ISSN: 2754-4753

Journal of Physics & Optics Sciences

SCIENTIFIC Research and Community

Review Article

Open Access

On the Theories of Gravitation Developed Based on the Ideas of Galileo and Descartes

Altaev N

Candidate of Chemical Sciences, Republic of Kazakhstan

ABSTRACT

As it's known, the results of the relativistic theory of gravitation were developed by Einstein, which were based on the ideas of Galileo's principle of relativity. On the other hand, it should be noted that Descartes developed a more general approach to the foundation of the theory of knowledge, leading to the derivation of Hamilton's equation. Subsequently, the fundamental equations of the Hamilton-Jacobi-Schrödinger theory (HJS) were obtained by solving them for a multitude of bodies (particles) subject to constraints, and Gibbs' equations for the case when particles move chaotically. In the article, the author attempts to demonstrate the possibilities of interpreting the nature of the HJS equations as a basis for developing a new variant of the theory of gravitation.

***Corresponding author**

Altaev N, Candidate of Chemical Sciences, Republic of Kazakhstan. E-mail: namaz_42@mail.ru.

Received: November 09, 2023; **Accepted:** November 14, 2023; **Published:** November 22, 2023

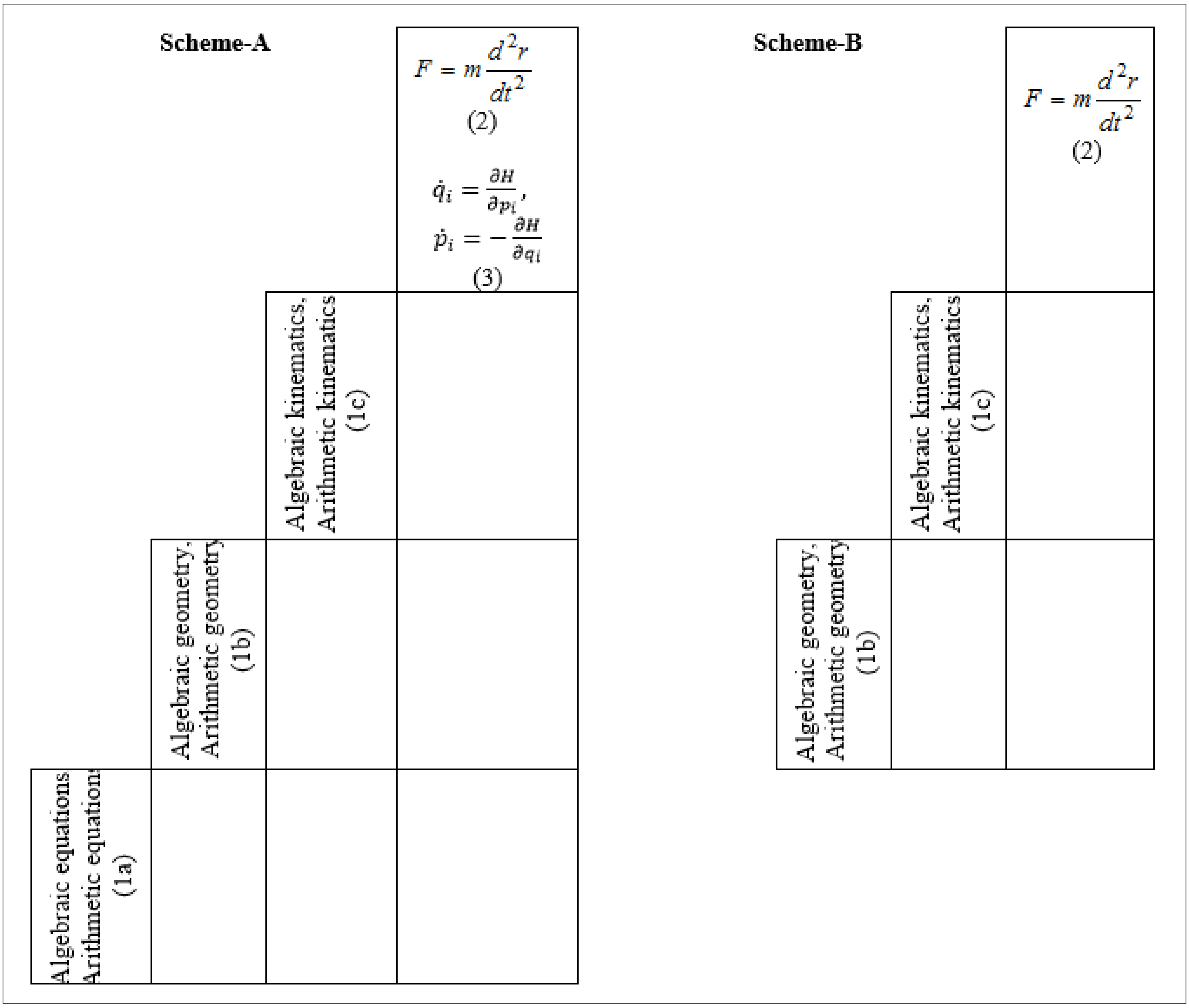
Analyzing the key ideas of Descartes in the context of scientific philosophy, one can conclude that to create a unified foundation for theoretical physics, it is advisable to rely on the principles laid down in Scheme №1:

Scheme No. 1

						Sociology
					Psychology	
				Biology		
			Physics			
		Kinematics				
	Geometry					
Algebra, Arithmetic						

Since the time of Descartes, key breakthroughs in theoretical physics have begun to be based on algebraic and arithmetic equations. These equations represent universal laws of nature and include the concept of an absolute frame of reference, that is, zero. Thus, they can serve as a foundation for the theory of thought. The basis of Scheme A was precisely these ideas:

DOI: doi.org/10.47363/JPSOS/2023(5)218



In constructing Scheme-A, important facts obtained in the development of the foundations of differential and integral calculus were taken into account, which led to the following key results in these areas:

a) Algebraic geometry,
b) Arithmetic geometry; (4)

a) Algebraic kinematics,
b) Arithmetic kinematics; (5)

a) Algebraic physics,
b) Arithmetic physics. (6)

Along with this, differential equations were obtained for:

a) A single geometric point,
b) A single kinematic point,
c) A physical point. (7)

After this, it became possible to derive Newton's differential equation (2) for case (7c). In the course of the research, facts were also taken into account that indicate the increasing complexity of the nature of the objects under study, which follow a certain hierarchy: from abstract points to geometric, then to kinematic points, and ultimately to physical particles. This complexity gave rise to a problem - to obtain results characteristic of:

a) Theoretical Geometry,
b) Theoretical Kinematics,
c) Theoretical Physics, (8)

it is necessary to find solutions to the differential equations (7 a, b, c) for:

a) Geometric points subject to connections the number of which tends to infinity;
b) kinematic points subject to connections, the number of which tends to infinity;
c) physical particles, either subject to bonds, or moving chaotically, but whose number is finite. (9)

It is known that the subsequent solution of Hamilton's equations (3) for (9c) led to the derivation of the following new equations:

$$\begin{aligned}&\text{a) } \frac{\partial S}{\partial t}+H\left(q_i,\frac{\partial S}{\partial q},t\right)=0,\\ &\text{б) } H\left(q_i,\frac{\partial S}{\partial q}\right)=E,\\ &\text{в) } \Delta\psi+\frac{8\pi^2 m}{\hbar^2}(E-V)\psi=0,\end{aligned} \tag{10}$$

$$\begin{aligned}&\text{a) } \frac{\partial\rho}{\partial t}-[H\rho]=0,\\ &\text{б) } [H\rho]=0,\\ &\text{в) } \rho_i=\exp\frac{F-\varepsilon_i}{kT},\\ &\text{г) } \rho_{i,n}=\exp\frac{\Phi+\mu n-\varepsilon_i}{kT}.\end{aligned} \tag{11}$$

In this context, equations (10) represent the fundamental equations of the Hamilton-Jacobi-Schrödinger theory, while equations (11) form the basis of Gibbs' statistical mechanics. From this, it becomes evident that further use of (10) and (11) could lead to the substantiation of results expressed in formulas (12a) and (12b), which are the Bohr and de Broglie formulas respectively, as well as (13a) and (13b), representing the formulas for effective masses and the Langmuir adsorption law.

