PERSPECTIVES — OF — POLARONS

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The monograph "Perspectives of polarons" presents further development of the polaron theory and its applications in various fields of physics. Originally polaron arose in condensed media physics to explain peculiarities of electron states in semiconductors, ionic crystals and other polar media. Subsequently methods of the polaron theory were used to describe electron properties in other condensed media. The states of polaron type in nonpolar media were named as condenson, in magnetoordered media as magnet polaron, in the electrolytes as ionon, etc. Nowadays methods of the polaron theory are widely used in such sciences as biology, chemistry, nuclear physics, etc. Such wide applications result from the fact that polaron is one of the first substantial examples of a nonlinear quasiparticle.

This monograph deals with only a small part of the problems indicated. It is based on the talks, given at the Workshops which were held in Pushchino in 1993 and 1994.

Our book includes selected articles, which are representative of the exciting scientific presentations that marked the workshops. The first Chapter is devoted to theory and applications of large polaron. The combination of polaron theory with modern quantum chemical calculations is presented in Chapter 2. The polaron problem includes issues which are being studied intensively in the quantum field theory and nonperturbative models of elementary particles. We include three works (Chapters 3, 4, and 13) devoted to applications of the polaron in quantum field theory of particles. The polaron behavior in magnetic systems and magnetic fields are considered in Chapters 6, 10, and 12. Effects of disorder and order of the structure on self-trapped electron states are treated in Chapters 7 and 8. We include the review devoted to quasi-one-dimensional polaron (Chapter 5) in biopolymers, due to vast number of applications of polaron model in one-dimensional structures. The study of high-temperature superconductivity stimulates the bipolaron theory. A generalization of the bipolaron problem to the anisotropic case is considered in Chapter 9.

We hope our book will be of interest to a broad range of readers, which can be able to sense the excitement of the articles.

The monograph will hopefully serve further development and contribute to the introduction of the polaron theory methods into various fields of physics.

Gennady N.Chuev

Victor D.Lakhno

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