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Thermodynamics and Statistical Mechanics Equilibrium by Entropy Maximisation Elsevier **The account of thermodynamics and statistical mechanics in Thermodynamics and Statistical Mechanics is based on entropy and its maximization. Building from first principles, it gives a transparent explanation of the physical behaviour of equilibrium thermodynamic systems, and it presents a comprehensive, self-contained account of the modern mathematical and computational techniques of statistical mechanics. This field of study is of vital importance to researchers, lecturers and students alike. Dr Attard is a well-known researcher in statistical mechanics who has made significant contributions to this field. His book offers a fresh perspective on the foundations of statistical thermodynamics. It includes a number of new results and novel derivations, and provides an intriguing alternative to existing monographs. Especially of note are the simple graphs and figures that illustrate the text throughout and the logical organization of the material. Thermodynamics and Statistical Mechanics will be an invaluable and comprehensive reference manual for research scientists. This text can be used as a complement to existing texts and for supplementary reading. Offers a fresh perspective on the foundations of statistical thermodynamics Includes a number of new results and novel derivations, and provides an intriguing alternative to existing monographs Simple graphs and figures illustrate the text throughout Logical organization of material An invaluable and comprehensive reference manual for research scientists Can be used as a complement to existing texts and for supplementary reading Non-equilibrium Thermodynamics and Statistical Mechanics Foundations and Applications** Oxford University Press **This title builds from basic principles to advanced techniques, and covers the major phenomena, methods, and results of time-dependent systems. It is a pedagogic introduction, a comprehensive reference manual, and an original research monograph-- Thermodynamics And Statistical Mechanics** World Scientific **This book provides a comprehensive exposition of the theory of equilibrium thermodynamics and statistical mechanics at a level suitable for well-prepared undergraduate students. The fundamental message of the book is that all results in equilibrium thermodynamics and statistical mechanics follow from a single unprovable axiom — namely, the principle of equal a priori probabilities — combined with elementary probability theory, elementary classical mechanics, and elementary quantum mechanics. An Introduction to Statistical Mechanics and Thermodynamics** Oxford University Press **This text presents statistical mechanics and thermodynamics as a theoretically integrated field of study. It stresses deep coverage of fundamentals, providing a natural foundation for advanced topics. The large problem sets (with solutions for teachers) include many computational problems to advance student understanding. Thermodynamic Formalism The Mathematical Structure of Equilibrium Statistical Mechanics** Cambridge University Press **Reissued in the Cambridge Mathematical Library this classic book outlines the theory of thermodynamic formalism which was developed to describe the properties of certain physical systems consisting of a large number of subunits. It is aimed at mathematicians interested in ergodic theory, topological dynamics, constructive quantum field theory, the study of certain differentiable dynamical systems, notably Anosov diffeomorphisms and flows. It is also of interest to theoretical physicists concerned with the conceptual basis of equilibrium statistical mechanics. The level of the presentation is generally advanced, the objective being to provide an efficient research tool and a text for use in graduate teaching. Background material on mathematics has been collected in appendices to help the reader. Extra material is given in the form of updates of problems that were open at the original time of writing and as a new preface specially written for this new edition by the author. Beyond the Second Law Entropy Production and Non-equilibrium Systems** Springer **The Second Law, a cornerstone of thermodynamics, governs the average direction of dissipative, non-equilibrium processes. But it says nothing about their actual rates or the probability of fluctuations about the average. This interdisciplinary book, written and peer-reviewed by international experts, presents recent advances in the search for new non-equilibrium principles beyond the Second Law, and their applications to a wide range of systems across physics, chemistry and biology. Beyond The Second Law brings together traditionally isolated areas of non-equilibrium research and highlights potentially fruitful connections between them, with entropy production playing the unifying role. Key theoretical concepts include the Maximum Entropy Production principle, the Fluctuation