

## CONTENTS

<b>Preface . . . . .</b>	xiii
<b>1. Introduction . . . . .</b>	1
<b>1.1. Structure of “Continuous Medium”. Gibbs Ensemble for Nonequilibrium Processes . . . . .</b>	1
1.1.1. <i>Gibbs Ensemble. Equilibrium State . . . . .</i>	1
1.1.2. <i>Gibbs Ensemble. Averaging over Distribution of Initial Values . . . . .</i>	3
1.1.3. <i>Physically Infinitesimal Scales in Kinetic Theory . . . . .</i>	6
1.1.4. <i>Physically Infinitesimal Scales in Hydrodynamic Description . . . . .</i>	8
<b>1.2. Transition from Kinetic to Gasdynamic Description . . . . .</b>	10
<b>1.3. Unified Description of Kinetic and Hydrodynamic Processes . . . . .</b>	12
1.3.1. <i>Physical Knudsen Number . . . . .</i>	12
1.3.2. <i>Reconciliation of Kinetic and Hydrodynamic Definitions of Continuous Medium . . . . .</i>	13
1.3.3. <i>Small-Scale and Large-Scale Fluctuations . . . . .</i>	14
1.3.4. <i>Equation for Unified Description of Kinetic and Hydrodynamic Processes . . . . .</i>	15
<b>1.4. Kinetic Description of Autowave Processes in Active Media. Basic Equation of Theory of Self-Organization (Synergetics) . . . . .</b>	18
<b>1.5. Dynamic and Statistical Description of Complex Motion in Macroscopic Open Systems. Constructive Role of Dynamic Instability of Motion . . . . .</b>	21
<b>1.6. Criteria of Self-Organization . . . . .</b>	24
1.6.1. <i>Physical Chaos in Open Systems. Controlling Parameters . . . . .</i>	24
1.6.2. <i>Evolution and Self-Organization . . . . .</i>	24
1.6.3. <i>Processes of Degradation. Boltzmann’s H-Theorem . . . . .</i>	25
1.6.4. <i>Gibbs Theorem . . . . .</i>	27
1.6.5. <i>Examples of H-Theorem for Open Systems . . . . .</i>	28
1.6.6. <i>Decrease in Entropy in the Process of Self-Organization. S-Theorem . . . . .</i>	28
1.6.7. <i>Assessment of the Relative Degree of Order Using the S-Theorem on the Basis of Experimental Data . . . . .</i>	30
<b>1.7. Entropy and Entropy Production in Laminar and Turbulent Flows . . . . .</b>	31
<b>1.8. Principle of Minimum Entropy Production in Processes of Self-Organization . . . . .</b>	32
<b>2. Dynamic and Statistical Description of Processes in Macroscopic Systems . . . . .</b>	35
<b>2.1. Hamilton Function. Reversible Equations of Motion. Functions of Dynamic Variables . . . . .</b>	35
<b>2.2. Liouville Theorem. Liouville Equation . . . . .</b>	38
<b>2.3. Local Dynamic Distribution of States in <math>6N</math>-Dimensional Phase Space . . . . .</b>	39
<b>2.4. Equation for Microscopic Phase Density. Microscopic Transfer Equations . . . . .</b>	40
<b>2.5. Ensemble of Identical Macroscopic Systems — the Gibbs Ensemble . . . . .</b>	44

<b>3. Statistical Theory of Equilibrium State . . . . .</b>	<b>47</b>
3.1. Microcanonical Gibbs Distribution . . . . .	48
3.2. System in Thermostat. Canonical Gibbs Distribution . . . . .	49
3.3. First Law of Thermodynamics . . . . .	51
3.4. Second Law of Thermodynamics for Quasistatic Processes . . . . .	53
3.5. Entropy as Measure of Uncertainty of Statistical Description of States of the System . . . . .	54
3.6. Gibbs Theorem . . . . .	58
3.7. Change in Entropy in the Course of Time Evolution . . . . .	59
3.8. Principle of Maximum of Entropy. Derivation of Canonical Gibbs Distribution . . . . .	60
