Introduction

In this volume are collected some of the contributions presented at the conference *Current Trends in Kinetic Theory and Related Models* organized in memory of Giampiero Spiga, which took place at University of Parma on October 13-14, 2022.

Recent developments in kinetic theory, also applied to non-conservative interactions and to non standard contexts, and advances in the investigation of macroscopic equations related to such theory or, more generally, to Continuum Mechanics are included in the present volume, honoring the high scientific profile of Giampiero Spiga and the versatility of his research activity.

Specifically, new mathematical properties have been proved for Boltzmann equation, as well as for Landau and Fokker-Planck-type equations. Moreover, new kinetic formulations have been proposed to describe Lotka-Volterra dynamics and the response of the immune system in autoimmune diseases. Applications of kinetic theory in quantum computing and in semiconductors problems are also shown and wave propagation in macroscopic equations is investigated.

Giampiero Spiga passed away suddenly, at the age of 73, on January 30, 2022 in Ancona, where he had moved after the retirement as Full Professor of Mathematical Physics at University of Parma.

Born in Bologna in 1948, graduated with honors in Nuclear Engineering in 1972 at University of Bologna, he arrived at University of Parma from Bari in 1990. His studies and research in the field of Mathematical Physics have mainly concerned kinetic equations and mathematical models of Boltzmann type. He has been a pioneer in the extension of kinetic theory of rarefied gas beyond a single gas modelling; in particular, he is recognized as a leading expert of extended kinetic theory for nonconservative phenomena, especially for chemical reactions in gas mixtures.

In his career, Giampiero Spiga has been a visiting professor at several international institutions, including the University of Illinois, the Virginia Polytechnic Institute, the University of California at Los Angeles and the University of Arizona in the United States, the University of Kaiserslautern and the University of Ulm in Germany, the University of Warsaw in Poland and the University of Kyoto in Japan.

Giampiero Spiga published in his career more than 170 papers on high-level scientific journals; he collaborated with many researchers in Italy and abroad, and some of them wanted to honor his memory by participating to the

conference in Parma and contributing with a paper for this special issue of the Rivista di Matematica dell'Università di Parma, that he directed with care and enthusiasm from 1998 to 2001.

Giampiero Spiga led generations of students into research, giving life to the kinetic theory group of Parma, which today gathers his legacy. He is remembered not only for his outstanding scientific profile but also for his great human qualities, his calmness, his kind ways, his lordship, his rectitude and his excellent abilities as a teacher. He knew how to teach and make people love mathematics. His students will never forget his blackboard, full of formulas, that contained all the lesson.

We are indebted with him for all the human and scientific teachings that he left us as a legacy. He lives in our memories and in our hearts forever.

Parma, October 2024

Marzia Bisi and Maria Groppi