

1. Record Nr.	UNINA9910818294403321
Autore	Cook David B
Titolo	Probability and Schrodinger's mechanics // David B. Cook
Pubbl/distr/stampa	River Edge, NJ, : World Scientific, c2002
ISBN	981-277-640-0
Edizione	[1st ed.]
Descrizione fisica	1 online resource (xviii, 323 p.)
Disciplina	530.12
Soggetti	Quantum theory Probabilities
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Bibliographic Level Mode of Issuance: Monograph
Nota di bibliografia	Includes bibliographical references and index.
Nota di contenuto	pt. 1. Preliminaries. ch. 1. Orientation and outlook. 1.1. General orientation. 1.2. Materialism. 1.3. Materialism and realism. 1.4. Logic. 1.5. Mathematics. 1.6. Reversing abstraction. 1.7. Definitions, laws of nature and causality. 1.8. Foundations. 1.9. Axioms. 1.10. An interpreted theory -- pt. 2. Probabilities. ch. 2. Simple probabilities. 2.1. Colloquial and mathematical terminology. 2.2. Probabilities for finite systems. 2.3. Probability and statistics. 2.4. Probabilities in deterministic systems. 2.5. The referent of probabilities and measurement. 2.6. Preliminary summary -- ch. 3. A more careful look at probabilities. 3.1. Abstract objects. 3.2. States and probability distributions. 3.3. The formal definition of probability. 3.4. Time-dependent probabilities. 3.5. Random tests. 3.6. Particle-distribution probabilities -- pt. 3. Classical mechanics. ch. 4. The Hamilton-Jacobi equation. 4.1. Historical connections. 4.2. The H-J equation. 4.3. Solutions of the H-J equation. 4.4. Distribution of trajectories. 4.5. Summary -- ch. 5. Angular momentum. 5.1. Coordinates and momenta. 5.2. The angular momentum "vector". 5.3. The Poisson prackets and angular momentum. 5.4. Components of the angular momentum "vector". 5.5. Conclusions for angular momentum -- pt. 4. Schrödinger's mechanics. ch. 6. Prelude: particle diffraction. 6.1. History. 6.2. The wave theory. 6.3. The particle theory. 6.4. A simple case. 6.5. Experimental verification. 6.6. The answer to a rhetorical question. 6.7. Conclusion -- ch. 7. The genesis of Schrödinger's mechanics. 7.1. Lagrangians, Hamiltonians, variation principles. 7.2.

Replacing the Hamilton-Jacobi equation. 7.3. Generalising the action S. 7.4. Schrödinger's dynamical law. 7.5. Probability distributions? 7.6. Summary of basic principles -- ch. 8. The Schrödinger equation. 8.1. The variational derivation. 8.2. Some interpretation. 8.3. The boundary conditions. 8.4. The time-independent Schrödinger equation -- ch. 9. Identities: momenta and dynamical variables. 9.1. Momentum definitions and distributions. 9.2. Abstract particles of constant momentum. 9.3. Action and momenta in Schrödinger's mechanics. 9.4. Momenta and kinetic energy. 9.5. Boundary conditions. 9.6. The "particle in a box" and cyclic boundary conditions -- ch. 10. Abstracting the structure. 10.1. The idea of mathematical structure. 10.2. States and Hilbert space. 10.3. The real use of abstract structures.

pt. 5. Interpretation from applications. ch. 11. The quantum Kepler problem. 11.1. Two interacting particles. 11.2. Quantum Kepler problem in a plane. 11.3. Abstract and concrete hydrogen atoms. 11.4. The Kepler problem in three dimensions. 11.5. The separation of the Schrödinger equation. 11.6. Commuting operators and conservation. 11.7. The less familiar separations. 11.8. Conservation in concrete and abstract systems. 11.9. Conclusions from the Kepler problem -- ch. 12. The harmonic oscillator and fields. 12.1. The Schrödinger equation for SHM. 12.2. SHM details. 12.3. Factorisation method. 12.4. Interpreting the SHM solutions. 12.5. Vibrations of fields and "particles". 12.6. Second quantisation -- ch. 13. Perturbation theory and epicycles. 13.1. Perturbation theories in general. 13.2. Perturbed Schrödinger equations. 13.3. Polarisation of electron distribution. 13.4. Interpretation of perturbation theory. 13.5. Quantum theory and epicycles. 13.6. Approximations to non-existent functions. 13.7. Summary for perturbation theory -- ch. 14. Formalisms and "hidden" variables. 14.1. The semi-empirical method. 14.2. The chemical bond. 14.3. Dirac's spin "Hamiltonian". 14.4. Interpretation of the spin Hamiltonian -- pt. 6. Disputes and paradoxes. ch. 15. Measurement at the microscopic level. 15.1. Recollection: concrete and abstract objects. 15.2. Statistical estimates of probabilities. 15.3. Measurement as "state preparation". 15.4. Heisenberg's uncertainty principle. 15.5. Measurement generalities -- ch. 16. Paradoxes. 16.1. The classical limit. 16.2. The Einstein-Podolsky-Rosen (EPR) paradox. 16.3. Bell's assumptions. 16.4. Zero-point energy -- ch. 17. Beyond Schrödinger's mechanics? 17.1. An interregnum? 17.2. The avant-garde. 17.3. The break with the past. 17.4. Classical and quantum mechanics.

Sommario/riassunto

This book addresses some of the problems of interpreting Schrödinger's mechanics - the most complete and explicit theory falling under the umbrella of "quantum theory". The outlook is materialist ("realist") and stresses the development of Schrödinger's mechanics from classical theories and its close connections with (particularly) the Hamilton-Jacobi theory. Emphasis is placed on the concepts and use of the modern objective (measure-theoretic) probability theory. The work is free from any mention of the bearing of Schrödinger's mechanics on God, his alleged mind or, indeed, minds at all. The author has taken the naïve view that this mechanics is about the structure and dynamics of atomic and sub-atomic systems since he has been unable to trace any references to minds, consciousness or measurements in the foundations of the theory.
