Problem of parallelism in geometry and physics.

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Abstract

Two different definitions of the two vectors parallelism are investigated and compared. The first definitions is based on the principle of geometry deformation, when any physical geometry is obtained as a result of some deformation of the proper Euclidean geometry. The second definition is the conventional definition of parallelism, which is used in the Riemannian geometry. It is shown, that the second definition is inconsistent. It leads to absence of absolute parallelism in Riemannian geometry and to discrimination of outcome outside the framework of the Riemannian geometry at description of the space-time geometry. The reason of the inconsistency appearance is discussed. Problems of the inconsistency elimination and consequences of this elimination for development of the microcosm physics are considered.

Keywords: principle of geometry deformation, absolute parallelism,

1 Introduction

The problem of definition of two vectors parallelism is very important, because parallelism lies in the foundation of particle dynamics. For instance, in the curved space-time the free particle motion is described by the geodesic equation

$$d\dot{x}^i = -\Gamma^i_{kl}\dot{x}^k dx^l, \qquad dx^l = \dot{x}^i d\tau \tag{1.1}$$

where Γ^i_{kl} is the Christoffel symbol. Equation (1.1) describes parallel transport of the particle velocity vector $\dot{x}^i$ along the direction $dx^i = \dot{x}^i d\tau$ determined by the velocity vector $\dot{x}^i$. If the parallel transport (1.1) appears to be incorrect and needs a modification, the equation of motion of a free particle needs a modification also. For instance, if at the point x a set of vectors u^i, which are parallel to the velocity vector $\dot{x}^i$, appears to be consisting of many mutually noncollinear vectors, the parallel transport of the velocity vector $\dot{x}^i$ stops to be single-valued, and the world line of a free particle becomes to be random.

Most researchers believe that there exists no parallelism problem, because this problem had been solved many years ago, when parallelism of two vectors was defined in the Riemannian geometry. It is right, but definition of two vectors parallelism in Riemannian geometry has two defects:

1. Definition of parallelism in Riemannian geometry is coordinate dependent, because it contains a reference to the number of coordinate (space dimension).

2. Parallelism is defined only for two infinitesimally close vectors. Parallelism of two remote vectors at points P_1 and P_2 is defined by means of parallel transport along some curve connecting points P_1 and P_2. In curved space the result of parallel transport depends on the way of transport, and the absolute parallelism is absent, in general.

In reality, there exists a definition which is free of the two defects. We introduce this definition and discuss the interplay between the new and old definitions.

The definition of the parallelism is given in the framework of so called T-geometry which is constructed on the basis of the pure metric conception of geometry [4]. T-geometry is a very general geometry giving on an arbitrary set Ω of points by setting the world function σ:

$$\sigma : \quad \Omega\times\Omega\rightarrow\mathbb{R}, \qquad \sigma(P,P)=0, \qquad \forall P\in\Omega \tag{1.2}$$

In general, no other constraints are imposed, although one can impose any additional constraints to obtain a special class of T-geometries. The world function σ is connected with the distance $\rho(P,Q)$ between points P,Q by means of relation $\sigma=\frac{1}{2}\rho^2$ [5]. T-geometry is symmetric, if in addition

$$\sigma(P,Q)=\sigma(Q,P), \qquad \forall P,Q\in\Omega \tag{1.3}$$

The T-geometry has no its own axiomatics. It is obtained as a result of a deformation of the proper Euclidean geometry. It means that, any geometric object $\mathcal{O}$ and any relation $\mathcal{R}$ of T-geometry are obtained as a result of some deformation of the corresponding geometric object $\mathcal{O}_{\mathrm{E}}$ and corresponding relation $\mathcal{R}_{\mathrm{E}}$ of the proper Euclidean geometry. The relation $\mathcal{R}_{\mathrm{E}}$ of Euclidean geometry is written in σ-immanent form (i.e. in terms of only world function). Thereafter the world function σ_{E} of the proper Euclidean space is replaced by the world function σ of the T-geometry in question. The relation $\mathcal{R}$ of T-geometry appears. Representation of a proper Euclidean relation in σ-immanent form is always possible, because the proper Euclidean geometry can be formulated σ-immanently (in terms of only world function) [4]. Such a method of geometry construction will be referred to as the *principle of geometry deformation.*

There are two different approaches two geometry: mathematical and physical ones. In the mathematical approach a geometry is a construction founded on a system of axioms about points and straights. Practically any system of axioms, containing concepts of point and straight, may be called a geometry. Well known mathematician Felix Klein [1] supposed that only such a construction on a point set is a geometry, where all points of the set have the same properties (uniform geometries). For instance, Felix Klein insisted that Euclidean geometry and Lobachevsky geometry are geometries, because they are uniform, whereas the Riemannian geometries are not geometries at all. As a rule the Riemannian geometries are not uniform, and their points have different properties. According to the Felix Klein opinion, they should be called as "Riemannian topographies" or as "Riemannian geographies". Thus, at the mathematical approach to geometry the main feature of geometry is existence of some axiomatics. One may say that the mathematical geometry (mathematical approach to geometry) is a system of axioms. Practically one can construct axiomatics only for uniform geometries, and mathematical geometry is a uniform geometry.

At physical approach to geometry a geometry is to describe mutual disposition of geometric objects in the space, or mutual dispositions of events in the event space (space-time). The mutual dispositions is described by the distance between any two points. It is of no importance, whether the geometry has any axiomatics or not. One may say that the physical geometry (physical approach to geometry) is a conception, describing mutual dispositions of geometric objects and points. Physical geometry may be not uniform, and it is not uniform in many cases.

T-geometry is a physical geometry as well as the Riemannian one. The Riemannian geometry has no axiomatics, because it is impossible to construct axiomatics for each of possible Riemannian geometries. Constructing Riemannian geometry, the infinitesimal Euclidean interval ds_{E}^2 (world function between two infinitesimally close points) is replaced by the infinitesimal Riemannian interval $ds^2 = g_{ik}dx^i dx^k$. Such a replacement is a deformation of the Euclidean space. The Riemannian geometry is constructed on the basis of the *principle of geometry deformation*, i.e. in the same way as T-geometry.

Class of possible Riemannian deformations is restricted by the constraint

$$\sigma_{\mathrm{R}}\left(x, x'\right) = \frac{1}{2}\left(\int\limits_{\mathcal{L}_{xx'}} \sqrt{g_{ik}dx^i dx^k}\right)^2 \qquad (1.4)$$

where σ_{R} is the world function of Riemannian geometry, and $\mathcal{L}_{xx'}$ denotes segment of geodesic between the points x and x'. The Riemannian geometry is determined by the dimension n and $n\left(n+1\right)/2$ functions g_{ik} of one point x. Class of possible Riemannian geometries is not so powerful as the class of possible T-geometries, which is determined by one function of two points x and x'.

