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HELPFULLY YOURS
By Evelyn E. Smith

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For Your Information

By WILLY LEY

HOW MUCH WATER?

ABOUT a year ago, I received an inquiry from a reader asking my opinion about the probable rise of the general sea level if the ice of the polar caps were melted. I replied at that time that, of course, not all the water from the melting polar caps would go into the oceans, but that a good deal of it

would be tied up by increasing the glaciers on mountains, increasing the size of inland lakes, raising the water table everywhere, etc., etc., and that I would not expect a rise of the sea level of more than about six meters or 20 feet.

Somewhat to my surprise, this little item was noticed by a large number of people who mentioned it, mostly in personal conversations, for several months after it had appeared. Most of them expressed astonishment that the figure was so small, a few were as pleased with it as if it had been an immediate danger, while several told me bluntly that I had been too conservative in my answer.

One man distinctly remembered having read somewhere that if all the ice on Earth were melted, the sea level would rise by 6,000 feet. Since I recognized this figure, I could write him that he remembered only a part of what he had read. What this estimate—a fairly old one—really said was that *if* the Earth were smoothed out, shoveling all the continents into the oceans, as it were, *and* if all the ice were melted in the process, our planet would be covered with water 6,000 feet deep. Whether this estimate is correct is a different question, which I did not take the time to check.

ANOTHER correspondent questioned my statement that much of the water would be tied up again in glaciers. He argued that if the climate grew warm enough to melt the polar caps, it would also be too warm to permit the formation of mountain glaciers, that those glaciers we now have would melt, too. This, of course, is correct, but as I recall the original letter, an artificial melting of the polar caps had been in the correspondent's mind, not a subtropical Earth from pole to pole.

But this did not answer the critics who had told me that I had been too conservative, quoting from books like *Physical Geology* (by Longwell, Knopf and Flint, 3rd ed., 1948) that "it is estimated that the complete wastage of all the glacier ice existing today would return enough water to the sea to raise its level about 100 feet. This would drown vast areas of land, much of it densely populated and would submerge large parts of such cities as New York, Boston, London and Hamburg."

The strongest quote came from a professional geologist in Berkeley who found that Dr. Ahlmann, former professor of geography at the University of Stockholm, had written that "on the basis of the French results in Greenland, André Cailleux is quite right in

saying that previous estimates of the world's existing glacier ice are too small. He calculates that the total volume of land ice must be between 26 and 36 million cubic kilometers. Melting of this volume of ice would raise the sea level by some 65 to 90 meters. Even after making allowance for isostatic adjustments, the rise would be from 43 to 60 meters. Now, as a result of the work in the Antarctic, we can say that the higher figure, 60 meters [197 feet], is probably a minimum value."

I conceded to correspondents that I *might* have been too conservative, but just the same I made a mental note that one day I would try to find out whether I actually had been. Pressure of other business intervened, but when I strolled, one Sunday afternoon, through the Chicago Museum of Natural History, I saw an exhibit which fitted right in with this problem. It was stated there that the northern Greenland ice covered an area of 637,000 square miles with an average thickness of 8,000 feet while the polar ice of Antarctica covered 5,000,000 square miles with an average thickness of 2,000 feet.

Since 5,000,000 square miles at 2,000 feet is the same as 1¼ million square miles at 8,000 feet, the figures also stated that the volume of the antarctic ice was very nearly twice that of the northern ice. And since 8,000 feet are just about 1½ miles, it was easy to compute that the northern ice amounted to 955,000 cubic miles. Since the southern ice was twice as much or 1,910,000 cubic miles, the polar ice of Earth had to be on the order of three million cubic miles—considerably less than Dr. Ahlmann's figures.

THE total surface of the Earth is 196,950,000 square miles. For the sake of simplifying the calculation, we'll round this off to 200,000,000 square miles. So the problem amounts to distributing 3,000,000 cubic miles over 200,000,000 square miles. All you have to do is to divide three by 200. The result is 0.015, which means that 1.5 per cent of a mile of water would be added, for 1.5 per cent of a mile is 79.2 feet.

This figure, of course, is four times as high as the one I had originally given. Even allowing for all the secondary factors, like the rise of the water table, the increase in area of existing lakes, the growth of mountain glaciers, the filling up of now dry depressions in arid areas and, last but certainly not least, the increase of the average relative humidity of the atmosphere, the rise would inevitably be greater than I stated.

