BIOLOGY

Life on Mars Seen Possible

A biologist has concluded that chances are "quite likely" for a form of life on Mars higher than the lichen or moss usually suggested, Ann Ewing reports.

➤ ONE OF THE MOST exciting possibilities of space probes to the planets, particularly Mars and Venus, is the chance of discovering some form of life outside earth.

For centuries, scientists and philosophers have speculated about the likelihood of life elsewhere in the universe. However, only in recent times has the challenging idea that the earth is not the center of the cosmos, and of living things, found more than a few believers.

After surveying all available evidence, some scientists suggest that the changing view we have of Mars is due to living organisms. Instead of the moss or lichen usually offered in explanation, the variations in Martian markings could be due to inhabitants of a much higher order, possibly even with intelligence.

If there is intelligent life on the planet that most resembles earth in the solar system, then man had better be careful before sending a robot-like machine down to sample the surface of Mars. As Dr. Frank Salisbury of Colorado State University warns:

"At least I can imagine how I might react if such an apparatus landed in my back yard and started grabbing for my apple tree, the cat, and maybe me!"

Dr. Salisbury believes that the only explanation for many of the observed changes on Mars is the existence of life, and that a higher form of life would require the least modification to account for the changes.

From "animals" that feed on plantlike forms able to thrive in the thin Martian atmosphere, low gravity and low temperatures, he suggests that it is "but one more step," although a big one, to intelligent beings.

The National Aeronautics and Space Administration agrees with Dr. Salisbury and most other scientists—the basic question about Mars, or Venus, or any other object in the solar system, is whether life exists there, or whether there are any signs it has existed.

Probes to the planets are, therefore, being designed to give clues to this problem. Even the moon, generally considered lifeless, might yield evidence of life outside the planet called earth.

Evidence for such life could be in the form of microorganisms, or even viruses, probably the simplest known form of life. This is one reason the United States is taking elaborate precautions to make sure that any vehicles sent through space to the moon or planets do not carry any earthly contamination.

As lunar probes did, so first probes to Mars and Venus should circle and send their information back to earth, rather than land. Therefore, the first Mars probe is expected to carry an infrared spectrograph to determine the presence or absence of organic molecules.

It will also have instruments to detect the presence or absence of ozone, the triple-weight oxygen that protects earth from the sun's otherwise deadly blast of ultraviolet radiation.

The Martian probe is also expected to send back to earth television-like pictures showing what the surface is like.

PLANET PROBE MODEL—Technicians of the National Aeronautics and Space Administration check out a model of the Saturn rocket before a supersonic wind tunnel run. The Saturn booster may send probes to Mars and Venus.

Clues Expected by 1963

These clues to possible life on Mars, and a better idea of what the planet is like, are expected by 1963.

One of the most direct arguments in favor of life on Mars comes from Dr. William Sinton of Johns Hopkins University, Baltimore. He used the world's most powerful telescope, the 200-inch atop Mt. Palomar, to look at Mars in the light it gives off in the infrared. He found absorption bands characteristic of the organic molecules in living organisms on earth.

In his searching analysis of what is now known about Mars, Dr. Salisbury finds astronomers mostly agree:

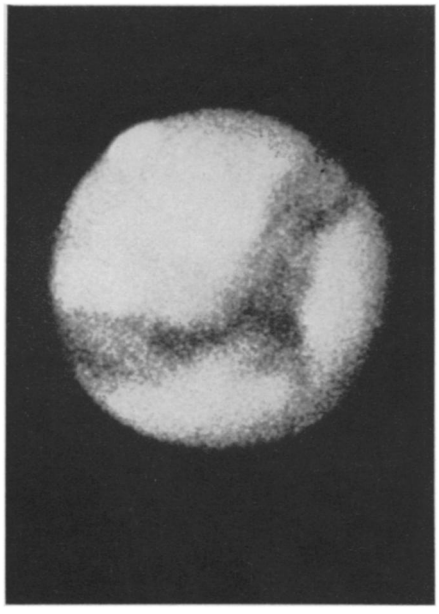
1. The atmospheric pressure at the Martian surface is about that at 10 to 11 miles above earth's surface, or twice the height of Mt. Everest.

2. The carbon dioxide content is two to 13 times that of the earth's surface.

3. There is only a minute quantity of water vapor, with no detectable free oxygen, ozone or water vapor. The bulk of the atmosphere is nitrogen, plus some argon produced by radioactive decay of potassium.

Astronomers have known for quite some time that Mars has about two-fifths the earth's gravitational attraction at its surface; the day length is nearly the same as earth's but the year is twice as long; and the intensity of sunlight reaching Mars averages about 43% of that reaching earth.

For any life form to exist under such conditions, Dr. Salisbury suggests that biochemistry there must be very different from earth. Water, for instance, might act like a "vitamin." There must definitely be some method for severely restricting the loss of water from Martian organisms. The oxygen so basic to terrestrial life forms might be replaced with nitrogen. Or the decay process might involve iron oxides, in much the same way that oxygen is split from water through photosynthesis on earth.



POLAR CAP ON MARS—This photograph shows clearly the southern polar cap on Mars. The white is believed to be a very thin layer of frost, which melts as "summer" there progresses and forms again during colder weather.

Even the scientists who do not agree with Dr. Salisbury's deductions concerning the evidence for life on Mars agree that discovery of life on another planet, or anywhere else in the universe, would be one of the most momentous events of human history.

