CHAPTER EIGHT

Mars—the Red Planet

IF LIFE EXISTS on any of the other planets of the Solar System, then the most likely home for it is the planet Mars. Venus and Mercury, the two inner planets, are too hot to support life. The outer planets, Jupiter, Saturn, Uranus, Neptune and Pluto, are all far too cold. Only on Mars are conditions even remotely similar to those on Earth, and there is strong evidence of life on the planet.

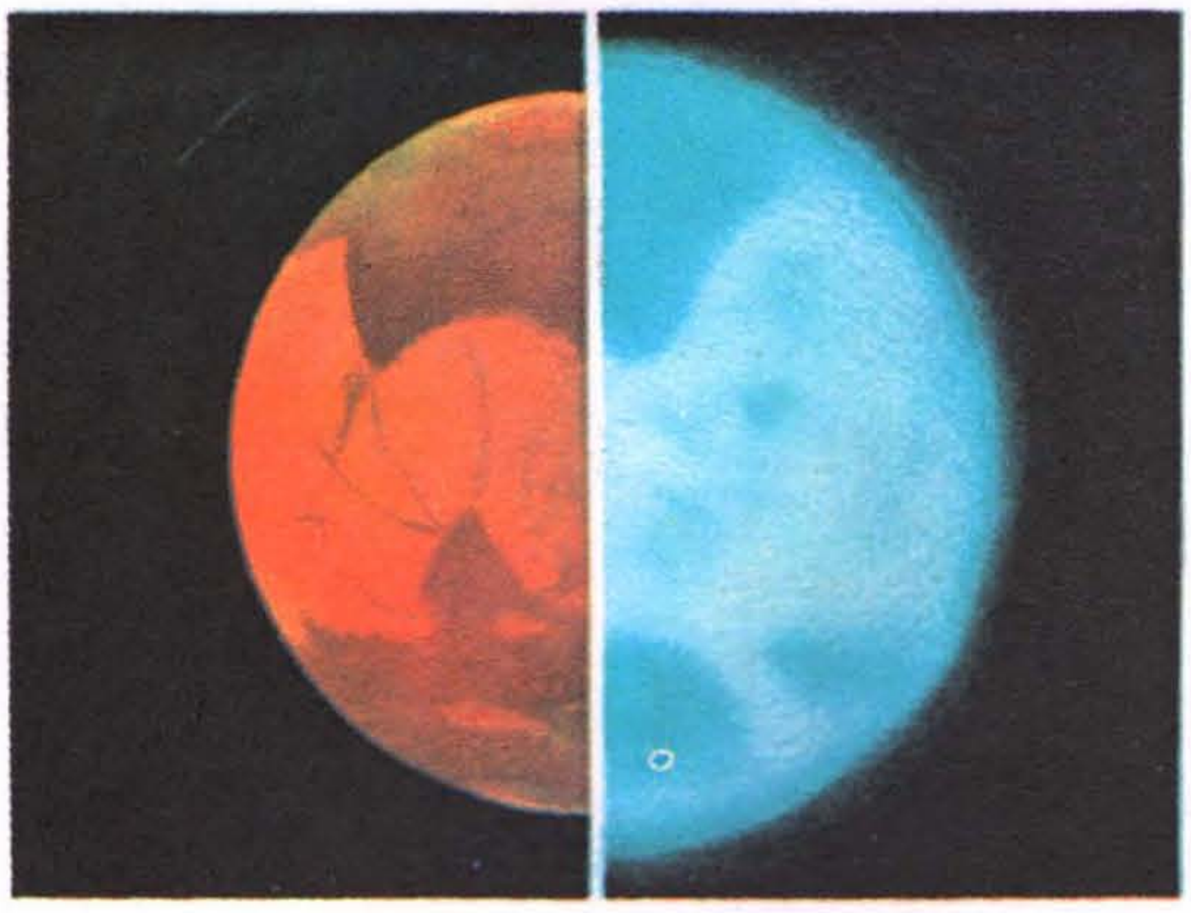
Martian life would probably be very different from terrestrial life. Mars is a small planet (its diameter is only about a half that of the Earth). Because it is smaller than the Earth, it exerts a smaller gravitational pull on its atmosphere, with the result that nearly all its atmospheric gases have long since escaped into space. So Mars has a very rarefied atmosphere, and very little oxygen, the gas essential to an Earth-like form of life. Added to this, Mars is an arid planet, with practically no water, another substance necessary for life. Moreover, Martian nights are very cold indeed. Mars has almost no atmosphere to insulate it and keep in the heat received during the Martian day.