3.9. Principle of Indistinguishability of Particles in Statistical Theory . . . . .	62
3.10. Dependence of Thermodynamic Functions on the Number of Particles . . . . .	63
3.11. Thermodynamic Functions of Ideal Gas . . . . .	64
3.12. Entropy of Ideal Gas. Gibbs Paradox . . . . .	65
<b>4. Distributions of Functions of Dynamic Variables. Fluctuations of Internal Parameters . . . . .</b>	<b>68</b>
4.1. Distribution Functions of Values of Dynamic Variables . . . . .	68
4.2. Distribution Function of Values of Internal Energy . . . . .	69
4.3. Mean and Most Probable Energy Values . . . . .	70
4.4. Distribution Function of Values of Entropy . . . . .	71
4.5. Distributions of Local Functions of Dynamic Variables . . . . .	73
4.6. Mean Density in Space of Momenta: Maxwell Distribution . . . . .	74
4.7. Boltzmann Distribution . . . . .	75
4.8. Gibbs Formulas . . . . .	77
4.9. Fluctuations of Volume and Pressure . . . . .	78
4.10. Boltzmann Principle . . . . .	79
4.11. Gaussian Distribution for Fluctuations of Values of Internal Parameters . . . . .	81
4.12. Fluctuations of Number of Particles. Poisson Distribution . . . . .	83
4.13. Generalization of Gibbs Theorem for Distributions of Values of Functions of Dynamic Variables . . . . .	84
4.14. Effective Hamilton Function in Statistical Theory of Equilibrium State . . . . .	86
<b>5. Methods of Distribution Functions and Microscopic Phase Density . . . . .</b>	<b>88</b>
5.1. Sequence of Distribution Functions . . . . .	88
5.2. Connection of Hydrodynamic and Thermodynamic Functions with One-Particle and Two-Particle Distribution Functions . . . . .	90
5.2.1. Gasdynamic Functions . . . . .	90
5.2.2. Internal Energy . . . . .	91
5.2.3. Pressure . . . . .	92
5.2.4. Free Energy . . . . .	92
5.3. Chain of Equations for Sequence of Equilibrium Distribution Functions . . . . .	93
5.4. Equations for Sequence of Nonequilibrium Distribution Functions . . . . .	95
5.5. Correlation Functions . . . . .	96
5.6. Method of Microscopic Phase Density . . . . .	98

<b>6. Boltzmann Kinetic Equation . . . . .</b>	102
6.1. Rarefied Gas. Boltzmann Kinetic Equation . . . . .	103
6.2. Properties of Boltzmann Collision Integral . . . . .	106
6.3. Equilibrium Solution of Boltzmann Equation . . . . .	107
6.4. Increase in Entropy During Time Evolution to the State of Equilibrium. Boltzmann's H-Theorem. Lyapunov Functional . . . . .	109
6.5. Relaxation Time and Length in Boltzmann Gas . . . . .	111
6.6. Approximations of Free Molecular Flow and Gas Dynamics . . . . .	112
6.7. Summary. Unsolved Problems . . . . .	115
<b>7. From BBGKY Equations to Kinetic Equations for Boltzmann Gas . . . . .</b>	117
7.1. BBGKY Equations in Approximation of Paired Interactions . . . . .	117
7.2. Separation of Dissipative Contribution of Interaction of Particles . . . . .	119
7.3. Transition to Boltzmann Equation . . . . .	121
7.4. Results. Unsolved Problems. Boltzmann's Hypothesis of Molecular Chaos . . . . .	126
<b>8. Kinetic Theory of Nonideal Gas . . . . .</b>	130
8.1. Equilibrium State. Perturbation Theory in Density Parameter . . . . .	130
8.2. Thermodynamic Functions of Nonideal Rarefied Gas . . . . .	131
8.3. Entropy and Free Energy of Nonideal Gas . . . . .	134
