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# Cartesian Ideas in Science and Philosophy is: "The Greatest Step Taken in the Progress of The Exact Sciences In Their Entire History" (J.S.Mill.)

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**ABSTRACT**

On the other hand, in 1908, the English mathematician W.W. Rose Ball still wrote the following about Descartes' ideas: "As to his philosophical theories, suffice it to say that he dealt with the same questions that have been discussed for the last two thousand years - and will probably be discussed with the same fervor for another two thousand years. It is hardly worth mentioning that these questions themselves are very important and interesting, but they have never been answered in any substantive way that can be rigorously proved or disproved".

The analysis showed that so far no answers to these questions have been given. In the article, taking as a basis the idea of scientific philosophy, an attempt is made to give answers to these questions. Thus results are received which can serve as the proof that Descartes is actually the founder of science and philosophy of New Time. And these questions were formulated by him very correctly. Therefore further their realization it was possible to reach only at reception of the basic results of quantum theory. The nature of these same results could be understood as laws of nature, as well as the basis of the theory of natural intelligence.

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## §1. On the reasons why it has so far not been possible to come to the realization that Descartes' basic ideas are in fact "the greatest step made in the progress of the exact sciences in their Entire History"

Of course, in order to successfully solve this kind of problems there is a need to systematize the main sections of scientific philosophy. And for this purpose, from the very beginning, the right choice of results must be made, which can properly fulfill the roles of

**basic theory of thought** (1)

That is, the results on the basis of which it is possible to take into account correctly the peculiarities of the interrelation of subjects and objects. Thereby there arises the necessity to correctly solve the basic problems of scientific philosophy. As it is known since ancient times physicists, when trying to solve these problems, proceeded from the assumption that the role (1) can correctly fulfill the basic results of classical dynamics. That is the section of science where the basic equations are

$$F = m\frac{d^2r}{dt^2} \quad (2)$$

$$\dot{q}_i = \frac{\partial H}{\partial p_i}, \quad \dot{p}_i = -\frac{\partial H}{\partial q_i} \quad (3)$$

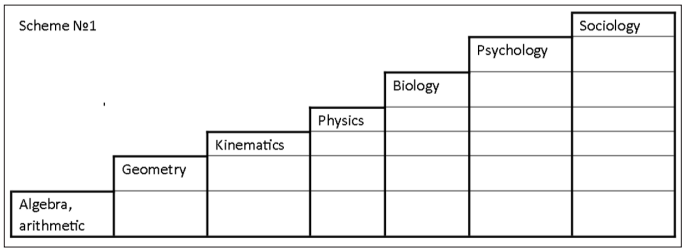
**" For a long time, classical dynamics was the prototype of the scientific approach. For its creators, the laws of classical mechanics coincided with the laws of thought."** (4)

On the other hand it is possible to pay attention to the following fact. That so far physicists on such a path have not quite succeeded to achieve the desired goal. That it is really so can be realized on the basis of the analysis of the results stated in these books [1,2]. In these books on the basis of the analysis of the results obtained for the last three centuries an attempt was made to find out the peculiarities of the relationship between dynamics and thermodynamics. At the same time, realizing that dynamics is the main section of theoretical physics, while thermodynamics is one of the main sections of empirical physics. The analysis of the results obtained in these books allows us to draw the following conclusion. That the authors have not really succeeded in achieving the desired goal. For there is every reason to suppose the following. That the nature of the interrelation between these sections of science can be correctly established only in the case when for the equation of thermodynamics it is possible to obtain justifications on the basis of the solution (3) for many chaotically moving particles. That it is so in general has been proved long ago in the works of Gibbs when he wrote his book on statistical mechanics [3]. However, unfortunately, the main results, which were obtained by this brilliant thinker still remain not quite mastered by the scientific community. For example, still trying to solve many problems, they try to solve them taking as a basis for the possibility

of the original results obtained in the works of Maxwell and Boltzmann. Although Boltzmann himself later began to realize the following. That those problems for the solution of which it will be necessary to take the possibilities of statistical mechanics is more appropriate to solve for this purpose, taking as a basis the possibilities of statistical mechanics of Gibbs. Boltzmann [4] so highly appreciated the ideas and results developed in Gibbs' book [3] he wrote the following thoughts about this book:

**" The honor of systematizing this science, of setting it down in a slender work, and of giving it a distinctive name belongs to one of the greatest American scientists, perhaps the greatest in the field of abstract thought and theoretical inquiry-Willard Gib bs."** (5)

