Forum

The Crisis in Theoretical Physics: The Problem of Scientific Truth

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ABSTRACT

The problem of truth in science - the most urgent problem of our time - is discussed. The correct theoretical analysis of the generally accepted foundations of theoretical physics is proposed. The principle of the unity of formal logic and rational dialectics is a methodological basis of the analysis. The main result is as follows: the foundations (i.e. classical thermodynamics, the special theory of relativity & quantum mechanics) contain logical errors. The existence of logical errors is irrefutable proof of incorrectness of the theoretical foundations and means that theoretical physics enters the greatest crisis. The crisis in physics leads inevitably to the general crisis in science. The crisis as effect is explained by existence of the global cause: the crisis is a collateral and inevitable result of inductive method of knowledge of the Nature.

Key Words: philosophy of science, logic, special relativity, quantum mechanics, quantum statistical physics, thermodynamics.

A small leak will sink a great ship
(English proverb)

1. INTRODUCTION

As is known, physics plays an important role in the development of science and technology. But the significant success of theoretical physics and the perfection of its mathematics "hide from our view weight of those sacrifices which have been made for this success" (A. Einstein). Now it becomes obvious that the truth is a name of these sacrifices. The existence of the problem of truth in theoretical physics means that physics enters the greatest crisis. Inevitability of the greatest crisis is corroborated by the fact that the foundations of theoretical physics (i.e. thermodynamics, statistical physics and physical kinetics, the special theory of relativity, quantum mechanics) include the set of logical errors [1-38]. These errors are explained by the global cause: the errors are a collateral and inevitable result of inductive method of knowledge of the Nature, i.e. result of movement from formation of separate concepts to formation of system of concepts. The inductive way of development of physics is characterized, for example, by A. Einstein's words: (a) *there has been formed a view that the foundations of physics were finally established and the work of a theoretical physicist should be to bring a theory in correspondence with all the time increasing abundance of the investigated phenomena. Nobody thought that a need for radical rebuilding of the basis of all physics could arise*; (b) *but the progress of science will cause revolution in its foundations. Our notions of physical reality never can be final ones. We should be always ready to change axiomatic basis of physics to substantiate facts of perception in logically most perfect form.* It follows from these words that "the progress in (inductive) science is the underlining of difficulties" (N. Bohr). And non-objective , incorrect theories should be replaced by objective, correct theories.

Larmor-Lorentz-Poincare-Einstein's special theory of relativity (STR) and quantum mechanics (QM) "played particularly important role in modern physics. Necessity of periodic change of basic principles of physics was shown for the first time in these theories" (V. Heisenberg). Change of

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science principles is always accompanied by broadening of scientists' consciousness, and broadened consciousness promotes deductive revision of foundations of science. At the same time, the STR and QM brought the paradoxes in theoretical physics. In my opinion, paradoxes are not properties of real phenomena. The paradoxes are consequence the starting-points and bases of the STR and QM, therefore, they are the inalienable parts of the STR and QM. Today all physicists know the foundations of theoretical physics, many analyze critically consequences of it, but only some are aware of instability of the basis of physics. The starting-points and bases of the STR, QM, statistical physics and physical kinetics, and classical thermodynamics were logically analyzed in the original works [1-38]. The purpose of the present work is to show that the generally accepted foundations of the STR, QM, and classical thermodynamics contain logical errors, and, consequently, to prove that theoretical physics enters the greatest crisis.

2. METHODOLOGICAL BASIS FOR THE THEORETICAL ANALYSIS

As is known, modern theoretical physics consists of the set of theories (for example, physical cosmology, classical mechanics, condensed matter physics, dynamics, dark matter, electromagnetism, field theory, fluid dynamics, general relativity, particle physics, quantum mechanics, quantum field theory, quantum electrochemistry, solid state physics, special relativity, statistical mechanics, thermodynamics) but does not contain criterion of the truth of physical theories. In my opinion, lack of the criterion of the truth of theories in theoretical physics is explained by the fact that the system of physical (i.e. special scientific) concepts and laws is incomplete: it does not include many universal (i.e. the general scientific) concepts and laws. The complete system – the system of physical concepts and the laws supplemented with the system of universal concepts and laws – would represent not only basis of physics but also methodological basis for the deductive analysis of physics. From this point of view, the unified criterion of the truth of physical theory should be formulated as follows: a physical (i.e. special scientific) theory must not contradict the system of the universal (i.e. general scientific) concepts and laws. The system of the universal concepts and laws represents a unity of formal logic and of rational dialectics. And this unity is a science of most general laws of development of the Nature, human society, and correct thinking. Consequently, this system is a methodological basis for a critical analysis of physical theories. The main dialectics principle is the principle of objectivity of human knowledge. It is formulated as follows: objective laws and truth must be invariant under choice of means and methods of cognition, i.e. under change of properties of system of reference (in particular, objective laws and truth must not contain references to devices, procedure and accuracy of measurement or of calculation). This methodological basis contains general arguments for the deductive proof of the theoretical propositions. The general arguments are represented by the following premises.

(1) Information is essence of the Universe, and material objects (particles, fields, bodies) are manifestation of essence.

(2) The material object has physical properties, and physical properties are the inseparable characteristics of a material object and belong only to a material object.

(3) Quantitative characteristics of physical properties of a material object are called physical quantities. The physical quantity is the measure of a material object. The measure is the philosophical category meaning unity of qualitative and quantitative determinacy of a material object. The measure means that quantitative determinacy belongs to qualitative determinacy.

(4) Mathematics studies the quantitative determinacy separated from qualitative determinacy of the material (physical) object. Therefore, mathematics has no physical meaning.

(5) Theoretical physics studies the measure of material object, i.e. unity of qualitative and quantitative determinacy of material object. In this case, the mathematical equation in theoretical physics belongs to physical object (i.e. the mathematical equation contains the reference to physical object) and, consequently, has physical meaning. Mathematical (quantitative) operations on the equation do not lead to change of qualitative determinacy of physical object.

(6) Both quantitative and qualitative determinacy of object obey logic laws. Therefore, according to the logic law of identity, the left and right parts of the mathematical equation must belong to the same physical object (to the same property of physical object or the physical model of the object). And, according to the logic law of contradiction, the left and right parts of the mathematical equation must not belong to different physical objects (to different properties, models).

3. SPECIAL THEORY OF RELATIVITY

3.1. The correct analysis of the foundations of the special theory of relativity

The purpose of this section is to prove that the STR is absolutely incorrect classical theory. The results of the logical analysis of the STR are as follows [1-6, 8, 11, 14, 15, 17, 18].

(1) The statement that there exist the contradiction between the experimental and calculated data of Michelson-Morley is a starting-point of Larmor-Lorentz-Poincare-Einstein's STR. One can understand cause of this contradiction on the basis of the following idea. The Earth and the Sun are in a relative motion ($\vec{V}$ is the velocity of the relative motion). It means that the Earth is a moving system of reference **E** only in the Sun system of reference S, and the Sun is a moving system of reference S only in the Earth system of reference E. The Michelson-Morley interferometer and an observer (doing measurements and calculations) are in the Earth system of reference **E**. Consequently, the interferometer and the observer are in the resting system **E**. In accordance with the logic law of identity, the comparison of experimental and calculated data with each other must be done in the resting system **E**.