In fact, the real space-time geometry does not belong to the class of Riemannian geometries, and the Riemannian geometry describes the space-time only approximately. The Riemannian geometry is appropriate for approximate description of the macrocosm geometry, but it cannot by applied for exact description of the microcosm space-time geometry.

A use of the principle of geometry deformation is sufficient for construction of any physical geometry. It does not use any logical conclusions and leads to a construction of a consistent physical geometry. Moreover, a use of additional means of the geometry construction is undesirable, because these means may disagree with the principle of geometry deformation. In the case of such a disagreement the obtained geometry appears to be inconsistent.

Although the Riemannian geometry is a kind of physical geometry, at its construction one uses additional means of description (dimension, concept of a curve, coordinate system, continuous manifold). Some of them appear to be incompatible with the principle of the geometry deformation, and as a result the Riemannian geometry appears to be inconsistent. Constraint (1.4), imposed on the world function of Riemannian geometry, restricts the class of possible physical geometries and reduces this inconsistency, but it fails to eliminate inconsistency completely. The σ-Riemannian geometry, i.e. the physical geometry, constructed by means of only the principle of geometry deformation on n-dimensional manifold and restricted by the constraint [5]

$$\sigma_i\left(x,x'\right)g^{ik}\left(x\right)\sigma_k\left(x,x'\right)=2\sigma\left(x,x'\right),\qquad \sigma_i\left(x,x'\right)\equiv\frac{\partial\sigma\left(x,x'\right)}{\partial x^i} \tag{1.5}$$

which is equivalent to (1.4), is rather close to the Riemannian geometry. Nevertheless, the absolute parallelism is absent in the Riemannian geometry, but it takes place in the σ-Riemannian geometry. This difference means that the Riemannian geometry is inconsistent, because the σ-Riemannian geometry cannot be inconsistent.

From viewpoint of principle of geometry deformation this inconsistency is conditioned by a use of special properties of the world function σ_{E} of n-dimensional proper Euclidean space. It means as follows. Before deformation the geometric objects $\mathcal{O}_{\mathrm{E}}$ and relations $\mathcal{R}_{\mathrm{E}}$ of the proper Euclidean geometry are to be represented in the σ-immanent form. Representing $\mathcal{O}_{\mathrm{E}}$ and $\mathcal{R}_{\mathrm{E}}$ in terms of σ_{E}, we must not use special properties of Euclidean world function σ_{E}. These special properties of σ_{E} are formulated for n-dimensional Euclidean space and contain a reference to the space dimension n. If these properties are used at the description of $\mathcal{O}_{\mathrm{E}}$, or $\mathcal{R}_{\mathrm{E}}$, the description contains a reference to the dimension n of the space. In this case after deformation we attribute to the constructed physical geometry some properties of *n-dimensional* proper Euclidean geometry. Formal criterion of application of special properties of σ_{E} is a reference to the dimension n. Being transformed to σ-immanent form, such a description of $\mathcal{O}_{\mathrm{E}}$, or $\mathcal{R}_{\mathrm{E}}$ contains additional points which are not characteristic for $\mathcal{O}_{\mathrm{E}}$, or $\mathcal{R}_{\mathrm{E}}$. Practically, these additional points describe the coordinate system, and number of these points depends on the space dimension n.

Definition of the scalar product of two vectors in Riemannian geometry contains special properties of Euclidean world function and attributes to Riemannian geometry some properties of the proper Euclidean geometry, mainly one-dimensionality of straight (geodesics). In general, this definition of scalar product is incompatible with the principle of geometry deformation. Restriction (1.4), imposed on the world function σ_{R}, eliminates geometries admitting non-one-dimensional straight and eliminate some corollaries of this incompatibility, but not all. Creators of the Riemannian geometry tried to conserve one-dimensional straights (geodesics) in the Riemannian geometry. They had achieved this goal, but not completely, because only straight (geodesic) $\mathcal{L}(P_0, \mathbf{P}_0\mathbf{P}_1)$, drawn through the point P_0 parallel to the vector $\mathbf{P}_0\mathbf{P}_1$, is one-dimensional, whereas the straight $\mathcal{L}(Q_0, \mathbf{P}_0\mathbf{P}_1)$, drawn through the point Q_0 ($Q_0 \neq P_0$) parallel to the vector $\mathbf{P}_0\mathbf{P}_1$, is not one-dimensional, in general. Note that the Riemannian geometry denied a possibility of constructing the straight $\mathcal{L}(Q_0, \mathbf{P}_0\mathbf{P}_1)$, referring to lack of absolute parallelism. Lack of one-dimensionality for $\mathcal{L}(Q_0, \mathbf{P}_0\mathbf{P}_1)$ can be seen only in the σ-Riemannian geometry, which is defined as a consistent T-geometry, whose world function is restricted by the relation (1.4). In the present paper we consider and compare definitions of parallelism in Riemannian geometry and in the consistent T-geometry (σ-Riemannian geometry).

From viewpoint of the principle of geometry deformation the fact of the Riemannian geometry inconsistency seems to be rather evident. It is more interesting, why absence of the absolute parallelism has not been considered for years as an inconsistency of the Riemannian geometry. In this paper we consider the reason of long existence of this inconsistency and possible consequences of this inconsistency overcoming. These factors are of a social character. They cannot be investigated mathematically, but they are very important for evaluation of further development of the microcosm physics, and we consider them informally.

2 Definition of parallelism

Vector $\mathbf{P}_0\mathbf{P}_1 \equiv \overrightarrow{P_0P_1}$ in T-geometry is the ordered set of two points $\mathbf{P}_0\mathbf{P}_1 = \{P_0, P_1\}$, $P_0, P_1 \in \Omega$. (The points P_0, P_1 may be similar). The scalar product $(\mathbf{P}_0\mathbf{P}_1.\mathbf{Q}_0\mathbf{Q}_1)$ of two vectors $\mathbf{P}_0\mathbf{P}_1$ and $\mathbf{Q}_0\mathbf{Q}_1$ is defined by the relation

$$(\mathbf{P}_0\mathbf{P}_1.\mathbf{Q}_0\mathbf{Q}_1) = \sigma(P_0, Q_1) + \sigma(P_1, Q_0) - \sigma(P_0, Q_0) - \sigma(P_1, Q_1), \tag{2.1}$$

for all $P_0, P_1, Q_0, Q_1 \in \Omega$. As it follows from (1.2), (2.1), in the symmetric T-geometry

$$(\mathbf{P}_0\mathbf{P}_1.\mathbf{Q}_0\mathbf{Q}_1) = (\mathbf{Q}_0\mathbf{Q}_1.\mathbf{P}_0\mathbf{P}_1), \qquad \forall P_0, P_1, Q_0, Q_1 \in \Omega \tag{2.2}$$

Further we shall consider only symmetric T-geometry and shall not stipulate this. (Asymmetric T-geometry is considered in [3]).

