

ON THE STRUCTURE OF PHYSICAL VACUUM
AND A NEW INTERACTION IN NATURE
(Theory, experiment, applications)

On the structure of physical vacuum and a new interaction in nature (theory, experiment, applications) – YU.A. BAUROV, Central Research Institute of Machine Building, Korolyov, Moscow Region, Russia. Nova Science Publishers, Inc., 2000. 217 pages. 55 figs. 164 refs. ISBN 1-56072-805-1. \$89

In the book, an unconventional physical model of creation of the observed physical space from a finite set of special discrete objects, *byuons* is presented. The global space anisotropy associated with a cosmological vectorial potential appearing in the definition of *byuons*, as well as a new interaction due to this anisotropy, are predicted. Results of an experimental investigation of the proposed new interaction are given.

A new method of power production based on the new interaction, as well as a new principle of motion of objects in nature with the use of physical space as a support medium, are advanced.

The book is intended for the general reading public, physicists (theorists and experimenters), astrophysicists, engineers (specialists in space technology and power engineering), and physical students.

Translated from Russian by E.P.Morozov.

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Contents of chapters.

Chapter I (Forerunners, or about what one could have perceived in quantum field theory in the mid-1980s).

Dynamics of the system of spinor and boson fields interacting with the electromagnetic field when choosing the propagation velocity of interactions C as a generalized coordinate is considered. In this case, gauge invariance is violated in some set x since the electric charge of the fields is assumed to be dependent on $C(x, t)$, as a result of which electric potentials become single-valued in this set and a fundamental vectorial potential $\mathbf{A}$ is introduced that

will be called lately a "cosmological vectorial potential $\mathbf{A}_g$ ". The Planck's constant h , elementary electric charge e_0 , constants of weak and strong interactions are defined in this Chapter through the magnitude $|\mathbf{A}_g|$ and some characteristic dimensions ($x_0 \sim 10^{-17}$ cm, $ct^* \sim 10^{-13}$ cm). Masses of all particles are to be proportional to the modulus of $\mathbf{A}_g$.

Chapter II (Physical vacuum structure and new interaction in nature).

This is the central part of the book. Here on base of invariants obtained in the preceding Chapter, the hypothesis is advanced for the origin of the observable space due to dynamics of a finite set of *byuons*, special discrete objects, in the process of minimizing potential energy of their interaction in the one-dimensional space formed by them.

In the theory of formation of the physical space from a finite set of byuons $[\mathbf{A}_\Sigma \cdot \mathbf{x}(i)]$, where $\mathbf{x}(i)$ is a quantum number of byuon, – its "length" (with the dimensionality [cm]), $i = 0, 1, 2, 3, \dots k \dots$, only three values are given for computation : $\hat{x}_0$ – a quantum of space ($\sim 10^{-33}$ cm) ($\mathbf{x}(i) = \hat{x}_0 \cdot i$); τ – a quantum of time ($\sim 10^{-43}$ s), and $|\mathbf{A}_g|$. The properties of surrounding world are obtained. The existence of a new interaction in nature being detected when changing some summary potential $\mathbf{A}_\Sigma$ bounded above by the magnitude of $\mathbf{A}_g$, is predicted.

The theoretical expression for the new force is presented, and the results of experimental investigations of its characteristics at the Kurchatov' Institute of Atomic Energy (IAE), the Institute of General Physics of Russian Academy of Sciences (IGPRAS), the Central Research Institute of Machine Building (CRIMB) and the Sternberg State Astronomical Institute (SSAI), are given.

Presented are also the results of experimental investigations of time variations of β -decay rate of radioactive elements, which were predicted by theory and confirmed in experiments at Sankt-Petersburg State Technology University and Joint Institute for Nuclear Reactions (JINR, Dubna).

The force-free mechanism of describing all existing interactions is physically justified.

Chapter III (Astrophysical manifestations of assumed physical space structure and new interaction in nature).

Based on the proposed in Chapter II model of origin of physical space and global space anisotropy associated with the vector $\mathbf{A}_g$ and responsible for existence of the new interaction, the problem of origin of galactic and intergalactic magnetic fields and relic radiation is considered, the Sun's motion relative to the nearest stars in direction of Hercules constellation (Sun's apex), anisotropy of solar flare distribution over the surface of the Sun as well as many others astrophysical phenomena, unexplained in the context of standard physical models, are addressed.

Chapter IV (Some applications of theory of physical space structure and new force).

In this chapter, the principles of creating propulsion and power systems using energy of physical space, are considered. The results of experimental investigations of early demonstrational prototypes of such systems are given.

The principles of development of new engines-generators and navigation devices for spacecrafts, based on the global space anisotropy associated with the $\mathbf{A}_g$ vector, are proposed.

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