It would clearly prove that earth is not alone in the cosmos. It would also culminate a long history in which the earth has been moved from the center of the universe to the third planet of the sun; the sun has been moved from the center of the universe to one star among many, and then earth's nearest star has been moved to one corner of a galaxy populated with millions upon millions of stars; and that galaxy is now believed to be only one of untold millions of galaxies in a universe seemingly without end.

Requirements for Life

Dr. Salisbury believes there are five requirements that any potential inhabitants of Mars must satisfy:

1. They must be visible or form visible colonies that cover the ground rather extensively.
2. They must account for the color and the observed color changes, which should take place in response to increases in temperature and atmospheric moisture.
3. They must account for the observed changes in size and shape of the Martian areas—that is, they must migrate or grow with some rapidity, and they should be able to re-emerge from a covering of yellow dust.
4. They must exhibit these various responses within the Martian environment, which is characterized by low temperature and great daily fluctuations in temperature; an extremely thin atmosphere, containing a considerable amount of carbon dioxide but only traces of oxygen or water, and occasionally penetrated by ultraviolet light.
5. They must conform to certain fundamental principles of ecology, such as the cycling of elements.

Dr. Salisbury notes that it is easier to modify higher plants mentally so that they will meet the criteria than it is to make the often discussed lichens meet these criteria. He suggests that a thin organ, such as a leaf, would offer the needed broad, flat surface to sunlight during the day.

At night, the leaf might roll into a small cylinder. A change of color, toward white, at night would also help cut down loss of heat by radiation during nighttime.

Fast warming during the day would be accelerated by pigment systems that tended to make the organism an efficient blackbody absorber.

Dr. Salisbury concludes that the basic shape of the leaf of a higher plant seems suited to conditions on Mars, but that earth dwellers "should be prepared to encounter some interesting surprises in biochemistry."

He urges that, in view of the evidence, "we should at least try to keep our minds open so that we could survive the initial shock of encountering" any life forms Mars might possibly possess.

• Science News Letter, 81:378 June 16, 1962

ASTROPHYSICS

Network Planned to Help Spot Fallen Meteorites

➤ A NETWORK in seven Midwestern states to locate meteorites quickly after they fall is being established by the Smithsonian Astrophysical Observatory.

Freshly fallen meteorites are invaluable to scientists, since they are the only solid material reaching earth from interplanetary space. They are especially valuable for determining their ages from their radioactivity and as a possible clue to life beyond earth.

Museum specimens are usually contaminated from having been on the earth's surface for some time.

The Smithsonian Astrophysical Observatory in Cambridge, Mass., is therefore setting up a network of 16 observing stations, which will scan a total possible recovery area of about two and a half billion acres. Each of 16 locations will have a four-windowed shelter to house four cameras aimed north, south, east and west.

Each camera will operate automatically from sunset to sunrise, taking pictures of the sky on Tri-X Pan film.

Stars as faint as magnitude eight will register, but fast-moving meteors must be of zero magnitude or brighter (considerably more brilliant than any of the stars in the Big Dipper) to be recorded. All film will be studied in Cambridge.

Those meteors brighter than the planet Venus will be analyzed for the possibility that they may have fallen to earth and be recoverable.

Most of the spotting stations are in flat areas, relatively stone-free, and far from brightly lighted cities. Combined population of the 16 towns is 19,000. Each station will be checked daily by a local assistant. About twice a month, workers from field headquarters in Lincoln, Nebr., will visit the sites to pick up film for processing, scanning and transmitting to Cambridge.

Quick recovery search trips will be made whenever a fall is indicated. Dr. Richard McCrosky is director of the project, it is reported in Sky and Telescope, 23:303, 1962.

The 16 sites are at Havana, Ill.; Milan and Vienna, Mo.; Vinton and Maple River, Iowa; Liberty, Alma, Neligh and Mullen, Nebr.; Farlinville, Goessel and Kalvesta, Kans.; Ward and Lower Brule, S. D.; and Cederdale and Hominy, Okla.

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ASTRONOMY

Computer Calculates B.C. Positions of Planets

➤ THE POSITIONS of the planets, the moon and the sun from 601 B.C. to 1 A.D. have been calculated using an electronic "brain," or computer.

The astronomical tables are expected to provide scholars with new insight in the study of ancient civilizations. Dr. Bryant Tuckerman, a mathematician with the International Business Machines Corporation, began the work while at the Institute for Advanced Study, Princeton, N. J., and continued it under IBM.

Dr. O. Neugebauer of Brown University, Providence, R. I., has worked with astronomical predictions from the pre-Christian era. Even before publication, the tables were used in dating and piecing together fragments of Babylonian clay tablets containing ancient astronomical records.

The analysis and computer programs for constructing the planetary, lunar and solar positions were based on modern mathematical theories describing the motions of the planets, together with improvements based on ancient observations. The theories are the mathematically derived results of applying Newton's laws of motion to the interactions of the bodies in the solar system. Past comparisons have shown good agreement with previously available ancient observations.

The tables of positions at five-day and ten-day intervals are available from the American Philosophical Society in Philadelphia.

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ASTRONOMY

Moon, Mars, Venus Aim of Balloon Flights

➤ THREE U.S. AIR FORCE balloon flights before the end of the year will tell more about the moon, Mars and Venus. Flight Star Gazer will have a human observer with a telescope.

Flight Sky Top will carry instruments to measure the moon's temperature in the infrared, while Balast is scheduled to analyze instrumentally the atmosphere of Venus. The balloon will rise 85,000 to 120,000 feet.

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