

Contents

Preface	5
Preface to the 1978 Edition	9
Introduction	13
1. Macrophysics	19
§ 1. Controlled Thermonuclear Fusion	19
§ 2. High-Temperature Superconductivity	24
§ 3. New Substances (Production of Metallic Hydrogen and Some Other Substances)	29
§ 4. Metallic Exciton (Electron-Hole) Liquid in Semiconductors	33
§ 5. Second-Order Phase Transitions (Critical Phenomena)	36
§ 6. Matter in Ultrahigh Magnetic Fields	42
§ 7. X-Ray Lasers, Grasers and Superpowerful Lasers	45
§ 8. Studies of Very Large Molecules. Liquid Crystals. Some Surface Phenomena	49
§ 9. Superheavy Elements (Far Transuranides)	52
2. Microphysics	55
§ 10. What Is Microphysics?	55
§ 11. The Mass Spectrum (The Third Spectroscopy)	60
§ 12. Fundamental Length (Quantized Space, etc.)	66
§ 13. Interaction of Particles at High and Superhigh Energies	69
§ 14. Weak Interactions. Violation of CP Invariance	72

§ 15. Nonlinear Phenomena in Vacuum in Superstrong Electromagnetic Fields	76
§ 16. Microphysics Yesterday, Today and Tomorrow	79
3. Astrophysics	89
§ 17. Experimental Verification of the General Theory of Relativity	89
§ 18. Gravitational Waves	92
§ 19. The Cosmological Problem. Singularities in General Relativity Theory and Cosmology	95
§ 20. Is there a Need for "New Physics" in Astronomy? Quasars and Galactic Nuclei	99
§ 21. Neutron Stars and Pulsars. Physics of "Black Holes"	105
§ 22. Origin of Cosmic Rays and Cosmic Gamma- and X-Ray Radiation	117
§ 23. Neutrino Astronomy	129
§ 24. The Present Stage in Development of Astronomy	131
Concluding Remarks	136
Addendum	142
References	155

