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## The physical meaning of the class of the geometric objects

In the Lagrangian theory of fields the expressions of the properties of the physical system under consideration are appropriate comitants both of the field descriptors  $\psi_A(\xi^k)$ , by which the system is described, as well as of the Lagrangian.

$$(1) \quad L = L(\psi_A, \psi_{A,k}, \dots)$$

which contains all information concerning the system. The form and the possible numerical values of these comitants depend on the transformation properties of the descriptors  $\psi_A$  under those symmetry bioperatives (grupoids, ..., groups) which are connected with the property in question.

In order to explain this more precisely we will consider the charge and the energy of the fields  $\psi_A$ .

### THE CHARGE AND ITS GROUP

In the Lagrangian formalism the expression of the charge-current vector density  $j^k$  is

$$(2) \quad j^k = \frac{\partial L}{\partial \psi_{A,k}} \frac{\delta \psi_A}{\delta \varphi},$$

where

$$(3) \quad \frac{\delta \psi_A}{\delta \varphi} = ie\psi_A,$$

when the Lagrangian  $L$  is invariant under the electric gauge group

$$(4) \quad \bar{\psi}_A = e^{ie\varphi(\xi)} \psi_A \equiv T_A[\psi_B, \varphi, \varphi_k, \dots],$$

where  $\varphi(\xi)$  is the descriptor function on the Lie group. Since, according to (4), the variation of  $\psi_A$  with respect to  $\varphi$  is

$$(5) \quad \delta \psi_A = ie\psi_A \delta \varphi \equiv \left. \frac{\partial T_A}{\partial \varphi} \right|_{\varphi=0} \cdot \delta \varphi + \left. \frac{\partial T_A}{\partial \varphi_k} \right|_{\varphi, k=0} + \dots$$

it is seen from the comparison of (3) and (5) that expression (2) contains the derivatives of the transformator (4) too. Taking this into account one sees from (2) that  $j^k$  depends on  $\psi_A$ ,  $T_A$ , and  $L$ , i.e. it is a comitant of them.

### THE COMITANT OF THE INTERNAL ENERGY

In the special relativistic field theory of subnuclear particles the canonical energy-momentum concomitant has the form

$$(6) \quad T_i^k = \frac{\partial L}{\partial \psi_{A,k}} \frac{\delta \psi_A}{\delta x^i} - \frac{\partial L}{\partial \psi_{A,k}} \psi_{A,i} + \delta_i^k L,$$

where  $\delta \psi_A$  is the isocal variation of  $\psi_A$  under the infinitesimal Poincaré transformation  $\delta x^i$  of coordinates.

The third term of (6),  $\delta_i^k L$ , is a pressure, which is a result of the interaction (or self-interaction). Therefore it does not constitute a part of the internal energy.

The second term,  $-\frac{\partial L}{\partial \psi_{A,k}} \psi_{A,i}$ , is the four dimensional path (kinetic) energy, which does not belong to the internal mass either.

Thus the density of the internal energy is either identical with, or is contained in the first term

$$(7) \quad T_0^0(1) = \frac{\partial L}{\partial \psi_{A,0}} \frac{\delta \psi_A}{\delta x^0}$$

Now the questions arise:

1. Is it natural that the subnuclear particles possess a number of charges (electric, barinic, etc) which are internal properties, that they possess spin, which is their internal angular momentum, and that they do not possess internal energy (mass)?

2. Supposing that they have internal mass, by what objects it may be described?

The answer to the last question is given in what follows, in the form of a theorem.

### THE ROLE OF THE TRANSFORMATORS

It is a known theoretical physical fact that the different descriptor fields of the particles with different spin have different transformation character (different transformators in our terminology) under the rotation subgroup