(2) The contradiction between the experimental and calculated data of Michelson-Morley is due to that the fundamental comparison between them was done incorrectly. Really, the experimental and calculated data belong to essentially different systems of reference: the experimental data belong to the reference system **E** related immobility with the Earth, and the calculated data containing the velocity $\vec{V}$ of the motion of the Earth belong to the reference system **S** related immobility with the Sun. Therefore, the comparison of this data with each other is the first and principal logical error. This error leads inevitably to the contraction hypothesis and its mathematical representation – the Lorentz transformation formulae.

(3) The experimental and calculated data of Michelson-Morley are in complete agreement with each other if they belong to one and the same reference system **E** related immobility with the Earth. From viewpoint of logic, it means that the contraction hypothesis and the Lorentz transformation formulae are not in agreement with Michelson-Morley's experiments and formulae. In other words, the incorrectness of the contraction hypothesis and of the Lorentz transformation formulae is proved by the experimental data.

(4) In accordance with the generally accepted opinion, the Lorentz transformation formulae are a consequence of the postulates of the STR. (First Postulate: The speed of light in vacuo is the same to all inertial observes. Second Postulate: Every physical theory should look the same mathematically to every inertial observer). However, one can prove erroneousness of this opinion. The true sense of the Lorentz transformation formulae becomes apparent if one takes into consideration the following statements: firstly, the standard method of deduction of Lorentz's formulae is the method of introduction (insertion) of the Galilean transformation into the equation of the front of the light wave; secondly, the principle of existence and of transformation of coordinates reads as follows: there are no coordinates and no transformation of coordinates in general, and there exist the coordinates and transformation of the coordinates of the object only. Really, the true sense is revealed as follows. (a) The front (i.e. the point) of the light beam (for example, in the Michelson-Morly interferometer) is the physical object **L**. The equation of the front of the light beam in the system of reference **S** (i.e. the Sun) is given by the expression:

$$x_L = ct\,,\ c = const \qquad (3.1.1)$$

where $\vec{c}$ is the velocity of light in vacuo (light is propagated in the positive direction of the axis Ox), $c = const$ is the mathematical expression of the principle of constancy of light speed (i.e. the first postulate of the STR; it is the postulate of the Michelson-Morley calculations as well), t is time. (b) The material point (for example, Michelson-Morly interferometer's mirror which is in the system of reference **E** (i.e. the Earth)) is the object **M**. The Galilean transformation represents the relation of the coordinate x_M of the point **M** in the system **S** to the coordinate x'_M of the point **M** in the system **E**:

$$x_M = Vt + x'_M \qquad (3.1.2)$$

where $\vec{V}$ is the velocity of motion of the system **E** relative to the system **S** in the positive direction of the axis Ox ($V < c$, in accordance with the principle of constancy of light speed, speeds V and c are physically independent). (c) Introduction (insertion) of the Galilean transformation into the equation of the front of the light beam means equality between the coordinates:

$$x_M(t) = x_L(t)\,. \qquad (3.1.3)$$

The equality between the coordinates of the objects **M** and **L** means an intersection of mathematical objects with each other. Hence, the physical meaning of the equality $x_M(t) = x_L(t)$ is that it express the coincidence of the physical objects **M** and **L** with each other. And the inequality $V < c$ is the necessary kinematic condition of this coincidence. (d) If $x_M(t) = x_L(t)$ is an equation in the unknown t, then a solution is given by the Michelson-Morly formulae:

$$t = D/(c - V) \text{ (in the system } \mathbf{S}\text{)}, \qquad t = D/c \text{ (in the system } \mathbf{E}\text{)} \qquad (3.1.4)$$

where D is the length of the interferometer's shoulder. (e) The statement that the equalities $x_M = x_L$ (in the system **S**) and $x'_M = x'_L$ (in the system **E**) must be valid at any moment of time results in the Lorentz transformations formulae:

$$x_M = \gamma\,(x'_M + \beta x'_L)\,,\ x_L = \gamma\,(x'_L + \beta x'_M) \qquad (3.1.5)$$

where $x_L = ct$, $x'_L = ct'$, $\beta \equiv V/c$, and $\gamma \equiv (1-\beta^2)^{-1/2}$ is the contraction factor. This equalities are not consequence of the postulates of the STR. (f) From the Lorentz transformation formulae, it follows that the equalities $x_M = x_L$ and $x'_M = x'_L$ are valid at any moment of time. Hence, the physical meaning of the Lorentz formulae is that they express the coincidence of the objects **M** and **L** (moving with different speeds) with each other at any moment of time. However, such picture of coincidence is physically impossible.

(5) Michelson-Morley's formulae represent conditions that individual light point **L** consists with interferometer's mirror **M** at the certain (only one) moment of time. Therefore, the spatial coordinates of the point of coincidence and the time of coincidence are constant in those formulae. Such picture of coincidence is physically correct.

(6) The second logical error is that the spatial coordinates of the point of coincidence (intersection) and the time of coincidence are variable quantities in the Lorentz transformation formulae. From viewpoint of the Michelson-Morley experiments, this error means that the individual

light point **L** consists with the mirror **M** at any moment of time. Consequently, the Lorentz transformation formulae represents neither physical nor logical consequence of the postulates of the STR. Moreover, the second logical error results in appearance of a relation of the spatial coordinates to the time. This relation leads to concept "space-time". But the existence of such relation is in conflict with: (a) the principle of constancy of light speed (because a mirror can be always considered as a light source or light receiver); (b) the essence of time [4, 11]; (c) the essence of space [15].

(7) The third logical error is that the Lorentz transformation formulae include the contraction factor γ. The contraction factor γ transmutes physically independent motions – the motion of the mirror **M** (i.e., of the light source or light receiver) relative to the Sun and the motion of the individual light point **L** – into physically dependent motions. Because of it, the dependence of the speed V of the mirror upon the speed c of the light appears and has the form

$$(1-\beta) > 0\,,\ \beta \equiv V/c < 1, \qquad (3.1.6)$$

i.e. speed limit appears in physics. Moreover, the spatial and time intervals become dependent on V. However, from viewpoint of the Michelson-Morley experiments and calculations, the true sense of the inequality $V/c<1$ is that it express the necessary kinematic condition of coincidence of the objects **M** and **L** at the certain (only one) moment of time.

(8) The principle of constancy of light speed (i.e. the first postulate of the STR) is valid in any arbitrary system of reference. Really, if the speed of light in vacuo is independent of the speed of light source or light receiver, then it is also independent of change of speed of light source or light receiver. However, the STR – a classic theory – cannot explain the principle of constancy of light speed.

(9) The constancy of light speed is explained by the fact that the light is not a material point of classical mechanics, and it is a set of quantum particles – photons. The motion of any quantum particle (in particular, photon) relative to a system of reference is the absolute motion [3, 5, 8, 12, 13, 18-20, 22]. The absolute motion is invariant under choice a system of reference (it means that the velocity addition theorem is not valid).

(10) Einstein's mass-energy relation

$$E = mc^2 \qquad (3.1.7)$$

(where E, m are the internal energy and the mass of the material point, respectively) is incorrect because the multiplication of the quantities m and c^2 characterizing not one and the same (unitary) object but the different (physically independent) objects **M** and **L** is a logical error [6, 12, 22]. Therefore, this relation represents the fourth logical error.

