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# Preface

The term strange kinetics originally referred to the dynamics of Hamiltonian systems which, in the limit of weak chaos, display superdiffusion and Lévy-walk characteristics. It was coined by G.M. Zaslavsky in a Nature paper carrying this title [1]. Here we employ the term strange kinetics in a generalized sense to denote all forms of slow kinetics or anomalous dynamics, such as sub-diffusion, superdiffusion, non-Debye relaxation, Lévy walks or fractional time evolutions.

Strange kinetics or anomalous dynamics in this general sense represents a common theme which covers an astonishing breadth of experimental observations, from amorphous semiconductors to subsurface tracer dispersion, from dynamics in glassy systems to the cellular cytoskeleton. Experimental observations of dielectric relaxation in glass formers have shown that anomalous fractional dynamics is not a transient or crossover phenomenon, but can extend over more than ten decades in time or frequency. Similar observations were made in mechanical measurements.

What are the signatures of strange kinetics? Owing to the large variety of topics, it is possibly best to give a negative definition. To some extent, strange kinetics is connected with deviations; deviations from exponential or Gaussian laws, and deviations from fast decaying correlations. Here, one faces the existence of long range correlations, disorder and cooperativity, shared by systems studied by physicists, chemists, engineers, and many more.

Theoretically strange kinetics and anomalous dynamics are intimately connected to descriptions based on random walks in continuous time, generalized master, Langevin, and Fokker–Planck equations. Recently it has become clear that many of these theoretical tools are mathematically related to the expanding area of fractional differential equations, i.e. to derivatives and integrals of non-integer order [2,3]. These are all represented in contributions in this volume.

In the papers, we tried to maintain a balance between new results and review-like aspects, such that the present issue is as a whole self-contained and, we hope, readily accessible to non-specialists in the field. We believe that the particular appeal of the present volume also lies in the fusion of both experiment and theory, thus providing the connection to reality of the sometimes demanding, mathematically-inclined contributions.

Deep thanks go to all our colleagues and friends who have contributed to this special issue. Each of them has made an effort not only to present recent results in a clear and lucid way, but also to provide an introductory review that helps to understand the different topics.

This special issue is dedicated to Professor Andrzej Plonka who passed away on 5th September 2001. Andrzej was a very active member of our community and an important promoter of the field. He noticed very early the need for new approaches to cope with the findings on electron transfer and relaxation in glassy systems. He opened these areas to concepts such as anomalous diffusion and dispersive kinetics. Andrzej took upon himself to cover recent developments in the field of strange kinetics in illuminating review papers that he kept on updating, and in his recent book on dispersive kinetics [4]. All these works are very

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valuable contributions to theory and experiment alike, a source of steady information for us all. We will miss Andrzej very much.

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