

# Mars Data Refined

From bits and pieces of accumulating information, a view of Mars is being slowly pieced together.

Scientists are preparing to drop a instrument package to the surface of Mars. They will hear the binary beeps that will tell them if life is the rule or the exception in the solar system.

But up to now, they do not even have maps good enough to land a package within 400 miles of any target they might pick.

Some 120 scientists met at an international gathering in New York recently to compare notes and plan experiments. Questions were more prevalent than answers at the Goddard Institute for Space Studies, sponsored by the National Aeronautics and Space Administration. One apparent answer was offered by Dr. Audouin Dollfus of the Observatoire de Paris.

Dr. Dollfus described polarization measurements establishing the major surface component of Mars to be hydrated iron oxide of the limonite type. Curves of the degree of polarization plotted against the phase angle between the sun, Mars and earth agree precisely with laboratory curves of limonite.

The polarization indicates a particle size at the surface of 10 to 200 microns.

Dr. L. V. Berkner of the Southwest Center for Advanced Studies contended that oxygen now on Mars cannot account for the formation of large quantities of limonite.

He suggested that even if Martian outgassing through thermal activity had been only 0.001 that of the earth, there could be today pools of water at remaining centers of thermal activity. These Martian hot springs, he argued, could support a biological community which in turn could supply the necessary oxygen to form the limonite.

One limitation of present measurements was spelled out by Dr. Joseph Otterman, formerly of General Electric, now at the University of Tel Aviv. Most measurements show that the water vapor density in the Martian atmosphere is equivalent to a layer about 25 microns deep.

This quantity is subject to daily and seasonal variations, however. As nighttime frost sublimates directly into the atmosphere during the Martian morning, the water vapor density increases. Dr. Otterman suggested that measurements taken from only the area experiencing high noon—rather than the entire disk—might reveal a noon bulge in the water vapor level as deep as 200 microns. The mean figure for the

earth's atmosphere is 5,000 microns.

Dr. B. C. Murray, a geologist from the California Institute of Technology, reported that initial figures for crater density derived from the Mariner IV photos were far too low. Refined techniques reveal a density equal to that of the lunar uplands, indicating that the surface of Mars is of the same age as the lunar uplands.

In a discussion of what processes may be modifying the Martian surface, Dr. Murray pointed out that neither impact nor volcanism could account for fine particles in the necessary quantities.

Dr. Thomas Gold of Cornell countered that it was unnecessary to account for such a process. The planet itself may have accreted from fine particles, he said.

Several geologists pointed out that while large quantities of water are necessary for the formation of limonite, the surface particles need not be pure limonite. They could well be grains of something else covered with a limonite patina.

Drs. Carl Sagan and James B. Pollack of the Smithsonian Astrophysical Observatory elaborated on their all-inclusive model for the Martian surface features first outlined last fall.

They interpret the dark areas as highlands, ranging six to nine miles in height with slopes of three to four degrees. The bright areas which cover most of the planet are "seas" filled with limonite dust. The "canals," long lines mostly in the bright areas, are mountain chains pushing through the dust.

Changes observed on the planet are caused by the deposit and removal of dust by the wind, according to Drs. Sagan and Pollack. This model would eliminate the biological explanations now offered for these changes, they said, but does not answer the question of whether there is life on Mars.

Too little is known about the material that forms the dark areas, Dr. Gerard de Vaucouleurs of the University of Texas said. These areas are actually laced with nodules of bright matter that dominate any observation. The spectral reflectivity or even the true color of the dark regions is not known.

Dr. de Vaucouleurs also called attention to relatively recent phenomena he called "cherries." These are thin dark lines extending from dark into bright areas terminating in dark pools about 35 miles across.

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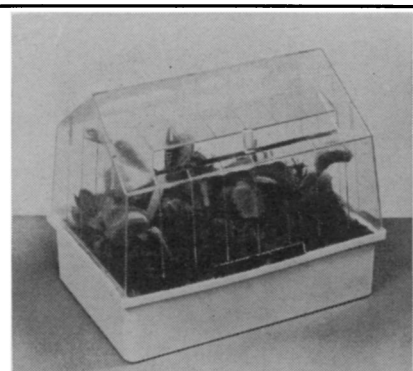
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