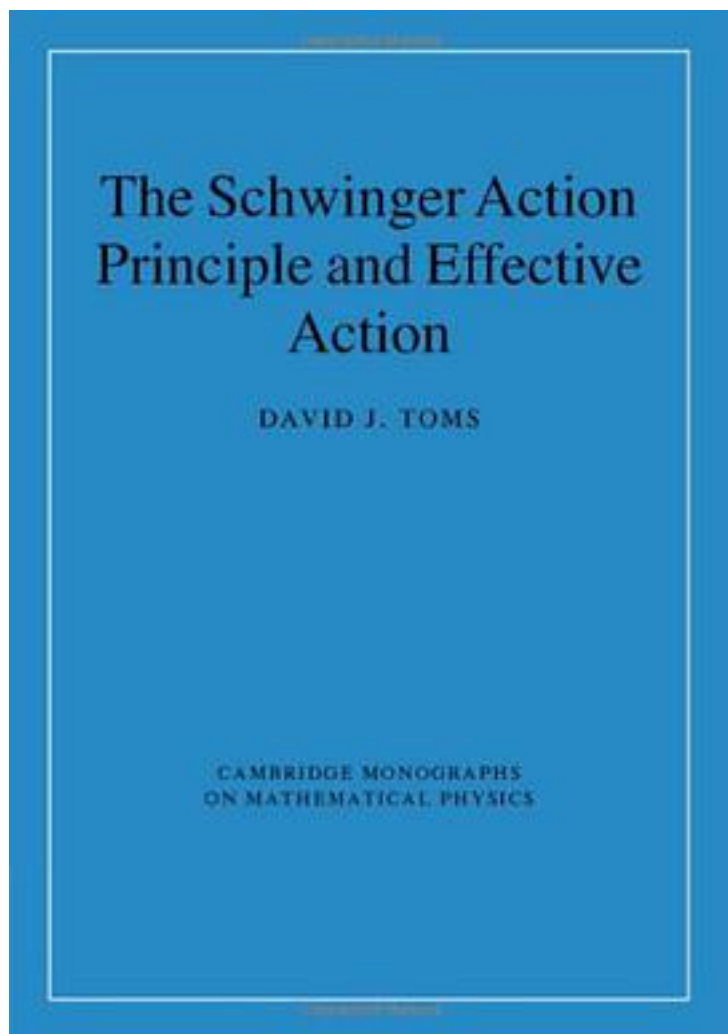# The Schwinger Action Principle and Effective Action

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著者:Toms, David J.

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This book is an introduction to the Schwinger action principle in quantum mechanics and quantum field theory, with applications to a variety of different models, not only those of interest to particle physics. The book begins with a brief review of the action principle in classical mechanics and classical field theory. It then moves on to quantum field theory, focusing on the effective action method. This is introduced as simply as possible by using the zero-point energy of the simple harmonic oscillator as the starting point. This allows the utility of the method, and the process of regularization and renormalization of quantum field theory, to be demonstrated with a minimum of formal development. The book concludes with a more complete definition of the effective action, and demonstrates how the provisional definition used earlier is the first term in the systematic loop expansion. Several applications of the Schwinger action principle are given, including Bose–Einstein condensation, the Casimir effect, and trapped Fermi gases. The renormalization of interacting scalar field theory is presented to two-loop order. This book will interest graduate students and researchers in theoretical physics who are familiar with quantum mechanics.

作者介绍:

David Toms is Reader in Mathematical Physics in the School of Mathematics and Statistics at Newcastle University. Prior to joining Newcastle University, Dr. Toms was a NATO Science Fellow at Imperial College London, and a postdoctoral Fellow at the University of Wisconsin-Milwaukee. His research interests include the formalism of quantum field theory and its applications, and his most recent interests are centred around Kaluza–Klein theory, based on the idea that there are extra spatial dimensions beyond the three obvious ones.

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