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The Potential For Systematizing The Basic Findings Of Quantum Theory Via Scientific Philosophy

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ABSTRACT

According to Richard Feynman "The next great era of human intelligence awakening may create a methodology for understanding the qualitative content of equations". However, he did not say how this goal could be achieved. In this paper, this goal was achieved by adopting the fundamental ideas of Descartes' scientific philosophy. That is, the idea that from the very beginning the equation of algebra and arithmetic was taken as the basis of the theory of thought. Then, when the problems of geometry, kinematics, physics are solved...And so that on this way the possibilities of the method of separation of variables and the method of abolition of variables were correctly used. The results which could be obtained on this way just turned out to be the results inherent for quantum geometry, quantum kinematics, quantum physics.... That is results on the basis of which it was really possible to put in order intellectual achievements of mankind.

Keywords - Algebra and Arithmetic **,** Quantum kinematics, Quantum physics

Introduction

How in the Way, Where the Possibility of Scientific Philosophy was taken as a Basis, it was Possible to Come to the Results Inherent to Quantum Geometry, Quantum Kinematics, Quantum Physics

As it was pointed out in [2] I here speaking about the main results constituting the content of scientific philosophy, I mean the following. When Descartes [3] introduced the results inherent in the Cartesian coordinate system, he did so in the following way. He for

The Basis of a Theory of Thought (1)

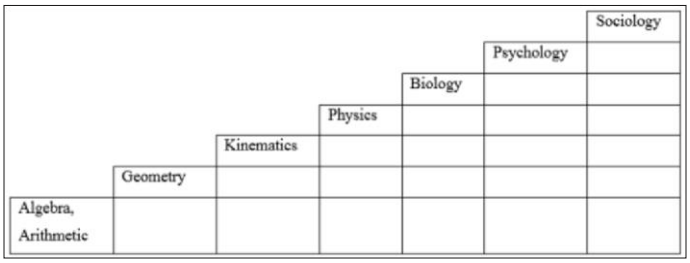
accepted the results

Algebra Equation, Arithmetic Equation (2)

He then considered that further on this basis there was a need to solve the problems of the

Geometry, Kinematics, Physics .... (3)

To put it another way, he believed that there were ideas taking place which could be systematised by means of schema-1



Taking as a basis the possibility of ideas, taken into account by means of scheme-1, proved useful to such an extent that further on its basis it was possible to come to the realisation of the following truths. That there are results which can be accounted for by Scheme-2 and 3 (theoretical physics), Scheme-4 and 5 (probabilistic physics) and Scheme-6 and 7 (unification of the basis of physics). Therefore, it further appeared necessary to interpret the nature of the result obtained in:

Algebraic Geometry, Algebraic Kinematics, Algebraic Physics (4)

On the other hand it meant the following. That the philosophical nature of the equation should be interpreted correctly

$$\text{а)}\ \frac{\partial\rho}{\partial t}-[H\rho]=0,\quad \text{б)}\ [H\rho]=0,\quad \text{в)}\ \rho_i=\exp\frac{F-\varepsilon_i}{kT},\quad \text{г)}\ \rho_{i,n}=\exp\frac{\Omega+\mu n-\varepsilon_i}{kT}, \tag{5}$$

$$\text{а)}\ \frac{\partial S}{\partial t}+H\left(q_i,\frac{\partial S}{\partial q},t\right)=0,\quad \text{б)}\ H\left(q_i,\frac{\partial S}{\partial q}\right)=E,\quad \text{в)}\ \Delta\psi+\frac{8\pi^2 m}{h^2}(E-V)\psi=0, \tag{6}$$

which are obtained by solving the Hamilton equation

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

for

α) for many orderly moving particles;

β) for many chaotically moving particles. And in such a way that results are obtained along the way

$$E_i=\alpha+k\beta_i,\quad \psi_i=\sum_{ir}C_{ir}x_r, \tag{8}$$

$$n_A^0=\frac{n^0}{\frac{1}{n_A}\exp\frac{\varphi-f}{kT}+1}, \tag{9}$$

as a justification for the results

$$\text{а)}\ E=-\frac{me^4}{2\hbar^2}\cdot\frac{1}{n^2},\quad \text{б)}\ 2\pi r=n\lambda; \tag{10}$$

$$\text{а)}\ K=\frac{n_{AB}}{n_A\cdot n_B},\quad \text{б)}\ \theta=\frac{bn_A}{1+bn_A}. \tag{11}$$

