The opening Part 1 of this book is devoted to *Fractional calculus and stochastic theory*. It presents in detail the theoretical and mathematical foundations of the formalism describing anomalous transport, such as fractional differentials and fractional differential equations, and gives a modern outline of random walk approaches to anomalous transport. These tools can be applied to a wide variety of complex systems, as is demonstrated in the reminder of the book. However, we emphasize that it is not mandatory to fully familiarize with all these techniques to understand the later more applied chapters.

This first part starts with a *Threefold introduction to fractional derivatives* by Rudolf Hilfer, which gives a thorough, intuitive and at the same time quite rigorous introduction to this indispensable instrument of theoretically analysing and describing anomalous diffusion as considered within the framework of random walk models. It is followed by Michael Schlesinger's *Anomalous processes with infinite moments* giving a general, easy-to-read and motivating account on the historical development of probabilistic models underlying anomalous diffusion and on most of the further problems discussed in the first part of the book. The part proceeds with *Continuous time random walks, Mittag-Leffler waiting time and fractional diffusion: mathematical aspects* by Rudolf Gorenflo and Francesco Mainardi, which contains a precise and rigorous discussion of one of the models mentioned above, namely of the continuous time random walk (CTRW). The following chapter, *Introduction to the theory of Levy flights* by Alexei Chechkin, Ralf Metzler, Joseph Klafter and Vsevolod Gonchar does the same for another model discussed by Michael Shlesinger, which are Lévy flights. *Fractional diffusion models of anomalous transport* by Diego del-Castillo-Negrete shows the path from mathematical descriptions to applications of the corresponding models, particularly to problems in hydrodynamics and in plasma physics. It combines CTRW theory with Lévy flights, which are both important ingredients of a general theory of anomalous transport. This chapter also contains a profound mathematical part, which is presented from a somewhat different point of view than the previous contributions. Part 1 concludes with *Anomalous kinetics leads to weak ergodicity breaking* by Eli Barkai discussing a question that was hardly mentioned in the previous chapters, where the theory was based on ensemble averages. Being a non-Markovian process with diverging characteristic time scales, CTRW theory refers to a situation where ensemble averages and the correspondingly taken time averages do not coincide, a behavior denoted as "weak ergodicity breaking". Eli Barkai's contribution

deals with these subtle problems, which have important implications both for the theoretical description and for the interpretation of experimental results of anomalous transport.