THE PLANET MARS—IS IT INHABITED?

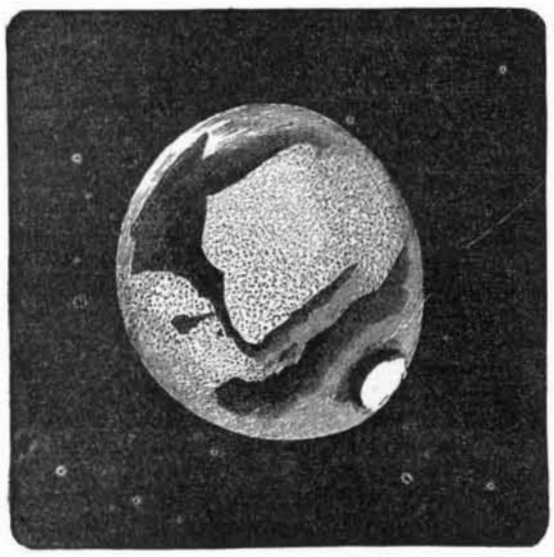
PART 2.

Having determined the existence of a vaporous envelope around Mars, similar to the clouds which float in our terrestrial atmosphere, if we assume the same to be aqueous, we must believe in large bodies of water from which it originates. But other fluids besides water generate vapor; hence, unless direct proof be adduced to the above effect, the hypothesis, that the vail observed is a cloud screen existing in an atmosphere like our own, is without substantial foundation.

The telescope has told its story, and a more wonderful instrument must add the sequel. The spectroscope, in the hands of the eminent English physicist Huggins, solves the problem. The planets reflect the light which they receive from the sun; and if their rays be passed through the prisms, we find in their spectra the solar spectrum, just as if it had been reflected by a mirror. Dr. Huggins on his first observation of the planet was unsuccessful, but at the opposition of Mars in 1867, he attained important results. On directing his spectroscope, attached to a powerful eight inch refractor, toward the star, he noticed that the spectrum obtained was crossed near the orange portion by black lines similar in position "to lines which make their appearance in the solar spectrum when the sun is low down, so that its light has to traverse the denser strata of our atmosphere." The question to determine, then, was: Were the lines due to the passage of the light through the atmosphere of the earth or through that of Mars? Turning his instrument toward the moon, then nearer the horizon than the planet, so that the atmospheric lines, if they appeared at all, would be much clearer in the moon's spectrum than in that of the object of his observation, Dr. Huggins found that they were totally absent. It was thus demonstrated beyond peradventure that the bands belonged to the Martial atmosphere, and not to that of the earth; and hence two aerial oceans, analogous to each other, encompass both planets.

But, it may be asked, what produced these lines? Carefully noting their position, the observer found them to be the signatures, not of oxygen or nitrogen, but simply of the vapor of water, of the same chemical composition as our own, oxygen and hydrogen. This proved, in this direction we need go no further; the existence of sea, of cloud, snow, ice, fog, and rain is demonstrated. Reasoning from this basis, we can trace the presence of winds which shift the masses of vapor from place to place, of aerial and ocean currents, of rivers flowing to the seas, of a climate tempered in the same manner as our own, and of copious rain fall which must nourish the land and cause the production of vegetation. If, further, there be continents and oceans, similar geological forces to those of the earth must be at work; there must be upheavals and depressions, mountains, valleys, and water sheds, in fact a miniature of our earth.

Here, then, millions of miles away in space, is another world, a small one, it is true, and seeming to the eye no larger than our engraving, which represents its appearance



at the present time; but it has water, air, light, winds, clouds, rains, seasons, rivers, brooks, valleys, mountains, all like ours.

"All the circumstances necessary for the production of animate existence being there, under what pretext, then," demand the believers in the habitability of the planet, "can it be asserted that living organisms, such as, under precisely similar conditions, exist upon our own earth, do not live and flourish there? Can it be that the sun, air, water, and earth are held in bonds and prevented from combining in organic evolution? Or can it be credible that, while every drop of water on our earth is peopled with millions, another world is a desert?" In our previous paper we observed that, owing to the eccentricity of its orbit, the amount of light and heat received by Mars from the sun must vary considerably. Further, we may add that, while the earth is 92,000,000 of miles from our source of light, the distance between that luminary and Mars is fully 141,000,000 miles. From this difference, and the relative sizes of the two planets, we can determine the amount of heat transmitted to Mars as compared with the quantity reaching the earth; and the average daily supply is found to be as two to five. More nearly, when Mars is closest to the sun, he receives somewhat more than half as much heat as the earth; when furthest, his supply falls to a little over one third that of our sphere. The sun would appear, to a person on his surface, to be about one third the size that it does to us.