That is for the results obtained by solving problems for many orderly and chaotically moving particles with the accuracy of probabilistic physics. Of course for this purpose the philosophical nature of the results inherent in (2) and also (4,a) (4,c) (4,c) must be correctly interpreted. This means understanding the role of subject and object in interpreting the nature of all these results. How this new path manages to solve this problem is written about in [2]. The following is also written about in these papers [2,4]. About how it was possible to correctly interpret the nature of differential equations inherent to the

1^{th} Geometrical Point, 1^{th} Kinematic Point, 1th Physical Particle (12)

And for this purpose using the possibility of multidimensional space. For only in this case it was possible to obtain correct results when integrating these equations. Thus, it was possible to obtain the results that constitute the content of the

Theoretical Geometry, Theoretical Kinematics, Theoretical Physics (13)

In this way, it has been possible to realise the nature of the main results that also constitute the content

Quantum Geometry, Quantum Kinematics, Quantum Physics (14)

I also want to note the following. In the case when schemes-6 and 7 were filled with content the results of quantum geometry, quantum kinematics, quantum physics were taken as a basis. For example, such as (8) and (9). Therefore, all those sections of scientific philosophy, which were taken into account during the construction of scheme-6 and 7 turned out to be such results on the basis of which it is possible to take into account both numbers and natures of the studied objects. Therefore, it became possible to take these results as such, on the basis of which it will be possible to systematise the intellectual achievements of mankind.

At this stage, it makes special sense to note the following. All those results, which were obtained in this way, turned out to be inherent for the case when the problems of substance-substance interaction (SSI) are solved. A characteristic feature for the results obtained when solving such problems is the following. The main problems in obtaining such results are solved on two independent paths. That is for the cases when the problems are solved for many subordinate particles and for the cases when the problems are solved for many chaotically moving particles. Only after obtaining such results further it becomes possible to solve satisfactorily the problem for the interaction of substances with radiation (VVSI), as well as for the problem for the interaction of substances with heat (VVSI). As it is indicated in papers [4,5], when solving the problem of VVSI by this method, the analogues that exist between the problems of VVSI and the problems of VVSV are taken as a basis. In particular, it is possible to take advantage of the following fact. The fact that there is an analogy between the Schrödinger wave equation (5, c) and the Maxwell wave equation

$$\nabla^2\bar{E}-\frac{1}{c^2}\frac{\partial^2\bar{E}}{\partial t^2}=0,$$
$$\nabla^2\bar{H}-\frac{1}{c^2}\frac{\partial^2\bar{H}}{\partial t^2}=0. \qquad (15)$$

Therefore, the following is assumed. Just as equation (5) makes sense in a 3N+1 dimensional space, equation (15) also makes sense in a space with dimensionality 3N+1. That is, these equations (5) and (15) make sense when the number of degrees of freedom is 3N+1. Therefore, just as the nature of expression (8) could be interpreted as results obtained with the precision of quantum physics, similarly, one can come to a correct understanding of the nature of the Rayleigh-Jeans formulae

$$\rho_v=\frac{8\pi v^2}{c^3}\cdot\bar{u} \qquad (16)$$

That is as a result which makes sense with the precision of quantum physics. It means that the nature of (16) can be understood as a result obtained at the solution of (7) for many subordinate bonding particles (photons). Therefore, the numbers P in the relations U=(P · ε)/N can be determined on the basis of

$$n_\phi^0=\frac{n^0}{\frac{1}{n_\phi}exp\frac{\varphi-f}{kT}-1} \qquad (17)$$

which can be found as an analogue of expression (9). Thereby it will be possible to obtain the equation

$$\rho_v = \frac{8\pi v^2}{c^3} \cdot \frac{h v_{\varphi f}}{\frac{1}{n_\phi} exp \frac{h v_{\varphi f}}{kT} - 1} \qquad (18)$$

That is, an equation of nature that can be understood as a justification for the equation that Planck derived in 1900.

