# Alois Würger

# From Coherent Tunneling to Relaxation

Dissipative Quantum Dynamics of Interacting Defects

With 51 Figures





# **From Coherent Tunneling To Relaxation**

R.W. Munn, Andrzej Miniewicz, Bogdan Kuchta

#### From Coherent Tunneling To Relaxation:

**From Coherent Tunneling to Relaxation** Alois Wurger, 2014-01-15 From Coherent Tunneling to Relaxation Alois Würger, 2007-09-28 From Coherent Tunneling to Relaxation is an impressive review of ten years of progress in our understanding of interacting tunneling systems. The dielectric and elastic response of 111 off center impurities in alkalide halides is investigated in detail and the coherent motion of an impurity pair is discussed in view of recently observed rotary echoes The low temperature properties of defect crystals with an impurity concentration higher than 100 ppm are reviewed and the dipolar interaction is shown to drive the cross over to relaxational dynamics. This comprehensive presentation of the theory is illustrated by experimental data for lithium cyanide and hydroxyl impurities in various host crystals This monograph is an ideal reference book for scientists working with defect crystals and glasses Ultrashort Processes in Condensed Matter Walter E. Bron, 2012-12-06 The Advanced Study Institute AS considered a number offacets of the very rapidly advancing field of theoretical and experimental aspects of ultrashort processes in condensed matter Common threads exist between a series of example cases One major subgroup of topics involves the ultrashort dynamics of excitations of various particles produced through the interactions of condensed matter with ultrashort duration laser light Examples of the excitations include electronic and hole carriers electron hole plasma phonons vibrons and rotons two phonon states and excitons Experimentation on the dynamics of such excitations are carried out in the bulk at surfaces in thin films and in quantum wells The dynamical steps which the excitations usually undergo include photo excitation local thermalization particle particle interaction particle phonon interactions and eventual return to true thermal equilibrium This ASI was organized to benefit particularly advanced graduate students specifically those near the end of their Ph D thesis projects and also for postdoctoral scholars already active in the field The overall organizational goal was centered around a set oftutorially based lectures intermingled with full scale discussion periods of equal time and importance as the lectures The general discussion periods were designed to offer to the participants ample time to ask detailed questions and to make comments and contributions of their own In order to complete the involvement of the participants a full length poster session was also held A representative set of abstracts of these posters appear as an Appendix to the lectures Ultrafast Spectroscopy of Semiconductors and Semiconductor Nanostructures Jagdeep Shah, 2013-11-21 The field of ultrafast spectroscopy of semiconductors and their nanostruc tures continues to be an active field of research Exciting new developments have taken place since the first edition of this book was completed in 1995 This revised edition includes a discussion of many of these recent develop ments in the field This is accomplished by adding a chapter on Recent De velopments at the end of the book This approach was selected to provide a discussion of results while they are still relatively recent Results published before the end of May 1998 were considered for inclusion in this book The objective of this revised edition remains the same as before to provide a co hesive discussion of the many diverse contributions of ultrafast spectrosco py to the field of