Considering, now, the question of the Martial heat, it seems to be of much smaller importance than it really is. The sun is the great storehouse of power, and the heat we obtain from him underlies all motion and life. If the supply from this source were diminished, manifestly life, as it now is upon the earth, could not be maintained. If we take away half the fuel from under a boiler, the engine, although it may work, will no longer be of the same efficiency. Imagine this reduction to have taken place ages ago, "before the sun's rays in a potential form," as Tyndall expresses it, were buried in the deposits of the carboniferous epoch, and consider that it would require 108,000,000 of horses, working night and day for a year, to develope the work equivalent to the energy in a hundred million tuns of coal—one year's produce of our mines. If, then, Mars, which we have proved to receive a far less quantity of heat than the earth, has been thus deprived during countless ages, it must be apparent that, if it require existing circumstances upon the earth to maintain the creatures thereon, the absence of such circumstances on Mars clearly shows the unfitness of that planet as a habitation for beings.

The point next arising is: Whether Mars be possessed of an inherent heat sufficient to compensate for this deficiency of solar heat, or has the planet enough heat stored up to render it an abode for living creatures? It is very probable that Mars has parted with much more of its inherent heat than the earth, for it is known that, of two bodies equally warmed, the smaller cools the more rapidly. We have no reason to believe that Mars has been hotter than our globe, and hence, as its sphere is smaller, it must now be a much colder body. If, then, we are to adopt the theory that the climate of the planet resembles our own, we must assume that there is a peculiarity about its atmosphere which enables it to retain a larger proportion of the sun's heat than can our aerial envelope. In such case, considering the constitution of such an atmosphere to resemble our air—a necessary hypothesis, if we are to believe in the existence of the beings with which we are familiar,—it must be much more dense, reasoning from the fact that there is a steady decrease in warmth as we ascend to the upper regions of our own atmosphere, due to the increased tenuity of the air.

We may presume that every planet has an atmosphere proportioned to the matter contained in it. Hence, the mass of Mars being about one fifth that of the earth, we must infer that its atmosphere is equal to one fifth part of the earth's. But the surface of the planet is fully two fifths that of our globe; hence, over each square mile, there would be a much less corresponding amount of air. In addition to this, we have already noted that in Mars exists less than two fifths the attractive force of the earth, the proportions being about as 38 to 100. The atmospheric pressure would therefore be reduced in proportion, even if the planet had as much air above each square mile of surface as there is above each square mile of the earth. This quantity of air would be twice as much as we should infer from the mass of Mars, and we should require five times as much air to have an atmosphere only as dense as our own at the sea level. An atmosphere about twice as dense as this would perhaps give a climate as mild, on the average, as that of our earth; but we can hardly assume that Mars has an atmosphere exceeding ten times in quantity what we should infer from the planet's mass.

If, now, we suppose that the Martial air is moderately dense, comparable, in fact, to our own air, then, since we know that considerable quantities of aqueous vapor are raised into that air, we must, from the circumstances already considered, conclude that there would be a precipitation of snow which would keep the surface of Mars permanently covered. But this is not the case, as Mars is not a white planet; and so we must assume so great a rarity of its atmosphere that sufficient water vapor can never be raised to produce a permanent snow envelope by precipitation. Consequently it is probably the most satisfactory course to return to our first assumption, namely, that the Martial atmosphere bears the same relation to the mass of Mars as the terrestrial atmosphere to that of the earth. Under this hypothesis it can be shown that the atmospheric pressure on Mars corresponds to about 4½ inches of the mercurial barometer. Can man exist for any length of time in such an atmosphere?

In the great balloon ascent of Coxwell and Glaisher, in 1862, the enormous hight of 37,000 feet above the sea level was attained. At 29,000 feet Mr. Glaisher fainted and did not revive until the balloon had descended and returned to the same point. At 37,000 feet the barometer stood at 7 inches, and the thermometer at 12° below zero. Coxwell became almost paralyzed, and only saved the life of himself and his fellow aeronaut by seizing the valve rope with his teeth, and thus allowing the gas to escape. If, by extreme fortitude, one man has managed to live at two miles above the fainting level of another, could human beings generally exist in an atmosphere reduced to five sevenths the density?

We have shown that Mars has, therefore, not only a far greater degree of cold, but an atmosphere of much greater tenuity than that of the earth, conditions manifestly incompatible with the existence of terrestrial creatures: a conclusion easily attained by considering the life (mere microscopic animalculæ) found on the mountain peaks of our earth, beyond the last stages of vegetation, where the air is rare and extreme cold prevails.