Theorem, and the Maximum Entropy method of statistical inference. Applications of these principles are illustrated in such diverse fields as climatology, cosmology, crystal growth morphology, Earth system science, environmental physics, evolutionary biology and technology, fluid turbulence, microbial biogeochemistry, plasma physics, and radiative transport, using a wide variety of analytical and experimental techniques. Beyond The Second Law will appeal to students and researchers wishing to gain an understanding of entropy production and its central place in the science of non-equilibrium systems – both in detail and in terms of the bigger picture. Entropy in Urban and Regional Modelling (Routledge Revivals)** Routledge **First published in 1970, this groundbreaking investigation into Entropy in Urban and Regional Modelling provides an extensive and detailed insight into the entropy maximising method in the development of a whole class of urban and regional models. The book has its origins in work being carried out by the author in 1966, when he realised that the well-known gravity model could be derived on the basis of an analogy with statistical, rather than Newtonian, mechanics. Subsequent investigation demonstrated that the entropy maximising method stems from an even higher level of generality, and the beginning of the book is devoted to an account of its importance and use as a general modelling tool. This reissue will be welcomed by a range of students and professionals from fields as diverse as urban and regional studies, economics, geography, planning, civil engineering, mathematics and statistics. Statistical Mechanics Entropy, Order Parameters and Complexity** OUP Oxford **In each generation, scientists must redefine their fields: abstracting, simplifying and distilling the previous standard topics to make room for new advances and methods. Sethna's book takes this step for statistical mechanics - a field rooted in physics and chemistry whose ideas and methods are now central to information theory, complexity, and modern biology. Aimed at advanced undergraduates and early graduate students in all of these fields, Sethna limits his main presentation to the topics that future mathematicians and biologists, as well as physicists and chemists, will find fascinating and central to their work. The amazing breadth of the field is reflected in the author's large supply of carefully crafted exercises, each an introduction to a whole field of study: everything from chaos through information theory to life at the end of the universe. Introductory Statistical Thermodynamics** Academic Press **Introductory Statistical Thermodynamics is a text for an introductory one-semester course in statistical thermodynamics for upper-level undergraduate and graduate students in physics and engineering. The book offers a high level of detail in derivations of all equations and results. This information is necessary for students to grasp difficult concepts in physics that are needed to move on to higher level courses. The text is elementary, self contained, and mathematically well-founded, containing a number of problems with detailed solutions to help students to grasp the more difficult theoretical concepts. Beginning chapters place an emphasis on quantum mechanics Includes problems with detailed solutions and a number of detailed theoretical derivations at the end of each chapter Provides a high level of detail in derivations of all equations and results Statistical Mechanics of Lattice Systems A Concrete Mathematical Introduction** Cambridge University Press **A self-contained, mathematical introduction to the driving ideas in equilibrium statistical mechanics, studying important models in detail. Non-equilibrium Thermodynamics and Statistical Mechanics Foundations and Applications** OUP Oxford **Non-equilibrium thermodynamics and statistical mechanics are covered from basic principles to advanced techniques. Both pedagogic and comprehensive, the book treats time-dependent systems with originality and clarity, with an appealing mix of physical intuition, mathematical derivation, and quantitative experimental and computational results. Thermodynamics and Regulation of Biological Processes** Walter de Gruyter GmbH & Co KG **Equilibrium and Non-Equilibrium Statistical Thermodynamics** Cambridge University Press **Publisher Description E. T. Jaynes: Papers on Probability, Statistics and Statistical Physics** Springer Science & Business Media **The first six chapters of this volume present the author's 'predictive' or information theoretic' approach to statistical mechanics, in which the basic probability distributions over microstates are obtained as distributions of maximum entropy (Le. , as distributions that are most non-committal with regard to missing information among all those satisfying the macroscopically given constraints). There is then no need to make additional assumptions of ergodicity or metric transitivity; the theory proceeds entirely by inference from