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## **Modern methods of dialectical logic and principles in physics**

The article deals with a new trend in the teaching of theoretical physics –method of mathematical, functional, dynamical theoretical physics. In which the important role belongs to the inner driving forces: logic, ideas, principles, serving as a backbone factor. Thus, physical and mathematical, philosophical and education approach, being at the categorical level an integral part of functioning and development of theoretical physics, represents the variety of coexisting and consequently changing specific structures of the physical object of different scale, providing finally establishment of the current unified physical theory. This is why the solution of the methodological and dialectical problems of theoretical physics is of high value.

*Key words:* theoretical physics, dialectical logic, space, time and matter, geometric idea.

Education makes a fundamental influence on development of personality in the cognition of reality and getting knowledge on how the world is arranged: the world of nature, the world of culture and the human world. By this way it forms knowledge, scientific outlook, and reveals the talents of the individual. Especially, in the conditions when education promotes learning for life.

In this process, a special role belongs not only methodological knowledge (as the study and knowledge of how the system of principles, ideas and ways of organizing and constructing a theoretical and practical human activity), but also deep scientific method of dialectical logic. Methodological and philosophical problems of physics has been studied in the paper [1]. In this paper, the authors discuss the problem of constructing knowledge and theoretical physics by the method of dialectical logic and principles. It is embodied, in the application of its laws not only in scientific, but also in practical training aspect, as people's attitude to the objective world, and also as the most logical choice of ways to achieve goals in this process.

If the theory is the result of the process of learning of the worlds and their transformation, the dialectical logic serves as the organizing principle for constructing logical frame pictures of the world and contributes to the advancement of new ideas and principles of construction. Modern approach is characterized not only by abstraction, such as mathematical and metaphysical approaches, but also the direct interaction of objective and subjective, material world and the human world, in concrete problematic conditions of cognition of the world.

Dialectic is universal method of theoretical research. Dialectics, as logic and theory of cognition, systematizes categories of science. «Analysis of scientific progress shows that it is characterized by the appearance of deep theories, broad generalizations, and the change of the style of thinking. According to its logical-epistemological characteristics, science of our day is like a giant self-sustaining system, which, at each progress to a new level, revises its own reasons. This feature of modern science requires its continued reflection that leads to the need to deepen the development of dialectics as logic, world outlook and methodology of modern thinking», — writes Zh.M. Abdildin [2].

The need for research and development of dialectical logic, especially the natural sciences emphasized repeatedly in the philosophical, physical and mathematical literature. Recently, much has been done in this direction; individual fundamental categories of materialist dialectics in close connection with modern science have been deeply investigated.

«Dialectical logic, as opposed to the old, purely formal logic, is not fulfilled by counting and putting without any connection next to each other near the forms of movement of thinking, i.e. various forms of judgments and conclusions. It is, on the contrary, derives these forms one from the other, establishes subordination between them, but not coordination, and develops higher forms from the lower ones», — wrote F. Engels.

In dialectical logic, problems of thinking should be examined in the context of broad materialist outlook of the world, the source of beginning of which are categories, such as, when we refer to physics, space, time, and matter. Specific and general concepts of space, time and matter which were developed on the basis of analysis of the subject activities of human, also act as the beginning of the logic of construction of physics. Further development and concretization of these universal concepts leads to categories of subject and object,

as well as object interaction with the person. Implementation in practice of a subject content of these concepts of objective reality leads to the study of relationship between practice and reflection, forms of reflection, where the interest is concentrated mainly around the cognitive relation. Here, universal concepts are seen as a reflection of reality, forms of the natural world, the human world, and of the stages of how human is distinguished from world of nature.

Consequently, to get knowledge on methodical issue, researching the interrelation of fundamental concepts in science, we should develop methods of dialectical logic. For example, in physics, these are not only space, time and matter, but also thinking, substance, human. They are inseparable, their unity is due to the fact that constructing a picture of the world and its knowledge is carried out using human thinking. Basic forms of thought are considered by formal logic, logical structural knowledge of the world, in the analysis of the process of scientific knowledge development, new principles, ideas, techniques, and methods of research.

