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Refinement of String Theory Results based on Ideas of Scientific Philosophy

Namaz Karabalaevich Altayev

Candidate of Chemical Sciences, Republic of Kazakhstan

ABSTRACT
As is known, A. Einstein's key method was unification through symmetry. He was able to formulate a symmetry unifying space and time. He was also able to formulate a generalized symmetry describing acceleration and gravity. However, Einstein's third approach to creating a great unifying theory was unsuccessful because he lacked a symmetry that would unify gravity and light. He even wrote: "I am sure that in order to make real progress, it is necessary to elicit from nature one more some general principle". This paper attempts to prove that this general principle is the principles of algebra and arithmetic.

*Corresponding author
Namaz Karabalaevich Altayev, Candidate of Chemical Sciences, Republic of Kazakhstan.

In 1970, when I entered graduate school, my supervisor Sokolsky D.V. set me the following tasks. As is known, in the field of the theory of catalytic processes, the adsorption equation is taken as a basis for the derivation of basic equations:

$$\theta = \frac{bn_A}{1 + bn_A} \quad (1)$$

Where n_A - is the concentration of the absorbed molecule, θ - number of active centers per unit surface. Sokolsky D.V. told me to get a theoretical justification for this equation. Moreover, for the equations that are its generalized versions. For only in this case there is an opportunity to use kinetic equations for a more complete description of experimental data. I soon became aware of the following. Gurevich L.E. had already made the theoretical conclusion for (1) in 1937 in [1]. When I familiarized myself with the contents of the paper [1] it became known to me that the author used the following form of the equation for a larger canonical distribution to describe problems of adsorption equilibrium:

$$\rho_{n,n'} = exp\frac{\Omega + \mu(n + n') - F_n - \Phi n'}{kT} \quad (2)$$

Where $\rho_{n,n}$ - is the probability of the particle being in the adsorbed or free state, F_n and $\Phi n'$ - free energies n and n' of the particle, μ - the chemical potential. Further, he after several transformations obtained the results

$$n_A = exp\frac{\mu - f}{kT} \quad (3)$$

$$n_A^0 = \frac{n^0}{1 + exp\frac{-\mu + \varphi}{kT}} \quad (4)$$

Then excluding $exp\frac{\mu}{kT}$ from (3) and (4), we obtain

$$\frac{n_A^0}{n^0} = \theta = \frac{n_A exp\frac{f - \varphi}{kT}}{1 + n_A exp\frac{f - \varphi}{kT}} \quad (5)$$

Which is the proof for (1). Here $\Delta G = (f - \varphi)$ are the free energies of adsorption. I would like to say that at this stage I was able to interpret the nature of (3) and (4) based on the model of the boundary layer theory [2-3]. Thereby to interpret the nature of expression (5). All this made it possible to apply the kinetic equations derived from (5), as well as similar equations that are its generalization to describe the experimental data at the level of quantum theory. Based on these studies, I wrote my Ph.D. thesis on "A Quantum Statistical Model of the Interaction of Reagents with a Solid Body Surface" and sent out an abstract. Then on May 22, 1974, I made a report at the seminar of the theoretical department of the Institute of EH of the USSR Academy of Sciences in Moscow in order to get a review of the thesis. However, the seminar refused to give me a positive decision. It was said that I used the results of Gurevich L.E.'s work without understanding their nature. I answered them that Gurevich L.E., having obtained new results of exceptional importance, could not realize it. I also said that the results he had obtained should have been used in the language of free energy to describe the experimental data. I noted that he, without realizing it, used in the language of statistical sum. In this situation, the director of the Institute, Academician A.N. Frumkin, made a decision: to leave me in the department for six months for internship. However, during this period we together with the staff of the department did not manage to establish full clarity on this issue. Nevertheless, during this time it became clear that my interpretation of the results obtained in [1] really made sense. Therefore, the institute gave me the "go-ahead" to defend myself. Of course, I promised them

that I would definitely achieve complete clarity in this matter.

I would like to say this at once: I have indeed succeeded in establishing a certain clarity in this matter. However, I had to work hard for more than fifteen years to achieve this. This was possible only after I had come to the realization that there are ideas and results of Descartes' scientific philosophy, which can be systematized by means of scheme 1. In addition, by means of schemes 2 and 3, schemes 4 and 5, and schemes 6 and 7, which are given in the article [4]. The results taken into account by means of schemes 2 and 3 belong to the field of theoretical physics. Whereas the results taken into account by means of schemes 4 and 5 belong to the field of probabilistic physics. The results taken into account by means of schemes 6 and 7 are obtained by combining schemes 2 and 4, and schemes 3 and 5. In this paper, for convenience of analysis, I will give the results of schemes 2 and 3, which belong to the field of theoretical physics:

