

The colony-building infusorial form *Uroglena* has appeared in the water of the LaFayette reservoir rather regularly in the summer months since 1896, and has been the cause of much annoyance to the water works officials. At such times it has imparted a very disagreeable odor and taste to the water, leading many consumers to complain that there were dead fish or eels in the pipes. In the summer of 1898 it became necessary to have the water completely drawn off from the reservoir in order to thoroughly cleanse it and get rid of the *Uroglena*. There has been no serious trouble since that time.

The star-shaped diatom *Asterionella*, although occurring in considerable numbers, has not, as far as known, caused any noticeable effect on the odor or taste of the water. Yet this is the organism which has so often given the characteristic geranium taste to many eastern water supplies.

Another infusorial form, *Dinobryon*, is present in the water of the reservoir in large numbers at the present time. Should this number increase to any great extent, we may expect to have a fishy odor and taste imparted to the water.

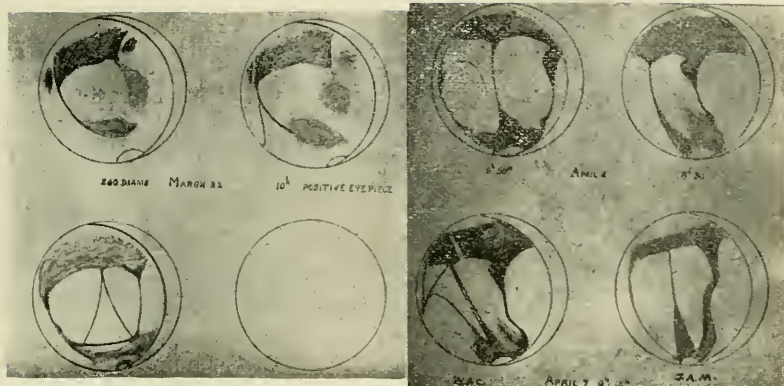
Aside from these three above mentioned forms, the organisms found in the reservoir have practically no effect on the odor or taste of the water.

PHYSICAL OBSERVATIONS OF THE PLANET MARS AT THE OPPOSITION OF 1901.

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Observations of the last opposition of Mars were made at the Kirkwood Observatory of Indiana University from the time the twelve-inch telescope was in place, early in February, till late in May. The observations consisted mainly in drawing the surface markings and were carried on nearly every good night between the dates mentioned. The drawings submitted herewith were all made between February 15 and May 1. Drawings of two different observers are included in the series, part being by Professor J. A. Miller, and part by the writer. Where the drawings of both for the same night are placed together they are generally marked by the proper initials. In all this work the drawing was done as independently as possible, neither looking at the other's drawing until both were complete. It will be seen that in every case the markings drawn are essentially the same, although the drawings vary slightly both in detail and in the location of the dark areas, Dr. Miller almost always placing the dark regions of the southern hemisphere somewhat farther to the south than did the writer.





This opposition was not nearly so favorable to the observation of surface characteristics as some in the past, as Mars and the earth were so situated that at the time of opposition Mars was at his greatest distance from the sun, while the earth was at its least distance, thus making the distance between Mars and the earth almost a maximum. So great is the eccentricity of the planet's orbit that this distance at opposition may vary from thirty-five million miles to over sixty-two million miles. In this case it was near the latter limit, the nearest approach being on the 22d of February.

This opposition was also somewhat unfavorable if we compare results with those obtained in 1892 and 1894, in that the southern pole of the planet which was at that time turned toward us, at this opposition was turned away from us.

The large dark areas on the planet are mainly in the southern hemisphere and are the most easily seen of anything on the surface except the polar cap. It will be observed that there are also large dark areas in the northern hemisphere, but these, for the most part, are very changeable, both in size and shape and intensity, indicating probably that they are really water and that the change is purely seasonal in character. One of the most conspicuous markings on the planet at the time of opposition was the great polar ice cap. It will be observed that the early drawings all represent this feature as large, and the brilliant white color made it stand out in a very conspicuous manner against the yellow and red of the rest of the surface, while, toward the end of the series, the cap has diminished in size so as to be easily overlooked altogether. It will also be observed that the ice cap is represented with a dark fringe surrounding it, that this fringe follows the edge of the cap as it melts away, and that at the same time the dark areas near this pole become much enlarged and much more intense in contrast with the bright yellow of the disk. This tends to show that these dark patches are really water and as the polar snows melt, the water runs out over the comparatively level surface in great pools.

