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WHAT IS MOTION

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This book was being written over more than thirty years. The author has made an effort to create the universal theory of motion meeting the requirements of natural science that continuously grow. A reader is supposed to have sufficient knowledge of general problems of modern physics to comprehensively read this theoretical study. However, anyone reading this book will undoubtedly feel reverence for the greatness and beauty of the Universe, the Lord predestined all of us to live in.

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PREFACE

The title of this book reflects, in a rather unambiguous manner, its principal contents and destination. In the course of reading the proposed work a reader will get to know what is motion as the author interprets it, and how is it realized in the world around us. In the preamble I would like to mention, probably, the most unexpected aspect of this theoretical study.

The creative search got along in such a way that to successfully solve the set problems which lead to motion understanding, the author had to face the problem of the Universe beginning. All the attempts to adapt the emerging mechanics of motion to the widely used “Big Bang” modern scientific theory did not give any positive results. Philosophical and physical texture of this popular cosmological hypothesis was helpless to assign such conceptual contents to the fundamental categories of the Universe, such as “substance”, “space”, “time”, which could be conducive to develop the comprehensive theory of motion and satisfy the most exacting requirements. The grade of our penetration into the secret of motion impressively depends on the quality of notion status of the aforesaid fundamental categories. According to scientific ideas, any motion can be realized only in the interaction between these concepts.

After long and rather complicated reflections I came to a firm conviction that the most reasonable and constructive scenario of the

creation of the world was proposed in remote past by Prophet Moses in the First Book, called Genesis. In contrast to the "Big Bang" scenario the Bible version of the creation of the world proved to be extraordinary flexible and fruitful. It allowed to theoretically fill the fundamental categories of the Universe with renewed physical contents and real prerequisites to build universal, quantum-relativistic theory of relativity appeared.

The reader will be demonstrated later on, in the proper place, the way of how the Moses narration evaluates up to the fundamental physical consequences. Here I would like to draw reader's attention to the revealing prospect of the unity of the Holy Scripture doctrines with the experience of the modern natural science. It is impossible to overestimate this prospect, because any progress in this field has unique significance for the whole elucidative culture. The author really hopes that it is this circumstance that will be his greatest creative success.

The thing is that today the Christian part of the humanity, for example, disposes, supposedly, of two independent concepts of creation and existence of the Universe. On the one hand, we have God-inspired books of experience generalization. It is supposed that any scientific model responds the requirements of human thoughts much more strictly compared with the Holy Writ, if we base on the criterion of the external justification, that is, on the compatibility with the observed reality.

Traditionally, our world view is built, mainly, on the basis of one of the aforesaid concepts, the Holy Writ, which include rather perfect picture of the surrounding world functioning, free of internal contradictions. In addition, this picture allows us to almost completely satisfy the necessities of the human spirit. On the other hand, in the course of the long history of its evolution human community elaborated its proper scientific model of the Universe existence, based on everyday and sometimes they are in violent antagonism to each other. Though, in effect, science and religion solve the same problem. Both of them help a man to maintain intellectual and psychological equilibrium, living in this "beautiful and violent world", as poets say. Science copes with its problems, basing on its starry-eyed idea of the Universe constructed with the

account of our cognitive abilities, and the efforts of human mind allow us to logically comprehend it in full. Religion, in its turn, adheres to the respectful conviction of a man conceived and "made" in such a manner as to subordinate and subject his private life to the Supreme Will which governs the Universe. In contrasting a man and the outer space, the science ranks first the individual with his personal pretensions and methods of self-affirmation. At the same time, the religion calls to entrust one's destiny, with resigned humility, to the hands of the Divine Providence. Strictly speaking, here one can see the roots of the elucidative culture split.

We know not for how long the cleavage has taken place, and whether an untroubled harmony existed in the mind and souls of people with respect to the comprehension of the global picture of the Universe, and place and predestination of a man in it. However, there are no doubts that the modern science, deprived of immortal aspirations and hopes on eternity, as well as religion dogmatics groundlessness, is not capable to separately lead the mankind to the comprehensive truth that uniquely can bring us total satisfaction.

Indeed, uncompromising confrontation between science and religion, whose witness and active participants during a long period of time is a mankind, promoted, in a certain manner, in the course of progress, the formation of religious, social and natural-science ideas. At the same time, we must not ignore or reject the perniciousness of non-availability of a unique system of fundamental knowledge about life and sense of the Universe existence, in human community. Tragic discord between spirit and mind which relentlessly pursuits any thinking person and humanity as a whole, is a direct consequence of lack of the higher harmony in our comprehension of the Universe. The aspiration of such a harmony is natural and ineradicable as a life itself.

A great latent danger exists in the fact that we, in reality, do not imagine what grade of conflict a person is able to accept this confrontation to. Natural sciences continuously develop. Religious conviction also acquires deeper forms. The contradictions between them fatefully and persistently rend souls and hearts of men. The possibility for a man to be cracked by the force of this confrontation becomes more threatening with every passing day. In this anxious

situation, the necessity of searching ways for unity of the Holy Scriptures doctrines and the experience of modern natural science becomes extremely actual.

The source of hope and optimism in the issue of our comprehension of the Universe harmonization is the obvious non-naturalness of the situation when the two branches of fundamental culture, which serve as a sign of civilization evolution, have no common points of intersection in our understanding. Such a situation contradicts the fundamental principle of knowing the real world, which results from the condition of global unity of the universe and, respectively, global generality of laws which regulate its existence. The world is single and indivisible, and consequently, contradictions which appear in connection with satisfaction of necessities of human spirit and mind, have, mainly, subjective origin. Their reasons are in us, better to say, in the system of our knowledge of the Universe.

CREATION OF THE WORLD

Proposing two independent concepts of the Universe creation and functioning, we bear in mind that they possess, in principle, absolutely equal rights (if we analyze them basing on the wide gnosiological standpoint). Positionally, these two visions are seen "fifty-fifty", as we use to say. The science, using reasonable methods, cannot find incontrovertible arguments prohibiting existence of the Divine Providence in the Universe. Religion, in its turn, is not able to present categorical evidences of its dogmatic pillars objectivity. Meanwhile, the negation of God on the only reason that nobody has ever seen Him, is untenable just like the doubt in existence of the stationary magnetic field at the surface of our planet. Nobody has seen this field and one can scarcely be honoured with such a fate.

As a rule, adherents of the scientific picture of the world make references to experimental evidences in similar situations. For instance, they believe that readings of compass needle which is always oriented towards the North pole, can serve as objective argument confirming existence of the stationary magnetic field at the surface of the Earth. In such a case a person with religious conviction has the right to make reference to the sacred image of the Most Holy Mother of God. The image of the Mother of God, in its turn, indicates the authenticity and confirms trustworthiness of the historical origin of the evangelic text.

Objections may arise, which state that the image on an icon is a matter of human fantasy, mind and hands. However, in such a case one must think that magnetic compass is also a matter of human creative fantasy, mind and hands. And research complex in Serpukhov where the secrets of the micro-world are being studied, is a matter of human mind and hands to the same degree as Troitse-Sergiyeva Lavra – centre of ecclesiastic mysteries and trust in Christian decease of our life. We must clearly realize that the experience of a Christian, in its essence and according to its results, does not differ from the intrinsic position and experience of a scientist. We do not have any objective evaluation criterion which could allow us to compare merits and adequacy of church hermit persuasions with a pride of scientific conviction of a Nobel Laureate in Physics.

Well, and what is this scientific experiment? All the history of natural science progress proves the impossibility to get solid axiomatic fundamental for theoretical science basing on experiments. Our ideas about physical reality are always incomplete, hence, imperfect. We are permanently able to change these ideas, change axiomatic fundamental of physics to interpret recently discovered facts in the most natural and consistent manner. In the first turn, it happens because the science does not dispose of any inductive method leading directly to the fundamental concepts which could help us to comprehend and speculatively reproduce the real picture of the world. Our thinking is of a deductive nature, it develops on the bases of hypothetic ideas and axioms. As a result, we are not given to know whether the degree of their reliability and trustfulness is sufficient to reflect real, true state of affairs.

In contrast to science, the Holy Scripture is a system of knowledge which is apprehended as once ascertained given, which is not subject to and does not need any adjustment and improvement. In this sense, the Holy Scripture, as compared with science, looks like more mature and self-sufficient system of the world view. The style of application and quality of theological knowledge are marked with particular transcendent specifics. Science is dedicated to reasoning nature of material objects, while religion, mainly, helps a man to maintain psychological equilibrium between finiteness of his

terrestrial life and infinity of the Universe. That's why, we can say, nobody is going to groundlessly raise electromagnetic field to the level of the Holy Spirit. However, nobody has the right to deny the possibility to bring axiomatic fundamentals of a science and its logical structures into accord with the Holy Scripture doctrine.

Probably, among all the subject matters of the Universe existence, the interpretation of the most mysterious and grand act known as "creation of the world" reveals an irreconcilable stand of science and religion. The adequate theoretical scenario of the Universe birth has a very important cognitive importance. Pursuant to its instructions the fundamental conceptual arsenal, which characterizes principal categories of the Universe, namely, "substance", "space", and "time", is laid. We associate objective perception of the outer space with registration of these comprehensive categories. And it is always desirable that the origin of the proposed fund of fundamental categories of the Universe bases on the least possible number of logically independent principles, embracing, however, as wide range of natural phenomena as possible.

Therefore, it is safe to assert that the deep understanding of how the events in the Universe at the early stages of its existence evaluate, is of exclusive importance for the successful formation of global conception of the Universe existence. If the initial information we get about the Universe existence is wrong, then the fundamental conceptual arsenal becomes doubtful, and all the further huge logical constructions which seem to reflect the true physical picture of the universe, only aggravate the initial inferiority of our comprehension of the Universe. It is not occasional that the First Book, called Genesis, by Moses, which is the beginning of the Holy Scripture, starts with the narration of creative and foundational acts of the Divine Universe.

Let us think of the first day of the creation of the world according to Moses:

"In the beginning God created the heavens and the earth.

And the earth was waste and void; and darkness was upon the face of the deep: and the Spirit of God moved upon the face of the waters.

And God said, Let there be light. And there was light.

And God saw the light, that it was good; and God divided the light from the darkness. And God called the light Day, and the darkness He called Night. And there was evening and there was morning, one day."

In this unpretentious manner and with perplexing sincerity the Holy Scripture brings us into the mystery of the Universe creation.

Voluminous bibliography related to the Bible version of the Universe creation, including critical one, is known. Theology states that the Hebrew word "bara" meaning "to create from nothing", in contrast to the other word, "assa", which means creation from any material substance, is used in the expression "created". Creation of the world from nothing assumes the action of the Divine Providence, which does not need any additional improvised means. This is the main point of God's sovereign power and His all-essence.

It is difficult to find in the Books of the Bible more tasty morsel than the creation of the world by Moses, which serves for those who, at any time and being adepts of any philosophical school, try to overwhelm theological doctrines "by stock order". A critical mind finds the most vulnerable side of the Moses narration in these acts of creation of "everything from nothing". A weak point of the Bible version results from the unavailability of a clear motivation of definitions: What is everything? And what is nothing? Convincingness of the Old Testament scenario of the creation of the world depends exclusively on our ability to find answers to these sacramental questions. To reconcile scientific idea with the religious standpoint concerning the creation of the world the theology needs to know to illustrate physical mechanism of substance beginning from nothing – according the Hebrew word "bara" interpretation.

As we know, the modern natural science disposes its own scenario of the creation of the world, which is independent of the Holy Scripture. This scenario, in the final analysis, comes to the effect of the Big Bang. The science invites us to come back to the past, to the events which happened billion years ago, and consider the situation when all the matter of the Universe was concentrated in a limited zone of space. Once a tremendous explosion of this matter occurred, and the matter scattered in the empty Universe in different directions like in a globe which is blowing uniformly. All the cosmic

conglomerates – galactic masses, planets, and interstellar dust appeared as a result of such a universal expansion. In short, we mean absolutely everything, which we characterize as material objects. According to recent cosmological evaluations, the first milliseconds of the existence of the Universe corresponded to the appearance of elementary particles, later on, in several seconds, the formation of atomic structures took place. Hence, any elementary particle of the matter may be considered as spectator and eyewitness of those remote exotic events. Easily observed red shift of spectral lines of light signal emitted by distant galaxies confirms the truth of the Big Bang theory. In brief, this is the scientific version of the Universe appearance.

The scientific scenario of the creation of the world also abounds in sacramental questions. A scientific thought, for example, is hampered by incomprehensibility of substance appearance and existence before the moment of the universe explosion. It is absolutely unclear, what has happened later, after the Big Bang. Where did, in fact, once exploded substance appear from? Moreover, many questions are associated with very complicated and diverse problems which emerge in the connection with this explosion if moving towards the commencement (when time $t = 0$).

As it often happens in our activity, a peculiar vogue takes place. It was time when the science considered convenient to present before-the-explosion substance as a global cosmic egg. It is difficult to deliver from a sound wish to look at that amusing bird that managed to lay such an egg. At present, the hypothesis of the Universe substance originating from the quantum jump as from nothing, strengthens its positions. In fact, it is approaching to the Bible version of the creation of the world. Sometimes one can observe attempts to get round cosmological difficulties by developing the pulsing model of the Universe on the basis of the repeating principle that underlies the famous Russian children's song "about the priest and his beloved dog". But such a manoeuvre by no means touches upon the crucial question of the universe fate at early stages; it only stimulates its solution. Therewith, the closed oscillating model of the Universe faces serious difficulties because of the infinite growth of entropy, which is inevitably associated with such a closed physical

system. In general, the situation with the scientific scenario of the creation of the world becomes dead-ended and dramatic, as it is found after Moses' words "Let there be light". The reason is that the number of unsolvable questions following the scientific version of the creation of the world, obviously, prevails over quality and quantity of answers to them.

To accept scientific scenario of the creation of the world, the theology formulates a prerequisite: scientists must answer a simple question – who or what is an author of all those complicated processes and manipulations which have taken place and are continually observed in the Universe? None normal person with his/her incomprehensibility of the own life, can accept the idea of his/her appearance in this world as a result of any thoughtless circumstances. Can one indifferently accept any thoughtless model of scientific and theoretical schemes applied to the scale of all the Universe existence? A tendency to search the secret of the creation of the world basing on any simplified, initial plasma state of the Universe, or anything else, looks too doubtful.

Moreover, why shall we only simplify the issues? Why is it this area of search that is chosen? Who has decided that one must advance towards the alphas of the Universe existence exclusively through the primitivism, that is, by resolving it into the simplest components? What can one say about a man, resolving him into elementary particles the substance consists of? Following this way we shall simply destruct the object of study itself. It goes without saying that a person, eventually, consists of a very large number of micro-structural combinations, but they do not determine the phenomenology of any individual being. These micro-particles, any concrete person consists of, have always existed on the Earth, they have existed before the appearance of this person in the Christendom, and they will remain in full after the person dies. Therefore, elementary particles of any substance are not related to the phenomenon of human nature. Even if one day we succeed to formulate the comprehensive theory of physics of the micro-world, things will not budge an inch to understand the supreme sense and predestination of the human life.

Is it not the same that happens when we try to perceive the great mystery of the creation of the Universe by reducing this act to the appearance of primitive material formations, to the physics of the micro-world? In this connection it would be useful to thing, whether it is possible for the Universe not to exist, isn't it a vain pastime – to arrange a birthday for the Universe? Isn't it more reasonable and reliable matter to dedicate our attention to some higher ideas and everlasting substances which embody really creative principles? We mean those ideas which are capable to give internal harmony and supreme reasonability to our conception of the Universe life. In any case, we must recognize that while the science looks for the secret of the creation of the world by simplifying the Universe, the religion turns to the higher creative forces, that does it honour.

Naturally, mutual pretensions and requirements brought by science and religion, must not lead to the point of absurdity. Because, upon atheist's barbaric request to show him the bedchamber of the Lord of Sabaoth, a Christian can always ask an atheist to demonstrate stool's ability to sing "Faust", in the light of evolution logics of dialectic materialism. However, we see that any confrontation between science and religion, in particular, in the sphere of the creation of the world, is rather uncompromising and double-edged.

It is already mentioned that the problem of the Universe appearance is characterized with extraordinary heuristic features, because as the result, the principal categories of the Universe, namely, "substance", "space", and "time", get their physical meaning. Logical series of the inverse sequence allows us to believe that the depth of our penetration into the great mystery of the creation of the world substantially depends on the grade of our attempts to adequately attribute the principal categories of the Universe. Moreover, the quality of all the collection of physical regulations governing the life of the Universe is determined, in fact, by the possibility to adequately attribute the categories of "substance", "space", and "time".

Intuitively, we imagine that space-time properties of the Universe framework, and the properties of any substance which is its material filling, must be interdependent and closely related to each other. In particular, it means that space and time, which possess their given

properties, may include a filling of a definite character. And vice-versa, given properties of any substance do not admit any arbitrariness in the choice of space-time framework. There is no doubt that certain relationship between the principal categories of the Universe exists, but it is not an easy task to disclose its character. To solve this problem, we must make a small historical review, which allows us to track the process of scientific view formation for the categories of "substance", "space", and "time".

When fundamental problems become an object of theoretical studies, the factor of finding a correct way to formulate a question related to the object of interest, acquires special importance. The ability to correctly put questions to the nature is highly appreciated in the science, and this requirement becomes even stricter for major tasks. The more crucial the status of the object of interest and wider the range of its application, the more diverse the scope of subjects included into the research process. Therefore, we need to know to select the most essential and critically important issues of this diversity. It is impossible to find any sphere in physics which, in one or another way, does not relate to the problem of attribution of the principal categories of the Universe. Any physical subject has the right to pretend to an outstanding part in the issue of adequate attribution of substance, space, and time. Prior to beginning the work with these categories, we must determine formal platform which could adequately confine such an infinite diversity of possible variation of approaches to the given subject matter.

If the assumption that any science develops towards the increasing simplicity of its logical fundamentals is true, we can, in principal, choose a formal platform consisting of four theoretically acceptable statements, and in the framework of these statements a research thought is capable to analyze the categories of "space" and "substance" from the standpoint of their possible material attribution. In this context, we bear in mind those four theoretically acceptable combinations when substance and space may be alternately considered as matter or another physical substance.

Let us write in compact form these four theoretically acceptable statements in the following order:

Firstly, we can assume that the notion of substance, even if it is an elementary particle, is matter. And space isn't a matter, in other words, it is void.

Secondly, we can accept space as matter, and elementary particles of substance being holes in void.

Thirdly, we can define space and the simplest elements of substance in it, as two absolutely different and independent kinds of matter;

And finally, we have the possibility to declare space and substance in it as the derivatives of the unique material substratum, as the derivatives of matter, which can take different qualitative and distinctive forms depending on the peculiarities of its actual physical conditions.

The idea of four formally acceptable statements noticeably restricts the sector of search for an adequate theoretical equivalent for the principal categories of the Universe. These statements don't allow us to lead the research thought away, towards abstract and farfetched constructions, which do not correlate with our speculative imagination. Naturally, in reality, the character of interrelations between space and substance is much more complicated than one can deduce basing on suggested basic wordings. However, in principle, any other variants are the work of the devil, one can say. In the course of consistent analysis our logical constructions, even being manipulated in any manner, inevitable go back to the crucial question of what is "space" and what is "substance" in their primordial physical sense. Is it matter or void?

Democritus, for instance, while creating his philosophy, carefully comparing and generalizing existing everyday experience, came to a conclusion that only two original categories, or arches – atoms and void – function in nature. Atoms are indivisible particles of matter, they are eternal and move continuously, and combinations of atoms of different shapes and dimensions form various bodies. Void is interpreted as space. Being applied to four formally acceptable statements for possible attribution of the principal categories of the Universe, Democritus's philosophy obviously correlates with the first suggested wording. It assumes that the category of "substance" is matter, and category of "space" is void. Nevertheless, the mirror

image or the image with opposite sign, of Democritus's division of the world into two original categories, is fixed in the second principal statement. According to this statement, we can consider space as matter, and elementary particles of substance – as holes in void.

During many centuries Democritus's philosophy firmly dominated in natural sciences, it determined the strategy of evolution of our attitude to reality. The principal merit of this scientific system consists in the fact that, being based on rough everyday experience, on information available in the course of our direct observations; it allowed the scientist to operate concepts, which could easily be introduced into the imaginary speculative visualization. The division of the world into void and matter gave an ideal possibility to figuratively interpret any form of motion and explain any process taking place in the Universe. It is very important that Euclidean geometry and Democritus's empty space symmetrically superpose; according to Euclid the shortest distance between two points is a straight line. That's why the scientists' concept of free motion was compatible with geodesic lines of Euclidean geometry and was interpreted as uniform straight-line motion. Democritus's philosophy got its perfect scientific representation in the Newtonian classical mechanics.

There are three basic conceptual categories in this mechanics: absolutely empty space, absolutely uniform time and massive material objects of substance, which, by the way, in Newtonian mathematical apparatus are considered as mass points. Massive bodies, according to Newton, may interact with each other, coming into direct contact. In case of gravitational attraction, the forces of instant remote action intervene. During long period of time it seemed that such a universal conceptual arsenal was absolutely sufficient to describe any natural phenomenon. However, mysterious forces of gravitational long-range interaction caused certain inconvenience, but, in general, the theoretical foundation of science seemed rather convincing and problem-free. Many thought that another small effort was needed to make the nature to open the last unread pages.

When the science just started to research electromagnetic processes, the position of the investigators radically changed. The scientists immersed in the sphere of phenomena which were

hopelessly closed for direct observations, and above all, they couldn't correlate with usual pictorial view of world division into two arches. All the attempts to choose an adequate physical image for registered electromagnetic processes within the framework of Democritus's philosophy, did not give expected results. Electric and magnetic forces did not find in our imagination any adequate physical equivalent, either as void or substance.

Soon it was clarified that the all-powerful Newtonian mechanics fails in describing recently discovered objective realities. At first, certain efforts were done to imagine electric charges as material masses of special form with certain forces existing between them, which are similar to gravitational forces. But this special kind of matter didn't manifest its principal and fundamental property, namely, inertia. And the forces acting between the charges and weighty matter remained unknown. In addition, polar character of electric charges wasn't compatible with the classic framework of Newton's mechanics. Unexpectedly, the scientists found themselves in the state of a blindfold pedestrian pushed out to the driveway. Nobody could properly explain how the electromagnetic interactions were realized and what physical processes were hidden behind these phenomena. Nobody knew whether the newly discovered interaction was a manifestation of certain properties of the space, or it was the result of action of any kind of substance; if so, than what should be called "space" and "substance"?

It is considered that the science succeeded in finding solution in such a difficult situation owing to the theory of electromagnetic field elaborated by Faraday and Maxwell. An innovation of Maxwell's theory consisted in the fact that the interaction between test bodies caused by electric and magnetic charges resulted from the processes which propagated in space at finite speed; this interaction wasn't caused by mysterious forces of instant reaction as it was assumed by the Newtonian mechanics. However, the behaviour and typical features of these objectively registered interactions correlated with none of already known fundamental categories. Then a decision to introduce a new, the fourth basic conceptual category was taken; this category was called a "field" and added to previously known three categories: "substance", "space", and "time". Thus, the field took a

firm position in the theoretical schemes associated with electromagnetic processes, together with mass points, representing substance mass in Newton's mechanics.