$$\begin{aligned}&\text{a) } E=-\frac{me^4}{2\hbar^2}\cdot\frac{1}{n^2},\\ &\text{б) } 2\pi r=n\lambda;\end{aligned} \tag{12}$$

$$\begin{aligned}&\text{a) } K=\frac{n_{AB}}{n_A\cdot n_B},\\ &\text{б) } \theta=\frac{bn_A}{1+bn_A}.\end{aligned} \tag{13}$$

Gibbs, at the beginning of his research, understood the potential of equations (11) for justifying formulas (13a, b), but was unable to complete his work to achieve this goal. At the same time, at the beginning of the 20th century, there was no understanding of how to derive the results (12) from equations (10a) and (10b), as equation (10c) had not yet been discovered. This led physicists to the realization of the need to solve a new problem: to determine the relationship between Newton's equation (2) and Maxwell's equations (14), which became one of the key problems of the early century:

$$\begin{aligned}&\nabla^2\vec{E}-\frac{1}{c^2}\frac{\partial^2\vec{E}}{\partial t^2}=0,\\ &\nabla^2\vec{H}-\frac{1}{c^2}\frac{\partial^2\vec{H}}{\partial t^2}=0.\end{aligned} \tag{14}$$

Maxwell initially understood that the use of equation (2) could lead to a deep understanding of the nature of equations (14). However, as is known, his attempts to resolve this issue were not successful. In this context, some physicists began to look for new approaches. They concluded that the connection between equations (2) and (14) could be clarified if the key ideas of Galileo's principle of relativity were laid as the foundation of theoretical physics.

The development of theoretical physics in accordance with the rationalism of Descartes (Scheme A), where the foundations of algebra and arithmetic are laid as the basis of the theory of thought, led to the solution of fundamental problems in geometry, kinematics, and physics. However, the transition in development to the ideology of the principle of relativity implied further development of theoretical physics based on Scheme B, where the idea of invariance was laid as the foundation of physicists' thinking. This meant that there are certain relationships that keep equation (2) unchanged:

$$\begin{aligned}&x'=x+\mathrm{v}t,\\ &y'=y,\\ &z'=z,\\ &t'=t,\end{aligned} \tag{15}$$

Similarly, relationships were derived that leave the equations (14) unchanged:

$$\begin{aligned}&x'=\frac{x+\mathrm{v}t}{\sqrt{1-\left(\mathrm{v}^2/c^2\right)}}\\ &y'=y,\\ &z'=z,\\ &t'=\frac{t-(\mathrm{v}/c^2)x}{\sqrt{1-\left(\mathrm{v}^2/c^2\right)}},\end{aligned} \tag{16}$$

Einstein based his fundamental results in the Special Theory of Relativity (STR) and the General Theory of Relativity (GTR) on these principles. It is universally recognized that Einstein derived the key equations of the relativistic theory of gravitation:

$$\boldsymbol{D}(\mathbf{g})=k\boldsymbol{T} \tag{17}$$

by generalizing the linear relations that can exist between two mathematical objects of the same type: the deformation tensor D and the stress tensor T. In other words, Einstein developed GTR as a theory of the elasticity of space-time. This implies:

1. The gravitational field is equivalent to the deformation of the geometry of space-time and should be described by the ten components of the metric tensor **g**.
2. The source of the gravitational field **g** is the distribution of mass-energy, momentum, and stress, which are described by the ten components of the energy-momentum tensor **T**.
3. The fundamental equation of relativistic gravitation should represent the law of elasticity of space-time (17), where **D(g)** is a mathematical object created from **g** and intended to describe the deformation of space-time, i.e., to determine how much space-time with the geometry described by g differs from the flat space-time of Minkowski.