When the world function σ is such one [4] that the σ-space $V = \{\sigma, \Omega\}$ is the n-dimensional proper Euclidean space E_n the scalar product (2.1) turns to the scalar product of two vectors in E_n. Besides, it follows from (1.2), (2.1) that in any T-geometry

$$(\mathbf{P}_0\mathbf{P}_1.\mathbf{Q}_0\mathbf{Q}_1) = -(\mathbf{P}_1\mathbf{P}_0.\mathbf{Q}_0\mathbf{Q}_1), \qquad \forall P_0, P_1, Q_0, Q_1 \in \Omega \tag{2.3}$$

$$
(\mathbf{P}_0\mathbf{P}_1.\mathbf{Q}_0\mathbf{Q}_1) + (\mathbf{P}_1\mathbf{P}_2.\mathbf{Q}_0\mathbf{Q}_1) = (\mathbf{P}_0\mathbf{P}_2.\mathbf{Q}_0\mathbf{Q}_1), \tag{2.4}
$$

for all $P_0, P_1, P_2, Q_0, Q_1 \in \Omega$. Two vectors $\mathbf{P}_0\mathbf{P}_1$ and $\mathbf{Q}_0\mathbf{Q}_1$ are parallel ($\mathbf{P}_0\mathbf{P}_1 \uparrow\uparrow \mathbf{Q}_0\mathbf{Q}_1$), if angle between the vectors is equal to 0, i.e.

$$
\frac{(\mathbf{P}_0\mathbf{P}_1.\mathbf{Q}_0\mathbf{Q}_1)}{|\mathbf{P}_0\mathbf{P}_1| \cdot |\mathbf{Q}_0\mathbf{Q}_1|} = 1, \qquad |\mathbf{P}_0\mathbf{P}_1| \equiv \sqrt{(\mathbf{P}_0\mathbf{P}_1.\mathbf{P}_0\mathbf{P}_1)}, \qquad |\mathbf{Q}_0\mathbf{Q}_1| \equiv \sqrt{(\mathbf{Q}_0\mathbf{Q}_1.\mathbf{Q}_0\mathbf{Q}_1)} \tag{2.5}
$$

Definition of parallelism (2.5) does not contain a reference to coordinate system, to a path of parallel transport, or to other means of description. The relation (2.5) determines parallelism of two remote vectors, using only world function σ. Parallelism of two vectors is absolute in the sense that any two vectors $\mathbf{P}_0\mathbf{P}_1$ and $\mathbf{Q}_0\mathbf{Q}_1$ are either parallel or not.

Vector $\mathbf{u}$ in n-dimensional Riemannian geometry is defined as a set of n quantities $\mathbf{u} = \{u_i\}$, $i = 1, 2, ...n$, given at some coordinate system K_n with coordinates $x = \{x^i\}$, $i = 1, 2, ...n$. At the coordinate transformation $K_n \to \tilde{K}_n$

$$
x^i \to \tilde{x}^i = \tilde{x}^i(x), \qquad i = 1, 2, ...n \tag{2.6}
$$

covariant components u_i of the vector $\mathbf{u}$ transforms as follows

$$
u_i \to \tilde{u}_i = \frac{\partial x^k}{\partial \tilde{x}^i} u_k, \qquad i = 1, 2, ...n \tag{2.7}
$$

Summation from 1 upto n is made over repeating indices.

Let x be coordinates of the point P, and x' be coordinates of the point P'. Then the vector $\mathbf{PP}'$ at the point P is introduced by the relation

$$
\mathbf{PP}' = \{-\sigma_i(x, x')\}, \qquad i = 1, 2, ...n \tag{2.8}
$$

$$
\sigma_i \equiv \partial_i \sigma(x, x') \equiv \frac{\partial \sigma(x, x')}{\partial x^i}, \qquad i = 1, 2, ...n \tag{2.9}
$$

where the world function σ is defined by the relation (1.4). Here $\sigma(x, x') = \sigma(P, P')$ is the world function between the points P and P'.

In the n-dimensional proper Euclidean space E_n and rectilinear coordinate system K_n the world function has the form

$$
\sigma(x, x') = \frac{1}{2} g_{(\mathrm{E})ik}\left(x^i - x'^i\right)\left(x^k - x'^k\right), \qquad g_{(\mathrm{E})ik} = \mathrm{const} \tag{2.10}
$$

and according to (2.8) the vector $\mathbf{PP}'$ has covariant coordinates $\left\{g_{(\mathrm{E})ik}\left(x^k - x'^k\right)\right\}$, $i = 1, 2, ...n$. Scalar product of two vectors $\mathbf{PP}'$ and $\mathbf{PP}''$, having common origin at the point P has the form

$$
(\mathbf{PP}'.\mathbf{PP}'')_{\mathrm{R_n}} = g^{ik}(x)\, \sigma_i(x, x')\, \sigma_k(x, x'') \tag{2.11}
$$

where index "$\mathrm{R_n}$" means that the scalar product is defined in the Riemannian space R_n according to conventional rules of Riemannian geometry.

