LETTERS TO PROGRESS IN PHYSICS

Rational Thinking and Reasonable Thinking in Physics

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The usual concept of space and time, based on Aristotle's principle of contemplation of the world and of the absoluteness of time, is a product of rational thinking. At the same time, in philosophy, rational thinking differs from reasonable thinking; the aim of logic is to distinguish finite forms from infinite forms. Agreeing that space and time are things of infinity in this work, we shall show that, with regard to these two things, it is necessary to apply reasonable thinking. Spaces with non-Euclidean geometry, for example Riemannian and Finslerian spaces, in particular, the space of the General Theory of the Relativity (four-dimensional pseudo-Riemannian geometry) and also the concept of multi-dimensional space-time are products of reasonable thinking. Consequently, modern physical experiment not dealing with daily occurrences (greater speeds than a low speed to the velocity of light, strong fields, singularities, etc.) can be covered only by reasonable thinking.

In studying the microcosm, the microcosm or any extreme conditions in physics, we deal with neo-classical, unusual physics. For example, the uncertainty principle in quantum physics and the relativity principle in relativistic physics are really unusual to our logic. We may or may not desire such things, but we shall agree with physical experiments in which there is no exact localization of micro-particles or in which, in all inertial systems, light has the same speed and, hence, time is not absolute. Our consent with such experiments, the results of which are illogical from the view-point of ordinary consciousness, means that we accept to start to operate at another level of consciousness which is distinct from the level of consciousness necessary for the acceptance of experimental results of classical physics. The fundamental difference consists of the human consciousness at such a new level which operates with other categories — forms of infinity.

The world is a thing of infinity. Hence, a logic which includes forms of infinity is necessary for its cognition. The logic in itself considers the thinking in its activity and in its product. This product shall then be used by all sciences. The one and only philosophy, underlining that problem of logic is to distinguish finite forms from infinite forms, and to show some necessity to consider thinking in its activity. This activity is supra-sensory activity; though it may look like sensual perception, such as contemplation. Therefore the content of logic is the supra-sensory world and in studying it we will stay (i.e., remain) in this world. Staying in this world, we find the universal. For instance, the general laws of the motion of planets, are invisible (they are not "written in the sky") and inaudible; they exist only as a process of activity of our thinking. Hence, we arrive at Hegel's slogan "what is reasonable, is real" [1] by which the status of thinking is raised to the status of truth. As a result, it is possible not only to assume that our real world has a tie with unusual geometries, but, in fact, it is true.

From this point of view, it is possible to agree with many mathematicians [2–6], that Euclid could direct natural sciences. In another way, at the same time, he could have taken not space as primary concept, but time.

Aristotle, having proclaimed the general principle of a world-contemplation of motions occurring simultaneously [7], has come to a conclusion (which is only natural to that epoch) that the duration of any phenomenon does not depend on a condition of rest or motion of a body in which this motion is observed, i.e. time is absolute and does not depend on the observer. This principle satisfied requirements of the person for the cognition of the world for such a very time. Why? Because, what is reasonable, is necessarily real. In reasoning itself, there is everything that it is possible to find in experience. Aristotle said, "There is nothing existent in (man's) experience that would not be in reason". Hence, in reasoning, there exist many constructions which can be adjusted to the experience.

Prior to the beginning of the 20th century, the Aristotle's principle of contemplation of world was sufficient for understanding our experiencing the world. The experiment of Michelson-Morley on measuring the velocity of light had not yet surfaced. This experiment appeared only later when there also appeared other experiments confirming relativity theory and quantum mechanics. The new principle of the contemplation of the world, explaining these experiments, has proclaimed things, which are "monstrous" from the point of view of rational thinking. Instead of time, it is the velocity of light which turns out to be the absolute magnitude. The observed duration of events (the perception of time) depends on the rest and motion of the observer. The understanding of this fact hasn't come from rational thinking, but from reasonable thinking. Rational thinking, which can ex-

plain only finite things, has become insufficient for a crucial explanation of new experimental data. Only reasonable thinking can realize such infinite things as, for example, the world, time, space. And only reasonable thinking can understand Aristotle's question whether time (related to that which divides the past and the future) is uniform or not, whether time remains always identical and invariable, or whether it constantly changes. Strict rational thinking protests against such a question, but reasonable thinking answers it. Furthermore, it depends on the level of our thinking (the level of consciousness of the observer). One may object: it depends not on one's level of consciousness, but from one's level of physical experiment. But experiment itself depends on the level of our knowledge and therefore depends on the level of our consciousness. Any principle of contemplation of the world exists in our reasoning. Our reasoning the chooses necessary principle for a concrete case. Really, our reasoning is infinite.

As it is known, after the experiments confirming relativity theory our relation to the real world has changed. Riemannian geometry has played a huge role in understanding the structure of physical reality. It was a victory of "reason over mind". Relativity theory and Riemannian geometry (and its special case — pseudo-Euclidian geometry of Minkowski's space which is the basis of the Special Theory of Relativity) are products of reasoning.

We ask ourselves, why is there no unusual geometry related to the ordinary representation of the observer? This results from the fact that in life, in usual experiment, we deal with small speeds and weak fields. In such conditions, the differences among geometries are insignificant. As a simple example, in seeing that bodies are in motion as a result of some action-force, our mind has decided, that it will be carried out in any case. That is, motion is force. It is an example of naive thinking. Newton's first law has finished with this kind of knowledge because, as it became known at some later stage in the history of physics, bodies can move with constant velocity without influence of any force. There are many such examples. Perhaps, among various possible representations, one may further revise the geometries of Lobachevsky, Riemann, and Finsler.

In receiving abnormal results, the mind will treat them somehow, but not in the direction of revision of "obvious" geometrical properties. Thus, if we can overcome the resistance of the mind and reconsider "obvious" things, then our thinking can reproduce from itself new sensations and contemplations.

For example, let's consider multi-dimensional time. Within the limits of existenting models that assume multi-dimensional time, there is a set of the parallel worlds (various spatial sections intersecting each other at the same point of a given space-time). It is like a set of possible states of a body in Euclidean space. Let's notice, that our reason at all does not resist to this new sensation in order to construct a new principle of the contemplation of the world.

Even if concepts of multi-dimensional space and time, constructed via reasonable thinking, demand confirmation by physical experiment (which at present seems far-fetched), it is still possible to confirm it in other ways. As Hegel has spoken, experience is done for the cognition of phenomena but not for the cognition of truth itself. One experience is not enough for the cognition of truth. Empirical supervision gives us numerous identical perceptions. However, generality is something different from a simple set. This generality is found only by means of reasoning.

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