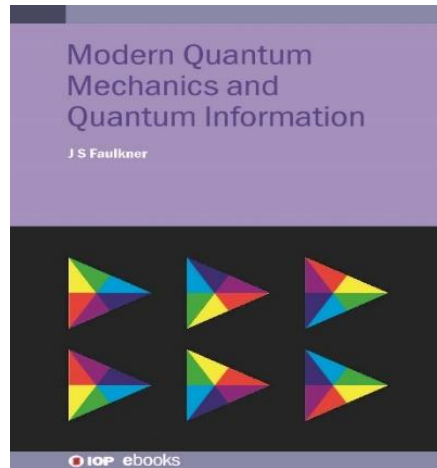


Toward Moving Puncture Simulations with the GHG System



The choice of topics and emphasis in Modern Quantum Mechanics and Quantum Information stem from the demonstrated interests of the physics community. Those interests are best illustrated by the list of the divisions of the American Physical Society (APS) that represent physicists who use quantum mechanics. The divisions established between 1943 and 1950 cover the fields of atomic physics, condensed matter physics, and chemical physics. The interest in applying the developments in those fields to the understanding of commercially interesting materials instigated the establishment of the Division of Materials Physics in 1984, and the fact that these applications require the development of techniques to carry out quantum calculations on large supercomputers prompted the foundation of the Division of Computational Physics in 1986. In 2017, the rapidly growing applications of quantum mechanics into such new areas as quantum computing and quantum cryptography led to the establishment of the Division of Quantum Information.

Topics in Modern Quantum Mechanics and Quantum Information that do not appear in older texts are the following. A mathematically sound treatment of delta functions and the rigged Hilbert space. A large chapter on relativistic Dirac theory. The explanation of chemical bonds and energy band theory. A separate chapter on group theory including Lie groups. A chapter on exotic quantum phenomena. A chapter on interpretations of quantum theory. Two chapters on quantum computers and quantum cryptography that prepare the student to read and understand Shor's fundamental paper. Many-body theory including density functional theory and Feynman diagrams.