3.2. Conclusion

Thus, from the above, it follows that the correct theoretical analysis of the generally accepted foundations of Larmor-Lorentz-Poincare-Einstein's special theory of relativity leads to the following main statements.

(1) The foundations of the STR are absolutely incorrect because: (a) the STR contains logical errors. In particular, the basic concept "space-time" is erroneous since the concepts "space" and "time" are mutually independent ones; Einstein's mass-energy relation contradicts logic law of identity. The existence of logical errors is irrefutable proof of incorrectness of the STR; (b) the STR contradicts Michelson-Morley's experiments.

(2) The concept "special relativity" should be abolished because a correct STR cannot be constructed in general.

(3) The STR is not consequence of the postulates of the STR. The STR is a consequence of coordinate relationships $x_M(t) = x_L(t)$ and $x'_M(t') = x'_L(t')$ representing the kinematic condition of coincidence of the objects **M** (mirror) and **L** (front of the light beam) in any moments t and t' of time.

(4) The first postulate of the STR – the principle of constancy of light speed – is a consequence of the new quantum theory.

(5) The second postulate of the STR – the principle of relativity – is a consequence of the principle of objectivity of human knowledge.

(6) The principle of objectivity of human knowledge is in logical connection with the concept "system of reference".

(7) The concepts "objectivity of human knowledge" and "system of reference" are basic concepts for science and theory of knowledge. Relation of science to theory of knowledge is that "science without the theory of knowledge becomes primitive and muddled one" (A. Einstein)

4. QUANTUM MECHANICS

4.1. The correct analysis of experiments on diffraction of quantum particles

The purpose of this section is to prove that the generally accepted interpretation experiments on diffraction of quantum particles (for example, photons, electrons, neutrons, atoms, molecules) is incorrect [12, 19, 20, 22], and, consequently, conception of wave-corpuscle dualism contradicts well-known experimental data. Arguments for the deductive proof are represented by the following premises:

(1) An experimental device for studying diffraction of particles consists of the following basic parts: (i) a source which emits noninteracting monoenergetic particles of the same kind; (ii) a scatterer (the scattering target) which scatters particles emitted by the source; (iii) a photographic plate which registers emitted particles.

(2) Any emitted particle is registered as a point on the photographic plate. Some points form an incomplete diffraction picture. The great set of points forms a complete diffraction picture.

(3) The set of the oscillations of a physical quantity is called a wave if these oscillations are the connected oscillations. The set of the oscillations which are the unconnected oscillations is not a wave. An oscillation and a wave are forms of absolute motion.

(4) The essence (qualitative determinacy) of a wave movement of physical quantity is manifested in that the diffraction and interference pictures formed by waves are always complete.

From the premises (1)-(4), the following conclusions are deduced. (a) The distinction between the complete and incomplete diffraction pictures formed by scattered particles is the quantitative distinction. There is no qualitative distinction since particles always hit in the regions of the diffraction maximums of intensity. This means that the qualitative determinacy of the set of particles is identical to the qualitative determinacy of one particle. (b) The phenomena of diffraction of a wave and diffraction of a set of quantum particles are not identical. This means that essence (qualitative determinacy) of wave motion of a physical quantity and essence of motion of a particle are not identical. In other words, translatory motion of a particle is not wave movement of a physical quantity. (c) From comparison of diffraction pictures of a wave and of a set of quantum particles, it follows that qualitative determinacy of wave motion of physical quantity and qualitative determinacy of motion of a set of quantum particles have a general (common) aspect: namely, periodicity of motion, that is, oscillations. Hence, translatory motion of a set of free quantum particles is a set of unconnected oscillations. Therefore, translatory motion of one particle is oscillatory, absolute motion (oscillation). (d) As it follows from the experimental data, the connectedness or the unconnectedness

of oscillations is not the essential feature for formation of a complete diffraction picture. But it is essential feature for formation of an incomplete diffraction picture. (e) From the phenomenon of interference of a set of quantum particles, it follows that the quantum particle flows around the obstacle and passes through the double-slit. It means that, firstly, the quantum particle is a particle with a varying size, and secondly, oscillatory change both of size and form of quantum particle is a way of translatory motion. Therefore, translatory motion is absolute. (These results underlie the new quantum theory [12]). (f) There are three various forms of matter (namely, a free quantum particle, a field and a body) and, respectively, three various forms of translatory motion in nature. Translatory motion of a free quantum particle is oscillatory, absolute motion. Translatory motion of a field is a wave, absolute motion. (A field is a set of connected quantum particles). Translatory motion of a body (i.e. of a classical particle) is relative (non-absolute) motion.

Thus, the correct theoretical analysis of experimental data on diffraction of quantum particles leads to the conclusion that there is no wave-corpuscle dualism of motion of a quantum particle (i.e. motion of a matter particle is not associated with a matter wave) in nature because the motion of a quantum particle has no wave aspect.

4.2. On the probabilistic interpretation of the psi-function

As is known, the problem of the interpretation of the ψ-function in quantum mechanics was the subject of the great but uncompleted discussion between Einstein and Bohr. After Einstein and Bohr this problem was not in the centre of physicists' attention. Therefore, now probabilistic interpretation (together with de Broglie's hypothesis) groundlessly underlies the standard formulation of quantum mechanics. In this connection, the purpose of this section is to prove that Born's principle,

$$P = |\psi|^2 \qquad (4.2.1)$$

connecting the probability density P with the ψ-function, is a logical error [19, 20]. Arguments for the deductive proof are represented by the following premises:

(1) According to dialectics, essence and phenomenon are not random aspects of objective reality. When the certain complex of conditions (i.e. the certain complex of external connections and relations) is realized, the phenomenon is divided into a set of events. Events are divided into two opposite (nonintersecting) classes: a class of random events and a class of nonrandom (certain) events. If there is a relation of randomness between elementary events of complete set of events, the relation of randomness defines the concept of the random event. In accordance with this, a class of the variables characterizing events is divided into two opposite (nonintersecting) classes: a class of random quantities and a class of nonrandom (certain) quantities. Opposite classes are boundaries of each other.

(2) Qualitative determinacy of events obeys to the formal-logic laws. The law of identity, *(Random event) = (Random event)* and *(Certain event) = (Certain event)*, expressing identity of quality is a formal-logic law. The law of contradiction, *(Random event) ≠ (Certain event)*, expressing contradiction of qualities is a formal-logic law.

(3) The concepts of random event, random quantity, probability of random event, and average value of random quantity are basic concepts of the theory of probability.

(4) The statistical ensemble of physical systems defines probability, and probability characterizes the ensemble. The statistical ensemble of physical systems represents an imagined (mental, informational) set of identical physical systems. The probability is the ratio of numbers of the systems of the ensemble. Therefore, the probability is an informational concept, and it has no physical meaning. Only the average of physical quantity has the physical meaning.

(5) The theory of probability studies measure, i.e. unity of qualitative and quantitative determinacy of random events. In this case, the mathematical equation in the theory of probability

belongs to the qualitative determinacy of event. Such a mathematical equation has both quantitative and qualitative meaning. Mathematical (quantitative) operations over the equation do not lead to a change of qualitative determinacy of this equation. Both quantitative and qualitative determinacy of the mathematical equation obey to the formal-logic laws. According to the logic law of identity, the left and right parts of the mathematical equation must belong to the same qualitative determinacy. And according to the logic law of contradiction, the left and right parts of the mathematical equation must not belong to different qualitative determinacy.

