Cosmology in Terms of Wave Geometry (X). Observers on the Nebulae.

By

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§ 1. Introduction.

In previous papers[1] we have shown that the de-Sitter type of universe is the only one allowed as a model in the wave-goemetrical cosmology and in that space-time we have deduced Hubble's velocity-distance relation and the other physical properties of this model, starting from the line element

$$ds^2 = -\frac{dr^2}{1-k^2r^2} - r^2d\theta^2 - r^2\sin^2\theta d\phi^2 + (1-k^2r^2)dt^2 , \qquad (1.1)$$

and the momentum-density vector

$$\left.\begin{aligned} u^r &= (-pe^{-kt}+qe^{kt})\,kr\sqrt{1-k^2r^2} \\ u^\theta &= u^\phi = 0 \\ u^t &= \frac{pe^{-kt}+qe^{kt}}{\sqrt{1-k^2r^2}} . \end{aligned}\right\} \qquad (1.2)$$

In a subsequent paper,[2] furthermore, the physical properties for the time lapse of this model were discussed.

In this paper we shall show (i) that observers situated on nebulae are equivalent to one another in Milne's sense,[3] (ii) that the mathematical expression of light : $ds^2 = 0$, which was postulated in the derivation of Hubble's velocity-distance relation, is consistent with our theory of the universe previously established, and (iii) what transformation formulae exist between the coordinate systems of observers on the nebulae, provided the nebulae move in accordance with the vector (1.2).

§ 2. Condition for Equivalent Observers.

We define, after Milne,[4] that two observers A and B are equivalent

(1) Y. Mimura and T. Iwatsuki, this Journal **8** (1938), 193, (W. G. No. 28).
      T. Sibata, this Journal **8** (1938), 199, (W. G. No. 29).
      H. Takeno, this Journal **8** (1938), 223, (W. G. No. 30).
      K. Itimaru, this Journal **8** (1938), 239, (W. G. No. 31).
(2) K. Itimaru, this Journal **10** (1940), 151, (W. G. No. 37).
(3) E. A. Milne : Relativity, Gravitation and World-Structure, (1935), 24.
(4) E. A. Milne : loc. cit.