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# SEMICLASSICAL PHYSICS



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Matthias Brack  
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# Semiclassical Physics

**Harald Siegfried Friedrich**



## Semiclassical Physics:

*Semiclassical Physics* Matthias Brack, Rajat Bhaduri, 2018-03-05 This book attempts to convey to the reader that semiclassical physics can be fun as well as useful for understanding quantum fluctuations in interacting many body systems. It presents applications to finite fermion systems in diverse areas of physics. **Semiclassical Mechanics with Molecular Applications** M. S. Child, 2014-08-21 The second edition of an established graduate text, this book complements the material for a typical advanced graduate course in quantum mechanics by showing how the underlying classical structure is reflected in quantum mechanical interference and tunnelling phenomena and in the energy and angular momentum distributions of quantum mechanical states in the moderate to large  $10^3$  quantum number regime. Applications include accurate quantization techniques for a variety of tunnelling and curve crossing problems and of non separable bound systems; direct inversion of molecular scattering and spectroscopic data; wavepacket propagation techniques and the prediction and interpretation of elastic, inelastic and chemically reactive scattering. The main text concentrates less on the mathematical foundations than on the global influence of the classical phase space structures on the quantum mechanical observables. Further mathematical detail is contained in the appendices and worked problem sets are included as an aid to the student.

**Springer Handbook of Atomic, Molecular, and Optical Physics** Gordon W. F. Drake, 2023-02-09 Comprises a comprehensive reference source that unifies the entire fields of atomic, molecular and optical (AMO) physics, assembling the principal ideas, techniques and results of the field. 92 chapters written by about 120 authors present the principal ideas, techniques and results of the field together with a guide to the primary research literature, carefully edited to ensure a uniform coverage and style with extensive cross references. Along with a summary of key ideas, techniques and results, many chapters offer diagrams of apparatus, graphs and tables of data. From atomic spectroscopy to applications in comets, one finds contributions from over 100 authors, all leaders in their respective disciplines. Substantially updated and expanded since the original 1996 edition, it now contains several entirely new chapters covering current areas of great research interest that barely existed in 1996, such as Bose-Einstein condensation, quantum information and cosmological variations of the fundamental constants. A fully searchable CD-ROM version of the contents accompanies the handbook. Advances in Solid State Physics Bernhard Kramer, 2003-07-01 The 2001 Spring Meeting of the 65th Deutsche Physikalische Gesellschaft was held together with the 65. Physikertagung in Hamburg during the period March 26-30, 2001. With more than 3500 conference attendees, a record has again been achieved after several years of stabilisation in participation. This proves the continuing and now even increasing attraction of solid state physics, especially for young colleagues who often discuss for the first time their scientific results in public at this meeting. More than 2600 scientific papers were presented orally as well as posters, among them about 120 invited lectures from Germany and from abroad. This Volume 41 of *Advances in Solid State Physics* contains the written versions of half of the latter. We nevertheless hope that the book truly reflects the current state of the field.

Amazingly enough the majority of the papers as well as the discussions at the meeting concentrated on the nanostructured solid state This reflects the currently extremely intensive quest for developing the electronic and magnetic device generations of the future which stimulates science besides the challenge of the unknown as has always been the case since the very beginning of Solid State Physics about 100 years ago

**Theoretical Atomic Physics** Harald Friedrich, 2017-05-10 This expanded and updated well established textbook contains an advanced presentation of quantum mechanics adapted to the requirements of modern atomic physics It includes topics of current interest such as semiclassical theory chaos atom optics and Bose Einstein condensation in atomic gases In order to facilitate the consolidation of the material covered various problems are included together with complete solutions The emphasis on theory enables the reader to appreciate the fundamental assumptions underlying standard theoretical constructs and to embark on independent research projects The fourth edition of Theoretical Atomic Physics contains an updated treatment of the sections involving scattering theory and near threshold phenomena manifest in the behaviour of cold atoms and molecules Special attention is given to the quantization of weakly bound states just below the continuum threshold and to low energy scattering and quantum reflection just above Particular emphasis is laid on the fundamental differences between long ranged Coulombic potentials and shorter ranged potentials falling off faster than  $1/r^2$  at large distances  $r$  The new sections on tunable near threshold Feshbach resonances and on scattering in two spatial dimensions also address problems relevant for current and future research in the field of cold and ultra cold atoms Graduate students and researchers will find this book a valuable resource and comprehensive reference alike

*Advances In Atomic, Molecular, and Optical Physics* Benjamin Bederson, Herbert Walther, 1998-08-24 This volume contains the index for volumes 1-38 in the Advances in Atomic Molecular and Optical Physics series

