

**Applications of Group Theory
in Quantum Mechanics**

M. I. Petrashen & E. D. Trifonov

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Dover Books On Physics

Arturo Cuomo



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The Theory of Groups and Quantum Mechanics Hermann Weyl, 1950-01-01 This landmark among mathematics texts applies group theory to quantum mechanics first covering unitary geometry quantum theory groups and their representations then applications themselves rotation Lorentz permutation groups symmetric permutation groups and the algebra of symmetric transformations **Group Theory and Quantum Mechanics** Michael Tinkham, 2003-12-17 Graduate level text develops group theory relevant to physics and chemistry and illustrates their applications to quantum mechanics with systematic treatment of quantum theory of atoms molecules solids 1964 edition **Group Theory and Its Application to Physical Problems** Morton Hamermesh, 2012-04-26 One of the best written most skillful expositions of group theory and its physical applications directed primarily to advanced undergraduate and graduate students in physics especially quantum physics With problems **Symmetry** R. McWeeny, 2002-01-01 This well organized volume develops the elementary ideas of both group theory and representation theory in a progressive and thorough fashion Designed to allow students to focus on any of the main fields of application it is geared toward advanced undergraduate and graduate physics and chemistry students 1963 edition Appendices **Applications of Group Theory in Quantum Mechanics** M. I. Petrashen, J. L. Trifonov, 2013-01-03 Geared toward postgraduate students theoretical physicists and researchers this advanced text explores the role of modern group theoretical methods in quantum theory The authors based their text on a physics course they taught at a prominent Soviet university Readers will find it a lucid guide to group theory and matrix representations that develops concepts to the level required for applications The text's main focus rests upon point and space groups with applications to electronic and vibrational states Additional topics include continuous rotation groups permutation groups and Lorentz groups A number of problems involve studies of the symmetry properties of the Schrodinger wave function as well as the explanation of additional degeneracy in the Coulomb field and certain subjects in solid state physics The text concludes with an instructive account of problems related to the conditions for relativistic invariance in quantum theory **Group Theory** Eugene Wigner, 2012-12-02 **Group Theory And Its Application To The Quantum Mechanics Of Atomic Spectra** aims to describe the application of group theoretical methods to problems of quantum mechanics with specific reference to atomic spectra Chapters 1 to 3 discuss the elements of linear vector theory while Chapters 4 to 6 deal more specifically with the rudiments of quantum mechanics itself Chapters 7 to 16 discuss the abstract group theory invariant subgroups and the general theory of representations These chapters are mathematical although much of the material covered should be familiar from an elementary course in quantum theory Chapters 17 to 23 are specifically concerned with atomic spectra as is Chapter 25 The remaining chapters discuss topics such as the recoupling Racah coefficients the time inversion operation and the classical interpretations of the coefficients The text is recommended for physicists and mathematicians who are interested in the application of group theory to quantum mechanics Those who are only interested in mathematics can choose to focus on

the parts more devoted to that particular area of the subject

Group Theory in Quantum Mechanics Volker Heine, 2014-05-15 Group Theory in Quantum Mechanics An Introduction to its Present Usage introduces the reader to the three main uses of group theory in quantum mechanics to label energy levels and the corresponding eigenstates to discuss qualitatively the splitting of energy levels as one starts from an approximate Hamiltonian and adds correction terms and to aid in the evaluation of matrix elements of all kinds and in particular to provide general selection rules for the non zero ones The theme is to show how all this is achieved by considering the symmetry properties of the Hamiltonian and the way in which these symmetries are reflected in the wave functions This book is comprised of eight chapters and begins with an overview of the necessary mathematical concepts including representations and vector spaces and their relevance to quantum mechanics The uses of symmetry properties and mathematical expression of symmetry operations are also outlined along with symmetry transformations of the Hamiltonian The next chapter describes the three uses of group theory with particular reference to the theory of atomic energy levels and transitions The following chapters deal with the theory of free atoms and ions representations of finite groups the electronic structure and vibrations of molecules solid state physics and relativistic quantum mechanics Nuclear physics is also discussed with emphasis on the isotopic spin formalism nuclear forces and the reactions that arise when the nuclei take part in time dependent processes This monograph will be of interest to physicists and mathematicians

Group Theory Paul Herman Ernst Meijer, Edmond Bauer, 1962

Applications of Group Theory in Physics and Mathematical Physics Moshé Flato, Paul Sally, Gregg Zuckerman, 1985-12-31 The past decade has seen a renewal in the close ties between mathematics and physics The Chicago Summer Seminar on Applications of Group Theory in Physics and Mathematical Physics held in July 1982 was organized to bring together a broad spectrum of scientists from theoretical physics mathematical physics and various branches of pure and applied mathematics in order to promote interaction and an exchange of ideas and results in areas of common interest This volume contains the papers submitted by speakers at the Seminar The reader will find several groups of articles varying from the most abstract aspects of mathematics to a concrete phenomenological description of some models applicable to particle physics The papers have been divided into four categories corresponding to the principal topics covered at the Seminar This is only a rough division and some papers overlap two or more of these categories

Theoretical Mechanics of Particles and Continua Alexander L. Fetter, John Dirk Walecka, 2003-12-16 This two part text fills what has often been a void in the first year graduate physics curriculum Through its examination of particles and continua it supplies a lucid and self contained account of classical mechanics which in turn provides a natural framework for introducing many of the advanced mathematical concepts in physics The text opens with Newton's laws of motion and systematically develops the dynamics of classical particles with chapters on basic principles rotating coordinate systems lagrangian formalism small oscillations dynamics of rigid bodies and hamiltonian formalism including a brief discussion of the transition to quantum mechanics This part of the book also

considers examples of the limiting behavior of many particles facilitating the eventual transition to a continuous medium The second part deals with classical continua including chapters on string membranes sound waves surface waves on nonviscous fluids heat conduction viscous fluids and elastic media Each of these self contained chapters provides the relevant physical background and develops the appropriate mathematical techniques and problems of varying difficulty appear throughout the text

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