According to (2.11) and in virtue of properties (1.5) of the world function of the Riemannian space we obtain

$$|\mathbf{PP}'|^2 \equiv (\mathbf{PP}'.\mathbf{PP}') = 2\sigma(P,P') \tag{2.12}$$

The definition (2.11) coincide with the general definition (2.1) in the following cases: (1) if the Riemannian space R_n coincide with the Euclidean space E_n, (2) if vectors $\mathbf{PP}'$ and $\mathbf{PP}''$ are infinitesimally small, (3) if $\sigma_i(x,x') = a\sigma_i(x,x'')$, $i = 1,2,...n$, $a =$const (as it follows from (1.5), (2.12)). In other cases the scalar products (2.11) and (2.1) do not coincide, in general. Besides, the scalar product (2.11) is defined only for vectors having a common origin. In the case of vectors $\mathbf{PP}'$ and $\mathbf{QQ}'$ with different origins the scalar product $(\mathbf{PP}'.\mathbf{QQ}')$ must be defined in addition. But this scalar product is not defined in Riemannian geometry, because to define $(\mathbf{PP}'.\mathbf{QQ}')$ for $Q \neq P$, the vector $\mathbf{PP}'$ must be transported at the point Q in parallel, and thereafter the definition (2.11) should be used. Result of parallel transport depends on the path of transport, and the scalar product $(\mathbf{PP}'.\mathbf{QQ}')$ for $Q \neq P$ cannot be defined uniquely. If one uses definition (2.1) and relation (1.4) for determination of $(\mathbf{PP}'.\mathbf{QQ}')$ for $\mathbf{Q} \neq \mathbf{P}$ the result is unique, but definition of parallelism on the base of this scalar product leads to a set of many vectors $\mathbf{QQ}'$, which are parallel to $\mathbf{PP}'$, whereas the conventional conception of Riemannian geometry demands that such a vector would be only one. In other words, the Riemannian geometry becomes to be inconsistent at this point.

The definition (2.1) does not contain any reference to the means of description, whereas the definition (2.11) does. The definition (2.11) is invariant with respect to coordinate transformation (2.6), but it refers to the dimension n of the space R_n and existence of n-dimensional manifold. It means that the definition (2.1) is more general and perfect, because it does not use special properties of the Euclidean world function σ_{E}.

These special properties of n-dimensional proper Euclidean space are determined as follows [4].

I:

$$\exists\mathcal{P}^n = \{P_0, P_1, ...P_n\}, \qquad F_n(\mathcal{P}^n) \neq 0, \qquad F_k\left(\Omega^{k+1}\right) = 0, \qquad k > n \tag{2.13}$$

where

$$F_n(\mathcal{P}^n) = \det||(\mathbf{P}_0\mathbf{P}_i.\mathbf{P}_0\mathbf{P}_k)|| = \det||g_{ik}(\mathcal{P}^n)|| \neq 0, \qquad i,k = 1,2,...n \tag{2.14}$$

Vectors $\mathbf{P}_0\mathbf{P}_i$, $i = 1,2,...n$ are basic vectors of the rectilinear coordinate system K_n with the origin at the point P_0, and metric tensors $g_{ik}(\mathcal{P}^n)$, $g^{ik}(\mathcal{P}^n)$, $i,k = 1,2,...n$ in K_n are defined by relations

$$g^{ik}(\mathcal{P}^n)\, g_{lk}(\mathcal{P}^n) = \delta_l^i, \qquad g_{il}(\mathcal{P}^n) = (\mathbf{P}_0\mathbf{P}_i.\mathbf{P}_0\mathbf{P}_l), \qquad i,l = 1,2,...n \tag{2.15}$$

II:

$$\sigma_{\mathrm{E}}(P,Q) = \frac{1}{2}g^{ik}(\mathcal{P}^n)\,(x_i(P) - x_i(Q))\,(x_k(P) - x_k(Q)), \qquad \forall P,Q \in \mathbb{R}^n \tag{2.16}$$

where coordinates $x_i(P)$ of the point P are defined by the relation

$$x_i(P) = (\mathbf{P}_0\mathbf{P}_i.\mathbf{P}_0\mathbf{P}), \qquad i = 1, 2, ...n \tag{2.17}$$

III: The metric tensor matrix $g_{lk}(\mathcal{P}^n)$ has only positive eigenvalues

$$g_k > 0, \qquad k = 1, 2, ..., n \tag{2.18}$$

IV. Continuity condition: the system of equations

$$(\mathbf{P}_0\mathbf{P}_i.\mathbf{P}_0\mathbf{P}) = y_i \in \mathbb{R}, \qquad i = 1, 2, ...n \tag{2.19}$$

considered to be equations for determination of the point P as a function of coordinates $y = \{y_i\}$, $i = 1, 2, ...n$ has always one and only one solution.

Conditions I – IV are necessary and sufficient conditions of that the σ-space $V = \{\sigma, \Omega\}$ is the n-dimensional proper Euclidean space [4]. These special properties of E_n are different for different dimension n, and contain a reference to n.

Let us use in Riemannian geometry two different definitions of parallelism, based on application of relations (2.5), (2.1) and (2.5), (2.11) respectively. Although definitions of (2.1) and (2.11) for the scalar product are different, they give the same result for parallelism of to vectors having a common origin.

The relations (2.5), (2.11) define, parallelism only for two vectors, having a common origin. To define parallelism of two remote vectors $\mathbf{u}(x)$ and $\mathbf{u}(x')$ in Riemannian geometry, one defines parallelism of two infinitesimally close vectors $\mathbf{u}(x)$ and $\mathbf{u}(x + dx)$ by means of the relation

$$u_i(x + dx) = u_i(x) - \Gamma_{il}^k(x)\, u_k(x)\, dx^l, \qquad i = 1, 2, ...n \tag{2.20}$$

$$\Gamma_{il}^k = \frac{1}{2} g^{kj}(g_{ij,l} + g_{lj,i} - g_{il,j}), \qquad g_{ij,l} \equiv \frac{\partial g_{ij}}{\partial x^l} \tag{2.21}$$

The vector $\mathbf{u}(x')$ at the point x' parallel to the vector $\mathbf{u}(x)$ is obtained by subsequent application of the infinitesimally small transport (2.20) along some path $\mathcal{L}$, connecting points x and x'. Note that the vectors $\mathbf{u}(x)$ and $\mathbf{u}(x + dx)$ are parallel, and besides they have the same length. In general, result of the parallel transport along $\mathcal{L}$ depends on $\mathcal{L}$. Such a situation is known as a lack of absolute parallelism. For flat Riemannian spaces there is the absolute parallelism, but for the curved Riemannian spaces the absolute parallelism is absent, in general.

Application of the parallelism definition, based on relations (2.5), (2.1) to vectors $\mathbf{PP}'$ and $\mathbf{P}_1\mathbf{P}''$ in Riemannian geometry with infinitesimally close points P and P_1 gives a result coinciding with (2.20), only if the displacement vector $\mathbf{PP}_1||\mathbf{PP}'$ (and hence $\mathbf{PP}_1||\mathbf{PP}''$). This property provides one-dimensionality of geodesics, obtained as a result of deformation of Euclidean straights. In other cases, the results of two definitions of parallelism appear to be different, in general, because the relation (2.20) gives only one vector $\mathbf{u}(x + dx)$, parallel to $\mathbf{u}(x)$, whereas relations (2.5), (2.1) generate, in general, a set of many vectors $\mathbf{P}_1\mathbf{P}''$, which are parallel to $\mathbf{PP}'$, but which are not parallel, in general, between themselves [4]. The difference is conditioned by the fact that the condition of parallelism (2.5) contains only one relation, whereas the condition of parallelism (2.20) contains n relations.

