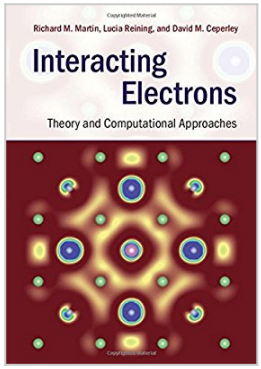

Interacting Electrons: Theory and Computational Approaches

By Richard M. Martin, Lucia Reining, David M. Ceperley

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Recent progress in the theory and computation of electronic structure is bringing an unprecedented level of capability for research. Many-body methods are becoming essential tools vital for quantitative calculations and understanding materials phenomena in physics, chemistry, materials science and other fields. This book provides a unified exposition of the most-used tools: many-body perturbation theory, dynamical mean field theory and quantum Monte Carlo simulations. Each topic is introduced with a less technical overview for a broad readership, followed by in-depth descriptions and mathematical formulation. Practical guidelines, illustrations and exercises are chosen to enable readers to appreciate the complementary approaches, their relationships, and the advantages and disadvantages of each method. This book is designed for graduate students and researchers who want to use and understand these advanced computational tools, get a broad overview, and acquire a basis for participating in new developments.

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Richard M. Martin is Emeritus Professor at the University of Illinois, Urbana-Champaign, and Consulting Professor at Stanford University. He has made extensive contributions to the field of modern electronic structure methods and the theory of interacting electron systems and and he is the author of the companion book Electronic Structure: Basic Theory and Methods.

Lucia Reining is CNRS senior researcher at the Ecole Polytechnique Palaiseau and founding member of the European Theoretical Spectroscopy Facility. Her work covers many-body perturbation theory and time-dependant density functional theory and she is a recipient of the CNRS Silver Medal and a Fellow of the American Physical Society.

David M. Ceperley is Blue Waters Professor at the University of Illinois, Urbana-Champaign, where he has pioneered the quantum Monte Carlo method, including the development of variational, diffusion and path integral Monte Carlo. He is a member of the US National Academy of Sciences and recipient of the Rahman Prize for Computational Physics of the APS and the Feenberg Medal for many-body physics.

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