Experience shows that in discovering the role of mind in the knowledge of the material world and the logic of building its foundations there is a special role of physics. Physics is the science about nature, which is studying the matter, the form of its motion, as well as fundamental interactions that govern the motion of matter. Physics is also a method of producing methodical knowledge, development of a new source of logical thinking. Physics is primarily interested in answering the following questions: «What to measure?», «How to measure and what will change?», «How to change?», «What value taken as an invariant in the study of the phenomena of the material world?», «What is the logic and what principle one should take as a basis, and what follows from them?», «Who is studying?» because it all organized and run by human. Human also creates a real physical picture of the world, the image of the world. These are his activity.

Numerous and extremely complex physical theories and problems require a clear understanding of their development that brings together and unites the different branches of physics, as they form the holistic picture of the physical world.

In principle, number of theories and laws of physics can be as much as known physical quantities. However, of all known concepts we select 1) space, 2) time, 3) matter and 4) human, which knows them and control.

The question arises, why do we distinguish these particular four notions (quadruple)? Firstly, they are singular phenomena, permeating the entire physical system and not only this kind of systems, but also constitute the fundamental basis for the construction of the physical world, the image of the world. Secondly, the dialectical logic says that they form the basis of things, and «dialectics of things creates the dialectic of ideas, and not vice versa.» Third, space and time (motion) as the dialectical logic, the way of the changes can not be replaced by something else in the physical theory. With regard to the matter, it is the basis of materialist logic. Matter is equivalent to the energy ( $E=mc^2$ ) [3]. Energy and its conservation is a fundamental law of not only physics, but also in the whole nature. It forms the basis of the diversity of the material world. The need to include human to the quadruple, his thinking as a crown, is due to the fact that the physical picture of the world, the appearance of the world are created by human, and develops his mind and thoughts. What we have around us, it all due to human.

In our opinion, physics is based on a special dialectical logic, based on real facts and derived from it the fundamental principles and ideas. They give a deeper understanding of the nature of physics. Consequently, it is riddled with human thinking in the unity of many sciences.

Now we turn to reveal the essence of this method. Our goal is to present a holistic and scientific basis for constructing knowledge of theoretical physics, to explain the essence of the theory and method of construction, and to show their logic.

The first logic is space as the creator of the manifold, the use of spatial relations (geometry) as an instrument of expansion of the physical world. This is an artificial mathematical logic, an imaginary picture of the world, it is the beginning of all beginnings in physics. However, it is not enough to build a real picture of the world. Therefore one needs in a second logic. Since it is a frozen moment, the track image, sign, symbol, etc. while the world is in perpetual change.

The second logic is the movement as a creator of change and development, interaction. It is dialectical, the basis of diversity, getting all the basics of nature. However, it can only create an imaginary picture of the world. To create a real physical picture of the world one needs in the third logic: materialistic logics — where, when and what moves.

The third logic is matter as the creator of energy as the basis of all the foundations of world. It is a materialistic logic. And only on the basis of these logics one can create real physical picture of the world. How-

ever, these logics are insufficient to create an image of the world. Thus it is required a fourth logic which is implementing, thinking, and creative.

Fourth logic created by nature itself is human. These pictures of the world are built by human, his thinking activity. Physics is science, and science is a human activity, product of activity and thinking. Only in the hands of human, space (s), time (t) and matter (m) acquire a real sense of physical development and birth of all the environment.

In our view, the first logic is the metaphysical one, the second is the dialectic one, the third is the materialistic one, and the fourth is activity logics, the thinking logics. And they in turn unite into a powerful method for constructing and learning of the picture and image of the world. We can say that thinking is a mirror of knowledge and logic is the idea and the principle of its construction.

Each of the above logic, painting a picture of the world (space, time and matter), and the image of the world (human) using a specific method that makes sense of the constructions. The first method originates from the idea of the geometry of Euclidean space, and develops to the modern geometrical constructions. It is a metaphysical one in regard to each moment of development, motion, without this moment there will be no motion and development. Consequently, metaphysics is the beginning of the dialectic. If there would be no metaphysics, there would be no dialectic. This is negation of the negation. There is no time, at the moment time and motion are frozen. Usually we say about «the collapse of metaphysics by Kant,» then we should say about the «collapse» of Newtonian physics, electrodynamics, with respect to, for example, quantum mechanics. However, we live using Newtonian mechanics and other laws of physics.