To explain the reason of this difference, let us rewrite relations (2.5), (2.11) in the form of scalar product of two unit vectors $\sigma_i(x,x')(2\sigma(x,x'))^{-1/2}$ and $\sigma_i(x,x'')(2\sigma(x,x''))^{-1/2}$

$$g^{ik}(x)\frac{\sigma_i(x,x')}{\sqrt{2\sigma(x,x')}}\frac{\sigma_k(x,x'')}{\sqrt{2\sigma(x,x'')}}=1, \tag{2.22}$$

Let the matrix of metric tensor $g^{ik}(x)$ has eigenvalues of the same sign. Then both vectors $\sigma_i(x,x')(2\sigma(x,x'))^{-1/2}$ and $\sigma_i(x,x'')(2\sigma(x,x''))^{-1/2}$ are equal, and one relation (2.22) is equivalent to n relations

$$\sigma_i(x,x')=a\sigma_i(x,x''), \qquad i=1,2,...n, \qquad a>0 \tag{2.23}$$

where a is some constant. Conditions (2.23) with arbitrary $a\neq 0$ mean that vectors $\mathbf{PP}'$ and $\mathbf{PP}''$, having a common origin, are collinear (parallel or antiparallel), provided their components are proportional.

In the n-dimensional proper Euclidean space E_n this condition can be written σ-immanently. Let vector $\mathbf{P}_0\mathbf{R}$ be collinear to the vector $\mathbf{P}_0\mathbf{P}_1$. Let us choose $n-1$ points $\{P_2,P_3,...P_n\}$ in such a way, that n vectors $\mathbf{P}_0\mathbf{P}_i$, $i=1,2,...n$ form a basis. Then the collinearity condition (2.23) of vectors $\mathbf{P}_0\mathbf{R}$ and $\mathbf{P}_0\mathbf{P}_1$ takes the form of n relations

$$(\mathbf{P}_0\mathbf{P}_i.\mathbf{P}_0\mathbf{R})=a(\mathbf{P}_0\mathbf{P}_i.\mathbf{P}_0\mathbf{P}_1), \qquad i=1,2,...n \tag{2.24}$$

Eliminating a from n relations (2.24) we obtain $n-1$ relations, which are written in the form

$$\mathbf{P}_0\mathbf{P}_1||\mathbf{P}_0\mathbf{R}: \qquad \begin{vmatrix} (\mathbf{P}_0\mathbf{P}_1.\mathbf{P}_0\mathbf{R}) & (\mathbf{P}_0\mathbf{P}_i.\mathbf{P}_0\mathbf{R}) \\ (\mathbf{P}_0\mathbf{P}_1.\mathbf{P}_0\mathbf{P}_1) & (\mathbf{P}_0\mathbf{P}_i.\mathbf{P}_0\mathbf{P}_1) \end{vmatrix}=0, \qquad i=2,3,...n \tag{2.25}$$

Thus, we have two different formulation of the collinearity conditions of vectors $\mathbf{P}_0\mathbf{R}$ and $\mathbf{P}_0\mathbf{P}_1$: (2.25) and the relation

$$\mathbf{P}_0\mathbf{P}_1||\mathbf{P}_0\mathbf{R}: \qquad \begin{vmatrix} (\mathbf{P}_0\mathbf{P}_1.\mathbf{P}_0\mathbf{P}_1) & (\mathbf{P}_0\mathbf{P}_1.\mathbf{P}_0\mathbf{R}) \\ (\mathbf{P}_0\mathbf{R}.\mathbf{P}_0\mathbf{P}_1) & (\mathbf{P}_0\mathbf{R}.\mathbf{P}_0\mathbf{R}) \end{vmatrix}=0 \tag{2.26}$$

which follows from (2.5). In E_n conditions (2.25), and (2.26) are equivalent, because choice of $n-1$ points $\{P_2,P_3,...P_n\}$ is arbitrary, and they are fictitious in (2.25). The collinearity conditions (2.25) and (2.26) are equivalent due to special properties (2.16) of E_n. In the n-dimensional proper Riemannian geometry the conditions (2.25), and (2.26) are also equivalent, and points $\{P_2,P_3,...P_n\}$ are also fictitious in (2.25). This is connected with the special choice of the world function (1.4) of n-dimensional Riemannian space. At another choice of the world function the points $\{P_2,P_3,...P_n\}$ stop to be fictitious.

To manifest difference between the conditions (2.25) and (2.26), let us construct the straight $\mathcal{T}_{P_0P_1}$, passing through points P_0,P_1, defining it as set of such points R, that $\mathbf{P}_0\mathbf{R}||\mathbf{P}_0\mathbf{P}_1$. Using two variants of the collinearity conditions (2.25), and (2.26) we obtain two different geometric objects

$$\mathcal{T}_{P_0P_1}=\{R|\ \mathbf{P}_0\mathbf{P}_1||\mathbf{P}_0\mathbf{R}\}=\left\{R|\left(\mathbf{P}_0\mathbf{P}_1.\mathbf{P}_0\mathbf{R}\right)^2=|\mathbf{P}_0\mathbf{P}_1|^2\left|\mathbf{P}_0\mathbf{R}\right|^2\right\} \tag{2.27}$$

and

$$\mathcal{L}=\left\{R\left|\bigwedge_{k=2}^{k=n}f\left(P_0,P_1,P_k,R\right)=0\right.\right\}=\bigcap_{k=2}^{k=n}\left\{R\left|f\left(P_0,P_1,P_k,R\right)=0\right.\right\} \tag{2.28}$$

where

$$f\left(P_0,P_1,P_i,R\right)=\left|\begin{array}{cc}(\mathbf{P}_0\mathbf{P}_1.\mathbf{P}_0\mathbf{R}) & (\mathbf{P}_0\mathbf{P}_i.\mathbf{P}_0\mathbf{R})\\ (\mathbf{P}_0\mathbf{P}_1.\mathbf{P}_0\mathbf{P}_1) & (\mathbf{P}_0\mathbf{P}_i.\mathbf{P}_0\mathbf{P}_1)\end{array}\right|=0,\qquad i=2,3,...n \tag{2.29}$$

In the n-dimensional proper Euclidean space and in the n-dimensional proper Riemannian space geometric objects $\mathcal{L}$ and $\mathcal{T}_{P_0P_1}$ coincide, but at a more general form of the world function geometric objects $\mathcal{L}$ and $\mathcal{T}_{P_0P_1}$ are different, in general.