macroscopic measurements and the underlying dynamical assumptions. Moreover, the method of maximizing the entropy is completely general and applies, in particular, to irreversible processes as well as to reversible ones. The next three chapters provide a broader framework - at once Bayesian and objective - for maximum entropy inference. The basic principles of inference, including the usual axioms of probability, are seen to rest on nothing more than requirements of consistency, above all, the requirement that in two problems where we have the same information we must assign the same probabilities. Thus, statistical mechanics is viewed as a branch of a general theory of inference, and the latter as an extension of the ordinary logic of consistency. Those who are familiar with the literature of statistics and statistical mechanics will recognize in both of these steps a genuine 'scientific revolution' - a complete reversal of earlier conceptions - and one of no small significance. Nonextensive Entropy Interdisciplinary Applications** Oxford University Press **A great variety of complex phenomena in many scientific fields exhibit power-law behavior, reflecting a hierarchical or fractal structure. Many of these phenomena seem to be susceptible to description using approaches drawn from thermodynamics or statistical mechanics, particularly approaches involving the maximization of entropy and of Boltzmann-Gibbs statistical mechanics and standard laws in a natural way. The book addresses the interdisciplinary applications of these ideas, and also on various phenomena that could possibly be quantitatively describable in terms of these ideas. Mathematical and Numerical Modelling of Heterostructure Semiconductor Devices: From Theory to Programming** Springer Science & Business Media **Part of my lecturing work in the School of Mathematics at the University of Leeds involved teaching quantum mechanics and statistical mechanics to mathematics undergraduates, and also mathematical methods to undergraduate students in the School of Electronic and Electrical Engineering at the University. The subject of this book has arisen as a result of research collaboration on device modelling with members of the School of Electronic and Electrical Engineering. I wanted to write a book which would be of practical help to those wishing to learn more about the mathematical and numerical methods involved in heteroju- tion device modelling. I have introduced only a comparatively small number of t- ics, and the reader may think that other important topics should have been included. But of the topics which I have introduced, I hope that I have given the reader some practical advice concerning the implementation of the methods which are discussed. This practical advice includes demonstrating how the implementation of the me- ods may be tailored to the speci?c device being modelled, and also includes some sections of computer code to illustrate this implementation. I have also included some background theory regarding the origins of the routines. Topics In Statistical Mechanics (Second Edition)** World Scientific **Building on the material learned by students in their first few years of study, Topics in Statistical Mechanics (Second Edition) presents an advanced level course on statistical and thermal physics. It begins with a review of the formal structure of statistical mechanics and thermodynamics considered from a unified viewpoint. There is a brief revision of non-interacting systems, including quantum gases and a discussion of negative temperatures. Following this, emphasis is on**

interacting systems. First, weakly interacting systems are considered, where the interest is in seeing how small interactions cause small deviations from the non-interacting case. Second, systems are examined where interactions lead to drastic changes, namely phase transitions. A number of specific examples is given, and these are unified within the Landau theory of phase transitions. The final chapter of the book looks at non-equilibrium systems, in particular the way they evolve towards equilibrium. This is framed within the context of linear response theory. Here fluctuations play a vital role, as is formalised in the fluctuation-dissipation theorem.The second edition has been revised particularly to help students use this book for self-study. In addition, the section on non-ideal gases has been expanded, with a treatment of the hard-sphere gas, and an accessible discussion of interacting quantum gases. In many cases there are details of Mathematica calculations, including Mathematica Notebooks, and expression of some results in terms of Special Functions. Extended Thermodynamics Springer Science & Business Media **Physicists firmly believe that the differential equations of nature should be hyperbolic so as to exclude action at a distance; yet the equations of irreversible thermodynamics - those of Navier-Stokes and Fourier - are parabolic. This incompatibility between the expectation of physicists and