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LIFE IN MARS.

THE question as to the habitability of other worlds than ours has always been a very fascinating one, and, indeed, it is not surprising that it is so; for since the days when the earth was debased from her proud position as centre of the universe, and was assigned her proper place among the planets, there seemed to be no particular reason why she alone should produce life, and why other planets, apparently as suitable for this purpose as she is, should wander uninhabited through space.

Up to the present time, it must be confessed, we have met with nothing but disappointment in this branch of inquiry; for not only have we not detected living creatures on any other member of the solar system, but, with the single exception we are considering, there is apparently no other body whose surface is under conditions which would lead us to suppose that it might support life, or at least life in any form with which we are acquainted. It is of course useless to argue about the possibility of life under entirely different conditions; for instance, there might be some form of life on the sun; we can only say that it would be so different from what we know as life, that the term would be hardly applicable; and whether it is likely to exist or not, is a question which our limited experience does not allow us to answer one way or the other.

The moon, again, may be the home of living creatures; but they must be so constituted as to exist without air of any sort, which is rather contrary to our notions of life.

We will not here go to the length of examining in detail the conditions which obtain on the surface of all the bodies within range of our telescopes; but we may state that in none of them, with the exception of the planet Mars, is there any resemblance to our earth, and therefore life as we know it could not exist on them. With Mars, the case is different, and at first sight, there appears to be a state of things which approximates closely to that which obtains here. The planet Mars appears to the naked eye a deep red colour,

and when examined with the telescope, we see that a large part of his surface is red; but between the red, and intersecting it in all directions, are patches and strips of a dull greenish hue. It was very soon conjectured that this green part was the Martial sea, and that the red was the land: this has been confirmed by later observations, and now no doubt exists on the point. The principal problem that we are here confronted with is this: assuming that what appears green on Mars is a liquid of some sort, can we assume that it is water, and not some other liquid with which perhaps we are unacquainted? This question appears at first sight impossible; for, unless we can bring some of the Martial sea down to the earth and analyse it, how can we determine its chemical constitution? The telescope evidently will not help us here, and we must call to our aid that powerful ally of the telescope—the spectroscope.

The method of observation employed is a question which we cannot enter into here; it must suffice to state results, which all tend to prove that these seas are composed of water similar to ours. It must not be understood that we have been able to determine this directly; the only fact that we know for certain about it is, that in the Martial atmosphere there is a considerable quantity of water-vapour, which it is only fair to assume has been raised by evaporation from the seas, which are therefore also water.

Some time ago, it was observed that situated at each pole of Mars there is a white patch, which increases and decreases at regular intervals. This had been observed for many years before the explanation was suggested by Herschel, that it was due to the freezing of the sea, and was exactly analogous to our Arctic and Antarctic Oceans. If this was true, the patch of ice would of course decrease in the Martial summer, and increase again as the winter came on. This was soon shown to be the fact. Thus we see that as far as regards the sea, Mars is very similar to our earth, with the exception, that the proportion of land is much larger. On the earth, the land is only about one-third of the area of the sea; while

on Mars, the land and sea surfaces seem to be about equal in extent. The land is much cut up by the water, which exists not so much in the form of a few large oceans, but rather as a number of curious-shaped narrow inlets and channels, which intersect the continents in all directions. The bright red colour of the land is a curious fact, for which no adequate explanation has as yet been suggested. Herschel considered it was due to the peculiar nature of the soil; but it certainly seems curious that in this point Mars should differ from all the other planets. The appearance of the earth seen from a similar distance would probably be a dirty green, or perhaps brown. In fact, on the earth we have no soil or rock, which occurs in any quantity, of the red colour which we observe on Mars. There is therefore no vegetation, unless we adopt the curious theory, advanced by a French savant, that in Mars the foliage is red. Unluckily, we have no instrument that can at all help us here; the telescope and spectroscope are alike useless, and, for the present, we must content ourselves with vain conjectures.