(6) Formation of the complete diffraction picture in experiments on diffraction of wave is a certain event because there are no incomplete diffraction pictures. In this case, it means that the complete diffraction picture is not the sum of incomplete diffraction pictures.

(7) In experiments on diffraction of the quantum particles, the complete diffraction picture is the sum of incomplete diffraction pictures. In this case, the formation of the incomplete diffraction picture is a random event.

(8) The ψ-function describes a certain event: namely, formation of a complete diffraction picture.

(9) The ψ-function has no physical meaning, i.e. the ψ-function is not a physical quantity.

From premises (1)-(9), the following conclusions are deduced. (a) The $|\psi|^2$ has neither a probabilistic nor a physical meaning since mathematical (i.e. quantitative) operations do not lead to the birth of probabilistic and physical meaning (qualitative determinacy). (b) The mathematical (quantitative) expression,

$$P_{(Random\ \ event)} \neq |\psi_{(Certain\ \ event)}|^2, \qquad (4.2.2)$$

is corollary of the formal-logic (qualitative) relation, *(Random event) ≠ (Certain event)*, because the probability of a random event is not a characteristic of a certain event. Thus, the probabilistic interpretation of the ψ-function, i.e. Born's principle,

$$P_{(Random\ \ event)} = |\psi_{(Certain\ \ \text{event})}|^2, \qquad (4.2.3)$$

is a logical error. And a correct interpretation the ψ-function should be based on the logic law of identity, *(Certain event) = (Certain event)*.

4.3. On the true meaning of the psi-function

As is known, Einstein could not convince Bohr and other physicists that the concepts "objective reality" and "complete description" represent the key to understanding of true meaning of the ψ-function in quantum mechanics. Einstein's arguments have not been realized. Therefore, the problem of the meaning of the ψ-function has not been solved. In this connection, the purpose of this section is to prove that the pseudo-informational meaning is the true meaning of the ψ-function [19, 20]. Arguments for the deductive proof are represented by the following premises:

(1) Concepts of objective reality and system of reference are key concepts.

(2) The system, 'mankind + means of knowledge' is called system of reference. In this wide sense, the system of reference is the universal informational and gnostic (cognizing) basis (i.e. the system consisting of natural bodies and processes, the constructed devices and instruments, the sum of human knowledge and skills) created and used by the mankind for the purpose of knowledge of the world.

(3) The main informational property of the unitary system, 'set of physical objects being researched + system of reference', is that the 'system of reference' defines (measures, calculates)

parameters of the subsystem, 'set of physical objects being researched'; parameters characterize the 'system of reference'.

(4) The main gnostic (cognizing) property of the system, 'set of physical objects being researched + system of reference', is that the 'system of reference' defines (formulates) the physical laws (i.e. creates theories); the physical laws characterize the 'system of reference'.

(5) Objective physical law is a form of scientific knowledge of objective reality. The principle of objectivity of physical laws reads as follows: objective physical laws (i.e. truth) must not contain references to system of reference (in particular, references to procedure and accuracy of measurement or of calculation).

(6) "The originality of a modern situation in quantum mechanics is that, in my opinion, not the mathematics of the theory but the physical interpretation of its statements is called into question" (A. Einstein, 1953).

(7) The ψ-function has no physical meaning. Hence, the $|\psi|^2$ has no physical meaning because mathematical (i.e. quantitative) operations do not lead to the birth or extermination of physical meaning (i.e. qualitative determinacy).

(8) ψ-function describes certain event. Hence, the $|\psi|^2$ has no probabilistic meaning because mathematical (i.e. quantitative) operations do not lead to the birth or extermination of the probabilistic meaning (i.e. qualitative determinacy).

From premises (1)-(9), the following conclusions expressing true meaning of the ψ-function are deduced: (a) The ψ-function is not the measure of physical object being researched. In other words, the ψ-function (i.e. quantitative determinacy) does not belong to the researched material object (i.e. qualitative determinacy) being researched. Therefore, the ψ-function does not represent the complete description of a material object. (b) The ψ-function belongs to a system of reference. The ψ-function is the fictitious informational quantity because, firstly, it does not belong to the material object being researched, and secondly, it represents the result of the incorrect analysis of the experimental information. Therefore, the ψ-function is a pseudo-informational quantity. (c) Probabilistic interpretation of $|\psi|^2$ should be replaced by pseudo-informational interpretation,

$$I_{(\text{pseudo}-\text{information})} = |\psi_{(pseudo-\text{information})}|^2 \qquad (4.3.1)$$

where $I_{(\text{pseudo-information})}$ is the pseudo-information intensity. In this case, pseudo-informational average of a physical quantity can be compared with experimental data. But the generally accepted quantum mechanics remains a nonobjective theory (based on unreliable information), a pseudo-theory containing only a partial truth.

Thus, from the above, it follows that the correct theoretical analysis of the generally accepted foundations of quantum mechanics leads to the following main statements. The foundations of quantum mechanics contain logical errors: the conception of wave-corpuscle dualism; probabilistic interpretation of the psi-function. The true meaning of the psi-function is a pseudo-informational meaning. Therefore, quantum mechanics is a nonphysical, nonobjective, pseudo-informational theory. This theory (i.e. the incomplete description of objective reality) should be replaced by the physical, objective, new quantum theory (i.e. the complete description of objective reality).

4.4. The new basis of quantum theory

The basis of the new quantum theory representing a new viewpoint that has arisen from the critical analysis of statistic physics, the special theory of relativity, and quantum mechanics was proposed in works [6, 7, 12, 19, 20, 22]. The basis is formed by the following heuristic principles.

(1) The principle of motion of quantum particle: the motion is the form of existence of quantum particle; the motion represents unity of internal and external (i.e. translatory) motions.

(2) The principle of energy of quantum particle: the energy

$$E_n \neq 0\,,\, n = 0, 1, 2, \ldots \qquad (4.4.1)$$

(where n is the energetic quantum number) is inalienable property of a quantum particle. Energy levels n of the quantum particle arise and disappear only as a result of absorption and emission of other quantum particles, respectively. (Consequently, the problem of quantization of energy is not the Shrödinger problem of eigenvalues).

(3) The principle of equivalence of energy E_n and frequency $h\nu_n$ of quantum particle: energy E_n is related to frequency $h\nu_n$ by the formula

$$E_n \equiv h\nu_n\,,\, \nu_n \neq 0 \qquad (4.4.2)$$

where h and ν_n are the Planck constant (i.e. quantum of action) and the frequency of the periodic process of mutual transformation of the internal and external motions, respectively. The concepts of energy E_n and of frequency $h\nu_n$ are identical ones. Multiplication of the quantities h and ν_n is permitted by logic law of identity if h is an oscillating quantity.

(4) The principle of speed of translatory motion of quantum particle: the speed v_n is defined by the formula

$$v_n \equiv \lambda_n \nu_n \qquad (4.4.3)$$

where $\lambda_n \neq 0$ is the size (the diameter) of the particle. The λ_n equals the distance traveled the particle for the oscillation period

$$\tau_n \equiv 1/\nu_n\,. \qquad (4.4.4)$$

This translatory motion is a result of contraction and extension of the size (diameter) of the particle. Therefore, the translatory motion of the quantum particle relative to a reference system is an absolute one. The absolute motion is invariant under choice of a reference system. This statement means that the velocity addition theorem for quantum particle is not valid.