We must say that from the philosophical standpoint, the idea of electromagnetic field propagation in the empty space realized in Maxwell's theory was none other than transposition of the well-known Kant's definition number one from his "Metaphysical Foundations of Natural Science". Immanuel Kant affirmed that "Matter is anything moving in space. That space which is unsteady itself is called material or relative space, and that space where, finally, any motion might be imagined (that's why such a space is immovable in any sense), is called pure or absolute space." Further, in his annotations to the definition, Kant developed this idea, affirming that the absolute space was not an object because one couldn't perceive it as an object of a direct experiment. It is anything which might be conceived out of limits of a given or really observed space. Space, which is really perceived on the basis of the experiment, must be material; this idea admits existence of another, wider space, and the abovementioned space can be realized in it.

Electromagnetic theory, in full compliance with Kant's philosophy, interpreted electric and magnetic fields as a special kind of relative material space, which was "placed" into a wider and absolutely empty space. One cannot deny that mathematical form of Maxwell's equations doesn't contemplate existence of any new conceptual substance other than reflection of space and time. Probably, authors of electromagnetic theory would better introduce the wording of a "relative electromagnetic space", instead of a newly introduced concept of a "field", which considerably complicated our ideas of physical status of principal categories of the Universe. Though, a rather mysterious definition of an unknown essence was launched into the scientific language. Till nowadays nobody can accessibly explain what is it, this electromagnetic field. How does it look and what is the difference between field and space or substance? Of course, here we don't take into account various hypothetic inventions, which, as usual, imply or insinuate anything, but are built on such doubtful assumptions and suppositions that it becomes

impossible to consider them as prerequisites to declare a new fundamental category.

It is believed that there are two circumstances which played a principal part in the decision to turn to the concept of the "field". Without any doubt, it is a special difficulty resulted from the obvious selectivity of electromagnetic forces. Not all the bodies experience their impact, hence, it is inconvenient to directly unite electromagnetic processes with the concept of "space". But it is even more important that the application of a new conceptual category would exempt investigators from the necessity to attribute recently discovered physical reality within tough frameworks of Democritus's world division into the arches. It is always rather easy to think up a new conceptual definition (which, in fact, neither expresses nor explains anything) for an unperceived phenomenon than bring it into accord with a strictly limited circle of logically independent arches. We mean the arches which are similar to those briefly formulated in the aforesaid four principal statements for material attribution of fundamental categories of the Universe. In any case, in the case of the electromagnetic theory the science followed the way of the least resistance, and as it usually happens, it wasn't the most worthwhile way.

A very big shortcoming of the new theory consisted in the fact that it even didn't make any attempt to propose any efficient interpretation for physical nature of the electromagnetic field origin. Maxwell's differential equations only related space and time derivatives of the parameters of electric and magnetic fields, as to electric charges – they were considered as regions with electric field divergence other than zero. In fact, this theory rather gave a rational mathematical form to the physical processes related to electromagnetic interactions, than described them.

A crucial turn in the history of science development was caused by the appearance of Maxwell's electromagnetic theory. It was that time when the scientists soundly rejected the idea of searching a specific physical image reflecting objective reality, and became satisfied with its mathematical space-time analogue. Lack of visual speculative image for this recently discovered and undoubtedly objective physical reality initiated the beginning of a very perfidious

conceptual crisis in the matter of attribution of principal categories of the Universe. This crisis, as we shall see further, didn't loose its actuality till nowadays. The reason is that the crisis, in fact, penetrated into all the spheres of modern physics and the concept of "objective reality" itself became a subject of very serious discrepancies.

The thing is that mathematical language, *per se*, doesn't imply any stating of semantic, conceptual definitions. It goes without saying that mathematical analysis is capable of projecting internal logics of physical phenomena onto it, and provides significant advancement on the way of truth comprehension. Our skill to give quantitative assessment to physical processes substantially enriches researcher's cognition, but never any mathematical frameworks could substitute conceptual fundamentals of any science. In the end, the objective of any cognition process consists rather in understanding of "what?" and "why?" than in answering the question "how many?"

Summarizing, we can say that a new fundamental conceptual category, "field", became current in science due to Faraday and Maxwell electromagnetic theory. One of the direct consequences of this innovation consisted in the inevitable growth of conceptual crisis which affected cognitive fundamental of natural sciences. The thing is that the new conceptual category was declared without prior arrangement or any acceptable theoretical basis. As a result, sacramental question was accentuated and remained open: indeed, what is "space", and what is "substance", and what is "field" in their original physical meaning? How do these fundamental physical categories differ, coexist and interact, and which of them is void and what is matter? As to matter – how many kinds of matter exist? What is its structure? How is it related to energy? And what is inertia? And many other questions appear.

Any reconstruction of electromagnetic theory creation cannot be complete if it ignores an outstanding contribution of Dutch scientist Hendrik Lorentz. In reality, this scientist paved the way for Einstein's electrodynamic theory of moving bodies which later became known as "Special Theory of Relativity". That's not the only point that all principal relativistic effects of special theory of relativity result from Lorentz's transformations. Lorentz's principal

merit consists in getting system of equations which relates space and time coordinates of the same event in two different inertial frames of reference. Moreover, their solutions were written as transformations, the equations of electrodynamics are invariant relative to. There remained one thing to do for Einstein – to expand the idea of electromagnetic processes invariance with respect to Lorentz's transformations and apply it to all physical processes, without any exception. The author of the relativistic theory brilliantly did it on the basis of a subtle analysis of the well known identity of electromagnetic and optical phenomena.

We must say that at the moment of special theory of relativity creation the situation with attribution of fundamental categories dramatically aggravated due to negative result received in the course of experiments aimed at etheric wind discovery. The scientific world anticipated the results of those experiments. The results seemed to put an end to a jumble with respect to definition of the physical status of the category of "space". However, the results of the experiments did not contribute to solution of the problem of reliable attribution of this category, in contrast, they utterly complicated the matter. The principal result of these experiments was the contradiction between discovered physical properties of circumterrestrial space and general principle of classical mechanics concerning addition of velocities. This rule which allows us to pass from one inertial frame of reference to another, evidently contradicted the principle of constant speed of light propagation in vacuum.

The results of experiments on etheric wind registration revealed a pressing need to review our attitude to the category of "space" and directly motivated the development of relativistic theory of motion. To a certain extent one can state that Albert Einstein, using his theory of relativity, hoped to arrange a reliable attribution of the category of "space" and eliminate accumulated differences and contradictions, which ruin the theoretical fundamental of mechanics of motion. However, it may be sound ironic, but the scientist made attempts to review the conceptual status of the category of "space" through a physical concept, whose conceptual and mathematical apparatus was fully adopted from electromagnetic theory, which initiated the

conceptual crisis concerning the attribution of fundamental categories of the Universe.

The succession of the theory of relativity couldn't be limited by its mathematical essence. Lack of conceptual arsenal of electromagnetic theory, together with equations, inevitably moved to it. Both the theory of motion proposed by Einstein and electromagnetic theory didn't suggest any ideas with respect to real physical meaning of its conceptual basis. In other words, the theory of relativity didn't propose any conceptual equivalents to reflect actual physical properties of substance, space, and time. The utmost thing Einstein succeeded to do, was the statement of light postulates, which reflect objective physical properties of a real space-time. But the nature and origin of these postulates were out of reach for relativistic theory cognition, and light postulates became one of its most incomprehensible aspects.

Nevertheless, the creative power of Einstein's intelligence played a very important part in that extremely contradictive situation. Perhaps, the outstanding imagination of the author of the relativistic theory was revealed, at the most, in acknowledgement of objective ambiguity when determining simultaneity of two events which occur in different points of the space. After a deep analysis of the procedure of observations and measurements of registered physical processes, Einstein rejected the Newtonian view of space and time absoluteness. The scientist proved their objective relativity basing on witty thought experiments. Once the time loses the quality of absolute, uniformly flowing substance, then our attitude to the world around us radically changes. Hence, it became obvious that the separate existence of space and time in motion description contradicts experimental logics, thus, it doesn't possess any theoretical grounds.

The theory of relativity convincingly demonstrated that the unique possible interpretation of space-time relations is the four-dimensional interpretation; moreover, it allows to effectively comment negative results of experiments on etheric wind registration. The introduction of another conceptual category, known as "four-dimensional space-time", into the scientific language is the result of Einstein's creative

efforts. Its existence allowed the scientists to exclude the problem of separate attribution of "space" and "time" categories from the agenda.

Einstein didn't put a lot of work to compile a needed mathematical expression to unite space and time into the unique texture. The science had already known the equation proposed by German Minkovskiy, which offered solution of the problem. However, the task to extrapolate this mathematical structure to valid conceptual fundamental was difficult. The thing is that the physical properties of the minimum interval of space and time are quite different. Their matching needs any specific, unknown theoretical calculation. It isn't random that the four-dimensional interpretation of space-time relations is one of insuperable (for our speculative perception) aspects of the relativistic theory. Of course, the relativistic theory, as any other theoretical generalization, has its cognitive limit. Behind this limit questions appear, whose reasonable solution and interpretation is impossible in the framework of this theory. Later on, we shall analyze in details certain problems related to motion, which are not solved in the framework of the relativistic theory. Now we shall pay attention to the conceptual insufficiency of its space-time arguments only.

It's curious, but Einstein himself was extremely careful while gleaning wordings and definitions. In case of any doubtful, ambiguous situation he made the best use of his skill to shift the physical problem to mathematical grounds, but steadily lead his ideas to outlined target. The methodological credo of the theory of relativity is compactly formulated in the introduction to the famous Einstein paper "On the electrodynamics of moving bodies". In particular, it is written there that "The theory to be developed is based – like all electrodynamics – on the kinematics of the rigid body, since the assertions of any such theory have to do with the relationships between rigid bodies (systems of co-ordinates), clocks, and electromagnetic processes." In this literally reprinted scientist's declaration one can easily notice intentional tendency to accurately avoid the direct use of the expression "space". One would think, how can we argue about the kinematics of the rigid body without regard for the category of "space"? Nevertheless, the author of the

relativistic theory prefers to prudently get round this perfidious definition.

Einstein in his guideline declaration substitutes the wording "systems of co-ordinates" for the concept of "space". As a result a subtle maneuver is made, ant it allows to transfer a purely physical category to the mathematical sphere. Doing so, the necessity of its physical attribution automatically disappears. Beyond any doubt, this effective research method – to describe physical realities using mathematical tools – serves as a central axle, the whole theory of relativity is mounted on. However, it doesn't mean that we must be led implicitly by the relativistic theory against common sense, which doesn't allow any total substitution of physical reality by mathematical constructions owing to the jeopardy of losing any control over the knowledge itself. Moreover, the method of transformation of purely physical problems into the sphere of abstract mathematical solutions adopted from Maxwell's electromagnetic theory, indicates the inability of a research thought to present adequate conceptual equivalents for the observed reality.

The thing is that in the objective world the motion is realized in the framework of interaction between space, time, and substance, without involvement of any mathematical means. For this reason the choice of mathematical apparatus and procedure of its application are always coupled with certain arbitrariness. The exhaustive theory of material objects displacement relative to each other must reflex the objective reality and describe, in the first place, the qualitative aspect of motion as a result of interaction between two fundamental categories of the Universe. And then the quantitative assessment of the results of such a motion must be done using mathematical tools. In this sense, the relativistic theory isn't unstained. It tries to persistently get round the qualitative aspect of motion and reduce our knowledge about it to quantitative assessment using mathematical analogue related to a physical law.

Without any doubt, Einstein was the first to know weak aspects of his relativistic theory. For this reason he dedicated many years of his creative biography to the problem of unified field theory development. The idea is that this theory must reduce fundamental categories of the Universe to the unified field substance and find

such mathematical expressions for it, which could describe any actual type of physical interactions. And at the same time, it is needed to stop with the deep conceptual crisis affecting the natural sciences.

It is already mentioned that physical properties of space-time framework and its material filling are closely interconnected and don't tolerate any arbitrariness in their selection. That's why, logically, the burst conceptual crisis concerning issues of the world space-time framework description, inevitably shifted onto its material filling. That is, onto our capacity to adequately attribute material objects expressing the category of "substance". Firstly, it was discovered that elementary components of a substance weren't simple material particles, but they may and must be considered as wave formations. Secondly, it was found that we were not able to give unambiguous mathematical definitions for those things that exist and occur with substance in space and time, in contrast to classical mechanics. Instead of it, the quantum physics offered us the probability partition for possible changes and states depending on time.

Therefore, our penetration into more complicated realities of the world around us resulted in the fact that the actual state of the science became characterised by the presence of two independent theoretical systems – the theory of relativity and quantum theory. It is significant that each of these two scientific generalizations, separately, describes certain groups of phenomena quite satisfactorily. However, the applicability of any of them is rather problematic beyond this bounded area. It seems that both concepts include components of the aspired comprehensive theory, and the only thing we must do is to find logically correct steps leading to unify the relativistic theory and quantum physics. Without any doubt, the relativistic theory must maintain its actuality, being the science which upholds the description of natural laws by space-time relations (to say the truth, we don't have any alternative). Apparently, the relativistic theory must do it without use of any differential equation having regular solution, but establishing quantum space-time characteristics for observed physical processes. At least, we may hope that fulfilment of this condition becomes a logical connective

leading to a wanted synthesis of the theory of relativity and quantum regularities.

Neither the future successes of the theoretical physics are based on adaptability of the relativistic theory to quantum regularities, nor does the quantum physics adapt logics of Einstein's space-time relations. The attempt to get quantum regularities as the relativistic theory corollary may be an example of this statement. Numerous elaborations of more complicated space-time geometries with the hope to expand them over a wider sphere of natural phenomena were made. But the attempt to construct a complete system of opinions failed, and this fact proved usefulness of such efforts.

To naturally combine these two fundamental theoretical generalizations, it would be more useful to step back to the initial line and try to formulate the optimal conceptual basis in the very sources of our knowledge. We need to fill our ideas about "space", "time", "substance", and "field" with the renewed conceptual contents, which could allow us to simultaneously adjust both opposing concepts. At the same time, they will organically combine into a unique scientific texture. When the scientists achieve a prospective level to succeed in making attribution for the principal categories of the Universe, the effective model of the creation of the world will be elaborated. The attribution of real physical contents to these categories takes place directly in the course of realization of the scenario of the world creation.

It is no mere chance that we made a brief review of formation of fundamental conceptual definitions in modern science. We needed to make this historical excursus to wider understand the general situation concerning the attribution of fundamental categories of the Universe and impartially assess the situation for formation of scientific concept of the creation of the world. It follows from the aforesaid that this situation was characterized by long-term conceptual crisis which affected theoretical assessment of the fundamental categories of the Universe. This crisis inevitably transformed into the scientific vision of this great creative and generating act, which is called "the creation of the world".

Hence, there are two theoretical scenarios of the world creation – Devine and scientific – before us. Moreover, we have the really

functioning Universe in its unique copy and with its evolutionary development which leaves no alternative. Let's try to understand which of these two scenarios corresponds to the results of experimental observation for sure, unifies our thinking and contains the least number of logically incomplete initial principles, whose combinatorics make possible to establish the relationship between all physical regularities which govern the existence of the Universe.

First of all, let us attentively consider the scientific version of the creation of the world, following the scenario of the Big Bang. Let us recall the origin of this theory. Once the American astronomer Edwin Hubble while observing the Universe through the telescope discovered the red shift of spectral lines of light signal emitted by remote galaxies. It was natural to explain the registered red shift by the Doppler change of light signal emitted by galaxies moving at a great velocity away (from us and, in general, from each other). The series of observations proved that the law of recession of galaxies in any direction is universal and general; it seems that the Universe expands as a whole. The other important discovery is related to velocities of receding galaxies, which are proportional to the distance to these objects. Taking into account the laws of formal logics, one must assume that certain time ago all the substance in the Universe was concentrated in a bounded region of the cosmic space. This assumption resulted fructiferous, and the science turned to the theory of the Big Bang.

We give this historical information about the formation of the Big Bang theory with the purpose to demonstrate a purely accidental character of its appearance. No mention was made of a comprehensive research and deep, systematic analysis needed to formulate such a wide-ranging generalizations as the theory of the creation of the world. In fact, the problem was formulated in a very simple way: it was needed to explain unexpectedly discovered red shift of spectral lines emitted by remote galaxies. The solution of this problem which looked as a "single-pass" one, resulted in appearance of the global scenario of the world creation.

For justice' sake we must mention the professor of the Petrograd University Aleksandr Fridman, who found non-stationary solutions of gravitational equations of the general theory of relativity prior to

Hubble's discovery. Hence, Fridman pointed out the possibility of existence of a non-stationary Universe. However, Fridman's works for certain reasons didn't directly affect the appearance of the Big Bang theory.

Nobody disputes the objective interrelation between the whole and its parts in nature. The correct distribution of these relations may serve as certain basis providing the successful mastery of the internal contents of the object of our interest. The usual mistake in speculations about the whole and its parts is the statement when particular attributes are deemed governing arguments, which determine general properties of the phenomena under research. When, for example, basing on the colour of the sea wave a man starts to comment the history of the origin of the Indian Ocean. Such a methodology is categorically non-applicable, moreover, it is absolutely non-applicable when working over the construction of such a quasi-scale generalization as the theoretical model of the Universe. In no way one can agree with the explanation of the shift of spectral lines of light signal emitted by remote galaxies basing on the presented new theory of the creation of the world. But it happened in the case of the Big Bang. It is allowed to advance from the whole to the particular, but not vice versa.

Unfortunately, all the complicated construction of our knowledge about the life of the Universe was erected mainly using this faulty method – from the specific to the whole. As a result, we continuously adjust and infinitely correct our vision of the life of the Universe taking into account recently discovered particulars. Imaginary unity of a reconstituted physical picture of the world, in reality, is unstable. The centuries-old experience of the natural sciences complex development with its never-ending amendments and reconstructions proves it. It happens, in the first place, because till now we don't understand the final goal of the cognition itself, which lasts for several millennia according to the principle – from the specific to the general. But what shall we say about goals, if we don't know whether the chosen course of natural sciences development is correct. It is not ruled out that all the theoretical schemes we use to orient ourselves in the visual environment have no relation to the reality, but are a product of our intellectual self-expression.

In this respect, the Holy Scripture offers us a unique chance to build an optimal model of the Universe with observance of the most prospective methodology of passing from the general to the specific. The Book of Genesis from the first page shows us the integer scheme of appearance of the Universe in its final form. It is a unique and unparallel possibility for us to reconstruct the complete theoretical scheme of the Universe origin basing on the firm, once and for all laid grounds. It goes without saying that science must not strike a wounded pose, it must respectfully try and grasp the meaning of the Prophet Moses Book. It is needed to take into account the époque, the Book has been written, and the intellectual level of a potential reader. And the main thing: we must try to choose the adequate physical equivalent to the events of the first days of the creation described in the Book of Genesis. Moreover, we don't have the right to neglect such a unique opportunity: the Holy Scripture enjoys a very high, unique authority.

Going back to the Big Bang theory we can note, that taking into account the aforesaid four principal statements whose frameworks allow the theoretical thought to materially attribute the categories of "space" and "substance", this concept obviously adheres Democritus's division of the world into two arches – "matter-substance" and "space-void". The most primitive, antique philosophical statement invisibly exists in the Big Bang scenario. The scientific version directly states that some time ago all the substance in the Universe was concentrated in a bounded region of the cosmic space and suddenly scattered in the void in any direction as a result of a gigantic explosion. It stands to reason that any of four principal statements has the right to aspire to exclusive attention in the course of possible attribution of principal categories of the Universe while elaborating the theoretical scenario of the creation of the world. In this respect they posses equal rights in full. However, the statements which divide the world into two arches are inevitably hampered by fateful questions: Who has made this division? What is the purpose for it? When did it happen? How did it occur? If we assume that the world always consisted of two independent arches, we definitively deny the idea of reducing principal categories of the

Universe to a unique conceptual substance, hence, we deny the possibility to elaborate the unified field theory forever.

Now, where is such a luxury from? All the centuries-old experience proves the contrary. Practically at every step we encounter the extreme stinginess of the creator-nature. Then the extravagant theory of world division into two arches seems very irrational. Especially as there are no positive reasons prohibiting the Universe to reduce to an integrated material substance.

Comparing the accumulated data we conclude that the galaxies are distributed non-uniformly in different zones of space of equal volume, taken in depths of the visually graspable outer space, in different directions from the Earth. Moreover, in large-scale velocity measurements the recession of galaxies in different directions is the same and depends exclusively on the distance to the observed object. Hence, the conclusion about the uniform and isotropic visible part of the Universe is made. But such a conclusion seems too unexpected in case of explosion origin of the Universe. Then, to make fragments thrown out from the epicentre of the Big Bang to uniformly and isotropically distribute in the outer space, a very specific organization of the initial conditions of the explosion must be realized; but it is difficult to naturally explain it.

We must keep in mind that in all the elaborated dispositions of the Big Bang, the initial stage of the event terrifically depends on the selection of certain special conditions. It includes parameters fitting to the unique physical accuracy. The impression is that the Providence took care of forming favourable conditions for appearance of nearly any elementary particle. And according to our estimations, there are almost 10^{80} elementary particles only in the visible part of the Universe.

Speaking of the extraordinary accuracy of parameters fitting at the early stage of the Universe development, we can think of the "cosmological constant problem". It consists in fantastic assumption that the initial energy of vacuum must differ from zero and have the accuracy of the order of 10^{-106}. This requirement results from the compensation mechanism of vacuum density jumps occurring because of phase transitions in gauge theories of a grand unification. There is no need to explain the complete mechanism of this

unyielding magnitude calculation in details; we shall limit ourselves by statement of the fact of its existence.

Now, it should be mentioned a riddle of an unbelievable proximity of the Universe to the three-dimensional space ($k = 0$) at its early stages of existence. This riddle is known as the "problem of a plane". It is caused by the circumstance that the Universe needs a very fine Ω-parameter fitting for its successful evolution from the moment of explosion up to the present time (Ω is the ratio of the average energy density in the Universe and so called "critical density"). Einstein's equations, the actual cosmological models are based on, are written in such a way that the problem of whether the Universe expansion changes for its compression or continues without end, depends on the value of Ω. For the Universe to develop in accordance with the scenario of the Big Bang and exist till nowadays (as the theoretical predictions state), the Ω-parameter fitting must be no less than 10^{-59} at the early stage. If this condition is not met, the expansion of the closed Universe will change for its compression within Plank's interval of time or so, and the open Universe will expand so swiftly that the considerable masses of substance will not have time to be formed. There is no necessity to describe the complete calculation of this incredible small magnitude; we mention only the fact of its existence.

