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THE BULGARIAN PHYSICIST GEORGI MANEV

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ABSTRACT

The Bulgarian physicist Georgi Manev (1884 - 1965) is a founder of the department of Theoretical Physics in Sofia University. His ideas found a new application in the region of celestial mechanics (so called Manev-type field) last ten years. We present some biographical data and documents concerning his life and scientific activity. A future conference dedicated to Georgi Manev will be organised in May 2004 in Bulgaria (for contacts: katya@skyarchive.org).

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Introduction

According to the bibliography "Bulgarian Contribution in Mathematics, Physics and Chemistry in the period 1889 – 1939" [1] Georgi Manev is among the first five significant Bulgarian physicists who worked at the beginning of the 20 century with 20 papers published in the most prestige journals at that time as Astronomische Nachrichten, Comptes rendus de l'Academie des Scienties de Paris, Zeitschrift fuer Astrophysik, etc. The ideas of Manev on the problems of cosmology and mathematical physics offered a classical alternative to special relativity and were object of discussion with A. Einstein [2]. After the political changes in Bulgaria in 1944 the name of Georgi Manev has been forgotten in the Bulgarian physical community up to 1993 when his ideas found a new application. F. Diacu [3] was searching for a non-Newtonian model in order to study the corresponding dynamics via McGehee transformations when he rediscovered the Manev's field in the monography of Hagihara [4]. This field, at the solar system level at least, provided the same good theoretical approximations as the general relativity, however without leaving the classical mechanics. During last years there is a systematic research performed by a group of the scientists from Canada, Romania, USA, Mexico, Spain, Portugal, Switzerland, Brazil, etc. aiming to describe the dynamics of systems in Manev's field, or in Manev-type fields, featured by the $A/r+B/r^2$ potential, with A and B real parameters. The results match the astronomical reality better than the Newtonian model without need to leave the classical mechanics. That is why the interest to Georgi Manev is reasonable. With this paper we would like to shed some more light on his personality, scientific activity and ideas.

Biography

Georgi Ivanov Manev was born on 15 (27) January 1884 in the town of Veliko Tarnovo. He finished the Veliko Tarnovo's secondary school in 1901, in 1905 he graduated from the Physico-Mathematical Department of the Sofia University. In the period 1905 – 1912 Manev was a teacher in the Veliko Tarnovo's secondary school. A mobilization in the Balkan and Alliance Wars (1912 – 1913) interrupted his teacher's carrier. After the wars (1913 – 1914) he won a specialization in theoretical physics in Toulouse (France) to Professor H. Bouasse. The First World War interrupted his carrier again because of the mobilization up to 1918.

In 1919 he started a scientific carrier as an assistant of physics in the Sofia University, dozent of mathematical physics and mechanics (1921), extraordinary professor of theoretical physics (1925), dean of Physico-Mathematical Faculty of the Sofia University in the periods 1926 – 1927 and 1930 – 1931, ordinary professor and chair of the Department of Theoretical Physics (1935) and rector of the Sofia University (1936 – 1937). As a rector G. Manev contributed to store the authonomy, budget and staff of Sofia University.

In 1938 he became a minister of the education in the second cabinet of the prime-minister Georgi Kyoseivanov. As a minister with a duration of his activity less than a year he created a State Economy Department of the Juridical Faculty of Sofia University, found funds for a new building of the Physico-Matematical Faculty of Sofia University, began to buld the University Printing House, initiated the state credit for increasing of the teacher's selaries, supported the organizations of expositions of German, as well as Russian and Soviet literatures in Sofia. In 1938 Georgi Manev was asked by the Nobel prize nomination committee for Nobel Prize 1939 and he gave his positive opinion for nomination of Patrick M.S. Blackett.

After the short period of political activity Manev continued his scientific work in Sofia University. In September 1944 the political system in Bulgaria changed and Georgi Manev is fired in December 1944 without right to work. Later on he is rehabilitated, but not accepted in the University. Georgi Manev worked at home up to his death in 1965. The archive of the family stores his last manuscript "Ether and the Principle of Action".

Scientific activities

The scientific interests of Georgi Manev cover the problems of theoretical and mathematical physics. He took part in the international congresses in Stockholm (1930), Prague (1934). Stored are two of the letters of A. Einstein to him. Manev is also lecturer in Sofia Univesity with a topic Mathematical Physics, Theoretical Physics, Vector Calculus. He is an author of textbooks for students in Bulgarian language: Introduction to Vector Calculus with Applications and Tasks (Sofia University Library; No. 185); Introduction to Theoretical Physics, Part I. Principle for Matter (Sofia University Library; No. 189), Introduction to Theoretical Physics, Part II. Principles for Ether, (Sofia University Library; No. 224), Theoretical Physics, Part I. Principles for Matter (Sofia University Library; No. 230).

