



Physics of Long-Range Interacting Systems

By A. Campa, T. Dauxois, D. Fanelli, S. Ruffo

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This book deals with an important class of many-body systems: those where the interaction potential decays slowly for large inter-particle distances; in particular, systems where the decay is slower than the inverse inter-particle distance raised to the dimension of the embedding space. Gravitational and Coulomb interactions are the most prominent examples, however it has become clear that long-range interactions are more common than previously thought.

A satisfactory understanding of properties, generally considered as oddities only a couple of decades ago, has now been reached: ensemble inequivalence, negative specific heat, negative susceptibility, ergodicity breaking, out-of-equilibrium quasi-stationary-states, anomalous diffusion. The book, intended for Master and PhD students, tries to gradually acquaint the reader with the subject. The first two parts describe the theoretical and computational instruments needed to address the study of both equilibrium and dynamical properties of systems subject to long-range forces. The third part of the book is devoted to applications of such techniques to the most relevant examples of long-range systems.

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Editorial Review

Review

The publication of this book is an important event in the field, because it collects in a clear and tutorial style, suitable to young researchers and graduate students [...], what is well-established in the broad field of long-range interacting systems ... The book is completed by an illuminating Foreword by David Mukamel, several useful appendices, a vast literature of almost 400 references, and a rather complete subject index. Altogether an excellent book. *Il Nuovo Saggiatore* This is a very interesting and timely book. Systems characterised by long range interactions, be they electromagnetic, gravitational or hydrodynamic, pose special problems. The authors show in a clear and systematic way how methods of statistical physics can advance understanding of both equilibrium and non equilibrium behaviour. The book, which emphasises interdisciplinary aspects and applications from several areas of physics, is well written and a pleasure to read. Peter Richmond, Trinity College Dublin An essential textbook for students and a useful tool for researchers, this timely work collects in one single volume clear and useful statistical physicist approaches to short-range systems, out-of-equilibrium dynamics, and long-range interactions. Guido Caldarelli, IMT Alti Studi Lucca

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