§2. How on the Basis of New Results Obtained on the Basis of Ideas of Scientific Philosophy it was Possible to Find Out those Deficiencies which still took place in the Results Obtained During the Development of the Basis of Quantum Planck's Theory

As it is known in 1900 Planck in obtaining his results proceeded from the following fact. That on the basis of the possibility of formula (16) it is possible to describe the nature of the long-wave study. However, if it is only assumed that there is a . U=kT. He therefore aimed at obtaining a similar result for describing the nature of also short-wave radiations. As has been pointed out in /6/ it was while trying to solve this part of the problems that the following ingenious idea occurred to Planck. The idea that it is necessary to introduce some new element into the theory, completely, of course, alien to the classical ideas. So he came up with the famous postulate:

Matter cannot Emit Radiation Energy except in Finite Portions Proportional to the Frequency of this Radiation (19)

Further, denoting the entropy of the system of N oscillators with frequency *v* through S_N Planck postulated the relation

$$S_N = k \ ln \ W \qquad (20)$$

where,

$$W = \frac{(N+P-1)!}{(N-1)!P!} \qquad (21)$$

number of distributions compatible with the energy of the system. To be able to determine *W* Planck had to assume that the total energy *E=NU* consists of an integer number P of "energy elements" ε so that $E = P\varepsilon$. Then jointly considering (20) and (21) obtained:

$$\bar{u} = \frac{\varepsilon}{exp \frac{\varepsilon}{kT} - 1} \qquad (22)$$

Thus from (16) and (22) obtained:

$$\rho_v = \frac{8\pi v^2}{c^3} \cdot \frac{hv}{exp \frac{hv}{kT} - 1} \qquad (23)$$

which is the basic equation of Planck's quantum physics.

Note, it is usually considered that on the basis of (23) it was possible to describe the experimental data in full. So Planck came up with the following idea. That now there is a need to obtain justifications for (23). It is reasonable to do this by taking as a basis the possibilities of the basic equations of theoretical physics. For example such equations as (5) and (6). That is, the equations of nature, which can be understood as equations of meaningful solutions obtained by solving equation (7) for the **α)** of many orderly moving particles;
β) of many chaotically moving particles.

However, as it is known at this stage Planck formed the following idea. That the first multiplier of equation (23) is the result obtained with the accuracy of classical physics. Whereas the second multiplier of equation (23) is the result obtained with the accuracy of quantum physics. Therefore, when writing the paper [7], which was given as a paper at the Solvay Congress in 1911, he formulated the essence of the problem as follows:

How Classical Statistical Mechanics must be Modified to Lead to the Radiation Law (23)

rather than the Rayleigh-Jeans law (24)

As it is known for solutions of these problems Planck further took as a basis the possibilities of the canonical Gibbs distribution function (6,c). Then on this basis he obtained the result:

$$\bar{u} = \frac{\sum_n E_n \exp\left(-\frac{\varepsilon_n}{kT}\right)}{\sum_n \exp\left(-\frac{\varepsilon_n}{kT}\right)} = \frac{\varepsilon}{exp\frac{\varepsilon}{kT}-1} \qquad (25)$$

in full agreement with (22). As pointed out by M.Jemmer /8/ on the basis of the analysis of these results Planck interpreted h as a finite extension of the elementary area in the phase space. Thereby concluded that the concept of energy quantum manifest as a result of some much deeper and general principle. He stated that this general principle was the results of the quantum of action. As is well known, further events began to unfold as follows. Taking as a basis the possibility of the quantum of action, the basic equations of quantum mechanics were derived:

$$i\hbar\frac{\partial\psi}{\partial t} - H\psi = 0 \qquad (26)$$

$$\left.\begin{aligned} &\dot{q}_k = \frac{\partial H}{\partial p_k}, \quad \dot{p}_k = -\frac{\partial H}{\partial q_k}, \\ &q_k q_s - q_s q_k = 0, \\ &p_k p_s - p_s p_k = 0, \\ &p_k q_s - q_s p_k = \frac{\hbar}{i}\delta_{is}, \end{aligned}\right\} \qquad (27)$$

Then at acceptance of these equations as a basis the basic results of quantum electrodynamics (QE) and the theory of superconductivity (SC) and superfluidity (SF) were received. At the same time many physicists had confidence that the results of these theories were obtained quite correctly. However, over time, some physicists began to have doubts that this was indeed the case. For example, one of such physicists was Dirac himself, who in 1927 laid the foundation of the available variant (QE). Similarly, there were physicists who were also convinced that the results of the SP and ST theories also contained defects.