MARS ♂

Distance from Sun (million miles):	141·5
Diameter (miles):	4,200
Volume (Earth=1):	0·15
Mass (Earth=1):	0·11
Density (Water=1):	3·96
'Day': 24 hr. 37 m.	'year': 687 days
Orbital speed (miles/sec.):	15
Escape velocity (miles/sec.):	3·1
Surface gravity (Earth=1):	0·37
Satellites in order of closeness:	Phobos, Deimos

All these factors would make life on Mars difficult. Also it has not been easy to collect evidence of life, for Mars is seldom in a favourable viewing position. It takes roughly two years to orbit the Sun. At its nearest point, it is only about 30 million miles away from the Earth. At this point Mars and Earth are said to be in *opposition*. But the Earth gets farther and

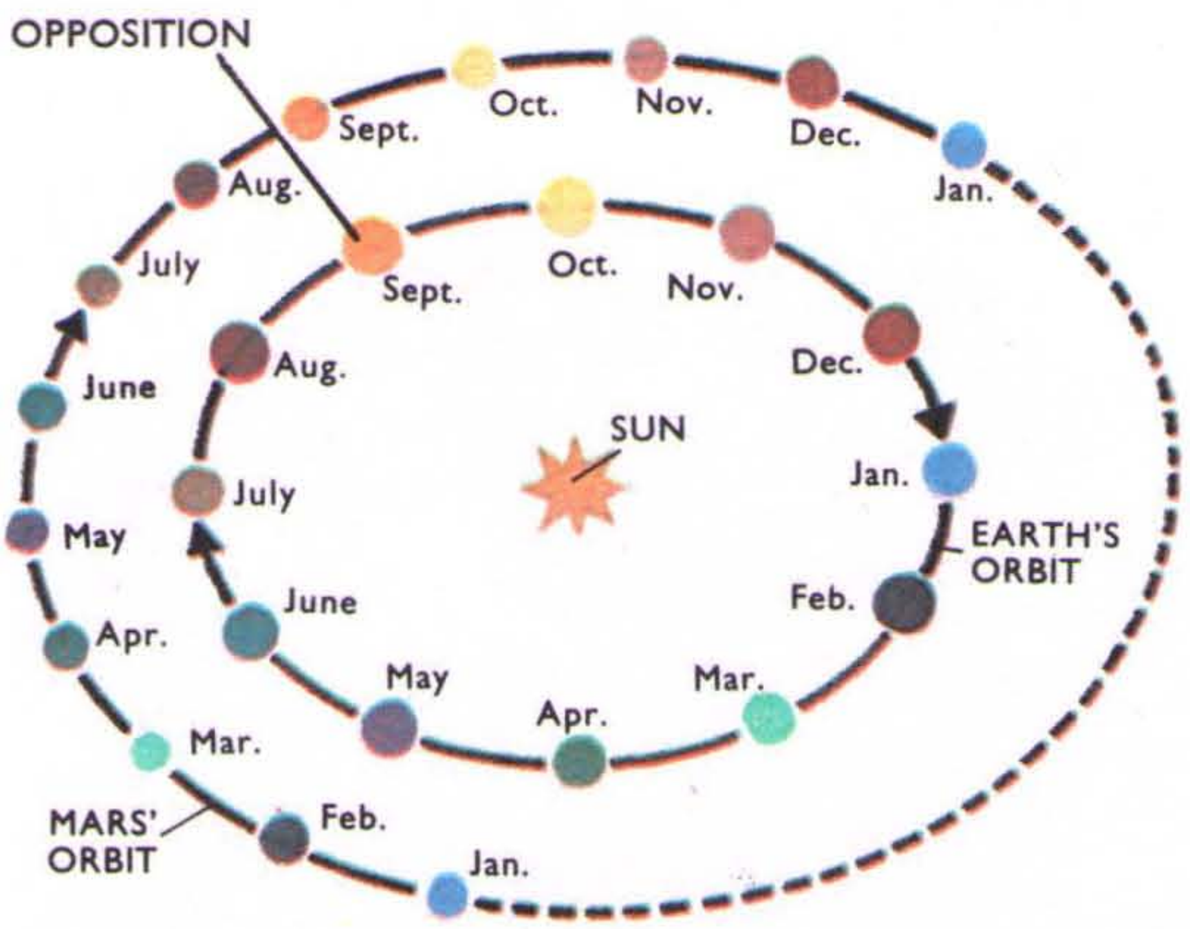
Each year the polar ice-caps melt and re-form. *Left:* **Mars in winter, with a prominent North Polar ice-cap.** *Right:* **how Mars appears three months later. Much of the ice-cap has already melted.**



