Classical And Quantum Dynamics Springer

Quantum Dynamics with Trajectories Quantum Dynamics Quantum Dynamics with Trajectories Molecular Quantum Dynamics *Molecular Spectroscopy and Quantum Dynamics* Many-Particle Quantum Dynamics in Atomic and Molecular Fragmentation *Classical and Quantum Dynamics* **Introduction to Quantum Control and Dynamics Intermediate Spectral Theory and Quantum Dynamics Multidimensional Quantum Dynamics Computational Strong-Field Quantum Dynamics** *Research Advances in Quantum Dynamics* **Adiabatic Perturbation Theory in Quantum Dynamics Elements of Photoionization Quantum Dynamics Methods Quantum Dynamics of a Particle in a Tracking Chamber** Classical and Quantum Dynamics in Condensed Phase Simulations **Quantum Dynamics** *Applications of Quantum Dynamics in Chemistry* **Introduction to Quantum Control and Dynamics** *The Picture Book of Quantum Mechanics* Numerical Quantum Dynamics **The Classical and Quantum Dynamics of the Multispherical Nanostructures Essays on Classical and Quantum Dynamics** *Applications of Quantum Dynamics in Chemistry Quantum Dynamics of Simple Systems Variational Principles in Dynamics and Quantum Theory* **Quantum Mechanics Quantum Dynamics for Classical Systems** Quantum Mechanics of Molecular Rate Processes **The Physics of Quantum Mechanics** Chaos in Classical and Quantum Mechanics **Geometric Quantization and Quantum Mechanics Quantum Mechanics Quantum Mechanics Dynamics of Classical and Quantum Fields** Stochastic and Quantum Dynamics of Biomolecular Systems **Introduction to Quantum Mechanics** Information Dynamics *Methods for Quantum Dynamics, Localization and Quantum Machine Learning* **Classical and Quantum Dynamics of Constrained Hamiltonian Systems**

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Variational Principles in Dynamics and Quantum Theory Sep 07 2020 DIVHistorical, theoretical survey with many insights, much hard-to-find material. Hamilton’s principle, Hamilton-Jacobi equation, etc. /div

Quantum Dynamics Oct 01 2022 Even though time-dependent spectroscopic techniques continue to push the frontier of chemical physics, they receive scant mention in introductory courses and are poorly covered in standard texts. Quantum Dynamics: Applications in Biological and Materials Systems bridges the gap between what is traditionally taught in a one-semester quantum chemistr

Quantum Dynamics of a Particle in a Tracking Chamber Aug 19 2021 In the original formulation of quantum mechanics the existence of a precise border between a microscopic world, governed by quantum mechanics, and a macroscopic world, described by classical mechanics was assumed. Modern theoretical and experimental physics has moved that border several times, carefully investigating its definition and making available to observation larger and larger quantum systems. The present book examines a paradigmatic case of the transition from quantum to classical behavior: A quantum particle is revealed in a tracking chamber as a trajectory obeying the laws of classical mechanics. The authors provide here a purely quantum-mechanical description of this behavior, thus helping to illuminate the nature of the border between the quantum and the classical.

Computational Strong-Field Quantum Dynamics Dec 23 2021 This graduate textbook introduces the com-putational techniques to study ultra-fast quantum dynamics of matter exposed to strong laser fields. Coverage includes methods to propagate wavefunctions according to the time dependent Schrödinger, Klein-Gordon or Dirac equation, the calculation of typical observables, time-dependent density functional theory, multi configurational time-dependent Hartree-Fock, time-dependent configuration interaction singles, the strong-field approximation, and the microscopic particle-in-cell approach. Contents How to propagate a wavefunction? Calculation of typical strong-field observables Time-dependent relativistic wave equations: Numerics of the Dirac and the Klein-Gordon equation Time-dependent density functional theory The multiconfiguration time-dependent Hartree-Fock method Time-dependent configuration interaction singles Strong-field approximation and quantum orbits Microscopic particle-in-cell approach

The Classical and Quantum Dynamics of the Multispherical Nanostructures Jan 12 2021 In this book, the issues regarding the theory of optics and quantum optics of spherical multilayered systems are studied. In such systems the spatial scale of layers becomes comparable with the wavelength of radiation, which complicates the analysis of important quantities such as reflectivity and transmission. Often, a large amount of time is spent on performing numerical calculations and simulation to elucidate the behavior of such electromagnetic properties. The author has written down the calculation details of important properties of multilayered microspheres in a more comprehensive manner, so that undergraduates and practitioners can follow them freely. From a skill-oriented point of view the book covers the following: electrodynamics of multilayered environments in the spherical geometry; methods of calculating both reflection and transmission coefficients from an alternating stack; calculations of eigenfrequencies and quality factors of electromagnetic oscillations; radial distribution ofthe electromagnetic field in a spherical cavity; computer methods of calculations with C++ as basic languages and construction of the graphic user interface (GUI); the object-oriented approach as a basis of the modern methods of calculation.