In order to vary, the motion at the beginning should be situated at some point at a certain time. And the volatility of the world is the cause that led to the logical necessity of creating these moments. For example, a plurality of spaces in physics and other objects and concepts remain unchanged at all times (Euclidean space, Minkowski, Lobachevsky, Riemann, Hilbert and other constants, etc., and the principles of Pauli, Heisenberg, etc.). They act as «standards», «benchmarks», etc., necessary to explain the change, development, movement in the real physical world [4]. They are metaphysical in every moment, but their combination in the development movement are dialectical, variable in transitions. This variability generates and requires new dialectical logic.

This is not a downfall of metaphysics, but the development and the transition to the dialectic. For example, all natural bodies have a length. This is an indisputable fact. But there are other real «things» that create the idea of the so-called «duration», «time period», «thinking.» We meet not only the bodies, but also with a «thing», which is called thought. But the idea is not a body. So, in a world in which we live, except for bodies is still something to which the predicate «length» is not applicable. But to this «something» we can apply another predicate: «duration», «thinking.» Lack of time stops the movement of nature. So, we have to add to this «spaciousness» some new idea: «time.» Consequently, we must move from the idea of space as a closed world to the world as the process, movement, changing the world. A movement is the interaction of space, time and matter, a process that responds to the question where and when that moves. Here there is a new, singular idea, the idea of matter, the materiality of the world and human creativity, and also of his thinking. Thought is born, develops, dies and is reborn in a new way in time and motion of matter. In the end, the matter turns into a living organism: a human being. That is what is at particularly foundations of dialectical logic.

The role of thought in the fact that, for example, line, square, cube, circle, etc. impossible «to make physically», all of them are «pure product of thought», «product of space and time», with the participation of the masses and of human thought. Change the position of a material point is the trajectory that in its movement versus time can represent a square, ellipse, etc. Consequently, all previous ideas and logic do not completely solve the problem of the real world. All of them are nothing in the absence of a person.

Thus, we come to the most important in the logics, where begin the limits of applicability of the theory to the real world physics. Transition to other logics, principles and ideas is the transition from nature, viewed as as space and time, to the nature of space-time matter, to their various forms, where the protagonist still stand space and time as the form and method of mutual existence from matter and man.

Transition is that we refuse to see the world as a set of objects and only their movements, but also begin to see the world in a full set of properties of inertia (mass) and gravity (field), interactions between bodies and charges, and micro- and macro particles, which form the basis of all living and nonliving, i.e. we come to the second, that moves what and who uses the services of these two logics. That is, turn to the problems of spatial distribution and temporal variation of development of the matter itself, and human activities, and his thinking. From the creation of artificial mathematical world, through the world of changes, the real world

movement detected in the experiments, experiments and expressions of real physical picture of the world, and from it to the man-made to the image of the world. Now let us consider more close the meaning of these four logics in terms of physics, and deriving from them the four fundamental principles and ideas used in the construction of sections of physics.

1. Space has dimension. And it is determined to Planck's constant  $\hbar$ . If  $\hbar=0$ , then we have macrospace, macroscopic world, and if  $\hbar \neq 0$ , the microscopic world.  $S$  is action function. It defines the feature geometry of the physical world, the geometry of the state vectors, Hilbert and other spaces.

2. Movement is characterized by speed. If the velocity of the bodies is much less the speed of light,  $v \ll c$ , then the movement is slow, and if  $v \approx c$  then quickly. That is, in the first case non-relativistic movement, while the second relativistic.  $c$  — *const* is new action function, so it creates a new geometry of the world, Minkowski, Riemann, Lobachevsky geometries and others.

3. Matter is complex brick world. Sign of the material world in a metaphysical representation is physicality in dialectic, time variability interconvertability matter. As the global physical process takes place in space and time, its unity with the matter should be obvious, obligatory, and necessary.

Matter is energy concentration in the time-space changes, as if managing change and space and time, at the same time changing itself. If space and time are forms and methods of the existence of matter and its characteristics, it is a form of matter and method of display properties of space and time, and their characteristics. They constitute a single system of the world process. Where there is matter, there is space and time, where there are space and time, there is matter. Where there is no matter, there are no space and time and, conversely, where there are no space and time, there is no matter.

Matter has surprising property of being simultaneously in the form of substance and in the form of field, i.e. possesses materiality and field. And this single property manifests itself in different ways in the real world. If the matter is more in the form of the massiveness of the «macrocosm» and «slowness» in the motion, it behaves more like a matter than the field, the wave process. If  $E = mc^2$  then the field dominated, if  $E = \frac{mv^2}{2}$  then it is property of substance.