8.4. Higher Approximations in Density Parameter in Kinetic Theory . . . . .	136
8.5. Kinetic Equations for Nonideal Rarefied Gas . . . . .	138
<b>9. Kinetic Theory of Fluctuations . . . . .</b>	142
9.1. Leontovich Kinetic Equation . . . . .	143
9.2. Equilibrium Solution of Leontovich Equation . . . . .	145
9.3. H-Theorem. Lyapunov Functional . . . . .	146
9.4. Comparison Between Entropies of Boltzmann and Leontovich. Correlations and Order of States of Gas . . . . .	147
9.5. Chain of Dissipative Equations for a Sequence of Distribution Functions . . . . .	148
9.6. Approximation of Perturbation Theory in Interaction, and Approximation of Second Correlation Functions in BBGKY Theory . . . . .	150
9.7. Leontovich Equation. Approximation of Second Correlation Functions . . . . .	154
<b>10. Langevin Method in Kinetic Theory of Fluctuations . . . . .</b>	159
10.1. Dissipative Equation for Smoothed Microscopic Phase Density . . . . .	159
10.2. Sequence of Equations in Moments of Smoothed Microscopic Phase Density . . . . .	161
10.3. Equation for Fluctuations of Distribution Function . . . . .	162
10.4. Langevin Method in Kinetic Theory of Fluctuations . . . . .	163
10.5. Entropy and Entropy Production for Nonequilibrium States Including Fluctuations . . . . .	165
10.5.1. Generalized Equation of Entropy Balance . . . . .	165
10.5.2. Entropy and Entropy Production for Nonequilibrium States Excluding Kinetic Fluctuations . . . . .	166

10.5.3. Entropy and Entropy Production Including Kinetic Fluctuations . . . . .	168
10.5.4. Entropy Production and Intensity of Langevin Source . . . . .	168
10.5.5. Effective Source of Fluctuations . . . . .	169
10.5.6. Criterion of "Small Deviation from Equilibrium" . . . . .	170
<b>11. From Kinetic Boltzmann Equation to Equations of Gas Dynamics . . . . .</b>	<b>172</b>
11.1. Gasdynamic Functions. Transfer Equations . . . . .	172
11.2. Zero Approximation. Local Maxwell Distribution . . . . .	175
11.3. First Approximation in Knudsen Number. Equations of Gas Dynamics Including Viscosity and Thermal Conductivity . . . . .	177
11.4. Equation of Entropy Balance in Gas Dynamics . . . . .	181
11.5. Equations of Gas Dynamics for Nonideal Gas . . . . .	183
11.6. Equations of Gas Dynamics in Approximation of Triple Collisions . . . . .	186
<b>12. Thermodynamics of Nonequilibrium Irreversible Processes . . . . .</b>	<b>188</b>
12.1. Thermodynamic Method in Theory of Nonequilibrium Processes . . . . .	188
12.2. Equations of Thermodynamics of Simple Liquids . . . . .	190
12.3. Boltzmann's Principle and Effective Hamilton Function . . . . .	193
12.4. Change of Free Energy and Entropy in Processes of Time Evolution. Lyapunov Functionals . . . . .	194
12.5. Distribution Function of Velocity in System with Heat Source . . . . .	199
12.6. Distribution of Kinetic Energy (Instant Temperature) . . . . .	204
12.7. Lyapunov Functional $\Lambda_S$ as Measure of Relative Nonequilibrium. Illustration of S-Theorem . . . . .	206
12.8. "Physical Chaos". General Formulation of S-Theorem . . . . .	208
12.9. Criterion of Self-Organization Based on Analysis of Time Spectra . . . . .	211
<b>13. Unified Description of Kinetic and Hydrodynamic Processes . . . . .</b>	<b>213</b>