Quantum Mechanics of Molecular Rate Processes Jun 04 2020 This survey of applications of the theory of collisions and rate processes to molecular problems explores collisions of molecules with internal structure, generalized Ehrenfest theorem, theory of reactive collisions, and role of symmetry. It also reviews partitioning technique, equivalent potentials and quasibound states, theory of direct reactions, more. 1969 edition.

Many-Particle Quantum Dynamics in Atomic and Molecular Fragmentation May 28 2022 This is the first comprehensive treatment of the interactions of atoms and molecules with charged particles, photons and laser fields. Addressing the subject from a unified viewpoint, the volume reflects our present understanding of many-particle dynamics in rearrangement and fragmentation reactions.

Quantum Dynamics with Trajectories Aug 31 2022 This is a rapidly developing field to which the author is a leading contributor New methods in quantum dynamics and computational techniques, with applications to interesting physical problems, are brought together in this book Useful to both students and researchers

Stochastic and Quantum Dynamics of Biomolecular Systems Oct 28 2019 Conference Location and Date: Jagna, Bohol, Philippines, 3-5 January 2008

Numerical Quantum Dynamics Feb 10 2021 It is an indisputable fact that computational physics form part of the essential landscape of physical science and physical education. When writing such a book, one is

faced with numerous decisions, e. g. : Which topics should be included? What should be assumed about the readers' prior knowledge? How should balance be achieved between numerical theory and physical application? This book is not elementary. The reader should have a background in qu- tum physics and computing. On the other way the topics discussed are not addressed to the specialist. This work bridges hopefully the gap between - vanced students, graduates and researchers looking for computational ideas beyond their fence and the specialist working on a special topic. Many imp- tant topics and applications are not considered in this book. The selection is of course a personal one and by no way exhaustive and the material presented obviously reflects my own interest. What is Computational Physics? During the past two decades computational physics became the third fun- mental physical discipline. Like the 'traditional partners' experimental physics and theoretical physics, computational physics is not restricted to a special area, e. g. , atomic physics or solid state physics. Computational physics is a meth- ical ansatz useful in all subareas and not necessarily restricted to physics. Of course this methods are related to computational aspects, which means nume- cal and algebraic methods, but also the interpretation and visualization of huge amounts of data.

The Picture Book of Quantum Mechanics Mar 14 2021 In learning quantum theory, intuitions developed for the classical world fail, and the equations to be solved are sufficiently complex that they require a computer except for the simplest situations. This book represents an attempt to jump the hurdle to an intuitive understanding of wave mechanics by using illustrations to present the time evolution and parameter dependence of wave functions in a wide variety of situations. Most of the illustrations are computer-generated solutions of the Schrödinger equation for one- and three-dimensional systems, with the situations discussed ranging from the simple particle in a box through resonant scattering in one dimension to the hydrogen atom and Regge classification of resonant scattering. Thoroughly revised and expanded to include a discussion of spin and magnetic resonance.

Research Advances in Quantum Dynamics Nov 21 2021 There continue at present many developments in the area of quantum mechanics and quantum dynamics in particular, of a very fundamental nature, all the way from implications for the foundations of physics to the influence of quantum mechanics on emerging technologies, such as the areas of quantum semiconductors and quantum computing, both of which are very important examples. It is hoped that the papers in this volume will be able to provide a much needed resource for researchers with regard to current fields of research in this dynamic area.