If the matter has more «microscopic» special form and high «speed» in the motion, it behaves more like a wave than the body substance.

If the matter is found in the form of elementary particles, in the form of a microcosm, it must be regarded as a special physical object, and having substance and wave properties simultaneously, i.e. as a particle and as a wave. This unity and contrast reveals new qualities of matter (particle-wave), i.e. quantum property.

This diversity of spaces, movements and forms of matter allow human hands to build a variety of physical picture of the world image of the world and shows the development of the world.

4. Human is a special phenomenon in this foursome. He is apex of the development of space, motion (time), and matter. He is also their unity. Previous three logic are the real stuff in the hands of man. Theoretical physics and general physics are created by human. If the highest point of the development of the space is variety while for movement it is the development, then the development of the matter is a living organism, whereas the highest point of the development of a living organism is a human, his consciousness and thinking. He is crown of all. Removing it from the triple means do not know this world. What nature was nor able to do, it requested human to do. And he is doing. All what is around us (houses, television, computers, cars, rockets, etc. and physics itself) are result of human activity. Hence the thesis: «World is for humans. Human is for World».

From the analysis of these logics and various properties of spaces ( $\vec{r}$ ), time ( $t$ ) and matter ( $m$ ), four fundamental principles and ideas have raised the author of which is a human. And on the basis of these principles and ideas four main branches of theoretical physics were built: 1) classical mechanics 2) electrodynamics, optics, special and general relativity, and 3) quantum mechanics and 4) thermodynamics and statistical physics. However, it should be noted that theoretical physics does not consist of only these branches. There are many of them. They all enjoy these logics, ideas and laws, and principles listed in these branches. Other branches of theoretical physics were developed as a result of use not only these, but also a variety of new logics, ideas, principles, approaches, regulations, etc.

The first fundamental principle is that the space ( $\vec{r}$ ), time ( $t$ ) and mass ( $m$ ) are absolute. They do not depend on the velocity of the body, if the matter has more property of being macroscopic and moves slowly. This idea was first proposed by Newton. And based on this idea, he laid the foundation of classical mechan-

ics. It was further developed in Lagrangian and Hamiltonian mechanics, who completed the construction of classical mechanics.

Newtonian mechanics considers free movement of bodies in Euclidean space where there is no variation so that  $\vec{r}$ , and  $t$ , while Lagrangian mechanics considers restricted motion in configuration space, where the space varies, i.e. whereas time is not varied. As for the Hamiltonian mechanics, it generally considers mechanical motion in phase space, where both time and space are varied, and which is the pinnacle of classical mechanics. In these three types of mechanics, respectively, the laws of Euclidean geometry, configuration space and phase space are used.

Einstein wrote that Newton discovered that «observable» geometric quantities and their manifestations in time in a physical sense is not fully characterize the motion. Consequently, besides the masses and changing the distance between them, there is something that defines the event is happening: that «something» he perceived as related to the « absolute space.» Newton knew that his laws can only make sense if the space has a physical reality in so far as material points and the distance between them.

The second fundamental principle is that space ( $\vec{r}$ ), time ( $t$ ) and mass ( $m$ ) are relative, that is, they depend on the velocity of the body; the speed of light is constant and it does not depend on the observer's velocity or speed of the source. This principle is extended Galilean principle of relativity. Here, based on the idea that matter (viewed as electromagnetic waves) has more field properties and represents a wave packet. This idea was proposed by Einstein and was named «relativity theory» [5].

«Consistent field theory requires continuity of all elements of the theory, and not only in time but also in space, and at all points. Consequently, the material point as the basic concept has no place in the field theory», — Einstein wrote in Ref. [6; 83].

Thus, there is the theory of electromagnetic phenomena and processes, i.e. it was laid the foundations of electrodynamics, optics and theory of relativity, and as a result the physics developed in two directions: 1) nonrelativistic one when bulk matter prevails, matter is characterized by macroscopic properties and velocity of the body is much less than the speed of light,  $v \ll c$ , and 2) relativistic one, where field is dominating, matter reveals microscopic properties, and.

If the motion is in a four-dimensional Minkowski (flat) space, then such a theory called the special theory of relativity, and if the motion occurs in curved Lobachevsky and Riemann spaces, then the theory is general theory of relativity. Curved spaces occurs as a result of action of force fields (field of matter). Here, the triple manifests itself in full unity and interdependence.

