

THE MANY-BODY PROBLEM

**An Encyclopedia of
Exactly Solved Models
in One Dimension**

Daniel C. Mattis

Third Printing with Revisions and Corrections



World Scientific

Manybody Problem An Encyclopedia Of Exactly Solved Models

Daniel C Mattis



Manybody Problem An Encyclopedia Of Exactly Solved Models:

Many-body Problem, The: An Encyclopedia Of Exactly Solved Models In One Dimension (3rd Printing With Revisions And Corrections) Daniel C Mattis,1993-03-15 This book differs from its predecessor Lieb Mattis Mathematical Physics in One Dimension in a number of important ways Classic discoveries which once had to be omitted owing to lack of space such as the seminal paper by Fermi Pasta and Ulam on lack of ergodicity of the linear chain or Bethe s original paper on the Bethe ansatz can now be incorporated Many applications which did not even exist in 1966 some of which were originally spawned by the publication of Lieb Mattis are newly included Among these this new book contains critical surveys of a number of important developments the exact solution of the Hubbard model the concept of spinons the Haldane gap in magnetic spin one chains bosonization and fermionization solitons and the approach to thermodynamic equilibrium quantum statistical mechanics localization of normal modes and eigenstates in disordered chains and a number of other contemporary concerns

The Many-body Problem: an Encyclopedia of Exactly Solved Models in One Dimension Daniel C. Mattis,1993 Classical statistical mechanics Spectrum of disordered and or anharmonic chains of oscillators Exactly Solvable Models In Many-body Theory Norman H March,Giuseppe G N Angilella,2016-05-27 The book reviews several theoretical mostly exactly solvable models for selected systems in condensed states of matter including the solid liquid and disordered states and for systems of few or many bodies both with boson fermion or anyon statistics Some attention is devoted to models for quantum liquids including superconductors and superfluids Open problems in relativistic fields and quantum gravity are also briefly reviewed The book ranges almost comprehensively but concisely across several fields of theoretical physics of matter at various degrees of correlation and at different energy scales with relevance to molecular solid state and liquid state physics as well as to phase transitions particularly for quantum liquids Mostly exactly solvable models are presented with attention also to their numerical approximation and of course to their relevance for experiments **Introduction to the Statistical Physics of Integrable Many-body Systems** Ladislav Šamaj,Zoltán Bajnok,2013-05-16 Including topics not traditionally covered such as 1 1 dimensional QFT this book considers a wide range of models and their applications

Quantum Field Theory I: Basics in Mathematics and Physics Eberhard Zeidler,2007-04-18 This is the first volume of a modern introduction to quantum field theory which addresses both mathematicians and physicists at levels ranging from advanced undergraduate students to professional scientists The book bridges the acknowledged gap between the different languages used by mathematicians and physicists For students of mathematics the author shows that detailed knowledge of the physical background helps to motivate the mathematical subjects and to discover interesting interrelationships between quite different mathematical topics For students of physics fairly advanced mathematics is presented which goes beyond the usual curriculum in physics **Classical and Quantum Nonlinear Integrable Systems** A Kundu,2019-04-23 Covering both classical and quantum models nonlinear integrable systems are of considerable theoretical and practical interest with