In my opinion, the main reason for not realizing this fact until now is the following. It was not possible to realize some very important ideas, which in his time Descartes himself widely used in obtaining his results. However, he has not yet written about it clearly. By this I hereby make the following point. That Descartes' fundamental ideas contain the ideas of scientific philosophy, which can be accounted for by Scheme-1:



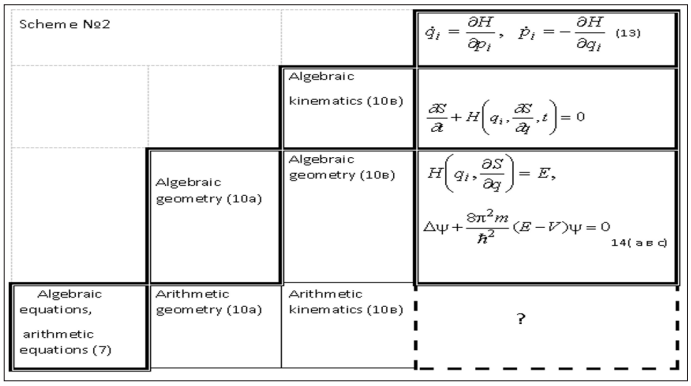

In my opinion, this very fact was not clearly recognized by the scientific community for a long time. Therefore it was not possible to widely use the possibility of those ideas which they contain. Therefore it was not realized the nature of basic results inherent to theoretical, empirical, probabilistic physics. And also the peculiarity of the relationship that takes place between the sections of scientific philosophy has not been revealed. Therefore, all these are the main reasons why it has not yet been possible to come to the realization of the following. That Descartes' main ideas in the fields of science and philosophy are in fact.

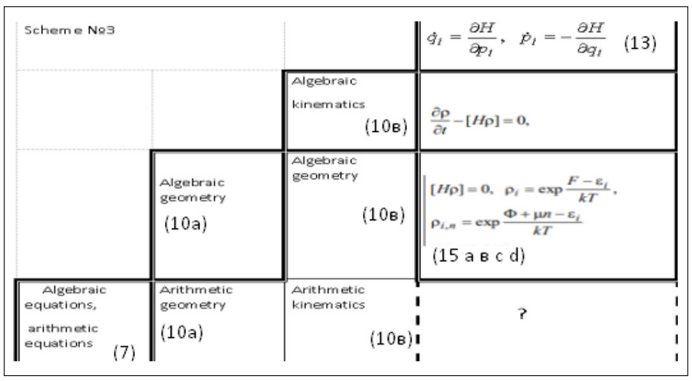
**"The greatest step made in the progress of the exact sciences in their entire history"** (6)

Further I will tell about how after it was possible to realize that there are such ideas, which can be taken into account by means of scheme-1, it was possible to come to the following. That the realization that there are such ideas is in fact (6).

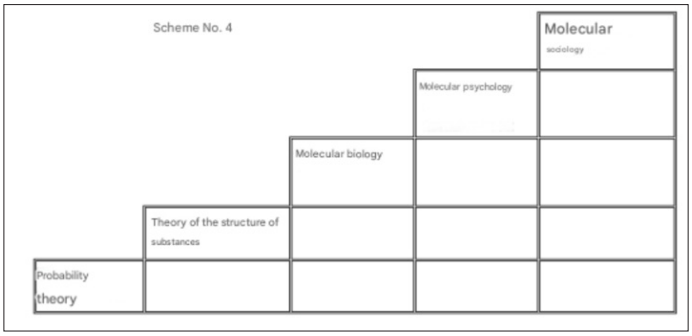
## §2. On the Essence of the Underlying Ideas of Descartes' Scientific Philosophy, Potentially contained in his Ideas about Cartesian Coordinate Systems

