

# On the Forces and Knowledge of the World

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The paper continued clarifications on the validity of Newton's laws of gravity. Opponents of the law and of Newtonian mechanics led a number of arguments in their favor. Based on the solution of a number of problems by the program Galactica it is shown that these arguments are untenable.

## 1. Introduction

I have proved [1] that following from Newton's law of gravity formula (5) determines the results in Tables 2 - 9 in the paper by Charles W. Lucas, Jr. [2]. In his response [3] Lucas had no objection. We can therefore conclude that his proofs of injustice of the Newton's law of gravitation in the Lucas's tables are unreliable.

In a new paper [3] Lucas brings a lot of arguments, theories and hypotheses which he considers to be good reason to doubt the Newton's law of gravitation. For example, Lucas has written that the Newton's law of gravitation does not explain the following phenomena.

1. Orbits of bodies do not lie in the equatorial plane of the Sun, although they were formed out of its substance.
2. Quantum properties of the Solar system which follow from the law Titius-Bode.
3. Expansion of bodies, galaxies and the universe.
4. Source of gravitational forces.
5. Redshift of Hubble.
6. Microwave background radiation.
7. Quantization of the redshift.
8. Gravitational action-at-a-distance.

Lucas also thinks that the use of an idealized point mass is a defect of Newton's laws. In addition, according to Lucas, the Newton's law of gravitation is set on the basis of experience rather than deduced from the axioms. Therefore, it cannot be used for scientific theories. It should be added that these considerations also lead to the Lucas in paper [4].

Newton's law of gravitation determines the force of the interaction of two bodies. Using this force and the laws of Newtonian mechanics we can calculate the interaction and movement of any bodies. This way, considered a lot of natural phenomena and obtained extensive knowledge of the world. Here is an example of our calculations of interactions of the Solar system. On the basis of Newton's law of gravitation, we calculated the interaction of planets, Moon and the Sun for 100 million years [5-6]. At time intervals of order 3 thousand years of the contemporaneous epoch the eccentricities, inclination of the orbital plane, the position of the perihelion, and other parameters of the planets orbits vary monotonically. These changes coincide with approximation of orbital parameters, based on observations made in 1895 by S. Newcomb and 100 years later, in 1994 by J. Simon et al. With increasing time interval the changes of parameters are transformed into oscillatory motion. With further increase in the interval of integration the oscillations of long periods are appeared.

We have integrated the differential equations of motion for 100 million years and found all the periods of oscillation of the orbits of the planets and of the Moon. The multiperiod oscillatory changes in the orbit are repeated in the range of 100 million years. This demonstrates the stability of the solar system.

The analysis results showed that changes in the orbits of the planets and the Moon are due to the four movements: 1) deformation of the orbit in its plane (the change of eccentricity), the rotation of the orbit in its plane (rotation of the perihelion); 3) the rotation of the orbit's axis around the vector of angular momentum of all Solar system (for the planets and the Sun) and around the movable axis of the Earth's orbit (for the Moon), 4) fluctuations of the orbit's axis relatively to its axis of rotation. The rotation of the pericenter of the planets and the Moon occur counterclockwise (in the direction of orbital motion), except for Pluto, whose perihelion rotates clockwise. The axes of the orbits of all bodies rotate in clockwise.

These results help to explain part of the first phenomena, formulated by Lucas: Why is the orbit planes do not lie in one plane. Due to the interaction of bodies the axes of their orbits rotate, so the orbital planes are always at an angle to each other.

The first item contained Lucas hypothesis that all bodies are formed from the substance of the Sun. But from what substance the Sun is formed? That is, this hypothesis has no advantage over the well-known position on the formation of the Solar system from the matter initially scattered in the space.

We have considered the application of Newton's laws for the investigation of orbital motion. We use the bodies as material points. In the compound model of the Earth the part of its mass we were divided into symmetrically located in the plane of its equator point particles [7]. Under the influence of other Solar system bodies the orbits of the Earth's model body begin to evolve. Thus, they model the evolution of the Earth's rotation axis. We found that the Earth's axis rotates as the Moon's orbit axis relative to the moveable axis of the Earth's orbit. In addition, the Earth's axis oscillates relatively it with periods ranging from semimonthly, semiannual and equal 18.6 years, which is confirmed by observations.

The axis of the Sun's rotation, as determined by observations for 150 years, also precesses, i.e. the plane of its equator is at different angles to the orbits planes of the planets. This result gives an answer to the second part of the first phenomena of Lucas. Interestingly, and as the Sun's axis revolved in the past, and how will rotate in the future? I think it can be determined by creating a compound model of the Sun is similar to the Earth rotation.

Then its motion may be set for hundreds of thousands or even millions of years. As I mentioned in [1], a compound model of the Sun, we've used, but only for other purposes. With its help, we have identified as a rotating flattened Sun affects the orbits of the planets. It turned out that it tells a small rotation of the perihelion of Mercury [8]. In this problem, too, appeared useful properties that we use the point masses.

So I do not agree with Lucas that the use of an idealized point mass is the lack of Newtonian mechanics. On the contrary, it is a great achievement. Due to the point mass the people define of interaction of bodies of different shapes by replacement their by set of point masses.

With regard to the approximation of the Titius-Bode distances to the planets and satellites to be no surprise. I have spent a lot of time for complex dependencies picked approximation in the form of simple formulas. These formulas it is convenient to use, it is possible to integrate and differentiate, but should always check the results to match the original addiction. Everyone know, that such formulas can be applied only to the considered phenomenon. Another phenomenon is described by another approximation.