A few of the numerous so-called canals are shown. As to just the character and origin of these objects there has been a great deal of discussion. Their reality was even questioned for some time after their discovery, but of that there can now be no doubt at all. These canals were first seen by Schiaparelli in 1877, and from that time till the present they have been a constant source of perplexity. The same observer shortly

afterward announced that at certain seasons these canals appeared to be doubled, and the same thing has been seen many times since, although as yet there is no really probable explanation offered. It has been supposed to be an optical effect by some, and due to atmospheric causes by others, and by some it is thought that the canal is really double. This doubling is shown in the drawing made on April 7.

As the rotation period of Mars is about thirty-nine minutes longer than our day, by looking at the planet at the same hour on successive nights we will see any particular marking shifted to the right from the center by about 10 degrees Martian longitude for each night. We are therefore able, in the course of about thirty-eight days, to view the whole surface by looking for a short time each night, and the rotation is sufficiently rapid so that even in the course of three or four hours the amount of new detail brought into view is large.

In the drawings of February 15 the most conspicuous part of the whole disk is the great northern ice cap with a large dark area bordering it. The dark band of color across the southern part of the planet is a portion of that great area, supposed at one time to be water, and near the center of the disk are two of the so-called canals, which, on this night, could be followed only for a short distance.

In all these drawings the contrast between the light and dark parts of the planet has been drawn greater than it really appears, so that the drawing would reproduce better. The outlines have been made distinct or hazy as they appeared, but the dark parts of the planet are not so dark generally as shown here.

By comparing the drawings of February 15 and those of February 20, the eastward drift of about ten degrees per day, mentioned above, has brought into view a very dark and conspicuous marking which will be found a number of times in the drawings of later date and which was always connected with the dark area about the pole by a well defined but irregular dark mark best shown in the drawings of the early part of April. This was the first real detail ever seen on the planet and was drawn by Huyghens in 1659. It has probably received more attention from observers than any other part of the planet. This dark line, with many more, from the polar seas leading toward the equator naturally suggests that the so-called canals do really carry away the water resulting from the melting snow. As they are about thirty miles wide, it has been suggested as more probable that they are really strips of vegetation bordering the

canal proper, and it is also probable that much of the dark belt covering the greater part of the southern hemisphere is due mainly to vegetation. These areas deepen in color very decidedly at about the time the water would reach them if it were really conducted from the poles to the equatorial regions in the canals, and after the ice cap is all melted and no evidence of other water supply is visible, these areas again turn lighter in color as if the vegetation dried up or died.

Some of those who have done the most in the observation of the planet are of the opinion that the extreme regularity and geometric exactness of the canal system indicate that it is artificial in its origin and it is only fair to say that this is the appearance of the planet when seen to the best advantage. While this idea leads to the conclusion that there is or has been some sort of intelligent life on Mars, yet the canal system (be they real canals or something else) has as yet no other explanation which we can consider at all possible. If we assume the existence on the planet of some sort of intelligent life, a canal system such as we see would be essential, as we can see no storms and but very few clouds, the whole water supply being apparently the melting polar cap.

On the other hand, it is possible that the polar caps are not ice, but some other material which will vaporize in the Martian sunlight and solidify during the long polar night. Unless Mars has some source of heat which the earth has not, the temperature, even at the best, must be far below that experienced at the same latitude on the earth; and as the atmosphere is not more than one-half as dense as ours this difference in temperature is greatly intensified. It has been suggested that the caps are solidified carbon dioxide and we can not say that they are not. The most that can be said for this theory is that carbon dioxide will act that way at a low enough temperature, but it fails to explain in any degree the seasonal changes in color, and suggests no use or origin for the marks called canals. The ice theory accounts for everything but the temperature to melt it.

Consequently, the climatic conditions on Mars, the physical characteristics of its surface, its habitability and inhabitants are still open questions upon which much time and labor must be expended before we can say much about them with certainty.