(4) The principle of mass and momentum of quantum particle: the mass m_n and the momentum p_n are defined by the formula

$$E_n \equiv (E_n/v_n^2)\,v_n^2 \equiv m_n\,v_n^2 \equiv p_n\,v_n\,. \qquad (4.4.5)$$

The concept of mass m_n and the concept of energy E_n are not identical ones. Therefore, the formula

$$E_n \equiv m_n\,v_n^2 \qquad (4.4.6)$$

does not express the principle of equivalency of mass and energy.

(5) The principle of equivalency of mass and energy of quantum particle: the energy E_n is related to the mass M_n by the formula

$$E_n \equiv kM_n \qquad (4.4.7)$$

where the concepts of the energy E_n and the mass M_n are identical ones, k is a universal constant, $[k] = erg/g$.

(6) The principle of acceleration and of deceleration of quantum particle: acceleration and deceleration of particle are results of absorption and emission of other quantum particles, respectively. The acceleration $w_{n+1,n}$ of the quantum particle under the transition $n \to (n+1)$ which is due to absorption of other quantum particle (photon) is defined by the formula

$$w_{n+1,n} \equiv (\nu_{n+1} - \nu_n)(\nu_{n+1} - \nu_n) \equiv \nu_{n+1,n}\,\nu_{n+1,n}. \qquad (4.4.8)$$

These heuristic principles lead to the following explanation of the principle of constancy of light speed. If: (a) light is a set of photons with different energies $E_n \equiv h\nu_n$, $E'_n \equiv h\nu'_n, \ldots$; (b) photon cannot absorb other quantum particle and, therefore, the energies of the photons take on values $E_0 \equiv h\nu_0$, $E'_0 \equiv h\nu'_0, \ldots$ only; (c) $E'_0/E_0 \equiv m'_0/m_0$ (i.e. distinction between energies (frequencies) is distinction between masses), – then the speed of light is the constant to all observers: $c \equiv \nu_o = \nu'_0 = const$.

4.5. Conclusion

Thus, from the above, it follows that the correct theoretical analysis of the generally accepted foundations of quantum mechanics leads to the following main statements: (a) the foundations of quantum mechanics contain logical errors: the conception of wave-corpuscle dualism; probabilistic interpretation of the psi-function; (b) the true meaning of the psi-function is a pseudo-informational meaning. Therefore, quantum mechanics is a nonphysical, nonobjective, pseudo-informational theory; (c) this theory (i.e. the incomplete description of objective reality) should be replaced by the physical, objective, new quantum theory (i.e. the complete description of objective reality).

5. CLASSICAL THERMODYNAMICS

5.1. The formulation of the problem

As is known, thermodynamics is a branch of physics which deals with the heat energy and work of a system. It is a fundamental part of the physical science. The results of thermodynamics are essential for other fields of physics and for chemistry, chemical engineering, cell biology, biomedical engineering, and materials science. The starting point for most thermodynamic considerations are four laws of classical thermodynamics: about internal energy, heat energy, entropy, and temperature. These laws do not depend on the details of the interactions or the systems being studied and postulate that: (a) energy can be exchanged between physical systems as heat and work; (b) there exist a quantity named entropy. The main concepts “internal energy”, “heat energy”, “entropy”, and “temperature” are not defined within the framework of thermodynamics. Therefore, classical thermodynamics – a phenomenological theory – should be scientifically grounded and explained by molecular-kinetic theory and statistical physics. Statistical interpretation of the second and third laws of thermodynamics is an object of statistical thermodynamics: the statistical interpretation is to derive all macroscopic properties from the statistical properties of moving constituent particles and the interactions between them. The result of great efforts putted into substantiation of the foundations of thermodynamics in 20th century can be expressed by A. Einstein’s words: “Classical thermodynamics is the unique classical physical theory which will be never refuted”. However, this statement was recently refuted: it was shown [7, 9, 10, 26-31] for the

first time that the foundations of classical thermodynamics and statistical physics contain logical errors. Consequently, there is the problem of truth in thermodynamics and statistical physics.

From the formal-logical point of view, thermodynamics and statistical physics cannot be compared with each other if there is no logical relations (identity, subordination, collateral subordination, partial coincidence, discrepancy) between thermodynamic and statistical concepts. Therefore, substantiation and explanation of thermodynamics means establishment of logical relations between thermodynamic and quantum-statistical concepts: "General relationship between energy and temperature can be understood only with the help of probabilistic consideration. The problem of temperature connects very closely with quantum hypothesis" (M. Planck). The correct base for comparison of the concepts is Gibbs quantum canonical distribution, and the principle of the unity of formal logic and of rational dialectics represents the methodological basis of the analysis. In connection with [7, 9, 10, 26-31], the critical analysis of the generally accepted foundations of classical thermodynamics (i.e., the first and second laws, equation of state, concepts of internal energy, heat energy, entropy, temperature) are proposed in this work. The purpose of the analysis is to prove that the standard foundations contain logical (mathematical) errors and to offer the correct formulations.

5.2. The correct formulation of the first law of thermodynamics

As is known, the generally accepted first law of thermodynamics reads as follows: the change in the internal energy of a closed thermodynamic system is equal to the sum of the amount of heat energy supplied to the system and the work done on the system. The first law is given by the differential expression

$$dU = dQ + dW \qquad (5.2.1)$$

where U, Q, W are internal energy, heat energy, and non-heat energy of the system, respectively. But this expression does not take into consideration the empirical fact that there is mutual transformation of heat energy and the work in practice. One should take into consideration this empirical fact in the following way. From mathematical point of view, quantities U, Q, W are in the following relation: U is a function of two independent variables, Q, W. Therefore, the correct formulation of the first law must be based on the concepts of function and differential of function. Really, if internal energy U of system is a function of two independent variables, $Q = Q(t)$ (describing of the heat form of energy) and $W = W(t)$ (describing non-heat form of energy), then the correct formulation of the first law of thermodynamics is

$$\frac{dU(Q,W)}{dt} = \left(\frac{\partial U}{\partial Q}\right)_W \frac{dQ}{dt} + \left(\frac{\partial U}{\partial W}\right)_Q \frac{dW}{dt} \qquad (5.2.2)$$

where t and

$$\eta \equiv -\left(\frac{\partial U}{\partial W}\right)_Q \Bigg/ \left(\frac{\partial U}{\partial Q}\right)_W \qquad (5.2.3)$$

are time and measure of mutual transformation of forms of energy, respectively. (For example, the energy of the molecules which absorbs laser radiation is a non-heat form of energy). Consequently, the generally accepted formulation of the first law of thermodynamics represents a logical (mathematical) error because its content (i.e. special assertion) is not a law (i.e. general assertion).