the classical laws of thermodynamics has prompted the formulation of extended thermodynamics. After describing the motifs and early evolution of this new branch of irreversible thermodynamics, the authors apply the theory to mon-atomic gases, mixtures of gases, relativistic gases, and "gases" of phonons and photons. The discussion brings into perspective the various phenomena called second sound, such as heat propagation, propagation of shear stress and concentration, and the second sound in liquid helium. The formal mathematical structure of extended thermodynamics is exposed and the theory is shown to be fully compatible with the kinetic theory of gases. The study closes with the testing of extended thermodynamics through the exploitation of its predictions for measurements of light scattering and sound propagation. The Method of Maximum Entropy** World Scientific **This monograph is an outgrowth of a set of lecture notes on the maximum entropy method delivered at the 1st Venezuelan School of Mathematics. This yearly event aims at acquainting graduate students and university teachers with the trends, techniques and open problems of current interest. In this book the author reviews several versions of the maximum entropy method and makes its underlying philosophy clear. Maximum Entropy and Bayesian Methods Cambridge, England, 1988** Springer Science & Business Media **Cambridge, England, 1988 Multiscale Thermo-Dynamics Introduction to GENERIC** Walter de Gruyter GmbH & Co KG **One common feature of new emerging technologies is the fusion of the very small (nano) scale and the large scale engineering. The classical environment provided by single scale theories, as for instance by the classical hydrodynamics, is not anymore satisfactory. The main challenge is to keep the important details while still be able to keep the overall picture and simplicity. It is the thermodynamics that addresses this challenge. Our main reason for writing this book is to explain such general viewpoint of thermodynamics and to illustrate it on a very wide range of examples. Contents Levels of description Hamiltonian mechanics Irreversible evolution Reversible and irreversible evolution Multicomponent systems Contact geometry Appendix: Mathematical aspects Atmospheric Turbulence a molecular dynamics perspective** OUP Oxford **This book, authored by a well-known researcher and expositor in meteorology, focuses on the direct link between molecular dynamics and atmospheric variation. Uniting molecular dynamics, turbulence theory, fluid mechanics and non equilibrium statistical mechanics, it is relevant to the fields of applied mathematics, physics and atmospheric sciences, and focuses on fluid flow and turbulence, as well as on temperature, radiative transfer and chemistry. With extensive references and glossary this is an ideal text for graduates and researchers in meteorology, applied mathematics and physical chemistry. An Introduction to Thermodynamics and Statistical Mechanics** Cambridge University Press **This introductory textbook for standard undergraduate courses in thermodynamics has been completely rewritten to explore a greater number of topics, more clearly and concisely. Starting with an overview of important quantum behaviours, the book teaches students how to calculate probabilities in order to provide a firm foundation for later chapters. It introduces the ideas of classical thermodynamics and explores them both in general and as they are applied to specific processes and interactions. The remainder of the book deals with statistical mechanics. Each topic ends with a boxed summary of ideas and results, and every chapter contains numerous homework problems, covering a broad range of difficulties. Answers are given to odd-numbered problems, and solutions to even-numbered problems are available to instructors at www.cambridge.org/9781107694927. From Statistical Physics to Statistical Inference and Back** Springer Science & Business Media **Physicists, when modelling physical systems with a large number of degrees of freedom, and statisticians, when performing data analysis, have developed their own concepts and methods for making the `best' inference. But are these methods equivalent, or not? What is the state of the art in making inferences? The physicists want answers. More: neural computation demands a clearer understanding of how neural systems make inferences; the theory of chaotic nonlinear systems as applied to time series analysis could profit from the experience already booked by the statisticians; and finally, there is a long-standing conjecture that some of the puzzles of quantum mechanics are due to our incomplete understanding of how we make inferences. Matter enough to stimulate the writing of such a book as the present one. But other considerations also arise, such as the maximum entropy method and Bayesian inference, information theory and the minimum description length. Finally, it is pointed out that an understanding of human inference may require input