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Disclosure of the True Essence of Quantum Theory on the Basis of Scientific Philosophy

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ABSTRACT

It is well known that in 1900, after Planck obtained the basic equation of quantum theory, there came a moment when it became necessary to obtain a theoretical justification of this equation. In 1911, based on the possibility of Gibbs' canonical distribution function (CDF), he solved this problem partially: he obtained a justification for the second multiplier of his equation. Then on the basis of the analysis of these results he stated that henceforth in the role of the basic concept of quantum theory there is a necessity to accept the possibility of the concept of the quantum of action. However, Poincaré at the same congress criticized these new ideas. For he recognized the value of the idea of the quantum of action in solving only frequent problems. Therefore, he further, in his article entitled "On the Theory of Quanta", made the following conclusion: in his opinion, the main essence of quantum theory is connected with the concept of the quantum of energy [1]. Thus, he wanted to say that in the future the main results of Planck's quantum theory have the possibility to substantiate only if the possibility of the concept of energy quantum is taken as more general. In this paper an attempt is made to prove that it is really so.

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§1. As it is known, M Jemmer, when writing his book [2], set himself the goal of revealing the regularities of evolution of the concept of quantum mechanics. Therefore, there is a reason to hope that on the basis of the analysis of ideas [2] there is a possibility to solve the problem which was formed in [1]. While reading the book [2], I realized the following. In section 4.2. "The philosophical background of non-classical interpretations", as well as in section 4.3. "Non-classical interpretations of optical dispersion" there are some very valuable ideas. The nature of these ideas can be interpreted to solve such a problem. In this connection I would like to say the following. At first in 4.2. Gemmer made a general review of philosophical assumptions of modern quantum physics. Then summarizing his thoughts he wrote:

"The philosophical movements we mentioned above - continentalism, existentialism, pragmatism, and logical empiricism - emerged in opposition to traditional rationalism and conventional ontology dating back to Descartes. The definite conception of life they asserted, the rejection of abstract intellectualism, culminated in the doctrine of free will, the rejection of mechanistic determinism and metaphysical causality." (1)

The following should be noted here. Gemmer, speaking about the main representatives of such currents as existentialism, pragmatism, ...mainly means Cournot, Renouvier, Butra, Kierkegaard and Geffding. In my opinion, in order to distinguish the essence of the main ideas that these philosophers put forward it makes sense to recall some of their thoughts. For example, Boutroux [3] stated that:

"In analyzing the concept of the law of nature as seen by the sciences themselves, I have found that life, sensation, and freedom are the true and profound realities, whereas the relatively unchanging and general forms grasped by science are only inadequate manifestations of these realities." **(2)**

In my opinion, the essence of the thought contained in these words reveals the anti-scientific orientation of the main ideas put forward by the representatives of the philosophy of life. On the other hand, it is a well-known fact that unfortunately, in due time the ideas of this current had a significant influence on such physicists as Bohr. Partially also on C G Darwin, as well as on Poincaré.

For example, in my opinion, it is precisely because of the influence of the main ideas of the current of philosophy of life that Poincaré was unable to come to a clear realization of the essence of Descartes' idea of scientific rationalism. He could not fully realize why in his time Descartes introduced the basic ideas and results that later became known as Cartesian coordinate systems [4]. He failed to realize that Descartes introduced these results in order to formulate the essence of the following thought:

It is necessary to take the equations of algebra and arithmetic as the basis of the theory of thinking from the very beginning. Then solve the problems of geometry-kinematics-physics. Moreover, so that at the very end it would be possible to obtain results based on which it would be possible to calculate not only numbers, but also the nature of the basic objects under study. Of course, this will be possible only in the following case. If further in the course of calculations, the possibility of the method of separation of variables and the method of abolition of variables will be correctly

used. For this is what is required by the fact that from the very beginning the equation of algebra and arithmetic is taken as a basis.
(3)

If Poincaré had been able to come to the realization that Descartes' original ideas contained such ideas, he would have been able to realize the following. He would have realized that the basic essence of what Planck discovered in 1900 is this. He realized the realization of the thoughts contained in Descartes' original ideas (3). However, as is known unfortunately Poincaré, like many others, failed to realize that this was so, although he came close to it. As a result, further the basis of theoretical physics began to develop in such a way that later C G Darwin in 1919 in the article "Critique of the foundations of physics" wrote:

"I have long believed that the fundamentals of physics are in a terrible state. The great advances of quantum theory have all along emphasized not only its importance but also the essential contradictions underlying it...It may happen that it will be necessary to change fundamentally our ideas of time and space, or to abandon the conservation of matter and electricity, or even as a last resort to attribute free will to the electron". **(4)**

