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IS THERE LIFE ON VENUS?

by

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IS THERE LIFE ON VENUS?

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by

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A.N. Kvashin and

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L.I. Miroshnichenko

The conditions for the nascency of biological life on the surface of Venus are not favorable. But does it mean, that our nearest neighbour is totally devoid of life? Scientists Dr. V. Libby* and Kh. Morovitz**, assume that in the clouds of Venus the life is possible. There is abundance of water, carbon dioxide and bright solar illumination which are sufficient conditions for the photosynthesis.

Morovitz assumes that in the upper cloud region water exists in the form of ice crystals and in the lower in the form of drops. The temperature in the clouds is approximately 210°K above and 260 - 270° below. At such temperatures the pressure should be of the order of 1 atm. Ozone and other gases, as well as some quantities of mineral dust, thrown off from the planet's surface, possibly exist in the atmosphere composition.

Measurements performed by AIS "Venera-4" and "Mariner-5" have shown that the atmosphere of this planet is composed almost entirely of carbon dioxide. It is possible to assume that dissociative recombination of CO_2^+ also takes place in the atmosphere, which is easily explained by the airglow in the ultraviolet region.

The carbon dioxide and the atomic oxygen emerge as the result of recombination. According to M.S. Belton's (1967) spectroscopical data the relative content of molecular oxygen is less than $5 \cdot 10^{-5}$. The essential part of Venus ionosphere evidently consists of protons.

* Science News, v. 93, No.12, 1968

** "Nature", v. 215, No.5107, 1967.

Following is the life pattern on Venus that Morovitz deems possible to assume. The macroscopical organisms inhabit the clouds. They have to be at specific level, since below the temperature is too high, while above it the humidity and temperature are low. By their form, these organisms apparently represent some sort of a floating bubble filled with hydrogen. With photosynthesis, they may derive molecular hydrogen from water. Such organisms are known in terrestrial conditions. With reasonable assumptions, computations allow us to assume that their dimensions are of the order of 4 cm. in diameter or more.

It is possible that photosynthesizing organisms inhabit even below the clouds. Here they can obtain water in the form of rain, and capture with their sticky coating the macroscopical mineral particles ejected from the planet's surface.

Proceeding from other positions, Dr. Libby asserts that there exist on Venus an ice polar cap and definite forms of life. He points to the results of investigations, according to which the planet's composition is analogous to that of the Earth, and that there should be a sufficient amount of water. At a corresponding temperature, the polar cap of about 5 km. thickness should be containing water in the required amount. Since Venus' rotation axis is apparently practically perpendicular to its orbit plane, the yearly shift of seasons on the planet should be absent, and the question amounts to what the temperature in the polar regions really is. Measurements of the Soviet interplanetary station "Venera-4" yield a +550°K temperature on the equator (about +257°C).

V. Libby* expresses the opinion that in the polar regions the temperature may be much lower, possibly even below 273°K (0°C), and such a temperature creates conditions for ice formation. Moreover, due to planet's low rotation, the transfer of heat from lower to upper latitudes apparently will take place slowly. Dr. Libby imagines Venus with polar cap, melted at the edges, and streams of water rushing to the hot equatorial region, where the water evapo-

* "Sky and Telescope", v.35, No.5, p.296, 1968

rates. In the transitional region of carbon dioxide atmosphere, some forms of life may exist.

As may be seen, Dr. Libby's point of view coincides with the Morovitz hypothesis, who develops it further. He considers, that the exchange of organisms' substance is analogous to the terrestrial one, and biochemical processes are also similar. With the corresponding conditions, a steady reproduction of organisms is possible. Thus, the life on Venus may be investigated on the basis of known terrestrial principles. As far as is known, conditions in the lower clouds of Venus are much nearer to the terrestrial ones, than anywhere else in the solar system.

It is possible, says Morovitz, that life on Venus originated on the planet's surface, when more temperate conditions existed. After that, the variations which took place on the planet's surface, compelled the organisms to seek more suitable conditions in the clouds. The matter of course is now in the biological experiments.

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