Photographs of Mars taken in blue light show up the atmosphere, while photographs taken in red light show the surface.

farther away from Mars, as it orbits the Sun in half the time Mars takes. By the time the Earth has completed one orbit, Mars has only reached the half-way of its orbit. The two planets are now at their greatest distance apart. Mars, hidden behind the Sun, is then practically invisible.

The Earth completes another orbit and, at about the same time, Mars completes her first orbit. Mars and the Earth are near each other once more, two years and two months after their last nearest point, or *opposition*. Only at times of opposition can de-



Mars is close to the Earth (in *opposition*) only once every two years.

tailed studies of the planet be made.

Most of the features of Mars' surface remain, like the seas and mountains of the Earth, fixed from season to season. Dark patches on the surface were once mistaken for oceans, but this was disproved when it was found that Mars was an exceptionally dry planet. Most of the rest of the surface has a reddish tint. This is thought to be arid desert, of dust rather than sand, and ice-cold most of the time.

One prominent feature of Mars does, however, change with the seasons. Like the Earth, Mars has two poles, marked by white polar ice-caps. But these are thought to be only thin layers of hoar-frost about an inch thick. As Mars orbits the Sun, first one pole, then the other is nearer the Sun, giving rise to four seasons, as on the Earth (only each season is twice as long on Mars). In the Martian summer-time, the frost melts, and it is thought that water from the pole flows towards the equator. The entire ice-cap may disappear.

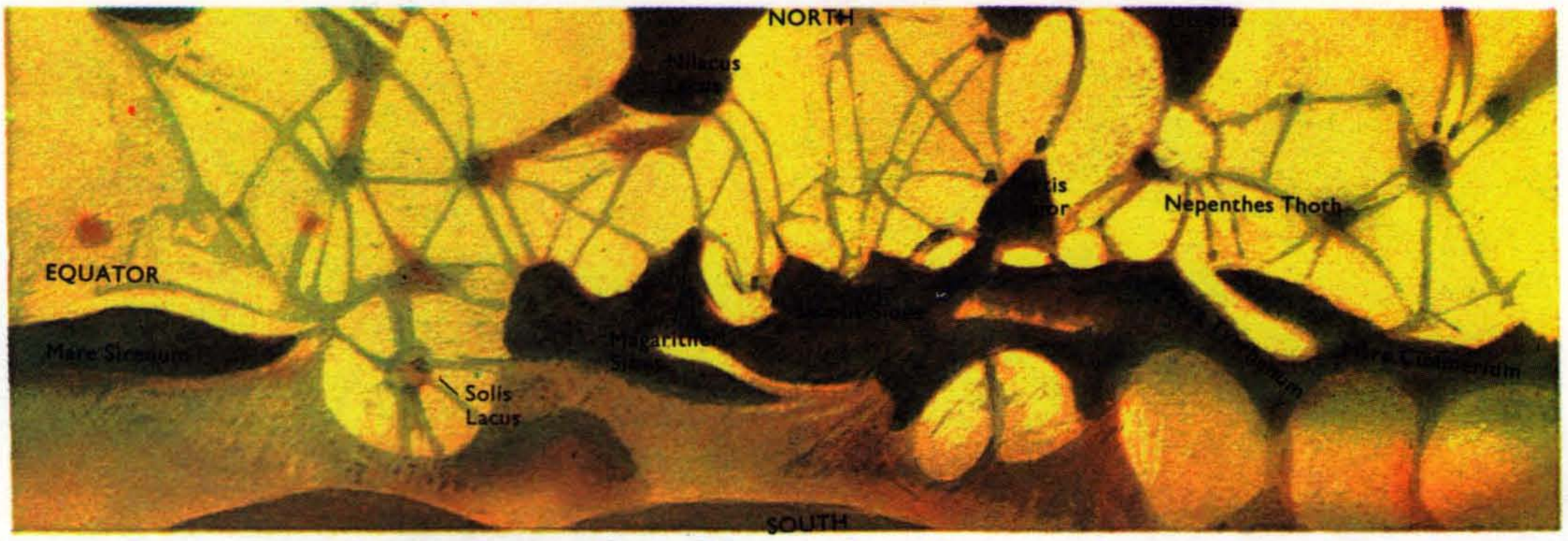
The ice-caps are, in fact, the only sources of water on Mars. As the melted ice reaches some of the darker areas of the surface, they seemingly change, turning from brown or lilac to a greenish colour. They are apparently revived by the arrival of the water. For this reason, plants are thought to be growing on these areas. They may be like mosses or lichens, and they must be hardy to survive extremes of temperature on Mars. At noon on Mars' equator, the temperature may reach 25° C. (77° F.) but during the night it may drop to −40° C. (−40° F.).

