On Some Characters of Time.

By

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1. Introduction.

In Wave Geometry, we saw the validity[(1)] of taking $u^i \equiv \psi^\dagger A\gamma^i\psi$ as the momentum density vector of the matter constituting space-time, the existence of that matter being asserted by ψ, the solution of the fundamental equation:

$$\left(\frac{\partial}{\partial x^i} - \Gamma_i\right)\psi = \Sigma_i\psi\,;$$

and by using this u^i we were able to establish a promising theory concerning universe.

The main reasons for taking u^i as momentum density vector of matter were the four following[(2)]:

(1) The equation of motion of matter should be included as a part of the field theory in consideration.

(2) When we choose the coordinates so that

$$ds^2 = -\sum_{a,b=1}^{3} g_{ab}dx^a dx^b + g_{44}(dx^4)^2, \qquad g_{ab},\, g_{44} > 0\,, \tag{1}$$

and identify x^4 with the coordinate t, the fourth component of u^i becomes $\psi^\dagger\psi$ except for a real factor $\dfrac{1}{\sqrt{g_{44}}}$, $\psi\psi^\dagger$ expressing the meaning of density or existence probability of matter represented by ψ.

(3) From the relation[(3)]:

$$g_{ij}u^iu^j \equiv M^2 + N^2 > 0 \qquad (\text{where } M = \psi^\dagger A\psi,\ N = \psi^\dagger A\gamma_5\psi)\,,$$

if we express by $'u^i$ the component of the vector u^i in a Minkowski local coordinate system at any point of the space-time whose metric is gived by (1), then we have the relation:

$$-('u^1)^2 - ('u^2)^2 - ('u^3)^2 + ('u^4)^2 > 0\,,$$

proving that the above-given relation satisfies the condition that u^i can be taken to represent a momentum density vector.

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(1) T. Iwatsuki, Y. Mimura and T. Sibata; This Journal **8** (1938), 187 (W. G. No. 27).
(2) loc. cit., 189, 192.
(3) T. Sibata; This Journal, **8** (1938), 175 (W. G. No. 26).