

PREFACE

The search of alternative concept about space (physical vacuum) has been abandoned for 100 years, considering that this issue is solved once for ever. At the same time Nature surprises the physicists with unexplainable phenomena. My 30 years experience in different fields of physics and technology gave me a confidence to try one original approach. For many years, my mind was bothered by the curiosity of Nature. Every atom, either here or in a distant galaxy has exactly the same complex spectral signature. Even for the simplest atom, the hydrogen, we need a complex mathematics to describe its spectrum. Then the logical question is: How the laws of Physics are written in the language of Nature? This issue obviously has physical and philosophical aspect. My endeavour to get a logical answer evolved into a deep rational vision about some fundamental principles in Nature. I arrived to ideas that may seem speculative from a first gland, but if the curious reader examines the analysis and arguments, he will find that the conclusions and the predictions are reasonable. Some of the most intriguing questions are: In what kind of space we live? What is behind the inertia and gravitation? For a first time, the reader will find such issue discussed in understandable way, free of abstractness. The analysis of some enigmatic phenomena from a new point of view leads to conclusions and predictions, which have not been discussed so far. They might invoke a new technological advance. This book provides the physical base for supporting of such statement. The presented theoretical work falls into the category of Unified Theories.

The most common definition of Unified Theory is a theory, which describes the gravitational, electromagnetic, strong and weak forces within a single, all-encompassing framework. Attempts for building of such theory are made for over 100 years. Let define first what should be the criteria for a successful Unified Theory:

- It must suggest a physical model of fundamental particles in a real 3-dimensional space, working in all fields of Physics without contradictions and able to explain the relations between the gravitational, electrical and magnetic fields
- The number of initially adopted postulates and fundamental particles must be as smaller as possible
- The derived models must be able to explain all kind of experiments and observations in all fields of Physics and in the range from micro-cosmos to Cosmology
- The energy conservation principle must be strictly observed

One additional criterion of philosophical aspect is that the theory must show how the laws of Physics are written in the language of Nature.

Presently, the existing theoretical models pretending to have features of Unified theory, could not suggest a model satisfying the above-defined criteria. What is proposed is an enormous number of particles, postulates and rules, often contradictable between themselves or using an unrealistic speculative multidimensional space. Since the suggested models suffer from logical understanding, it has been claimed that the human logic fails, so a mathematical one must replace it. Such statement, criticized in the past (1900-1930), now is silently accepted. It became convenient for development of an enormous number of abstractive theories, while the main issue is unsolved.

The treatise Basic Structures of Matter, a Super Gravitation Unified Theory unveils the relation between the forces in Nature by adopting of the following framework:

- Empty Euclidian space without any physical properties and restrictions
- Two super dens fundamental particles, able to vibrate and congregate
- A fundamental law of Super Gravitation (SG) – an inverse cubic law valid in empty space.

These two fundamental particles driven by the fundamental SG law are able to congregate to geometrical formations. The enormous abundance of such mixture with energy above some

critical level form self-organised hierarchical levels of geometrical formations, which leads deterministically to creation of space with quantum properties - physical vacuum and a galaxy as observable matter. All known laws of Physics are embedded in the underlying structure of the physical vacuum and the structure of the elementary particles. The fundamental SG law is behind the gravitational, electric and magnetic fields and governs all kind of interactions between the elementary particles in the space of physical vacuum.

The treatise Basic Structures of Matter (BSM) is based on an original idea about physical vacuum, which has never been investigated so far. It follows the recommendation of James Clerk Maxwell, the father of Modern Physics, for search of the structure of the space. In his “Treatise on Electricity and Magnetism” vol. II he writes:

... If something is transmitted from one particle to another at a distance, what is its condition after it has left the one particle and before it has reached to the other?... Hence, all these theories lead to the conception of a medium in which the propagation takes place, and if we admit this medium as an hypotreatise, I think it ought to occupy a prominent place in our investigations, and that we ought to endeavor to construct a mental representation of all the details of its action, and this has been my constant aim in this treatise

In his book “Sidelights on Relativity” (1922) Albert Einstein” states in favor of Ether quoting “According to General Theory of Relativity, space without ether is unthinkable”. In the same book he states that all attempts to explain the Maxwell’s electrodynamics by a physical model of material ether has failed, but he doesn’t suggest a proof that this is impossible. In fact the Casimir forces have been discovered 35 years later, although nobody so far has guessed that they might be the detectable signature of the inverse cubic SG law, so such a law could be used for building a physical model of the material Ether.

The space concept suggested in BSM allows explanation of all enigmatic phenomena in Particle Physics, Quantum mechanics, Relativity and Cosmology using reliable classical methods. The derived theoretical models show excellent agreement with the experiments and observations. This opens a new opportunity for investigating the micro and macro Cosmos. One of the practically useful results is the unveiled structure of the elementary particles and atomic nuclei, graphically presented in the Appendix *Atlas of Atomic Nuclear Structures*. They could be used in the fields of structural chemistry, nanotechnology, biomolecules and for further understanding of the nuclear reactions and radioactivity. Some conclusions have important ecological aspect. One important issue, for example, is the envisioned new kind of danger from a nuclear explosion (discussed in chapter 12), which has not been recognized so far. Another example is the opportunity to investigate the tornado phenomenon from a new point of view.

The BSM is particularly useful for researchers in the fields of the Zero Point Energy, gravitation and inertia. Among the most important results, summarized in the last Chapter 13, are the following: Theoretical proof for existence of the most universal law in Nature – the Law of Supergravitation. It is behind all physical phenomena and directly related to a hidden space energy, which appears to be a primary source of the nuclear energy; Predicting the possibility and the potential physical mechanisms for control of the gravitation and inertia of a material object; Predicting of hidden non-EM waves and a possibility for Supercommunication by them.

I acknowledge the moral support of my family, my wife Denka, and my son Ivor, without whose tolerance and encouragement this work could not have been finished. I would like to express special thanks for my colleagues, scientists, engineers, relatives and friends, which have encouraged me to complete this monograph.

Stoyan Sarg, PhD in Physics
Toronto, Canada