semiconductors Extensive cross references are made to earlier chapters in order to accomplish this goal The chapter on Recent Developments begins with a brief discussion of new lasers new techniques of ultrafast spectroscopy and novel nanostruc tures This is followed by a section on Coherent Spectroscopy where some of the most interesting recent developments have taken place These include observation of quantum kinetic effects effects that require going beyond the mean field approach of the semiconductor Bloch equations coherent control of populations and current in semiconductors exciton continuum interac tions and many diverse aspects of coherent spectroscopy including studies of microcavities Bragg structures quantum dots and quantum wires Resonant Tunneling in Semiconductors L.L. Chang, E.E. Mendez, C. Tejedor, 2012-12-06 This book contains the proceedings of the NATO Advanced Research Workshop on Resonant Tunneling in Semiconductors Physics and Applications held at Escorial Spain on May 14 18 1990 The tremendous growth in the past two decades in the field of resonant tunneling in semiconductor heterostructures has followed if not outpaced the expansion wit nessed in quantum structures in general Resonant tunneling shares also the multi disciplinary nature of that broad area with an emphasis on the underlying physics but with a coverage of material systems on the one end and device applications on the other Indeed that resonant tunneling provides great flexibility in terms of materials and configurations and that it is inherently a fast process with obvious device implications by the presence of a negative differential resistance have contributed to the unrelenting interest in this field These proceedings consist of 49 refereed articles they correspond to both invited and contributed talks at the workshop Because of the intertwinning nature of the subject matter it has been difficult to subdivide them in well defined sections Instead they are arranged in several broad categories meant to serve only as guidelines of emphasis on different topics and aspects The book starts with an introduction to res onant tunneling by providing a perspective of the field in the first article This is fol lowed by discussions of different material systems with various band structure effects **Condensation And Coherence In Condensed Matter, Proceedings Of The Nobel Jubilee Symposium** T Claeson, P Delsing, 2003-03-21 In 2001 the Nobel Foundation celebrated the 100th anniversary of the first Nobel Prize and all previous Nobel laureates were invited to attend the Nobel ceremonies in Stockholm This gave an excellent opportunity for arranging jubilee symposia with topics that would attract several of the laureates The chosen subject of Condensation and Coherence in Condensed Systems attracted sixteen Nobel laureates and another thirty five leading scientists The idea was to bring scientists together from several related subdisciplines atomic physics quantum optics and condensed matter physics for cross breeding of ideas concepts and experience Subjects like phase transitions in strongly coupled systems Bose Einstein condensation in weakly coupled systems macroscopic quantum phenomena coherence in mesoscopic structures and quantum information were intensively discussed from different points of view Coherence phenomena in condensed systems were emphasized A special session was devoted to the emerging field of quantum computing with experimental and theoretical results reported for different types of gu bits The 2001 Nobel Prize awarded to

Eric Cornell Wolfgang Ketterle and Carl Wieman for the achievement of Bose Einstein condensation in dilute gases of alkali atoms and for early fundamental studies of the properties of the condensates gave an extra flavor to the theme of the Centennial Symposium Condensation and Coherence in Condensed Matter Tord Claeson, P. Delsing, 2003 In 2001 the Nobel Foundation celebrated the 100th anniversary of the first Nobel Prize and all previous Nobel laureates were invited to attend the Nobel ceremonies in Stockholm This gave an excellent opportunity for arranging jubilee symposia with topics that would attract several of the laureates The chosen subject of Condensation and Coherence in Condensed Systems attracted sixteen Nobel laureates and another thirty five leading scientists. The idea was to bring scientists together from several related subdisciplines atomic physics quantum optics and condensed matter physics for cross breeding of ideas concepts and experience Subjects like phase transitions in strongly coupled systems Bose Einstein condensation in weakly coupled systems macroscopic quantum phenomena coherence in mesoscopic structures and quantum information were intensively discussed from different points of view Coherence phenomena in condensed systems were emphasized A special session was devoted to the emerging field of quantum computing with experimental and theoretical results reported for different types of qu bits The 2001 Nobel Prize awarded to Eric Cornell Wolfgang Ketterle and Carl Wieman for the achievement of Bose Einstein condensation in dilute gases of alkali atoms and for early fundamental studies of the properties of the condensates gave an Compton Scattering Frank Wissmann, 2003-12-03 A extra flavor to the theme of the Centennial Symposium comprehensive summary of experiments on Compton scattering from the proton and neutron performed at the electron accelerator MAMI The experiments cover a photon energy range from 30 MeV to 500 MeV The reader is introduced to the theoretical concepts of Compton scattering followed by a description of the experiments on the proton their analysis and results Quantum Dissipative Systems (Fifth Edition) Ulrich Weiss, 2021-09-21 This comprehensive textbook provides the fundamental concepts and methods of dissipative quantum mechanics and related issues in condensed matter physics starting from first principles It deals with the phenomena and theory of decoherence relaxation and dissipation in quantum mechanics that arise from the random exchange of energy with the environment Major theoretical advances in combination with stunning experimental achievements and the arising perspective for quantum computing have brightened the field and brought it to the attention of the general community in natural sciences Expertise in dissipative quantum mechanics is by now beneficial in a broad sphere This book originally published in 1992 and republished as enlarged and updated second third and fourth edition in 1999 2008 and 2012 dives even deeper into the fundamental concepts methods and applications of quantum dissipation The fifth edition provides a self contained and updated account of the quantum mechanics and quantum statistics of open systems The subject matter of the book has been thoroughly revised to better comply with the needs of newcomers and the demands of the advanced readership Most of the chapters are rewritten to enhance clarity and topicality Four new chapters covering recent developments in the field have been added There are about 600 references This book is