The existence of unparallel, fantastically small magnitudes in the theory of the Big Bang is the most mysterious aspect of this event and makes up to be careful not to deal with an artefact. There is a bundle of examples of such a succession when firstly a preconceived idea appears and then, justificative arguments are gleaned to please it. As a rule, these arguments, due to a farfetchedness of the general idea, possess extraordinary, unique character. Usually the adepts of the Big Bang theory refer to the uncommonness of the event, its exclusiveness, hence, the possibility to introduce certain "peculiarities". To put it bluntly, they try to choose rules of play which are convenient for them, and using these rules they play the Universal patience. Though, the fundamental problem of the cosmology consists in constructing such a theoretical model where the Universe exists and develops to its actual state absolutely

independently of the peculiarities of initial conditions, obeying the fundamental laws of physics only.

It is considered that the possibility to return in time to the very beginning of the Universe existence (when time t = 0) directly depends on our knowledge in the sphere of interaction of elementary particles having high densities and energies. Here the cosmologic problems directly border on physics of the micro-world. It is non-random that all the dispositions of the Big Bang scenarios are built on the following basis: t ~ 0.3 sec., temperature T ~ 3×10^{10} deg., density P ~ 10^7 g/cm^3 (we believe that when the density P ~ 10^7 g/cm^3 a neutrino leaves a nucleon and practically lives till nowadays). On making acquaintance with such a dashing reconnoitring, one becomes deep in thoughts. If we venture to bank in a heap, at one stroke, all the substance existing in the Universe and arrange grandiose cosmic fireworks, then after such a breathtaking flight of fantasy we must know exactly what are the ordinary elementary particles, so to say, the most primitive peaces of substance. However, we are far from it. Just now we face the greatest difficulties. It is easy and light-heartedly to discuss the things which happened in the Universe billions of years ago (due to remoteness of events and unavailability of witness, as the saying goes), but it is much more difficult to examine the things on your writing desk.

To tell the truth, today none of the scientists is able to clearly explain what the ordinary electron is. What is its real physical essence? Actually, we cannot deny any real objective environment to electron. The theoretical thought is quite helpless, and any considerations about any quasi-processes which took place billions of years ago in the Universe, seem too premature. Without any doubt, we can and must elaborate various scenarios of the creation of the world, but at the same time we must not loose sense of harmony. Can we speak about modes of substance functioning in the Universe, if it doesn't lead us to the understanding of elementary, primary elements of this grandiose aggregation?

The principal shortcoming of the Big Bang theory is its undisguised non-productivity. Nothing resulted or followed from this theory some day. The science cannot mention at least one physical idea based on this conception. The red shift of spectral lines emitted

by remote galaxies was registered before the Big Bang theory. The relict emission was also discovered absolutely unexpectedly and quite independently of the Big Bang conception. The well-known formula: "the mountain has brought forth a mouse", in reality, is more fruitful than the scenario of the creation of the world the science offers for consideration. The global theory intended to interpret the greatest act of the "birth of the Universe" cannot exist as a "thing in itself" and "for its sake". The theory must lead to principal problems of the modern natural sciences and offer their solutions.

In particular, it would be very convincing if the accepted theory of the creation of the world finds the explanation of one of the most universal and all-embracing physical interactions known as the "universal gravitation". It is desirable that the scientific conception of the creation of the Universe should include the ideas which could help to systemise various and, sometimes, contradictory information concerning the micro-world, for instance, corpuscular-wave duality. It goes without saying that such a theory must contribute to overcoming the acute conceptual crisis related to attribution of the principal categories of the Universe. One would like to expect many other important conclusions basing on the valuable theory of the creation of the world. But the Big Bang hypothesis rather actively creates new questions than answers ours. And it is inadmissible for such a reputable cosmological generalization. As a result, a very big number of questions without answers which appear from the Big Bang theory cross out the cognitive value of the interpretation of the red shift of light signal emitted by remote galaxies basing on Doppler's effect. It happens any time when an attempt to explain any complicated and abstruse thing using more complicated or very obscure arguments, is made.

At the same time, as we have already mentioned, we have the scenario proposed by the Holy Scripture at our disposal, which can offer a consistent and fruitful picture of the creation of the world if supplemented with adequate physical ideas. And from this picture, efficient ideas serving as a basis to solve actual problems of natural sciences will naturally appear. In this context we have in mind those events of the first days of creation, described by Moses in the Book

of Genesis. Those days, when God created earth and heaven, likely, from nothing.

Taking into account the four principal statements for possible attribution of the categories of "space" and "substance", the Bible version of the creation of the world well agrees with the fourth variant of the considered set of theoretically acceptable statements. According to this variant, space and material objects of the substance are the derivatives of the integrated material subject. They are different modifications of matrix space of the Universe which can take qualitatively distinctive forms depending on peculiarities of actual physical conditions and functioning modes.

The objective interaction of a man with the outer space and the centuries-old experience solidly fixed the division of the world into "void" and "matter" in our conscience. To conform our perception of the world around us to the fourth statement we need to make a speculative effort and try to imagine all the diversity of the world as manifestation of different physical states of the absolute matrix space of the Universe. Let us illustrate this idea.

Imagine a homogeneous physical medium, let it be common water and an ice sphere of a football diameter in it. Water will represent the space, and the ice sphere acts as a substance. As to its material interpretation, the ice sphere is a qualitatively distinctive form of the local zone of the medium it exists in. Both water and ice are usual molecules H_2O. It is the difference of their temperature-energy levels, or qualitatively distinctive state of H_2O molecules that allows us to clearly distinguish between these two forms of material constructions. This is a visual model that illustrates the character of interrelations between space and substance in accordance with the fourth principal statement for the possible material attribution of the fundamental categories of the Universe. This model perfectly meets the requirements of the Bible version of the world creation. In concordance with this version a spontaneous possibility to create substance from matrix space exists, and no additional material tools are needed.

If we need to choose names for the fundamental categories of the Universe again, then in accordance with the requirements of the fourth principal statement it would be reasonable to reserve the

traditional definition of the "space" for absolute matrix space of the Universe. It should be mentioned that the physical state of the matrix space is taken as a zero normal. Then all the other states of the matrix space, being deviations from the zero normal, must be called "contra-space" and combine the exposed material world in the form of "field", "substance", and "time". But we shall keep to the historically established names for fundamental categories, taking in mind that all of them express different states of the matrix matter of the absolute space of the Universe.

An extremely important and irreplaceable advantage of the fourth fundamental statement, which considers space and substance as derivative of a single matrix matter, is its utmost inclination to evolution. This statement implies the objective possibility for self-appearance of massive material objects directly from space substratum. In this case the substance may appear in any zone of the space and be relegated to obscurity in quite calm and understandable way, like ice formation and melting. Then it is no need to invent noisy illuminations of the Big Bang type. It is important that in the context of the fourth principal statement, the Holy Gospel according to Saint John, which begins with sublime verse: "In the beginning was the Word, and the Word was with God, and the Word was God", acquires more deep and fructiferous cognitive weight than other pseudoscientific conclusions.

The whole point is that in the verses of Saint John the Evangelist the expression "Word" – which is also "Logos" – is given an extremely lofty, hypostatic meaning. And it is not strange that this key biblical definition is written with a capital letter. In compliance with the fourth principal statement about the possible attribution of the categories of "space" and "substance", the appearance of substance with the help of God's "Word" may be interpreted as a wide-ranging crystallisation of substance from the matrix space at behest of the Supreme ecumenical will. Envoys of the Supreme ecumenical will may be inoculating "ideas-crystals", as well as any elementary particle possessing its rest mass. Their presence in the concentrated material space may disturb from the state of equilibrium and provoke the beginning of crystallization reaction. Hence, considerable masses of substance, like stars, planets and galactic

systems, must be formed. The crystallization process in concentrated media is well studied and accessible to our understanding.

Therefore, we have every reason to assume that the "Word" really was at the source of our planet birth, and the idea itself deserves scientific attention. Saint John's statement that "In the beginning was the Word" fully corresponds to Moses' narration about the first days of the creation of the world due to the efforts of the Providence. This creation took place according to the Hebrew word "bara", which means "create from nothing". The act of creation of everything from nothing is the token of infinite variety of forms of the Universe existence. Because embodied initial material would limit the range of material world manifestations. In the Universe constructed in accordance with the theological scenario, any fixed forms of material structures existence actually are not available. The continuous process of space transition into substance and vice versa takes place in it.

Recall the Universe model according to the Big Bang scenario. It is utmost static, though seems to be dynamical. The only variable is the distance between masses of substance. The principal components of the Universe, or its embodied component are present in the Big Bang theory in once given stationary forms. One can say that it is an undisguised mechanical model with a strong accent on Democritus world division into two arches: matter-substance and space-void.

The scientific optimism of the Big Bang theory is based on the firm belief that the nature is a naturalized execution of a certain unyielding logical scheme, when all future states of a physical system definitely result from the state of this system at a certain moment of time. This theory reflects the most primitive dialectics of a standard human thinking based on cause-effect relationship. We have already got accustomed to interpret any event as inevitably necessary and obeying the law of cause-effect relationship between phenomena in full. As if only they may reflect objective regularities of the outer world evolution.

Meanwhile we know for certain that the laws of nature are of no casual but, mainly, statistical character. The continuous change of possible states probabilities takes place in the physical world around us. That's why there is no reason or need to speak about rigorous

cause-effect, definite relations. While the adepts of the Big Bang theory use such relations to advance towards the early stages of the Universe life.

In fact, there is no necessity for us to know the reasons for appearance of unstable state of the matrix matter and beginning of large-scale substance crystallization at any zone of the cosmic space. It is much more important for us to get understanding of the possibility for substance appearing from matrix matter of the space itself. The matrix matter constantly balances near the mark corresponding to the possible initiation of the large-scale crystallisation of the substance or, vice versa, the transformation of substance into the space matter. But for very persistent atheists or adepts of the determinism we can offer consolatory assumption stating that inter-transformation between space and substance takes place due to constant movement of galactic masses. In this case the nulling mechanism of symmetrical distribution of masses of substance in the cosmic space becomes activated.

We believe, that, firstly, the possibility for spontaneous self-appearance of substance from the matrix matter of space allows us to find accord between the Bible and scientific versions of the creation of the world. Secondly, space and substance reduction to an integrated material substance gives the possibility to take natural sciences out of the complicated conceptual crisis pursuing attribution of fundamental categories of the Universe. And the principal thing is the prospect to create universal quantum-relativistic theory of motion on the basis of renewed fundamental conceptual arsenal.

PERSONAL SPACE – TIME CONTINUUM, WHAT IS IT?

The assumption of a universal material substance standing behind the category of "space" is not new. For the first time this idea appeared when wave properties of light were discovered. Realization of wave processes implies the existence of a physical system or medium capable of being in the state of wave excitation and carry energy. Pursuant to these ideas the wave attributes of light may be naturally explained by the existence of a certain type of luminiferous ether, which expresses definite properties of material space guaranteeing the process of light waves propagation. For long years the idea of the luminiferous ether ranked solidly in theoretical reasoning, and it seemed sufficient to fix the priority of this hypothesis on the basis of some supplementary experimental observations. Various models (sometimes, they were clumsy) of "gaseous" or "jellylike" state of ether were proposed, they corresponded to longitudinal or transversal character of light waves propagation.

We understand quite well that the idea of luminiferous ether gives physical space its qualities of objective reality, and these qualities can be observed and registered together with material objects. In such a case, motion must be considered not only as a visible displacement of material objects with respect to each other, but also as controllable displacement of material objects with respect to the observed space, which plays a part of luminiferous medium. Then

any attempt to consider material space as absolute and fixed frame of reference suitable for different measurements and observations, seems quite logical. At the end of the nineteenth century the physicists, including the experimenters Michelson and Morley, were absolutely sure that on-land instruments must register the velocity of the orbital motion of our planet about the Sun with respect to the luminiferous ether.

Being adepts of the idea of the luminiferous ether, these scientists endowed the absolute space with certain hypothetical properties allowing the space to be in the state of wave disturbance and function like mechanical light-transferring medium. Then the velocity of light signal near the surface of the Earth must differ in different directions and depend on orientation of planet's motion in the absolute luminiferous space. In other words, a simple rule of addition of velocities must be true; this rule takes into account the velocity of light propagation in hypothetical ether and the velocity of the planet relative to the luminiferous space. It was expected to find the absolute velocity of the Earth relative to the luminiferous space of the Universe, comparing the sum of the aforesaid velocities in different directions.

When Michelson and Morley took a decision to conduct their famous experiments to discover the effect of the ether wind, they, supposedly, were encouraged by Foucault's experiments. These experiments allowed the scientist to observe the Earth rotation about its axis using laboratory method. As it was possible to register the results of such rotation with the help of on-land devices, it seemed logical to observe the planet motion relative to the absolute luminiferous space acting as a universal frame of reference. The velocity of the Earth motion in its orbit was known to be about thirty kilometres per hour.

The scientists brilliantly prepared and performed a series of witty experiments, and, in their opinion, the experiments had to register the existence of the ether wind. But the disappointment of the scientists was very great when the devices failed to give expected results. The speed of light signals propagation in any direction was the same. It seemed that the Earth maintained the state of rest relative to the light ether and there were no evidences of the effect of velocity addition.

The negative results of the experiments on ether wind registration caused deep confusion. Introduction of an active space material medium in the scientific use was urgently needed. Such a medium could exercise its wave-forming function, which is very important in the light of an impressive manifestation of the wave nature of the micro-world physics. The other reason consisted in a great wish to have a reliable universal frame of reference related to universal space and time framework. This frame of reference, in reality, should be all-embracing, and it would become possible and convenient to show the global picture of the world from any point in the Universe. However, insuperable logic of experimental results in every possible way impeded any realization of these apparently sound expectations.

Though, the situation required adoption of any effective and satisfactory explanations. The thing is that negative result of experiments is also a distinctive outcome, and as any outcome it needs relevant comments. It is necessary to say that sometimes we are mistaken while extolling the role of experiments in science. Really crucial decisions are taken rather on the basis of explanations which follow experiments than the experiments themselves. But certain interested parties are present here, as it happens in any man's activity. They can interpret the same event or phenomenon in a way which is convenient for their world-view and reflects their subjective creative aspirations. It can be easily seen in the debates on the results of the experiments performed by Michelson and Morley.

Now let us formulate a question: how did Albert Einstein make a categorical declaration that luminiferous ether didn't and couldn't exist in nature, if he based on the results of the experiments which did not confirm existence of the ether wind? Such a conclusion isn't indisputable, as it may be seen at first sight. Michelson and Morley formulated a concrete problem for themselves: they tried to register an effect of the ether wind. But the results of their experiments were negative. They clearly fixed absence of any ether wind in the vicinity of the surface of the planet. This statement constitutes and limits indisputable conclusions based on the results of the experiments commented upon. Einstein, in his turn, arbitrarily develops this statement and makes a step which is far from irreproachability, if basing on the logical standpoint. He declares that as the ether wind

doesn't exist, hence, no luminiferous ether may exist. Formally, a faulty practice was actuated, and the well-known principle "if the facts are against us, then it is worth for these fact" prevailed.

In fact, let us think, why did Einstein inseparably linked the existence of the luminiferous ether and the effect of the ether wind? These self-reliant physical arguments may have their independent self-expression. The idea of light ether existence itself is not obliged to definitely lead to the effect of the ether wind. We know that for the ether wind to appear, two principal requirements must be strictly met. Firstly, the existence of the luminiferous ether, and secondly, the existence of two relative velocities (constant velocity of light signal propagation in void and the velocity of the Earth motion relative to the luminiferous space) is needed. Non-compliance with any of these two mandatory conditions results in negative results in the experiments on the ether wind discovery. Einstein based his reasoning on the simplest fundamental laying practically on the surface. He supposed that the ether wind didn't exist because of the deficit of the luminiferous ether, and declared this principle to be the core requirement for his relativistic theory functioning. However, the other way to interpret the results of the experiment made by Michelson and Morley was needed, though this approach didn't get a due progress. The alternative variant is formulated in the following way: the ether wind doesn't exist because of absence of one of two relative velocities, the fact of their availability being the mandatory condition for the appearance of the ether wind effect. In other words, the principally needed speed of the Earth motion relative to the luminiferous space is missed.

The planet in fact rotates about the Sun, but it doesn't imply that it definitely moves relative to the luminiferous space. The statement "the Earth moves relative to the light ether at a speed of thirty kilometres per second" makes real physical sense if we know to demonstrate that the metric structure of the universal luminiferous ether is firmly bound to the solar mass. If this key requirement isn't met, any experiments aimed at detection of the ether wind effect, cannot and will not lead to positive results. However, we don't have any cogent arguments to absolutize solar mass and consider it as a privileged material object in the Universe, the light ether metric

being related to it. Therefore, there are no reasons to link the speed of the planet motion in its orbit about the Sun to the speed of the Earth motion relative to the luminiferous space.

One must note that the science repeatedly made attempts to remove one of the two speeds providing the opportunity to register the ether wind effect. As a rule, it was related to the idea to gravitationally bind the luminiferous ether to the mass of the planet. The scientists supposed that the Earth, during its motion in the absolute space, carries the spacious luminiferous shell along with it, as it carries the atmosphere along. It is clear, that such a version eliminates the factor of the Earth displacement relative to the luminiferous ether and allows developing of counter-Einstein's interpretation of the results of Michelson and Morley experiments. The principal weak point of the idea consists in various "technical" difficulties arising in the course of realization of the model of the appropriate luminiferous ether, capable to displace relative to the absolute space together with the mass of the planet.

Meanwhile, the theoretical statement itself, making emphasis rather on personally oriented luminiferous space organically linked with the mass of the object under investigations, than on the absolute luminiferous ether, is in good compliance with Einstein's light postulates. In fact, one can assume that every material object with rest mass, for instance, our planet, acquires its personally oriented luminiferous space because of its interaction with the absolute material space of the Universe. It is the existence of the personal, four-dimensional space-time, which is metrically related to the centre of mass of the planet, that makes the light postulates true and impedes appearance of the ether wind effect.

If we generalize this statement and declare that not only the Earth, but every material object with rest mass possesses its personal luminiferous space-time, then the law of constant light speed in void becomes mandatory for an observer related to any body of reference. Then one and the same light ray has the same speed for various observers moving with their devices relative to each other. The idea of personal luminiferous ether existence is in good compliance with Einstein's light postulates, though the author of relativistic theory categorically rejected the existence of the luminiferous ether.

It is obvious that the task to give concrete physical meaning to the idea upholding the existence of the personal luminiferous space-time, develop it and obtain fundamental, mathematical consequence is much more difficult than the way of luminiferous ether negation chosen by Einstein. Nevertheless, we emphasise that repeatedly confirmed results of the experiments on ether wind existence, in principle, allow us to elaborate counter-Einstein theory of motion, which doesn't contradict the presence of the luminiferous ether. Later we shall show that such an ether-acceptable conception of kinematics of motion helps to move the theory of relativity to a more substantial level and then it becomes possible to use quantum regularities.

It was already mentioned that quite a contradictory situation was formed with respect to the attribution of the category of "space" (because of the results of Michelson-Morley experiments) at the time when the special theory of relativity intended for description of inertial state of physical systems was developed. On the one hand, experiments soundly demonstrated unavailability of the ether wind. On the other hand, the same experiments expressively indicated that circumterrestrial space belonged to the observed material substance, because the space under investigation possessed a set of specific physical properties. These properties were compactly formulated by Einstein as his light postulates. It is clear that light postulates look like intellectual ghosts beyond material attribution, and we simply must relate the circumterrestrial space together with the light postulates to observed material substance. As a result, a very serious dilemma appears: whether it was necessary to reject the idea of the luminiferous ether or find such a theoretical conceptual interpretation for the circumterrestrial space which could unite seemingly incompatible properties. The thing is that the imaginary circumterrestrial space must obey the light postulates and, hence, be subject to the material attribution. At the same time, the imaginary circumterrestrial space must reject the ether wind phenomenon.

Ii is well-known than in such a contradictive situation Einstein didn't follow the way of looking for adequate physical image for the circumterrestrial space, which could satisfy the results of Michelson-Morley experiments. He decided to simplify the situation and

rejected the idea of the luminiferous space itself. However, rejecting the idea of luminiferous ether he didn't propose any acceptable alternative instead of it to attribute the circumterrestrial space with its light postulates. The author of the relativistic theory put himself in an exclusively difficult situation. There was nothing else left for him to do but to transform this mainly physical question into a mathematical sphere. The scientist threw a four-dimensional coordinate grid over the circumterrestrial space and began to use it as a universal space-time framework which served as a background for his picture of the world. Einstein had to do an unprecedented step to give the status of objective reality to this mathematical coordinate system and make it compatible with the results of the experiments on the ether wind discovery. The mathematical structure was given physical properties, which were compactly formulated in light postulates.

Of course, we must appreciate the decision of the scientist, who ventured to raise a mathematical structure to the level of physical argument, but at the same time we must clearly realize that such a situation isn't standard. Without any doubt, any substitution of physical reality by mathematical constructions is a forced procedure; it needs persistent search of real physical essence behind all these abstract constructions, especially, in the course of solution of fundamental problems. A latent danger of carrying our knowledge into the sphere of artificial intellectual maxims always exists. Naturally, we must hope that the deducted mathematical regularities reflect real state of things in the world and may act as consequences of observed mathematical phenomena. But in no case any mathematical construction may act as a cause, which determines objective physical properties itself. The thing is that two apples plus two apples is, of course, four apples. But to get together four apples we need to do certain work related to overcoming the inertia, for instance. The apples themselves, at the command "two plus two" jump only in the circus.

It goes without saying that any physical idea which is expected to correspond to objective reality, must be followed by mathematical corollaries. Mathematical equations, though being absolutely abstract, possess internal rigor. In their interaction with conceptual statements they seem to control the truth of our theoretical structures and detect

any logical arbitrariness. Meanwhile, this statement must not take a form of a contrary dependence when mathematical construction is raised to the level of physical arguments. Without any doubt, the methodology of mathematical structures aimed at an intentional taking of mathematical structures to the level of physical realities, is a forced procedure. It is a direct consequence of the deficit of the conceptual arsenal, which is used in modern scientific circulation.

Such a spontaneous presentation of mathematical solutions and their further application to physical consequences are clearly seen in the logical texture of the theory of relativity. That's how matters stand with light postulates when they are associated with four-dimensional coordinate grids, or with general theory of relativity when Riemann space-time geometry is raised to the level of the gravitational field. What is the use of such a method?

Assume that Einstein has found a mathematical expression, which helps to consider time in the united mathematical manifold along with space dimensions. But it doesn't mean that this expression can give us any intelligent idea about the matching of these different physical categories. To speak formally, the equations of the special theory of relativity don't give rise to doubts, but at the same time, do not budge things an inch on the way of understanding the physical nature of the four-dimensional space-time, even if the light postulates are applicable to it. It happens because Einstein always used bare mathematical structures as fundamental for his theoretical constructions. It would be better to introduce a suitable conceptual context, and then elaborate them up to desirable mathematical corollaries.

