



# Physics of Long-Range Interacting Systems

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

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**Physics of Long-Range Interacting Systems** By A. Campa, T. Dauxois, D. Fanelli, S. Ruffo

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

### **About the Author**

**A. Campa, Senior Scientist, Istituto Superiore di Sanita, Roma, T. Dauxois, Directeur de Recherche, CNRS and ENS de Lyon, D. Fanelli, Associate Professor, Universita degli Studi di Firenze, S. Ruffo, Full Professor, Universita degli Studi di Firenze**

A. Campa is Senior Scientist at the Health and Technology Department of the Istituto Superiore di Sanita, Roma (Italy). He holds a Laurea in Physics (University of Roma "La Sapienza") and a Ph.D. in Physics (The Rockefeller University, New York, USA). His activities are in statistical physics, nonlinear dynamics, radiation physics, and modelling of ionizing radiation effects on biological systems. He worked as a postdoc of the Italian National Institute of the Physics of Matter (INFM) and he is now associated to the Italian National Institute of Nuclear Physics (INFN).

T. Dauxois is a CNRS Research Director at the Ecole Normale Supérieure de Lyon (France). His scientific activity is in nonlinear physics and statistical physics, with applications to condensed matter and hydrodynamics. He was the Head of Graduate Studies in Physics (M2) at ENS-Lyon (2005-11), Chairman of the Committee for Theoretical Physics in CNRS (2010-12) and is now Director of the Physics Laboratory at ENS de Lyon.

D. Fanelli is Associate Professor in the Department of Physics and Astronomy at the University of Florence (Italy). Fanelli's research interests fall in the realm of statistical mechanics and nonlinear physics, with applications to biology and biophysics. He holds a Laurea in Physics (University of Florence) and a Ph.D. in Numerical Analysis and Computer Science (KTH, Stockholm). He worked as a postdoc and researcher at the Karolinska Institute in Stockholm and as permanent staff member (Lecturer in Theoretical Physics) at the University of Manchester. He was also awarded the prestigious "Rientro dei Cervelli" grant.

S. Ruffo is a Full Professor in the Department of Physics and Astronomy of the University of Florence (Italy). His scientific activity is in the field of statistical and nonlinear physics. He is an editor of 'Communications in Nonlinear Science and Numerical Simulations'. He has been Weston Visiting Professor at The Weizmann Institute of Science, Department of Physics of Complex Systems (2009-2010) and "Chaire

d'Excellence ANR" at the Physics Laboratory of ENS-Lyon (2010-13). He is the Chairman of the C3 Commission (Statistical Physics) of IUPAP.

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