

THRILLING WONDER STORIES

VOL. XXXVIII, NO. 3 A THRILLING PUBLICATION

AUGUST, 1951

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SAM MERWIN, JR., Editor

THRILLING WONDER STORIES. Published every other month by STANDARD MAGAZINES, INC., 10 East 40th Street, New York 16, N. Y. N. L. Pines, President. Copyright, 1951, by Standard Magazines, Inc. Subscription (12 issues), \$3.00; single copies, 25c. Foreign and Canadian postage extra. Re-entered as second-class matter October 8, 1946, at the Post Office at New York, N. Y., under Act of March 3, 1879. Names of all characters used in stories and semi-fiction articles are fictitious. If the name of any living person or existing institution is used, it is a coincidence. Manuscripts must be accompanied by self-addressed, stamped envelopes and are submitted at the author's risk. In corresponding with this publication, please include your postal zone number, if any. PRINTED IN THE U.S.A.

Our Inhabited Universe

By JAMES BLISH

II—THE CORPSE PLANET



THE planet Venus, second from the sun, is the solar system's biggest disappointment.

For many years, we have thought of Venus as a steaming swampy world, teeming

with life. This portrait of the planet has been sketched in virtually every science fiction story which has used Venus for a setting.

There was at one time considerable justification for this theory. Venus is almost exactly the same size as Earth—its diameter is 97.3% of that of our planet, its mass four-fifths of Earth's. It has a deep thick atmosphere. Its surface temperature seems to be warmer than that of Earth, as one would expect on a planet closer to the sun than we are, but not uncomfortably so. It revolves on its axis, although rather slowly, so that it doesn't present the same face to the sun as does Mercury.

Furthermore Venus comes very near to us—26 million miles at closest approach—and even when it is farthest away from us we can get a pretty good view of it. These observations have shown us a planet so thickly covered by masses of clouds that we have never actually seen anything of the surface of the planet—although some few observa-

tions have been made of a dubious marking which some astronomers think might be a 50-mile-high mountain, a conclusion not generally accepted.

All these facts seemed to add up to a steamy marshy world, uncomfortable for men but certainly able to support life. No wonder that "green hell on Venus" has been a staple idea of science fiction for many years.

Lately, however, this view of conditions on Venus has been virtually destroyed by some new and disturbing pieces of information.

There is no free oxygen on Venus.

There is no free water, either.

These two simple facts completely explode the "green hell" theory. A third fact—that most of Venus' atmosphere evidently consists of unbreathable carbon dioxide—seems to show that Venus was stillborn.

Almost all known forms of life need free oxygen in some form—either as a gas or in solution. The only exceptions are such simple forms as the anerobic bacteria. And even these simple forms, which can split bound oxygen out of chemical combinations for their use, need water or water vapor in which to operate.

The part of the cloud blanket of Venus we can see, even when we use haze penetrating infra-red light, is very high above the surface of the planet. But it is not likely that there is oxygen or water-vapor below that level. The

WHY THE ODDS ARE LONG AGAINST LIFE ON VENUS!

clouds of Venus change rapidly, indicating the persistence of storms and gales. If there were oxygen being produced at the surface enough of it would find its way to the top of the atmosphere to enable us to detect it. This holds true also for water-vapor.

Furthermore the high proportion of carbon dioxide and the lack of oxygen tells us plainly that there are no green plants on Venus. Green plants convert the heavier gas into the lighter one. It is this action which cut the originally high carbon-dioxide content of our own air down to almost nothing and which maintains our own oxygen supply.

Since animal life as we know it depends upon green plants the moral is plain—there are no animals on Venus.

The further we follow these few simple new discoveries about Venus the more depressing they become. We know, for instance, that carbon dioxide has a great fondness for infra-red light—radiant heat. Once it has captured it, it is reluctant to let it go. A planet blanketed by carbon dioxide would therefore be very like a gigantic greenhouse, holding much of the heat which it received from the sun and letting it go only very slowly.

The surface of Venus, then, must be much hotter than the cloud-surface we can see and measure. At noon on Venus' equator the temperature is probably hotter than that of boiling water. On the night side the temperature cannot be much lower.

Thus chances for life on Venus—the old "green hell"—are not good to say the least. The notion that it could support little green men three feet high who could build flying saucers, as a recent hoaxer would have us believe, is strictly for the birds.

Yet there are still those clouds. Occasional very faint clouds have been seen on Mercury, which might have been volcanic clouds—but can Venus really be so volcanic a planet as to keep its dense atmosphere constantly full of dust to a depth of nearly 200 miles? It seems

unlikely. Venus, as we've noted, is an Earth-like planet in many respects. Probably, like Earth, it has a number of active volcanoes but it cannot be as volcanic as all that.