from psychologists. This lively debate, which is of acute current interest, is well summarized in the present work. The Maximum Entropy Formalism A Conference Held at the Massachusetts Institute of Technology on May 2-4, 1978** MIT Press (MA) **This is the first book to deal specifically and entirely with the maximum entropy formalism, an extremely powerful mathematical technique for the assignment of probability distributions that was originally developed as part of statistical thermodynamics. It is an especially timely review because the formalism has in recent years reached an impressive state of maturity and found application in an increasingly diverse array of fields."Maximum Entropy Formalism" brings together sixteen papers that grew out of a conference held at MIT in May 1978. The range and depth of the contributions will make the book useful to an unusually large audience. Chemists, biologists, ecologists, systems engineers and modelers, physicists, and social scientists will find here a comprehensive introduction and guide to the literature and a progress report that provides much new and provocative material on the formalism and its applications.The book is divided roughly into four parts--overview, statistical mechanics, information theory, and biological systems. It provides both the scope needed to show the central intellectual core of the formalism and the details required by specialists for narrow applications.Three of the major figures in the development of the field--Richard Cox, Walter Elsasser, and Edwin Jaynes--have contributed chapters. The short treatise by Edwin Jaynes is especially noteworthy. In some 100 pages he reviews the development of the principle, considers some of its general properties and answers some criticisms that have been raised, places it in the wider context of statistical decision theory, speculates on future applications and future theoretical developments, and presents details of what is currently the most highly promising application of the principle: the extension of the Gibbs formalism to irreversible processes.Other chapters explore such topics as the growth of information theory; the bases of logic and induction; problems in determining constraints and Lagrange parameters; applications to nonequilibrium systems; "mixing character"; search theory and its relation to information theory; entropy increase and group symmetry; and applications of the formalism to biological systems.Contributors include, in addition to the editors and the authors already noted, N. Agmon, Y. Alhassid, Gregroy J. Chaitin, Robert B. Evans, James C. Keck, Edward H. Kerner, Bernard O. Koopman, Rolf Landauer, C. Alden Mead, John G. Pierce, Baldwin Robertson, and Jerome Rothstein. Statistical Physics An Entropic Approach** John Wiley & Sons **This undergraduate textbook provides a statistical mechanicalfoundation to the classical laws of thermodynamics via acomprehensive treatment of the basics of classical thermodynamics,equilibrium statistical mechanics, irreversible thermodynamics, andthe statistical mechanics of non-equilibrium phenomena. This timely book has a unique focus on the concept of entropy,which is studied starting from the well-known ideal gas law,employing various thermodynamic processes, example systems andinterpretations to expose its role in the second law ofthermodynamics. This modern treatment of statistical physicsincludes studies of neutron stars, superconductivity and therecently developed fluctuation theorems. It also presents figuresand problems in a clear and concise way, aiding the student’sunderstanding. The Theoretical Minimum What You Need to Know to Start Doing Physics** Basic Books **A master teacher presents the ultimate introduction to classical mechanics for people who are serious about learning physics "Beautifully clear explanations of famously 'difficult' things," -- Wall Street Journal If you ever regretted not taking physics in college -- or simply want to know how to think like a physicist -- this is the book for you. In this bestselling introduction to classical mechanics, physicist Leonard Susskind and hacker-scientist George Hrabovsky offer a first course in physics and associated math for the ardent amateur. Challenging, lucid, and concise, The Theoretical Minimum provides a tool kit for amateur scientists to learn physics at their own pace. Progress in Group Field Theory and Related Quantum Gravity Formalisms** MDPI **Following the fundamental insights from quantum mechanics and general relativity, geometry itself should have a quantum description; the search for a complete understanding of this description is what drives the field of quantum gravity. Group field theory is an ambitious framework in which theories of quantum geometry are formulated, incorporating successful ideas from the fields of matter models, ten-sor models, spin foam models and loop quantum gravity, as well as from the broader areas of quantum field theory and mathematical physics. This special issue collects recent