Consideration of the matter in two forms makes it easy to explain the absence of ether as a medium for propagation of electromagnetic waves. For example, for mechanical waves, medium for their propagation is the substance itself. There seems to be no reason to invent additional medium (ether) for electromagnetic waves, when the electromagnetic field itself can serve as a medium.

The third fundamental principle is that the space ( $\vec{r}$ ), time ( $t$ ) and mass ( $m$ ) are quantized, i.e. electromagnetic waves (photons) and behave as a particle, quantum, and elementary particles (electrons, protons, neutrons, atoms, molecules, etc.) not only behave as a particle but also as a wave.

The idea of quantized photon wave proposed by Planck, and the wave properties of the electron by de Broglie. On the basis of these ideas quantum mechanics was built: nonrelativistic quantum mechanics by Schrödinger and Heisenberg, and relativistic quantum mechanics by Dirac.

They had to offer new approaches, as laws of classical mechanics obtained from macroscopic world and substances were inapplicable to such particles, since they do not take into account the field, the wave properties of matter. On the other hand, the theory of relativity was also unable to explain quantum phenomena, because it does not take into account the real properties of the microscopic world, the corpuscular properties of matter.

So it was necessary to find laws, equations that take into account simultaneously both the properties of matter, i.e. dualism of elementary particles, microcosm.

Approach covering these properties microscopic world appeared to be principle of corpuscular-wave dualism, the meaning of which is to replace the conventional physical quantities of classical physics by operators and the wave properties of matter by wave function, where the operators act on the wave function, changing it. Heisenberg's matrix approach was also suggested for the same reason. Dirac showed that these approaches are equivalent. Here the operator characterizes corpuscular properties of the particles, giving new properties to physical quantities and expanding the space, while taking into account the wave, and the wave functions takes into account field properties of the particles, giving the periodicity of the process, while tak-

ing into account the corpuscular properties of the microcosm. Their unity was the foundation of quantum mechanics. This mechanics uses state vectors in Hilbert space.

As a result, amazing, not previously known properties of elementary particles, and new concepts (such as spin, baryon and lepton charges, etc.) and principles (superposition of states, Pauli exclusion principle, Heisenberg uncertainty principle, complementarity and Bohr's correspondence, etc.) were discovered. Interpretation of operators showed that they may be commuting or non-commuting and have special properties. Interpretation of the wave function has shown that quantum mechanical processes have probabilistic statistical nature. The laws of quantum mechanics are fundamentally different from that of classical mechanics and classical physics.

Manifestation of these principles, in particular, such as the Heisenberg uncertainty principle, the Pauli exclusion principle, led to the development of all of physics, and even the development of other sciences, such as chemistry, biology, etc. If you do not have these principles, it would not be discovery of nature of atoms, molecules, diversity of surrounding world, and most importantly nature of life on earth and of human himself. That is, we cannot discover the mysteries and secrets of these worlds.

The fourth fundamental principle. In the book «The geometrical ideas in theoretical physics» [7], we did not consider the problem of statistical physics and thermodynamics as one of the main branches of theoretical physics. Some aspects of this problem have been analyzed in [8]. But the problem was considered in theoretical terms, and not in terms of the methodologies and dialectics.

We would like to fill this gap and at the same time pay attention to the quantum statistics.

Space, its geometry, enables one to determine not only the object itself, but also its shape, size, structure and some properties by observing its features, similarly to the possibility to determine musical instrument by its sound. At that time we did not know which space plays this role. We have overcome this problem by getting interesting, profound results that determine the patterns of development of quantum thermodynamic systems, revealing their internal structure by spatial logic components while changing thermodynamic objects consisting of an infinite number of particles, where the laws of other branches of theoretical physics do not apply, and having probabilistic nature. So space for quantum thermodynamics and quantum statistics is a spectral space with certain geometry. These are differential equations with partial derivatives and their relation with the asymptotic behavior of the symmetry group. On the methodological language this is the geometry of the Hilbert space generated by the subspace of eigen values of the Laplace-Beltrami operator. This is the basis of spectral geometry of quantum statistics of thermodynamic systems. This is the geometry of the spatial distribution of thermodynamic systems. Here, the main role again belongs to the space, movement, and mass. Movement is characterized by the distribution, while mass by the state of the system.

