

Table of Contents

THE CONDITIONS IN WHICH THE INITIAL STATE OF THE UNIVERSE IS A DE SITTER STATE

M.A. Markov, V.F. Mukhanov 1.

DENSITY MATRICES AND WIGNER FUNCTIONS OF QUASICLASSICAL QUANTUM SYSTEMS

V.V. Dodonov, V.I. Man'ko

1. Introduction	7
2. Quantum Description of Systems with Linear Equations of Motion by Wigner Functions within the Scope of Fokker-Planck Equations	8
3. Integrals of Motion of the Fokker-Planck Equation	17
4. A Damped Quantum Oscillator	20
5. Eigenfunctions of Quadratic Hamiltonians in the Wigner Representation	36
6. Universal Invariants of Quantum Systems	42
7. Quantum Corrections to the Distribution Function of Charged Particles in a Nonuniform Electromagnetic Field	58
8. A Comparison of Quasiclassical and Exact Formulae for the Singular Oscillator Case	62
9. The Quasiclassical Propagator and Density Matrix of a Particle in a Uniform Field on the Semiaxis	65
10. Quantum Oscillator Relaxation in a Magnetic Field	74
11. Bibliography	90

VACUUM POLARIZATION EFFECTS OF MASSIVE FIELDS IN ALGEBRAICALLY-SPECIAL SPACES

A.I. Zel'nikov, V.P. Frolov

1. Introduction	102
2. Effective Action	104
3. Vacuum Polarization in Algebraically-Special Gravitational Fields	111
4. Vacuum Polarization in the Gravitational Field of a Rotating Black Hole	116
5. Bibliography	126

DAMPING AND FLUCTUATIONS IN SYSTEMS OF COUPLED QUANTUM OSCILLATORS

R. Glauber, V.I. Man'ko

1. Introduction	130
2. A Damped Quantum Oscillator	131
3. A Forced Oscillator	138
4. A System of Two Coupled Oscillators	146
5. Correlation Functions	157
6. A System of N-Coupled Oscillators	161
7. An N-Dimensional Forced Oscillator	170
8. Bibliography	174

THE AHARONOV-BOHM EFFECT: THEORETICAL CALCULATIONS AND INTERPRETATIONS

V.D. Skarzhinskiy

1. Introduction	176
2. The Vector-Potential of a Solenoid, Gauge Transformations and the Single-Valuedness Requirement of the Wave Functions	178
3. Solenoid Charged Particle Scattering	183
4. The Aharonov-Bohm Effect for Bound States	191
5. The Switching on Procedure and the Aharonov-Bohm Effect	196
6. Bibliography	201

**REPRESENTATION THEORY AND THE PARAMETRIC
EXCITATION OF QUANTUM SYSTEMS**

V.V. Dodonov, V.I. Man'ko, S.M. Chumakov

1. Introduction	209
2. Nonstationary Singular Oscillator	210
3. Correlation Functions	214
4. Generating Functions and Sum Rules	218
5. Multidimensional Systems	227
6. Bibliography	229

**GENERALIZED CANONICAL FORMALISM AND THE S-MATRIX OF
THEORIES WITH CONSTRAINTS OF THE GENERAL TYPE**

T.Ye. Fradkina

1. Introduction	233
2. The Quantization of Relativistic Systems with Bose-Fermi First and Second Class Constraints. Ward Identities	242
3. The Application of Quantization Theory of Systems with Constraints to Relativistic Systems	249
4. Generating Functional for Momentum-Quadratic Systems	256
5. Relativistic Membrane: Rank-n Gauge Theory. Generalized Canonical Quantization and the S-Matrix	268
6. Bibliography	273

**SELECT GEOMETRIC AND GROUP METHODS IN THE
THEORY OF COMPLETELY INTEGRABLE NONLINEAR EQUATIONS**

Ye.V. Doktorov

1. Introduction	275
2. The Wahlquist-Estabrook Method and the Geometry of Fiber Spaces	277
3. Sigma-Model for the Ernst Equation: The Lax Representation and Backlund Transformations	285
4. Backlund Transformations for Axially-Symmetrical Bogomol'niy Equations	289
5. Bibliography	294

DYNAMICAL SYMMETRIES OF NONLINEAR EQUATIONS

A.N. Leznov, V.I. Man'ko, S.M. Chumakov

1. Introduction	299
2. Completely Integrable Dynamical Systems	301
3. Soliton Solutions Associated with Algebra $sl(2, R)$	305
4. Soliton Solutions of the Periodic Toda Lattice (Series A_k)	315
5. A List of Completely Integrable Nonlinear Equations	324
6. Conclusion	347
7. Appendix	348
8. Bibliography	350
SUBJECT INDEX	361