intended for use by advanced undergraduate and graduate students in physics and for researchers active in the field They will find the monograph as a rich and stimulating source Molecular Magnets Juan Bartolomé, Fernando Luis, Julio F. Fernández, 2013-10-17 This book provides an overview of the physical phenomena discovered in magnetic molecular materials over the last 20 years It is written by leading scientists having made the most important contributions to this active area of research The main topics of this book are the principles of quantum tunneling and quantum coherence of single molecule magnets SMMs phenomena which go beyond the physics of individual molecules such as the collective behavior of arrays of SMMs the physics of one dimensional single chain magnets and magnetism of SMMs grafted on substrates The potential applications of these physical phenomena to classical and quantum information communication technologies and the emerging fields of molecular spintronics and magnetic refrigeration are stressed. The book is written for graduate students researchers and non experts in this field of research **Tunneling In Complex Systems** Steve Tomsovic, 1998-06-19 Quantum tunneling is an intriguing phenomenon arising in a multitude of physical contexts New experiments in systems as wide ranging as superdeformed nuclei Bose Einstein condensed gases and nanomagnetic systems are spurring theoretical studies into the fundamental nature of tunneling In this volume the articles include i tunneling out of a metastable state ii coherence between two wells in tunneling contact iii the consequences of the nature of the underlying dynamics i e regular motion chaos or some mixture in low dimensional systems and its connection to newly identified tunneling phenomena such as chaos assisted tunneling iv nanomagnetic systems with focus on comparing environmental descriptions of nuclear spins and oscillators v solitons in Bose condensates vi tunneling out of the nuclear superdeformed well and its use as a probe of pairing and chaos in excited nuclear states and vii problems linked to the Bose condensed phase of atomic alkali gases These subjects and others are gathered in six pedagogical courses given during the spring of 1997 at the National Institute of Nuclear Physics program Tunneling in complex systems The purpose of the courses was to give graduate students and postdoctoral researchers exposure to a sampling of such recent theoretical advances and experimental contexts of tunneling as well as a bridge for the communication gaps between researchers in the various fields concerned with tunneling **Relaxation in Polymers** Takayoshi Kobayashi,1993 Conjugated polymers are attractive from the viewpoint of possible applications as novel nonlinear optical materials and conductive materials. They are also very important as a group of materials of one dimensionality The progress of research in this field is very rapid At the present stage it is extremely useful to have review articles giving information on the most recent progress Relaxation in Polymers contains state of the art reviews on ultrafast responses in various conjugated polymers with large optical nonlinearity ultrafast relaxation in polysilanes electronic properties of polysilanes fast transient photoconductivity studies of polyacetylene and polydiacetylene evolution of photoexcitations in polyacetylene and related polymers from femtoseconds to milliseconds photoexcited states in conjugated polymers optical properties of halogen bridged mixed valent metal complexes

and dynamics of soliton pairs in polyacetylene *Ouantum Well and Superlattice Physics*, 1990 Radiation-Chemical Processes in Solid Phase Evginiy I. Grigoriev, Leonid I. Trakhtenberg, 1996-11-14 Unlike many other references Radiation Chemical Processes in Solid Phase analyzes experimental data on radiolysis in terms of solid state physics It traces the effect exerted by media from primary processes of radiation substance interaction to final products The authors consider the main chemically active elementary excitations arising under irradiation of solids and discuss the mechanisms of chemical reactions induced by them They present the general principles of solid state and molecular physics and cover numerous radiation Low-Temperature Physics Christian Enss, Siegfried Hunklinger, 2005-12-05 Science is often a journey to the limits of the feasible and ascertainable In low temperature physics this journey strives towards absolute zero When Louis Cailletet on December 2nd 1877 realized a major step in terms of the production of low temperatures namely the rst liquefaction of oxygen he could hardly imagine the wealth of exciting physical phenomena that would be discovered in this eld Despite the anticipation from every day experience which generally equates cold with discomfort and sti ening condensed m ter at low temperatures reveals a wide array of fascinating properties As the mostprominent examples let us mention super uidityandsuperconductivity whose attraction is undiminished since their discovery With every step wards lower temperatures numerous new insights have resulted which make the traditional subject of low temperature physics an attractive and modern research topic The present book is based on material from lectures that both authors have given several times at the universities of Heidelberg Bayreuth and Konstanz It is focused on the discussion of physical phenomena that become most apparent at low temperatures The book is mainly aimed at students and provides a compact and comprehensible introduction to various topics of low temperature physics Selection and emphasis of the material is subj tive and certainly re ects our personal preferences However we have tried to give room for as wide a spectrum of topics as possible The contents are organized in three parts entitled quantum uids solids at low temperatures and principles of refrigeration and thermometry