And also the formulas

$$E_i = a + k\beta_i \qquad (14\ e,\ g)$$

$$n_{\text{Å}}^0 = \frac{n^0}{\frac{1}{n_{\text{Å}}}exp\frac{\varphi-f}{kT}+1}, \qquad (15\ g,\ h)$$

$$\Psi_i = \Sigma_{ir} C_{ir} x_r$$

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

Scheme No. 2

Algebraic equations, Arithmetic equations (7)	Arithmetic Geometry (10A)	Arithmetic Kinematics (10B)	
	Algebraic Geometry (10A)	Algebraic Geometry (10B)	$H\left(q_i, \frac{\partial S}{\partial q}\right) = E,$ $\Delta\psi + \frac{8\pi^2 m}{\hbar^2}(E - V)\psi = 0$ (14 a to c).
		Algebraic Kinematics (10B)	$\frac{\partial S}{\partial t} + H\left(q_i, \frac{\partial S}{\partial q}, t\right) = 0$
			$\dot{q}_i = \frac{\partial H}{\partial p_i}, \quad \dot{p}_i = -\frac{\partial H}{\partial q_i}$ (13)
			?

Scheme No. 3

Algebraic equations, Arithmetic equations (7)	Arithmetic Geometry (10a)	Arithmetic Kinematics (10c)	
	Algebraic Geometry (10a)	Algebraic Geometry (10c)	$[H\rho] = 0, \quad \rho_i = \exp\frac{F-\varepsilon_i}{kT},$ $\rho_{i,n} = \exp\frac{\Phi+\mu n-\varepsilon_i}{kT}$ (15 a,b,c,d)
		Algebraic Kinematics (10c)	$\frac{\partial\rho}{\partial t} - [H\rho] = 0,$
			$\dot{q}_i = \frac{\partial H}{\partial p_i}, \quad \dot{p}_i = -\frac{\partial H}{\partial q_i}$ (13)
			?

When taking into account, which it is possible to fill with, content the lowest and last cells of schemes 2 and 3. Moreover, these results (6) and (7) were obtained as a proof of the following expressions

$$\text{a)} \quad E = -\frac{me^4}{2\hbar^2}, \qquad \theta = \frac{bn_A}{1 + bn_A}, \qquad (1)$$

$$(6a, b)$$

$$\text{b)} \quad 2\pi r = n\lambda \quad K = \frac{n_{AB}}{n_A \cdot n_B} \qquad (7)$$

which are the results obtained in the development of the theory of the structure of matter and physical chemistry.

After receiving these results, taking them as a basis, I decided to find out what these results could provide to explain the reason for the disagreements that arose at one time in the dispute of the employees of the theoretical department. It was possible to find out that the disagreement arose because of the following reasons. At that time, we could not understand: the formula (5), based on which I began to explain the experimental data, is in fact a result obtained with the precision of quantum physics. Moreover, not only in the sense that the possibilities of the boundary layer theory model were utilized along the way. In addition, because of the fact that (5), i.e. (7a) are obtained as a result that makes sense for three-dimensional space from the Gibbs equation that makes sense for 6N+1 space. I would like to emphasize the following. It is this point that is very important in order to understand the main essence of the new results obtained in this new approach. An approach where, from the very beginning, the possibilities of ideas taken into account with Scheme 1 are taken as a basis. It turns out, then, that in our arguments we failed to realize all of this. That is, that these new results may contain those new ideas that R. Feynman [5] had. Feynman [5] had in mind when he wrote the following thoughts: "The next great era of awakening of human intellect may create a technique for understanding the qualitative content of equations".

Now I want to talk about what all this has given to reveal the meaning of the idea and results obtained in the field of string theory. As it is known, in 1968 G. Veneziano realized that taking as a basis the Euler beta function, there is a possibility to describe the experimental results obtained in the study of the strong nuclear interaction. A formula required an explanation. It is believed that this problem was solved in 1970 by I. Nambu, H. Nielsen, L. Susskind. This group of scientists showed that when small oscillating one-dimensional strings represent elementary particles, the strong interaction of these particles is exactly described by the Euler function. However, it was soon proved that the description of the strong interaction by means of the string contains flaws. For it was shown that in the field of quantum chromodynamics, in which the point model of particles of nature was used, the strong interaction could be described more correctly. Considering all this, when obtaining results on a new way these problems can be solved more successfully. Moreover, all those shortcomings, which are usually caused by the use of the point particle model, are eliminated. To come to the realization that it is so, let us pay attention to the following facts. As is known, in an attempt to explain the inconsistency of string theory with quantum theory, it was suggested that the problems in the calculations were because strings can oscillate in only three directions. If strings could vibrate