We have now presented sufficient data to form a clear idea of the arguments which go to prove the unsuitability of Mars as a habitation for the higher orders of beings. Did space permit, we might continue and refer to the atmosphere, which must be at least 100 miles high, and the winds which must prevail, which carry aqueous vapor, in the form of snow, to the poles. Here great masses of glaciers are heaped, which sometimes disappear, leaving vast gaps discernible even at forty millions of miles away, producing convulsions which must affect the entire planet.

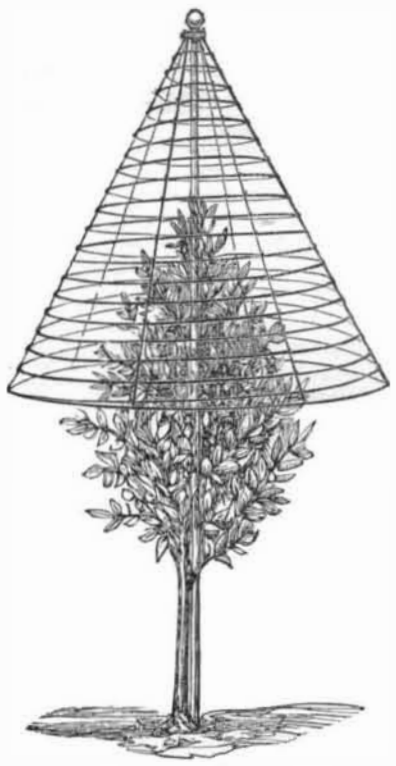
The weight of evidence, it seems to us, is against the existence of beings of a nature with which we are familiar. No terrestrial creature could live even in the torrid zone, so cold and dismal must it be. Even vegetable life, however hardy, would not survive a single hour. If inhabitants there be, they must be of different form from us, to correspond to the decreased attraction of gravity; if red vegetation exist, their eyes must be different from ours; to live in such an atmosphere their respiratory organs must be totally unlike our own; and thus we might go on specifying points of variance until we find that, in the end, there is no more possibility of Mars being inhabited by beings like ourselves than there is of the sun or Jupiter being similarly peopled. In fine, we cannot say whether other worlds are or are not abodes of life. We can assert with reasonable probability that on no other planet are there conditions suitable for the existence known in our globe. Whether there be beings in the fiery vapors of the sun, on the molten mass of Jupiter, in the bleak deserts of the moon, or in those remote parts of the universe, from which our entire solar system seems but as a single bright star, is a problem within the knowledge of only Him "to whom all things are possible."

Exposition Awards.

The *Commercial Bulletin* thinks that it is time that the practice of exhibition rewards should be abandoned. Any one who has seen the inside and secret workings of exhibitors, to obtain the coveted prizes, knows that lobbying and friendship have much to do in determining awards, and that they who have friends at court are seldom found empty handed when the day for awarding prizes arrives. And even those who, in all honesty and from the merit of the articles which they exhibit, are rewarded are, by their brother exhibitors and especially less successful rivals, accused of lobbying in some form or other. If exhibitors did but know it, the benefit which they derive from industrial expositions comes not from diplomas and medals, but from the fact that vast numbers are brought to see and inspect the machines and products exhibited.

A SIMPLE TREE PROTECTOR.

The first frost—and it has already made its appearance in the northern part of New York and the New England States—is apt to cause sad havoc among our young fruit trees,



tropical plants, and ornamental trees, before the gardener is prepared for it. The device represented in our engraving is therefore of timely importance and will prove of value to nurserymen and agriculturists generally. The *Ironmonger*, from whose columns we extract the illustration, states that it has recently been introduced in England, and that in construction it is simply a conical frame of galvanized iron wire, supported at its apex by a wooden post driven in the ground beside the tree. It is only needed to cover the wire with cloth, or even newspaper, to render the tree safe from the frost.

The *Utah Mining Gazette*, published at Salt Lake city, adds to a paragraph from the *Mining and Scientific Press* (in which the editor states that Arizona wants more practical miners and fewer speculators without means, more men of capital, and no mining experts or wiseacres) that Utah, also, would be far better off if she had fewer "experts and more men with plethoric bank accounts. It is these experts—at swindling—that have already done us so much damage. Like Arizona, we want a new class of speculators."

SUCH is the marvelous ductility of gold that a single ounce of the pure metal may be drawn out into a wire thirty three miles in length.