CLASSICS OF SCIENCE:

Canals on Mars

Astronomy

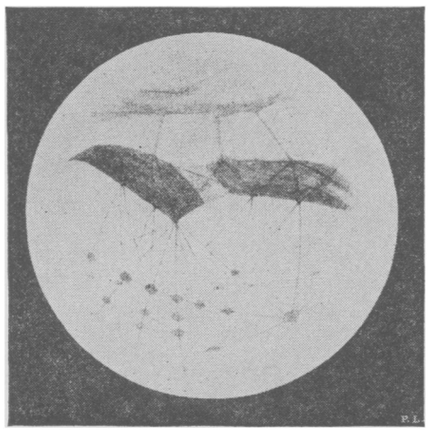
With this issue, the SCIENCE NEWS-LETTER inaugurates a series of Classics of Science in Astronomy, which will appear the first of each month, in the number with the Star Map, giving the most interesting observations on each of the planets in our solar system. A few years ago, the canals on Mars might have been classed by many astronomers as pure fiction. It is now felt that they represent real markings on the surface of our nearest planetary neighbor. Their origin must ever be a most fascinating speculation. There follows one eminent astronomer's exposition of his side of that famous controversy which furnished our literature with one of its outstanding characters, "the Man from Mars."

MARS, by Percival Lowell. Boston, 1895.

First Appearances

In the last chapter we saw how badly off for water Mars, to all appearance, is; so badly off that inhabitants of that other world would have to irrigate to live. As to the actual presence there of such folk, the broad physical characteristics of the planet express no opinion beyond the silence of consent, but they have something very vital to say about the conditions under which alone their life could be led. They show that these conditions must be such that in the Martian mind there would be one question perpetually paramount to all the local labor, women's suffrage, and Eastern questions put together—the water question. How to procure water enough to support life would be the great communal problem of the day.

Were Mars like the Earth, we might well despair of detecting signs of any Martians for some time yet. Across the gulf of space that separates us from Mars, an area thirty miles wide would just be perceptible as a dot. It would, in such case, be hopeless to look for evidence of folk. Anything like London or New York, or even Chicago in its own estimation, would be too small to be seen, so sorry a figure does man cut upon the Earth he thinks to own. From the standpoint of forty millions of miles distance, probably the only sign of his presence here would be such semi-artificialities as the great grain-fields of the West when their geometric patches turned with the changing seasons from ochre to green, and then from green to gold. By his crops we should know him. A tell-tale fact this, for it would be still more likely to be the case with Mars. If the surface of the planet were cultivated at all, it would probably be upon a much more thorough plan than is the case with the Earth. Conditions hold there which would necessitate a much more artificial state of things. If cultivation there



CANALS ON MARS, from a drawing by Dr. Lowell. The long, straight line, known as the Titan, shows near the center of the disk.

be, it must be cultivation largely dependent upon a system of irrigation, and therefore much more systematic than any we have as yet been forced to adopt.

Now, at this point in our investigation, when the broad features of Mars disclose conditions which imply irrigation as their organic corollary, we are suddenly confronted on the planet's face with phenomena so startlingly suggestive of this very thing as to seem its uncanny presentment. Indeed, so amazingly lifelike is their appearance that, had we possessed our present knowledge of the planet's physical condition before, we might almost have predicted what we see as criterion of the presence of living beings. What confronts us is this:—

When the great continental areas, the reddish-ochre portions of the disk, are attentively examined in sufficiently steady air, their desert-like ground is seen to be traversed by a network of fine, straight, dark lines. The lines start from points on the coast of the blue-green regions, commonly well-marked bays, and proceed directly to what seem centers in the middle of the continent, since most surprisingly they meet there other lines that have come to the same spot with apparently a like determinate intent. And this state of things is not confined to any one part of the planet, but takes place all over the reddish-ochre regions.

The lines appear either absolutely straight from one end to the other, or curved in an equally uniform manner. There is nothing haphazard in the look of any of them. Plotting upon a globe betrays them to be arcs of great circles almost invariably, even the few outstanding exceptions seeming to be but polygonal combinations of the same. Their most instantly conspicuous characteristic is this hopeless lack of happy irregularity. They are, each and all, direct to a degree.

The lines are as fine as they are straight. As a rule, they are of scarcely any perceptible breadth, seeming on the average to be less than a Martian degree, or about thirty miles wide. They differ slightly among themselves, some being a little broader than this; some a trifle finer, possibly not above fifteen miles across. Their length, not their breadth, renders them visible; for though at such a distance we could not distinguish a dot less than thirty miles in diameter, we could see a line of much less breadth, because of its length. Speaking generally, however, the lines are all of comparable width. . . .

A Network of Lines

But, singular as each line looks to be by itself, it is the systematic network of the whole that is most amazing. Each line not only goes with wonderful directness from one point to another, but at this latter spot it contrives to meet, exactly, another line which has come with like directness from quite a different direction. Nor do two only manage thus to rendezvous. Three, four, five, and even seven will similarly fall in on the same spot,—a gregariousness which, to a greater or less extent, finds effective possibility all over the surface of the planet. The disk is simply a network of such intersections. Sometimes a canal goes only from one intersection to another; more commonly it starts with right of continuation, and, after reaching the first rendezvous, goes on in unchanged course to several more.

The result is that the whole of the great reddish-ochre portions of the planet is cut up into a series of spherical triangles of all possible sizes and shapes. What their number may be lies quite beyond the possibility of count at present; for the better our own air, the more of them are visible. About four times as many as are down (*Turn to next page*)

Canals on Mars—*Continued*

on Schiaparelli's chart of the same regions have been seen at Flagstaff. But, before proceeding further with a description of these Martian phenomena, the history of their discovery deserves to be sketched here, since it is as strange as the canals themselves.