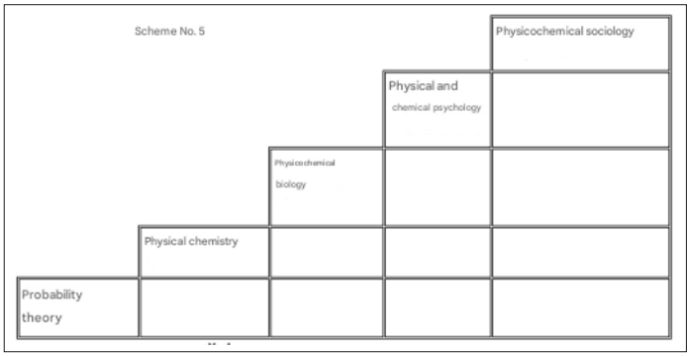
As it is written about in the articles [6,15] in the case when jointly analyzed the ideas taken into account with scheme-1 and the main results that since Descartes in the basis of science and philosophy managed to come to the realization of the following. That since long ago ripened the results to be taken into account by means of Scheme-2 and 3:




in the field of theoretical physics. On the other hand ripening, the results of which could be taken into account with the help of Scheme-4 and 5:




which are obtained in the path where (1) was taken as the results:

**probability theory** (7)

The problems were then solved for cases where the objects under study are:

α) the set of orderly moving particles

β) the set of chaotically moving particles.

When further we began to analyze the results taken into account by means of these schemes, it was possible to realize the following. That since the time of Descartes the most important results began to be obtained in the way, where for (1) was accepted

**algebraic equations, arithmetic equations** (8)

Then we started solving problems

**geometry, kinematics, physics** (9)

In this way, the main results inherent to:

**a) algebraic geometry, c) arithmetic geometry** (10)

**a) algebraic kinematics, c) arithmetic kinematics** (11)

**a) algebraic physics, c) arithmetic physics** (12)

Then it became possible to realize the following. That on this path there is a necessity to come to the realization of some deep truths that lie at the basis of the fundamental ideas of Descartes' scientific philosophy. For example, the need to interpret the philosophical nature of (8) as well as (10), (11), (12). It began to seem that only then would it be possible to uncover the essence of those ideas of Descartes, which gives the possibility to consider that Descartes' basic ideas of science and philosophy are in fact (6). Previously published articles have already written about the following. To appear in the case when we deal with (8a) while performing calculations over the

**abstract quantities when their nature is taken into account** (13)

In the same case when we take advantage of the possibility (8c) while performing calculations

**by a finite number of abstract sets given their number and nature** (14)

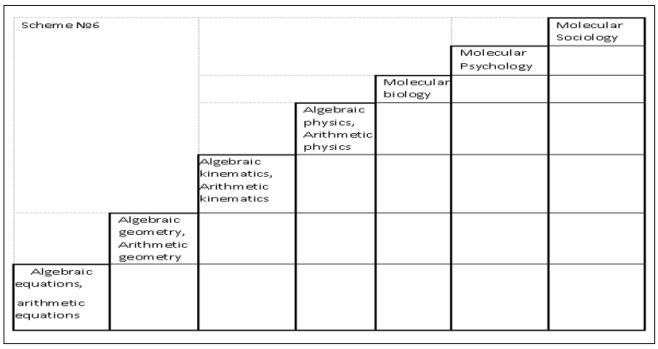
Similarly in the case where we take the opportunity 10a, 11a, 12a while performing computations over

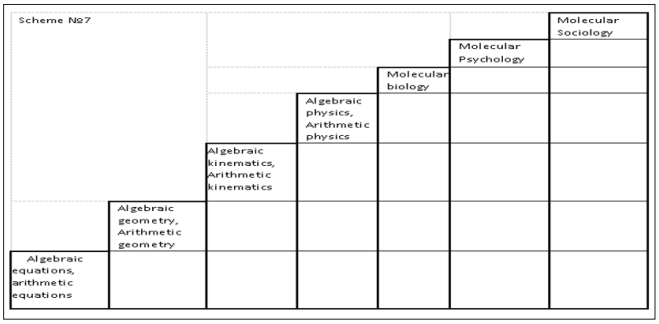
**(a) Geometric quantities**
**c) kinematic quantities**
**(c) Physical** (15)

In the same case when we use the possibility of 10 in, 11 in, 12 in while doing calculations

**a) geometrical points subordinated to the connection, the numbers of which tend to infinity**
**c) kinematic points subordinated to the connection, the number of which tends to infinity**
**(c) Physical particles, subordinate or chaotically moving, whose numbers are finite** (16)

On the basis of the analysis of these facts it was possible to come to the realization of the following. That the philosophical nature of the results taken into account with the help of scheme 2 and 3 could be interpreted in such a way that it led to the results that can be behind the proof of the results taken into account with the help of scheme - 4 and 5. Thus it was possible to come to the realization of the following. It turns out that the results taken into account with the help of scheme 2 and 4, as well as schemes 3 and 5 can be combined in such a way as it was possible to take into account in the construction of scheme 6 and 7:




