Introduction

It would be foolish to try describing Paul Erdős as an applied mathematician, somebody who is looking outside of mathematics for motivation and justification of his activity. Yet we believe that the word application in the title is justified. An essential part of Erdős' personality and success is his broad knowledge and a true feeling of unity of mathematics. This understanding brought him to many of his crucial discoveries and topics. Randomness is a pivotal example of this Erdős approach. With M. Kac he initiated this technique in number theory in 1939 (see the Erdős paper in Chapter 1) and in graph theory he did so in 1946. This technique — the probabilistic or nonconstructive method — is by now one of the universally accepted modern combinatorial techniques and this is also reflected by papers in this section. The origins of the probabilistic method are described in the paper by Spencer while the random graph papers of Erdős and Rényi are described in the Karonski-Ruciński paper. Applications of probabilistic methods have reached virtually all mathematical disciplines as well as many areas of theoretical computer science. The papers by Pyber, Pudlák and Sgall, and Razborov are such examples. This does not exhaust the papers relevant to probabilistic methods in this volume, see for example, the papers by Bollobás and Füredi in Chapter 4, by Kahn in Chapter 5, the papers by Laczkovich and Ruzsa in Chapter 6 and the paper by Cameron in Chapter 7 (devoted to infinity). All of these papers are related to various aspects of Erdős' work and belong to branches pioneered by him. By now this is well recognized and, there are, in fact, numerous books devoted to these areas, such as: B. Bollobás: Random Graphs, B. Bollobás: Extremal Graph Theory and also E. M. Palmer: Random graphs, P. Erdős, J. Spencer: Probabilistic methods in combinatorics and N. Alon, J. Spencer: The probabilistic method, P. D. T. A. Elliot: Probabilistic number theory, and P. Erdős, A. Hajnal, A. Maté, R. Rado: Combinatorial Set Theory.