History of the Canals

The first hint the world had of their existence was when Schiaparelli saw some of the lines in 1877, now eighteen years ago. The world, however, was anything but prepared for the revelation, and, when he announced what he had seen, promptly proceeded to disbelieve him. Schiaparelli had the misfortune to be ahead of his times, and the yet greater misfortune to remain so; for not only did no one else see the lines at that opposition, but no one else succeeded in doing so at subsequent ones. For many years fate allowed Schiaparelli to have them all to himself, a confidence he amply repaid. While others doubted, he went from discovery to discovery. What he had seen in 1877 was not so very startling in view of what he afterward saw. His first observations might well have been of simple estuaries, long natural creeks running up into the continents, and even cutting them in two. His later observations were too peculiar to be explained, even by so improbable a configuration of the Martian surface. In 1879 the *canali*, as he called them (channels, or canals, the word may be translated, and it is in the latter sense that he now regards them), showed straighter and narrower than they had in 1877: this not in consequence of any change in them, but from his own improved faculty of detection; for what the eye has once seen it can always see better a second time. As he gazed they appeared straighter, and he made out more. Lastly, toward the end of the year, he observed one evening what struck even him as a most startling phenomenon,—the twinning of one of the canals: two parallel canals suddenly showed where but a single one had showed before. The paralleling was so perfect that he suspected optical illusion. He could, however, discover none by changing his telescopes or eye-pieces. The phenomenon, apparently, was real.

At the next opposition he looked to see if by chance he should mark a repetition of the strange event, and went, as he tells us, from surprise to surprise; for one after another of his canals proceeded startlingly to become two, until some twenty of them had thus doubled. This capped the climax to his own wonderment, and, it is needless to add, to other people's incredulity; for nobody else had yet succeeded in seeing the canals at all, let alone seeing them double. Undeterred by the general skepticism, he confirmed at each fresh opposition his previous discoveries, which, in view of the fact that no one else did, tended in astronomical circles to an opposite result.

For nine years he labored thus alone, having his visions all to himself. It was not till 1886 that any one but he saw the canals. In April of that year Perrotin, at Nice, first did so. The occasion was the setting up of the great Nice glass of twenty-nine inches aperture. In spite of the great size of the glass, however, a first attempt resulted in nothing but failure. So, later, did a second, and Perrotin was on the point of abandoning the search for good, when, on the 15th of the month, he suddenly detected one of the canals, the Phison. His assistant, M. Thollon, saw it immediately afterward. After this they managed to make out several others, some single, some double, substantially as Schiaparelli had drawn them; the slight discrepancies between their observations and his being in point of fact the best of confirmations.

Since then, other observers have contrived to detect the canals, the list of the successful increasing at each opposition, although even now their number might almost be told on one's hands and feet.

Steady Air Essential

The reason that so few astronomers have as yet succeeded in seeing these lines is to be found in our own atmosphere. That in ordinary atmosphere the lines are not easy objects is certain. A moderately good air is essential to their detection; and unfortunately the location of most of our observatories preclude this prerequisite. Size of aperture of the telescope used is a very secondary matter. That Schiaparelli discovered the canals with an 8 1-3 inch glass, and that the 26-inch glass at Washington has refused to show them to this day, are facts that speak emphatically on the point. . . .

Next in importance to a steady air comes attentive perception on the part of the observer. The steadiest air we can find is in a state of almost constant fluctuation. In consequence, revelations of detail come only to those who patiently watch for the few good moments among the many poor. Nor do I believe even average air to be entirely without such happy exceptions to a general blur. In these brief moments perseverance will show the canals as faint streaks. To see them as they are, however, an atmosphere possessing moments of really distinct vision is imperative. For the canals to come out in all their fineness and geometrical precision, the air must be steady enough to show the markings on the planet's disk with the clear-cut character of a steel engraving. No one who has not seen the planet thus can pass upon the character of these lines.

Percival Lowell was born in Boston in 1855, and died November 12, 1916, at Flagstaff, Arizona. He was graduated from Harvard at the age of 21. After extensive travels, including about ten years in Japan, he established the Lowell Observatory at Flagstaff in 1894 and edited its "Annals."

Mars is the fourth planet from the sun, its orbit lying next outside that of the earth. It is frequently visible as a brilliant reddish planet, which may be seen high in the sky. Its mean distance from the sun is a little more than one and one-half times that of the earth. Its average distance from the earth is 48,600,000 miles. The Martian year is nearly twice the length of ours, but the length of the day there is almost exactly the same as on the earth. Mars has an atmosphere containing oxygen and water vapor. The sky is blue and occasionally cloudy. The surface has no rugged mountains. There are large desert areas. There are also large areas where vegetation appears in the spring, expands as the days grow warmer, withers in the fall, and disappears in the winter. This vegetation must be hardier than ours, however, for the temperature during the day is about 50 degrees Fahrenheit, and at night drops below the freezing point. Polar caps expand during the winter and retreat in summer. The one at the south pole frequently disappears in summer, but the northern one is permanent. One explanation of the markings known as canals on the surface of the planet is that they carry water from the melting snow-caps to the other parts of its land. Two moons of Mars, discovered for earth-dwellers in 1877 by Dr. Hall of the U. S. Naval Observatory, revolve around the planet. The outer one, Deimes, appears to the Martians as a brilliant planet. The inner one, Phobos, ten miles in diameter, looks to them more as our moon looks to us, although apparently only about one-third as large, with the strange exception that it rises in the west and sets in the east.

Science News-Letter, January 12, 1929