Thus it was possible to come to the realization of the following. That the nature of these results can be understood as constituting the content of the

**of the golden fund of intellectual achievement of mankind** (17)

On the other hand, the nature of these results could still be understood as the main results when tidying up the foundation

**quantum geometry, quantum kinematics, quantum physics** (18)

And all this became possible to obtain only after the following facts were taken into account. At their obtaining equations

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

(19)

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

(20)

from (3) the following assumption was made. That on this way one has to take advantage of the possibility of 3N+1 and 6N+1 dimensional spaces. Therefore further on their basis it was possible to obtain the results inherent in quantum physics

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

(21)

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

(22)

The results that make sense already in the usual three-dimensional space, it became clear that it was possible to get such results by taking advantage of the opportunity:

**variable separation method , variable elimination method** (23)

As it was pointed out in the works [15] all these results obtained on such a path is also possible to understand as constituting the content of the

**theories of natural intelligence** (24)

Thus, I would like to point out the following. It became possible to obtain all these results only after it was possible to realize that there are ideas which can be taken into account by means of scheme-1. Therefore, there is every reason to believe that the realization of this very fact already in our days has made it possible to realize the following. The fact that this fact was not realized for a long time was the reason why it took a long time to come to the realization of the fact that the fundamental ideas of Descartes' scientific philosophy are really (6).

## §3. The Ability of Scientific Philosophy to prove that the underlying ideas of the Theory of Relativity Contradict the Law of Nature

As we know the essence of the basic ideas of the principle of relativity boils down to the following. Given the fact that the expressions

$$\begin{aligned} x' &= x + \mathrm{v}t, \\ y' &= y, \\ z' &= z, \\ t' &= t, \end{aligned} \qquad (25)$$

leaves unchanged equation (2) similarly assumes that

$$\begin{aligned} x' &= \frac{x + \mathrm{v}t}{\sqrt{1-\left(\mathrm{v}^2/c^2\right)}} \\ y' &= y, \\ z' &= z, \\ t' &= \frac{t-(\mathrm{v}/c^2)x}{\sqrt{1-\left(\mathrm{v}^2/c^2\right)}}, \end{aligned} \qquad (26)$$

leaves Maxwell's equations unchanged

$$\begin{aligned} \nabla^2\vec{E} - \frac{1}{c^2}\frac{\partial^2\vec{E}}{\partial t^2} &= 0, \\ \nabla^2\vec{H} - \frac{1}{c^2}\frac{\partial^2\vec{H}}{\partial t^2} &= 0. \end{aligned} \qquad (27)$$

Therefore, further on such a path one obtains such results, when analyzing which one has to realize the following. That at high speeds time slows down and distance shortens. That is, we have to deal with such solutions, which are absurd from the point of view of common sense. Of course, this raises the problem of the need to find out what the reasons are for this to happen.

In this connection we can say the following. These problems could be solved if it could be proved that the nature of Maxwell's equation (27) has a meaningful notion as a solution which can be obtained from (2) or (3). As it was pointed out in [16] it was actually possible to come to the realization that it is possible to obtain such results. This became possible after it was realized that there are equations (19 a, c, c) which have the sense of solutions in 3N+1 and 3N spaces. That is, solutions that are obtained from (3) in the way when this equation is solved for many subordinate bonded particles. Then in a similar way it was possible to arrive at the realization of the following. That the nature of Maxwell's wave equation (27) also manages to be understood as equations having the sense of solutions. For before it was possible to prove that the nature of the wave Schrödinger equation (19s) could be understood as an equation having sense at the solution obtained from (3) for its solution for many subordinate particles. Thus in fact it was possible to prove that at one time those physicists who formulated the ideas of the principle of relativity made mistakes. For they did not then realize the following fact. That the nature (27) can be understood as equations having sense, which solutions can be received at the solution (3) for many subordinated particles. And for this purpose optimally taking advantage of the possibility of the concept of the number of degrees of freedom. The numbers, which in this case are: 3N+1 and 3N.