The next point that ought to engage our attention is the atmosphere, without which no life is possible. The method we use to determine whether a planet has an atmosphere is a very simple one: we have only to observe it pass in front of a fixed star; then, if there is no air round it, the light from the star will be extinguished instantaneously, as it is in the case of the moon; whereas, if it has an atmosphere, the light will gradually die away; because, instead of being cut off suddenly by an opaque body, it will be slowly diminished by the increasing thickness of the air that it is viewed through, and will very likely have entirely disappeared before the actual body of the planet is interposed. By applying this observation to Mars, it has been determined that it has an atmosphere, the exact thickness of which, however, we are unable to measure. It seems fair to assume that the amount of air which surrounds it is about the same proportion to the total mass of the planet as in the case of the earth. Without entering into calculations, we may state that if this is true, the pressure of the air at the surface of Mars would be about equal to five inches of mercury, or about one-sixth of the normal atmospheric pressure on the earth.

Now, given an atmosphere and a large extent of sea, we should naturally expect that clouds would form a prominent feature on the Martial surface; and observation has proved this to be the case. On several occasions, some of the features of the planet have been observed to be obscured by a sort of white film, which it is only fair to assume was a cloud. These clouds appear more markedly at the edge of the disc, or at those points where it would be morning or evening, and we may therefore assume that, similar to the earth, Mars is liable to mists or clouds forming at dawn and in the evening. It has

been suggested that these white films are due not to clouds in the air, but to a deposition of snow on the surface, which disappears when the sun rises. There seems to be no particular reason for adopting this theory; it does not explain the observed phenomena better, nor does it seem more likely to be true.

The air on Mars being very much less dense than on the earth, it is presumable that the winds would move with much greater velocity; and for this reason, it has been thought that trees could not grow to any considerable height. We must, however, bear in mind that though the velocity would be high, the actual force of the wind would probably not be very great, on account of its excessive tenuity.

In an inquiry as to the probability of the existence of life, one of the most important points to be taken into account is the amount of heat available. Now, Mars is at such a distance from the sun that on the whole it would receive about two-fifths as much solar heat as we do. This does not, however, give the amount of heat that is actually received on the surface of the planet, a considerable proportion being absorbed by the atmosphere; and since our atmosphere is so much denser and thicker than that of Mars, it follows that we lose a much larger percentage of the solar heat. To calculate the exact amount of heat absorbed by a given thickness of air is a very difficult, if not impossible, problem; but it seems likely that, taking everything into account, the inhabitant of Mars will receive more heat from the sun than we do. This would have the effect of making the evaporation very large, and if so, the Martial atmosphere would be mostly composed of water-vapour.

According to Professor Langley, the true colour of the sun is blue; and its yellowness is due to the dirt always present in the air. To the inhabitants of Mars, it would most probably appear nearly white, unless, indeed, they also have volcanoes to fill the air with lava-dust.

Let us now sum up the facts we have stated, and determine as far as we can what sort of man the inhabitant of Mars must be.

In the first place, the force of gravitation at the surface is only just over one-third of its equivalent on the earth; a pound would therefore weigh about six ounces in Mars. If, therefore, we assume that the men are of such a size that their weight and activity are the same as ours, they would be about fourteen feet high on the average. This would make their strength very great; for not only would it be actually superior to ours, but, as every weight is so much smaller, it would be apparently proportionally increased. We should, therefore, expect to find that the Martialites have executed large engineering works; perhaps also their telescopes are much superior to ours, and we have been objects of interest for their observers. With regard to telescopes, it may be interesting to examine what is the effect of the highest magnifying power we can use. At his nearest approach, the distance from us to Mars is about thirty-seven million miles; and assuming that the highest power that can be used with advantage is twelve

hundred, we approach with our telescopes to a distance of thirty thousand miles, so that houses, or towns, or indeed any artificial works, would be hopelessly invisible. With regard to the supply of heat and light, we have seen that the Martialite is not worse off than we are. To him the sun would appear as a white, or perhaps blue disc about two-thirds of the diameter that it appears to us. The Martial day differs but slightly from ours; his year, however, is much longer, being about six hundred and eighty-seven of our days, which is about six hundred and fifty Martial days. The inclination of his axis to the plane of the orbit is such that his seasons would be very similar to ours. It is difficult to reconcile the idea of an extensive vegetation with his peculiar red colour; it is just possible, however, that some of the green patches, generally supposed to be seas, may in reality be large forests.