When the seasons change once more, and the polar ice-cap returns, it is thought that the plants, drained of their moisture, die down and remain dormant until they are revived by the

next arrival of polar water.

There are other pointers which suggest that the dark greenish areas are caused by a plant-like kind of life. Plants on Earth absorb a certain wavelength of light in the infra-red part of the spectrum, and this wavelength is therefore absent in the light reflected by the plants. By examining the light received from Mars (this is light, coming originally from the Sun, which is reflected by the planet) astronomers have been able to detect a similar absorption of infra-red light of practically the same wavelength. This particular wavelength is lacking in the light reflected by Mars. It has been absorbed by the dark greenish areas.

Another piece of evidence has been gleaned from examining the ultra-violet light reflected by Mars. Although Mars' atmosphere is very scant (even at the surface, the atmosphere is thinner than the atmosphere at the top of Mount Everest), it does provide some protection against harmful ultra-violet light coming from the Sun. The atmosphere absorbs much of the ultra-violet light, and prevents it from reaching the surface. But sometimes the atmosphere is disrupted, and the ultra-violet light gets through. Occurrences of this kind can be detected by examining the ultra-violet light reflected by Mars. If the season is suitable, and the ultra-violet absorbing atmosphere is there, then

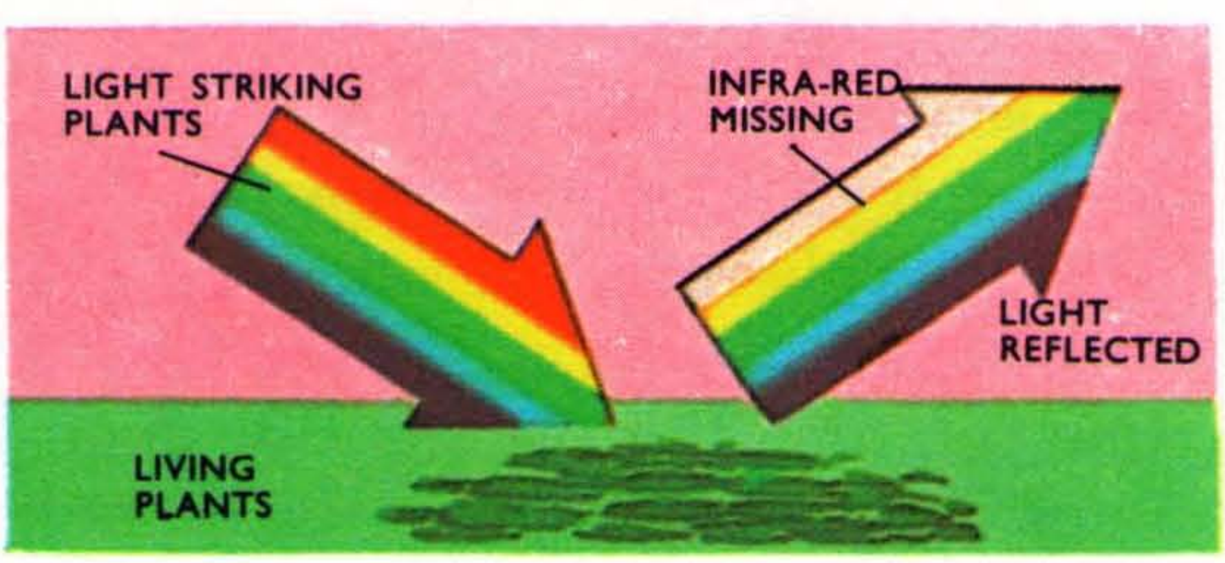


Maps of Mars can be built up from the results of many observations. The Martian canals are shown by close inspection to be very irregular markings.