In short, I had satisfied myself

that I *had* been too conservative. Right now, however, I'm afraid that I may have to revise my opinion once more. *Time* of May 17, 1954, carried a short resume of a release by Edward L. Corton, Jr., of the U. S. Navy Hydrographic Office, dealing with the northern ice cap.

"At present," it stated, "the pack contains only 6,500 cubic miles of ice (barely enough to cover the state of Texas with a 125-foot layer) and it is steadily shrinking." This is just about 0.68 per cent of the figure for the northern ice which I had been using.

Apparently earlier researchers had been enormously misled by too few and too hasty measurements in a few spots and had greatly overestimated the amount of ice in the north. If that figure is correct, the melting of the northern ice alone would be just about 18 inches of additional water, while the southern ice by itself would contribute some 52 feet—*if* the figure of 5,000,000 square miles at an average of 2,000 feet of ice is correct.

But is it?

AN UNKNOWN REPTILE IN WEST TEXAS?

MY short piece on "Europe's Unknown Poisonous Lizard" brought me two interesting letters. One came from an American officer stationed in Bavaria who wrote that he had heard this animal mentioned, though he unfortunately had not seen it himself.

The other letter came from a Mr. W. E. Crutcher, now of Phoenix, Arizona, who topped my story with a tale of what might be an unknown reptile in West Texas.

"Some years ago," he wrote, "when I was traveling West Texas for manufacturers, I was driving on U. S. Highway 84 between Snyder and Roscoe, through moderately hilly country. Without warning, a creature ran across the pavement in front of my car and disappeared into the underbrush on the other side of the road. The experience was startling, to say the least, since I had never before seen anything quite like it.

"I have looked in a number of reference books to identify the animal—the reptile, to be more specific. It looked almost exactly like a miniature Tyrannosaurus and I would estimate its standing height at about three feet. In the short time I had to observe it, I couldn't determine too much detail. Its overall color was a light green, something between a lime and a chartreuse. It ran as a man runs, one leg before the other, holding its front legs loosely in

front of its chest, with tail almost erect . . .

"I stopped for gasoline and inquired of the station proprietor as to the name of the critter. He identified it rather readily as a 'Mountain Boomer' and mentioned that he had seen them in his youth. He also said that if you 'chowsed' one of them (made as if you were going to attack it), it would run at you, hissing loudly. Those are about all the details that I can recall at this time, except that the gas station man 'believed' that it was poisonous."

My correspondent was convinced that the reptile he had seen was known, if probably rare, and asked for identification. What struck me most was the name Mountain Boomer. Only about a year ago, while looking for something else, I had found an old magazine article in which its author complained that nobody believed his truthful reports about a noise-making gigantic lizard in West Texas.

BUT first I wrote back to Mr. Crutcher, naming various reptiles known to run on their hind legs occasionally, adding that most of them are not supposed to occur any farther north than Mexico, but that an occasional "wetback" does not seem impossible, even though I did not know of any actual cases. I also told where he could find pictures of them.

He replied that none of them fitted his memory, though a reconstruction of an extinct saurian came fairly close: "If you'll look at vol. VII, p. 391 of the 1948 edition of the *Encyclopaedia Britannica*, you'll find a panel depicting twelve dinosaurs. Figure 6 is Podokesaurus. Now, if you shorten the neck about half and reduce the tail about 60 per cent, fatten the standing legs a bit and erect the body so that the backbone is vertical or even inclining to the rear a slight bit, you have a pretty close approximation of a Mountain Boomer."

The letter went on to say: "I was able to determine the date as January 18, 1950. I note that I filled with gas at Colorado City on that date . . . and I am sure now that the sighting actually took place between Snyder and Colorado City on State Highway 101 instead of U. S. 84, not too far from the town of Dunn."

While this letter was in the mails, I refreshed my memory about the magazine article mentioned earlier. It can be found in the German monthly *Kosmos* for 1907 and was written by a man who referred to himself as "an old German Texan." His name was H. J. Richarz and he died in San Antonio where he apparently lived, off and on, most of his life.

His memories dated back to the "early 1850s" and he stated that the lizard, at that time, occurred in the canyons of the Frio, Nueces and Devil's rivers.