Based on the analysis of the thoughts contained in lines (4) one can realize the following. If the basis of theoretical physics were to develop along the path of truth, it should have developed without severing its connection from the basic results of mathematical analysis. This means the following. At one time after the derivation of the basic differential equations for:

1-th geometric point, 1-th kinematic point, 1-th physical particle (5)

These equations would have to be solved for:

(a) Geometric points subordinate to the number bond, which tends to infinity;
b) Kinematic points subordinate to the linkage the number of which tends to infinity;
c) Physical particles subject to bonding or chaotically moving, but whose numbers are finite." (6)

However, as it is known in due time the basis of mathematical analysis did not develop in such integrity.

On the contrary, the basis of mathematical analysis together with the main results of mathematical physics began to develop as follows. Its development at the very end led to the results of Cantor's infinite abstract set theory [5]. Of course, all this led to various kinds of contradictions and paradoxes. Moreover, all this happened mainly because of the following. Even Newton, although at the beginning to obtain his results followed the path of truth, after obtaining the basic equation of theoretical physics, as well as the successful development of celestial mechanics, further strayed from the path of truth. It happened when he, as well as Leibniz, having declared Descartes a dogmatist, declared that it is expedient to use the possibility of non-algebraic method as well. Thus, I want to say the following: further, the basis of the scientific theory of cognition began to develop on a false way. If the basis of theoretical physics would have developed on the way of truth, the possibility of the method of separation and abolition of variables could have been used correctly, then the following would have happened. C G Darwin would later have no need at all to write the thoughts available in lines (4). For the basis of theoretical physics would have developed in a slightly different way. Such concepts as space and time would have been abolished from further use in their original sense in the course of calculation. That is on the way, when all calculations began to be carried out so that at the very end to come to the results inherent in quantum theory.

Thus, based on the above, the following conclusions can be drawn. Poincaré clearly realized that the concept of energy quantum is really a fundamental concept of theoretical physics. Moreover, in the same sense as the notion of a particle. It seems that in his consciousness he had in mind the following: the fact that earlier Newton had obtained the basic equation of theoretical physics for one particle. Unfortunately, however, he was then unable to prove theoretically that this was indeed the case. In my opinion, this was due to the following reasons. At that time, although the basic equations of theoretical physics were already known such as

$$\dot{q}_i = \frac{\partial H}{\partial p_i}, \quad \dot{p}_i = -\frac{\partial H}{\partial q_i} \qquad (7)$$

as well as equations

$$\frac{\partial S}{\partial t} + H\left(q_i, \frac{\partial S}{\partial q}, t\right) = 0 \qquad \frac{\partial \rho}{\partial t} - [H\rho] = 0,$$

$$H\left(q_i, \frac{\partial S}{\partial q}\right) = E, \qquad (8) \qquad [H\rho] = 0, \quad \rho_i = \exp\frac{F - \varepsilon_i}{kT}, \quad \rho_{i,n} = \exp\frac{\Phi + \mu n - \varepsilon_i}{kT} \qquad (9)$$

but the Schrodinger equation was still unknown

$$\Delta\psi + \frac{8\pi^2 m}{\hbar^2}(E - V)\psi = 0 \qquad (10)$$

Therefore, he did not have the opportunity to realize that the nature of equations (8) + (10), as well as equation (9), is possible to understand as equations having the sense of solutions obtained by solving (7):
α) for many orderly moving particles obeying the force;
β)for many chaotically moving particles.

In addition, to solve in such a way that on these paths it becomes possible to obtain a solution, which can be taken as a proof for, results of the form

$$\text{а)}\ E = -\frac{me^4}{2\hbar^2}\cdot\frac{1}{n^2}, \quad \text{б)}\ 2\pi r = n\lambda; \qquad (11) \qquad \text{а)}\ K = \frac{n_{AB}}{n_A \cdot n_B}, \quad \text{б)}\ \theta = \frac{bn_A}{1 + bn_A}. \qquad (12)$$

That is, the results which were previously obtained at the solution of many-particle problems because of probability theory. Which already partially made sense of the results inherent to quantum theory.