13.1. Necessity of Unified Description of Kinetic and Hydrodynamic Processes . . . . .	214
13.2. Physical Definition of Continuous Medium . . . . .	216
13.2.1. Physically Infinitesimal Scales in Kinetic Theory . . . . .	216
13.2.2. Physically Infinitesimal Scales in Gasdynamic Description . . . . .	217
13.2.3. Reconciliation of Kinetic and Gasdynamic Definitions of Physically Infinitesimal Scales . . . . .	218
13.2.4. Smoothing Over Physically Infinitesimal Volume. Physical Knudsen Parameter . . . . .	219
13.3. Generalized Kinetic Equation for Unified Description of Kinetic and Gasdynamic Processes . . . . .	220
13.4. H-Theorem for Generalized Kinetic Equation. Entropy Flux and Entropy Production. Lyapunov Functionals . . . . .	225
13.4.1. H-Theorem . . . . .	226
13.4.2. State of Local Equilibrium . . . . .	227
13.4.3. Lyapunov Functional $\Lambda_S$ for Closed System . . . . .	228
13.4.4. Non-Closed System. Lyapunov Functional $\Lambda_F$ . . . . .	229
13.5. Definition of Thermal Flux for Arbitrary Knudsen Numbers . . . . .	231
13.6. Thermal Flux in External Field . . . . .	233

<b>14. Transition from Generalized Kinetic Equation to Equations of Gas Dynamics . . . . .</b>	235
14.1. Equations of Gas Dynamics with Self-Diffusion . . . . .	235
14.2. Diffusion Stage of Relaxation Towards Equilibrium . . . . .	239
14.3. Wave Excitations in Gas Dynamics . . . . .	243
14.4. Navier – Stokes Equation for “Incompressible” Gas . . . . .	245
14.5. Equation of Entropy Balance for “Incompressible” Gas . . . . .	247
14.6. Thermal Convection in Rarefied Gas . . . . .	248
14.6.1. Generalized Kinetic Equation for Description of Thermal Convection . . . . .	248
14.6.2. Gasdynamic Equations for Convective Motion . . . . .	249
14.7. Condition of Instability of Convective Motion . . . . .	251
14.8. Kinetic and Gasdynamic Description of Heat Transfer . . . . .	255
<b>15. Nonlinear Brownian Motion . . . . .</b>	258
15.1. Two Ways of Describing Brownian Motion . . . . .	259
15.1.1. Langevin Equation . . . . .	259
15.1.2. Fokker – Planck Equation . . . . .	260
15.2. Brownian Motion in Medium with Nonlinear Friction. Three Forms of Fokker – Planck Equation . . . . .	261
15.3. Fokker – Planck Equation for Boltzmann Gas . . . . .	266
15.4. Smoluchowski Equation, Master Equation . . . . .	269
15.5. Two Ways of Transition from Master Equation to Fokker – Planck Equation . . . . .	271
15.6. Master Equation for System of Atoms in Electromagnetic Field . . . . .	276
15.7. Brownian Motion of Quantum Atoms Oscillators . . . . .	279
15.7.1. Master Equation . . . . .	279
15.7.2. Fokker – Planck Equation . . . . .	281
15.8. Master Equations for One-Step Processes . . . . .	281
15.8.1. Traditional Definition of Transition Probability . . . . .	281
15.8.2. Non-Traditional Definition of Transition Probability . . . . .	284
15.9. Spatial Diffusion. Einstein – Smoluchowski Equation . . . . .	286
15.9.1. Spatial Diffusion. Langevin Method . . . . .	287
15.9.2. Diffusion of Brownian Particle in External Field . . . . .	288
15.9.3. Stationary Distributions in “Linear” and “Nonlinear” Thermostats . . . . .	291
15.10. Hydrodynamic Description of Brownian Motion . . . . .	292