Applications of Quantum Dynamics in Chemistry May 16 2021 This book explains the usage and application of Molecular Quantum Dynamics, the methodology where both the electrons and the nuclei in a molecule are treated with quantum mechanical calculations. This volume of Lecture Notes in Chemistry addresses graduate students and postdocs in the field of theoretical chemistry, as well as postgraduate students, researchers and teachers from neighboring fields, such as quantum physics, biochemistry, biophysics, or anyone else who is interested in this rising method in theoretical chemistry, and who wants to gain experience in the opportunities it can offer. It can also be useful for teachers interested in illustrative examples of time-dependent quantum mechanics as animations of realistic wave packets have been designed to assist in visualization. Assuming a basic knowledge about quantum mechanics, the authors link their explanations to recent experimental investigations where Molecular Quantum Dynamics proved successful and necessary for the understanding of the experimental results. Examples including reactive scattering, photochemistry, tunneling, femto- and attosecond chemistry and spectroscopy, cold chemistry or crossed-beam experiments illustrate the power of the method. The book restricts complicated formalism to the necessary and in a self-contained and clearly explained way, offering the reader an introduction to, and instructions for, practical exercises. Continuative explanation and math are optionally supplemented for the interested reader. The reader learns how to apply example simulations with the MCTDH program package (Multi Configuration Time Dependent Hartree calculations). Readers can thus obtain the tools to run their own simulations and apply them to their problems. Selected scripts and program code from the examples are made available as supplementary material. This book bridges the gap between the existing textbooks on fundamental theoretical chemistry and research monographs focusing on sophisticated applications. It is a must-read for everyone who wants to gain a sound understanding of Molecular Quantum Dynamics simulations and to obtain basic experience in running their own simulations.

Intermediate Spectral Theory and Quantum Dynamics Feb 22 2022 The spectral theory of linear operators plays a key role in the mathematical formulation of quantum theory. This textbook provides a concise and comprehensible introduction to the spectral theory of (unbounded) self-adjoint operators and its application in quantum dynamics. Many examples and exercises are included that focus on quantum mechanics.

Quantum Dynamics for Classical Systems Jul 06 2020 Introduces number operators with a focus on the relationshipbetween quantum mechanics and social science Mathematics is increasingly applied to classical problems infinance, biology, economics, and elsewhere. Quantum Dynamics forClassical Systems describes how quantum tools—the numberoperator in particular—can be used to create dynamicalsystems in which the variables are operator-valued functions andwhose results explain the presented model. The book presentsmathematical results and their applications to concrete systems anddiscusses the methods used, results obtained, and techniquesdeveloped for the proofs of the results. The central ideas of number operators are illuminated whileavoiding excessive technicalities that are unnecessary forunderstanding and learning the various mathematical applications.The presented dynamical systems address a variety of contexts andoffer clear analyses and explanations of concluded results.Additional features in Quantum Dynamics for ClassicalSystems include: Applications across diverse fields including stock markets andpopulation migration as well as a unique quantum perspective onthese classes of models Illustrations of the use of creation and annihilation operatorsfor classical problems Examples of the recent increase in research and literature onthe many applications of quantum tools in applied mathematics Clarification on numerous misunderstandings and misnomers whileshedding light on new approaches in the field Quantum Dynamics for Classical Systems is an idealreference for researchers, professionals, and academics in appliedmathematics, economics, physics, biology, and sociology. The bookis also excellent for courses in dynamical systems, quantummechanics, and mathematical models.

Elements of Photoionization Quantum Dynamics Methods Sep 19 2021 The dynamics of quantum systems exposed to ultrafast (at the femtosecond time-scale) and strong laser radiation has a highly non-linear character, leading to a number of new phenomena, outside the reach of traditional spectroscopy. The current laser technology makes feasible the probing and control of quantum-scale systems with fields that are as strong as the interatomic Coulombic interactions and time resolution that is equal to (or less than) typical atomic evolution times. It is indispensable that any theoretical description of the induced physical processes should rely on the accurate calculation of the atomic structure and a realistic model of the laser radiation as pulsed fields. This book aims to provide an elementary introduction of theoretical and computational methods and by no means is anywhere near to complete. The selection of the topics as well as the particular viewpoint is best suited for early-stage students and researchers; the included material belongs in the mainstream of theoretical approaches albeit using simpler language without sacrificing mathematical accuracy. Therefore, subjects such as the Hilbert vector-state, density-matrix operators, amplitude equations, Liouville equation, coherent laser radiation, free-electron laser, Dyson-chronological operator, subspace projection, perturbation theory, stochastic density-matrix equations, time-dependent Schrödinger equation, partial-wave analysis, spherical-harmonics expansions, basis and grid wavefunction expansions, ionization, electron kinetic-energy and angular distributions are presented within the context of laser-atom quantum dynamics.