5.3. The correct formulation of the second law of thermodynamics

As is known, the generally accepted second law of thermodynamics reads as follows: the total entropy of any isolated thermodynamic system tends to increase over time, approaching a maximum value. The second law is given by the differential expression

$$dS_{(\text{thermodynamic})} = dQ_{(\text{thermodynamic})} / T_{(\text{thermodynamic})}, \quad 0 < T_{(\text{thermodynamic})} < \infty \qquad (5.3.1)$$

where $Q_{(\text{thermodynamic})}$, $S_{(\text{thermodynamic})}$, $T_{(\text{thermodynamic})}$ are the thermodynamic heat energy, the thermodynamic entropy, and the thermodynamic temperature of the system. In order to research this expression, one should establish logical relations between concepts “thermodynamic heat energy”, “thermodynamic entropy”, “thermodynamic temperature” and concepts “statistical heat energy”, “statistical entropy”, “statistical temperature”. Correct solution of this problem is based on Gibbs quantum canonical distribution which represents the correct and complete quantum-statistical description of isolated macroscopic system – ideal gas of molecules (quantum particles) – in thermodynamic equilibrium.

Gibbs quantum canonical distribution is consequence of the new basis of quantum theory and the following set of premises.

(1) A molecule of isolated ideal gas is individual quantum particle. The energy of the molecule represents discrete random quantity since molecules collide with each other in a random way.

(2) The random quantity takes on the values E_n, $n = 0, 1, 2, \ldots$ where $E_0 = 0$ is origin of counting of the random quantity;

(3) f_n is probability that molecule is in energetic quantum state n and has energy E_n. The probabilities f_n give complete quantum-statistical description of the ideal gas of molecules.

(4) Rule of addition of probabilities has the following form:

$$\sum_{n=0}^{\infty} f_n = 1 \qquad (5.3.2)$$

where

$$0 < f_n < 1, \quad \lim_{n \to \infty} (f_{n+1} / f_n) < 1. \qquad (5.3.3)$$

(5) Rule of combination (multiplication) of probabilities for independent random events has the following form:

$$f_{n,m} = f_n \, f_m \qquad (5.3.4)$$

where $f_{n,m}$ is combined probability that two molecules have energy $E_n + E_m$. In this case, f_n is the exponential function (A. Cauchy, 1821):

$$f_n = f_0 \exp(-\beta E_n) \qquad (5.3.5)$$

where $1/\beta$ is a statistical parameter of molecule. The parameter $1/\beta$ is introduced for mathematical reasons: quantity βE_n must be dimensionless one. This parameter is consequence of existence of

energy spectrum of quantum particle (atom, molecule) and does not depend on structure of energy spectrum. If the parameter was dependent on n it would represent value of some (indefinable) random quantity.

(6) The parameter

$$1/\beta = -E_n/\ln(f_n/f_0) \qquad (5.3.6)$$

or (in other form)

$$1/\beta = -(E_{n+1} - E_n)/\ln(f_{n+1}/f_n) \qquad (5.3.7)$$

represents physical-statistical property of molecules of gas and has both mathematical and physical meaning. From mathematical point of view, $1/\beta$ is a continuous and limited variable. From physical point of view, $1/\beta$ is the physical quantity which has energy dimension. Zero is origin of counting of this physical-statistical quantity and is the same for molecule of any kind. Range of existence of this parameter is defined by the relationship

$$0 < 1/\beta < E_\infty . \qquad (5.3.8)$$

Quantum-statistical description of ideal gas of molecules loses statistical meaning outside this range: (a) if $1/\beta = 0$, then the energy of the molecule is not a random quantity; (b) if $1/\beta = E_\infty$, then the set $\sum_{n=0}^{\infty} f_n$ is diverged.

(7) The parameter $1/\beta$ has the same value for any (every) molecule of the system. Consequently, $1/\beta$ is the universal statistical parameter (i.e. statistical potential) of the system. This parameter has essential property of temperature. As is empirically known, this property is that temperature has the same value for every part (subsystem) of system if the system is in a state of heat equilibrium. Therefore, the identity

$$1/\beta \equiv T_{(\text{statistical})} \qquad (5.3.9)$$

is the conjecture, the postulate. Owing to this postulate, the function f_n is called Gibbs canonical distribution, and the temperature $T_{(\text{statistical})}$ is called absolute temperature. The absolute temperature is temperature in the sense of the concept "Gibbs quantum canonical distribution". The absolute temperature does not depend on the existence of a thermometer (device).

It follows from above that

$$f_n = f_0 \exp(-E_n/T_{(\text{statistical})}) \qquad (5.3.10)$$

is Gibbs quantum canonical distribution. It has objective meaning because E_n and $T_{(\text{statistical})}$ are independent of existence of a thermometer. Gibbs quantum canonical distribution defines the correct relationship between the statistical-average (microscopic) energy E of molecule, the statistical-average (microscopic) entropy s of molecule, and the statistical temperature $T_{(\text{statistical})}$ of molecule. This relationship has the form:

$$E = sT_{(\text{statistical})}, \quad 0 < s < 1, \quad \lim_{T_{(\text{statistical})} \to 0} s = 0 \qquad (5.3.11)$$

where

$$E \equiv \sum_{n=0}^{\infty} E_n f_n, \quad s \equiv \sum_{n=0}^{\infty} s_n f_n, \quad s_n \equiv E_n / T_{(\text{statistical})} = -\ln(f_n / f_0). \qquad (5.3.12)$$

Obviously, the heat energy E is a nonlinear function of the $T_{(\text{statistical})}$ because entropy s depends on the $T_{(\text{statistical})}$. In the case of binary gaseous mixture, it follows from the condition $T_{(\text{statistical})} = T'_{(\text{statistical})}$ of thermal equilibrium that, in general, $E \neq E'$ where E and E' are the statistical-average energies of molecules of components.

The correct relationship between microscopic and macroscopic quantities has the form:

$$Q_{(\text{macroscohic})} = S_{(\text{macroscopic})} T_{(\text{statistical})}, \; Q_{(macroscopic)} = N_{(\text{macroscopic})} E,$$
$$S_{(\text{macroscopic})} = N_{(\text{macroscopic})} s, \qquad (5.3.12)$$

where $N_{(\text{macroscopic})}$ is total (macroscopic) number of molecules in the system. The following statement follows from this relationship. If: (a) the relationship

$$Q_{(\text{macroscohic})} = S_{(\text{macroscopic})} T_{(\text{statistical})} \qquad (5.3.13)$$

is correct; (b) the identities

$$Q_{(\text{thermodynamic})} \equiv Q_{(\text{macroscopic})}, \; S_{(\text{thermodynamic})} \equiv S_{(\text{macroscopic})},$$
$$T_{(\text{thermodynamic})} \equiv T_{(\text{statistical})} \qquad (5.3.14)$$

is valid (i.e. thermodynamics concepts “thermodynamic heat energy”, “thermodynamic entropy”, and “thermodynamic temperature” are identical with the concepts “macroscopic heat energy”, “macroscopic entropy”, and “statistical temperature”, respectively), – then the generally accepted formulation of the second law of thermodynamics is incorrect. Since the ranges

$$0 < T_{(\text{thermodynamic})} < \infty, \; 0 < T_{(\text{statistical})} < E_{\infty} \qquad (5.3.15)$$

of existence of $T_{(\text{thermodynamic})}$ and $T_{(\text{statistical})}$ differ in degree, there exist partial coincidence between concepts “thermodynamic temperature” and “statistical temperature”.

Thus, the generally accepted second law of thermodynamics represents a logical (mathematical) error.