Einstein determined the value of the space-time elasticity coefficient k based on the requirement that in a certain approximation, the ten equations (17) corresponded to Newton's theory of gravitation, which predicts a force inversely proportional to the square of the distance, emanating from a single gravitational potential. He found that

$$k=\frac{8\pi G}{c^4}, \tag{18}$$

where G is Newton's gravitational constant, appearing in the force of attraction between two masses m and m`, separated by a distance r:

$$F=G\frac{mm'}{r^2}. \tag{19}$$

Based on such results, it was possible to describe experimental data with higher accuracy than was possible using Newton's theory. Einstein then moved on to develop the concept of a unified field theory, assuming that it could be formulated in such a way as to explain the results of quantum physics. However, despite significant efforts, Einstein was unable to achieve this ambitious goal. This led many physicists after him to strive to understand why he was unable to achieve his goal.

In this context, I would like to share how I managed to find an answer to the aforementioned question, based on new results obtained in the course of research based on the ideas laid down in schemes №1 and scheme-A. As I have detailed in my publications, a comprehensive analysis of the results considered in the development of scheme №1, as well as achievements made since the time of Descartes in various fields of science, made it possible to realize the following truths [1-5]. It turns out that the main results obtained since then in the field of theoretical physics can be systematized based on schemes №2 and №3. Results in the field of probabilistic physics were systematized and presented in schemes №4 and №5 in works [1-5].

In these articles it is detailed how it was possible to interpret the philosophical essence of the results inherent in equations (4), (5), (6), which were considered in the development of schemes №2 and №3. Also presented is the interpretation of the nature of the differential equations derived for systems (7a,b,c).

I have come to the conclusion that if equations (4a) and (5a) are applicable in space with a dimension tending to infinity, then equations (6a), for example, (10) and (11) are relevant in spaces with dimensions 3N+1 and 6N+1, respectively. Such an approach allows further, based on these equations, to come to the main results for (4b), (5b), and (6b), which are applicable in ordinary three-dimensional space.

The results for (4b) and (5b) can be interpreted as inherent to quantum geometry and quantum kinematics. These results can be understood as obtained as a result of solving differential equations (7a) and (7b) for geometric and kinematic points subject to connections, the number of which tends to infinity.

On the other hand, this approach allows for the interpretation of the results (20) and (21), derived from equations (10) and (11), as outcomes of quantum physics applicable in three-dimensional space:

$$\boxed{\begin{aligned} E_i &= \alpha + k\beta_i, \\ \psi_i &= \sum_{ir} C_{ir} x_r, \end{aligned}} \qquad (20)$$

$$\boxed{\begin{aligned} n_{\grave{A}}^0 &= \frac{n^0}{\frac{1}{n_{\grave{A}}}\exp\frac{\varphi - f}{kT} + 1}, \\ n_{\phi}^0 &= \frac{n^0}{\frac{1}{n_{\phi}}\exp\frac{\varphi - f}{kT} - 1}, \end{aligned}} \qquad (21)$$

It should be noted that based on the results (20) and (21), a justification for (12) and (13) was achieved. This means that based on the results obtained with the precision of theoretical physics, a justification for the results obtained with the precision of probabilistic physics was possible.

Thanks to this, it became clear that there are results that can be systematized using schemes №6 and №7. Ultimately, in the fundamental part of the research, it was possible to complete the solution of the problem of interaction of matter with matter, achieving complete certainty.

Furthermore, by applying new ideas developed during these studies, it was possible to complete the solution of problems of interaction of matter with radiation, as well as interaction of matter with heat. As a result, it was concluded that with the attainment of such results, the task of developing the fundamental foundations of quantum physics in its principal part is completed. This also signifies the completion of the program for the unification of the foundations of theoretical physics.

In Lee Smolin's book [6], there are these lines:

Each of these two discoveries, relativity and quantum mechanics, requires us to make a certain break with Newtonian physics. However, despite the great progress over the century, they have remained incomplete. Each has defects that point to the existence of a deeper theory. But the main reason for the in-completeness of each lies in the existence of the other.

Reason calls for a third theory to unify all of physics, and for a simple reason. Nature, in an obvious sense, is 'unified'. The universe in which we find ourselves is interconnected, meaning that everything interacts with everything else. There is no reason why we should have two theories of nature covering different phenomena, as if one never acted in conjunction with the other. Everything requires that the ultimate theory be a complete theory of nature. It must encompass everything we know. Physics has long existed without such a unified theory.