The most cited papers of G. Manev were published in the period 1924 – 1930 [5, 6, 7, 8, 9]. Here G. Manev proposed a gravitational model obtained by applying Max Planck's general action-reaction principle to classical mechanics. The model explains solar system phenomena with the same accuracy as relativity, however without leaving the framework of classical mechanics. It has been recently shown that in the so-called planetary approximation the Manev's model is the natural classical analog of the Schwarzschild model. This model provided unexpected results that match better the astronomical reality (both statistically and observationally) than the classical Newtonian model; it offers a wide framework for applying the most various methods of celestial mechanics and theory of dynamical systems to a background different from the classical one; it brings a unifying point of view for many problems belonging to astronomy, astrophysics, space dynamics, classical physics, mechanics, even atomic physics; it seems to build a bridge between relativity and classical mechanics; moreover, the study of the anisotropic Manev problem could contribute to a better understanding of the connection between quantum and classical mechanics.

From this point of view, Manev's model, which belongs to the classical mechanics, is mathematically much more suitable in tackling dynamical problems than relativity. We must not forget that relativity, even answering tremendous questions in physics and astronomy, was so far unable to obtain coherent results in the n-body problem.

The history of the Manev field is more than three centuries old. Newton himself considered it. He showed that a force generated by a potential of the form $A/r+B/r^2$ (with positive A and B) entails a precessionally elliptic relative orbit, i.e. the trajectory of a point mass with respect to a fixed frame, originating in another point mass, is an ellipse whose focal axis rotates in the plane of the motion. Except for this result, Newton's research on such a model remained unpublished during his lifetime. The reason was the impossibility of explaining the Moon's apsidal motion within the framework of his inverse-square force model.

Clairaut later reconsidered Newton's Manev-type model for the same reason: the impossibility to explain the Moon's perigee motion. Later he found an argument within the framework of the classical Newtonian model and gave up his endeavours on the Manev-type law.

Poincare himself questioned the validity of the Newtonian model, when, in a popular account on the stability of the solar system, published in 1898, he wrote: "One of the questions with which researchers have been most preoccupied is that of the stability of the solar system. This is, if truth be told, more a mathematical question than a physical one. Even if one were to discover a general and rigorous proof, one could not conclude that the solar system is eternal. It may, in fact, be subject to forces other than those of Newton." This came at a time when the world of physics was already seeking a new path, a search that would eventually lead towards the discovery of quantum mechanics and relativity.

Manev was the first to determine the right coefficients in the equations, describing the potential function, known still to Newton. His arguments were based on the following facts: Poincare had noticed that Lorentz's theory concerning the electrodynamics of moving bodies, on which the special relativity would be founded, failed to satisfy the action-reaction principle. In 1903 M. Abraham defined the quantity of electromagnetic movement, which helped to prove the accuracy of Lorentz's contraction principle. In 1908, using this new quantity of electromagnetic movement, Max Planck stated a more general action-reaction principle, verified by the special relativity, and from which Newton's third law followed as a theorem. On the basis of these results, Manev showed that, applying the more general action-reaction principle to classical mechanics, one is naturally led to a law given by the potential of the form $A/r+B/r^2$.

Present Development of the Manev’s ideas

The investigations oriented towards already classical subjects in celestial mechanics, transposed for Manev-type potentials, would certainly show exotic features according to Donald Saari, Richard McGehee, Philip Holmes, George Bozis, Ernesto Lacomba, etc. working in the field of celestial mechanics.

The interest in the Manev-type models is continuously increasing according to the number of the papers, books or PhD and MSc thesisis which appeared. The scientists use such models from most various points of view. The interest of astronomers in this model is legitimate. Many observed astronomical events, can be explained by the Manev-type classical model much easier than by relativity. The interest of mathematicians in this model is much more natural: first, because the study of dynamics in fields other than the Newtonian one constitutes a temptation, second, because the Manev-type model, which already unveiled surprising mathematical properties, offers a vast unexplored field. The weak interest of the physicists to this model is inexplicable. The physicists have to take in view that the Manev’s model, which is based on physical arguments, does not compete relativity, but is its classical analog and they can complement one another.

The conference dedicated to scientific heritage of Georgi Manev plans to gather astronomers, mathematicians and especially physicists and to identify joint fields of research based on such a fruitful model.

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