Methods for Quantum Dynamics, Localization and Quantum Machine Learning Jul 26 2019

Geometric Quantization and Quantum Mechanics Mar 02 2020 This book contains a revised and expanded version of the lecture notes of two seminar series given during the academic year 1976/77 at the Department of Mathematics and Statistics of the University of Calgary, and in the summer of 1978 at the Institute of Theoretical Physics of the Technical University Clausthal. The aim of the seminars was to present geometric quantization from the point of view· of its applica tions to quantum mechanics, and to introduce the quantum dynamics of various physical systems as the result of the geometric quantization of the classical dynamics of these systems. The group representation aspects of geometric quantiza tion as well as proofs of the existence and the uniqueness of the introduced structures can be found in the expository papers of Blattner, Kostant, Sternberg and Wolf, and also in the references quoted in these papers. The books of Souriau (1970) and Simms and Woodhouse (1976) present the theory of geometric

quantization and its relationship to quantum mech anics. The purpose of the present book is to complement the preceding ones by including new developments of the theory and emphasizing the computations leading to results in quantum mechanics.

Molecular Quantum Dynamics Jul 30 2022 This book focuses on current applications of molecular quantum dynamics. Examples from all main subjects in the field, presented by the internationally renowned experts, illustrate the importance of the domain. Recent success in helping to understand experimental observations in fields like heterogeneous catalysis, photochemistry, reactive scattering, optical spectroscopy, or femto- and attosecond chemistry and spectroscopy underline that nuclear quantum mechanical effects affect many areas of chemical and physical research. In contrast to standard quantum chemistry calculations, where the nuclei are treated classically, molecular quantum dynamics can cover quantum mechanical effects in their motion. Many examples, ranging from fundamental to applied problems, are known today that are impacted by nuclear quantum mechanical effects, including phenomena like tunneling, zero point energy effects, or non-adiabatic transitions. Being important to correctly understand many observations in chemical, organic and biological systems, or for the understanding of molecular spectroscopy, the range of applications covered in this book comprises broad areas of science: from astrophysics and the physics and chemistry of the atmosphere, over elementary processes in chemistry, to biological processes (such as the first steps of photosynthesis or vision). Nevertheless, many researchers refrain from entering this domain. The book "Molecular Quantum Dynamics" offers them an accessible introduction. Although the calculation of large systems still presents a challenge - despite the considerable power of modern computers - new strategies have been developed to extend the studies to systems of increasing size. Such strategies are presented after a brief overview of the historical background. Strong emphasis is put on an educational presentation of the fundamental concepts, so that the reader can inform himself about the most important concepts, like eigenstates, wave packets, quantum mechanical resonances, entanglement, etc. The chosen examples highlight that high-level experiments and theory need to work closely together. This book thus is a must-read both for researchers working experimentally or theoretically in the concerned fields, and generally for anyone interested in the exciting world of molecular quantum dynamics.

Adiabatic Perturbation Theory in Quantum Dynamics Oct 21 2021

Quantum Dynamics with Trajectories Nov 02 2022 This is a rapidly developing field to which the author is a leading contributor New methods in quantum dynamics and computational techniques, with applications to interesting physical problems, are brought together in this book Useful to both students and researchers

Multidimensional Quantum Dynamics Jan 24 2022 The first book dedicated to this new and powerful computational method begins with a comprehensive description of MCTDH and its theoretical background. There then follows a discussion of recent extensions of MCTDH, such as the treatment of identical particles, leading to the MCTDHF and MCTDHB methods for fermions and bosons. The third section presents a wide spectrum of very different applications to reflect the large diversity of problems that can be tackled by MCTDH. The result is handbook and ready reference for theoretical chemists, physicists, chemists, graduate students, lecturers and software producers.

