

will be very luxuriant. Water containing large quantities of carbonic acid will act powerfully upon the silicates and other minerals, and cause a rapid formation of carbonates. Again, the carbonic acid issuing from Mars' interior will further increase the temperature. Hence we maintain (as against the now generally received opinion that the climate of Mars is more than arctic) that, on the contrary, it is nowhere too cold to prevent the chemical reactions of carbonic acid in solution, or to arrest the development of the most luxuriant vegetation upon the greater part of the Martian surface. And at the same time, the amount of carbonic acid it is necessary to assume as existing on Mars (in order thus to greatly raise the temperature of its climate) would not be so great as to be at all injurious to animal life, even supposing it were of the same type as the terrestrial.

The Rotational Motion of the Orion Nebula

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A RESUME of the results of the new application of the "Method of interferences" to the study of the Orion Nebula may be found interesting. The method has been applied by the astronomers Buisson, Fabry and Bourget. By its means the radial velocity of various parts of the nebula can be measured. The line H gamma in the spectrum has been specially chosen for examination, because it exists also in the spectrum of the nebula. The position of this line was compared with that of its comparison spectrum in the laboratory. It has thus been found that the radial velocity of the nebula varies from point to point, and on an average it is about 9 miles per second. The region surrounding the Trapezium rotates in an almost opposite direction to that of our Sun. And in general it may be said that whilst the outer Sp. region recedes from us at about 3 miles a second, the Sf. region approaches us at about the same rate. It can be readily gathered from the above statements that its rotational movement is very irregular. It may be described very roughly as rotating from S.E. to N.W. Further, both the atomic weight and the temperature of the nebula can be found by this same method.

Renandot affirms that the two ultra-violet lines are produced by an unknown element of an atomic weight which agrees very closely with the theoretical value of the atomic weight of nebulium as given by Nicholson. The strong green line (which is so marked a feature of this nebula) is, however, due to an element whose atomic weight is considerably less. The temperature of the nebula could not be less than fifteen thousand degrees centigrade.

The Effects of Tidal Friction upon the Evolution of the Earth-Moon System

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THE raising of the tides by the Moon is the result of small differences of attraction upon different parts of the Earth. But this differential force not only affects the waters of the oceans, but the solid earth as well, though to a much smaller extent. The ocean tides would be half as great again as they actually are, did not the solid earth yield somewhat to tidal strain. Again, were the solid earth to yield to the same extent as the oceans, there would be no perceptible tides at all. Owing to friction between the Earth and the oceans, the Earth tends to carry the tidal wave ahead of the Moon, whilst the Moon tends to draw the water back. Hence a couple is formed which diminishes the Earth's angular velocity, and tends to lengthen the day. But tidal friction does not merely diminish the Earth's rotational velocity. For on the principle of the conservation of moment of momentum, there must be reaction somewhere else. The Moon's orbital velocity is accelerated, and hence her areal velocity, and hence her distance (since the distance varies as the square of the area) and hence her periodic time. Thus the month is lengthened. It must be noted that the Earth-Moon system occupies a critical situation in the solar system. It alone is truly binary. For the interior planets possess no satellites, and the exterior possess several. And further, the Moon relatively to the size of its primary is by far the largest satellite. Tidal friction has been a powerful force in the assignment of satellites to the various planets. In the case of the interior planets, tidal friction caused by the Sun has been sufficiently