EDUCATIONAL

SUNLIGHT AND MOONLIGHT.

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(Continued from page 277.)

SUCH, then, are some of the facts which are revealed to us by the light reflected from the moon's surface, and so much do they tell us of her past history and present condition. But such information, and similarly acquired, we also receive from other sources, as in the case of our companion worlds, the planets, whose light, like that of the moon, is but reflected sunlight, modified by, and thus informing us of their special conditions of surface.

As regards the interior planets Mercury and Venus, their propinquity to the sun and their intense illumination, together with other causes, such as their small size, renders our observations most meagre and unsatisfactory, but when we direct our view to Mars, we see much that is of interest, and has a meaning which we may hope to interpret.

We find there a condition of things quite antipodal to that of the lunar surface. The planet Mars is undoubtedly wrapped in an atmosphere loaded with vapor and clouds, and possesses a surface diversified by oceans and continents, lakes and peninsulas. The changes and the observations produced by the movements, formations and dispersions of clouds, makes the determination of the permanent features of this planet very difficult, but yet by a careful comparison of various sets of drawings, such as those of Beer and Madler, made in 1830, those of Father Secchi, made in 1858, and the latest by Mr. J. N. Lockyer, in 1862, we see clearly that certain general markings are permanent after years have elapsed, and regain their original appearance after being temporarily obscured and concealed.

Such, for example, is the part marked *a*, on Plate 5, and known as the Scorpion, and the part marked *b*, which we might well call,

by analogy, the Atlantic, and c, the Mediterranean. The formation and grouping of clouds on the other hand, causes certain appearances which we learn to recognize as unconnected with the geographical constitution of the planet, by reason of their evanescent character.

A striking instance is shown in the accompanying plate, which is taken from a series of drawings by Mr. Lockyer, published in the *Memoirs of the Royal Astronomical Society*, 1863, p. 179.

Here we have two views, taken at the interval of half an hour, one bearing date October 3d, 11 h. 23', the other October 3d, 11 h. 51'.

In the first, it will be observed that the area indicated by x, is devoid of all markings except a small rounded shade; in the second, this shade has developed into a chain of three connected lakes. In the first case, we suppose that the region was covered and concealed by a mass of cloud, which subsequently dispersing or perhaps falling as a snow storm, or as a rain shower, left the existing features of the planet evident to our eyes.

The growth and decrease of the snow zones, which surround either pole, and which creep out in the winter of each hemisphere, and melt away again as the time of summer comes to each, is also a curious evidence of a series of meteorological and climatic phenomena, wonderfully in accordance with our own terrestrial experience.

The consideration of these things gives us a vivid impression of the wonderful revealing power of the agent, which we are now studying.

We often admire the wonders of the electric messenger and his timeless flight, annihilating distance, and bringing together the ends of the earth, but what are these achievements compared to those here accomplished.

The electric fluid flashing along the cable-covered wire, can give warning to the coast of England, that a tempest has begun its march across the broad Atlantic, and although now a thousand miles distant, will soon be howling across the chalk cliffs of the island and thundering into its bays, but here the swifter footed light, flashing out from the sun across the fields of space, and turning back to us from its momentary resting place on the continents, or oceans, the mountain summits or their cloudy crowns, the polar snows or equatorial deserts, of this distant planet, tells how a tornado of snow and sleet is at almost the same instant sweeping over that globe *thirty-five millions of miles away*.

The picture which is now thrown upon the screen, shows you at a glance, prepared as you are to interpret the meaning of its various indications by what you have seen before, what we can learn as to the physical constitution of the planet Jupiter. You see a series of belts of an irregular form, but following the line of the planet's equator, and these by their form and by their changes, indicate that when we look towards this planet, we see little more than the cloud masses of its watery atmosphere, drawn out into such zone-like lines, by the action of trade winds.

You now see in turn, the planet Saturn, with his eight satellites and his rings. These last, which have since their discovery been among the mysteries of the universe which seem to defy human ingenuity, are now believed to be, not continuous masses of matter, but troops of satellites, minute, innumerable, closely arrayed, yet moving in independent harmony. A choral band, sweeping in majestic measure round their ruling centre and primary.

Among our reasons for so regarding them, the most prominent are these: When they have been in such position as to be seen edgewise, breaks have been observed in their substance, as is shown in the figure. Now, a break in a continuous ring, it is easy to prove, must result in its speedy destruction of form and coagulation into a globe, without the possibility of a restoration to the annular shape, but in a swarm of circling planets, such gaps might naturally occur from time to time, and close again without disturbance.

Other changes inconsistent with the continued existence of a continuous mass, are also noticed, such as the longitudinal splitting of the rings, and it is also believed that a scattered interior mass of these minute planets has formed within the inner ring in modern times, being the result of collision and consequent in-falling of the revolving fragments. This cloud, called "the veil," was first seen in 1850 by Bond and Dawes, with difficulty, in their powerful instruments, but is now easily discerned with an objective of but four inches aperture.

(To be continued.)