15.11. Evolution of Free Energy and Entropy at Brownian Motion. Lyapunov Functionals $\Lambda_F$ , $\Lambda_S$ . . . . .	295
15.11.1. Master Equation. H-Theorem . . . . .	295
15.11.2. Fokker – Planck Equation. H-Theorem . . . . .	298
15.11.3. Einstein – Smoluchowski Equation. H-Theorem . . . . .	298
<b>16. Examples of Nonlinear Brownian Motion . . . . .</b>	300
16.1. Brownian Motion in Self-Oscillatory Systems. Van der Pol Oscillator . . . . .	300
16.2. Van der Pol Oscillator. Symmetrized Nonlinearity . . . . .	304
16.3. Combined Action of Natural and External Noise . . . . .	307
16.4. Symmetrized Oscillator. Distribution of Coordinates and Velocities . . . . .	308
16.5. H-Theorem for Van der Pol Oscillator . . . . .	309
16.6. Self-Organization in Van der Pol Oscillator. S-Theorem . . . . .	312
16.7. Oscillator with Inertial Nonlinearity . . . . .	315
16.8. Bifurcations of Energy of Limiting Cycle. Oscillators with Multistable Stationary States . . . . .	317

<b>16.9. Oscillators in Discrete Time. Bifurcations of Energy of Limiting Cycle and Period of Oscillations . . . . .</b>	322
<b>16.10. Criterion of Stability upon Transition to Discrete Time Based on H-Theorem . . . . .</b>	325
<b>16.11. Brownian Motion in Chemically Reacting Systems. Partially Ionized Plasma . . . . .</b>	329
<b>16.12. Malthus – Verhulst Process . . . . .</b>	332
 <b>17. Nonlinear Brownian Motion. Unified Description of Kinetic, Hydrodynamic and Diffusion Processes . . . . .</b>	335
<b>17.1. Generalized Kinetic Equation in Theory of Brownian Motion . . . . .</b>	335
<b>17.2. Diffusion Description of Brownian Motion . . . . .</b>	339
<b>17.3. Two Models of Harmonic Oscillators . . . . .</b>	341
17.3.1. Brownian Motion in Plasma Oscillatory Circuit . . . . .	341
17.3.2. Brownian Motion in Dielectric Oscillatory Circuit . . . . .	345
<b>17.4. Brownian Motion of Atoms Oscillators . . . . .</b>	346
<b>17.5. Brownian Motion in Oscillator with Nonlinear Frequency. Van der Pol – Duffing System . . . . .</b>	349
<b>17.6. Time of Crossing a Barrier . . . . .</b>	352
<b>17.7. Mutual Influence of Equilibrium and Nonequilibrium Phase Transitions . . . . .</b>	355
17.7.1. Effect of Phase Transition in Ferroelectric on Generation of Laser Radiation . . . . .	355
17.7.2. Effect of Phase Transition in Liquid Crystal on Characteristics of Laser Radiation . . . . .	356
<b>17.8. Evolution Towards Stationary State in Systems with Two Controlling Parameters. H-Theorem . . . . .</b>	357
<b>17.9. Optimization of Process of Evolution in Space of Controlling Parameters Based on S-Theorem . . . . .</b>	358
 <b>18. Kinetic Theory of Active Media . . . . .</b>	361
<b>18.1. Kinetic Equations of Reaction Diffusion Type. Kinetic and Gasdynamic Description of Heat Transfer in Active Medium . . . . .</b>	362
<b>18.2. Manifestations of Structure of “Continuous Medium” in Processes of Time Relaxation . . . . .</b>	365
<b>18.3. Medium of Bistable Elements. Kinetic Approach in Theory of Phase Transitions . . . . .</b>	367
18.3.1. Kinetic Equation . . . . .	367
18.3.2. “Hydrodynamic Approximation” in Statistical Theory of Active Media . . . . .	369
<b>18.4. Lyapunov Functionals <math>\Lambda_F</math>, <math>\Lambda_S</math>. H-Theorem . . . . .</b>	371