applications over a wide range of topics including water waves pin models nonlinear optics correlated electron systems plasma physics and reaction diffusion processes Comprising one part on classical theories *Models of Quantum Matter* Hans-Peter Eickel, 2019-07-29 An important task of theoretical quantum physics is the building of idealized mathematical models to describe the properties of quantum matter This book provides an introduction to the arguably most important method for obtaining exact results for strongly interacting models of quantum matter the Bethe ansatz It introduces and discusses the physical concepts and mathematical tools used to construct realistic models for a variety of different fields including condensed matter physics and quantum optics The various forms of the Bethe ansatz algebraic coordinate multicomponent and thermodynamic Bethe ansatz and Bethe ansatz for finite systems are then explained in depth and employed to find exact solutions for the physical properties of the integrable forms of strongly interacting quantum systems The Bethe ansatz is one of the very few methodologies which can calculate physical properties non perturbatively Arguably it is the only such method we have which is exact This means once the model has been set up no further approximations or assumptions are necessary and the relevant physical properties of the model can be computed exactly Furthermore an infinite set of conserved quantities can be obtained The quantum mechanical model under consideration is fully integrable This makes the search for quantum models which are amenable to an exact solution by the Bethe ansatz and which are quantum integrable so important and rewarding The exact solution will provide benchmarks for other models which do not admit an exact solution Bethe ansatz techniques provide valuable insight into the physics of strongly correlated quantum matter **Theory Of Magnetism Made Simple, The: An Introduction To Physical Concepts And To Some Useful Mathematical Methods** Daniel C Mattis, 2006-03-10 This new version of a classic updates much of the material in earlier editions including the first chapter on the history of the field Important modifications reflect major discoveries of the past decades A historical perspective is maintained throughout The reader is drawn into the process of discovery starting with a phenomenon finding plausible explanations and competing theories and finally the solution The theory of magnetism is practically a metaphor for theoretical physics The very first quantum many body theory Bethe's ansatz was devised for magnetic chains just as mean field theory was invented a century ago by Weiss to explain Curie's Law The first two chapters of this book are immensely readable taking us from prehistory to the spin valves of the most recent past Topics in subsequent chapters include angular momenta and spin Chapter 3 quantum theory of simple systems followed by increasingly technical insights into ordered and random systems thermal fluctuations phase transitions chaos and the like Contemporary developments in nanotechnology now seek to take advantage of the electron's spin as well as of its charge The time is not far off when nano circuits made entirely of silicon exhibit such many body properties as superconductivity or ferromagnetism without any superconducting materials or magnetic ions being present The reader of this book will be prepared for such exotic twenty first century applications Daniel C Mattis BS MS PhD Fellow of the American Physical Society APS is a frequent

lecturer at research institutions and the author of several textbooks and numerous research articles His expertise includes many body theory electrical conductivity quantum theory of magnetism and most recently nanotechnology Prof Mattis is on the editorial panel for high temperature superconductivity of the International Journal of Modern Physics B and Modern Physics Letters B both published by World Scientific Currently serving as Professor in the Physics department at the University of Utah in Salt Lake City Utah USA at various times he has been visiting Professor at Yale University New Haven State University of New York Buffalo Temple University Philadelphia and served as Wei Lun Visiting Professor at the Chinese University of Hong Kong A founding member of the Few Body Physics section of the APS he has also served as Chair of the standing committee of the APS for the International Freedom of Scientists

150 Years of Quantum Many-body Theory

Raymond F. Bishop, Klaus A. Gernoth, Niels R. Walet, 2001 In July 2000 a conference was held to honour the 65th birthdays of four of the leading international figures in the field of quantum many body theory The joint research careers of John Clark Alpo Kallio Manfred Ristig and Sergio Rosati total some 150 years and this festschrift celebrated their achievements These cover a remarkably wide spectrum The topics in this book reflect that diversity ranging from formal aspects to real systems including nuclear and subnuclear systems quantum fluids and solids quantum spin systems and strongly correlated electron systems The book collects more than 30 invited contributions from eminent scientists chosen both from among the participants at the conference and from colleagues who were unable to attend but nevertheless wished to contribute To match the high standing of the honourees the articles are of an exceptionally high quality Together they provide a vivid overview of current work across the spectrum of quantum many body theory

150 Years Of Quantum Many-body Theory: A Festschrift In Honour Of The 65th Birthdays Of John W Clark, Alpo J Kallio, Manfred L Ristig & Sergio Rosati Raymond F Bishop, Klaus A Gernoth, Niels R Walet, 2001-09-06 In July 2000 a conference was held to honour the 65th birthdays of four of the leading international figures in the field of quantum many body theory The joint research careers of John Clark Alpo Kallio Manfred Ristig and Sergio Rosati total some 150 years and this festschrift celebrated their achievements These cover a remarkably wide spectrum The topics in this book reflect that diversity ranging from formal aspects to real systems including nuclear and subnuclear systems quantum fluids and solids quantum spin systems and strongly correlated electron systems The book collects more than 30 invited contributions from eminent scientists chosen both from among the participants at the conference and from colleagues who were unable to attend but nevertheless wished to contribute To match the high standing of the honourees the articles are of an exceptionally high quality Together they provide a vivid overview of current work across the spectrum of quantum many body theory

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