The most valid objection to the habitability of Mars lies in the fact of the extremely low atmospheric pressure, which, as we have seen, would probably average about five inches of mercury. The lowest pressure that a man has ever lived in, even for a short time, is about seven inches, which was reached by Coxwell and Glaisher in their famous balloon ascent. The aeronauts, however, narrowly escaped perishing, not only on account of the low pressure, but also because of the extreme cold.

It seems impossible that a man constituted exactly as we are could live for any length of time breathing air only one-sixth of the density of ours. But it is rather going out of our way to assume that the Martialites would be exactly the same as we are in every way; the chances are a million to one against it; and on the other hand, a very slight modification of the lung arrangement would suffice to make life perfectly possible under such conditions.

The nights on Mars would be very dark, for he has no satellite like our moon. He has, it is true, two moons, but they are so small that their illuminating power is *nil*, being respectively only sixty and forty miles in diameter. The smallest of these presents the curious phenomenon that it revolves round Mars faster than the planet turns on his own axis, and therefore would appear to rise in the west and set in the east.

Our earth, as seen from Mars, when at his nearest, would appear about the same size as Jupiter does to us; that is to say, would subtend an angle of about forty seconds. At his furthest distance, this would be reduced to fourteen.

We thus see that there is ample reason for assuming that this, the most interesting of all the planets, is the abode of creatures not essentially different from ourselves. Being considerably older than we are, the Martialites are probably much further advanced in the arts and sciences; and perhaps there may be some truth in the story of the Italian astronomer who says he has lately detected lights on the planet moving about in such a way as seems to indicate a deliberate intention to open communication with the earth. What the language of the lights is, we have not been informed; let us hope it is something more practical than the proposal of the

Russian savant to communicate with the moon by cutting a huge figure of the forty-seventh proposition of Euclid on the plains of Siberia, which, he said, any fool would understand.

IN ALL SHADES.

CHAPTER XXX.

THAT evening, Rosina Fleming went as she was bid to the old African's tent about half-past eleven, groping her way along the black moonless roads in fear and trembling, with infinite terror of the all-pervading and utterly ghastly West Indian ghosts or duppies. It was a fearful thing to go at that time of night to the hut of an obeah man; heaven knows what grinning, gibbering ghouls and phantoms one might chance to come across in such a place at such an hour. But it would have been more fearful still to stop away; for Delgado, who could so easily bring her Isaac Pourtales for a lover by his powerful spells, could just as easily burn her to powder with his thunder and lightning, or send the awful duppies to torment her in her bed, as she lay awake trembling through the night-watches. So poor Rosina groped her way fearfully round to Delgado's hut with wild misgivings, and lifted the latch with quivering fingers, when she heard its owner's gruff, 'Come in den, missy,' echoing grimly from the inner recesses.

When she opened the door, however, she was somewhat relieved to find within a paraffin lamp burning brightly; and in place of ghouls or ghosts or duppies, Isaac Pourtales himself, jauntily seated smoking a fresh tobacco-leaf cigarette of his own manufacture, in the corner of the hut where Louis Delgado was sitting cross-legged on the mud floor.

'Ebenin', missy,' Delgado said, rising with African politeness to greet her; while the brown Barbadian, without moving from his seat, allowed his lady-love to stoop down of herself to kiss him affectionately. 'I send for you dis ebenin' because we want to know suffin' about dis pussen dat callin' himself buckra, an' stoppin' now at Orange Grobe wit you. What you know about him, tell us dat, missy. You is Missy Dupuy own serbin'-le-ady: him gwine to tell you all him secret. What you know about dis pussen Noel?'

Thus adjured, Rosina Fleming, sitting down awkwardly on the side of the rude wooden settee, and with her big white eyes fixed abstractedly upon the grinning skull that decorated the bare mud wall just opposite her, pulled her turban straight upon her woolly locks with coquettish precision, and sticking one finger up to her mouth like a country child, began to pour forth all she could remember of the Orange Grove servants' gossip about Harry Noel. Delgado listened impatiently to the long recital without ever for a moment trying to interrupt her; for long experience had taught him the lesson that little was to be got out of his fellow-countrywomen by deliberate cross-questioning, but a great deal by allowing them quietly to tell their own stories at full length in their own rambling, childish fashion.

At last, when Rosina, with eyes kept always timidly askance, half the time upon the frightful