<b>18.5. Example of Generalized FKPP Equation . . . . .</b>	374
<b>18.6. Temperature as Controlling Parameter at Phase Transitions . . . . .</b>	376
18.6.1. Landau’s Theory. Kinetic Approach . . . . .	376
18.6.2. Relative Degree of Order at Phase Transitions. S-Theorem . . . . .	377
<b>18.7. Medium of Bound Oscillators . . . . .</b>	380
<b>18.8. Kinetic Description of Media with Chemical Reactions . . . . .</b>	383
 <b>19. Kinetic Theory of Fluctuations in Active Media . . . . .</b>	387
<b>19.1. Unified Description of Kinetic and Hydrodynamic Fluctuations . . . . .</b>	388
<b>19.2. Kinetic Fluctuations at Brownian Motion . . . . .</b>	390
19.2.1. Langevin Source in Fokker – Planck Equation . . . . .	390
19.2.2. Langevin Source in Einstein – Smoluchowski Equation . . . . .	391
19.2.3. Time Correlations at Brownian Motion . . . . .	394

<b>19.3. Calculation of Hydrodynamic Fluctuations Based on Boltzmann's Kinetic Theory . . . . .</b>	398
19.3.1. General Properties of Langevin Source in Boltzmann Equation . . . . .	398
19.3.2. Langevin Sources in Equations of Gas Dynamics . . . . .	399
<b>19.4. Traditional Calculation of Fluctuations of Gasdynamic Functions. Langevin Method . . . . .</b>	402
19.4.1. Langevin Equations for Gasdynamic Functions . . . . .	402
19.4.2. High-Frequency Fluctuations $\delta p$ , $\delta \rho$ , $\delta T$ , $\delta u^l$ . . . . .	404
19.4.3. Low-Frequency Fluctuations $\delta p$ , $\delta T$ , $\delta s$ . Inconsistencies of Traditional Calculation of Gasdynamic Fluctuations . . . . .	407
<b>19.5. Calculation of Hydrodynamic Functions with Self-Diffusion . . . . .</b>	408
<b>19.6. Kinetic Fluctuations in Active Medium . . . . .</b>	411
19.6.1. Langevin Source in Kinetic Equation . . . . .	412
19.6.2. Langevin Source in Reaction-Diffusion Equation . . . . .	413
19.6.3. Kinetic Fluctuations at Heat Transfer in Active Medium . . . . .	416
 <b>20. Anomalous Brownian Motion. Equilibrium and Nonequilibrium Natural Flicker Noise and Residual Time Correlations . . . . .</b>	421
20.1. Equilibrium Natural Flicker Noise . . . . .	422
20.2. Theory of Equilibrium Natural Flicker Noise . . . . .	423
20.3. Residual Time Correlations . . . . .	429
20.4. Langevin Equation for Domain of Flicker Noise . . . . .	430
20.5. Flicker Noise in Space of Wave Numbers . . . . .	431
20.6. Natural Flicker Noise in Finite Active Systems at Reaction-Diffusion Processes . . . . .	432
20.6.1. Active Medium of Bistable Elements . . . . .	432
20.6.2. Flicker Noise at Heat Transfer in Medium with Heat Source . . . . .	435
20.7. Flicker Noise in Media Composed of Elements with Complex Behavior . . . . .	435
20.8. Natural Flicker Noise in Music . . . . .	437
20.9. Flicker Noise and Superconductivity . . . . .	439
20.10. Spectrum of Thermal Radiation in Superconductors: Violation of Rayleigh – Jeans Law in Domain of Flicker Noise . . . . .	444
20.11. Flicker Noise of System of Independent Sources with Exponential Distribution of Relaxation Times . . . . .	445
20.12. Diffusion in Space of Fractal (Fractional) Dimensionality. Anomalous Brownian Motion . . . . .	446
 <b>21. Criteria of Self-Organization . . . . .</b>	450
21.1. Evolution in Time. Degradation and Self-Organization. H-Theorem . . . . .	451