Advances in Photochemistry, Volume 24 Douglas C. Neckers, David H. Volman, Günther von Bünau, 2009-09-24 Setting the pace for progress and innovation There is no doubt that these are hot and exciting research areas Advances in Photochemistry could easily serve as a definitive source of background information for future researchers Journal of the American Chemical Society For any library wishing to maintain a first rate reference series on the photochemical literature Physics Today More than a simple survey of the current literature Advances in Photochemistry offers critical evaluations written by internationally recognized experts These pioneering scientists offer unique and varied points of view of the existing data Their articles are challenging as well as provocative and are intended to stimulate discussion promote further research and encourage new developments in the field In this volume Optical Single Molecule Detection at Room Temperature ALFRED J MEIXNER Pressure Tuning Photochemistry of Metal Complexes in Solution RUDI VAN ELDIK AND PETER C FORD Photo Induced and Spontaneous Proton Tunneling in Molecular Solids H PETER TROMMSDORFF The EPR

Spectroscopic D Parameter of Localized Triplet Diradicals as Probe for Electronic Effects in Benzyl Type Monoradicals WALDEMAR ADAM HEINRICH M HARRER FUMIO KITA AND WERNER M NAU Photothermal Studies of Photophysical and Photochemical Processes by the Transient Grating Method MASAHIDE TERAZIMA Introductory Essays M. M. Pintar, 2013-03-12 This set of essays was given as lectures at the 4th Waterloo International Summer School on Nuclear Magnetic Resonance held in June 1975 at the University of Water loo The school was sponsored by the National Research Council of Canada and by the Canadian Association of Physicists These Contributions are introductory and were not intended to be review papers For valuable help I would like to thank R S Hallsworth D W Nicoll and R T Thompson M M Pintar Table of Contents A Guide to Relaxation Theory By A G Redfield 1 Thermodynamics of Spin Systems in Solids An Elementary Introduction By J Jeener 13 Coherent Averaging and Double Resonance in Solids By J S Waugh 23 Macroscopic Dipole Coherence Phenomena By E L Hahn 31 Nuclear Spins and Non Resonant Electromagnetic Phenomena By G J Bene 45 Nuclear Spin Relaxation in Molecular Hydrogen By F R McCourt 55 Longitudinal Nuclear Spin Relaxation Time Measurements in Molecular Gases By R L Armstrong 71 Spin Lattice Relaxation in Nematic Liquid Crystals Via the Modulation of the Intramolecular Dipolar Interactions by Order Fluctuations By R Blinc 97 NMR Studies of Molecular Tunnelling By S Clough 113 Effect of Molecular Tunnelling on NMR Absorption and Relaxation in Solids By M M Pintar 125