The relation (2.28) determines the straight $\mathcal{L}$ in the n-dimensional proper Euclidean space as an intersection of $n-1$ $(n-1)$-dimensional surfaces

$$\mathcal{S}\left(P_0,P_1,P_k\right)=\left\{R\left|f\left(P_0,P_1,P_k,R\right)=0\right.\right\},\qquad k=2,3,...n \tag{2.30}$$

In general, such an intersection is a one-dimensional line, but this line is determined by $n+1$ points $\mathcal{P}^n\equiv\{P_0,P_1,...,P_n\}$, whereas the straight $\mathcal{T}_{P_0P_1}$, defined by the relation (2.27), depends only on two points P_0,P_1.

In general case, when the special properties of the Euclidean space disappear, the relation (2.28) describes one-dimensional object depending on more than two points. Thus, one can eliminate dependence of the collinearity definition (2.23) on the coordinate system, but instead of this dependence a dependence on additional points appears. These additional points $P_2,P_3,...$ represent the coordinate system in the σ-immanent form. The number of additional points which are necessary for determination of the straight (2.23) as a one-dimensional line depends on the dimension of the Euclidean space. From formal viewpoint the geometric object $\mathcal{L}$, determined σ-immanently by (2.28), is not a straight, but some other geometric object, coinciding with the straight in the n-dimensional proper Euclidean space.

The straight in the n-dimensional proper Euclidean space has two properties: (1) the straight is determined by two points P_0, P_1 independently of the dimension of the Euclidean space, (2) the straight is a one-dimensional line. In general, both properties are not retained at deformation of the Euclidean space. If we use the definition (2.27), we retain the first property, but violate, in general, the second one. If we use the definition (2.28), depending on the Euclidean space dimension and on the way of description (in the form of coordinate system, or in the form of additional arbitrary points), we retain the second property and violate, in general, the first one. Which of the two definitions of the straight should be used?

The answer is evident. Firstly, the definition (2.27) does not refer to any means of description, whereas the definition (2.28) does. Secondly, the property of the straight of being determined by two points is the more natural property of geometry, than the property of being a one-dimensional line. Use of the definition (2.27) is a logical necessity, but not a hypothesis, which can be confirmed or rejected in experiment. Consideration of the straight as an one-dimensional geometric object *in any geometry* is simply a preconception, based on the fact, that in the proper Euclidean geometry the straight is a one-dimensional geometric object. The statement that there is only one vector $\mathbf{Q}_0\mathbf{Q}_1$ of fixed length which is parallel to the vector $\mathbf{P}_0\mathbf{P}_1$ is another formulation of the preconception mentioned above.

3 Consequence of inconsistent definition of parallelism

Abstracting from the history of the Riemannian geometry creation and motives of its creation, let us evaluate what is the Riemannian geometry as a kind of physical geometry. The conventional Riemannian geometry is to be a special case of a physical geometry, constructed on the basis of the principle of geometry deformation. The Riemannian geometry uses definition of the scalar product (2.11), which is completely compatible with the principle of geometry deformation only for several geometries. To compensate inconsistencies, generated by incorrectness of definition (2.11), the Riemannian geometry uses the constraint (1.4), tending to eliminate geometries, for which the definition (2.11) is inconsistent. The constraint (1.4) removes most of possible inconsistencies, but not all, and the Riemannian geometry appears to be inconsistent geometry.

In contemporary geometry and physics the definition (2.23) or (2.28) is used, and this circumstance is a reason for many problems, because this definition lies in the foundation of geometry, and geometry in turn lies in the foundation of physics.

Let us list some consequences of the statement that the straight is a one-dimensional geometric object in any space-time geometry.

1. Lack of absolute parallelism in the space-time geometry (i.e. in Riemannian geometry used for description of the space-time).

2. Discrimination of any space-time geometry, where the timelike straight is not a one-dimensional object, and (as a corollary) discrimination of stochastic motion of microparticles.

3. Consideration of spacelike straights, describing superlight particles (taxyons), in the Minkowski space-time geometry, as one-dimensional geometric objects.

Let us discuss the first point. The world function of the Riemannian geometry is chosen in such a way that the tube $\mathcal{T}_{P_0P_1}$ (we use this term instead of the term "straight "), passing through the points P_0, P_1 and defined by the relation (2.27), is a one-dimensional geometric object in the Riemannian space-time geometry, provided interval between the points P_0, P_1 is timelike ($\sigma(P_0,P_1)>0$). But the timelike tube

$$\mathcal{T}(P_0,P_1;Q_0)=\{R|\ \mathbf{P}_0\mathbf{P}_1||\mathbf{Q}_0\mathbf{R}\}=\left\{R|\left(\mathbf{P}_0\mathbf{P}_1.\mathbf{Q}_0\mathbf{R}\right)^2=|\mathbf{P}_0\mathbf{P}_1|^2|\mathbf{Q}_0\mathbf{R}|^2\right\} \quad (3.1)$$

passing through the point Q_0 parallel to the remote timelike vector $\mathbf{P}_0\mathbf{P}_1$, is not a one-dimensional object, in general, in the σ-Riemannian geometry (in Riemannian geometry $\mathcal{T}(P_0,P_1;Q_0)$ is not defined). One cannot achieve that any timelike tube (2.27) to be a one-dimensional geometric object. In other words, one cannot suppress globally nondegeneracy of all collinearity cones of timelike vectors $\mathbf{Q}_0\mathbf{R}$, parallel to the timelike vector $\mathbf{P}_0\mathbf{P}_1$, although locally the collinearity cone nondegeneracy of timelike vectors $\mathbf{P}_0\mathbf{R}$, parallel to the timelike vector $\mathbf{P}_0\mathbf{P}_1$, can be suppressed, if the world function is restricted by the constraint (1.4). In fact, according to the correct definition (2.26) in the σ-Riemannian geometry there are many timelike vectors $\mathbf{Q}_0\mathbf{R}$ of fixed length, which are parallel to the remote timelike vector $\mathbf{P}_0\mathbf{P}_1$. As far as according to the Riemannian conception of geometry there is to be only one timelike vector $\mathbf{Q}_0\mathbf{R}$ of fixed length, which is parallel to the remote timelike vector $\mathbf{P}_0\mathbf{P}_1$, one cannot choose one vector among the set of equivalent vectors $\mathbf{Q}_0\mathbf{R}$, and one is forced to deny the absolute parallelism.

