<<量子系统中的几何相位>>

图书基本信息

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前言

对于国内的物理学工作者和青年学生来讲，研读国外优秀的物理学著作是系统掌握物理学知识的一个重要手段。
但是，在国内并不能及时、方便地买到国外的图书，且国外图书不菲的价格往往令国内的读者却步，因此，把国外的优秀物理原著引进到国内，让国内的读者能够方便地以较低的价格购买是一项意义深远的工作，将有助于国内物理学工作者和青年学生掌握国际物理学的前沿知识，进而推动我国物理学科研和教学的发展。
为了满足国内读者对国外优秀物理学著作的需求，科学出版社启动了引进国外优秀著作的工作，出版社的这一举措得到了国内物理学界的积极响应和支持，很快成立了专家委员会，开展了选题的推荐和筛选工作，在出版社初选的书单基础上确定了第一批引进的项目，这些图书几乎涉及了近代物理学的所有领域，既有阐述学科基本理论的经典名著，也有反映某一学科专题前沿的专著。
在选择图书时，专家委员会遵循了以下原则：基础理论方面的图书强调“经典”，选择了那些经得起时间检验、对物理学的发展产生重要影响、现在还不“过时”的著作（如狄拉克的《量子力学原理》）。
反映物理学某一领域进展的著作强调“前沿”和“热点”，根据国内物理学研究发展的实际情况，选择了能够体现相关学科最新进展，对有关方向的科研人员和研究生有重要参考价值的图书。
这些图书都是最新版的，多数图书都是2000年以后出版的，还有相当一部分是当年出版的新书。
因此，这套丛书具有权威性、前瞻性和应用性强的特点。
由于国外出版社的要求，科学出版社对部分图书进行了少量的翻译和注释（主要是目录标题和练习题），但这并不会影响图书“原汁原味”的感觉，可能还会方便国内读者的阅读和理解。
“他山之石，可以攻玉”，希望这套丛书的出版能够为国内物理学工作者和青年学生的工作和学习提供参考，也希望国内更多专家参与到这一工作中来，推荐更多的好书。

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内容概要

Aimed at graduate physics and chemistry students, this is the first comprechenslve monograph covering the concept of thegeometric phase in quantum physics from its mathematical foundations to its physical applications and experimental manifestations. It contains all the premises of the adiabatic Berry phase as well as the exact Anandan-Aharonov phase. It discusses quantum systems in a classical time-independent environment (time dependent Hamiltonians) and quantum systems in a changing environment (gauge theoryofmolecular physics). The mathematical methods used are a combination of differential geometry and the theory of Iinear operators in Hilbert Space. As a result, the monograph demonstrates how non-trivial gauge theories naturally arise and how the consequences can be experimentally observed. Readers benefit by gaining a deep understanding of the long-ignored gauge theoretic effects of quantum methanics and how to measure them.

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书籍目录

章节摘录

6.1 Introduction In the preceding chapter, we have developed the parts of the theory of fiber bundles which are relevant to our study of geometric phases and briefly described gauge theories. We introduced abstract gauge theories as generalizations of the Abelian gauge theory of electromagnetism. There is also another Abelian gauge theory which we encountered in Chap. 4. We call the latter the Abelian gauge theory of quantum mechanics. The parameter space of this gauge theory is the projective Hilbert space P（H） associated with a Hilbert space H, the matter fields are the pure state vectors which belong to H, the gauge or symmetry group is the group U（1） of the phases of the state vectors,and the gauge potential is the Aharonov-Anandan （A-A） connection. The defining PFB associated with this gauge theory is the A-A bundle n whose structure is determined by the Hilbert space H. The A-A connection defines a natural geometric structure on n. The associated vector bundle to that yields the state vectors as its global sections is the one defined by the standard representation of U（1）. Thus it is a complex line bundle over 9（H）. In this chapter, we shall present a detailed description of the mathematical structure of the Abelian gauge theory of quantum mechanics. In particular we offer different holonomy interpretations of the Abelian geometric phase and reveal their relationship. 6.2 Holonomy Interpretations of the Geometric Phase In Chap. 4, we outlined a holonomy interpretation of the geometric phase."This interpretation used the U（1） PFB n （4.33） and identified the phase with the holonomy of a particular connection which we called the AharonovAnandan （A-A） connection. We shall devote this section to a more systematic discussion of the holonomy interpretations of the geometric phase. We shall start our analysis by first describing an alternative interpretation of the adiabatic phase.

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