Thus, I believe that as a foundation for the theory emphasized by this author, one can use the results, the general outlines of which I have already described. These concepts are presented in articles and in books, access to which can be obtained on the Scicom.ru website [1-5].

I am confident that the results obtained using this new method, designated as (10) and (20) and derived from Hamilton's equations (3) for a system of interacting particles, can be recognized as results of quantum gravity theory. This is explained by the fact that these results were obtained by a method in which, from the very beginning, the equations of algebra and arithmetic were adopted as the basis for theoretical thinking. As a result, solutions were found that effectively take into account the quantity and nature of the objects studied. It is particularly significant that to obtain these results, it was not necessary to take into account the sizes of objects, since such concepts are not applicable in algebra and arithmetic.

Therefore, I find it appropriate to quote the thoughts written by M.P. Bronstein [7]:

Future physics will not maintain that strange and unsatisfactory division that made quantum theory a 'microphysics', governing atomic phenomena, and relegated the relativistic theory of gravitation to 'macrophysics', controlling not individual atoms but only macroscopic bodies. Physics should not be divided into microscopic and cosmic; it must and will become unified and indivisible.

As mentioned earlier, the results of Einstein's theory of gravitation were based on ideas embedded in Scheme-B, which in turn is an element of the broader Scheme-A. This suggests that the results characteristic of (4b) and (5b), related to quantum geometry and quantum kinematics, were obtained as a result of solving

DOI: doi.org/10.47363/JPSOS/2023(5)218

differential equations (7a) and (7b) for a system of interconnected geometric and kinematic points, the number of which tends to infinity. This explains why in Einstein's theory, space and time have the ability to deform. Thus, the results obtained by Einstein can also be interpreted as results achieved using quantum theory.

Additionally, it should be noted that the results obtained based on both theories confirm the validity of the conclusions made within Newton's theory. The accuracy of describing experimental data was improved thanks to Einstein's theory. Using these new data, the philosophical aspects of Newton's results were also refined.

Conclusion

In conclusion, two key points should be emphasized:

1. The ideas and results embedded in Scheme A led to fundamental discoveries in quantum physics and proved to be more universal than the approaches used in Scheme B for field theory. This explains why field theory could not achieve the same results as quantum physics. It also demonstrates the reasons why Einstein was unable to unify these theories.
2. New results obtained in the course of research solved problems №1 and №2 indicated in source [6], and confirmed that equations (10) and (11) are fundamental for theoretical physics. This calls into question the necessity of using some traditional equations of quantum mechanics, including the time-dependent Schrödinger equation and the basic equations of matrix mechanics.

References

1. Altaev N.K. (2016) Solution of the Navier-Stokes Equation by the Methods of Theoretical Physics. In Proceedings of the Congress on Fundamental Problems in Natural and Engineering. Series: Problems of Research of the Universe 37: 6-25. https://scicom.ru/files/congress/congress-2016/proceedings-2016/proceedings-2016-1.pdf
2. Altaev N.K. (2023) Philosophical Approach to the Resolution of the Sixth Millennium Prize Problem. Scicom.ru. https://scicom.ru/materials/arcticle_site/altaev-nk-filosofskij-podhod-k-resheniju-shestoj-problemy-tysjacheletija/#more-3824
3. Altaev N.K. (2022) Towards a Theory of Superfluidity and Superconductivity. Problems of Research of the Universe 40.
4. Altaev N.K. (2022) The Possibility of Descartes' Scientific Philosophy Ideas for Unveiling the True Essence of Planck's Revolution in Physics. Problems of Research of the Universe 40.
5. Altaev N.K. (2023) Cartesian Approach to Developing the Foundations of Quantum Physics. Journal of Physics & Optics Sciences 5: 1.
6. Smolin L. (2006) The Trouble with Physics: The Rise of String Theory, the Fall of a Science, and What Comes Next. Houghton Mifflin, Boston. http://alpha.sinp.msu.ru/~panov/Smolin-TroubleWithPhysics.pdf
7. Bronshtein M.P. (1930). On the Nature of Positive Electricity. Nauchnoe Slovo, (5), pp. 39-49.