5.4. The correct formulation of the equation of state

As is known, if movement of molecules (quantum particles) is cause of gas pressure, then average pressure $\bar{p}_{(\text{macroscopic})}$ of molecules of gas is defined by the unique relationship

$$\bar{p}_{(\text{macroscopic})} = \bar{\mu}_{(\text{macroscopic})} \bar{E} \qquad (5.4.1)$$

where $\bar{\mu}_{(\text{macroscopic})}$ and $\bar{E}$ are average number of molecules in unit volume and average energy of one molecule, respectively. This relationship represents the correct "equation of state" of gas. In the case of heat movement of molecules, average energy $\bar{E}$ of one molecule is E. Putting

$$E = \bar{p}_{(\text{macroscopic})} / \bar{\mu}_{(\text{macroscopic})} \qquad (5.4.2)$$

into the left part of the relationship

$$Q_{(\text{macroscohic})} = S_{(\text{macroscopic})} T_{(\text{statistical})}, \qquad (5.4.3)$$

one can express "equation of state" in the "heat" form:

$$Q_{(\text{macroscopic})} = \bar{p}_{(\text{macroscopic})} V_{(\text{macroscopic})}, \text{ i.e. } S_{(\text{macroscopic})} T_{(\text{statistical})} = \bar{p}_{(\text{macroscopic})} V, \qquad (5.4.4)$$

where

$$V \equiv N_{(\text{macroscopic})} / \bar{\mu}_{(\text{macroscopic})}, \quad N_{(\text{macroscopic})} \equiv \bar{\mu}_{(\text{macroscopic})} V \qquad (5.4.5)$$

are volume of molecular gas and total number of molecules in gas, respectively. If $E_n = E_1 n$ and $E_1 / T_{(\text{statistical})} << 1$, then value of entropy at the high-temperature limit is approximately equal to one, $s \approx 1$, and heat "equation of state" takes the following linear form:

$$\bar{p}_{(\text{macroscopic})} V \approx N_{(\text{macroscopic})} T_{(\text{statistical})}. \qquad (5.4.6)$$

Distinction between this form and standard thermodynamic "equation of state",

$$\bar{p}_{(\text{macroscopic})} V = N_{(\text{macroscopic})} T_{(\text{thermodynamic})}, \qquad (5.4.7)$$

is not only distinction in degree, but also distinction in kind. In order to explain qualitative and quantitative determinacy of the $T_{(\text{thermodynamic})}$, one should consider the gas system in development.

As is known, the rational dialectics principle reads as follows: one should consider the system in development. In accordance with this principle, one should consider the following development of the gas system absorbing energy without limitation:

(gas of molecules) $\rightarrow$ *(gas of atoms)* $\rightarrow$ *(gas of elementary particles)*. (5.4.8)

The system "gas of elementary particles" does not obey Gibbs quantum canonical distribution. Consequently, the elementary particles (photons, electrons etc.) have no statistical temperature, and the system is not in heat equilibrium. Moreover, the system have no thermodynamic temperature because there is no the heat form of energy in this system. There exist the concept of average energy of elementary particle only: $\bar{E}_{(\text{photon})}$, $\bar{E}_{(\text{electron})}$ etc. . If one measures the average energy with the

help thermometer, the thermometer will read the temperature: $T_{(\text{photons})}$, $T_{(\text{electrons})}$ etc. . Temperature (i.e., physical property of the thermometer, the device, contacting the gas) exists only as measure of the thermometer, i.e. as the unity of qualitative and quantitative determinacy of the thermometer, as the ordered set of the thermometer states (thermometer readings). The concept of temperatures $T_{(\text{photons})}$, $T_{(\text{electrons})}$ is the conventional concept connecting with the existence of the concept of thermometer (device). From formal-logical point of view, it means that the concept of thermodynamic temperature connects inseparably with the concept of thermometer: the concept "thermodynamic temperature" exists as consequence of the concept "thermometer". Consequently, concepts "thermodynamic temperature" and "statistical temperature" are not identical ones, and the concept "thermodynamic temperature" has no objective meaning.

Thus, the expression

$$Q_{(\text{macroscopic})} = \bar{p}_{(\text{macroskopic})} V \qquad (5.4.9)$$

is the unique correct formulation of the "equation of statistical state". The generally accepted formulation of "equation of thermodynamic state" represents a logical (mathematical) error because, firstly, $T_{(\text{thermodynamic})}$ has no qualitative determinacy at $T_{(\text{thermodynamic})} \to \infty$ and, secondly, the concept of thermodynamic temperature is logically erroneous and non-objective one.

5.5. Conclusion

As is known, formal logic is a science of the laws of correct thinking. One of its main principles is that definition of scientific concept must be exact and complete. However, classical thermodynamics does not satisfy this principle: within the framework of classical thermodynamics – a phenomenological theory, – one cannot give exact and complete definition of the thermodynamic concepts (i.e. concepts of internal energy, of heat energy, of entropy, of temperature). In order to define thermodynamic concepts one should include the concepts of thermodynamic instruments (thermometer, calorimeter etc.) and of measurement in the theory. Theory including concepts of instrument (device) and of measurement is nonobjective, and a phenomenological theory excluding these concepts has no scientific meaning. This is the qualitative determinacy of any phenomenological theory. Therefore, the phenomenological, nonobjective theory (classical thermodynamics) must be scientifically grounded and interpreted by the objective theory (statistical physics) which has the same object of scientific research. However, a part of results of the phenomenological theory loses scientific meaning at the grounding and interpreting.

Thus, the correct theoretical analysis shows that classical thermodynamics – a phenomenological theory – is not an objective theory. Its foundations (i.e., the first and second laws, equation of state, concepts of internal energy, of heat energy, of entropy, of temperature) contain logical (mathematical) errors. The existence of logical errors is irrefutable proof of incorrectness of classical thermodynamics.

6. GENERAL CONCLUSION

Thus, formal-logical and rational-dialectical analysis of the generally accepted foundations of theoretical physics results in the following main statements.

(1) These foundations contain essential logical errors. The existence of logical errors is irrefutable proof of incorrectness of the generally accepted foundations. The errors are explained by the global cause: the errors are a collateral and inevitable result of inductive method of knowledge of the Nature, i.e. result of movement from formation of separate concepts to formation of system of concepts.

(2) Theoretical physics is not essence science but phenomenon science. It means that theoretical physics is an unwieldy science (since it is created by the inductive method); having primitive non-universal foundations; not having a clear purpose; containing a set of delusions, logical errors, and vagueness (vagueness often cannot even be realized and formulated in the generally accepted physical concepts since physics does not contain many universal concepts; furthermore, vagueness often results from the "thoughtless application of mathematics" (L. Boltzmann)). Therefore, physical theories and fields of physics defy both natural unification and correct development. These statements – as a result of my 25-year experience of the critical analysis of foundations of theoretical physics – are the ground for the following main conclusion: physics enters the greatest crisis. The crisis in physics leads to the general crisis in science.

(3) According to M. Planck's opinion, the correct theoretical physics will be created by the rising generation, and opponents of correct physics will gradually die out not having acknowledged their own wrongness. And in accordance with the principle of development of Humankind, the correct physical laws found in the deductive and meditative way will not carry the names of their discoverers.

(4) The problem of scientific truth is the most urgent problem of our time. This problem can be solved only with help of a new theory of knowledge since “science without the theory of knowledge becomes primitive and muddled” (A. Einstein).

