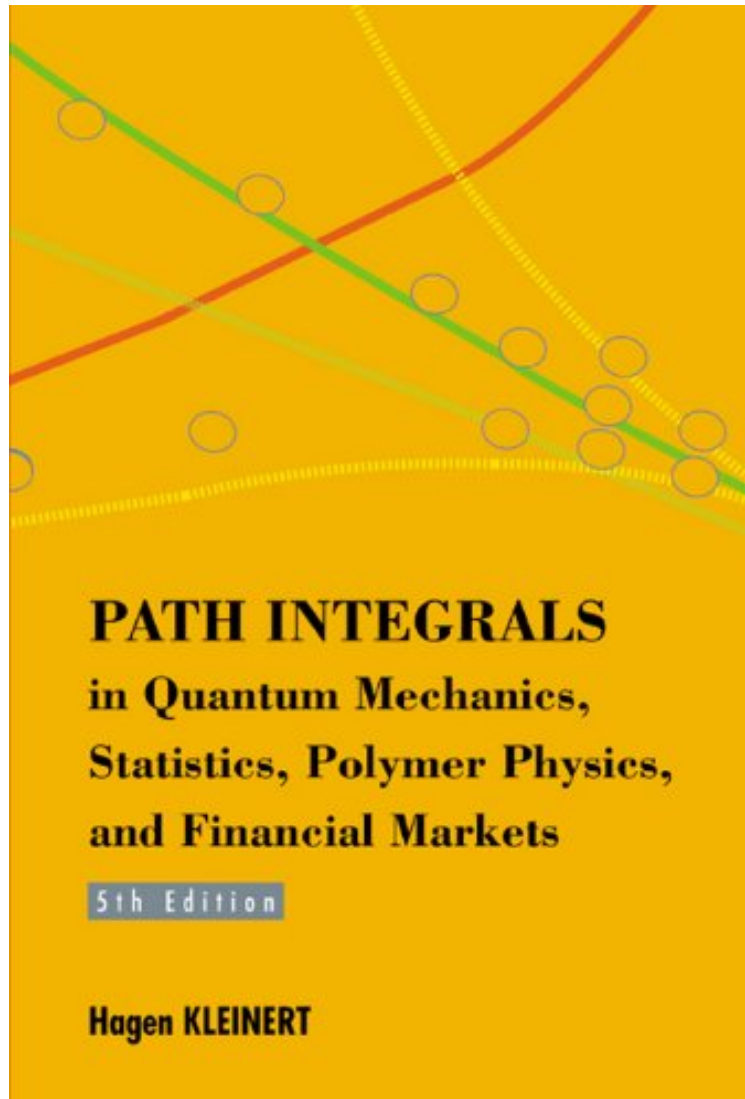


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Path Integrals in Quantum Mechanics, Statistics, Polymer Physics, and Financial Markets

Hagen Kleinert

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Hagen Kleinert : Path Integrals in Quantum Mechanics, Statistics, Polymer Physics, and Financial Markets before purchasing it in order to gauge whether or not it would be worth my time, and all praised Path Integrals in Quantum Mechanics, Statistics, Polymer Physics, and Financial Markets:

1 of 1 people found the following review helpful. Remarkable... and giganticBy JosephThough I haven't read very much of this enormous tome, I like the idea of reading it (some day). Kleinert has been extremely thorough here, and his expository style is excellent. One word of caution: if you're mathematically oriented and are looking for a rigorous

foundation of functional integration of the kind used in Feynman's approach to quantum mechanics, you won't find it here. This book concerns itself more with explaining and displaying the many uses of path integration, than with the foundations of the subject. That said, I highly recommend this fascinating book. 2 of 2 people found the following review helpful. Very good book. By Francisco Ortiz Arango This is an excellent book for people who already know a little of the issue of path integrals, but for someone Neophyte be difficult to understand. Its applications are excellent. 0 of 1 people found the following review helpful. A Bible for applications of path integrals By Weidong SU This is absolutely a great work for theoretical physicists in current time who are interested in various aspects of applications of an important tool of mathematical physics.