Without any doubt, Einstein's scale and level of creative efforts was so high that he couldn't make any declarations because of his inattentiveness or thoughtless. However, we permit ourselves to indicate certain incompliance between the logics of mathematical tools used in the relativistic theory and Einstein's conceptual context.

It is known that the key equation of the special theory of relativity in the most general case is written as follows:

$$S^2 = (ct)^2 - (x^2 + y^2 + z^2). \qquad (3.1)$$

It is believed that equation (3.1) is originated from the four-dimensional space-time coordinate systems. Such coordinate systems appear as a result of combining three space coordinates axes with another or the fourth time dimension. The geometry where a distance between two points is determined by equation (3.1) is called Minkowski geometry. Minkowski geometry reflects a combined space-time topology, because along with space distances it also includes time intervals. That's why it is considered that the theory of relativity is the theory of motion of material objects in four-dimensional space-time, in contrast to Newtonian mechanics, which describes motion in space and time taken separately.

It is obvious that the right side of equation (3.1) includes two substantially autonomous physical arguments. Usually the first member in the right side of this equality, $(ct)^2$, is identified with time coordinate axis. The second member, $\left(x^2 + y^2 + z^2\right)$, is related to combination of three space dimensions. The difference between these two members-arguments is a solution for a four-dimensional space-time interval, S^2, limited by two check points on the trajectory of a test body. The majority of researchers relate the expression $(ct)^2$ to the fourth time dimension. More cautious scientists call $(ct)^2$ the "fourth imaginary coordinate".

But if we analyze the dimension of $(ct)^2$, which is $m \times \sec / \sec$, it is safe to say that this expression in no case may be identified with coordinate dimension only. A coordinate axis, in the strict sense, is a consecutive series of points in the space or moments in time. And the dimension of $(ct)^2$ allows us to naturally and truly consider this expression as still unknown three-dimensional function in a respective three-digit coordinate system, having axes as $m \times \sec / \sec$.

It is impossible to overestimate the level of understanding physical nature of the expression $(ct)^2$ because it is this argument that concentrates the relativistic essence of the theory of relativity. When we identify this expression with one coordinate axis and call it the "fourth coordinate", an unfortunate inaccuracy takes place. Of course, it is possible to call anything as you wish, but we must aspire to use

definitions reflecting the real character of the phenomena we study. In this sense, all known speculations about the "fourth" or "imaginary" coordinate axis in equations of the theory of relativity, look absolutely unsatisfactory. To accept the one-dimensional interpretation of the topology of $(ct)^2$ we need to try to find, as minimum, an explanation of metric three-digits for this exotic coordinate dimension. Following an open-minded logics and agreeing with obvious tree-digit metric structure of the expression $(ct)^2$, we must try to clarify, what, in fact, is hidden behind this mysterious argument of the famous equation by Hermann Minkowski.

It happened that the theory of relativity didn't develop along the way of the adequate interpretation of the true topology of the expression $(ct)^2$, hence, of the adequate interpretation of the true metric of equality (3.1). We continue to use this equation and understand it as equivalent for interval definition in a supposed four-dimensional geometric manifold, which allows us to determine mathematical dependence of the results of relative motion. However, all the attempts to represent a universal geodesic line in Einstein's four-dimensional space-time, and represent it figuratively or graphically, always failed.

There is no need to prove that unavailability of a clear idea about the true topology of chosen mathematical method essentially restricts its cognitive value. Thus, the traditional one-dimensional interpretation of a metric structure of the expression $(ct)^2$ isn't only imperfect. Undoubtedly, Minkowski's equation interpretation in such a geometrical expression impedes the further development of the theory of relativity itself. Moreover, it definitely witnesses the serious insufficiency of the theoretical conceptual arsenal used in it. The problem does not consist in the narrow-mindedness of our imagination, as some authors assert. First of all, the problem consists in conceptual groundlessness of the notional background for the reconstructed picture of kinematics of motion.

When Einstein began to develop his general theory of relativity destined to describe non-uniform motion, and at the same time, solve

problem of gravitational interactions, it was discovered that the nature of universal gravitation is tightly linked to geometrical properties of space-time. This link was soundly expressed in the equivalence principle, which stated absolute identity of inertial and gravitational masses. The idea of curved space-time existence extremely aggravated the problem of finding an adequate physical image for this absolutely objective reality. It became inconvenient to limit oneself by mathematical coordinate grinds only. The matter is that here we deal with global physical forces and interactions, and any fundamental physical factor must be related to it.

Deficit of an adequate conceptual filling in interpretation of the topology of the four-dimensional space-time in the special theory of relativity and sound failure in explanation of the physical nature of light postulates inevitably transformed into conceptual context of the general theory of relativity. The conceptual deficit became an insuperable obstacle on the way of establishing the real physical status of the category of "space-time" and its role in gravitational interactions realization. In this fuzzy atmosphere the author of the theory of relativity decided to use the idea of gravitational waves as the most reasonable one. But in reality, this idea only emphasised and aggravated unfoundedness of Einstein's conceptual arsenal.

In fact, a strange and absolutely useless duality takes place. If a curved four-dimensional space-time is an objective reality destined to guarantee universal gravitation, then what shall we do with gravitational waves? On the other hand, if gravitational waves is an objective reality, then what shall we do with the curved four-dimensional space-time? This tricky duality when describing the nature of the gravitational field, serves a true signal of troubles existing in our imagination of universal gravitation origin.

Such an ambiguous interpretation of the gravitational interaction origin is caused by a deficit of a reliable conceptual basis the author of the relativistic theory used when applying to pseudo-Riemann geometry. What are real tools that make the four-dimensional space-time be curved? It is beyond our comprehension. Hence, till now we don't understand the origin of the metric tensor in equations of the general theory of relativity.

We must note that the theory of relativity itself owes gravitational waves absolutely nothing. It perfectly functions even without their existence. The problem is that a fundamental physical idea cannot be perfect without a reliable conceptual basis. Thus, beyond the words "curved four-dimensional space-time" a really existing physical factor (and not a simple mathematical manifold) must stand. In fact, how is it possible to seriously speak about a curved void? Lack of a comprehensive semantic equivalent for a curved space-time triggered the author of the relativistic theory to look for additional conceptual means capable to compensate functional insufficiency of its theoretical arsenal. Einstein imagined that gravitational waves, whose unsuccessful searches continue till nowadays, might be such an additional instrument.

It seems that Albert Einstein, who declared curved space-time as a physical reality, was astonished by this discovery and being somewhat disappointed, urgently began to invent gravitational waves with the aim to maintain traditional "electromagnetic" distinction for his general theory of relativity. But an appeal to gravitational waves is a direct rollback to Lorentz's standards in definition of conceptual status of the category of "space".

Lorentz considered that there was an empty space capable to function as a carrier of the electromagnetic field between material particles, which were carriers of electric charges. Electromagnetic field could be present or not in the empty space, but such an empty space itself always exists. It may be filled with electromagnetic field or emptied, in full compliance with Kant's definition of absolute and relative space. The only difference is that relative space was called a field. The same syndrome of a double standard is well seen in the idea of gravitational waves existence. This idea provides for existence of heavy masses – carriers of gravitational charges and an expanded empty space where gravitational waves emitted by these charges can propagate. In any case, the hypothesis of gravitational waves existence expressly parodies the electromagnetic theory where two spaces, absolute and relative, exist.

By the way, the behaviour of a pendulum in Foucault's experiment totally discredits the idea of existence of gravitational waves similar to electromagnetic waves. We know that when a

source of electromagnetic field rotates about its axis, emitted force field rotates together with the mass generating it. Then the gravitational field of the Earth must rotate together with the mass of the planet, like electromagnetic field does it. However, the behaviour of Foucault's pendulum proves the contrary. The experiments show that the Earth really rotates about its axis, but it doesn't result in gravitational field rotation. Should the gravitational field rotate together with the mass of the Earth, the trajectory of Foucault's pendulum oscillations shall be invariable relative to the surface of the planet. Then it follows that the nature of the gravitational field has nothing in common with the nature of the electromagnetic field.

Hence, we see that the Achilles heel of the theory of relativity is conceptual insufficiency of its space-time arguments. These principle categories of the Universe look too abstract and somewhat isolated from real physical conceptions. In addition, the situation with declared one-dimensionality of the expression $(ct)^2$, which is the main link in the relativistic equations of motion, looks rather problematic.

It would be incorrect to think that the present theoretical investigation, which stands for the Bible version of the creation of the world, is aimed at substitution or abolition of the relativistic theory. The main line of the exposition is the deepening of the relativistic theory of motion, exclusively. But we shall not complicate it with mathematical solutions, when one seeks for sophisticated geometries leading to more complicated coordinate systems. This process, in fact, is endless. If there is a will, we can always find a desirable trajectory of motion which doesn't match with the known coordinate systems, and then new space-time manifolds appear. The effective prospect for the development of the theory of relativity, in our opinion, is related to its principal equation (3.1).

Anticipating things, we can say that we consider the famous equation by Hermann Minkowski in a signature which allows to represent the basic member of this equality, we mean $(ct)^2$, as a three-dimensional function which agrees with the dimension of this expression. It contradicts the traditional and, in our opinion,

inadmissible identification of metric structure $(ct)^2$ with only one coordinate axis. We shall do it in non-traditional way, when they propose to complicate the space-time geometry of the relativistic theory in a signature $(4+N)$, here 4 stands for four-dimensional coordinate system of the theory of relativity, and *N* corresponds to additional coordinate dimensions. We shall link equation (3.1) to an effective and analytically controllable signature which agrees with the dimensions of all members-arguments written in this equality. It allows introducing quantum regularities into the theory of relativity, and drastic expanding of its cognitive possibilities.

Beginning to expound this quantum-relativistic theory of relative motion we shall follow the historical context of modern ideas about mechanics of motion. Thus, let us start with the analysis of experimental results on the ether wind detection. It seems to us that the unconditional conclusion based on the results of these experiments consists in the indication that the circumterrestrial space belongs to the observed material substance. If the space directly takes part in experiments and is subject to registration procedure (light postulates prove it), then, by definition, such a space is material. It acts as a controlled physical reality along with material objects of substance. We adhere to the undeniable persuasion that observability, in fact, means materiality.

As the space proves to be a material medium, a problem to identify the character of interrelations between such a space and substance arises. These relations must obviously differ from Democritus presence of substance in void. For example, we must know to distinguish between substance and space. We must know to differentiate these material formations. In the previous chapter we demonstrated the expected character of interactions between the space and substance taking a closed physical system “water – ice” as an example. Then it is necessary to construct an absolutely specific mechanics of motion that allows the two material categories to effectively and consistently interact in the process of motion. There are two different concerns: when objects of substance displace in an empty Democritus space and when the motion takes place in a material medium. Any motion of inertial interpretation, when a direct

substance transfer from one zone of the space to another is observed, faces certain difficulties in a new situation. Then quality of a total set of physical regularities governing the life of the Universe must be adjusted in accordance with conditions of interactions between material space and substance.

It was already said that according to accepted principal statement for material attribution of fundamental categories of the Universe the interrelations between space and substance are well illustrated by the physical system "water – ice". Water, as well as ice, as to its material content, is a set of a very big number of ordinary molecules, H_2O. Only the difference of temperature-energy levels between molecules of water allows us to draw a distinguished boundary separating these two types of material formations.

Drawing an analogy between the "space" and "substance" it is natural to assume that the fact of existence of elementary particles of substance in the cosmic space is caused by variation of energy levels for matter which belongs to the check micro-particle, and matrix matter of space. If we liberate the particle of substance from the energy $E = mc^2$, the matter which belongs to the elementary particle appears on the same energy level as a matrix matter of space. A micro-particle seems to transform into the spacious matter, like melted ice transforms into water.

Going back to the ice sphere immersed in water, we must say that the isolated physical system "water – ice" belongs to the class of non-stable systems. The thing is that within certain time the ice sphere melts (we assume that water mass is big enough and its temperature is high). Ice transformation into water is followed by entropy increase, the closed system "water – ice" tends to its state of equilibrium when the further energy exchange becomes impossible.

Then the closed physical system "space – micro-particle" must be unstable. Elementary particle must dissipate energy which causes its existence in the matrix matter of space. It also expresses the tendency of the isolated physical system "space – micro-particle" to reach the state of equilibrium when any energy exchange is prohibited. Dissipation of proper energy of the elementary particle in matrix matter of space is realized through expansion of this micro-particle in any direction from its centre. Elementary particle seems to grow like

a sphere which is uniformly blown. It tends to "dilute" and occupy the same energy level of the matrix matter of space.

In accordance with Newton's laws, two mass points interact with forces which are numerically equal and directed in opposite directions. In such a case, if an elementary particle expands at certain speed in any direction from its centre, the material space starts to displace at the same speed in the direction towards the centre of the micro-particle. The particle tends to dissipate in the space, but the reverse displacement of the matrix matter compensates this dissipation and controls the object in a stable state.

Therefore, we are witnesses of the situation when elementary particles of substance are present in the cosmic space of the Universe like astrophysical black holes – they absorb the surrounding material space. It is natural that any massive body consisting of a big number and variety of elementary particles, due to the fact of its existence in the space of the Universe, absorbs the matrix mater of the space. In this context all massive bodies operate like black holes in the space of the Universe, they continuously absorb the surrounding material space.

Cosmological red shift of spectral lines of light signal emitted by remote galaxies is a convincing proof of matrix matter absorption by massive objects of substance. If all the massive bodies in the Universe absorb surrounding material space, its continuous extension must take place. Then the distance between two check points of the space must continuously increase. The greater the distance between two points selected for our observations, the greater the speed at which these points move away from each other. As a result, though our galaxy and remote galaxies maintain relative state of rest, light signals reaching us from distant cosmic objects pass through continuously extending material space. It is this process of space extension due to its absorption by massive material objects that results in effect of cosmological shift of spectral lines from distant galaxies.

Speed of a check point of space moving into the zone of the mass of the object under investigation due to matrix matter absorption, is determined by well-known Newton's expression:

$$v = \gamma^{"D"} \frac{M}{R^2} \tag{3.2}$$

But we must note that the dimension of the Newtonian gravitational constant is / m^3, kg^{-1}, sec^{-2} / , while the dimension of "D" constant in equation (3.2) is / m^3, kg^{-1}, sec^{-1} /.

To give proof of equality (3.2) let us show the logics of its derivation without using Newtonian constant.

The energy of dissipation of any elementary particle possessing rest mass and tending to dissipate in matrix space, has constant value and is quantized:

$$E\Delta t = \pi h \tag{3.3}$$

here $E\Delta t$ is the energy, the elementary particle dissipates within one second; πh is the product of "pi" number by Planck's constant.

Let us write (3.3) as

$$mcv\Delta t = \pi h \tag{3.4}$$

Here m is the rest mass of the reference micro-particle; c is the light speed in vacuum; v is the speed of the particle expansion in the space. On the other hand, v is the speed of matrix matter which enters the zone of classical radius of the observed micro-particle and keeps it in a stable state; Δt equals one second.

From (3.4) we find v:

$$v = \frac{\pi h}{mc\Delta t} \tag{3.5}$$

To determine the speed the matrix space enters the zone of the material object, which possesses a considerable mass and consists of a big number and variety of elementary particles, we must substitute the proportionality ratio into the right side of equation (3.5). This is

the ratio of mass and radius squared of the investigated object (M, R^2) and mass and classical radius squared of any elementary particle (m, r^2). Assume that a particle is an electron. Then:

$$v = \frac{\pi\hbar r^2 M}{m^2 c \Delta t R^2} \tag{3.6}$$

If we eliminate all constant values from the right side of equation (3.6), then we get the value of the Newtonian gravitational constant "D" prime.

$$\gamma^{"D"} = \frac{\pi\hbar r^2}{m^2 c \Delta t} \tag{3.7}$$

Simplifying (3.6) we get the expression similar to (3.2):

$$v = \frac{\pi\hbar r^2 M}{m^2 c \Delta t R^2} = \gamma^{"D"} \frac{M}{R^2} \tag{3.8}$$

It is needed to make a special note concerning the use of classical radius of the elementary particle in the equations. The classical radius of an electron in these solutions isn't a physical quantity which characterizes its absolute size. Nobody identifies the radius of the Earth as an absolute volume occupied by planet substance in the cosmic space. The substance constituting the mass of the planet, may be concentrated in a more or less compact form depending on particular conditions. The density may vary from that of a neutron star to gas cloud. The radius of the observed cosmic object subject to registration also varies in the same wide range. We use classical radius for the electron, and believe that its value, in accordance with scale invariance, is compatible with the scale level of quantities written in equation (3.6) and satisfies their solution.

In reality, elementary particles (electron among them) may have complicated internal structure at a quark or even finer level. But by no means has it influenced the actuality of our solutions. The

proposed mathematical apparatus describes displacement of the check point of matrix matter of space beyond the classical radius of investigated objects.

We must note that the given equations allow overcoming classical boundaries and penetrating into finer structures. For instance, it is possible to determine so called "classical radius" of elementary particles of substance. Speaking about critical radius we mean the value, when matrix matter of space penetrates into the zone of investigated elementary particle at a speed of light. Taking into account the fundamental significance of this speed, we can reasonably assume that the real frontal opposition between the micro-particle tendency to dissipate, on the one hand, and return motion of the matrix space, on the other hand, exists exactly on the level of the critical radius of elementary particles. In some respect the critical radius of the elementary particle is an absolute quantity. In none case its value may be less than this limit. One can calculate the critical radius from equation (3.5).

To do it we substitute light speed, c, for v in the left side of equation (3.5). In the right side we write the ratio of the square of classical radius, r^2, and the square of critical radius, $r_{cr.}^2$. Then (3.5) may be written as:

$$c = \frac{\pi\hbar r^2}{m^2 c \Delta t r_{cr.}^2}. \tag{3.9}$$

From (3.9) we get $r_{cr.}$,

$$r_{cr.} = \sqrt{\frac{\pi\hbar r^2}{m^2 c^2 \Delta t}}. \tag{3.10}$$

We believe that the critical radius of elementary particles of a substance plays an important restricting role for our capacity to penetrate into the depth of the micro-world. This radius outlines the micro-horizon of events, and the physical reality existing beyond it is

always hidden for our observations. We loose, one can say, any possibility to get any information about the events which take place beyond this horizon. The thing is that the speed of matrix matter intrusion into the limits of a micro-particle completely neutralizes the speed of information propagation from the profoundness of the reference particle of substance. The similar things, but having the scale of the macro-cosmos, take place with the expanding Universe. When the speed of the Universe expansion reaches and overcomes light threshold, we become completely isolated from the information originating from remote galaxies. In this case opposite extremes link together, as it often happens.

As all massive material objects of substance are present in the space of the Universe as consumers of matrix matter, we get a unique possibility to create a very dynamic mechanism of the Universe functioning, which ensures continuous self-renewing of the Universe. It this favourable cosmological conditions the possibility of existence of any fixed forms of material constructions, specified once and for all, is completely excluded. We refer to a very broad range of such constructions, from the simplest elementary particles of substance to combined galactic configurations. In essence, we find ourselves in a qualitatively different world, which is more natural and dynamic than that which corresponds to the Big Bang statements. But the most important thing is that in these conditions of qualitatively renewed ideas about the physical status of the fundamental categories of the Universe, we get good prerequisites to update our understanding of mechanics of motion. We get the opportunity to find more dynamic theoretical grounds for relative motion, with sound mathematical and conceptual contents.

So, we consider that the presence of material objects in the space of the Universe is caused by spread of energy levels between the matter which belongs to these objects, and matrix matter of the space. In its turn, this energy levels spread is followed by absorption of the material space by masses of substance. The interpretation of the infinite space as an absolute material medium results in putting a question about motion relative to this absolute space, which seems to be able to function as a universal frame of reference. Let’s analyze this issue with more details.

While imposing the function of universal frame of reference on an absolute material space one must not miss the following circumstance. The matrix space itself, being a homogeneous and continuous medium, in principal, cannot operate as a universal frame of reference. The latter assumes the existence of reference marks, all the measurements and observations be made relatively to. The acceptance of any reference mark in the real space is realized through assignment of a certain physical meaning to it. This is the only way to mark such a point out of a material medium. In such a case we must consider the selected point rather as an independent material object than as an element of the absolute space. Then all the measurements made with respect to the selected point have actual value relative to this point as an independent objective reality, but not with respect to the absolute space.

Prior to considering the motion relative to the absolute space, we must mention the marking procedure, which allows us to select reference points in this space and perform all possible measurements with respect to them. At the same time the marking procedure must maintain the state of the zero normal of matrix matter, or, in other words, it must not destruct the state of space continuity and homogeneity. It is obvious that these requirements are unrealizable in principle. Thus, all the discussions about the absolute motion with respect to infinite space taken as a universal frame of reference seem to be meaningless.

However, let us try to analyze the circumstances which allow the material space to acquire all necessary features to function as a valid frame of reference where light postulates are true, as a physical system, whose material structure is able to acquire the state of wave disturbance and operate as hypothetic luminiferous ether.

It is known that the principal prerequisite to wave disturbance propagation is the existence of a certain stable system or medium carrying any regulated stable state in its structural memory. If we disturb such a system or medium from its position of equilibrium though impulse disturbance, it starts to harmonically oscillate tending to return to its initial stable state.

It was mentioned earlier that the matrix material space isn't that physical system or medium, whose structural memory keeps any

regulated stable bonds. It is absolutely homogeneous medium without any marks, and because of the unavailability of stable structural bonds there is nothing to become in the state of wave disturbance. For this reason any idea of imposing functions of the luminiferous ether on the matrix space cannot be seriously considered. However, the question of how the light wave signals propagate near the Earth surface and what is the part of the matrix material space in this propagation, is still open.

Is we solve equation (3.2) substituting the values for M and R^2 which correspond to the Earth, then we find that the matrix matter of the space flows into the limits of the Earth classical radius at a speed of approximately 9.8 m/sec. In fact, it means that all the infinite space of the Universe is oriented towards the centre of the Earth and is stable with respect to it, according to equation (3.2).

The displacement of matrix matter towards the centre of the Earth imparts objective qualities of physical reality to the space, the reality possessing internal metric consistency. Each point of this regulated structure acquires a specific dynamic load. If we disturb such a dynamically consistent space from the given regulated position by light impulse, its metric background becomes disturbed and as a result, the space has to acquire the state of wave disturbance. The similar things are observed when a stone is thrown into the calm water and then wave disturbances are generated on its free surface. Therefore, we have all grounds to consider absolute space rushing towards the centre of the Earth as really marked medium capable to carry electromagnetic information and perform its duties of the luminiferous ether.

All the aforesaid allow us to formulate a principally important generalization: as the Earth absorbs the matrix matter of the absolute space of the Universe, then so called "personal space-time continuum" (PS-TC) must be formed. A unique important physical property of the terrestrial PS-TC is its capacity to acquire the state of wave disturbance and carry electromagnetic energy at a constant speed, which has the same value in any direction. When we say that the speed of light near the surface of the Earth equals 300,000 km/sec, we must keep in mind that we speak about the speed of light waves propagation as on the luminiferous normal level of the Earth personal

space-time continuum. The latter was successfully detected in the experiments performed by Michelson and Morley, which proved the circumterrestrial space capacity to perform luminiferous function.