In addition to these four logics and four fundamental principles and ideas in the construction of modern theoretical physics, new ideas and logic appeared in the recent years. In particular, it is proposed the existence of interior spaces with symmetries characterizing new properties of matter, associated as coordinates with the outer space and symmetry, but do not depending on them. Also it was proposed the ideas of supersymmetry, and theories of supergravity, superstrings, supermembranes related to it. In addition to Galilean and Lorentz transformations, some new ones appeared such as gauge field transformations. Through the use of this there appeared possibility for merging electroweak and strong interactions. This issue will be considered elsewhere.

To summarize, let us consider the ensuing logical structural schemes of construction of theoretical physics. Figure 1 is devoted to the components of a real physical picture of the world, and Figure 2 describes components of the physical world discoveries of authors and their applications.

In our opinion, the Figures 1 and 2 represent the ongoing educational process, i.e. reflect the dialectical logic of knowledge and the real physical picture of world. And its relationship with the subject, his thinking and creativity. This is the result of thinking, human creativity shown in a schematic form. This is also a visibility to generate knowledge about the environment and reality of the physical world. They teach, guide to learning, to knowledge of physics, its branches, introduce the authors of physical laws, processes, etc.

### Components of real picture of physical world

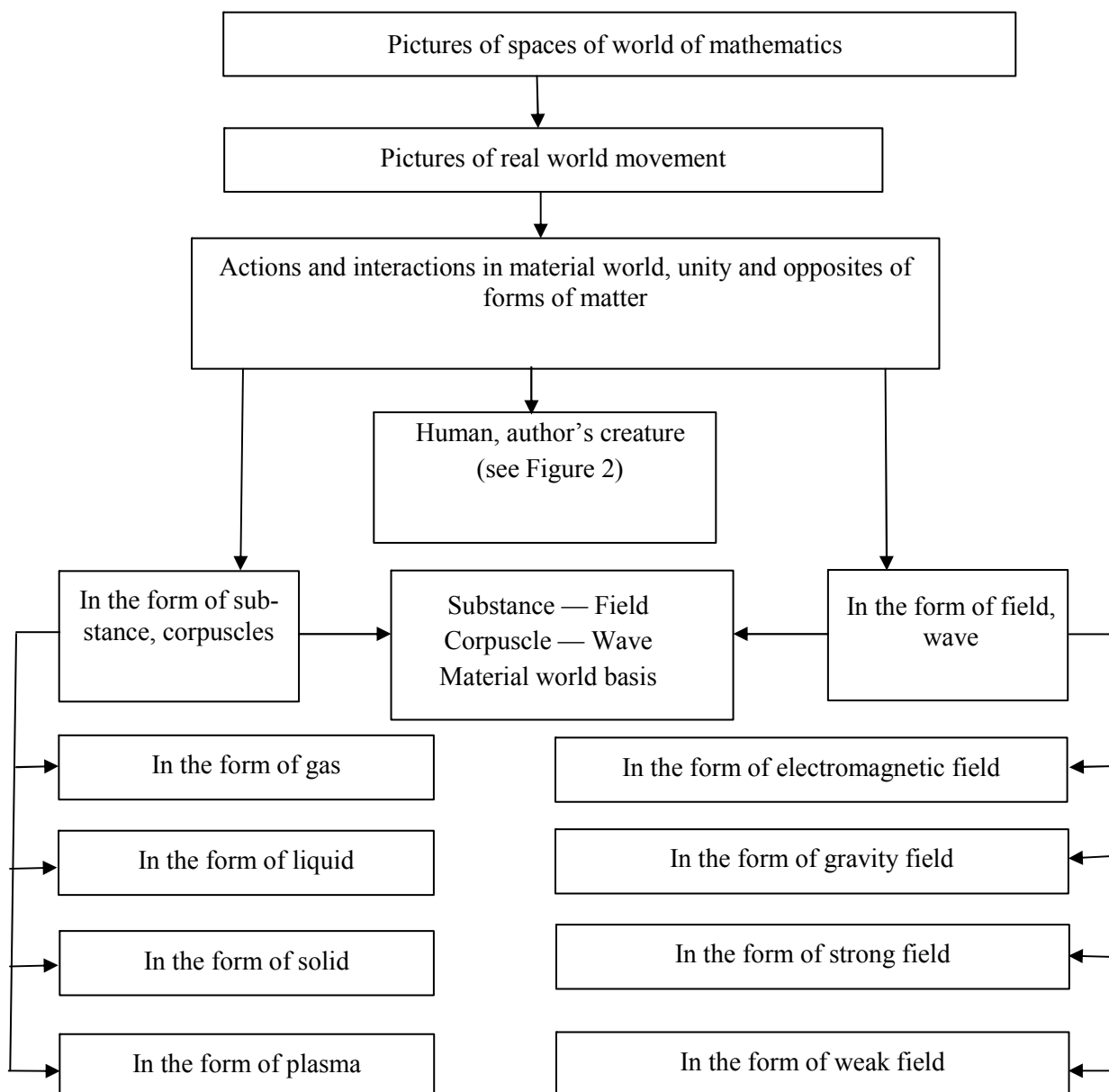


Figure 1. Logical structure diagram of fundamentals of real physical world

Analysis of Figure 1 begs the question «What was in the beginning? The macro- or micro-world?» In our view, it is impossible to put such a kind of question. We understand this as a series of repetitive processes, in both micro- and macro-scales. In this process, there is no beginning and no end. The question arises «How to interpret the Big Bang in the evolution of our universe?» We understand it as a moment in forever changing world. The matter state was in micro size and at macro density as a totality. It can be thought of the third form of matter which unifies and substance and field forms that differs from the quantum, corpuscle-wave form by allowing hidden «dark» forms of matter and energy. This is due to the fact that when the density of matter is of the order of understanding via ordinary spaces fail and one is forced to use another space, another geometry, another time, another form of matter which are not amenable at current level of science. In our view, the space at such densities is a kind of Minkowski space, including mass as an additional coordinate, and having strong curvature.