This is the fifth, expanded edition of the comprehensive textbook published in 1990 on the theory and applications of path integrals. It is the first book to explicitly solve path integrals of a wide variety of nontrivial quantum-mechanical systems, in particular the hydrogen atom. The solutions have been made possible by two major advances. The first is a new euclidean path integral formula which increases the restricted range of applicability of Feynman's time-sliced formula to include singular attractive $1/r$ - and $1/r^2$ -potentials. The second is a new nonholonomic mapping principle carrying physical laws in flat spacetime to spacetimes with curvature and torsion, which leads to time-sliced path integrals that are manifestly invariant under coordinate transformations. In addition to the time-sliced definition, the author gives a perturbative, coordinate-independent definition of path integrals, which makes them invariant under coordinate transformations. A consistent implementation of this property leads to an extension of the theory of generalized functions by defining uniquely products of distributions. The powerful Feynman-Kleinert variational approach is explained and developed systematically into a variational perturbation theory which, in contrast to ordinary perturbation theory, produces convergent results. The convergence is uniform from weak to strong couplings, opening a way to precise evaluations of analytically unsolvable path integrals in the strong-coupling regime where they describe critical phenomena. Tunneling processes are treated in detail, with applications to the lifetimes of supercurrents, the stability of metastable thermodynamic phases, and the large-order behavior of perturbation expansions. A variational treatment extends the range of validity to small barriers. A corresponding extension of the large-order perturbation theory now also applies to small orders. Special attention is devoted to path integrals with topological restrictions needed to understand the statistical properties of elementary particles and the entanglement phenomena in polymer physics and biophysics. The Chern-Simons theory of particles with fractional statistics (anyons) is introduced and applied to explain the fractional quantum Hall effect. The relevance of path integrals to financial markets is discussed, and improvements of the famous Black-Scholes formula for option prices are developed which account for the fact, recently experienced in the world markets, that large fluctuations occur much more frequently than in Gaussian distributions. Contents: Fundamentals Path Integrals — Elementary Properties and Simple Solutions External Sources, Correlations, and Perturbation Theory Semiclassical Time Evolution Amplitude Variational Perturbation Theory Path Integrals with Topological Constraints Many Particle Orbits — Statistics and Second Quantization Path Integrals in Polar and Spherical Coordinates Wave Functions Spaces with Curvature and Torsion Schrödinger Equation in General Metric-Affine Spaces New Path Integral Formula for Singular Potentials Path Integral of Coulomb System Solution of Further Path Integrals by Duru-Kleinert Method Path Integrals in Polymer Physics Polymers and Particle Orbits in Multiply Connected Spaces Tunneling Nonequilibrium Quantum Statistics Relativistic Particle Orbits Path Integrals and Financial Markets Readership: Students and researchers in theoretical physics.

"Kleinert's book presents the reader with a very complete and very thorough discussion of path integration ... a new extensive and, again, rather complete chapter has been added on the use of path integration techniques in the analysis of financial markets. This chapter would do well in any high-level course on stochastic financial models and is a wonderful occasion for candidate mathematical and theoretical physicists to realize what great potential there hides still in the methodologies and techniques that have been developed ... It profits from the clarity and conciseness that is also a hallmark of Kleinert's scientific papers ... this volume is highly recommendable for any student considering majoring in theoretical physics or chemistry, and an absolute must for any lecturer in this area ... In fact, I don't know of any excuse not to have your own copy." the best single book on the subject: the depth of knowledge and exposition is representative of a true master scholar -- Australian Physics "Australian Physics" From the Inside Flap This is the fifth, expanded edition of the comprehensive textbook published in 1990 on the theory and applications of path integrals. It is the first book to explicitly solve path integrals of a wide variety of nontrivial quantum-mechanical systems, in particular the hydrogen atom. The solutions have been made possible by two major advances. The first is a new euclidean path integral formula which increases the restricted range of applicability of Feynman's time-sliced formula to include singular attractive $1/r$ - and $1/r^2$ -potentials. The second is a new nonholonomic mapping principle carrying physical laws in flat spacetime to spacetimes with curvature and torsion, which leads to time-sliced path integrals that are manifestly invariant under coordinate transformations. In addition to the time-sliced definition, the author gives a perturbative, coordinate-independent definition of path integrals, which makes them invariant under

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