(5) In accordance with the new theory of knowledge, science – as “threats and bribery” for Humankind – is a means of cognition. Knowledge of Universe Moral (i.e. universal moral, moral in the broad sense) is aim of scientific activity of Humankind as well as the criterion of truth of science and human life. Scientific achievements depend on the moral qualities of man: in ancient Greek philosopher Socrates’ opinion, the existence of objective truth is consequence of the existence objective moral principles. Therefore, “the moral qualities of the prominent person are, probably, of great importance for the given generation and all course of history than purely intellectual achievements. The lasts depend on greatness of spirit to an greater degree than it is usually accepted to consider” (A. Einstein).

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REFERENCES

[1] T.Z. Kalanov, "The correct theoretical analysis of the Michelson-Morley experiments", Doklady Akademii Nauk Respubliki Uzbekistan, No. 11-12 (1995), p. 22.
[2] T.Z. Kalanov, "Proof of non-correctness of the Lorentz transformation", Doklady Akademii Nauk Respubliki Uzbekistan, No. 1-2 (1996), p. 32.
[3] T.Z. Kalanov, "On the theory of relative motion", Doklady Akademii Nauk Respubliki Uzbekistan, No. 12 (1997), p. 15.
[4] T.Z. Kalanov, "On the theory of time", Doklady Akademii Nauk Respubliki Uzbekistan, No. 5 (1998), p. 24.
[5] T.Z. Kalanov, "Kinematics of material point: Modern analysis", Doklady Akademii Nauk Respubliki Uzbekistan, No. 7 (1999), p. 9.
[6] T.Z. Kalanov, "$E \neq mc^2$: The most urgent problem of our time", Doklady Akademii Nauk Respubliki Uzbekistan, No. 5 (1999), p. 9.
[7] T.Z. Kalanov, "Correct quantum-statistical description of ideal systems within the framework of master equation". Proc. XXVth ICPIG, Nagoya, Japan---Ed. By Toshio Goto / Japan: Nagoya Univ., 2001, Vol. 3, p. 235.
[8] T.Z. Kalanov, "On logical errors lying in the base of special theory of relativity", Bull. Am. Phys. Soc., V. 46, No. 2 (2001), p. 99.

[9] T.Z. Kalanov, "On a solution of the problem of unitarization of the elementary principles of statistical physics and physical kinetics", Bull. Am. Phys. Soc., Vol. 47, No. 2 (2002), pp. 163-164.
[10] T.Z. Kalanov, "On the main errors underlying statistical physics", Bull. Am. Phys. Soc., Vol. 47, No. 2 (2002), p. 164.
[11] T.Z. Kalanov, "On the essence of time", Bull. Am. Phys. Soc., V. 47, No. 2 (2002), p. 164.
[12] T.Z. Kalanov, "On a new basis of quantum theory", Bull. Am. Phys. Soc., V. 47, No. 2 (2002), p. 164.
[13] T.Z. Kalanov, "For the problem of the correspondence principle", Bull. Am. Phys. Soc., Vol. 48, No. 2 (2003), p. 153.
[14] T.Z. Kalanov, "On a new theory of the system of reference", Bull. Am. Phys. Soc., V. 48, No. 2 (2003), pp. 153-154.
[15] T.Z. Kalanov, "On the essence of space", Bull. Am. Phys. Soc., V. 48, No. 2 (2003), p. 154.
[16] T.Z. Kalanov, "For the problem of knowledge of the Universe", Bull. Am. Phys. Soc., Vol. 48, No. 2 (2003), pp. 154-155.
[17] T.Z. Kalanov, "The theory of relativity: An error of the transformation of coordinates", Bull. Am. Phys. Soc, V. 48, No. 2 (2003), p. 155.
[18] T.Z. Kalanov, "On logical errors underlying the special theory of relativity", Journal of Theoretics (USA). Vol. 6-1, 2004 (http://www.journaloftheoretics.com).
[19] T.Z. Kalanov, "The correct theoretical analysis of the foundations of quantum mechanics", Journal of Ultra Scientists of Physical Sciences (India), V. 16, No. 2 (2004), pp. 191-198 (http://www.ultrascientist.org).
[20] T.Z. Kalanov, "On the correct theoretical analysis of the foundations of quantum mechanics", Bull. Am. Phys. Soc., V. 50, No. 2 (2005).
[21] T.Z. Kalanov, "On a new theory of physical vacuum", Bull. Am. Phys. Soc., Vol. 50, No. 2 (2005).
[22] T.Z. Kalanov, "On a new approach to the solution of the problem of quantization of energy", Bull. Am. Phys. Soc., V. 51, No. 2 (2006), p. 62.
[23] T.Z. Kalanov, "On a new theory of the black hole", Bull. Am. Phys. Soc., Vol. 51, No. 2 (2006), p. 62.
[24] T.Z. Kalanov, "The problem of the SETI: A methodological error in cosmology and astrophysics", Bull. Am. Phys. Soc., Vol. 51, No. 2 (2006), p. 60-61.
[25] T.Z. Kalanov, "On the hypothesis of Universe's "system block"", Bull. Am. Phys. Soc., Vol. 51, No. 2 (2006), p. 61.
[26] T.Z. Kalanov, "On the correct formulation of the first law of thermodynamics", Bull. Am. Phys. Soc., Vol. 51, No. 2 (2006), p. 60.
[27] T.Z. Kalanov, "The second law of thermodynamics: Mathematical error", Bull. Am. Phys. Soc., Vol. 51, No. 2 (2006), p. 60.
[28] T.Z. Kalanov, "Bose's method: A logical error", Bull. Am. Phys. Soc., Vol. 51, No. 2 (2006), p. 61.
[29] T.Z. Kalanov, "Dirac's theory of physical vacuum: Continuation of Bose's logical errors", Bull. Am. Phys. Soc., Vol. 51, No. 2 (2006), p. 61.
[30] T.Z. Kalanov, "Bose-Einstein statistics and Fermi-Dirac statistics: A logical error", Bull. Am. Phys. Soc., Vol. 51, No. 2 (2006), p. 61.
[31] T.Z. Kalanov, "On the correct analysis of Maxwell distribution", Bull. Am. Phys. Soc., Vol. 51, No. 2 (2006), p. 61-62.
[32] T.Z. Kalanov, "On the correct analysis of the of the foundations of the special theory of relativity", Bull. Am. Phys. Soc., Vol. 52, No. 2 (2007).
[33] T.Z. Kalanov, "On the correct analysis of the foundations of theoretical physics", Bull. Am. Phys. Soc., Vol. 52, No. 2 (2007).
[34] T.Z. Kalanov, "On the hypothesis of control of the Universe", Bull. Am. Phys. Soc., Vol. 52, No. 2 (2007).
[35] T.Z. Kalanov, "Theoretical model of God: The key to correct exploration of the Universe", Bull. Am. Phys. Soc., Vol. 52, No. 2 (2007).
[36] T.Z. Kalanov, "Critical analysis of the special theory of relativity", Bull. of Pure and Applied Sciences, Vol. 26D, No 1 (2007), pp. 1-15 (www.bulletinpureappliedscience.com).
[37] T.Z. Kalanov, "The correct theoretical analysis of the foundations of classical thermodynamics", Bull. of Pure and Applied Sciences, Vol. 26D, No 2 (2007), pp. 109-118 (www.bulletinpureappliedscience.com).
[38] T.Z. Kalanov, www.wbabin.net, www.mrelativity.net.