SPECIAL ARTICLES

NEW MEASUREMENTS OF PLANETARY RADIATION

IN view of the fact that the popular press has not yet reached such a stage of reliability that one can turn to it for accurate information on scientific subjects this seems an appropriate time and place to record some of the results of our recent measurements on the radiation emitted by the major planets.

Continuing our measurements of 1922, by means of suitable transmission screens the planetary radiation, which consists of wave lengths of 8 to 14 μ, has been successfully separated into spectral components. In this manner it is possible to determine the shape of the spectral energy curve of that part of the planetary radiation which is transmitted by our atmosphere and thus form an estimate of the temperature of the planetary surface.

In the case of Mars, these radiometric measurements show that the equatorial zones are much warmer than the polar regions which emit practically no planetary radiation; the morning side of the planet is at a lower temperature than the afternoon side which has been exposed to the sun's rays for a longer time; the dark regions are at a higher temperature than the light ones, and a gradual rise in temperature of the surface of the southern hemisphere, where summer is now advancing, was recorded.

Tests were applied showing that there is an excess of incoming low-temperature radiation from the planet over the outgoing radiation from the radiometer receiver, which could not occur if the temperature of the effective radiating surface of Mars were at a lower temperature (15° C.) than the receiver.

A direct comparison was made of the spectral components (λ 8–12.5 μ and λ 12.5–5 μ) of the planetary radiation from Mars with similar measurements on the moon, which is commonly supposed to have a temperature of 50 to 100° C. or even higher. This with two other methods of comparison indicate that the temperature of Mars, under a noonday sun, is up to 20° C. or even higher.

In the case of Venus not only does the illuminated crescent show the presence of considerable planetary radiation, but the unilluminated part of the disk also emits a large amount of infra red rays. The planetary radiation (per unit surface) from the unilluminated part of the disk amounts to about 10 per cent. of the total radiation from the brightly illuminated crescent. This radiation is highly selective, the spectral component of wave lengths λ 8–12.5 μ being over 60 per cent. of the total planetary radiation measured.

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THE EXPERIMENTAL REVERSAL OF POLARITY IN PLANARIA

THE establishment of polarity is a universal and fundamental phenomenon among organisms, and since it must precede all further differentiation it is important to understand just what is the basis of polarity itself. Although polarity shows itself as a matter of visible structure, it is probably fundamentally a dynamic phenomenon, the visible polarity being the expression of the physiological activities of the individual; this expression should therefore be capable of reversal if the controlling activities are reversed. Polarity is most susceptible of analysis through regeneration experiments on simple, axiate forms such as Tubularia or Planaria, which have consequently been much used in its study. Both of these forms are definitely polarized along an axis, and this polarity ordinarily reappears in the regeneration of an isolated piece of the body.

Both Morgan[1] and Loeb[2] considered polarity as dependent upon definite organ-forming substances, Morgan postulating a gradation of hydranth-forming substance in the stem of a tubularian and Loeb a condition in the protoplasm "of the nature of a current (*e.g.*, of liquid) by which certain substances were carried through the stem." Mathews[3] reported differences of electrical potential between the anterior and posterior cut surfaces of a stem of hydroid and believed these differences to be due to unequal degrees of protoplasmic activity at different regions.

Child's gradient theory[4] regards polarity as an expression of a gradient along the polar axis. This gradient is susceptible of measurement as a gradation in rate of metabolism, in differences of electrical potential at different points along the axis, or in other ways. Miss Hyman[5] has shown that the anterior end of an isolated piece of a planarian, which is undergoing metabolism more rapidly than is the rest of the piece, is electronegative, galvanometrically, to the posterior end, where the rate is lower. There is a certain stimulation of metabolic activity as a result of cutting, and this, according to Miss Hyman, causes chemi-

[1] Morgan, T. H., 1905, "Polarity considered as a phenomenon of gradation of materials." *Jour. Expt. Zool.*, Vol. 2, p. 495.

[2] Loeb, J., 1906, "The Dynamics of Living Matter." Columbia University Press.

[3] Mathews, A. P., 1903, "Electrical polarity in the hydroids." *Am. Jour. Physiol.*, Vol. 8, p. 294.

[4] Child, C. M., 1915, "Individuality in Organisms." University of Chicago Press.

[5] Hyman, L. H., 1918, "Suggestions regarding the causes of bioelectric phenomena." SCIENCE, N. S., Vol. 48, p. 518.