In contrast to the author of the theory of relativity, we do not simply declare light postulates, but try to assign full motivation to the law of light speed constancy for any coordinate system related to any chosen body of reference. The important advantage of the proposed theoretical choice is its tendency to consider the categories of "space" and "substance" in continuous relationship with each other. We mean not only the close interaction between the personal space-time continuum and substance, but principal impossibility of their independent existence as well. While according to Einstein, such a real interdependence between space and substance doesn't actually exist. Hence, reliable prerequisites to unite the theory of relativity with quantum regularities aren't available.

Unlike Einstein's four-dimensional space-time, the personal space-time continuum isn't an abstract mathematical construction which doubtfully includes light postulates, but objectively existing physical reality, whose properties we can easily understand and discover basing on the experiments done by Michelson and Morley. But the most important thing is that this reality can be reasonably understood. We can perceive that the terrestrial personal space-time continuum may be used as a valid space-time framework and it is reasonable to perform different measurements and observations against its background or, if we want to be more exact, on the luminiferous normal level.

If we project a three-dimensional Cartesian coordinate system on a terrestrial PS-TC in such a way that the origin of the terrestrial personal continuum (centre of mass of the Earth) coincides with the point of intersection of three coordinate axes, then the four-dimensional nature of this objective physical reality becomes imaginable. Three spacious and one time dimensions organically interlace in the personal continuum due to matrix matter sliding along the spacious coordinates axes. The motion is that unique state when space and time become inseparably linked with each other. As we see, to illustrate four-dimensional space-time we don't need to refer to any puzzling combinations seeming to be independent of our

imagination. It is needed to possess clear idea of the object of investigations and be guided by the sole desire to understand its real physical essence.

It is obvious that not only the Earth, but any massive body possesses its personal space-time continuum in the absolute space of the Universe. If we have a system of two or more massive bodies, any PS-TC may be successfully used as a universal space-time framework, and it looks reasonable to perform various measurements and observations against its background. In this aspect all the personal space-time continuums are equivalent, and there is no privileged frame of reference. However, in each specific case of choosing the frame of reference, the decision word is that of the observer. It is location of the observer that determines the choice of a personal space-time, when the global picture of the Universe becomes clear on the luminiferous normal level.

For example, for us who live on the Earth any information about the events taking place in the surrounding cosmic infinity, comes and manifests itself on the luminiferous normal level of the terrestrial personal space-time. This circumstance causes the personal targeted orientation of the global picture of the Universe registered by the observer on the Earth. In particular, we must clearly imagine that the centre of mass of the planet, being the original point of the terrestrial PS-TC, regularly seems to be the centre of the Universe for the observer on the Earth. It is only an intellectual way which leads to understanding of how the Earth rotates about the Sun. It is impossible to register this motion by performing experiments on the Earth, and the results of observations made by Michelson and Morley prove it. Hence, our forefathers haven't sinned against the truth believing that the world exists as we see it and the Earth is the centre of the Universe. The Earth together with its personal space-time continuum is the only and firm universal framework for us, and we register any event taking place in the Universe against its background.

It's just the right time now to think of the Holy Scripture and address the Prophet Moses. It is written in the First Book, called Genesis, that the first day of creative and foundational acts of the Divine Universe, Heavens, Earth and light were created. There are the words "one day" at the end of the verses dedicated to the first day

of the creation of the world. It is known that in the original text written in Hebrew, the words "one day" have rather quantitative than ordinal number interpretation. For this reason all declarations with respect to the first day of the Great Creation must be understood as an inseparable creative and forming act. It is incorrect to use our common chronometry of 24 hours of day and night. Nothing is said in the Bible whether the first day of creation was long or not. But it is important to understand that everything occurred that day must be interpreted as a combined one-act action, and the independent appearance of Heavens, Earth or light in isolation from each other isn't acceptable.

The onset of light on the first day of the creation of the world was criticized more than once; it cast doubt on the Divine Providence logics. According to Moses' narration the creation of the heavenly bodies occurred on the fourth day of creation, it is directly indicated in the verses dedicated to the fourth day. Than an inevitable question arises: what is the day the Holy Scripture speaks about, if on the first day of the creation of the world there were no heavenly bodies? To suspect the Prophet Moses of light-mindedness would be too naïve business.

In accordance with the logics of this theoretical research we can assume that, narrating the creation of the Heaven, the Earth and light on the first day, the Prophet declares the one-time-only creation of the Earth, its personal space-time continuum with its capacity to carry luminiferous information. The existence of the terrestrial PS-TC in the absolute space of the Universe, and its capacity to operate as a luminiferous medium is impossible without the existence of the Earth mass. Just as the existence of the Earth is also impossible without its personal space-time continuum together with light postulates. These three physical categories are organically interdependent. None of them assumes its autonomous existence in the Universe, and the Prophet Moses knew it. The Bible tells us that God separated the light from the darkness. In other words, He created the luminiferous space-time medium of the matrix matter of the absolute space (which is darkness, because it isn't capable to carry electromagnetic information). Should the Earth be created without its personal space-time continuum, it shall not be able to give or receive

any information. In such a case it would be isolated from the outer world, being relegated to oblivion.

It would seem how could Moses know these subtleties of the Universe operating? However, this is the great mystery and exclusive God-inspiration of the Holy Scripture. By God's grace, the prophets knew those innermost depths of the being that we try to find out by grains at the cost of incredible efforts. The ability to perceive the Earth and its luminiferous space-time medium as an inseparable physical system was one of those mysteries within the power of the prophets. Besides, the prophets knew that the appearance of such a physical system in the matrix space of the Universe occurred at the one-time-only principle; it is this idea that is proved by the statement of the "one day".

However, Moses wasn't alone to narrate mysteries of light mains laying in the Holy Scripture! Let's think of the Book of Job, in particular, its 38th chapter, when the Most High examines Job's knowledge of the innermost mainsprings regulating the life of the Universe. In the 19th verse God asks Job: "Where is the way where light dwelleth? and as for darkness, where is the place thereof?" And then in the 24th verse He asks: "By what way is the light parted, which scattereth the east wind upon the earth?"

Let us analyze the question "By what way is the light parted?" Isn't it the principal idea of Einstein's light postulates making the most inconceivable aspect of the theory of relativity? One thing is to declare that the speed of light is the same in any coordinate system and possesses the same value in different directions at any zone of the coordinate system. But the other thing is to know to suggest physical grounds for such a declaration. Einstein in his relativistic theory doesn't even endeavour to answer questions resulting from the light postulates, though his world vision is based on the declaration that the light speed is absolute.

The factor of light speed constancy (firstly, in inertial frames of reference only) plays a key part in the theory of relativity and serves as its physical grounding. We don't have any doubt that the success of the electromagnetic theory by Maxwell and Lorentz inspired faith in Einstein that the statement of the constant speed of light in the space was true. The experiments on the ether wind discovery

redoubled his conviction. Einstein's merit was to apply the law of light speed constancy to all inertial frames of reference as a principle.

Prior to appearance of the theory of relativity it was known that Maxwell's equations, thus, the law of the **c**onstancy of the velocity of light in vacuum is invariant with respect to Lorentz transformations. This fact allowed Einstein to come to a conclusion that a transition from one inertial frame of reference to another must take place according to Lorentz transformations applied to thee space coordinates – X_1, X_2, X_3, and one time coordinate – X_4.

Then, basing on the obvious requirement that the laws of physics must be the same in all inertial systems of coordinates, Einstein found necessary to declare that all physical equations, which reflect the general laws of nature, were invariant with respect to Lorentz transformations. Hence, the essence of the special theory of relativity may be formulated in one phrase: all physical laws and equations which result from them must be expressed in a way which implies their covariance with respect to Lorentz transformations.

Later, Einstein decided to expand the idea of light speed constancy over any coordinate systems, including those moving with acceleration. It meant that according to the fundamental principle of equivalency, the idea of considering equivalent inertial systems only was unreasonable. We must agree that non-linear transformations of X_1, X_2, X_3, X_4 coordinates are also considered equivalent. If we make such a transformation of rectilinear coordinates of the special theory of relativity, then metric becomes Riemannian. Einstein selected such a special group of continuous transformations of coordinate functioning as Lorentz transformations in special theory of relativity, which could assure relative covariance of fundamental equations of physics when passing from one accelerated coordinate system to another.

It made possible to generalize the idea about unavailability of any physically preferential state of motion in nature. Hence, there are no preferential frames of reference, and equations of physics must be covariant with respect to any point transformations of the four-dimensional space-time continuum. The author of the theory of relativity makes this statement the fundamental principle of

covariance, serving as a unique possible solid foundation to construct the physical science structure over.

It goes without saying that the general principle of relativity, stating that the laws of physics must be covariant with respect to any transformation of a coordinate system, is a true and limiting principle. Possibly it is similar to that principle lying as basis for thermodynamics which impedes perpetuum mobile operating. This general principle of relativity requires all physical laws of nature be invariant for observers in any coordinate system. One can think that the principle of general covariance exists independently of the theory of relativity, because it is caused by the nature of matters itself. However, a great and crucially important question arises: whether Einstein's equations contain real limitations for physical laws or they are purely mathematical combinations working for themselves.

It is known that any physical law which is true for any coordinate system may be reformulated in such a way that its new expression has a general covariant form. Always there are a big number of field equations which accept such a general covariant formulation. Of course, the theory of relativity proposes solutions which seem to be simple enough, though they are general covariant. But this advantage itself cannot guarantee adequacy of Einstein's systems of equations. In this situation we formulate the principle question: what physical properties of space and time are taken as fundamental basis which makes possible to establish the general covariance of physical laws while passing from one coordinate system to another? And then it is natural to put another question: what must be the mathematical character of the equations which meet requirements of fundamental physical properties of space and time? Or, using other words, the only firm guarantee for the complete compliance of equations of the theory of relativity with objective reality is the clear presentation of physical processes behind their mathematical representation. Eventually, real life in the Universe is the interaction of physical regularities exclusively, not mathematical ones.

In this context, the theory of relativity is extremely restrained, because it never proposes anything else but light postulates which express real physical properties of the four-dimensional space-time and ensure general covariance of Einstein's equations. The

declaration of light speed constancy and identity in any coordinate system is a pure declaration only. Such a declaration cannot satisfy our natural desire to perceive its real physical substantiveness. Moreover, we cannot accept light postulates as an absolutely true idea. They have never been verified, and have absolutely empiric nature. Nobody has ever tried to measure speed of light in any coordinate system. One cannot guarantee that the light speed on the surface of the Moon equals the light speed on the surface of the Mars. That's why light postulates in their general application are, in fact, wishful thinking.

In general, one can speak about constancy of light speed more or less definitely in inertial frame of reference only, in the absence of gravitational fields. In this case the complete geodesic coincidence of light signal path exists and it becomes possible to compare the two trajectories superimposing them. The other way is to compare these trajectories with any rigid model. Such a procedure faces certain difficulties in accelerated frames of reference. In this case we cannot interpret coordinate axes using rigid self-congruent standards and isochoric clock. Hence, the task to compare light signal trajectories as well as their velocities while passing from one frame of reference to another becomes rather problematic or even impossible.

And even if, in reality, the speed of light is constant and has the same numerical value for any coordinate system, we need to know why it happens. We must know to answer the question put to Job by the Almighty in the Old Testament: "Where is the way where light dwelleth?" Without answering this very important and complicated question the real physical value of the theory of relativity seems rather relative.

It isn't a secret for anybody that certain assumptions lie in the depth of the fundamental science, and sometimes they don't result from the experiment. Strong evidence is the assumption of constancy and equality of light speed for all coordinate systems. It happens because we never can comprehend the physical picture of the world around us. And within our cognition, assumptions which make more or less logically completed theoretical system of scientific ideas about the world around us appear. In these circumstances the question is how deeply and haw widely do these assumptions

embrace a range of multiform natural phenomena? An assumption is acceptable till the moment when new experimental and theoretical results allow formulating more general assumption which includes the previous as a particular case with restricted applicability.

We believe that the results of experiments on the ether wind discovery served as experimental basis for light postulates acceptation. However, the idea of constancy and equality of the speed of light for any coordinate system doesn't obligatory result from the experiments performed by Michelson and Morley. We have already mentioned that the single reliable conclusion which directly results from these experiments is that speed of light in the personal space-time continuum of the Earth equals 300,000 km/sec. But the constancy of light speed in the PS-TC of the Earth doesn't imply free extrapolation of this constant over all other space-time continuums. Moreover, we have every reason to believe that this numerical value of the speed of light, 300,000 km/sec, is applicable to the personal space-time continuum of the Earth only. It characterizes physical properties of the personal space-time continuum just of the Earth.

Thus, if we consider a local terrestrial gravitational field as a uniformly accelerated frame of reference, according to equivalence principle, then we can reason as follows. Acceleration is the rate of change of velocity of a check body with respect to an external frame of reference or initial conditions of the experiment. The thing is that acceleration may be registered irrespectively to any external reference points. Besides, it is known that, according to the equivalence principle, an isolated observer cannot distinguish between acceleration and the presence of the gravitational field. In such a case a classical observer isolated in the terrestrial gravitational field (let him be closed in an empty lift) at any moment of time may switch on his measuring devices and determine his state as a continuous increase in his velocity with respect to initial conditions of the experiment with the acceleration of 9.8 m/sec^2. There is no contradiction in this experiment because the principle of equivalency allows the observer isolated in the terrestrial gravitational field, to consider his own state as uniformly accelerated motion with acceleration of 9.8 m/sec^2. It happens though the observer is in state of rest relative to the surface of the Earth.

And now a question arises: how long can an isolated observer register his acceleration if it follows from the theory of relativity that nothing can move faster than at light speed? Earlier or later the classical observer, grounding on readings of his devices must register that he reaches and exceeds the speed of light respective to initial conditions of the experiment.

In this connection let us clarify what is the interval of time needed for the classical observer to register the fact that he reaches the speed of light. The value we get equals the lunar Islamic calendar year:

$$t = \frac{c}{g}. \tag{3.11}$$

Here t is the interval of time which contains twelve lunar or synodic months (every synodic month lasts 29 days, 12 hours, 44 minutes and 2.9 seconds); c is the speed of light in vacuum; g is the acceleration due to gravity at the surface of the Earth.

It is known that the Islamic year is based on the lunar cycle and corresponds to the interval of time the Moon needs to return to its initial position. If an observer synchronizes the beginning of the experiment with the position of the Moon on the vault of heaven, then when his speed reaches the speed of light he finds that the Moon has returned to its previous place. The situation is similar to that of a traveller trying to reach the end of the Earth.

The Moon is a natural satellite of the Earth and its trajectory essentially depends on the intensity of the terrestrial gravitational field. The fact that the observer isolated in the terrestrial gravitational field, according to the equivalence principle reaches (to a high accuracy) the speed of light in a lunar calendar year is hardly occasional. This circumstance indicates the existence of still unknown deep interrelation between the space-time topology of the terrestrial gravitational field and characteristic of velocity of light signal in it. It is probable that the numerical value of light in vacuum, 300,000 km/sec, isn't an absolute and universal value for the whole Universe. It is possible that this value reflects personal metric

properties of the terrestrial PS-TC only, and is actual exclusively for terrestrial gravitational field.

It stands to reason that this assumption needs a serious study; however it is critically important for us to know to explain the origin of equation (3.11). This equality is too exact and convincing to be a simple coincidence of chances. And the most important thing is that according to Einstein, physical properties of the four-dimensional space-time are stipulated by light postulates in their traditional statement, but the reality may be absolutely different. It is not ruled out that the registered speed of light in vacuum is, in fact, the expression of a metric structure of a specific gravitational field, or specific accelerated frame of reference. Because it follows from (3.11) that

$$c = t \times g \,. \tag{3.12}$$

The uniqueness of this equality consists in the fact that it allows to prove the known value of the speed of light in vacuum with the help of gravitational potential of the terrestrial personal space-time.

It may happen that we have to deny Einstein's light postulates in their general categorical statement. Then a new theory of relativity will be created, and in this theory the general covariance of principal equations of physics will be true due to the change in the velocity of light in different coordinate systems and not to its constancy. In any case, the problem of the velocity of light as a basic element of the theory of relativity, needs great attention.

There is nothing else left for us to do but construct our world-view on the basis of Eisntein's light postulates. Especially as the terrestrial space-time continuum in full measure meets all there requirements and allows us to comprehensively describe the general picture of the world around us.

QUANTA OF MOTION

The theory of relativity is mainly intended to comprehensively illustrate results of different types of motion. We know that a man lives in the continuously changing world, in the world of kaleidoscopic displacement of various material objects with respect to each other. To reduce the dynamical picture of the world around us into a certain coordinated state we need to freely and adequately know to describe motion and orient in it. For this purpose the theory of relativity uses four-dimensional coordinate grids with three space and one time dimension. Four-dimensional coordinate systems operate like world space-time framework in it, and process of motion is realized against its background.

Einstein was the first to realize that time propagates in space at a finite speed, which is the speed of electromagnetic field expansion in Maxwell – Lorentz equations. As time looses its absolute character because of its impossibility to cover space distances infinitely quickly, then the four-dimensional space-time perception of reality becomes the only possible thing. In special theory of relativity the linear four-dimensional coordinate systems are used. They meet requirements of the space-time geometry by Minkowski when Euclid's geometry axioms are true. In the general theory of relativity the curved coordinate axes are used, which result in appearance of a curved space-time with pseudo-Riemann metrics, which is contrary to Euclid's geometry.

Location of a test body is called "event" in physics; it is understood as a point argument and determined by a set of real numbers – projections of the check point on four coordinate axes. The theory of relativity tracks out the trajectory and determines the speed of a moving observed object in the space-time coordinate frame of reference with the help of the square of the interval, dS^2, between two arbitrary close events, taking into account the way of its solution.

When Einstein formulated the problem to find the trajectory of a test body in a free gravitational field, he assumed that, basing on the requirements of the principle of equivalence, the trajectory of the check body shall be fully determined by the geometry of the curved space-time and described through the solution of the interval dS^2. Therefore, from the mathematical standpoint, Einstein's theory of relativity, in fact, is a theory of the differential space-time interval, dS^2, solution. We can add to it, that the interval between two arbitrary close events is solved through the Pythagorean theorem, which states that in any right triangle the square of the hypotenuse equals the sum of squares of the remaining sides of the triangle.

Speaking about the conceptual substantiveness of the theory of relativity we must recognize that it radically expands the limits of our ideas about the general picture of the external world due to revision of the physical status of the fundamental categories of the Universe. Einstein managed to deprive space and time of their casual absoluteness when they were the only factors affecting position of massive bodies, being unyielded themselves. The theory of relativity revealed the deep interrelation between massive bodies and metric structure of the surrounding space-time. However, it didn't put any conceptual equivalents concerning actual character of this interrelation or its actual physical content, at our disposal.

The thing is that the use of mathematical four-dimensional coordinate grids, in itself, cannot clarify the nature of space and time unification in a single topological matter. And no coordinate systems can provide understanding of the principles of interrelation between four-dimensional space-time and masses of substance. On the contrary, the use of four-dimensional coordinated grids in the theory of relativity aggravated the situation. In accordance with the specifics

of the conceptual contest of the theory of relativity, abstract mathematical manifold substituted for physical space-time reality. By the way, this mathematical manifold is isolated from the reasonable comprehension and till nowadays it doesn't have any physical attribution accessible to our imagination. We don't know what stands behind the four-dimensional space-time continuum of the theory of relativity and what the solution of the interval dS^2 is. In such a case we cannot, with certainty, present this solution as a unique true and correct description of results of motion, which cannot be intentionally changed or cancelled.

In fact, we don't know whether our mathematical constructions reflect the objective picture of the deep processes taking place on the mysterious infiniteness of the material world. Imaginary identity of physical reality and its mathematical equivalents is rather unstable, and the whole history of the development of natural science is its true witness. That's why it becomes very important for our mathematical computations not to burden vacillating conceptual theoretical basis of physics with additional contradictions. And in this sense, the theory of relativity has its fault. We can mark out at least three serious problems which cannot be logically understood, with respect to application of the interval dS^2 and interpretation of its components – point ideas about the concept of the "event", in the theory of relativity.

Let us arrest our attention on these problems and carefully analyze each of them separately.

It is considered that Einstein interpreted the unified theory of field developed by him as universal physical conception applied to any type of interaction (strong, weak, electromagnetic and gravitational interaction). Such a vision is reasonable and we would like to see a new comprehensive theory explaining different kinds of interaction and possessing a reliable mathematical ground. But it was rather another idea that didn't give a moment's peace to Einstein and provoked his creative work. The main purpose of the author of the theory of relativity, who tried to demonstrate new solutions of equation of motion, consisted in his wish to exceed the limits of interpretation of dS^2 as a measure of space-time relations and expand

it over material objects of substance. Let us look into the essence of matter.

In Figure 1 one can see two positions of a steel sphere moving along the *X*-axis, at two fixed instants of time.

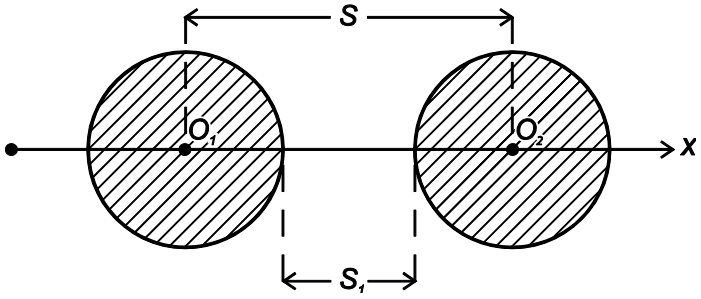

Fig. 1

In the theory of relativity and in Newtonian mechanics as well, massive material objects are considered as mass points. Then the distance between two fixed locations of a steel sphere moving along the *X*-axis, is *S* – the interval between two points, O_1 and O_2. In classical mechanics this interval, *S*, is a mathematical measure of distance between points O_1 and O_2. Theoretically, it is quite acceptable and absolutely sufficient for Newtonian mechanics functioning. However, in the theory of relativity the situation differs. In this theory the distance between O_1 and O_2 is interpreted not as a conventional mathematical measure of distance but as a natural space-time interval with its real physical properties as a moving material object possesses them, which directly results from light postulates.

In Figure 1 one can easily notice that, strictly speaking, the space-time interval between two fixed locations of a steel sphere moving along the *X*-axis is the distance S_1 and no more than that. Otherwise, is we consider *S* as a real space-time interval, we need to ground the fact of reduction of the mass of the steel sphere to its status of space-time argument together with light postulates. Hence, the necessity to

solve the problem of difference (S minus S_1) arises. We must clarify the situation with this difference and attribute it either to substance or to space-time. The theory of relativity keeps silence with respect to this problem, though when interval S approaches the differential expression the problem becomes even more critical and unsolvable.