In this connection I would like to say the following. As it is written about it [15] in his time Einstein (1915) while writing the article [17] already began to realize the following. He wrote that in the future, when the basis of theoretical physics is completed in its entirety, the following may happen. For example, when the basic results, which constitute the content of quantum physics, will be obtained, the true nature of the laws of nature may be revealed. On the other hand after such results are obtained it may lead to the realization of the following. That in the ideas of the principle of relativity, which led to the results of the theory of relativity, reality has defects. Time has shown that he, who expressed such an idea, was absolutely right.

Now, in order to realize more deeply that mistakes were actually made in obtaining results on such a path, let us pay attention to the following. In the book [1] in chapter 7 it is written as follows:

**" A scientific description must be consistent with the sources available to the observer, belonging to the world it describes, and not to an entity contemplating our world "from the outside". This is one of the fundamental requirements of STO."** (28)

However, in the case when we try to analyze and understand these thoughts for this, accepting the possibility of new results, it will be possible to draw a completely different conclusion. That within the possibility of STO, conclusions of this content were hastily made because of the following reason. Along the way, the main results of the principle of relativity were taken as (1). On the other hand if we will analyze all this for this on the basis of the fact that on the new way for the basis of (1) was accepted (8) in such case it will be possible to draw a completely different conclusion. On such a path, when one speaks of subjects one means the following. On this path, the results of (8) are the results that fulfill the role of the subject. To put it in other words, on this path the role of the subject can be performed by numbers. Precisely because of this on this new way of such concepts as space and time there is a possibility to abolish from further use at all. For on this way the

main results could be obtained for this in the course of calculation, using the possibilities (23). In my opinion this is the essence of quantum physics.

**§4. Proof that the Basic Ideas of the Correspondence Principle Contradict the Law of Nature. Thereby prove that the Basic Equations of Quantum Mechanics are obtained on a False Path.**

As it is known the basic equation of quantum physics in the original version

$$\rho_v = \frac{8\pi v^2}{c^3} \times \frac{hv}{exp\frac{hv}{kT}-1} \qquad (29)$$

Planck obtained 1900. Then in 1906, on the basis of the analysis of (29), he drew attention to the following fact. That when h tends to zero, the second multiplier, which could be obtained with the precision of quantum physics, also tends to zero. Thus only the expression for the first multiplier remains. On the other hand at that time about the nature of the expression,

$$\frac{8\pi v^2}{c^3} \qquad (30)$$

derived from the wave equation (27), it was realized that this is a result inherent to classical physics. Thus on the basis of such thoughts began to form an idea, which further became known as the correspondence principle. Then at obtaining the basic equation of matrix mechanics

$$\left.\begin{aligned} &\dot{q}_k = \frac{\partial H}{\partial p_k}, \quad \dot{p}_k = -\frac{\partial H}{\partial q_k}, \\ &q_k q_s - q_s q_k = 0, \\ &p_k p_s - p_s p_k = 0, \\ &p_k q_s - q_s p_k = \frac{\hbar}{i}\delta_{is}, \end{aligned}\right\} \qquad (31)$$

the basic ideas inherent in the correspondence principle were taken as a basis. It seemed to the authors that by obtaining such equations they were able to arrive at results on the basis of which the relationship between the observed quantities was established. Then by equation (31) equation

$$i\hbar\frac{\partial \psi}{\partial t} - \mathbf{H}\psi = 0 \qquad (32)$$

which Schrödinger got under the influence of the idea of matrix mechanics became considered as the basic equations of quantum mechanics. For at aspiration h to zero it is possible to come to the original equation of classical mechanics (3). However, as it is known further in the case when these equations began to be analyzed it led to such a result as the uncertainty relation. On the other hand it probably meant the following. Because of the fact that in the course of calculation some false steps were made thereby uncertainty was introduced into the basis of theoretical physics. Of course, in such a state of affairs, the problem arises that it is necessary to find out what is the cause of all this. Of course, in order to do this it will be necessary to obtain new results on the basis of (3). New results, at obtaining of which the relationship between the observed quantities will be established more correctly. That is, in such a way that no uncertainty will be inherent in them. Now I want to say the following. How on the new way, where the basic ideas of scientific philosophy are taken as a basis, it was possible to achieve this goal.