### Components of global physical discoveries, their authors and applications

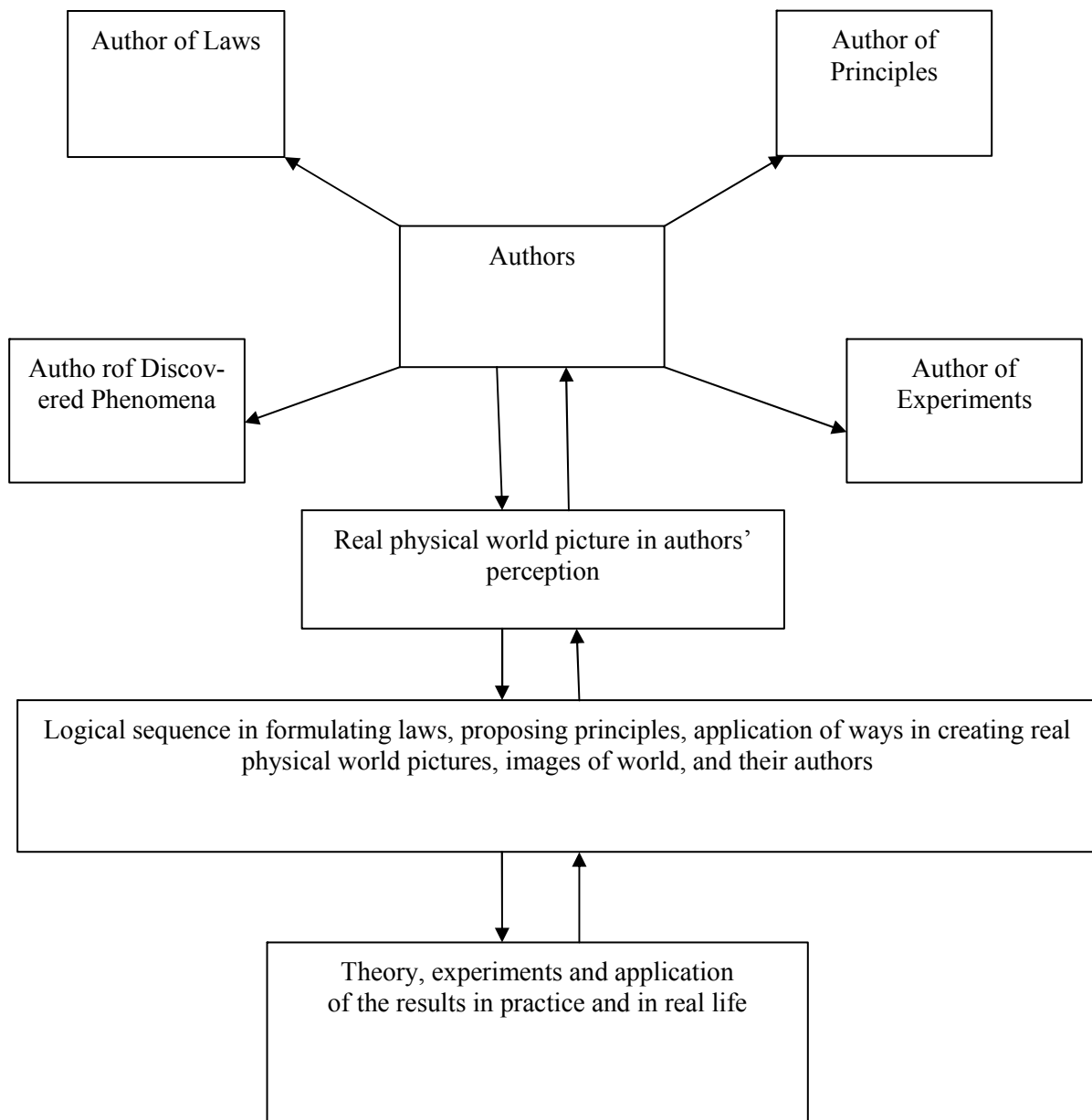


Figure 2. Relations between human activity and development of physical (objective and subjective) picture of world

At earlier time we considered electricity and magnetism separately and since 1820 these are viewed as a single phenomenon: electromagnetism. By this analogy, one can consider the matter and field as a single phenomenon, a single property, yet giving possibility to interpret them separately, similarly to electrostatics and magnetostatics in general electrodynamics.

#### Conclusions

Approach developed in the present paper allowed us to formulate new direction in teaching theoretical physics — method of mathematical, functional, dynamical theoretical physics, in which the important role belongs to the inner driving forces: logic, ideas, principles, serving as a backbone factor.

Such an approach can be also applied to gravity theory. For this it is necessary to solve the problem of antimatter. In our view, it is linked to the existence of another space and another time with special properties.

Thus, physical and mathematical, philosophical and education approach, being at the categorical level an integral part of functioning and development of theoretical physics, represents the variety of coexisting



and consequently changing specific structures of the physical object of different scale, providing finally establishment of the current unified physical theory. This is why the solution of the methodological and dialectical problems of theoretical physics is of high value.

This method can also be applied in other sciences, as they are in the ongoing disclosure of the basic concepts, principles and structure schemes, can also use the results of the present paper: the disclosed logic (space, motion, matter and thinking human), the ideas and principles to form their unified theories with standpoint of dialectical logic, methodological and ideological approaches.