If we consider the difference between O_1 and O_2 in the framework of differential calculus, then the interval dS^2 is found inside the steel sphere. In this case it is not a measure of space and time, but a measure of distance between two points of substance, O_1 and O_2 (Fig. 2). Then it would be reasonable to call the interval O_1O_2 a four-dimensional "material-space-time" argument. By the way, it isn't related to light postulates, because within the mass of a steel sphere it is really difficult to hold light postulates.

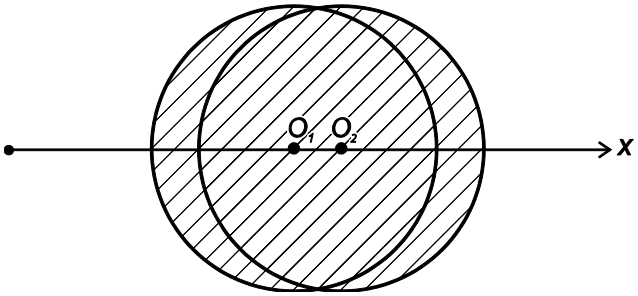

Fig. 2

In Figure 2 we can clearly see that the interval between O_1 and O_2 is a measure of distance between the points of substance. If we say that this interval is a space-time quantity, then we bereave substance of its quality of objective physical reality. On the other hand, if we expressly declare the interval between O_1 and O_2 as a measure of distance between two points of substance, then we must deny forever the possibility to consider this interval as a space-time argument. If doing it, the theory of relativity will be bereft of all its logical foundations, and it will become impossible to use it as a theory operating space-time relations.

Einstein was aware of his theory applicability exclusively for point, hence, incorporeal ideas about material objects. For lengthy bodies the differential interval between two events looses its space-time reality, but becomes a measure of distance between points of substance. In reality we live in the world of corporeal, lengthy bodies. Hence, an inevitable question arises: how can substance pass into space-time, and is such a transition possible? The theory of relativity keeps silence with this respect. Einstein didn't solve, let us say, the first problem of the interval dS^2. It is related to the transition of substance into space-time or, vice versa, with the transition of space-time into substance.

The author of the theory of relativity hoped to solve this problem with the help of the unified theory of field. It was suggested that space-time and substance may function as derivatives of the unified universal field in this new universal theory of motion. It would allow us to naturally operate with the interval dS^2 for categories of "substance" and "space-time". Einstein hoped to get this result basing on the unified theory of field. The thing is that without understanding of what does the interval dS^2 characterize – the distance between two points of substance or two points of space-time, it was impossible to determine the grade of objectivity of the theory of relativity. And only later, one can say, in the background, it was thought about the capability of the unified theory of field to describe different types of motion.

The second problem of the interval dS^2 isn't less acute and principal than the first one. It appears in the theory of relativity because of our contradictory attitude to motion as it is. The essence of the problem is as follows. It is known that the trajectory of the moving object consists rather of a continuous succession of events than of a set of intervals dS^2. That's not only the point that the interval is a secondary notion relative to the concept of event, though it makes deep sense. The thing is that, in fact, we can observe only a singular event at any fixed instant of time. The presence of the second event which closes the interval dS^2, is of intellectual origin only. At a moment of its registration the second event exists exclusively in our intellectual imagination. In principle, it is impossible to observe interval dS^2 without involvement of past or

future time. Therefore, such an interval is rather a product of our intellectual capacities than reflection of objectively existing realities taken at any fixed instant at present. However, the laws of nature must act on the level of actually existing phenomena and quantities, independently of our imagination. It is a circumstance of a fundamental order – we either describe real processes or start to investigate products of our intellectual self-expression.

The complicacy of motion registration within the limits of a separate event was discovered for the first in famous Zeno's aporia. Recollect one of his aporia – that with the flying arrow, when its head passes points *A*, *B* and *C* which are close to each other both in space and in time. Zeno constructed a logical series: in a moment when the head of the flying arrow is at a point B, it isn't already at a point A, and isn't at a point C yet. And in the actual, escaping, zero-long border between the past and the future, at a point B, the head of the arrow is within zero interval of time, or, in other words, it isn't there. Using time and distance division Zeno tried to approach the ideal, instantaneous motion within the limits of a point. The thinker believed that without such a motion within the limits of a point interval of space and time, the course of motion itself looses its real sense.

In effect, the question about location of the head of a flying arrow and other relative paradoxes is reduced to a problem of a proper attribution of the concept of "event". Point interpretation of the concept of "event" accepted by Zeno and existing till nowadays was formulated on the principle of Democritus ideas about the space and time. Classical Newtonian mechanics strengthened these ideas by giving them a mathematical ground. The theory of relativity filled the categories of "space" and "time" with a new relativistic content. But the concept of "event" itself in Einstein's world-view kept the features of old classical mechanics. It happened because Einstein failed to illustrate the transition from the state of rest to that of motion in the framework of a single event. An event, in the interpretation of the author of the theory of relativity, maintains its point character independently of kinematics, independently of whether the head of the arrow is in its state of rest or motion.

Without any doubt the optimal theory of motion must proceed from a rule stating that the equations of mechanics adequately correspond to their direct destination if the motion is given within the framework of a separate event. The possibility to change the state of motion at any fixed moment of time by another state following immediately the first one is needed. Otherwise, we never get to know to track a continuous trajectory of a moving object.

The theory of relativity considers the existing interval between two events, which is the true result of motion. Both relativistic theory and Newtonian mechanics pay no attention to the dynamical moment, which is the transition from one event to another. Any reference to differentiability of the interval dS^2, references to the level of infinitesimal quantities, by no means help to understand kinematics of motion but drive the subject matter into a corner. An event is one event, and the interval dS^2 corresponds to two separate events having different coordinates. The theory of relativity knows nothing about the mechanism of transition from one point event to another, in fact, it is in captivity of Zeno's aporias. It is incapacity of the theory of relativity to describe motion in the framework of a separate event that makes content of the second problem of the interval dS^2, resulting from Einstein's four-dimensional coordinate systems.

The third problem of the interval dS^2 results from the evident contradiction between the principle of equivalency and point approach to the concept of "event". This problem emerges in the following way.

It follows from the general theory of relativity that the existence of the gravitational field is caused by the existence of the pseudo-Riemann metrics in the four-dimensional space-time. Topological structure of this curved space-time is described with the help of the same differentiated square of the interval dS^2. Its existence is associated with four-dimensional coordinate grid put over gravitational field, and arbitrary selection of two infinitely near check points. It is clear that the procedure of selecting two points at the extremes of the interval dS^2 is of an absolutely speculative origin. However, it makes possible to digitally mark the given space-time structure and find adequate mathematical expression for its check interval.

If we place a test body into the curved space-time, according to principle of equivalency, it will experience universal gravitation. We realize that in reality, at any specific instant of time, a point event may be located at a single point of the curved space-time. To make the observed event be governed by geometrical settings and transported from one point of the curved space-time to another, let us say, initial point, the original event has to know to receive topological information about the space-time which surrounds it. However, we know that a point, by definition, is neutral with respect to any geometrical structures, because it is impossible to say a part of what geometrical structure this point is. An event of point interpretation, in principle, cannot accept topological information about the surrounding space-time, hence, cannot be governed by its metric settings. Incapacity of a point event to react on the curved space-time casts doubt on the possibility of interval dS^2 appearance, which corresponds to the given metric structure. And becomes unclear, how can the interval dS^2 appear as a result of the test body presence in the curved space-time.

Therefore, we can state the existence of the explicit contradiction between the principle of equivalency and point conception about the notion of "event". To overcome this contradiction we need to take the concept of event out of limits of a point and provide it with theoretical basis, which allows the event to accept topological information about the surrounding space-time and be governed by its metric settings. Then the space-time interval dS^2, which corresponds to the given metric structure, can appear. In fact, this is the third problem of the interval dS^2 in Einstein's theory of relativity.

Albert Einstein, during all his creative life, consistently defended the belief that all physical laws must have space-time expression. He insisted that any law could be expressed in the language of space-time relations. It is difficult to object to this statement, but it doesn't follow that the laws of nature must have just that space-time presentation as the theory of relativity offers. In particular, it isn't necessary to define a minimum element of motion by the solution of the differential interval dS^2, that is, using equations having regular continuous solutions. The modern physics convincingly proves that mainly periodic elementary processes are realized in nature. They, in

principle, are not subject to differential fragmentation and posses exclusively quantum character. In this connection it is natural to assume that space-time characteristics of the minimum element of motion must have a certain finite value and not be subject to infinite fragmentation.

Newton in his time laid down the foundations of differential calculus to give exact mathematical assessment of a relative velocity and acceleration. Differential equations gave him the opportunity to track continuous geometrical trajectory of an idealized mass point in an idealized Democritus space and time. In fact, nothing prohibited Newton to carry on an infinite fragmentation of a minimum interval of motion in an imaginary empty space and absolute time, which don't carry any physical interpretation. Classical ideas about space and time gave the possibility to consider material objects in the form of mass points because the idealized space and time with their physical properties couldn't be applied to volumetric masses. And real dimensions of material objects had no significance. The thing is that these geometrical shapes belong only to them and nothing could fill their place with another physical content. Logical completeness of classical mechanics is caused by the fact that the same check masses act as a unique reason for interaction between masses in classical mechanics. And the imaginary universal space and time framework was that ideal background which couldn't be objectively registered and didn't object to its infinite fragmentation.

Einstein set himself much more complicated task. He combined space and time in a single geometrical manifold, and assigned specific physical properties to this metric structure, together with massive material objects. These properties, though in the only form of light postulates, were fixed for the four-dimensional space-time. This decision wasn't a free expression of scientist's will; it was predetermined by the general course of physics development and, in particular, by the results on detecting the ether wind. The experiments irrefutably proved that the four-dimensional space-time functions in the mode of light postulates. Therefore, it acts as an objective physical reality, as masses do it. In such a case the motion itself must be considered rather as a result of special kind of interaction between moving material object and physically active

four-dimensional space-time than a simple classical substance transfer from one zone of the empty space and absolute time to another.

While an empty space and absolute time in classical mechanics admit application of any mathematical solutions provided that they allow tracking the imaginary trajectory on the observed object in the emptiness, then now the situation radically changed. In the conditions of renewed conceptions of the principal categories of the Universe, the mathematical apparatus used to describe motion, must respond to physical interaction between the active four-dimensional space-time and material object moving in it. This interaction must be natural and non-contradictory; it doesn't admit existence of any paradox mentioned in the course of analysis of three critical problems resulting from the use of the differentiated interval dS^2.

We don't have any doubt that the most vulnerable element of the theory of relativity is its fatal adherence to the Newtonian differential calculus. It happened due to successful development of the theory of electromagnetic field by Faraday and Maxwell. In the electromagnetic theory the field acts as a physical reality carrying energy. This reality is described by continuous functions of coordinate systems. The principal conclusion of the theory of field consists in the statement that the interaction between check objects is realized through the processes propagating at constant speed in the space, but not with the help of the instantaneous forces acting between them.

While the electromagnetic field, together with electric charges, occupies the place of reality in the electromagnetic theory, the four-dimensional space-time is present instead of the electromagnetic field in the theory of relativity. It acts as a central acting personality in all relativistic constructions. In this connection it seemed natural for Einstein to apply the method of differential calculus which was successfully used in the electromagnetic theory of the field, to the theory of relativity created by him. In addition, the supposed identity of electromagnetic and optical processes factually predetermined the use of equations of electromagnetic theory, including the Lorentz transformations of coordinate systems in Einstein's theory of relativity.

Honestly, we must say that Einstein never blindly championed ideas related to mathematical solutions of the electromagnetic theory by their mechanical transfer into the relativistic theory of motion. Suffice it to mention that he persistently selected geometrical equivalents for these solutions with the hope that the geometry would be capable to project objective physical properties of the four-dimensional space-time and formulate the unified theory of field. One means the comprehensive theory where the four-dimensional space-time and material objects would coexist harmonically, permitting to interpret any physical interaction using some universal metric relations. What shall we say? It is obvious that one can deem geometry as a science capable to project the logics of physical interactions taking place between material bodies in space-time, and consider them in a topological expression. However, the topology of the theory of relativity in four-dimensional geometry doesn't make this theory free of a complex of problems arising from the solution of the interval dS^2, taken from Einstein's four-dimensional space-time.

To exempt the theory of relativity of the necessity to use the differentiated interval dS^2, it isn't needed to perform any sophisticated multi-step operations with it. It is sufficient to take the concept of "event" out of limits of a point and assign it a quantum space-time definition. If we succeed in filling the concept of "event" with quantum content, we shall be able to consider the check event as a minimum element of motion, a quantum of relative velocity.

Quantum event will allow once and for all put an end to the necessity to use differentiated interval dS^2 when describing motion. In this case the space-time characteristics of one check event are sufficient to qualitatively estimate the relative speed.

Giving the interval dS^2 up, we, firstly, remove the problem of transition of this space-time interval into substance, or, vice versa, of substance into space-time. We have already spoken about this problem, and we want to emphasize once again that it is a godforsaken place for the theory of relativity.

Secondly, when we remove the concept of "event" out of limits of a point, we get the opportunity to track translational motion at any fixed moment of time. A lengthy quantum packet will envelop the location of a check event. Hence, the statement that the head of a

flying arrow may be found at a certain local, mathematical point makes no sense at all. The location of the head of a flying arrow becomes an undividable quantum event and we finally put an end to the paradox of motion formulated by Zeno as long ago as in ancient time.

And thirdly, an event in its quantum form may naturally react on space-time topology. In other words, the check event will be able to accept metric settings of the curved space-time and be subject to the influence of its topology. It corresponds to the principle of equivalency in full.

Experimental physics convincingly demonstrates that in the micro-world the existence of material objects is subject to corpuscular-wave regularities. Then the comprehensive theory of displacement of material objects with respect to each other must reflect this objective reality and organically combine two forms – both corpuscular and wave motion. But the theory of relativity unreservedly "ignores" corpuscular-wave duality; it seems that it has nothing to do with this obvious physical reality. Einstein, being a very consistent scientist and applying to care of experiments tried to do his best to eliminate such an obvious contradiction between his theory of motion and logics of direct experiments.

A logical interest with respect to reasons which impede the author of the theory of relativity to use quantum regularities in this theory appears. What prevented him from considering the category of "event" out of limits of a geometrical point and ascribe quantum theoretical interpretation to the "event", which would make possible to avoid the differentiated interval dS^2. In fact, such a reason exists; it is hidden behind the choice of the mathematical apparatus of the theory of relativity and interpretation of its topological basis. To find the origin of these reasons we must analyze whether the metric signature of space-time relations considered in the theory of relativity, is fair. In other words, we must clarify, whether the space-time topology of equations of the theory of relativity is really an expression of the four-dimensional geometric manifold.

In this respect, let us try to examine, what is the reason for the number "four", why just four coordinate axes represent space-time in the theory of relativity? It is used to thing that Einstein's four-

dimensional coordinate grids appear as a result of addition of three space coordinate axes and one time axis. However, the theory of relativity categorically states that neither three-dimensional space, nor absolute one-dimensional time exists. In such a case we must believe that the four-dimensional coordinate systems appear as a result of addition of geometrical dimensions of physical categories which don't exist in reality. The number "four", which characterized the signature of equations of the relativistic theory, is accepted as a result of addition of metric dimensions of geometrical configurations which don't exist in nature. We add anything which doesn't exist in nature, but we wish to get anything absolutely real.

The choice of mathematical and conceptual apparatus both in the theory of relativity and in physics, in general, is closely related to the choice of geometry, with the selection of the metric signature for physical equations and its conceptual statements. It gives rise to the special responsibility of this subject matter. It seems absolutely impossible for us to take any incomprehensible matter and add it to the equally incomprehensible something with the aim to determine the geometrical signature of the space-time manifold under examination. Any consideration of the Minkowski equations in four-dimensional metric signature is equally impossible. Let's write once again this equality:

$$S^2 = (ct)^2 - \left(x^2 + y^2 + z^2\right) \qquad (4.1)$$

We have already mentioned that this equation referencing to four coordinates axes logically contradicts with the dimension of the expression $(ct)^2$. Any ambiguity is impossible while determining geometry of the applied mathematical apparatus. And it is absolutely unclear, how can the coordinate axis declared as the "time axis", have the dimension of m · sec /sec. In accordance with the dimension of $(ct)^2$ it would be logical to consider this expression as still unknown three-digit function in three-dimensional coordinate system having its axes with dimension of m · sec /sec. Then an assumption can be made: metric configuration of the Minkowski equations is

based on six (not four) coordinate dimensions. This is the sum of three coordinate axes from the expression $(ct)^2$ and three Cartesian space coordinates $(x^2 + y^2 + z^2)$.

To determine the true topology of the Minkowski equation and find its true signature we must thoroughly analyze the origin and predestination of this equality.

Speaking about the origin of the Minkowski equation (as well as any physical equation) we must take into account that it should not be supposed that mathematical solutions are direct analogue models of the objective reality. All equations of physics are direct analogues of certain measuring procedures the researcher use to have contact with the world around us. Experimental measuring procedures underlie the whole process of cognition. They make possible the interaction between the scientist and reality and the choice of proper conceptual and mathematical equivalents. Therefore, equations of physics act rather as mathematical copies of results of some instrumental-measuring manipulations allowing us to quantitatively estimate the observed natural phenomena than as mathematical copies of objective reality as it is.

Usually we don't think about it, but the most ordinary physical statement: "long loaf weights one kilogram" in fact means that we have measuring procedure at out disposal and according to this procedure the given mass of bread may be put in equilibrium with a kilogram weight standard. Without the measuring procedure the statement: "long loaf weights one kilogram" doesn't possess any physical sense. The same thing is when we say that "space-time of the theory of relativity is the expression of the four-dimensional geometric manifold", it must mean that, in fact, we have any objective instrumental-measuring procedures, which make possible to determine the four-dimensionality of the geometric topology of the given space-time. And the number of coordinate dimensions of space-time under investigation, will correspond to the four-dimensional mathematical manifold only in the case when the metrics of the laboratory instruments which permit to find geometric properties of this space-time, includes four independent coordinate axes.

The famous equation of Hermann Minkowski is based on the measuring procedure which supposes that specific laboratory tools equivalent to each of its members-arguments, are available. For example, the argument $\left(x^2 + y^2 + z^2\right)$ is associated with Cartesian coordinate system consisting of three space coordinate axes. Cartesian coordinate system is a geometrical measuring instrument consisting of three linear metric standards, which are at right angles to each other. Any event or check object subject to be measured with the help of these simple tools may be represented and described as an element of the three-dimensional space geometric manifold.

The argument $(ct)^2$ in the Minkowski equation is associated with two independent laboratory instruments – light signal and traditional chronometer. These two laboratory instruments allow us to fix check points in space and establish light-like relations between them using light signal and isochronous clock. The ability to establish light-like or, which is the same, time-like relation between two points in the space allows determining motion as a result of propagation in time metric aspect.

Classical mechanics described motion in space and time taken apart because it couldn't reduce space and time to a single mathematical texture. Isaac Newton didn't know how to add metres to seconds or subtract them, and without this operation it was impossible to combine elements of space and time in a single mathematical solution. When we knew to establish time-like relation between two points in space multiplying speed of light and certain time interval, we got the possibility to transform time interval into space interval. As a result, it became possible to subtract $\left(x^2 + y^2 + z^2\right)$ from the period of time $(ct)^2$ transformed into the space interval. It is the comparative mathematical analysis of the results of motion in the time interval transformed into space and in Cartesian coordinate system that is present in the mathematical texture of the Minkowski equation.

We see that the topology of equation (4.1) assumes the presence of three measuring instruments. It is the Cartesian system of space coordinate axes, light signal and reliable chronometer. The use of three laboratory devices let the investigator combine relative motion

in space and time. As a result a combined space-time interval $(ct)^2$ appears, and it characterizes the numerical value of the relative speed.

Now, guided by common sense stating that any coordinate system of coordinate axis is a mathematical analogue of certain measuring tools, we shall try to clarify the true signature associated with equation (4.1). In other words, we shall try to find the number of coordinate axes in equation (4.1) and their real topological essence.

Usually we consider that the Minkowski equation is composed according to the signature (3 + 1), here 3 is the number of three Cartesian space coordinate axes, and 1 is the time coordinate axis. It is supposed that the topology of the trajectory of light signal in the expression $(ct)^2$ seems to disintegrate and become projected on one space coordinate of the Cartesian coordinate system and on time coordinate axis. In this case a conclusion that the signature of equation (4.1) corresponds to a certain four-dimensional geometric manifold and consists of four coordinate axes, is made.

But a very perfidious methodological error is hidden in this logical consideration. It leads us away from the correct interpretation of the topology of the Minkowski equation. This error is an arbitrary, ungrounded division of the metrics of the light signal trajectory into one Cartesian coordinate axes and time coordinate axes.

The light speed in all relativistic equations is not a result of our fantasy but objective physical reality fixed by light postulates. In the Minkowski equation this objective reality acts as a reliable measuring instrument together with Cartesian coordinate system and laboratory clock. Every measuring instrument is a standard metric measure, one can say, a "veritable truth" which doesn't need any additional measurement using other measuring standards. Hence, every measuring instrument possesses its proper metric topology irrespectively to the metrics of other laboratory devices used in the experiment.

When a researcher arbitrarily assigns any topologic parameters of other laboratory means to a measuring instrument, he commits a destroying action. Bereaving light signal trajectory of its proper, standard space-time metrics, we remove light signal from a series of

laboratory instruments objectively participating in the experiment. The procedure of registration of space interval which is present in the expression $(ct)^2$ doesn't assume presence of any linear standard. Such a registration is made by the method of marking two check points of space with the help of light signal and laboratory clock. An absolutely special measuring instrument is used in this case, it has nothing with linear metric standard, hence, Cartesian coordinate axes. That's why any attempt to bind the metrics of light signal path to the Cartesian space coordinate axis looks absolutely unfair.

It is not needed to think of anything supernatural to keep metrics of light speed indivisible. One just has to know to apprehend the trajectory of light signal as combined two-digit coordinate axis with dimension of m/sec. One must admit that the topology of light signal trajectory in principle cannot de metrically delimited and must be always considered as two-dimensional geometric reality, which consists of two coordinate axes of space and time which seem to be combined.

All the heuristic relativistic sense of equation (4.1) is caused by the existence of light signal trajectory in it, and the space-time topology of this signal acts as indivisible, two-dimensional geometric reality. It takes only to distribute the topology of light signal trajectory over separate coordinate dimensions of space and time, and our world-view immediately will be concentrated in the framework of the Newtonian mechanics. The combined space-time metrics of the light signal trajectory act as an interlink, which helps to overcome classical ideas about space and time as physical categories existing separately.

Returning to the issue of true topology determination for the Minkowski equation, we must agree that the general metrics of the expression $(ct)^2$ must be identified with three-dimensional geometric manifold consisting of two-dimensional trajectory of light speed plus time coordinate axis, but not with one coordinate dimension. In such a case we can say with certainty that the true geometry of the key equation of the theory of relativity bears no relation to the four-dimensional coordinate systems. The thing is that the first term in the right side of equation (4.1), we mean $(ct)^2$, contains three metric

dimensions, and the second term, $\left(x^2 + y^2 + z^2\right)$, includes three coordinate dimensions which have independent interpretation. Then the complete signature of the Minkowski equation must be interpreted as (3 + 3), and it corresponds to six-dimensional geometric manifold.