As it was pointed out above initially on the basis of (3) equations (19a,c) and (20a, c, c, d) were obtained. This was the time when the Schrödinger equation (19c) was not yet obtained. It was at this time that the basic equations of matrix mechanics (31) and (32) were obtained on a different path. As well as the time-dependent Schrödinger equation (33). The following may be emphasized. At this stage there was a chance for the future development of the basis of theoretical physics to take as a basis or equations (19 a, c, c) and (20 a, c, c, e). That is, the equations that were obtained in the way where the possibilities (8) were taken as (1). However, as we know, the choice was made for the basic equations of quantum mechanics: (31) (32). That is, for the equations that were obtained in the way where the possibilities of the correspondence principle were taken as (1). This happened perhaps because of the influence of the high authority of N Bohr. For he too was one of the authors of the correspondence principle. Besides, W. Heisenberg was his pupil. However, as it is known later, when taking as a basis the possibilities of these equations and began to solve specific problems, various kinds of difficulties began to arise. For example, in the ways, when they began to develop the foundations of quantum electrodynamics (QE), as well as the theory of superconductivity (SP) and the theory of superfluidity (ST).

Of course, in order to develop the basis of the QE it was necessary to come to obtain the theoretical proof of Planck's equation (29) more strictly. However, as it is known physicists could not achieve such a goal. Mainly because they in their attempts to develop the basis of QE took the basic equations of quantum mechanics as a basis. Therefore they on such way at the very end came to reception of such results which on contents already has no relation to results of true variant of QE. This happened because of the following reason. The nature of what actually is the essence of quantization still remained not completely revealed. So I believe that these problems could be solved on a new way. In a way where from the very beginning the basic ideas of scientific philosophy were taken as a basis. So what I'm trying to say is this. All this became possible when it was possible to realize that in the works of Descartes, there are ideas of scientific philosophy, which became possible to systematize with the help of scheme-1. After that it became possible to come to the realization that there are results that can be accounted for by schema-2 and 3, schema-4 and 5, and schema-6 and 7. After realizing that there are such results taking place, then how was it possible to arrive at the derivation of Eq.

$$\rho_v = \frac{8\pi v^2}{c^3} * \frac{hv_{\varphi f}}{\frac{1}{n_\phi}exp\frac{hv_{\varphi f}}{kT}-1} \qquad (33)$$

which is the proof for Planck's original 1900 equation. It was realized that now the nature of this equation (33) could be understood as the basic equation of QE. For on the new path it was possible to prove the following. That in fact not only the results inherent to the second multiplier, but also the results inherent to the first multiplier, are results obtained with the precision of quantum physics.

Now I will tell about how on a new way it was possible to develop more rigorous theoretical variants of SP theory and ST theory. Let's note at attempts to obtain new results, as a basis we take the possibility of expression of

$$Q = \frac{\pi R^4}{8\mu}\nabla p, \qquad (34)$$

$$I = \frac{\Delta U}{\rho\frac{\ell}{S}} \qquad (35)$$

The results that were obtained by analyzing the experimental results. On a new way there appeared possibilities to understand the nature of these results as having a sense of the solutions obtained by solving (3) for many particles that flow under the influence of external forces [8]. Then, when interpreting the values for viscosity (μ) and for resistivity (ρ), the expressions were taken as a basis for

$$n_\phi^0 = \frac{n^0}{\frac{1}{n_\phi}\exp\frac{\varphi - f}{kT} - 1} \qquad (36)$$

Expressions, which are obtained from the possibility of Gibbs equations of statistical mechanics. And as some analog for expression (18) for cases when there are no restrictions for the filling number. Thus it was possible to obtain the results

$$Q = \frac{\pi R^4 \nabla p}{8\left(\frac{h\nu_{qf}}{\frac{1}{n_\phi}\exp\frac{h\nu_{qf}}{kT} - 1}\right)}, \qquad (37)$$

$$I = \frac{\Delta U}{\frac{\ell}{S}\left(\frac{h\nu_{qf}}{\frac{1}{n_\phi}\exp\frac{h\nu_{qf}}{kT} - 1}\right)}, \qquad (38)$$

On the basis of analyzing these results it was possible to ascertain the following. That on their basis it is possible to understand the reason for the following. Why at very low temperatures for some substances we have to deal with the phenomena of superfluidity and superconductivity. This became possible after the following was realized. It turns out that on this new path of the nature of both the first and the second multiplier included in (36) and (37) could be understood as results obtained with the precision of quantum physics. That is, as results obtained by solving Eq. (3): α) for many orderly moving particles, obeying external forces; β) for many chaotically moving particles. Perhaps the following should be emphasized. That all this is a consequence of the fact that these results could be obtained on the basis of the solution (3) for many particles. And at the same time using the possibility (20a) and (20c).

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