



**MARS FLYBY**—The path taken by Mariner 4 is shown diagrammatically with approximate TV picture-taking positions.

SPACE

## Mariner Observes Mars

In addition to Mariner 4, scientists in laboratories and observatories around the nation are obtaining information on Mars to be correlated with that sent from the spacecraft.

▶ WHILE MARINER 4 was successfully televising Mars, astronomers across the United States were making their own careful observations for comparison with these pictures.

The pictures of Mars were transmitted to earth as a series of five million radio signals representing zeros and ones. These digits, received at Jet Propulsion Laboratory (JPL) in Pasadena, Calif., were reconstructed by a computer to produce the images in the form of a series of dots of varying shades. The images were formed by 200 lines of 200 dots each.

Powered by sunlight shining on its four wing-like panels, Mariner 4 used only 10 watts of transmitter power to send the information.

JPL, for many months the busiest space center west of Cape Kennedy (the Ranger moon shots were monitored at JPL), has been keeping an earthbound eye on Mars through a telescope on Table Mountain, Calif., in addition to keeping track of the spacecraft.

The Lowell Observatory in Flagstaff, Ariz., has always been one of the most active observers of Mars, but the possibility of close-up pictures taken from a mere 5,700 miles away has inspired the observatory to step up its coverage even more, according to the director, Dr. John S. Hall.

New Mexico State University has also been keeping a vigil, and even at the Naval Observatory in Washington, D.C., where equipment is occupied with an investigation of double stars, one astronomer made a series of sketches of Mars on his own.

Besides making their own observations, Lowell, JPL and New Mexico State are all serving double duty as "control stations" for

the National Aeronautics and Space Administration, providing "official" views of Mars to be correlated with Mariner's findings. A fourth control point will be the Lick Observatory at Mt. Hamilton, Calif., whose 120-inch reflecting telescope and 36-inch refracting telescope are each the second largest of their types in the world.

A project at the University of Texas will not be helping Mariner but will be helped by it. A detailed map of Mars, compiled from the best observations made of the planet since 1877, has been in progress for the last six or seven years. Mariner's pictures will be fitted into the map, providing a much clearer view of a narrow strip of Mars.

Even though the strip is a narrow one, however, it could help to clarify the entire map. By comparing Mariner's photos of a given area with previous, less clear pictures, scientists may be able to judge what other parts of the planet should look like.

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BIOLOGY

### Mars Atmosphere Is As Earth's Once Was

▶ THE ATMOSPHERE of Mars today appears to be much like the atmosphere of the earth some two billion years ago or more, two prominent scientists reported.

In the earth's early years there was a very primitive atmosphere with only tiny traces of oxygen, as low as 0.1% of the present level, reported Drs. Lloyd V. Berkner and Lauriston C. Marshall, Southwest Center for Advanced Studies, Dallas, Texas, in the *Journal of Atmospheric Sciences*, 22:225, 1965.

"Such life would be confined to lakes or volcanic-fed springs at a depth of a few meters," they said.

As the oxygen level in the atmosphere increased through time by photosynthesis of primitive plant life, radical evolutionary changes took place, they said.

When the oxygen passed one percent of the present level, the ocean surfaces were sufficiently shadowed from deadly ultraviolet rays to permit widespread expansion of life there. This oxygen level is known as the "first critical level" and is identified with the "explosive" evolutionary advances of the Cambrian period some 600 million years ago.

When the oxygen level passed 10% of the present level, the land surfaces were sufficiently shadowed by the resulting denser atmosphere so that life could begin to spread to the land. This is known as the "second critical level" and is identified with the appearance and rapid spread and development of organisms on the land at the end of the Silurian period, some 420 million years ago.

It seems reasonable that the atmosphere of Mars appears similar to that of the earth in its primitive state, the doctors reported. "Life on Mars would therefore be subject to the same restrictive ecology as existed on earth during Archeozoic or early Proterozoic eras."

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TECHNOLOGY

### Spinning Space Net Designed for Reentry

▶ A HUGE FABRIC DISK like an oversized fireman's safety net has been added to the ever-growing list of devices designed to slow down a space vehicle and keep it from burning up as it descends through a planetary atmosphere.

Called "Rotornet," the disk would be packed into a compartment on the nose of a spacecraft and would be opened by centrifugal force from spinning either the entire vehicle or just the nose compartment.

They would be made of closely-woven, heat-resistant fibers and extremely light in weight. A 200-pound Rotornet could handle a 10,000-pound payload for a reentry from earth orbit. However, the disks would be very large in diameter.

The designer, A. C. Kyser, an engineer at the Astro Research Corp., Santa Barbara, Calif., said that despite the cost of the huge, complicated loom required to weave the net, since they must be constructed in one continuous piece, the actual nets would be very inexpensive.

Other devices being considered for use as reentry aids include:

1. Conventional parachutes, such as those being used in current manned Gemini flights.
2. Paragliders which look like huge folded paper airplanes.
3. Rogallo wings, the National Aeronautics and Space Administration's version of the paraglider.
4. Ballutes, a cross between a balloon and a parachute, shaped like an inverted teardrop.

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