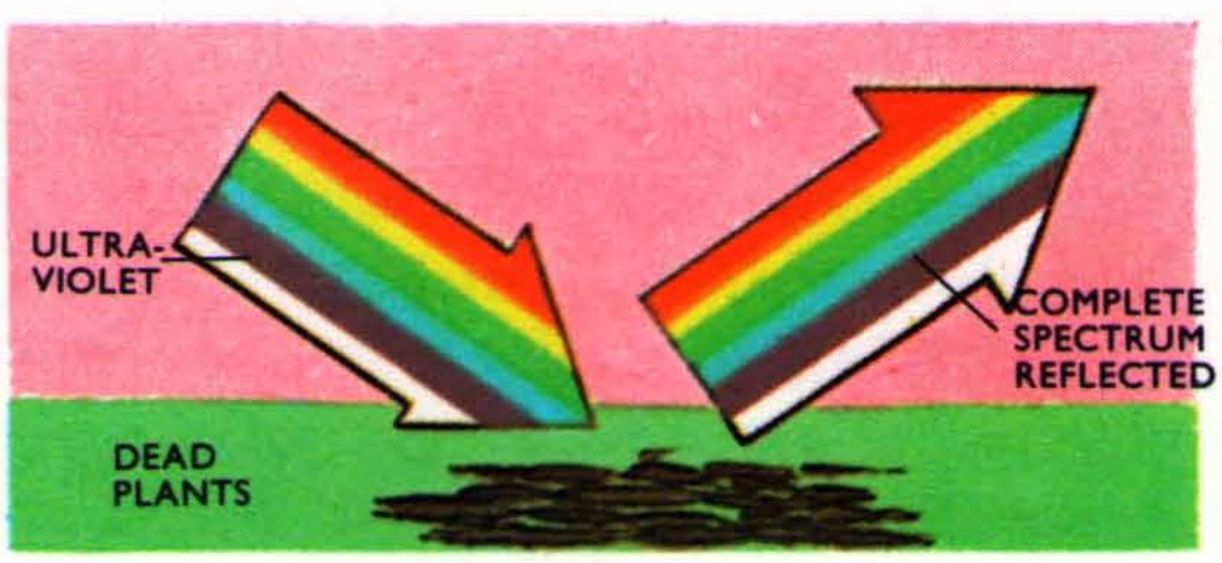
the dark areas spread. The plants are flourishing. When the atmosphere is disrupted, the dark areas lighten again, and contract. The interpretation of this is that the plants have been killed by bombardment with ultra-violet light.

Leading out from the dark patches of 'vegetation' are thin dark 'lines', appearing to criss-cross the surface. Earlier astronomers imagined in the dark 'lines' far more regularity than they could actually see. They considered that the lines, or *canals*, could have been produced only by an intelligent population. The canals had been built to take water from the polar regions to irrigate the dry regions near the Equator. The amount of water on Mars is, however, only enough to fill one river, and scarcely enough to supply a complicated network of canals. With more powerful telescopes, it can be seen that the 'canals' are not regular at all. They may be borders between areas of slightly different brightness, or specks of volcanic dust which stand out clearly against the red of the desert.

Mars has been examined in fair detail from the Earth. The next step is the making of observations on Mars itself, landing sampling rockets on the Martian surface to probe it. The instruments carried by the rockets would be able to analyse the 'vegetation', and transmit information about it back to interpreters on Earth.



Vegetation on Earth is known to absorb some infra-red light. So this light is missing in the light reflected by the plants. Absorption of infra-red has been detected in light reflected by the greenish areas of Mars.



Vegetation can be killed by exposing it to ultra-violet radiation. The atmosphere stops most of the ultra-violet. When Mars' atmosphere is disrupted, the ultra-violet gets through, and the greenish areas turn to brown.