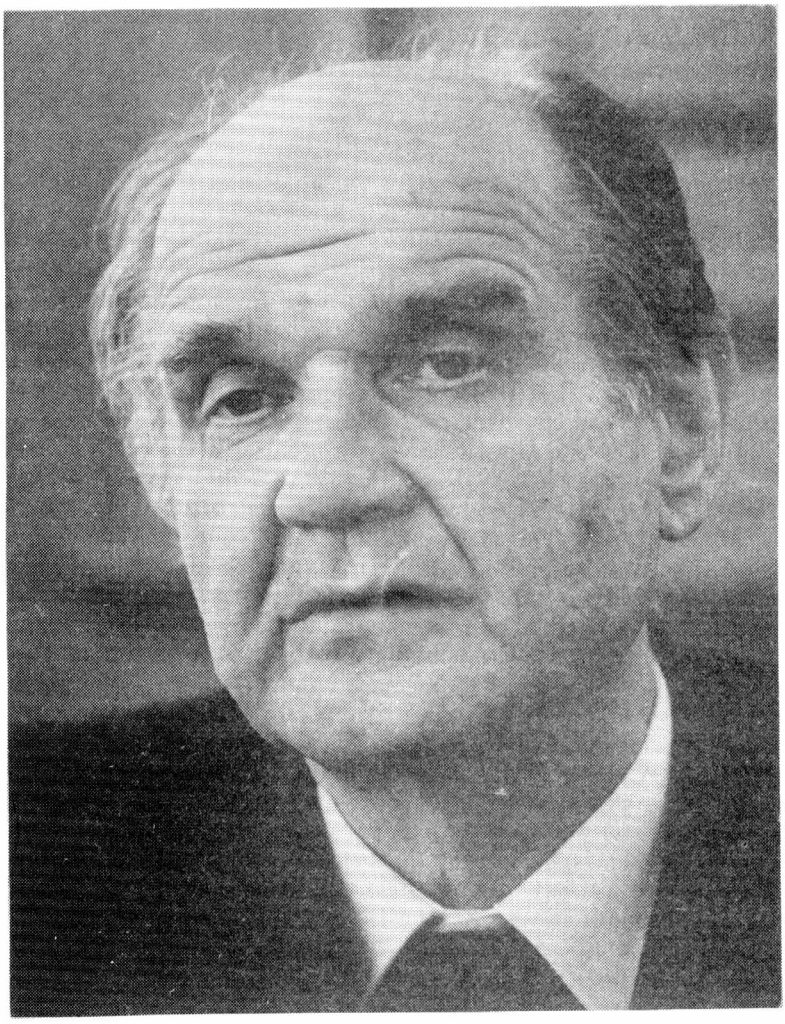

This collection of scientific papers on the actual problems of condensed matter physics is dedicated to the anniversary of Professor Ihor Yukhnovskii, prominent Ukrainian scientist and high school teacher, the founder of the Lviv school of statistical physics, member of the Ukrainian National Academy of Sciences.

Igor Yukhnovskii is widely recognized for his research in the fields of electrolyte theory, Bose and Fermi systems, theory of phase transitions in crystals and fluids. He proposed mathematical methods which are successfully used for the microscopic description of thermodynamic and structural properties of classical and quantum systems of interacting particles. He is the author of 5 books and the quantum mechanics course which was given to students of physics at Lviv University for many years. During last years Ihor Yukhnovskii works in the Ukrainian Parliament and Cabinet of Min-

isters and takes active part in the forming of the independent Ukrainian state. His book "Ukraine - an Independent State" (Lviv, 1994) reproduces the basic milestones of the parliament struggle for the political independence of Ukraine and contains valuable analysis of the problems of further development of the Ukrainian State.

Ihor Yukhnovskii became a high-skilled professional in theoretical physics under the influence of Academician M.M.Bogoliubov scientific school. At the beginning of 60-ies, I.Yukhnovskii accomplished a series of the original research papers devoted to the construction of the theory of charged particles systems, based on the collective variables method he had developed previously. The main achievement of this method is the principal solution for the problem of correct and simultaneous account of both short-range and long-range interactions in many-particle systems. The fundamental results which Professor Yukhnovskii has obtained developing the microscopic theory of electrolyte solutions comprised the basis of his book (together with M.F.Holovko) "Statistical Theory of the classical equilibrium Systems" (Kyiv: Naukova Dumka, 1980). Equal consideration of both direct and indirect interactions between the electrolyte ions and solvent molecules provided the possibility to calculate the thermodynamical and structural properties of the wide class of condensed systems, including liquids and solutions. The theory of electrolytes was extended by pupils of Prof. Yukhnovskii to the spatially inhomogeneous systems, ionic melts and ofher physical objects.