Similarly, the approximation of the Titius-Bode law is valid only for the Solar system. Assume that any star positions of the planets will be for this approximation is no longer available. Nobody uses the Titius-Bode's approximation for the Solar system because it gives false results, for example, at the fifth position there is not a planet, and between the sixth and seventh position there is the Neptune. Therefore, the approximation of the Titius-Bode useless. Except for the generation of various extravagant hypotheses it for anything else not in use.

For the third phenomenon, referred to Lucas, which is associated with the extension of bodies and galaxies, it is too paradoxical that it can be taken into account seriously. This extension is associated with the interpretation of the observed phenomena and has no reason. When the grounds and reasons for expansion will appear, then the hypothesis of expansion can be taken into consideration.

The Hubble's redshift, its quantization, and other properties necessary study and collect information about it. When it will be sufficiently studied, and then will be clarified his source, and other circumstances. A hasty conjectures about the universe expands, the change of the gravitational constant with time are insane, in the sense of Bohr and Einstein, but, sadly, alienates us from reality. I do not think that any one researcher would not want to break away from the real world and immerse themselves in a fantasy world. So let's discard this hypothesis, and the real world we perceive, solving the problem of interaction of real bodies using Newtonian mechanics and gravity.

In the microcosm the charged particle acts on another by force (1), which I quoted in the paper [1]. Unlike gravity, it depends not only on the distance between the particles, but also on their relative velocity. Objections, which resulted in Lucas [3] against this force is also associated with some hypotheses and interpretation of evidences, which I am not motivated. The important thing is how well the force can define interaction and motion of electrified and magnetized bodies. I have performed many calculations for different tasks. The accuracy of their solutions is higher than the accuracy of solutions by the Theory of Relativity. In [9-10] the

trajectory of interaction between two charged particles for different eccentricities and velocities at perihelion are calculated. At high velocities these trajectories are very different from the trajectories of the Coulomb interaction. The interpretation of experiments on the dispersion of elementary particles using the new trajectories will lead to new understanding of the microworld.

I shall focus on 4 and 8 items mentioned Lucas. Of course, the sources of the gravitational attraction of bodies to each other are themselves the body. If anyone can take away all the substance of the bodies, and the attraction remains then another source of gravity will be set. Until this is done, all sources of gravitational forces in the representation of a Lucas are imaginary.

The bodies attract each other at a distance. The attraction is always there, no matter how great the distance may be between the bodies. This is reality. Who are prone to fantasies can come up with additional body that will make real-world body by direct contact attracted to each other. I do not understand the purpose of these fantasies. I do not see sense in them. So I do not advise for persons to spend their time. During this time, a person can learn a lot about the real world around him.

Among all the scientists I would single out two groups of people: some of them are interested in science, and interest of others is the world around. I belong to the second group. It is interesting to me to find out, how the world is arranged. With the help of mechanics I can calculate the motion of bodies, and this movement explains the phenomenon that I observe. Therefore this phenomenon becomes for me clear. A scientific theories and hypotheses, which in modern science there are very many, I had them dropped if they explain the phenomenon differently.

Lucas thinks that good scientific theories must be based on axioms.

Firstly, the question arises: what is a scientific theory? In my book [11] I have answered this question. And in respect of the axiomatic method, I say that this is a bad method. A man learns about a world from experience. The positions and rules is established by the experience and repeatedly is verified by experiment. Such positions the theorists pose as axioms. The younger generation these axioms are presented as the truth, do not depend on experience. Appear gradually some science or theory, which consist only of the axioms. Hence the illusion that new knowledge can be obtained from old knowledge on the basis of logical operations with the axioms.

This is misleading. Scientists are in captivity axiomatic theories, new knowledge about the world will never receive.

The second damage of the axiomatic approach is that the younger generation, trained him to become incapacitated. These people are unable to cross the boundary of the unknown, to create something that never existed before. They always will remain an obstacle to people capable, talented people, leading to further development of mankind.

Modern science is characterized by great diversity. On the one hand in the practical field there are large developments that each decade significantly changes our lives. On the other hand, part understanding the knowledge there is a mixture of fragments of different opinions, theories, hypotheses, which eventually created the idea of the randomness of the world, its uncertainty and it is unknowable.

Glenn Borhardt [12], which has analyzed the development of thought in human society, came to the conclusion that epochs of determinism was be constantly alternated by the epochs of indeterminism. According to him, today we are in the epoch of indeterminism. I am one of the deterministic directions in science. As we know, a number of its representatives are often exaggerated the capabilities of this direction. It is therefore necessary that the representatives of these two directions often discussed among them the issues related to knowledge about our world. Dr. Charles W. Lucas, Jr. in [3] presented his understanding of the problem. I thank him, because his papers allowed me to formulate my thoughts on these problems. And the main one is that the solution of problems of interaction of bodies with the help of Newton's gravity force and force (1) of [1], we can get real knowledge about the world.

To obtain new knowledge about the world through Newton's laws it is necessary to have extensive knowledge and experience. To facilitate this problem, we developed system Galactica to solving problems of the gravitational  $n$ -body interactions. It is based on high-accuracy method for integration of differential equations. The system is available at [13]. The description of Galactica is in the files GalDiscrp.pdf and GalDiscrE.pdf in Russian and English, respectively. It allows even the novice researcher to formulate and to solve the problems by using the Galactica.

In his works Dr. Charles W. Lucas, Jr. claims about the fallacy of Newton's law of gravity for the reason that it does not give the law of Titius-Bode distribution of planets in their orbits. This is not true, because no one has tackled the problem of the Solar system formation, resulting in solutions which are formed in certain orbits of the planet. The system Galactica allows solving this problem. It laid the algorithms of association bodies as they approach each other. These bodies get own spin and thermal energy. Therefore, when solving a problem with the help of Galactica will be playing all the processes that are observed in the Solar system.

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