Basic notions of condensed matter physics

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P. W. Anderson. *Basic Notions of Condensed Matter Physics*, Benjamin/Cummings, London; Amsterdam; Don Mills; Sydney; Tokyo, 1984. 549 pp. (Frontiers in Physics, Ed. D. Pines. V. 55).

The book is part of the well-known series "Frontiers in Physics" published under the general editorship of D. Pines. Many books of this series have been translated into Russian, and some of the books have been written by Soviet authors.

The book under review consists of two parts: the first part containing 5 chapters presents (quite informally) the modern state of affairs in the particularly prominent "hot spots" of condensed matter physics; the second part contains reprints of original articles by different authors (including those of P. Anderson) which have to a great extent determined the development of condensed matter physics during the last 20–30 years. Of greatest interest for the Soviet reader is the first part, since most of the articles from the second part are in fairly accessible sources.

The introductory chapter of the first part contains a brief review of the contents of the book. The second chapter "Basic Principles I: Broken Symmetry" contains a qualitative presentation of the phenomenon of symmetry violation. The general theory is illustrated by well-chosen examples primarily from the theory of phase transitions. The next chapter "Basic Principles II: Adiabatic Continuity and Renormalization" begins with a brief exposition of the theory of the Fermi-liquid. This is followed by a discussion of the principle of continuation as it is applied to liquids, solids, superconductivity and anisotropic superfluidity. An essential position in this chapter is occupied by the section devoted to the renormalized perturbation theory, and as an example the theory of multiple scattering is examined.

The two concluding chapters (on quantum solids and the renormalization group) contain basically illustrative material: the quantum theory of oscillations of the lattice both in the harmonic approximation and with anharmonic effects taken into account, spin and exchange effects, renormalization group theory of critical points, the scaling theory of Kondo, the concept of phase transitions as a condensation of defects; possible prospects of using the ideas of the renormalization group for unification of the theory of complex systems are sketched out.

Most of the results presented in this book have been obtained by the author or with his very active participation. The book is written in a very interesting language and can serve as useful material for graduate and undergraduate students and for scientists working in the field of solid state theory or statistical physics.

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