in four dimensions. The calculations showed that even in this case the problems remain, but the number of contradictions in the equations decreases. Therefore, they continued to increase the number of dimensions until they introduced the whole 9 dimensions in space, at which, finally, the theory of sous perstrings converged with quantum mechanics and GR. As you know, this moment has gone down in history as "the first-string theory revolution". Therefore, I believe that in obtaining results on a new path, these very problems are solved in a slightly different way. On the way to obtaining results that can constitute the content of string theory, one manages to solve Hamilton's equation (13) for 1) for many bonded particles and 2) for many chaotically moving particles. Of course, what I am referring to here is the fact that the results accounted for by schemes 2 and 3 are the ones obtained. This means: those results, which are taken into account by means of scheme 2, can be taken as results, which can constitute the content not only of the theory of the structure of matter, but also of string theory. For with such an approach many things become clearer. For example, the fact that the nature of the strong nuclear interaction, as well as the nature of the strong chemical interaction can be described on the basis of formula (5), i.e. (15j). These results are described within the possibility of Scheme 3. Whereas the nature of the interaction which is of primary importance in the formation of the string manages to be described on the basis of the results (14 e,g), which are obtained within the possibility of scheme 2. On this new path, all those difficulties that are usually caused by the use of point particles are successfully overcome. This becomes possible when it is assumed that in obtaining equations (14) and (15) one has to use the possibility of 3N+1 and 6N+1 dimensional spaces. Thus, we can say the following. The main defects that exist in the results obtained in the field of string theory are mainly due to the following fact. In obtaining them for some reason they did not pay attention to the fact that any theory of theoretical physics must be developed by solving Hamilton's equations (13) for many subordinately coupled particles and for many chaotically moving particles. I would also like to note the following. On a new path, the results inherent to the quantum theory of gravitation were actually obtained on a path where the results obtained in the field of string theory played a major role. More specifically, in the field of superstring theory. This proved that in their time, Schwartz and Green came close to realizing the truth. In connection with the essence of ideas and results of the theory possessing the supersymmetry property, one can also say the following. The equations of algebra and arithmetic, which from the very beginning were taken as the basis of the theory of thinking, have the possibility to become the basis of all subsequent theories, taken into account in the construction of scheme 1. Consequently, there is a need to develop the results of these theories also as sections of such a theory. It means that all these theories should be developed in such a way that for each of some sections a solution

is obtained based on which it is possible to carry out calculations taking into account the number and nature of basic objects. That is, so that a solution is obtained based on which the unification of particles and their interaction is obtained. Moreover, not only by means of a boson, but also because of exchange of electrons. For example, as in the case of chemical action, this becomes possible when such solutions can be obtained in such a way that it leads to a correct solution of the problem of the relationship between the subject and the object. In my opinion, this is the possibility of the results (5) i.e. (15 g). Lee Smolin on understanding these problems came close to the path of truth when he wrote chapter 6 of his book entitled "From Unification to Superunification" [7]. On the other hand, B. Green came very close to realizing such truths when he wrote his thoughts in chapter 15 [8]. He wrote the following thoughts: "Theorists are now in the position of Einstein, who has lost the principle of equivalence. Since Venetian's insightful 1968 conjecture, theory has been assembled piece by piece, discovery by discovery, and revolution by revolution. However, the central organizing principle that encompasses these discoveries as well as other properties of the theory in one universal and systematic approach that makes the existence of each ingredient inevitable has yet to be found. The discovery of this principle would be a central event in the development of string theory, as it would likely reveal the inner workings of the theory with previously unattainable clarity. Of course, there is no guarantee that such a fundamental principle exists, but the evolution of physics over the last century gives theorists reason to hope that it does. As we consider the next stage in the development of string theory, finding it, the 'principle without alternativity' - that base of ideas from which the whole theory will emerge with necessity - is of the highest priority." As we see, such a fundamental principle, about the existence of which B. Green is not quite sure yet, turns out to be actually already there. It is the ideas and equations of algebra and arithmetic.

Thus, to conclude this paragraph, I would like to say the following. It turns out that at one time, i.e., in the 70's Venetiano and I both worked with similar problems at the same time. He was dealing with a problem that was supposed to lead to the discovery of the nature of the strong interaction between the particles that make up the nucleus. I, on the other hand, was dealing with a problem that was supposed to lead to the discovery of the nature of the strong interaction that takes place when atoms or molecules collide. Therefore, I believe that the way in which I worked and got my results was truer.

M. Kaku in [9] wrote: "We still have to take the final step in the creation of string theory to find its fundamental physical principles. The point is that we still do not understand how to derive the whole theory from a single of a single equation. In 1995, string theory underwent another metamorphosis and the so-called M-theory was born".

Now I want to say the following. In the new way where from the very beginning the equations of algebra and arithmetic are taken as the basis of the theory of thinking, this problem, about which it is written in [9], can be solved in a truer way. The matter is the following. As it is written in [4] on this way there arises a necessity to obtain basic equations of the theory of cognition for this purpose obtaining differential equations for the 1st geometrical point, for the 1st kinematic point, for the 1st physical particle. Then the problem arises about the necessity of solving such differential equations for 1) geometrical points subordinated to the connection the number of which tends to infinity, 2) kinematic points subordinated to the connection the number of which tends

to infinity, 3) finite numbers of physical particles subordinated to the connection or not subordinated to the connection. In this connection, I would like to say the following. On this way those results which can be accounted for by means of scheme-2, which can be obtained on the basis of the solution of equations (13) for many subordinate particles are the results inherent to the theory of the structure of matter and string theory. It is thus proved that the results of string theory can be deduced from the equations of algebra and arithmetic.

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