Of course, given this state of affairs, there is every reason to believe that all this is a consequence of some deep reasons. So, I believe that all these defects, which are present in the results of Planck's quantum physics, are the consequence of the following reasons. That is the fact that in his time Planck in his results began to receive, taking as a basis the possibilities of classical electrodynamics and technical thermodynamics. That is the results of the doctrine, which do not have the possibility to take into account the role of the nature of matter. For example, Planck got his results assuming that the distribution of radiation does not depend on the nature of the radiating body. Here I want to say the following. That on a new way where for a basis the possibility of ideas of a scientific philosophy is accepted it is possible to overcome all these disadvantages inherent for results of Planck's quantum theory. This happens mainly because of the following reasons. On this new path the main results are obtained in the path where the possibilities of chemical thermodynamics are taken as a basis. And also the possibilities of the large canonical Gibbs distribution. As it is known in 1911 Planck, when he obtained the results (25), took the possibilities of the canonical Gibbs distribution as a basis. I believe that this fact is the weakest point of the results obtained by Planck. For in obtaining the results with such accuracy one fails to take into account the most basic achievement of Gibbs' statistical mechanics. I am referring here to the conditions of chemical equilibrium: μ=μ^'.

I also want to say the following. On this new way one more essential drawback of Planck's quantum theory can be eliminated. I here mean the result known as the corpuscular-wave dualism. In my opinion, a lot of confusion around this issue has arisen because of the following reasons. Because of the fact that it took a long time to realise the nature of some important ideas. For example, in my opinion, in order to obtain the true results in 1911 Planck should have come to realise the following thoughts in place of the thoughts contained in lines (24):

How the nature of the basic equations of theoretical physics (5) and (6) should be interpreted so that further on their basis it would be possible to come to obtaining of the basic results of quantum theory quite correctly. And so that then on the basis of these results it would be possible to obtain the proofs of Planck's equation (23). That is, proofs that both the result of the first and the second multiplier are obtained with the accuracy of quantum physics. (28)

Of course, if such thoughts in Planck's time had been realised in time, then he would have been able to realise the following. That there are ideas which can be taken into account by means of scheme-1. Further on such a path it would have been possible to realise that these equations (5) and (6) could be obtained by solving (7) for many orderly or chaotically moving particles. In such a case further it would be possible to come to realisation of the following. That the notion of the corpuscular-wave duality are not fundamental notions, but are notions having derivative character. Therefore there are reasons to believe that at one time this notion of dualism penetrated into the basis of theoretical physics because of the fact that the role of the theory of fluctuations was too highly appreciated.

In conclusion, I would like to emphasise some of the results that were realised on this new path. In the path where the basic ideas of scientific philosophy were taken as a basis. In my opinion, the most important of these results is the following. Problems about BBBV turned out to be the most important and the simplest in order to come to the basic results of quantum physics. Because at solution of equations (7) for many orderly and chaotically moving particles such equations as (5) and (6) could be obtained comparatively easily. Because on this way it was possible to successfully use the idea, which are taken into account at construction of scheme-2 and 3. Moreover, when obtaining such equations it was possible to realise that in order to achieve this goal there is a need to take advantage of the possibility of multidimensional space. For example, in the case when (7) is solved for many subordinate particles it was necessary to use the possibility of 3N+1 dimensional space. In the case when (7) is solved for many chaotically moving particles it is necessary to use the possibility of space with dimension 6N+1.

Only after it was possible to obtain the basic results of quantum physics at the solution of the problem on BWSR, then taking these new ideas as a basis further it was possible to solve also the problems on BWSR and BWST quite correctly. Therefore further on the basis of new results comparatively easily it was possible to come to development of bases of QE. And also to development of bases of the theory of SP and ST. Here I still consider it appropriate to recall the following. The author of the book [8] also analysed the problem about the easiest way to develop the foundations of quantum physics. Thus he mainly limited himself to the analysis of the peculiarity of the problem about VVSI and VVST. However, in the way when the possibilities of the ideas of scientific philosophy were taken as a basis of the analysis it was possible to come to the following conclusion. That from the basic problems of theoretical physics the simpler and comparatively easily solvable is the problem about VVSV. For at reception of results on this way it was possible to prove the following. That the notion of corpuscular-wave dualism is not a notion fundamental, but is a notion, the nature of which can be explained. And in the way, when the concept of physical particle is taken as fundamental concepts of theoretical physics.

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