21.2. Evolution in Space of Controlling Parameters. S-Theorem . . . . .	454
21.3. Assessment of Relative Degree of Order from Spectra . . . . .	459
21.4. Distribution Function of Separation of Trajectories . . . . .	460
21.5. K-Entropy and Lyapunov Indices at Dynamic and Statistical Description of Complex Motion . . . . .	462
21.6. Nonlinear Characteristic of Divergence of Trajectories. $K_{nl}$ -Entropy . . . . .	464
21.7. K-Entropy and Entropy Production. Statistical Analog of K-entropy . . . . .	466
21.8. Evolution in Space of Controlling Parameters. S-Theorem . . . . .	468
21.9. Renyi Entropy in Statistical Theory of Open Systems . . . . .	470
 21.10. Self-Organization upon Transition Across Gas-Liquid Critical Point . . . . .	475
21.11. Some Unsolved Problems . . . . .	480

<b>22. Turbulent Motion. Kinetic Description of Turbulence . . . . .</b>	483
22.1. Is Turbulent Motion Chaos or Order? . . . . .	484
22.2. Characteristic Features of Turbulent Motion . . . . .	485
22.3. Incompressible Liquid. Reynolds Equations and Stresses . . . . .	487
22.4. Hydrodynamic Instability and Onset of Turbulence . . . . .	491
22.5. Well-Developed Turbulence. Number of Degrees of Freedom . . . . .	491
22.6. Intensity of Langevin Source, Entropy Production and Turbulent Viscosity for Well-Developed Turbulence . . . . .	494
22.7. Semi-Empirical Prandtl – Karman Theory . . . . .	498
22.8. Onset of Steady Turbulent Flow. Evaluation of Critical Reynolds Number . . . . .	500
22.9. Entropy Production at Laminar and Turbulent Flows . . . . .	506
22.10. Entropy Decrease upon Transition from Laminar to Turbulent Flow . . . . .	508
22.11. Arguments in Favor of Kinetic Description of Turbulent Motion . . . . .	511
22.11.1. Maximum Values of Reynolds Number in Kolmogorov Theory . . . . .	511
22.11.2. Problem of Closure in Kinetic and Hydrodynamic Description . . . . .	512
22.11.3. Equation of Entropy Balance for Turbulent Motion in Incompressible Liquid . . . . .	514
22.12. Two Possible Kinetic Descriptions of Turbulent Motion . . . . .	514
22.13. Analogy with Gas-Liquid Transition in Van der Waals System . . . . .	517
22.14. Unified Kinetic Description of Laminar and Turbulent Motion . . . . .	518
22.15. Kinetic Description of Steady Turbulent Poiseuille Flow in Flat Channel . . . . .	519
22.16. Equation of Entropy Balance for Turbulent Motion . . . . .	521
22.17. What Is Turbulent Motion? Final Remarks . . . . .	523
<b>23. Bridge from Classical Statistical Theory of     Open Systems to Quantum Theory . . . . .</b>	525
23.1. Microscopic and Macroscopic Schrödinger Equations . . . . .	528
23.2. Electron in Equilibrium Electromagnetic Field . . . . .	535
23.3. Equilibrium State of System of Electrons and Field. Fluctuation-Dissipation Relation . . . . .	538
23.4. Transition from Reversible Dynamic Equations to Dissipative Equations of “Continuous Medium” . . . . .	543
23.5. Example of Ground State Structure . . . . .	547
23.6. Is the Concept of “Pure Ensemble” Justified in Quantum Mechanics? Is Quantum Mechanical Description Complete? Are There “Hidden Parameters” in Quantum Theory? . . . . .	551
<b>Conclusion . . . . .</b>	555
<b>References . . . . .</b>	557