The point two. The Minkowski space-time geometry T_{M} with the σ-space $\{\sigma_{\mathrm{M}},\mathbb{R}^4\}$ is the unique uniform isotropic flat geometry in the class of Riemannian geometries. The class of uniform isotropic T-geometries on the set $\mathbb{R}^4$ of points is described by the world function $\sigma=\sigma_{\mathrm{M}}+D(\sigma_{\mathrm{M}})$, where the arbitrary distortion function D describes character of nondegeneracy of timelike tubes $\mathcal{T}_{P_0P_1}$. In the Minkowski space-time geometry a motion of free particles is deterministic. If $D>0$ the world line of a free particle appears to be stochastic, because the running point moves along the world line in the direction of vector tangent to the world line. There are many vectors tangent to the world line. The particle can move along any of them, and its motion becomes stochastic, (see details in [2]). In fact, motion of microparticles (electrons, protons, etc.) is stochastic. It means that the Minkowski geometry is not a true space-time geometry. One should choose such a space-time geometry, which could explain stochastic motion of microparticles. Such a space-time geometry is possible. In this space-time geometry the distortion function $D(\sigma_{\mathrm{M}})=\hbar/(2bc)$ for $\sigma_{\mathrm{M}}>\sigma_0\approx\hbar/(2bc)$, where $\hbar$ is the quantum constant, c is the speed of the light, and b is a new universal constant. In such a space-time geometry the world function contains the quantum constant $\hbar$, and nonrelativistic quantum effects are explained as geometric effects [2]. Insisting on the definition (2.23) of the parallelism, we discriminate space-time geometries with $D\neq0$. As a result we are forced to use incorrect space-time geometry and to explain quantum effects by additional hypotheses (quantum principles).

Let us consider straights in the Minkowski geometry. Let us define straight by the relation (2.27). Let $\mathbf{e}=\mathbf{P}_0\mathbf{P}_1$ and $\mathbf{x}=\mathbf{P}_0\mathbf{R}$ be the running vector. Then the relation determining the straight $\mathcal{T}_{P_0P_1}$ has the form

$$\mathcal{T}_{P_0P_1}:\qquad \begin{vmatrix}(\mathbf{e}.\mathbf{e}) & (\mathbf{e}.\mathbf{x})\\ (\mathbf{x}.\mathbf{e}) & (\mathbf{x}.\mathbf{x})\end{vmatrix}=0 \qquad (3.2)$$

Looking for its solution in the form

$$\mathbf{x} = \mathbf{e}\tau + \mathbf{y} \tag{3.3}$$

and substituting this expression in (3.2), we obtain the equation of the same form.

$$\begin{vmatrix} (\mathbf{e}.\mathbf{e}) & (\mathbf{e}.\mathbf{y}) \\ (\mathbf{y}.\mathbf{e}) & (\mathbf{y}.\mathbf{y}) \end{vmatrix} = 0 \tag{3.4}$$

Evident solution $\mathbf{y} = \alpha\mathbf{e}$ is not interesting, because it has been taken into account in (3.3). Imposing constraint $(\mathbf{e}.\mathbf{y}) = 0$, one obtains from (3.4)

$$(\mathbf{e}.\mathbf{y}) = 0, \qquad \mathbf{y}^2 = 0$$

If the vector $\mathbf{e}$ is timelike, for instance, $\mathbf{e} = \{1, 0, 0, 0\}$, then $\mathbf{y} = 0$. If the vector $\mathbf{e}$ is spacelike, for instance, $\mathbf{e} = \{0, 1, 0, 0\}$, then the solution has the form $\mathbf{y} = \{a, 0, a\cos\psi, a\sin\psi\}$, where a and ψ are arbitrary parameters. Thus, in the Minkowski space the timelike straight is a one-dimensional object, whereas the spacelike "straight" is a three-dimensional surface, containing the one-dimensional spacelike straight $\mathbf{x} = \mathbf{e}\tau$. In other words, timelike directions are degenerate, and free particles, moving with the speed $v < c$, are described by one-dimensional timelike straights. The spacelike directions are nondegenerate, and free particles, moving with the speed $v > c$ (taxyons) are described by three-dimensional surfaces. It is difficult to say, what does it mean practically. But, maybe, taxyons were not discovered, because they were searched in the form of one-dimensional spacelike lines.

4 Overcoming of the Riemannian geometry inconsistency and possible consequences of this overcoming

Finally, let us make several important remarks, concerning relation of the scientific community to the considered problem.

Sometimes a physical theory is inconsistent, or it contains some wrong statement, which cannot be discovered and corrected. In other words, the theory appears to be imperfect. Sometimes one cannot simply reject such a theory, because a more perfect theory is absent. But a theory is necessary, because any theory (perfect, or imperfect) elaborate some concepts which admit to describe and to systematize observed phenomena. For this reason even imperfect theory is better, than lack of a theory. Working with imperfect theory, researchers discover that some logical conclusions, founded on statements of such a theory do not lead to true results. This circumstance generates a distrust of researchers to logical conclusions, which has not been confirmed experimentally. During long work with the imperfect theory this distrust increases an takes some exaggerated form, when researchers distrust not to the theory itself, but to the method of obtaining of predictions from the theory. Such an approach is quite natural, when the theory works fine for one set of phenomena, but it cannot explain another phenomena (usually newly discovered).

Attempts of improving such a theory appear to be unsuccessful, and the theory appears to have no alternative. The best, that can be done in such a situation, is an addition of a list of exclusions from rules to the rules, obtained by the logical way from the fundamental statements of the theory. As the theory is developed, the list of exclusions increases and some of exclusions turn to rules. Thereafter exclusions from these new rules appear. The further development of the theory is carried out by means of further increase of new rules which are invented for explanations of newly discovered phenomena. The number of rules becomes so large that their connection with the fundamental statements of the theory is lost. Concept of so called scenario appears. Now the researchers are not interested in the question whether or not the connection between the fundamental statements and the rules supposed newly can be established. It is important only one thing: to establish such a set of rules (scenario) to explain some set of physical phenomena. What is the number of these rules and how they are connected with fundamental statements of the theory is considered to be secondary. The scenario is considered to be well (as compared with other ones), if it can explain or predict some new physical phenomenon, which cannot be explained by other scenarios. The number of suppositions made at the scenario construction is of no importance. Nobody troubles about the circumstance that at the explanation of newly discovered physical phenomena now existing scenario will be replaced by a new scenario. Explanation of such a frequent change of scenarios is as follows. The microcosm is very complicated. One needs to change many scenarios before one succeeds to explain it.