work in group field theory and these related approaches, as well as other neighbouring fields (e.g., cosmology, quantum information and quantum foundations, statistical physics) to the extent that these are directly relevant to quantum gravity research. Advances in Chemical Physics** John Wiley & Sons **This series provides the chemical physics field with a forum for critical, authoritative evaluations of advances in every area of the discipline. Non-equilibrium Thermodynamics and the Production of Entropy Life, Earth, and Beyond** Springer Science & Business Media **The present volume studies the application of concepts from non-equilibrium thermodynamics to a variety of research topics. Emphasis is on the Maximum Entropy Production (MEP) principle and applications to Geosphere-Biosphere couplings. Written by leading researchers from a wide range of backgrounds, the book presents a first coherent account of an emerging field at the interface of thermodynamics, geophysics and life sciences. Introductory Applied Quantum and Statistical Mechanics** John Wiley & Sons *** An applied focus for electrical engineers and materials scientists. * Theoretical results supported with real-world systems and applications. * Includes worked examples and self-study questions. * Solutions manual available. Computational Statistical Mechanics** Elsevier **Computational Statistical Mechanics describes the use of fast computers to simulate the equilibrium and nonequilibrium properties of gases, liquids, and solids at, and away from equilibrium. The underlying theory is developed from basic principles and illustrated by applying it to the simplest possible examples. Thermodynamics, based on the ideal gas thermometer, is related to Gibb's statistical mechanics through the use of Nosé-Hoover heat reservoirs. These reservoirs use integral feedback to control temperature. The same approach is carried through to the simulation and analysis of nonequilibrium mass, momentum, and energy flows. Such a unified approach makes possible consistent mechanical definitions of temperature, stress, and heat flux which lead to a microscopic demonstration of the Second Law of Thermodynamics directly from mechanics. The intimate connection linking Lyapunov-unstable microscopic motions to macroscopic dissipative flows through multifractal phase-space structures is illustrated with many examples from the recent literature. The book is well-suited for undergraduate courses in advanced thermodynamics, statistical mechanic and transport theory, and graduate courses in physics and chemistry. Complexity Science** Cambridge University Press **This introductory textbook provides detailed coverage of the rapidly growing field of complexity science and accommodates readers from a wide variety of backgrounds, and with varying levels of mathematical skill. The book contains a broad range of end of chapter problems and extended projects, with solutions available to instructors online. Statistical Physics of Particles** Cambridge University Press **Statistical physics has its origins in attempts to describe the thermal properties of matter in terms of its constituent particles, and has played a fundamental role in the development of quantum mechanics. Based on lectures taught by Professor Kardar at MIT, this textbook introduces the central concepts and tools of statistical physics. It contains a chapter on probability and related issues such as the central limit theorem and information theory, and covers interacting particles, with an extensive description of the van der Waals equation and its derivation by mean field approximation. It also contains an integrated set of problems, with solutions to selected problems at the end of the book and a complete set of solutions is available to lecturers on a password protected website at www.cambridge.org/9780521873420. A companion volume, Statistical Physics of Fields, discusses non-mean field aspects of scaling and critical phenomena, through the perspective of renormalization group. Spatial Analysis of Interacting Economies The Role of Entropy and Information Theory in Spatial Input-Output Modeling** Springer Science & Business Media **6. 2 Basic Model Characteristics 185 6. 3 A Closed Model Approach to Interregional Estimation 189 7 Towards an Integrated System of Models for National and Regional Development 205 7. 1 Introduction 205 7. 2 In Search of a Framework for Integration 207 7. 3 National Development Scenarios 222 7. 4 The National-Regional Interlace 231 7. 5 Regional Development Scenarios 236 7. 6 Concluding Remarks 244 Appendixes 253 A Basic Microstate Descriptions 253 B Incomplete Prior Information: A Simple Example 257 C Computing Capital**