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### **Физикадағы диалектикалық логикалар мен ұстанымдардың қазіргі заманғы әдістері**

Мақалада теориялық физиканы оқытуда жаңа бағыт — динамикалық теориялық физиканың функционалды және математикалық әдісі қарастырылды. Жүйекүрушы фактор ретінде қызмет ететін ішкі қозғаушы күштерге не логикалар, идеялар, принциптер маңызды рөл атқаратындығы дәлелденген. Авторлар физика-математикалық, философия-педагогикалық әдісті бірыңғай физикалық теорияның құрылуын қамтамасыз ететін, бірін-бірі алмастыратын әр түрлі масштабтағы ерекше құрылымды физикалық нысан, физикалық теорияның дамуында қатар жүретін алуан түрлілік көрсететін және жоғары дәрежелі қызметінің ажырамас бөлігі деп сипаттайды. Сол себепті теориялық физиканың әдіснамалық және диалектикалық мәселелері шешу мәніне байланысты.

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### **Современные методы диалектической логики и принципов в физике**

В статье рассмотрено новое направление в преподавании теоретической физики — метод математической, функциональной, динамической теоретической физики. Отмечено, что в нем важная роль принадлежит внутренним движущим силам: логикам, идеям, принципам, выступающим в качестве системообразующего фактора. Физико-математический, философско-педагогический подходы, будучи на категориальном уровне неотъемлемой стороной функционирования и развития теоретической физики, представляют многообразие сосуществующих и сменяющих друг друга специфических структур физического объекта разного масштаба, обеспечивающих, в конечном счете, становление единой физической теории. Вот с чем связано значение решения методологической и диалектической проблемы теоретической физики.

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