I would like to point out the following. Solutions such as

$$E_i = \alpha + k\beta_i, \quad \psi_i = \sum_{ir} C_{ir} x_r, \qquad (13) \qquad n_A^0 = \frac{n^0}{\frac{1}{n_A}\exp\frac{\varphi - f}{kT} + 1}, \quad n_\phi^0 = \frac{n^0}{\frac{1}{n_\phi}\exp\frac{\varphi - f}{kT} - 1}, \qquad (14)$$

Further actually succeeded in obtaining. However, only after it was possible to realize the following truths. When it was possible to realize that at reception of the equation (8) + (10), and the equation (9) it is necessary to use the possibility of (3N+1) and (6N+1) space. This is in order to further obtain the results of quantum theory (13) and (14) as meaningful in the usual three-dimensional space.

Thus, summarizing all the above said we can draw the following conclusions. It turns out that in his time Poincaré was close to obtaining such results. Thus, he was close to completion of development of the foundations of quantum theory in full. However, he could not. Mainly because he did not get Descartes' original thoughts, which are contained in lines (3). Therefore, in due course, other physicists also failed to successfully complete the development of the foundations of Planck's quantum theory. In addition, to do so, they successfully completed the problems on the interaction of substances with radiation (VVSI). However, unfortunately, they thought that they had successfully completed the solution of such problems. It was meant that such results were obtained at the time when the main results of Boz on the derivation of the original Planck equation were obtained [6]. However, they failed to realize that it was still not so.

§2. Now I will tell how further at this state of the question physicists had a new idea. Now they tried to solve the problem on disclosure of physical essence of Planck's quantum theory in a slightly different way. In this connection, I would like to say the following. M Jemmer in section 4.2. wrote that [2]:

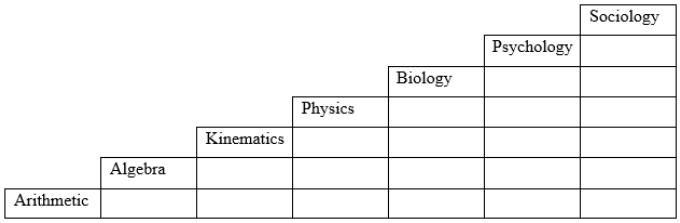
"C G Darwin was particularly interested in the question of harmonizing the phenomenon of optical dispersion with the theory of quanta [7]. It was in this connection, apparently for the first time in the history of physics, that a solution based on the extension of the existing conceptual apparatus of theoretical physics was put forward." (15)

Then further physicists tried to solve the program contained in the thought (15) in the following way. First Ladenburg in 1921 and Krammers in 1924 obtained the results of the quantum theory of dispersion. Then in 1925 the following thought already appeared. A more rigorous quantum theory can be developed if one takes as a basis the equation

$$\ddot{X} + \omega_o X = 0 \qquad (16)$$

$$\ddot{X} + \omega_o X + \lambda X^3 = 0 \qquad (17)$$

obtained for the harmonic and anharmonic oscillator it will be possible to obtain a justification for the results of Krammers theory. Further, the basic equations of matrix mechanics have been obtained exactly at realization of such program. However, in connection with all these I would like to say the following. They at this stage to achieve this goal have made several steps in the truth of which there is reason to doubt. Speaking in other words, they further to obtaining of the basic equations of matrix mechanics have come without solving the basic equation of theoretical physics (7) for many particles. They came to the derivation of these equations taking as a basis equation (16) and (17). Then taking advantage of a number of artificial assumptions. Therefore, there is every reason to believe that at one time physicists trying to extend the existing apparatus of theoretical physics on such way began to make mistakes. In my opinion for correct expansion of existing apparatus of theoretical physics, (so that it led to disclosure of true essence of quantum theory) they had to get their results on other way. To come to realization that there are ideas of scientific philosophy which can be considered with the help of scheme-1:



This is written about in the article [8]. After it was realized that there are such results, further it was possible to come to the realization of the following truths. That is, that there are results which can be taken into account by means of scheme-2 and 3 (theoretical physics); scheme-4 and 5 (probable physics); scheme-6 and 7 (unification of the basis of physics). In [8,9] it is written that in obtaining such results it was possible to solve the problems of interaction of substances with substances (BVSV) at first. Only then, it was possible to solve the problems of interaction of substances with radiation (VVSI) and the problems of interaction of substances with heat (VVST). By this, I want to say the following. On this new way, the problem about necessity of expansion of existing basis of theoretical physics to come to disclosure of true essences of quantum theory really managed to solve more successfully. Approximately as it is written about it in §1. It was shown that for this purpose at first based on the solution of Hamilton's equation (7) for many orderly and chaotically moving particles the equation (8) + (10) and (9) should be obtained. Then the interpretation of the nature of these equations had to be understood in such a way as to further be able to obtain the results (13) and (14). In addition, in such a way that their nature could be understood as having meaning as basic results inherent to quantum theory. Thereby strictly proving that the main objects of investigation dealt with by quantum theory are many ordered and chaotically moving particles. Thereby proving rigorously that the notion of the quantum of action is not inherent to quantum theory. This is exactly what Poincaré began to guess.