Feynman And Computation Anthony Hey, 2018-03-08 Computational properties of use to biological organisms or to the construction of computers can emerge as collective properties of systems having a large number of simple equivalent components or neurons The physical meaning of content addressable memory is described by an appropriate phase space flow of the state of a system A model of such a system is given based on aspects of neurobiology but readily adapted to integrated circuits The collective properties of this model produce a content addressable memory which correctly yields an entire memory from any subpart of sufficient size The algorithm for the time evolution of the state of the system is based on asynchronous parallel processing Additional emergent collective properties include some capacity for generalization familiarity recognition categorization error correction and time sequence retention. The collective properties are only weakly sensitive to details of the modeling or the failure of individual devices **Noise in Spintronics** Farkhad Aliev, Juan Pedro Cascales, 2018-09-04 This book covers the main physical mechanisms and the different contributions 1 f noise shot noise etc behind electronic fluctuations in various spintronic devices It presents the first comprehensive summary of fundamental noise mechanisms in both electronic and spintronic devices and is therefore unique in that aspect The pedagogic introduction to noise is complemented by a detailed description of how one could set up a noise measurement experiment in the lab A further extensive description of the recent progress in understanding and controlling noise in spintronics including the boom in 2D devices molecular spintronics and field sensing is accompanied by both numerous bibliography references and tens of case studies on the fundamental aspects of noise and on some important qualitative steps to understand noise in spintronics

Moreover a detailed discussion of unsolved problems and outlook make it an essential textbook for scientists and students desiring to exploit the information hidden in noise in both spintronics and conventional electronics *Electrical and Related Properties of Organic Solids* R.W. Munn, Andrzej Miniewicz, Bogdan Kuchta, 2012-12-06 Organic solids exhibit a wide range of electrical and related properties They occur as crystals glasses polymers and thin films they may be insulators semiconductors conductors or superconductors and they may show luminescence nonlinear optical response and complex dynamical behaviour The book provides a broad survey of this area written by international experts one third being drawn from Eastern Europe Electrical optical spectroscopic and structural aspects are all treated in a way that gives an excellent introduction to current themes in this highly interdisciplinary and practically important area The coverage is especially strong in the areas where electrical and optical properties overlap such as photoconductivity electroluminescence electroabsorption electro optics and photorefraction

The Top Books of the Year From Coherent Tunneling To Relaxation The year 2023 has witnessed a remarkable surge in literary brilliance, with numerous compelling novels captivating the hearts of readers worldwide. Lets delve into the realm of top-selling books, exploring the captivating narratives that have enthralled audiences this year. From Coherent Tunneling To Relaxation: Colleen Hoovers "It Ends with Us" This poignant tale of love, loss, and resilience has gripped readers with its raw and emotional exploration of domestic abuse. Hoover masterfully weaves a story of hope and healing, reminding us that even in the darkest of times, the human spirit can succeed. Uncover the Best: Taylor Jenkins Reids "The Seven Husbands of Evelyn Hugo" This captivating historical fiction novel unravels the life of Evelyn Hugo, a Hollywood icon who defies expectations and societal norms to pursue her dreams. Reids compelling storytelling and compelling characters transport readers to a bygone era, immersing them in a world of glamour, ambition, and self-discovery. Discover the Magic: Delia Owens "Where the Crawdads Sing" This evocative coming-of-age story follows Kya Clark, a young woman who grows up alone in the marshes of North Carolina. Owens crafts a tale of resilience, survival, and the transformative power of nature, entrancing readers with its evocative prose and mesmerizing setting. These top-selling novels represent just a fraction of the literary treasures that have emerged in 2023. Whether you seek tales of romance, adventure, or personal growth, the world of literature offers an abundance of compelling stories waiting to be discovered. The novel begins with Richard Papen, a bright but troubled young man, arriving at Hampden College. Richard is immediately drawn to the group of students who call themselves the Classics Club. The club is led by Henry Winter, a brilliant and charismatic young man. Henry is obsessed with Greek mythology and philosophy, and he quickly draws Richard into his world. The other members of the Classics Club are equally as fascinating. Bunny Corcoran is a wealthy and spoiled young man who is always looking for a good time. Charles Tavis is a guiet and reserved young man who is deeply in love with Henry. Camilla Macaulay is a beautiful and intelligent young woman who is drawn to the power and danger of the Classics Club. The students are all deeply in love with Morrow, and they are willing to do anything to please him. Morrow is a complex and mysterious figure, and he seems to be manipulating the students for his own purposes. As the students become more involved with Morrow, they begin to commit increasingly dangerous acts. The Secret History is a brilliant and suspenseful novel that will keep you speculating until the very end. The novel is a cautionary tale about the dangers of obsession and the power of evil.

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## From Coherent Tunneling To Relaxation Introduction

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