**Theoretical Atomic Physics** Harald Siegfried Friedrich, 2005-12-27 This established text contains an advanced presentation of quantum mechanics adapted to the requirements of modern atomic physics The third edition extends the successful second edition with a detailed treatment of the wave motion of atoms and it also contains an introduction to some aspects of atom optics that are relevant for current and future experiments involving ultra cold atoms Included Various problems with complete solutions

**Compendium of Quantum Physics** Daniel Greenberger, Klaus Hentschel, Friedel Weinert, 2009-07-25 With contributions by leading quantum physicists philosophers and historians this comprehensive A to Z of quantum physics provides a lucid understanding of key concepts of quantum theory and experiment It covers technical and interpretational aspects alike and includes both traditional and new concepts making it an indispensable resource for concise up to date information about the many facets of quantum physics

**Quantum Physics, Volume 1** Vladimir Zelevinsky, 2010-12-28 This two volume set can be naturally divided into two semester courses and contains a full modern graduate course in quantum physics The idea is to teach graduate students how to practically use quantum physics and theory presenting the fundamental knowledge and gradually moving on to applications including

atomic nuclear and solid state physics as well as modern subfields such as quantum chaos and quantum entanglement The book starts with basic quantum problems which do not require full quantum formalism but allow the student to gain the necessary experience and elements of quantum thinking Only then does the fundamental Schrodinger equation appear The author has included topics that are not usually covered in standard textbooks and has written the book in such a way that every topic contains varying layers of difficulty so that the instructor can decide where to stop Although supplementary sources are not required Further reading is given for each chapter including references to scientific journals and publications and a glossary is also provided Problems and solutions are integrated throughout the text

Semiclassical Nonadiabatic Molecular Dynamics Chaoyuan Zhu, 2024-08-02 This book shows how to derive the simple and accurate semiclassical methods analytically and its applications to excited state molecular dynamics and spectroscopy simulation with and without classical trajectories It consists of eight chapters demonstrating interesting conical and intersystem driven photochemical processes in complex systems targeting on large scale ab initio direct nonadiabatic molecular dynamics It also includes two chapters dealing with time independent and time dependent nonadiabatic molecular dynamics and clarifies the underline principle of Born Oppenheimer approximation associated with coherence decoherence quantum effects that have a wide range of applications in photochemistry and photophysics This book is interesting and useful to a wide readership in the various fields of basic quantum chemistry and physics associated with large scale excited state simulation of nonadiabatic molecular dynamics and spectroscopy

**Interpreting Physics** Edward MacKinnon, 2011-11-23 This book is the first to offer a systematic account of the role of language in the development and interpretation of physics An historical conceptual analysis of the co evolution of mathematical and physical concepts leads to the classical quatum interface Bohrian orthodoxy stresses the indispensability of classical concepts and the functional role of mathematics This book analyses ways of extending and then going beyond this orthodoxy orthodoxy Finally the book analyzes how a revised interpretation of physics impacts on basic philosophical issues conceptual revolutions realism and reductionism

*Differential Equations and Mathematical Physics* Rudi Weikard, Gilbert Weinstein, 2000 This volume contains the proceedings of the 1999 International Conference on Differential Equations and Mathematical Physics The contributions selected for this volume represent some of the most important presentations by scholars from around the world on developments in this area of research The papers cover topics in the general area of linear and nonlinear differential equations and their relation to mathematical physics such as multiparticle Schr dinger operators stability of matter relativity theory fluid dynamics spectral and scattering theory including inverse problems Titles in this series are co published with International Press Cambridge MA

**Computational Physics** Karl H. Hoffmann, Michael Schreiber, 2012-12-06 Computational Physics Selected Methods Simple Exercises Serious Applications is an overview written by leading researchers of a variety of fields and developments Selected Methods introduce the reader to current fields including molecular dynamics hybrid Monte Carlo algorithms and neural networks

