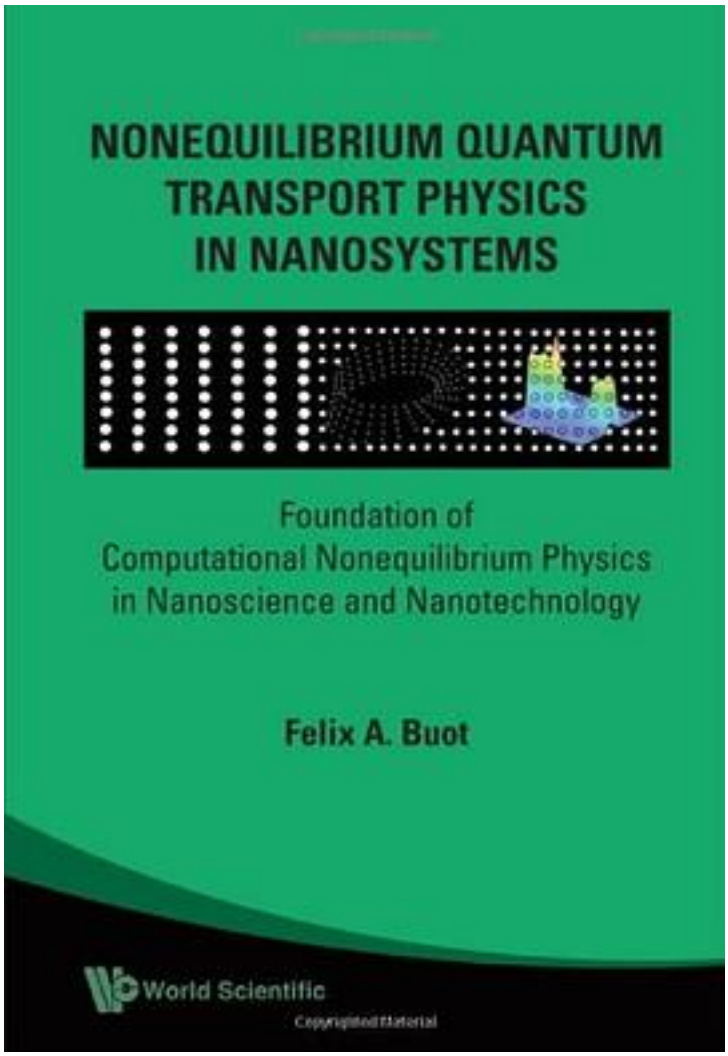
Nonequilibrium Quantum Transport Physics In Nanosystems



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著者:Felix A. Buot

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This book presents the first comprehensive treatment of discrete phase-space quantum mechanics and the lattice Weyl-Wigner formulation of energy band dynamics, by the originator of these theoretical techniques. Also included is the author's quantum superfield theoretical technique for nonequilibrium quantum physics, without the awkward use of artificial time contour employed in previous formulations of nonequilibrium physics. These two main quantum theoretical techniques combine to yield general and exact quantum transport equations in phase-space, appropriate for nonlinear open systems, including excitation-pairing dynamics. The derivation of Landauer and Landauer-Buttiker formulas in mesoscopic physics from the general quantum transport equations is also treated. New emerging nanodevices for digital and communication applications are discussed in the light of the quantum-transport physics equations, and an in-depth treatment of the physics of resonant tunneling devices is given. Extension of discrete phase-space quantum mechanics on finite fields is briefly discussed for completeness, together with its relevance to quantum computing. In addition, quantum information theory is covered in an effort to shed more light on the foundation of quantum dynamics, along with selected topics on nonequilibrium nanosystems in quantum biology.

作者介绍:

目录:

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