Quantum Dynamics Jun 16 2021 Even though time-dependent spectroscopic techniques continue to push the frontier of chemical physics, they receive scant mention in introductory courses and are poorly covered in standard texts. Quantum Dynamics: Applications in Biological and Materials Systems bridges the gap between what is traditionally taught in a one-semester quantum chemistry course and the modern field of chemical dynamics, presenting the quantum theory of charge and energy transport in biological systems and optical-electronic materials from a dynamic perspective. Reviews the basics Taking a pedagogical approach, the book begins by reviewing the concepts of classical mechanics that are necessary for studying quantum mechanics. It discusses waves and wave functions and then moves on to an exploration of semiclassical quantum mechanics methods, an important part of the development and utilization of quantum theory. Time-independent and time-dependent perspectives The main focus of the book is the chapter on quantum dynamics, which begins with a brief review of the bound states of a coupled two-level system. This is discussed with a time-independent as well as a time-dependent perspective. The book also explores what happens when the two-level system has an additional harmonic degree of freedom that couples the transitions between the two states. The book reviews different ways in which one can represent the evolution of a quantum state, explores the quantum density matrix, and examines the basis for excitation energy transfer between molecules. Later chapters describe the pi electronic structure of conjugated organic systems and discuss electron-phonon coupling in conjugated systems and transport and dynamics in extended systems. Includes Mathematica(R) downloads On an accompanying website, Mathem

Introduction to Quantum Control and Dynamics Mar 26 2022 The introduction of control theory in quantum mechanics has created a rich, new interdisciplinary scientific field, which is producing novel insight into important theoretical questions at the heart of quantum physics. Exploring this emerging subject, Introduction to Quantum Control and Dynamics presents the mathematical concepts and fundamental physics behind the analysis and control of quantum dynamics, emphasizing the application of Lie algebra and Lie group theory. To advantage students, instructors and practitioners, and since the field is highly interdisciplinary, this book presents an introduction with all the basic notions in the same place. The field has seen a large development in parallel with the neighboring fields of quantum information, computation and communication. The author has maintained an introductory level to encourage course use. After introducing the basics of quantum mechanics, the book derives a class of models for quantum control systems from fundamental physics. It examines the controllability and observability of quantum systems and the related problem of quantum state determination and measurement. The author also uses Lie group decompositions as tools to analyze dynamics and to design control algorithms. In addition, he describes various other control methods and discusses topics in quantum information theory that include entanglement and entanglement dynamics. Changes to the New Edition: New Chapter 4: Uncontrollable Systems and Dynamical Decomposition New section on quantum control landscapes A brief discussion of the experiments that earned the 2012 Nobel Prize in Physics Corrections and revised concepts are made to improve accuracy Armed with the basics of quantum control and dynamics, readers will invariably use this interdisciplinary knowledge in their mathematics, physics and engineering work.

Quantum Mechanics Jan 30 2020 This textbook presents quantum mechanics at the junior/senior undergraduate level. It is unique in that it describes not only quantum theory, but also presents five laboratories that explore truly modern aspects of quantum mechanics. These laboratories include "proving" that light contains photons, single-photon interference, and tests of local realism. The text begins by presenting the classical theory of polarization, moving on to describe the quantum theory of polarization. Analogies between the two theories minimize conceptual difficulties that students typically have when first presented with quantum mechanics. Furthermore, because the laboratories involve studying photons, using photon polarization as a prototypical quantum system allows the laboratory work to be closely integrated with the coursework. Polarization represents a two-dimensional quantum system, so the introduction to quantum mechanics uses two-dimensional state vectors and operators. This allows students to become comfortable with the mathematics of a relatively simple system, before moving on to more complicated systems. After describing polarization, the text goes on to describe spin systems, time evolution, continuous variable systems (particle in a box, harmonic oscillator, hydrogen atom, etc.), and perturbation theory. The book also includes chapters which describe material that is frequently absent from undergraduate texts: quantum measurement, entanglement, quantum field theory and quantum information. This material is connected not only to the laboratories described in the text, but also to other recent experiments. Other subjects covered that do not often make their way into undergraduate texts are coherence, complementarity, mixed states, the density operator and coherent states. Supplementary material includes further details about implementing the laboratories, including parts lists and software for running the experiments. Computer simulations of some of the experiments are available as well. A solutions manual for end-of-chapter problems is available to instructors.