It is important that the six-dimensional interpretation of the key equation of the theory of relativity allows us to consider this solution in the framework of corpuscular-wave regularities. In accordance with relativistic view, equation (4.1) determines the trajectory of material object displacement in the space-time metric manifold. The displacement in topological space is realized along three Cartesian coordinate axes. The displacement in time metrics is realized in three-digit coordinate system with the dimension of the expression $(ct)^2$. While the motion is realized on the basis of corpuscular regularities in three Cartesian coordinate dimensions, when a classical transport of substance from one zone of the space to another takes place, then the displacement in time metrics must be realized in accordance with wave regularities. It happens because any displacement in time is a qualitative change of the physical state of the observed object. Anyone, living his life from childhood to old age, is a good example of qualitative changes in time. In mechanics, the motion based on qualitative change of the physical state of a system or medium is typical for wave processes.

The dimension of the expression $(ct)^2$ convincingly proves the wave nature of the relative motion in the time metrics of the key equation of the theory of relativity. In compliance with this dimension the geometric equivalent for $(ct)^2$ must be interpreted as a wave function in the respective coordinate system with axes of m · sec /sec dimension. Then the true meaning of equation proposed by Hermann Minkowski consists in the fact that the required interval of observed relative motion, S^2, may be determined by subtracting the space interval from the length of the wave function in coordinate system of $(ct)^2$ dimension.

From the aforesaid we can conclude that the Minkowski equation, more that any other equation of the quantum physics, corresponds to

the mode of corpuscular-wave duality. To consistently comprehend and discover the nature of the relative motion, we must activate in our theoretical considerations two self-sufficient conceptions of relative motion realization – corpuscular and wave, which are related to each other by a well-known principle of complementarity. The relation between these two theories of motion, according to the rule of quantum uncertainty, must be compatible with the idea that the more distinctly we incline to corpuscular or wave motion, the farther we go away from the opposed dynamic form.

The theory of relativity in Einstein's conceptual and mathematical interpretation is, mainly, a theory of motion of a corpuscular sense. A moving material object acts in it as a stationary formed mass of substance. This mass in the course of motion is removed from one zone of the four-dimensional space-time and placed into another zone. Then, in accordance with the wave regularities, the moving mass of substance must be interpreted as a running, disturbed local region of the given space-time continuum, which carries energy. And at any new moment of time the next local region of space-time will serve as a material platform for displacing mass of substance.

The aim of this theoretical research is to develop a wave theory of relative motion, which according to the rule of quantum uncertainty organically supplements the traditional, or, we can say, corpuscular theory of relativity. While the traditional theory of relativity is expressly based on the corpuscular forms of motion that may be visually represented in the space metric plan $\left(x^2 + y^2 + z^2\right)$, the wave theory of relativity is mainly based on wave regularities operating successfully in time topologic plan of the metric structure of the expression $\left(ct\right)^2$. Then we shall consider the expression itself as a wave function the wave relative motion is realized in accordance with. If we know the characteristics of this wave function, we shall be able to find phase, as well as relative speed of displacement of the material object in the stated personal space-time continuum.

As our target is to expressly formulate the wave conception of the relative motion, which corresponds mainly to wave regularities, it seems reasonable to consider the simplest case of wave disturbance propagation on the free surface of water, and to refresh our ideas

about physics of wave processes. Let us project the Cartesian system of coordinates on the disturbed water surface in such a way that *X*-axis indicates the direction of the phase velocity, *Y*-axis is oriented along the front of wave propagation, and *Z*-axis is at right angles to *X*-axis and *Y*-axis (Fig. 3)

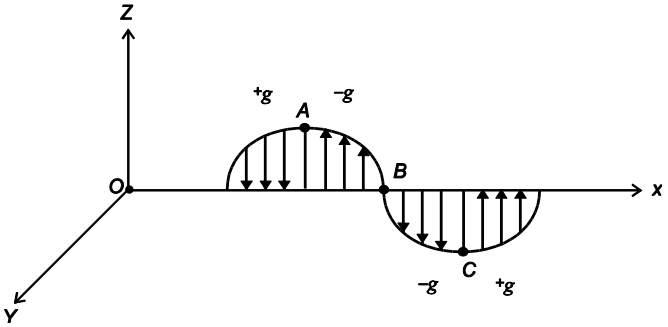

Fig. 3

In general case, the propagation of wave disturbances on the free water surface is associated with the bending of two-dimensional mirror oriented into the third dimension. Observations of the check point on the disturbed water surface in the Cartesian coordinate system prove that the motion of a corpuscular type, which is direct transport of substance from one region of the space to another, takes place only in one dimension, along *Z*-axis. Any displacement of water along *X*-axis isn't observed at all, however, this fact doesn't impede the appearance of the phase velocity of a running wave just in this direction.

The corpuscular displacement of a check point on a disturbed water surface is characterized by its acceleration with respect to quiet mirror with negative and positive signs. In Fig. 3 acceleration is directed along the arrows, and for waves of "gravity" it equals the acceleration due to gravity in the given gravitational field, if we neglect forces of surface tension. Simple calculations are known to find the function of the plane wave packet *ABC* marked at certain characteristic points with respect to *Z*-axis, if the phase velocity of

wave disturbance propagation along the *X*-axis and acceleration along the *Z*-axis are given.

We can add that, if we know characteristics of the plane wave packet *ABC*, in particular, its length, and if we set a gravitational potential, then we can find the value of the phase speed of wave disturbance propagation on the free water surface. For the waves of "gravity" the phase speed is determined as follows:

$$v_{phase} = \sqrt{\frac{g\lambda}{2\pi}}. \qquad (4.2)$$

Here g is the gravitational potential, λ is the length of the wave packet.

From this picture of wave disturbance propagation on the free water surface we can mark out the following.

Firstly, let us take into account that there are three independent velocity factors in wave disturbances on water surface. It is the phase velocity of wave disturbance propagation along *X*-axis, and acceleration along *Z*-axis. The third velocity factor, whose existence is of a special importance for us, is the initial velocity at negative acceleration and final velocity at positive acceleration of the check point of a progressive wave directed along *Z*-axis. This velocity corresponds to the moment when initial impulse causes the appearance of wave disturbance. It is similar to that moment when a stone falls on the quiet water surface. It is at this moment that certain initial velocity is given, and firstly, the gravitational potential makes it to decrease, and then, after passing the zero level of the state of rest, it increases up to the initial, in the ideal case, value.

And secondly, we must recognize that the plane wave packet *ABC*, which appears when wave disturbances propagate on the free water surface, in fact, plays a part of an extreme metric formation, and the curved water surface is gauged according to it. While determining the plane wave packet *ABC* as an extreme metric formation, we base on the idea that the category of "wave" is an indivisible quantity. We can mathematically resolve the wave function into separate fragments, but this procedure cannot be done in real physical

situation. We can perform very sophisticated experiments, but it is impossible to get neither a part of a wave, nor a point of it. Any wave exists as a whole, it is a quantum formation, that's why the plane wave packet *ABC* on the disturbed water surface is an extreme and indivisible quantity.

To determine the configuration of the asked wave function responsible for relative motion on the basis of wave regularities, we need to analyze the process of material object displacement in the given PS-TC with respect to the time component of the Minkowski equation. In other words, we need to describe relative motion as a result of wave disturbance propagation in the three-dimensional coordinate system having the dimension of $(ct)^2$. While doing it we shall apply the useful experience based on observations of wave disturbances on the free water surface. The acquired experience proves that the appearance of the plane wave packet *ABC* responsible for gauging the wave disturbance, is followed by the existence of three speed factors. It is natural to assume that the appearance of wave function which allows us to calibrate the relative motion in time metrics is also associated with three independent speed factors.

The wave function corresponding to the expression $(ct)^2$ is shown in Figure 4 in three-dimensional coordinate system with axes having m · sec /sec dimension.

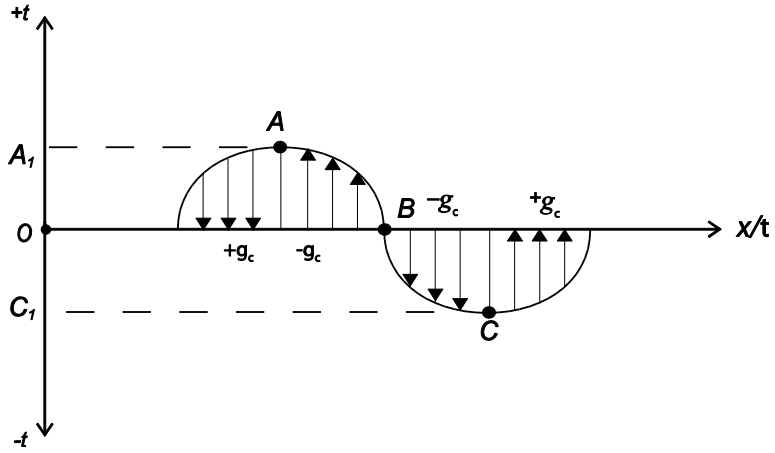

Fig. 4

The coordinate system shown in Fig. 4 consists of two-digit *X/t* coordinate axis, which is identified with the trajectory of light signal propagation, and time *t* coordinate axis. The positive direction of the time *t* axis corresponds to the future, its negative direction corresponds to the past, and point *O* (point of intersection of coordinate axes) corresponds to the present. The peculiarity of the chronometric version of the time *t* coordinate axis consists in the fact that all qualities of past, present and future time act as equivalent arguments. It means that any time series projected on the time axis consists of equivalent points without any exclusion.

In the Figure we can easily see that the wave disturbance, which characterizes the displacement of material object in time metrics of the given PS-TC is followed by acceleration of the check point of the wave function along the time axis. Similar to wave disturbances on the water surface, this acceleration may acquire positive or negative values depending on its direction, but it always equals the value of the light speed in vacuum ($+g_c$ or $-g_c$). Note that this acceleration is the first speed factor of the set of three independent speeds, following the appearance of the wave disturbance. The initial velocity at the negative acceleration and the final velocity at the positive acceleration, being the primary impulse for wave process appearance (it is analogous to the moment when a stone falls over a calm water surface), correspond to corpuscular relative velocity of the material object displacement in the given PS-TC. Let us determine the relative velocity, *v*, as the second speed factor causing the origin of the wave disturbance. The phase velocity of wave disturbance propagation along the *X/t* axis always equals the light velocity in vacuum and acts as the third speed factor needed for the wave process progress.

We have marked three characteristic points of the wave function along *t*-axis in the same Figure. Points *A*, *B* and *C* limit the plane wave packet, which appears when the material object displaces in time metrics of the given PS-TC and is the extreme metric formation for given wave disturbance. We take into account that the wave packet is a quantum quantity which is not subject to further fragmentation.

A is the amplitude of the plane wave packet ABC, whose projection on the time axis (distance A_1C_1) has time dimension and is determined by the solution of three aforesaid speeds,

$$A = \frac{c - \sqrt{c^2 - v^2}}{g_c}. \tag{4.3}$$

Here c is the phase speed, which is equal to the speed of light in vacuum; v is the corpuscular speed of the displacement of a material object in the given PS-TC; g_c is the acceleration of the check point of the wave function in time coordinate dimension, which equals the light speed in vacuum.

If $v = 0$ the solution of equation (4.3) becomes zero, which conforms the theoretical premise about the appearance of the plane wave packet ABC when a material object displaces in the time metrics of the given PS-TC. If $v = c$ the amplitude of the wave packet reaches its maximum value of unity. If the speed of the relative motion exceeds the speed of light, $v > c$, the initial speed at the negative acceleration along the t-axis, being the primary impulse for wave disturbance appearance, exceeds the rate of change of the acceleration itself, and the wave disturbance isn't realized in the time metrics of the given PS-TC. A moving material object just shoots through the given space-time continuum without registration because the plane wave packet ABC which gauges the wave disturbance has no time to form. That's why the theory of relativity puts limitations and prohibits increase in relative velocity over the value of light velocity. It is clear that the displacement of material objects with respect to each other may occur at any high velocity. But only that material object whose relative speed doesn't exceed that of light, may be registered in the specific PS-TC, *i.e.* pass the state of wave disturbance in its time metric plan.

The plane wave packet ABC shown in Figure 4, in fact, is a geometrical justification for relative motion wave conception functioning, which is based on a time component of the Minkowski equation. In accordance with the wave theory of relativity, when a material object moves uniformly along straight line in given personal

space-time continuum, the wave disturbance of a material platform of the moving object in a time metric plan of the given PS-TC takes place. This wave disturbance is gauged in accordance with the configuration of the plane wave packet *ABC*, suitable for the expression $(ct)^2$. For any accelerated relative motion the configuration of the wave packet *ABC* transforms from its plane symmetry into a curved, but in this context the talk turns to the inertial motion.

We remember that the category of "wave" is an indivisible quantity, and we have to consider a plane wave packet *ABC* shown in Fig. 4, as an indivisible quantum of the event, because it is an extreme geometric formation. If we know the characteristics of this quantum of the event, we can determine the relative velocity of material object displacement in the given PS-TC. The latter directly results from equation (4.3). For example:

$$v = \sqrt{Ag_c\left(2c - Ag_c\right)}. \tag{4.4}$$

It was already noted that our ideas about the relative notion in accordance with quantum regularities must meet the requirements of the corpuscular-wave duality. That's why we cannot present its comprehensive description using only corpuscular or wave mechanics of relative motion. When relative displacement of the material object in the given PS-TC becomes object of observations, we need to combine elements of two dynamic types of motion and get a resulting. The combination must be made in such a way that the relative motion in the space metric plan should realize in accordance with corpuscular regularities, and in time metric plan – according to wave regularities. The famous equation written by Hermann Minkowski suggests such an averaged corpuscular-wave characteristic of relative motion. Pursuant to this equality the true relative velocity of material object displacement in the given PS-TC is the difference between the length of the wave packet responsible for calibration of the relative motion in the time metric plan and space interval, which is the result of relative motion in the space metric plan.

To better imagine the actual combination of wave and corpuscular signs of the relative motion we need to apply to the well-known Zeno's aporia with the flying arrow. Let us analyze the situation when the head of the flying arrow consequently passes closely set points *A*, *B* and *C* in the personal space-time continuum.

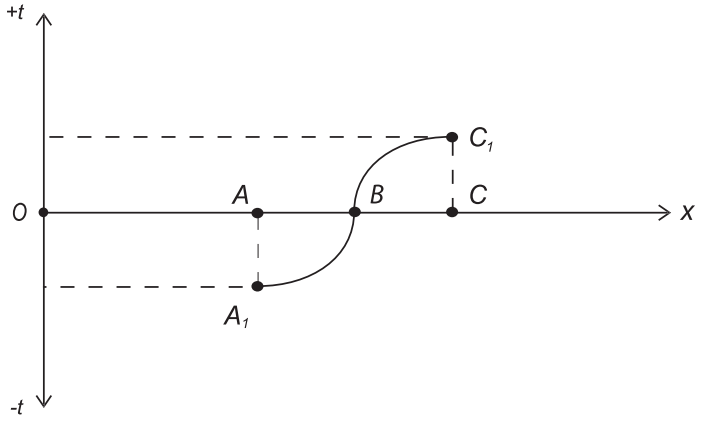

Fig. 5

With this aim let us place the trajectory of Zeno's arrow into the two-dimensional coordinate system consisting of one space coordinate axis, *X*-axis, and one time, *t*, axis (Fig. 5). In fact, the flight of Zeno's arrow with respect to the given PS-TC takes place in the six-dimensional geometric manifold. To visualize our considerations we use only one coordinate axis, *X*-axis, taken from the space metrics, and time, *t*, coordinate axis, taken from the time metric plan of the given PS-TC. Nevertheless, we shall continuously take into account that it is a combined space-time coordinate system where both corpuscular and wave signs of motion are realized.

The logical reasoning proposed by Zeno and stating that at the moment when the head of the flying arrow is at the point B, it is no longer at the point A, but not yet at the point C (Fig. 5), is based on classical ideas about space and time absoluteness. Antique philosopher imagined relative motion exclusively as a corpuscular process. But in fact, in accordance with the quantum regularities the

statement that at any fixed moment of time the head of the flying arrow is at the point *B* doesn't possess any physical meaning. In view of corpuscular-wave ideas about relative motion, the head of the arrow at any fixed moment of time is present at the same time at the wave function A_1BC_1 as a whole, which acts as an indivisible quantum of relative motion. The only reserve must be made: at a segment from A_1 to *B* the head of the flying arrow is present in past time, at a segment from *B* to C_1 it is present in future time, and only at the point B the location of the head of the flying arrow corresponds to the present moment of time. Besides, we must clearly realize that the head of the flying arrow at one time objectively is present at the wave function A_1BC_1 as a whole in past, present and future quality. There are wave regularities that prohibit us to tear these time qualities due to existing impossibility to divide wave packet A_1BC_1 into separate and independent fragments.

Therefore, all the paradoxes formulated by Zeno in his famous aporias, result from incorrect understanding of nature of motion. As soon as we take the concept of "event" away of the point limits and give it space-time definition, these paradoxes will be resolved by themselves.

Relativistic effects serve as reliable evidence of the fact that the displacement of material objects in the given PS-TC is realized in accordance with corpuscular-wave regularities. In particular, we can mention the Lorentz contraction of registered length of the moving object. In fact, if we place a newspaper sheet on the disturbed water surface, we can find that the projection of the sheet on the coordinate axis directed along the phase velocity of wave disturbance propagation is less than the length of this sheet in its free state. The greater the phase velocity, the bigger the curvature of the wave disturbance and the shorter is the length of the projected newspaper sheet. Similarly, the projection of the length of a material object moving in the given PS-TC on the space coordinate axis indicating the direction of the relative velocity is less than the length of the same object in the state of rest.

Geometrical dependence of Lorentz contraction of the length of a flying arrow with respect to the amplitude of the plane wave packet which gauges the relative motion, is shown in Fig. 6 in two-

dimensional space-time coordinate system. Similar to the previous experiment with the flying arrow, to make our considerations more obvious, we take only one space coordinate axis, X, and time axis, t, of the six-dimensional metric manifold which corresponds to the metrics of the given PS-TC. As a result, we get a combined space-time coordinate system shown in the Figure.

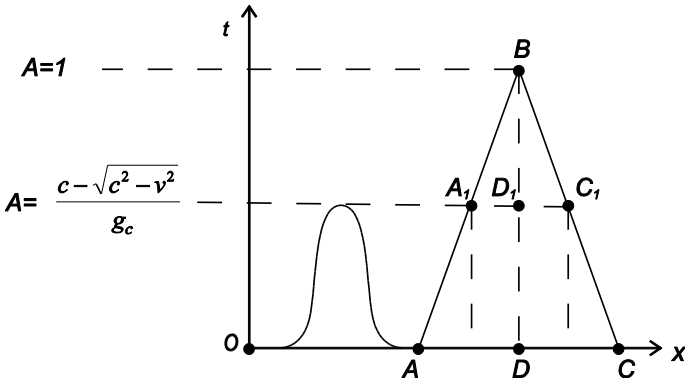

Fig. 6

Let the distance AC along the X-axis correspond to the length of the flying arrow in the state of rest, L^0. Then the two legs of the triangle ABC show all possible values of the relativistic length of the flying arrow projected on the X-axis, depending on the value of the relative velocity. One of them is shown as a segment A_1C_1 parallel to AC, and other values are found in the range from the base of the triangle AC up to its vertex. This distance decreases when we approach point B. The value of the length of the flying arrow registered by immobile observer is determined in this Figure by the amplitude of the plane wave packet represented in the Figure by a small wave function. The amplitude of this wave packet, the distance DD_1, marks the level of space coordination of the projection of the length of the flying arrow on X-axis. For example, when $v = c$, the amplitude of the plane wave packet used to calibrate relative motion has its maximum value which equals 1. Then the relativistic length of

the flying arrow projected on the *X*-axis is point *D* or practically equals zero.

To determine the relativistic length of the flying arrow one must find the distance A_1C_1 in Fig. 6. The procedure is as follows:

$$\frac{AC}{BD} = \frac{A_1C_1}{BD_1}; \qquad A_1C_1 = \frac{AC \times BD_1}{BD};$$
$$A_1C_1 = \frac{AC \times (BD - DD_1)}{BD}. \tag{4.5}$$

We can write (4.5) as:

$$L = L^0 \times \frac{\Delta t - \frac{c - \sqrt{c^2 - v^2}}{g_c}}{\Delta t}. \tag{4.6}$$

Determine g_c in equation (4.6) as rate of change of velocity and make the substitution. Then:

$$L = L^0 \times \frac{\Delta t - \frac{c - \sqrt{c^2 - v^2}}{c}\Delta t}{\Delta t} =$$
$$= L^0 \times \left(1 - \frac{c - \sqrt{c^2 - v^2}}{c}\right) =$$
$$= L^0 \times \left(1 - 1 + \frac{1}{c}\sqrt{c^2 - v^2}\right) =$$
$$= L^0 \times \sqrt{\frac{c^2 - v^2}{c^2}} = L^0 \times \sqrt{1 - \frac{v^2}{c^2}} \tag{4.7}$$

As we see, in the result of these calculations we get Lorentz transformation for the length of the flying arrow which was used by Einstein in his theory of relativity.

INERTIA

Any mechanics which pretends to be a comprehensive theory of motion, must be, in the first place, a theory of matter and explain its basic property – the inertia. For this purpose it must have an effective conceptual arsenal capable to adequately attribute the nature of principal categories of the Universe and comprehensively describe their functional contribution to different states related to dynamics of motion. In principle, we can mention four absolutely independent states of the test massive material object in the given personal space-time, each of them having its independent physical concept which distinguishes them from other states. Let us indicate these states and name them "four problems of Newtonian apple".

The first state corresponds to the situation when the apple hangs on the tree branch and maintains its state of rest relative to the Earth. Physical sense of such a state is determined by the interaction of the check apple and the terrestrial gravitational field. As a result the apple hanging on the tree acquires a reserve of potential energy.

The second state of the apple may be registered during its free fall in the terrestrial personal space-time. In this situation the apple seems to be released from the "arms" of universal gravitation and accepts its metric settings. But at the moment when the apple loses contact with the tree the mysterious transformation of the potential energy into kinetic energy takes place. And we don't know what happens at this moment to the check apple, and how does the energy transformation occur.

The third state was registered by Isaac Newton at that time. This state corresponds to the moment when the falling apple reaches the surface of the Earth. Then the kinetic energy is released from the apple and it transforms into impact, heat, sound energy, etc. In other

words, the kinetic energy of the falling apple seems to crumble to various kinds of different energies. And again, we know absolutely nothing about these energy reincarnations. The thing is that we don't know the kind or form of energy accumulated in the falling apple before its "crumbling" to variety of energies.