We know then that the clouds are not made of water vapor like our clouds. Probably some of them are dust-clouds, like the occasional dust-clouds of Mercury or the sandstorms of Mars, but only a very few of them. What are the rest of these clouds made of?

The present answer—according to the best theory we have so far—is perhaps the most discouraging idea about Venus that has been formulated since the planet was first observed. Only within the most recent tick of the cosmic clock has Man's lifetime encompassed the synthesis of plastics and met the task of putting them to work for him. Venus, by the new theory mentioned above, cooled millennia ago into a deathly embarrassment of riches. Those abundant clouds are made of—

Formaldehyde plastics.

Formaldehyde is an invisible and extremely poisonous gas. In solution—when it is called "ormalin"—it makes a very good pickle and is used in most biological laboratories as a medium in which to preserve specimens. In combination with tiny amounts of water vapor—much too small for us to detect on Venus from here—it produces compounds resembling the plastics with which we are all familiar.

The chances are good that the clouds of Venus consist mostly of small gummy drops of such plastics, plus flying crystals of formaldehyde. The evidence for this is too complicated to explore in detail here but it looks like good evidence.

The sphere that is Venus is living out its planetary life inside a plastic coffin. It is evidently not only a dead planet but a shrouded and pickled one. Its surface must be barren and desolate, scored by hot winds, marked mainly by eroded rock—its sky grey and turbulent, torn by constant tornadoes. Probably there are no mountains because of the heavy

erosion which must have been going on ever since the planet first cooled. Instead the surface must be deep in arid sand, duned and constantly on the move, broken only by a few contorted shapes of rock a few hundred feet high.

Men could set up a base there without much difficulty, once the problems of landing through the eternal clouds had been met. The "weather" would not be too severe. Only a nominal amount of protection against the heat would be needed. The air pressure would be only slightly greater than our own. The gravity would be almost the same.

Supplies of oxygen, water and food would have to be brought from Earth but that would be true for Mercury too and for the moon. Far simpler sealed shelters could be maintained on Venus than those we would need on those two worlds. But would it be worth it?

I doubt it. There would be nothing to see but thick dry fog, nothing to do but wait for the next transport with mail from Earth. Venus is so much like Earth in basic respects that no research of any importance could be done there that could not be done as well or better here at home. As an astronomical or military base it would be worse than useless. No mining could be done there worth the expense and the difficulty.

We know there is life on at least one other planet in our Solar System and it seems likely there may be life on several. But Venus, the planet we once pictured as a kind of Garden of Eden with steam heat, a living museum of our own prehistory, a teeming jungle complete with dinosaurs and giant ferns—so similar to Earth that we thought it must be our younger hoyden sister is sterile.

Venus does at least serve to remind us that life is an unusual thing. Tough and varied though the creatures of Earth's varied environments may be—from elephant and condor and man to caddis-worm and cyclamen and spirochete—they all need oxygen and water vapor, and the temperature range which they can endure is very narrow.

Furthermore, Venus is not noticeably younger than Earth. Even if its atmosphere conformed closely to Earth's it would not now be in its Carboniferous Era but in one roughly approximating our own age of manipulated plastics. The planetary colors and atmospheres, clouds and soils are functions of their physical composition at the outset, not of age in years of millennia.

What seems to have happened on Venus is that it was cheated of its birthright. At its very beginning it was given less water and water vapor than Earth. Long before seas could form most of this water vapor was spun off into space while the planet was still white-hot. When Venus cooled, the remaining water vapor was too scanty to permit life to begin and plants to develop.

Without plants to produce oxygen and consume carbon dioxide Venus retained its primordial shroud—exactly the same sort of shroud that covered our own planet when it was young, before plants arrived to free the oxygen from the carbon dioxide. If all our layers of fossil plants—our coal and oil deposits—could be reburned, our air would again be devoid of free oxygen and our planet reduced to a state very like the state of Venus today.

Venus, then, is not our younger sister. Earth and Venus are twins—were nearly identical twins at birth. The difference between them is crucial for possible inhabitants of the two worlds.

Mercury—by Earth standards too hot on one side, too cold on the other, too small, too close to the sun—may nonetheless support simple forms of life. Less deadly Venus, which passes muster on all these counts, which looks to be—and started out to be—our near-duplicate, lost out through a fatal lack of free water. It is not hot enough to encourage un-Earthly life but it is not quite Earth-like enough—and can never grow old enough—to support our kind of life.

Venus is instead the embalmed and shrouded corpse of another Earth that died before it began to live.