Part I

Bridging the gap
between
physics and the social sciences

The emergence of two new fields, the science of chaos and the science of networks changed the way in which we are looking at physical and social systems. From the first we learned that simple (in the sense of having few degrees of freedom) physical systems can undergo chaotic motions and display intricate trajectories. The double pendulum is one of the simplest systems of this kind. Initiated by Benoît Mandelbrot in the 1970s, the science of chaotic systems has already produced substantial achievements. This book relies only occasionally on the analysis of chaos; in contrast it relies heavily on the ideas of network science. Although it can be traced back to system theory which flourished in the 1960s and 1970s, network science really emerged in the late 1990s through the works of people such as Albert-László Barabási, Sergei Maslov, Steven Strogatz or Duncan Watts. It has been instrumental in convincing us that what really matters in a system are its nodes, its links and their respective weights. Seen in this perspective, the real nature of the system, whether of physical, biological or social nature, is of little relevance.

But looking at physical and social systems in an abstract, purely structural way takes away much of their substance. The real challenge is to do real physics and real sociology in the framework of network theory. This is what we call “bridging the gap”. In the five chapters which compose this first part we analyze the implications of a perspective based on network science without losing contact with real systems. We consider the problems of measuring the strength of bonds, of reducing the level of noise in social systems; we discuss the differences between equilibrium and non-equilibrium phenomena. Finally, by way of specific examples, we emphasize that the question of data reliability has so far received too little attention in the social sciences.