Specifically, he wrote, he had heard the lizard (or iguana) call "or more properly whine" during a hunting trip "to the upper Seco and Rondo, accompanied by Dr. Wisselberg and Joe Ney." Mr. H. J. Richarz had supplied Prof. Ward of Rochester, N. Y., with Texan animals, but when he wrote of this reptile, Prof. Ward had proved skeptical and replied cautiously: "A crying or whining variety of lizards or iguanas would be of great scientific interest. But I have to doubt your assertion until you send me a specimen."

Mr. Richarz never did, but at a later date (about 1880, as can be inferred from his article), his son shot one and sent the head to his father, who said that it was like that of an iguana, about four inches long, that the scales were "a dirty silvery white, with a black ring around the neck immediately behind the head."

Well, that, to my regret, is all the available data. What ties the two reports, a century apart in time, together is the locality and the noise-making habit as specifically mentioned in one case and implied in the name of the animal of the second report. Do we deal here with unusual behavior of something otherwise known or is it actually a still unknown reptile?

ANY QUESTIONS?

Would the gravity be noticeably weaker at the equator than at the poles due to centrifugal force?

Jim Caughran
3110 *South 44th St.*
Lincoln 6, Nebraska

Since the movement of a point of the equator is just about 1,000 miles per hour, there is a noticeable difference in gravitational acceleration, usually called attraction. It does not matter in practice when the weights under consideration are relatively small, say 100 lbs. or so. But if you weighed a whole shipload of material on spring scales, you'd find a fair amount of "shrinkage." The precise figures are as follows, expressed in centimeters per second, squared:

at the pole	**983.13**
at 45°	**980.61**
at equator	**978.10**

To find the figure for any latitude L, the following formula is used: (1 - 0.0025935 times cosine of 2 L) multiplied by the figure for 45 degrees of latitude.

I have read that over 99% of all stars are in spectral classes O, B, A, F, G, K and M, the remaining 1% belonging to other spectral classes. Would you describe them, please?

Donald Simpson
518 Auburn St.
Modesto, Calif.

The letters attached to the spectral classes of the stars are indications of their surface temperatures. The O-type stars are the hottest and the temperature decreases as you progress through the sentence, Oh, Be A Fine Girl, Kiss Me Right Now, Sweetheart. Specifically, in degrees centigrade:

O	**above**	**25,000°**
B	**"**	**23,000°**
A	**"**	**11,000°**
F	**"**	**7,400°**
G	**"**	**6,000°**
K	**"**	**5,100°**
M	**"**	**3,400°**
R	**below**	**3,000°**
N	**"**	**2,000°**

The S stars, of course, are the coldest. For finer distinctions, a number is added to the letter—K3 would mean, for example, that the star is colder than a K, namely 3/10th of the difference in the direction of M. R5 would mean halfway between R and N.

I have two questions: (1) what is the dividing line between a planet and a moon? I have read that some of Jupiter's moons are almost as large as the planet Mercury. Has the dividing line been picked so that Mercury is just above and Jupiter's moons just below? My second question is this: just what is a comet? I have never seen one.

Name Withheld
Red Bank, N. J.

There is no "dividing line" between planets and moons in regard to size. It would be quite possible for a moon to be far bigger than a planet (but not, of course, *its* planet) because the distinction lies in the movement. Bodies moving around the Sun are planets; bodies moving around a planet are moons.

Just to clean up loose ends at this point, I wish to add that a "moon of a moon" is a theoretical possibility, though we don't seem to have any in our solar system. If a moon and "its" planet should be of fairly equal size, one would probably refer to them as a "double planet." Since the Earth-Moon system approaches this condition, some authors have used the term "double planet" for Earth and Moon.

I do not agree with this usage because the common center of gravity of the Earth-Moon system is still inside the Earth.

"Double planet," in my opinion, should be used only if the common center of gravity is somewhere between the *surfaces* of the two bodies.

As for comets, there are a few every year, but all since the last appearance of Halley's comet have been quite small; that is to say, telescopic. The few large enough to be visible to the naked eye were absolutely unspectacular.

The comets move around the Sun like the planets, but their orbits are highly elongated ellipses while those of the planets are nearly circular ellipses.

The behavior and appearance of the comets has been explained by Dr. Fred L. Whipple of Harvard Observatory by assuming that a comet consists essentially of frozen gases of various kinds, mostly such simple substances as carbon dioxide, water and ammonia. Some solid matter (dust particles) is probably imbedded in this mixture. As the comet approaches the Sun, the frozen gases evaporate, forming first the so-called "coma" of the comet and then its tail.