Applications of Quantum Dynamics in Chemistry Nov 09 2020 This book explains the usage and application of Molecular Quantum Dynamics, the methodology where both the electrons and the nuclei in a molecule are treated with quantum mechanical calculations. This volume of Lecture Notes in Chemistry addresses graduate students and postdocs in the field of theoretical chemistry, as well as postgraduate students, researchers and teachers from neighboring fields, such as quantum physics, biochemistry, biophysics, or

anyone else who is interested in this rising method in theoretical chemistry, and who wants to gain experience in the opportunities it can offer. It can also be useful for teachers interested in illustrative examples of time-dependent quantum mechanics as animations of realistic wave packets have been designed to assist in visualization. Assuming a basic knowledge about quantum mechanics, the authors link their explanations to recent experimental investigations where Molecular Quantum Dynamics proved successful and necessary for the understanding of the experimental results. Examples including reactive scattering, photochemistry, tunneling, femto- and attosecond chemistry and spectroscopy, cold chemistry or crossed-beam experiments illustrate the power of the method. The book restricts complicated formalism to the necessary and in a self-contained and clearly explained way, offering the reader an introduction to, and instructions for, practical exercises. Continuative explanation and math are optionally supplemented for the interested reader. The reader learns how to apply example simulations with the MCTDH program package (Multi Configuration Time Dependent Hartree calculations). Readers can thus obtain the tools to run their own simulations and apply them to their problems. Selected scripts and program code from the examples are made available as supplementary material. This book bridges the gap between the existing textbooks on fundamental theoretical chemistry and research monographs focusing on sophisticated applications. It is a must-read for everyone who wants to gain a sound understanding of Molecular Quantum Dynamics simulations and to obtain basic experience in running their own simulations.
Chaos in Classical and Quantum Mechanics Apr 02 2020 Describes the chaos apparent in simple mechanical systems with the goal of elucidating the connections between classical and quantum mechanics. It develops the relevant ideas of the last two decades via geometric intuition rather than algebraic manipulation. The historical and cultural background against which these scientific developments have occurred is depicted, and realistic examples are discussed in detail. This book enables entry-level graduate students to tackle fresh problems in this rich field.
Classical and Quantum Dynamics Apr 26 2022 Graduate students who wish to become familiar with advanced computational strategies in classical and quantum dynamics will find in this book both the fundamentals of a standard course and a detailed treatment of the time-dependent oscillator, Chern-Simons mechanics, the Maslov anomaly and the Berry phase, to name just a few topics. Well-chosen and detailed examples illustrate perturbation theory, canonical transformations and the action principle, and demonstrate the usage of path integrals. The fifth edition has been revised and enlarged to include chapters on quantum electrodynamics, in particular, Schwinger’s proper time method and the treatment of classical and quantum mechanics with Lie brackets and pseudocanonical transformations. It is shown that operator quantum electrodynamics can be equivalently described with c-numbers, as demonstrated by calculating the propagation function for an electron in a prescribed classical electromagnetic field.
Quantum Mechanics Dec 31 2019 Julian Schwinger, who shared the 1965 Nobel Prize for Physics for his pioneering work on quantum electrodynamics, had a considerable influence on the conceptual development of modern quantum field theory. He was a brilliant teacher and researcher, and this book demonstrates his outstanding ability to expose a difficult subject in a clear and concise style. In this book the whole of quantum kinematics and the underlying quantum action principle are derived through a systematic analysis of experimental phenomena. A unique legacy, these lecture notes of the Schwinger course held at the University of California at Los Angeles were carefully edited by his former collaborator Berthold-Georg Englert. They constitute a textbook on quantum mechanics and an indispensable source of reference.
Quantum Dynamics of Simple Systems Oct 09 2020 The present level of experimental sophistication in quantum physics allows physicists to explore domains unimaginable just a decade ago and to test the most fundamental laws of quantum mechanics. This has led to renewed interest in devising new tests, experiments, and devices where it is possible to observe the interaction and localization of just a few atoms or photons. These techniques have been used to reveal new nonclassical effects, to question the limit of the principle of correspondence, and to force quantum behavior in semiconductors. With contributions from leading experts in quantum systems, Quantum Dynamics of Simple Systems provides an overview of the present range of quantum dynamics, exploring their use and exotic behaviors. It covers specific subjects of quantum dynamics in a competent and detailed way with emphasis on simple systems where few atoms or electrons are involved. This volume will prove to be a useful tool for graduate students as well as experienced physicists.
