Wave Geometry No. 42

Cosmology in Terms of Wave Geometry (VII) Some Characteristics of the Universe.

By

Kiyosi SAKUMA.

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§ 1. **Introduction and summary.** Cosmology in terms of wave geometry is characterized by the equations:

$$\frac{\partial\psi}{\partial x^i}=(\Gamma_i+\Sigma_i)\psi \tag{1.1}$$

$$u^i=\psi^\dagger A\gamma^i\psi \tag{1.2}$$

$$u^i\nabla_i u^j=Qu^j. \tag{1.3}$$

(1.1) is the fundamental equation of wave geometry. (1.2) is the definition of u^i, where ψ is the solution of (1.1) and A an hermitian matrix which makes $A\gamma^i$ hermitian.(1) (1.3) is the condition that u^i may generate a geodesic. From these equations it results that the universe is either (i) of de Sitter type or (ii) of Einstein type. We have here, on plausible grounds,(2) adopted the de Sitter type as representing the universe.

u^i thus defined has been identified with the momentum-density vector of a constituent matter of the universe, and the phenomena of red-shifts of the spectral lines in nebulae, i. e. Hubble's velocity-distance relation, have been successfully explained.

The physical interpretations of u^i, however, present some difficulties, which are considered in detail in § 2. In § 3 we proceed to further properties of u^i and other physical quantities in our cosmology, defining a material energy tensor analogously to relativistic hydrodynamics.

§ 2. **The physical meanings of u^i and M.** In cosmology in terms of wave geometry, a nebula was considered as having two aspects, one being that of a particle to detect the structure of the universe, the other being that of probability-existence, all the nebulae being regarded as almost smeared out all over the universe.(3) Therefore it seems natural to study the physical properties of the universe in a manner analogous to the gas theory or fluid mechanics in the classical theory.

(1) T. Sibata: this Journ., **8** (1938), 172, (W. G. No. 26).
(2) K. Itimaru: this Journ., **8** (1938), 240, (W. G. No. 31).
(3) Y. Mimura and T. Iwatsuki: this Journ., **8** (1938), 194 (W. G. No. 28).