The studies of the systems of interacting quantum particles were an important stage in Prof. Yukhnovskii's research activity. In 60-ies he proposed and developed the method of displacements and collective variables (DCV) which appeared to be quite convenient for the investigation of Bose and Fermi systems. The theory of superfluid helium is (developed in his papers together wih I.Vakarchuk), which already in zero approximation leads to the results of well-known N.N.Bogoliubov's theory of Bose liquids. The developement of DCV method initiated the elaboration of new methods for the study of systems of interacting fermions namely, the modified displacements method and reference system approach in the theory of an electron liquid. This approach is based on the dynamic CV and was implemented in his works with M.Vavrukh. They also proposed the mechanism of high-temperature superconductivity, taking into account the peculiarities of the behaviour of the strongly degenerated non-ideal electron subsystem.

It was these studies that demonstrated the advantage of the consideration of long-range interactions between particles in the phase space of CV and enabled to express their properties quantitavely within a wide range of external parameters, like temperature and magnetic field. The idea of reference consideration of the short-range interactions and description of the wide class of materials which are described by pseudospin models (particularly law-dimensional magnetic systems) was developed in papers by I.Yukhnovskii and R.Levitskii.

The construction of a microscopic theory for phase transitions of the second type was an important stage in scientific activity of I.Yukhnovskii. The CV method after generalization for spin systems is used as a mathematic tool for the theory. Substitution of the reference distribution form for fluctuations in a critical region became an important pre-condition for the creation of phase transition (PT) theory. The rigorous proof was given in papers together with Yu.K.Rudavskii that the correct description of a PT can be fulfilled on the basis of non-Gaussian measure densities only. An original way for the calculation of the statistical sum of three-dimensional statistical systems near phase transition point became a central point of the theory. The approach is new and different from that by other authors

because non-Gaussian reference distribution of fluctuations is used, and the perturbation theory series causing non-physical divergencies of some characteristics of a system at a PT point were rejected. The approach proposed by I.R.Yukhnovskii to describe a phase transition does not require small parameter and enables to reproduce the real physical picture of the phenomenon.

An application of the general approach for the phase transition description was made for an another PT model, namely three dimensional Ising model. In a series of papers together with M.P.Kozlovskii the full analytical solution for this model is accomplished beginning from calculation of a PT temperature up to formulas for thermodynamical and correlation functions near a PT point. The influence of microscopic parameters of a system on a PT process it was researched for first time in the world literature. The results obtained for Ising model provide the possibility to describe PTs in a liquid-gas system, investigate its behaviour near a critical point (together vith I.M.Idzyk and V.O.Kolomijetz), apply them for the description of multicomponent fluids (together with O.V.Patsagan), ferroelectric cluster systems (together with M.A.Korynevskii), n-component model of a structural phase transition (togther with I.M.Mryglod) and critical behaviour of n-component magnet (together with Yu.V.Holovach).

The methods developed by I.R.Yuknovskii are succesfully used in various fields of the condensed matter physics. In particular, the synthesis of CV and pseudopotential methods appeared to be an efficient way to describe the order-disorder phase transition in substitutional alloys.

The behaviour of thermodynamic properties was studied for the first time within the framework of microscopic approach and the method for the calculation of phase diagrams for binary alloys was developed. The theory solves consequently the problem of consideration of short order effects, describes local static displacements of atoms, which cause the dependence of alloy physical properties on the concentrations of components. Results of the investigations were generalized in the monography by I.R.Yukhnovskii (together with Z.O.Gurskii) "Quantum statistic theory of disordered systems" (Kyiv: Naukova dumka, 1991).

Academician Yukhnovskii makes considerable efforts for organization of the Ukrainian science. Beginning from 60-ies, initiated a regular series of meetings and of conferences on the statistical physics. Energetic research activities of the member of Lviv school of statistical physics in various areas of theoretical physics resulted in the creation of the Institute for Condensed Matter Physics in Lviv. Professor I.R.Yukhnovskii is the director of the Institute.

Being in the prime of creative work, Academician I.R.Yukhnovskii continues the fruitful scientific activity, in particular, he studies the problems related to processes into nuclear reactors and prognose of their evolution during burning of the fuel. Ideas and methods initiated and proposed by I.R.Yukhnovskii remain an efficient source of new theoretical elaborations for the new generation of theoretical physisists.