Molecular Spectroscopy and Quantum Dynamics Jun 28 2022 Molecular Spectroscopy and Quantum Dynamics, an exciting new work edited by Professors Martin Quack and Roberto Marquardt, contains comprehensive information on the current state-of-the-art experimental and theoretical methods and techniques used to unravel ultra-fast phenomena in atoms, molecules and condensed matter, along with future perspectives on the field. Contains new insights into the quantum dynamics and spectroscopy of electronic and nuclear motion Presents the most recent developments in the detection and interpretation of ultra-fast phenomena Includes a discussion of the importance of these phenomena for the understanding of chemical reaction dynamics and kinetics in relation to molecular spectra and structure
Information Dynamics Aug 26 2019 This wide-ranging book introduces information as a key concept not only in physics, from quantum mechanics to thermodynamics, but also in the neighboring sciences and in the humanities. The central part analyzes dynamical processes as manifestations of information flows between microscopic and macroscopic scales and between systems and their environment. Quantum mechanics is interpreted as a reconstruction of mechanics based on fundamental limitations of information processing on the smallest scales. These become particularly manifest in quantum chaos and in quantum computing. Covering subjects such as causality, prediction, undecidability, chaos, and quantum randomness, the book also provides an information-theoretical view of predictability. More than 180 illustrations visualize the concepts and arguments. The book takes inspiration from the author's graduate-level topical lecture but is also well suited for undergraduate studies and is a valuable resource for researchers and professionals.
Quantum Mechanics Aug 07 2020 The important changes quantum mechanics has undergone in recent years are reflected in this approach for students. A strong narrative and over 300 worked problems lead the student from experiment, through general principles of the theory, to modern applications. Stepping through results allows students to gain a thorough understanding. Starting with basic quantum mechanics, the book moves on to more advanced theory, followed by applications, perturbation methods and special fields, and ending with developments in the field. Historical, mathematical and philosophical boxes guide the student through the theory. Unique to this textbook are chapters on measurement and quantum optics, both at the forefront of current research. Advanced undergraduate and graduate students will benefit from this perspective on the fundamental physical paradigm and its applications. Online resources including solutions to selected problems, and 200 figures, with colour versions of some figures, are available at www.cambridge.org/Auletta.
Introduction to Quantum Control and Dynamics Apr 14 2021 The introduction of control theory in quantum mechanics has created a rich, new interdisciplinary scientific field, which is producing novel insight into important theoretical questions at the heart of quantum physics. Exploring this emerging subject, Introduction to Quantum Control and Dynamics presents the mathematical concepts and fundamental physics behind the analysis and control of quantum dynamics, emphasizing the application of Lie algebra and Lie group theory. After introducing the basics of quantum mechanics, the book derives a class of models for quantum control systems from fundamental physics. It examines the controllability and observability of quantum systems and the related problem of quantum state determination and measurement. The author also uses Lie group decompositions as tools to analyze dynamics and to design control algorithms. In addition, he describes various other control methods and discusses topics in quantum information theory that include entanglement and entanglement dynamics. The final chapter covers the implementation of quantum control and dynamics in several fields. Armed with the basics of quantum control and dynamics, readers will invariably use this interdisciplinary knowledge in their mathematical, physics, and engineering work.
Classical and Quantum Dynamics of Constrained Hamiltonian Systems Jun 24 2019 This book is an introduction to the field of constrained Hamiltonian systems and their quantization, a topic which is of central interest to theoretical physicists who wish to obtain a deeper understanding of the quantization of gauge theories, such as describing the fundamental interactions in nature. Beginning with the early work of Dirac, the book covers the main developments in the field up to more recent topics, such as the field?antifield formalism of Batalin and Vilkovisky, including a short discussion of how gauge anomalies may