The described way of obtaining new scenarios is bad, because in reality one fails to explain anything. Something like that took place in the science history. In his doctrine of celestial mechanics Ptolemeus used incorrect statement that the Earth (not the Sun) is a center of the planetary system. He succeeded to compensate incorrect fundamental statement by means of additional suppositions on the heaven bodies motion (epicycles and differents). His doctrine described fine the solar and lunar eclipses and the observed motion of planets. If discrepancies between the calculations and observations appeared, the necessary number of epicycles was added. Thereafter the agreement between the calculations and observations restored. The observations were explained. What did one need else?

The Ptolemaic doctrine was some fitting of rules using in theory to such a form which could explain observational data. Although something was behind this fitting, but nevertheless it was a fitting, because it did not correct erroneous statement of the theory, and the theory could not develop effectively. On the basis of the Ptolemaic doctrine one cannot discover the law of gravitation and construct dynamics, which was constructed by Newton subsequently. Once Copernicus had corrected the mistake in the Ptolemaic doctrine and made the Sun to be a center of the planetary system, all this could be made. Copernicus died at once after publication of his doctrine, and he was not forced to answer the sacramental question of Ptolemaic disciples: "Can the Copernicus doctrine explain any observed phenomena, which cannot be explained by the Ptolemaic doctrine? If no, then why is it better, than the Ptolemaic doctrine?"

One can answer to the second part of the question, referring to the fact that the Copernicus doctrine contains less fundamental statements, than the Ptolemaic one, because the Copernicus doctrine does not contain arbitrary suppositions connecting with a choice of epicycles. But the first part of the question cannot be answered positively, because there were no observed phenomena which could not be explained by the Ptolemaic doctrine and could be explained by the Copernicus one. Furthermore calculations according to the Ptolemaic doctrine were more exact, because in the first version of the Copernicus doctrine the planets moved along the cycles (but not along ellipses), whereas in the framework of Ptolemaic doctrine the necessary number of epicycles could be taken always. From viewpoint of the Ptolemaic disciples the impossibility of presentation of new observed phenomena, which could not explain by the Ptolemaic doctrine, was a very serious defect of the Copernicus doctrine. As regards the reduction of the number of fundamental statements in the Copernicus doctrine, it was not considered to be an essential advantage of the doctrine. From viewpoint of researchers dealing with fitting the number of used fundamental statements was of no importance.

In the beginning of the XX century a stochastic character of the microparticles motion was discovered. Being a strongly deterministic theory, the classical mechanics could not explain this stochasticity. For explanation of this phenomenon one needed to itemize the space-time geometry again. Unfortunately, it was impossible, because there was a *mistake* (in particular, in definition of parallelism) in foundation of geometry. This mistake must be discovered by physicists. But the idea of solving physical problems by improving the geometry foundation did not occur to physicists. Existence of this mistake did not perturb mathematicians, because it led mainly to restriction of the class of possible geometries. Besides, the geometry foundations was considered to be a solved problem, and mathematicians made up their mind to lack of absolute parallelism in the Riemannian geometry.

But the microcosm should be investigated, and physicists had no choice except for following the Ptolemaic way. Then physicists had invented the quantum principles. They were additional suppositions which were exceptions from the classical mechanics principles. These exceptions formed a new system of rules. On the basis of these rules the nonrelativistic quantum mechanics had been constructed. The quantum mechanics was a kind of Ptolemaic conception, because it contained a mistake very deeply in its foundation. It was developed according to the laws of development of a Ptolemaic conception, i.e. by the trial and error method. First the quantum theory was developed very successfully and amazingly fast. When it went outside the domain, where the quantum principles were applicable (domain of nonrelativistic phenomena), its development slacked and finally came to a deadlock. The relativistic quantum theory was enriched by a lot of new scenarios (it is the same as epicycles in the Ptolemaic theory). But there is a luck of human imagination for inventing those things which could be obtained in the true theory by means of a common logic. In this relation the example of interplay of doctrines of Copernicus and Ptolemeus is very characteristic.

The classical mechanics in space-time with the correctly chosen geometry explains freely quantum effects without using quantum principles and other additional suppositions. But from viewpoint of contemporary researchers of microcosm this circumstance is of no importance. Three generations of the microcosm researchers are educated in the example of the investigation method of the type: hypothesis – experimental test. This method is the only possible investigation method in the framework of a Ptolemaic conception. The role of logical conclusions is reduced to the lowest notch. For the contemporary researchers of microcosm any test of a new conception reduces to the only question: "Is it possible to show such physical phenomena which could be explained by the newly suggested theory and could not be explained by the existing theory and existing scenarios?" If yes, then such a theory deserves a consideration. If no, then such a theory is not better, than already existing theory.

The same question was posed by Ptolemeus disciples for Copernicus disciples: Galileo, Kepler and Newton. To answer this question they needed hundred years. Maybe, now the time needed for the answer will be of the same order. The fact is that this question is invented specially for a test of new scenarios, because the connection between a scenario and corresponding experiment is very close. Any scenario is invented for explanation of some experiments. In the case, when the peculiarities of microcosm are explained by its space-time geometry, we have another situation. Firstly, it is necessary to chose the valid space-time geometry leading to the true character of the particle stochasticity. Secondly, it is necessary to construct the particle dynamics in such a "stochastic" geometry. Thirdly, it is necessary to construct dynamics of metric fields (electromagnetic, gravitational and other metric fields, generated by asymmetric T-geometry). Fourthly, one needs to construct theory of the matter influence on the space-time geometry. Maybe, some additional problems will arise that cannot be envisaged now. One can discuss seriously the question whether such a theory agrees with the experiment only after all this has been done.

To construct all this, it is necessary efforts of many researchers, as far as it carries too many guns for one person. Only one thing may be predicted in advance. Such a theory will be not worse, than the already existing conceptions, as far as all existing scenarios may be developed in the new space-time geometry with the same or greater success. But there is a hope that these scenarios will be not used, as well as we did not need the quantum mechanics principles for explanation of nonrelativistic quantum effects. This hope is founded on the fact, that we succeeded to remove an inconsistency from the geometry foundations.

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