly during peak loads. These are days of grace which we cannot afford to waste. Much of the world's supply of water is presently unfit to drink in its natural state.

Space workers at Kennedy Space Center and Cape Kennedy understand their ocean playground. Close proximity to the waters of the Atlantic provides continual opportunity to study the nuclei of condensation, particularly salt particles from the breaking waves on the ocean, which are now necessary to cause water vapor in the present atmosphere to condense even at low temperatures. After water droplets are formed, they may remain suspended in the sky as clouds or they may coalesce into large particles and fall as rain (19). Water from the sea can be turned into drinking water by many different methods. Some are too costly for the shrinking dollar. We should be aware that tomorrow's facilities will not be available to recapture and reuse water unless we use today's resources.

Spinoffs from space can provide future water for a thirsty world. Some of these spinoffs include the capability for a world warning system for high waters and detection by satellite of impending runoff which can be estimated by computers; the equivalent of 10,000 Probes a day of the global atmosphere; observations of dam leaks and spillways as seen on infrared film; contamination control through optical detection of oil on water (3); a water recycling system for all hospitals, schools, and other large water users; and a prototype for turning brackish and saline water into industrial or potable water at a competitive cost.

The water budget in the United States is more likely to be curtailed than in any other part of the world. We don't know if we can coax water-laden clouds to drouth areas. Although the water in the world's atmosphere would cover the ground to an average depth of less than two inches, recent measurements indicate the water in the atmosphere over the United States averages only three-fourths of an inch (13).

Only a handful of people have explored the upper atmosphere and pointed a camera at the sun. Think about it!

The American people have paid for spinoffs from space—let's get busy and use them. All of our thirsty tomorrow's may depend on it!

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