Simple Exercises give hands on advice for effective program solutions from a small number of lines to demonstration programs with elaborate graphics Serious Applications show how questions concerning for example aging many minima optimisation or phase transitions can be treated by appropriate tools The source code and demonstration graphics are included on a 3 5 MS DOS diskette [Encyclopedia of Nonlinear Science](#) Alwyn Scott,2006-05-17 In 438 alphabetically arranged essays this work provides a useful overview of the core mathematical background for nonlinear science as well as its applications to key problems in ecology and biological systems chemical reaction diffusion problems geophysics economics electrical and mechanical oscillations in engineering systems lasers and nonlinear optics fluid mechanics and turbulence and condensed matter physics among others [Applied Bohmian Mechanics](#) Xavier Oriols Pladevall,Jordi Mompart,2019-05-24 Most textbooks explain quantum mechanics as a story where each step follows naturally from the one preceding it However the development of quantum mechanics was exactly the opposite It was a zigzag route full of personal disputes where scientists were forced to abandon well established classical concepts and to explore new and imaginative pathways Some of the explored routes were successful in providing new mathematical formalisms capable of predicting experiments at the atomic scale However even such successful routes were painful enough so that relevant scientists like Albert Einstein and Erwin Schrödinger decided not to support them In this book the authors demonstrate the huge practical utility of another of these routes in explaining quantum phenomena in many different research fields Bohmian mechanics the formulation of the quantum theory pioneered by Louis de Broglie and David Bohm offers an alternative mathematical formulation of quantum phenomena in terms of quantum trajectories Novel computational tools to explore physical scenarios that are currently computationally inaccessible such as many particle solutions of the Schrödinger equation can be developed from it **Quantum Aspects Of Beam Physics - Advanced Icfa Beam Dynamics Workshop** Pisin Chen,1999-04-19 The frontiers of beam research point to increasingly high energy greater brightness and lower emittance beams with ever increasing particle species These demands in turn have triggered a rapidly growing number of beam phenomena that involve quantum effects Concurrently the violent accelerations which are becoming available through novel accelerator research may perhaps help to investigate fundamental physics associated with general relativity In view of these exciting developments and the important role they may play in the next century the world's first conference on the Quantum Aspects of Beam Physics held at Monterey California in January 1998 attracted a broad spectrum of experts from beam physics particle physics laser science astrophysics condensed matter physics nuclear and atomic physics At the end of the meeting a new term quantum beam physics was coined This book collects together the excellent reviews and papers on new advances in the field which were presented during the workshop It should be a valuable reference to all physicists interested in the frontiers of quantum beam physics [Handbook of Nanophysics](#) Klaus D. Sattler,2010-09-17 Providing the framework for breakthroughs in nanotechnology this landmark publication is the first comprehensive reference to cover both fundamental

and applied physics at the nanoscale After discussing the theoretical principles and measurements of nanoscale systems the organization of the set follows the historical development of nanoscience Each peer reviewed chapter presents a didactic treatment of the physics underlying the nanoscale materials applications and detailed experimental results State of the art scientific content is enriched with fundamental equations and illustrations many in color [Encyclopedia of Chemical Physics and Physical Chemistry](#) John H. Moore, Nicholas D. Spencer, 2023-07-03 The Encyclopedia of Physical Chemistry and Chemical Physics introduces possibly unfamiliar areas explains important experimental and computational techniques and describes modern endeavors The encyclopedia quickly provides the basics defines the scope of each subdiscipline and indicates where to go for a more complete and detailed explanation Particular attention has been paid to symbols and abbreviations to make this a user friendly encyclopedia Care has been taken to ensure that the reading level is suitable for the trained chemist or physicist The encyclopedia is divided in three major sections FUNDAMENTALS the mechanics of atoms and molecules and their interactions the macroscopic and statistical description of systems at equilibrium and the basic ways of treating reacting systems The contributions in this section assume a somewhat less sophisticated audience than the two subsequent sections At least a portion of each article inevitably covers material that might also be found in a modern undergraduate physical chemistry text METHODS the instrumentation and fundamental theory employed in the major spectroscopic techniques the experimental means for characterizing materials the instrumentation and basic theory employed in the study of chemical kinetics and the computational techniques used to predict the static and dynamic properties of materials APPLICATIONS specific topics of current interest and intensive research For the practicing physicist or chemist this encyclopedia is the place to start when confronted with a new problem or when the techniques of an unfamiliar area might be exploited For a graduate student in chemistry or physics the encyclopedia gives a synopsis of the basics and an overview of the range of activities in which physical principles are applied to chemical problems It will lead any of these groups to the salient points of a new field as rapidly as possible and gives pointers as to where to read about the topic in more detail **Advances in Chemical Physics, Volume 59, Index 1 - 55** Ilya Prigogine, Stuart A. Rice, 2009-09-08 The Advances in Chemical Physics series provides the chemical physics and physical chemistry fields with a forum for critical authoritative evaluations of advances in every area of the discipline Filled with cutting edge research reported in a cohesive manner not found elsewhere in the literature each volume of the Advances in Chemical Physics series serves as the perfect supplement to any advanced graduate class devoted to the study of chemical physics [Introduction to Quantum Mechanics](#) David Tannor, 2008-02-01 Introduction to Quantum Mechanics is a completely original manifesto covering quantum mechanics from a time dependent perspective in a unified way from beginning to end This text will change the way people think about and teach about quantum mechanics in chemistry and physics departments This brilliant new text a completely original manifesto covers quantum mechanics from a time dependent perspective in a unified way from beginning to end

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