On Space which has the Homogeneous Property for Observation Systems.

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§ 1. Introduction and summary.

In Wave Geometry, considering that the momentum-density vector of a moving particle whose existence is defined by ψ is given by $u^l \equiv \psi^\dagger A \gamma^l \psi$, and assuming that the vector u^l generates a congruence of geodesics, we have established the wave-geometrical cosmology.(1) We possess, however, no clear reason why it is only in the case of cosmology that u^l generates a congruence of geodesics.(2) Over this obscurity we feel some dissatisfaction, so we are tempted to study whether there is a way to rectify this unsatisfactory point of the theory.

Since we have seen, in the previous paper,(3) that our cosmology is characterized by *a homogeneous property for observation systems,* the question arises: Is it not possible to establish a cosmology proceeding from the homogeneity of space-time for observation system without assuming that each constituent particle in the universe describes a geodesic ?

To answer this question, in this paper, we shall first make clear the conception expressed by the term "*homogeneity of space-time.*" After doing this we shall find all the space-time continuum having the "*homogeneous*" property for observation systems, and by studying the relations between those observation systems, we shall make some contributions to the wave-geometrical cosmology; and in the next paper we shall remove the obscurity indicated above.

The results obtained in this paper are: *There exist three types of homogeneous and statical space, i.e., (I) the Minkowski, (II) the Einstein, and (III) the de-Sitter type. In (I), each system of coordinates is in a uniform motion relative to the other; in (II), the systems do not change relative positions; in (III), each system is in motion, with the velocity v*

(1) T. Iwatsuki, Y. Mimura and T. Sibata: this Journal, **8** (1938), 187 (W. G. No. 27) and the following papers.

(2) In fact,—e. g., in the theory of spiral nebulae—u^l does not generate a congruence of geodesics; cf. T. Iwatsuki and T. Sibata: Theory of Spiral Nebulae, this Journal, **11** (1941), 47 (W. G. No. 44).

(3) T. Sibata: this journal, **11** (1941), 21 (W. G. No. 43).