The fourth state of the apple is associated with the forced imposition of acceleration to it, when deeply vexed Newton throws this ill-fated apple which hurt his head, away. The energy exchange takes place again. Newton's energy is transferred to the apple thrown away, and acquires the form of kinetic energy in it. Using real arguments we must explain the way for Newton's energy transfer to the thrown apple, and physical transformation taking place during the process.

Any of four states mentioned above and associated with the presence of the test apple in the terrestrial PS-TC, possesses its individual physical meaning. The reliable, let us say it, theory of relative motion must clearly explain each of these states. It must reasonably explain the energy reincarnations in these thought experiments. It must do it using the mathematical language and with the help of conceptual statements accessible to our understanding as well.

We must acknowledge that the modern scientific thought doesn't possess any reasonable theory of motion to fully explain any of the four aforesaid states of apple, though it seems quite strange. If we succeed in finding the complete explanation for any of these states, then such a theoretical procedure might be universal tool to create a comprehensive theory of relative motion. One shall get a possibility to explain all other dynamic states of the apple related to its presence in the terrestrial PS-TC.

It is known that the Newtonian mechanics with its famous laws offers satisfactory mathematical solution for any of the mentioned states of the apple in the terrestrial personal space-time. But it succeeds to do it in the special conceptual system consisting of mass points acting at a distance and absolutely empty space when absolute time passes uniformly. A weak point of the classical mechanics is caused, firstly, by insufficiency of conceptual arguments it is based on. In fact, none mathematical point or differentiated intervals

between them are related to principal categories of the Universe. Hence, they cannot be interpreted as real physical equivalents for the natural process of relative motion. And secondly, the mathematical apparatus of the Newtonian mechanics isn't adapted to Lorentz corrections whose significance becomes rather important at higher relative speeds.

Within the framework of Newton's conceptual system any promising prerequisite for the solution of any of the four problems related to the check apple presence in the terrestrial PS-TC, actually doesn't exist. The thing is that the methodology of considering massive material object as a mass point doesn't imply any positive result in searching any effective idea to consider the apple as a carrier of energy. In fact, from the physical standpoint, what can we say about the apple hanging on a tree and possessing potential energy if this apple is represented by a mass point and the amount of energy depends only on a distance to the Earth? How shall we indicate the place of this energy concentration and type of the energy, if instead of real picture of processes taking place in nature we have only points and distances between them at our disposal?

Later, Einstein proposed a renewed version of the Newtonian mechanics after finding its triviality and restriction of its applicability. This version possesses its own system of concepts consisting of a continuous space-time field and same mass points substituting massive material objects. Einstein's equations of motion are much more exact compared with Newton's equations, but they are also vapid in the sense that they don't include expressions for force and energy accessible for our understanding. Even if such an expression exists, it is a very arbitrary one, because force and energy existing in it, depend on derivatives of coordinate with respect to time. In any case, the theory of relativity is only a geometric scheme of distribution of the mentioned mass points substituting real material objects. This is merely a scheme in four-dimensional coordinate grid imitating the four-dimensional space-time.

The theory of relativity, as well as Newtonian mechanics, doesn't offer any promising ideas capable to explain the difference between the apple hanging on a tree and the apple in state of free fall. While from the physical standpoint we deal with two absolutely different as

to their interpretation material objects. In one of them potential energy is accumulated, and it is the kinetic energy in the other object. And we cannot speak of any comprehensive theory of relative motion till the moment when we really determine the way of energy transformation. This problem cannot be solved if a massive material object is represented by a point mass. Even the bravest imagination cannot represent a point as a carrier of energy or as a place for its transformations.

To predict the possible universal theory of motion, let us thoroughly analyze one of four problems related to the check apple in the terrestrial personal space-time continuum. Let us pay attention to the situation when Newton throws the apple fallen on his head, away, and analyze it. Let us try to find the answer to the question about the way, Newton's force was transported to the ill-fated apple. Newton imparts kinetic energy to the apple at the moment when the apple accelerates. But the energy is exclusively a physical notion, not a mathematical one, hence, it is a material notion. Therefore, we must attribute this event in the system of physical concepts instead of doing any recalculation of abstract coordinates-symbols.

We can formulate the problem of Newton's energy transfer to the thrown apple in another way, as an unwillingness of the mass experiencing the force, to move. The Austrian scientist Ernst Mach thought that one can explain inertia – unwillingness of a mass to move when the force is applied, by mutual attraction of all the substance in the Universe. In this case the mass of a material object isn't its distinctive feature but depends on mass distribution in the Universe. If the substance in the outer space is distributed non-uniformly, then the inertia has different values in different directions. This hypothesis is known as "Mach's principle". To illustrate his considerations Mach offered thought experiments with a classical astronaut. Let us recall one of these experiments.

Imagine the Universe with the only material object in it. Let it be the Newtonian apple which possesses its personal space-time continuum in the absolute matrix space, as we already know it. The centre of mass of the apple is organically related to the initial point of its PS-TC. In the absolute space of the Universe they act as a unified

physical system “material object – personal continuum”. Let us show this physical system in Fig. 7.

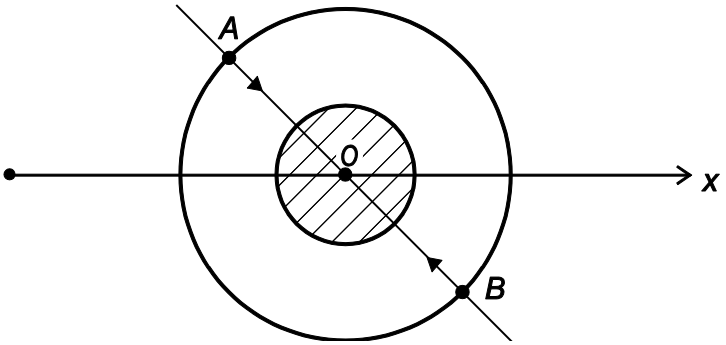

Fig. 7

The small shaded area in Fig. 7 represents the Newtonian apple. Two opposite directions, *AO* and *BO*, represent two arbitrary trajectories of the matrix matter of the absolute space entering the mass of the apple. Suppose that the apple is the source of electromagnetic waves (light source) and circumscribe a reference circle in its personal space-time continuum, which is drawn along the front of light waves propagation. Note that the radius *OA* equals the distance travelled by the light within one second.

By analogy with Fig. 7 we construct a working model shown in Fig. 8.

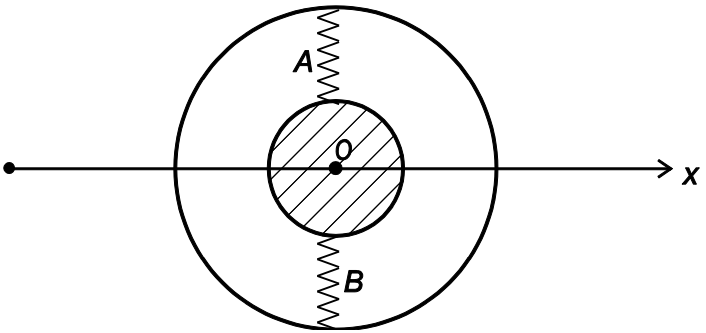

Fig. 8

The model consists of aluminium hoop with the experimental apple hanging on two springs, *A* and *B*, fixed in its geometrical centre. The analogy between two physical systems represented in Fig. 7 and 8 consists in the fact that both of them are flexible structures. Any kinematical manipulations with the experimental apple shown in Fig. 8, cannot propagate immediately over the model. The reaction of the aluminium hoop on any change in the relative speed of the experimental apple occurs with certain delay which depends on flexible properties of the springs. In the same way the restrictions imposed on the speed of light signals propagation in the tested PS-TC make the physical system "material object – personal continuum" as flexible, as the working model is.

In addition, the both constructions naturally tend to the balanced, equilibrated state. Then the experimental apple shall be found in the geometrical centre of the aluminium hoop, which is similar to the Newtonian apple at the centre of its PS-TC. We shall repeat all the further thought experiments with Newtonian apple in empty Universe with the working model. It will guarantee the visualization of further conclusions and reliability of their argumentations.

Assume that a classical astronaut in the empty Universe comes up to the Newtonian apple and starts to uniformly displace it along the straight-line *X*-axis (Fig. 7). As the thought experiments takes place in the empty outer space (in the absence of any material objects), we interpret *X*-axis as an idealized geometrical direction which isn't related to any body of reference. At a certain moment of time let the classical astronaut send a light signal from the Newtonian apple moving along *X*-axis towards the greater circle which is drawn along the front of light waves propagation in its personal space-time continuum. Let us see how this though experiment might be realized. And let us see whether the equilibrium state of the physical system "material object – personal continuum" is disturbed or not.

We know that the initial point for any personal continuum is inherently related to the centre of mass of a material object, which causes the existence of the given PS-TC. Then, if the Newtonian apple is displacing uniformly at a certain speed along the idealized *X*-axis, its personal space-time will follow it at the same speed together with the circle drawn along the front of light waves propagation. To

be sure of it, we must repeat this thought experiment using the working model. It is obvious that when the experimental apple uniformly displaces along *X*-axis (Fig. 8), the physical system "check apple – aluminium hoop" will have the same aspect as it has in its state of rest.

Now assume that the classical astronaut comes up to the Newtonian apple and starts to impart constant acceleration to it along the idealized *X*-axis (Fig. 9).

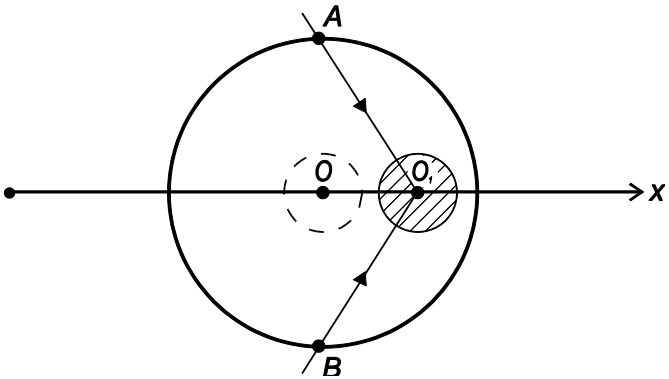

Fig. 9

Let the astronaut send a light signal at a certain moment of time from the accelerating apple towards the circle drawn along the front of light waves propagation. Let us see what impact the proposed experiment will make on the general state of the physical system "material object – personal continuum". And try to clarify the character of relations between the centre of mass of the Newtonian apple and geometrical centre of its PS-TC.

It is known that the restrictions imposed on the speed of light signals propagation result in flexibility of the structure of the physical system "material object – personal continuum". Any dynamical manipulations related to displacement of the Newtonian apple cannot immediately propagate through the whole system. The example of such manipulations is a case when a classical astronaut starts to change the relative speed of the Newtonian apple

displacement along the idealized *X*-axis applying his force. This change in velocity cannot spread over the whole personal space-time continuum of the check apple at a time. Meanwhile the light signal sent by the classical astronaut covers the distance *OA* (Fig. 9) and reaches the circle drawn along the front of light waves propagation, the centre of mass of the apple travels the distance between points *O* and O_1.

Under the action of astronaut's force the mass of the apple leaves the geometrical centre of the circle drawn along the front of light waves propagation in its PS-TC. It means that the physical system "material object – personal continuum" becomes disturbed from its state of equilibrium. Once the action of astronaut's force over the apple stops, the physical system "material object – personal continuum" immediately tends to its state of equilibrium, when the centre of mass of the apple becomes the geometrical centre of its PS-TC. It is this tendency of the physical system "material object – personal continuum" to reach the state of equilibrium that causes the unwillingness of any mass to move in response to the force action.

The similar thought experiment can be done on the working model. It definitely indicates that the accelerating mass of the experimental apple becomes displaced from the geometrical centre of the aluminium hoop as a result of apple's acceleration along *X*-axis.

Therefore, we can conclude that according to Mach's principle all the bodies which have rest mass resist the action of a force independently whether there are other masses in the surrounding world or not. This unwillingness of the test body to obey the force is caused by the tendency of the physical system "material object – personal continuum" to reach the state of equilibrium. And the force applied to the accelerating object, is used to displace the mass of the object from the geometrical centre of its PS-TC. The greater the mass of the object under investigation, the stronger the internal bindings which control the physical system "material object – personal continuum" in its state of equilibrium, and greater effort is needed to disbalance it.

However, continue our thought experiments with the Newtonian apple, now let us do them not in the empty Universe, but in more realistic conditions. In other words, let us analyze different dynamic

states of the apple relative to the real PS-TC instead of idealized *X*-axis. The peculiarity of these experiments consists in the fact that when we describe the kinematics of the Newtonian apple in real conditions we deal with two personal space-time continuums instead of one. We mean the given external personal continuum related to the selected body of reference, and the personal space-time of the test apple.

Basing on the statement of equality and equivalence of all personal continuums we can use both given external PS-TC and personal space-time of the Newtonian apple to describe its motion. In such a case, on the one hand, we can speak about the displacement of the experimental apple with respect to the external PS-TC and plot the wave packet for calibration of this relative motion at the level of the luminiferous normal level of the external personal space-time. On the other hand, we can describe the displacement of the Newtonian apple using its PS-TC and plot the wave packet at the level of the luminiferous normal level of the personal space-time of the apple itself.

Let the classical astronaut impart certain constant and rectilinear velocity to the Newtonian apple with respect to the external personal-time continuum related to a certain massive material object but not the idealized *X*-axis. Try to clarify, how shall we interpret such a thought experiment? It is known that in the course of inertial displacement of the Newtonian apple relative to the external PS-TC, wave disturbance of the local region of the given personal space-time takes place. This region serves as the real material platform for a moving object. The wave disturbance takes place in the time metrics of the given PS-TC and is followed by an emerging plane wave packet needed to gauge the given relative motion. If we know the characteristics of this wave packet acting as an indivisible quantum of an event, we can find both phase and relative velocities of the Newtonian apple displacement relative to the external PS-TC.

If we consider the inertial displacement of the Newtonian apple from the standpoint of its PS-TC, then we find that the given relative velocity cannot be registered in the personal space-time of the apple itself. From the results of the previous thought experiments it follows that in case of uniform rectilinear displacement of the experimental

apple along the idealized *X*-axis, the physical system "material object – personal continuum" maintains the same aspect as in the case when it is in its state of rest. It means that in the course of inertial displacement of the Newtonian apple there are no wave disturbances in its personal space-time, and it is impossible to speak about the appearance of the wave packet to gauge relative velocity. Now we can formulate the first principally important generalization. According to this generalization an inertial motion of any material object in the external personal space-time is identical to the state of rest of this object in its PS-TC.

Now assume that the classical astronaut begins to impart constant acceleration to the Newtonian apple. Let us try to investigate the process of the apple accelerated motion relative to both external and inherent PS-TC.

We have already established that in the course of the inertial motion the Newtonian apple maintains its state of rest in its inherent PS-TC, but displaces relative to the external personal space-time. But if a certain constant acceleration is given to the Newtonian apple, the situation radically changes. Now the mass of the check apple displaces relative to the external personal space-time continuum and its inherent PS-TC as well. However, we must note that while the Newtonian apple moves with constant acceleration if it is uniformly accelerated by a classical astronaut relative to the external PS-TC, then it moves uniformly at constant velocity relative to its inherent PS-TC.

And now the second principally important generalization, which is symmetric to the first one, can be formulated. It states that the accelerated motion of a material object relative to the external PS-TC is equivalent to its uniform straight-line motion in its inherent personal space-time. It is this fundamental identity between accelerated motion of a test body in an external personal continuum and uniform motion in its inherent personal space-time that later on serves as a guiding idea to understand the nature of the universal gravitation.

Assume that the classical astronaut stands on the roof of a multi-storeyed building with the Newtonian apple in his hand. The apple, as it is known, possesses its inherent PS-TC in the absolute space of

the Universe. The proposed thought experiment takes place provided that the unified physical system "Newtonian apple – personal continuum" is placed into the personal space-time continuum of the Earth. Let the astronaut send a light signal from the check apple at a certain moment of time. We shall consider the process of light signal propagation from the standpoint of the terrestrial PS-TC and personal space-time of the apple itself. To do it, let us analyze Fig. 10.

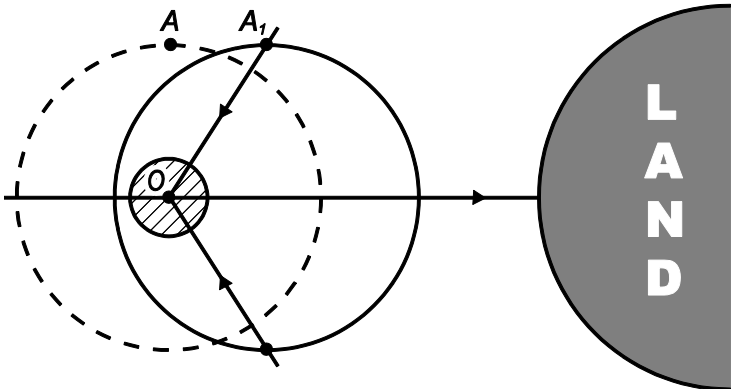

Fig 10

In Fig. 10 we see the Newtonian apple with its centre of mass at point *O*. A big dotted circle with its geometrical centre at point *O* is drawn along the front of light waves propagation in the personal space-time continuum of the Newtonian apple. Such a relation between the centre of mass of a material object and geometrical centre of its PS-TC is typical for the case when the physical system "material object – personal continuum" is in the state of equilibrium. The radius *OA* is the distance travelled by the light signal within one second.

Near the surface of the Earth the matrix matter of the absolute space moves towards the centre of its mass at a speed of 9.8 m/sec, in accordance with the solution of equation (3.2). Let us write this equality again:

$$v = \gamma^{"D"} \times \frac{M}{R^2}. \qquad (5.1)$$

If our planet absorbs the matter of the absolute space of the Universe in it limits, then in Fig. 10 the events must proceed as follows. Meanwhile the light signal sent from the Newtonian apple travels the distance from point *O* to point *A* (distance travelled within one second), point *A* itself displaces to the point A_1 at a speed of 9.8 m/sec. And in addition to point *A* which displaces to the point A_1 the whole circle (dotted line) drawn along the front of light waves propagation displaces to the position indicated by a circle drawn in Fig. 10 using the continuous line. As a result we find that in spite of the apparent state of rest of the check apple relative to the surface of the Earth, the physical system "Newtonian apple – personal continuum" has the same aspect as if the check apple would displace in its inherent PS-TC at a constant speed of 9.8 m/sec, or, which is the same, uniformly accelerate relative to the terrestrial personal space-time with acceleration 9.8 m/sec^2.

Therefore, the classical astronaut standing with the apple in the hand on the roof of the multi-storeyed building comes to a conclusion that if the check apple maintains its state of rest relative to the surface of the Earth, then the combined physical system "Newtonian apple – personal continuum" demonstrates all signs of uniformly accelerated motion. It means that the classical astronaut logically comes to the general principle of equivalency which declares the absolute equivalency of inertial and gravitational mass. According to this general principle the observer cannot distinguish between uniformly accelerated motion of the test body in the absence of gravitational fields and the state of rest of the same body in an intensive gravitational field.

We can add that the classical astronaut keeps certain possibility of option. Depending on his will, he has the possibility to find the acceleration of the physical system "Newtonian apple – personal continuum" which is in state of rest relative to the Earth from the

standpoint of the terrestrial PS-TC. In this case, he gets satisfactory solution using the famous Newtonian equality:

$$g = \gamma \times \frac{M}{R^2}. \qquad (5.2)$$

The dimension of the solution of Newtonian equation (5.2) is m/sec^2. This is absolutely justified dimension if applicable to the terrestrial personal space-time.

If the classical astronaut decides to find the acceleration of the physical system "Newtonian apple – personal continuum" which is visually in state of rest relative to the Earth from the standpoint of the apple itself, he needs to operate with equation (5.1).

The dimension of the solution of this equality is m/sec. This dimension is also absolutely justified if applicable to the inherent personal space-time of the check apple.

From the physical standpoint both equalities (5.1) and (5.2) are absolutely identical. They are identical in the interpretation given in connection with the fundamental symmetry between the uniformly accelerated motion of the test body in the given PS-TC and its uniform displacement in the inherent personal space-time.

The principal conclusion made by the classical astronaut standing with the Newtonian apple in his hand on the rood of the multi-storeyed building may be briefly formulated as follows. As the Earth within its limits absorbs the matter from the absolute space of the Universe at a speed of 9.8 m/sec, the check apple in the terrestrial PS-TC maintains its state of rest relative to the Earth, however the combined physical system "Newtonian apple – personal continuum" experiences such an action as if the apple be imparted constant acceleration of 9.8 m/sec^2.

A breaking of the equilibrium state of the physical system "check apple – personal continuum" results in the fact that the classical astronaut standing on the roof of the multi-storeyed building experiences the pressure of the apple mass directed towards the centre of the Earth. The force of pressure of the apple in the astronaut's hand is the expressions of the tendency of the physical

system "material object – personal continuum" to reach the state of equilibrium. As soon as the astronaut standing on the roof of the high building releases the experimental apple, the physical system "material object – personal continuum" gets the chance to acquire the state of equilibrium. It happens when the geometrical centre of the circle drawn along the front of light waves propagation in the personal space-time of the check apple and the centre of its mass coincide. It may happen if the Newtonian apple uniformly accelerates with acceleration of 9.8 m/sec^2 relative to the Earth.

In fact, when the apple is in the hand of the astronaut, or in the state of rest relative to the Earth, the physical system "Newtonian apple – personal continuum" experiences acceleration. But now the physical system "Newtonian apple – personal continuum" returns to its state of equilibrium due to acceleration of the check apple with respect to the Earth.

If we sum up our theoretical speculations and try to track the logical line reflecting the order of realization of the mechanism of the universal gravitation, we can make such a generalization.

In Newtonian mechanics universal gravitation is the result of gravitational interaction between two masses of substance realized with the help of the mysterious forces of instant long-range action. There are two attributed physical operators in this mechanics; they are two masses of substance and an unknown essence. The theory of relativity radically changes the situation. Gravitational interaction according to Einstein is realized in accordance to much more complicated scheme. In accordance with the theory of relativity, the gravitating mass forms a gravitational field that imparts acceleration to the test body. In other words, the test body reacts on the gravitational field and not on the mass forming this field, as Newton thought. As we see, there are three attributed physical operators in the theory of relativity – two masses of substance and gravitational field. And the key interaction according to Einstein consists in interrelations between gravitational field and test body. This assumption is analogous to that of Maxwell's electromagnetic theory built on interaction of the electromagnetic field and electromagnetic charge.

In this theoretical construction the universal gravitation is realized in accordance with even more complicated scheme. Here the gravitating mass forms its personal space-time. The latter, in its turn, influences the metric structure of the personal continuum of the test body. And the intrinsic personal space-time continuum of the text body makes the check mass to experience universal gravitation. Therefore, there are four attributed physical operators participating in gravitational interaction. And the key events, according to our version, take place in the interaction between personal continuums of two gravitating masses.

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What is motion