According to Van Nostrand's Scientific Encyclopedia, the White Dwarf star 0_2 Eridani B has a specific gravity, or density in terms of water, of 64,000. *I would like to know how this is possible when the heaviest elements on Earth have densities of only slightly higher than* 20.

Charles Husted
2609 *Arnott*
San Diego 17, *Calif.*

The explanation for the wide discrepancy between the densities of the heaviest elements found on Earth and the densities of the White Dwarf stars lies in the fact that terrestrial matter is always composed of "complete atoms" while the matter of the White Dwarfs is not. Each terrestrial atom consists of a nucleus, composed of protons and neutrons, which is surrounded by a number of electrons. The electrons move around the nucleus in so-called "shells" at various definite distances.

Under any normal pressure which may occur on Earth and even under laboratory pressures obtained so far, the forces holding the atom together are strong enough to resist any attempt to squeeze the electron shells of one atom into the electron shells of the neighboring atom.

It is for this reason that liquids and solids are virtually incompressible. But there must be a limit to the resistance the electron shells of an atom can offer. If the external pressure is

large enough, it must be possible to crush the electron shells.

This, astrophysicists have deduced, is what happened in the White Dwarfs. If you consider such "crushed matter," as it is called, you realize that there is no longer any meaning to the word "atom." You no longer have atoms, but a mixture of atomic nuclei and unattached electrons, probably free neutrons, too. Because there are no whole atoms left, there can no longer be any great resistance against outside pressures so that matter, once crushed, can be compressed still more with relative ease.

Compressibility is normally the characteristic of a gas and crushed matter (although it probably would look like molten iron) must, therefore, be considered a gas. Since Enrico Fermi was the first to investigate the theory of crushed matter, this entirely unexpected new state of matter is often referred to as a Fermi gas.

I recently looked through an astronomical book for the diameter of the Moon.

I found it all right, but at the bottom of one page I saw something which was not explained. It said: January 1st, 1950 A.D. —J.D. 2,433,283.

What does that mean?

C. F. Weinstein
Kansas City, Mo.

The letters J.D. stand for Julian Day. This is a method, used almost exclusively by astronomers, to pin down a date without reference to the year. Especially when it comes to B. C. dates, you always have to remember that 1 A.D. followed immediately after 1 B.C., though logically one should expect a year *zero* (namely, the year of the birth of Christ) between them.

In addition to this difficulty there have been, as you have read in last month's column, several revisions of the calendar which would have to be taken into consideration.

To avoid all these difficulties, one Joseph Scaliger, quite some time ago, suggested simply counting days, without reference to months or years. To make this scheme workable, one had to start at a very early arbitrary date and Scaliger chose January 1st, 4713 B.C. He also suggested calling the days counted from that date the Julian Days. This has nothing to do with Julius Caesar and the Julian calendar, but was meant to honor Joseph Scaliger's father Julius.

The Julian Day 2,429,630 is the first of January, 1940; the

figure you happened across is the J.D. number for the first day of 1950. Since the J. D. is used chiefly by astronomers, it does not begin at midnight, because that may change the J. D. in the middle of an observation. The Julian Day consequently begins at noon.

Why is a salamander called an amphibian like a frog, but a lizard is called a reptile like a turtle? Does it have anything to do with whether they live in water or on land?

Morris Moore
Philadelphia, Pa.

Yes, it does have something to do with where they live, but the connection is not that simple. The word "amphibian" comes from *amphi* (both) and *bios* (life) and means that such animals live both in water (fresh water only) and on land in the course of their lives. The best and also best-known example is the frog, which is hatched in water, goes through a tadpole stage and then climbs up on land where it may spend the rest of its life, going back into the water only for mating. The marine turtles (reptiles) do the opposite; they spend all their lives in the seas and crawl back on land only to lay their eggs.

More specifically, amphibians have gills when immature and lungs later, although a few of them retain the gills all their lives. Amphibians also have a soft skin equipped with skin glands, which may be the reason why no salt-water amphibian is known. Reptiles have lungs and a skin covered with scales and *without* skin glands and are essentially land animals, even though some, like the marine turtles, the marine iguana of the Galápagos islands and the sea snakes of the Indian Ocean, have chosen to return to the ocean.

—WILLY LEY