

toward us, her bright one being always toward the sun. But she is not exactly on a line with the sun except on the very rare occasions of a transit across the sun's disk. Hence, on ordinary occasions, when she seems very near on a line with the sun, we see a very small part of the illuminated hemisphere, which now presents the form of a very thin crescent like the new moon. And this crescent is supposed to be a little broader than it would be if only half the planet were illuminated, and to encircle rather more than half the planet. Now, this is just the effect that would be produced by an atmosphere refracting the sun's light around the edge of the illuminated hemisphere.

The difficulty of observations of this kind is such that the conclusion may be open to doubt. What is seen during transits of Venus over the sun's disk leads to more certain, but yet very puzzling, conclusions. The writer will describe what he saw at the Cape of Good Hope during the transit of December 5, 1882. As the dark planet impinged on the bright sun, it of course cut out a round notch from the edge of the sun. At first, when this notch was small, nothing could be seen of the outline of that part of the planet which was outside the sun. But when half the planet was on the sun, its outline off the sun was marked by a slender arc of light. A curious fact was that this arc did not at first span the whole outline of the planet, but only showed at one or two points. In a few moments another part of the outline appeared, and then another, until, at last, the arc of light extended around the complete outline. All this seems to show that while the planet has an atmosphere, it is not transparent like ours, but is so filled with mist and clouds that the sun is seen through it only as if shining in a fog.

Not many years ago the planet Mars, which is the next one outside of

us, was supposed to have a surface like that of our earth. Some parts were of a dark greenish gray hue; these were supposed to be seas and oceans. Other parts had a bright warm tint; these were supposed to be continents. During the last twenty years much has been learned as to how this planet looks, and the details of its surface have been mapped by several observers, using the best telescopes under the most favorable conditions of air and climate. And yet it must be confessed that the result of this labor is disappointing. We are less confident than before that the so called seas are really seas. When it comes to comparing Mars with the earth, we cannot be certain of more than a single point of resemblance. This is that during the Martian winter a white cap, as of snow, is formed over the pole, which partially melts away during the summer. The conclusion that there are oceans whose evaporation forms clouds which give rise to this snow seems plausible. But the telescope shows no clouds, and nothing to make it certain that there is an atmosphere to sustain them. There is no certainty that the white deposit is what we call snow; perhaps it is not formed of water at all.

To make the matter worse, there is no agreement among observers as to minuter details of light and shade on the surface of the planet, though they agree as to the main features. Where some see broad hazy streaks, others see fine dark lines, and yet others nothing definite at all. The result is that the question of the real nature of the surface of Mars and of what we should see around us could we land upon it and travel over it is still one of the unsolved problems of astronomy.

If this is the case with the nearest planets that we can study, how is it with more distant ones? Jupiter is the only one of these of the condition of whose surface we can claim to have