Coefficients and Turnpike Solutions: The DYNIO Package 259 D Minimizing Information Losses in Simple Aggregation: Two Test Problems 274 E Computing Interregional and Intersectoral Flows: 276 References 287 Index 305 vi LIST OF FIGURES 1. 1 A Three-Dimensional Guide to Later Chapters 12 2. 1 Historical Development of the Entropy Concept 32 2. 2 Selected Applications of Information Theory to Input-Output Analysis and Interaction Modelling 48 3. 1 The Bose-Einstein Analogy 58 5. 1 The Dog-Leg Input-Output Table 159 7. 1 A General Multilevel Social System 219 7. 2 The Hierarchical System of Models 219 7. 3 Choice of Production Techniques 230 7. 4 The National-Regional Interface 235 7. 5 A Sequential Compromise Procedure 243 7. 6 The Integrated Modelling System 246 vii LIST OF TABLES 3. 1 Production-Constrained Microstate Descriptions 59 3. 2 Production-Constrained Entropy Formulae 62 3. 3 Production-Constrained Solutions 65 3. 4 Doubly-Constrained Solutions 73 4. 1 The Static Input-Output Table 85 4. An Introduction to Statistical Mechanics and Thermodynamics Second Edition Oxford University Press, USA **An Introduction to Statistical Mechanics and Thermodynamics returns with a second edition which includes new chapters, further explorations, and updated information into the study of statistical mechanics and thermal dynamics. The first part of the book derives the entropy of the classical ideal gas, using only classical statistical mechanics and an analysis of multiple systems first suggested by Boltzmann. The properties of the entropy are then expressed as "postulates" of thermodynamics in the second part of the book. From these postulates, the formal structure of thermodynamics is developed. The third part of the book introduces the canonical and grand canonical ensembles, which are shown to facilitate calculations for many model systems. An explanation of irreversible phenomena that is consistent with time-reversal invariance in a closed system is presented. The fourth part of the book is devoted to quantum statistical mechanics, including black-body radiation, the harmonic solid, Bose-Einstein and Fermi-Dirac statistics, and an introduction to band theory, including metals, insulators, and semiconductors. The final chapter gives a brief introduction to the theory of phase transitions. Throughout the book, there is a strong emphasis on computational methods to make abstract concepts more concrete. Statistical Thermophysics Covers thermostatics, equilibrium statistical thermophysics, noninteracting fermions and bosons, dielectric and magnetic systems, phase transitions, interacting particles, renormalization, irreversible processes, and fluctuations Gravity and the Quantum Pedagogical Essays on Cosmology, Astrophysics, and Quantum Gravity** Springer **This book provides a compilation of in-depth articles and reviews on key topics within gravitation, cosmology and related issues. It is a celebratory volume dedicated to Prof. Thanu Padmanabhan ("Paddy"), the renowned relativist and cosmologist from IUCAA, India, on the occasion of his 60th birthday. The authors, many of them leaders of their fields, are all colleagues, collaborators and former students of Paddy, who have worked with him over a research career spanning more than four decades. Paddy is a scientist of diverse interests, who attaches great importance to teaching. With this in mind, the aim of this compilation is to provide an accessible pedagogic introduction to, and overview of, various important topics in cosmology, gravitation and astrophysics. As such it will be an invaluable resource for scientists, graduate students and also advanced undergraduates seeking to broaden their horizons. Frontiers of Nonequilibrium Statistical Physics** Springer Science & Business Media **The four-week period fran May 20 to June 16, 1984 was an intensive period of advanced study on the foundations and frontiers of nonequili brium statistical physics (NSP). During the first two weeks of this period, an advanced-study course on the "Foundations of NSP" was con ducted in Albuquerque under the sponsorship of the University of New Mexico Center for High-Technology Materials. This was followed by a two-week NATO Advanced Study Insti tute on the "Frontiers of NSP" in Santa Fe under the same directorship. Many Students attended both meetings. This book comprises proceedings based on those lectures and covering a broad spectrum of topics in NSP ranging fran basic problems in quantum measurement theory to analogies between lasers and Darwinian evolution. The various types of quantum distribution functions and their uses are treated by several authors. other tools of NSP, such as Langevin equations, Fokker-Planck equations, and master equations, are developed and applied to areas such as laser physics, plasma physics, Brownian motion, and hydrodynamic instabilities. The properties and experimental detection of squeezed states and antibunching are described, as well as experimental tests of the violation of Bell's inequality. Information theory, mean-field theory, reservoir theory, entropy maximization, and even a novel nonlinear generalization of quantum mechanics are used to discuss nonequilibrium phenanena and the approach toward thermodynamic equilibrium. Self-organisation and Dissipation in Real and Synthetic Earthquake Populations**