be incorporated into this formalism. All topics are well illustrated with examples emphasizing points of central interest. The book should enable graduate students to follow the literature on this subject without much problems, and to perform research in this field.

Classical and Quantum Dynamics in Condensed Phase Simulations Jul 18 2021 The school held at Villa Marigola, Lerici, Italy, in July 1997 was very much an educational experiment aimed not just at teaching a new generation of students the latest developments in computer simulation methods and theory, but also at bringing together researchers from the condensed matter computer simulation community, the biophysical chemistry community and the quantum dynamics community to confront the shared problem: the development of methods to treat the dynamics of quantum condensed phase systems. This volume collects the lectures delivered there. Due to the focus of the school, the contributions divide along natural lines into two broad groups: (1) the most sophisticated forms of the art of computer simulation, including biased phase space sampling schemes, methods which address the multiplicity of time scales in condensed phase problems, and static equilibrium methods for treating quantum systems; (2) the contributions on quantum dynamics, including methods for mixing quantum and classical dynamics in condensed phase simulations and methods capable of treating all degrees of freedom quantum-mechanically. Contents:Barrier Crossing: Classical Theory of Rare but Important Events (D Chandler)Monte Carlo Simulations (D Frenkel)Molecular Dynamics Methods for the Enhanced Sampling of Phase Space (B J Berne)Constrained and Nonequilibrium Molecular Dynamics (G Ciccotti & M Ferrario)From Erying to Kramers: Computation of Diffusive Barrier Crossing Rates (M J Ruiz-Montero)Monte Carlo Methods for Sampling of Rare Event States (W Janke)Proton Transfer in Ice (D Marx)Nudged Elastic Band Method for Finding Minimum Energy Paths of Transitions (H Jónsson et al.)RAW Quantum Transition State Theory (G Mills et al.)Dynamics of Peptide Folding (R Elber et al.)Theoretical Studies of Activated Processes in Biological Ion Channels (B Roux & S Crouzy)The Semiclassical Initial Value Representation for Including Quantum Effects in Molecular Dynamics Simulations (W H Miller)Tunneling in the Condensed Phase: Barrier Crossing and Dynamical Control (N Makri)Feynman Path Centroid Methods for Condensed Phase Quantum Dynamics (G A Voth)Quantum Molecular Dynamics Using Wigner Representation (V S Filinov et al.)Nonadiabatic Molecular Dynamics Methods for Diffusion (D Laria et al.)and other papers Readership: Computational and statistical physicists. Keywords:Quantum;Molecular Dynamics;DynamicsReviews: “… this volume is a useful introduction to currently popular, and widely-used techniques in chemical and statistical physics. The authors are well-respected researchers in the field and the level is appropriate to graduate students and researchers.” Journal of Statistical Physics

Introduction to Quantum Mechanics Sep 27 2019 Introduction to Quantum Mechanics covers quantum mechanics from a time-dependent perspective in a unified way from beginning to end. Intended for upper-level undergraduate and graduate courses this text will change the way people think about and teach quantum mechanics in chemistry and physics departments.

Dynamics of Classical and Quantum Fields Nov 29 2019 Dynamics of Classical and Quantum Fields: An Introduction focuses on dynamical fields in non-relativistic physics. Written by a physicist for physicists, the book is designed to help readers develop analytical skills related to classical and quantum fields at the non-relativistic level, and think about the concepts and theory through numerous problems. In-depth yet accessible, the book presents new and conventional topics in a self-contained manner that beginners would find useful. A partial list of topics covered includes: Geometrical meaning of Legendre transformation in classical mechanics Dynamical symmetries in the context of Noether’s theorem The derivation of the stress energy tensor of the electromagnetic field, the expression for strain energy in elastic bodies, and the Navier Stokes equation Concepts of right and left movers in case of a Fermi gas explained Functional integration is interpreted as a limit of a sequence of ordinary integrations Path integrals for one and two quantum particles and for a fermion in presence of a filled Fermi sea Fermion and boson Fock spaces, along with operators that create and annihilate particles Coherent state path integrals Many-body topics such as Schrieffer Wolff transformation, Matsubara, and Keldysh Green functions Geometrical meaning of the vortex-vortex correlation function in a charged boson fluid Nonlocal particle-hole creation operators which diagonalize interacting many-body systems The equal mix of novel and traditional topics, use of fresh examples to illustrate conventional concepts, and large number of worked examples make this book ideal for an intensive one-semester course for beginning Ph.D. students. It is also a challenging and thought provoking book for motivated advanced undergraduates.

The Physics of Quantum Mechanics May 04 2020 "First published by Cappella Archive in 2008."

Essays on Classical and Quantum Dynamics Dec 11 2020 A collection of essays suitable for college students or practitioners of theoretical physics, written for a symposium, "Fundamental problems in classical and quantum mechanics," in Washington, DC, October 1988. Among the classical topics are fractal time stochastics in the glass transition, Kovalevski exponents, and chaos in spin-wave systems. Quantum dynamics is discussed from such perspectives as topology and quantization, a simple normal-form approach to anharmonic oscillators, and channeling radiation of electrons in crystal lattices. In addition, one of the 13 essays discusses nonlinear dynamics in brain processes. Annotation copyrighted by Book News, Inc., Portland, OR