§3. In conclusion, I would like to say a few words about one particularly important problem. The problem of the necessity of comparative analysis of the basic equations (8) + (10) and (9) obtained based on solution (7) for many orderly and chaotically moving particles. That is basic equations of quantum mechanics

$$i\hbar\frac{\partial\psi}{\partial t} - H\psi = 0 \qquad (18)$$

$$\left.\begin{aligned} &\dot{q}_k = \frac{\partial H}{\partial p_k}, \quad \dot{p}_k = -\frac{\partial H}{\partial q_k}, \\ &q_k q_s - q_s q_k = 0, \\ &p_k p_s - p_s p_k = 0, \\ &p_k q_s - q_s p_k = \frac{\hbar}{1}\delta_{ik}, \end{aligned}\right\} \qquad (19)$$

This raises the question to find out which of these equations are truer. In my opinion, equations (8) + (10) and (9) are true from these pairs of equations. For these equations are obtained by solving Hamilton's equations (7) for many particles. On the other hand, (18) and (19) are equations obtained artificially as some analogs of equation (7). I will try to explain why I think so. At one time, a problem arose about the necessity to understand the nature of the following facts. That is, the facts that there are so-called stationary orbits of electrons, as well as the processes associated with the transition of electrons from one orbit to another. Therefore, under this condition the problem arose as to the necessity of interpreting these results. Now I would like to say

the following. In my opinion these facts based on the possibility of equation (8) + (10) and (9), can be explained in a better way than because of equation (18) and (19). When I say so I mean the following. Based on the possibility of equation (8) + (10) while taking into account the expression for potential energy, one can arrive at the results (13). Thereby one can come to understand the nature of the stationary orbit. On the other hand, based on equation (9) when taking into account such a result which is known as Gibbs chemical equilibrium conditions ($\mu = \mu'$) one can come to obtain results (14a, c). Then, based on these results, one can come to understand the nature of the process that takes place when electrons transfer from one level to another. I would like to point out the following. I came to the realization that such results take place after I was able to interpret in a new way the results obtained in 1937 by L. E. Gurevich in the article [10]. It is written about it in my works: scicom.ru; namaz-altaev.kz.

As it is known, in order to explain the nature of the above-mentioned facts, the basic equations of matrix mechanics [11] were also derived. That is the fact that takes place when the roles of stationary orbits dominate, and when the role of transition process dominates. As it is known for obtaining, the equation of matrix mechanics Newton's equation was taken as a basis. Then taking into account the fact that there are still the equations of the theory of elasticity: F= -k X us came to obtain equations (16) and (17) for harmonic and anharmonic oscillators. Then assuming that at classical periodic motion X (t) can be decomposed into Fourier series it was written:

$$X(t)= \sum_{\alpha=-\infty}^{\infty} a_{\alpha} e^{i\alpha\omega t} \qquad (20)$$

And also, the expression:

$$X(t)= \sum_{\alpha=-\infty}^{\infty} a_{\alpha}(n) e^{i\alpha\omega_n t} \qquad (21)$$

for the case of quantum theory. Of course, taking into account that in this case the coefficients aα and the frequency ω depend on the quantum number n. Then the terms of the Fourier expansion (21) were replaced by terms of a new type:

$$a\,(n,\, n\text{-}\alpha)\; e^{i\,\omega\,(n,\, n\text{-}\alpha)\,t} \qquad (22)$$

which correspond to the transition from state n to state n-α; ω (n, n-ω) is the frequency of light.

I would like to say the following. In these area expressions (21) and (22) have been obtained artificially. This is to explain the case when the role of stationary orbits dominates, and when the role of the transition process dominates. Therefore, (21) and (22) are analogs of expression (13) and (14). This means that in order to make the right choice which of the pair of equations (8) + (10), (9) or (18) and (19) are more true the problem arises to make a choice which of the pair (13), (14) or (21) and (22) are more true. In this regard, I would like to say the following. Based on the analysis it was possible to conclude that from these results equations (8) + (10), (9) as well as (13), (14) are truer. Thus, it was possible to prove that in their time the authors of matrix mechanics received the results of this doctrine without realizing that the problems, which they wanted to solve successfully, can be solved based on the basic equations of Gibbs' statistical mechanics (9).

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