

R. BOŠKOVIĆ AND A. EINSTEIN

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1. In his discussions "De spatio ac tempore", "De spatio et tempore, ut a nobis cognoscuntur", "De motu absoluto, an possit a relativo distigui" and "De vi inerties", R. Bošković (R. Boscovich, 1711-1787) displayed his relativistic views upon space, time and motions, taking critical aspect towards Newton's conceptions of space, time and motions at the same time. Those Bošković's views are similar to Einstein's relativistic conceptions of space, time and motions.

Bošković distinguishes two spaces. One of them is imaginary or empty and in fact represents threedimensional continuum of geometrical points. The other one is real discrete and finite in number of its elements as "real local points" ("puncta loci realia"). It is hypothesis related to physical space. Bošković's real time is set of "real ways of existance" ("reales existendi modi") of material points, and imaginary or empty time is onedimensional continuum of imaginary or empty moments. According to Bošković, there is no real space and real time out of real material points, and empty space and empty time exist as possibilities, which by presence of material points transform to reality, that is real space and real time. His real space is placed in finite part of empty space, that is "radius" of his real space is finite, like space radius "populated" with material in Einstein's general theory of relativity.

Bošković takes critical position not only towards illusion of ordinary people when measuring space and time, but as well towards opinion of educated "phylosphers", which in his time at first place meant Newton's conception that time interval between two happenings

and distance between two points of rigid body are independent of referent body motion, which implied hypotheses fundamental for Classical mechanics. Bošković neglected both hypotheses. In his Special theory of relativity Einstein neglected them too, in his well known way.

Contraction of length measure and dilatation of time measure in Einstein's theory of relativity result from principle of relativity and constancy of light velocity displayed in empty space, when motion by itself is not considered, but the motion referring to the chosen body of reference; according Bošković's theory the change of length measure and time measure appear by motion itself, based on his structure of materia hypothesis created upon activity of attractive-repulsive forces.

That portrays one common, similar kernel in Bošković's and Einstein's global relativistic visions of space and time. While Einstein, conducted with the power of genius and being sharp mathematician, widened and deepened his visions in his Theory of relativity, putting them into precise mathematical formulations with far-reaching applications and with concrete results in researching many physical phenomena and revealing its lawfulness, Bošković, determined with personal and his time conditions, mostly remained in terms of critical and very keen-witted physical and epistemological analyses of time and space relationship relativity.

Bošković, as Newton, accepts absolute motion, but, differing Newton, he claims determinately and reasonably that absolute motion can "never and by no means differ from relative one" ("motum absolutum a relativo nulla unquam ratione posse distinguere"), subjecting Newton's idea about absolute force of inertia to shrewdly critics and emphasizing his relativistic conception of inertial force. Therefore only in that may, when we consider motion, Bošković be regarded as a relativist, and as such should be distinguished from

completely consequented relativists such as E.Mach, H.Poincaré and A. Einstein especially, who refuse the idea of absolute motion completely.

2. Principle of relativity in Bošković's and Einstein's searching for lawfulness of natural phenomena has a status of universal natural principle. It is one of their elementary premises in those searchings. Treated by Einstein it became basic and precise physical-mathematical postulate with all the consequences of creating and applying the Theory of relativity, while treated by Bošković it remained mostly in form of intuitive scientific-epistemological postulate without mathematical-physical efficiency and generality in Einstein's sense, but with indisputable anticipations of relative modern, relativistic ideas that can be found with Poincaré and afterwards with Einstein.

The idea of physical field and of the four-dimensional space-time ("Quodlibet punctum habet modum realem existendi, per quem est ibi, ubi est, et alium, per quem est, cum est"), two great and fundamental ideas in Einstein's theory of relativity, can be genetically connected with corresponding basic ideas in Bošković's theory of natural philosophy.

Bošković's and Einstein's conviction in universe harmony, in universal connection of phenomena in nature and in objective lawfulness of this connection had a character of general-scientific or epistemological principle and as such in a certain way has reflected itself in their searching for general laws of nature and in their constructions of corresponding theories, that is: in Bošković's theory of unique law forces and in Einstein's endeavouring to form the general physical fields theory. That embodies, as might be said, their elementary common characteristic as researchers and theorists of

physical phenomena and as philosophers in general, who search for general nature laws.

Realizing necessity of critical examination of facts acquired by sensis and the necessity of distinguishing illusive from real, Bošković and Einstein both with their theories have revolutionary overwhelmed the illusion of sensual perceptions and traditionally rooted conceptions. Each of them in his way kept underlining the necessity of theory agreement with experience and the necessity of its internal logical connection, which characterizes their theories not only as hypotetic-deductive but as empiric-inductive. Being great minds each of them, in accordance with his time and his personal terms, deeply and prophetically felt all those cognition difficulties and real dilemmas that appear when attempting to clear up the paths in labyrinth of physical phenomena. Einstein by strength and length of his genius felt it especially. But those dilemmas, whatever insoluble at the moment, did not mislead them, as philosophers, to the wrong way of scepticism and agnosticism. All that, in global at least, reflexes general-scientific, in one way, and epistemological similarity, in the other way, of their theories and their philosophical attitudes in interpreting nature's phenomena.

3. Contemporary physics, with its researches in the field of micro - and ultramicroworld, constantly affirms and shows that Bošković with his theory of natural philosophy stood before his time on the way which leads, so to say, from Newton's dynamical synthesis of universe to Einstein's theory of relativity and Einstein's attempts to dynamical synthesis of microworlds by theory of unique physical field.

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VLADIMIR VARIČAK'S INVESTIGATIONS IN THE FIELD
OF EINSTEIN'S THEORY OF RELATIVITY

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In 1903, Varičak started his investigations of Lobachevski's non-Euclidean geometry, stimulated by the interpretation given by Poincaré, Lahtin and Schwarz. He was investigating various problems concerning non-Euclidean geometry for several years. However, he soon realized that certain analogy between Lobachevski's geometry and some Lorenz's results in physics could be found, while Einstein's theory of relativity, formulated in 1905, gave him new impulses in the search of the analogies with physics. Having found various analogies between Lobachevski's non-Euclidean geometry and Einstein's theory of relativity, Varičak gave non-Euclidean interpretation of the theory of relativity formulae first, and then he reversed the treatment: under the hypothesis that phenomena were occurring in the space of Lobachevski, he derived geometrically the formula in the theory of relativity.

After 1920, Varičak came to the conclusion that the structure of our physical space should be non-Euclidean one, with negative sign of cosmic parameter. The opinions about the problem were different at Varičak's time, while the space problem has still remained open today. Varičak's credit in pointing out and using the analogy between the interpretation of the theory of relativity via Lobachevski's geometry and the one of classical physics through Euclidean geometry are considerable, because he has been among the first to call attention to it. It has become evident that Varičak's insisting on using Lobachevski's

geometry in the theory of relativity has its good points. Despite the fact that scientists' opinions differ, Varičák's credit is that he has raised certain questions of which we can discuss some also today.