Mathematisches Forschungsinstitut Oberwolfach

Report No. 27/2007

Non-Classical Interacting Random Walks

Organised by
Francis Comets (Paris)
Martin Zerner (Tübingen)

May 20th – May 26th, 2007

Abstract. The workshop focused on recent developments in the theory of random walks (RWs) in a broader sense. Among the models considered were RWs in random environment, RWs in random potential and random polymers, branching RWs, excited RWs, reinforced RWs, and trapped RWs.

Mathematics Subject Classification (2000): 60xx, 82xx.

Introduction by the Organisers

The workshop was organized by Francis Comets (Paris 7) and Martin Zerner (Tübingen). It was attended by fifty participants of about twenty different nationalities. Among the participants was a relatively large number of young researchers, some of which were supported by the European Union within the Marie Curie Conferences Programme and by the National Science Foundation.

The title of the workshop was *Non-Classical Interacting Random Walks*. The study of random walks (RWs) goes back to the beginnings of probability theory in the seventeenth century. Some of the first probabilists like Bernoulli and Pascal investigated the properties of coin tossing sequences and other simple games of chance, which nowadays are modeled by RWs. Such a RW takes steps at fixed time intervals, and at each step a random direction is chosen, which gives a chaotic trajectory. So in their most stringent definition, RWs come up as sums of independent and identically distributed random variables with real or often integer lattice values. A somewhat wider definition includes time-homogeneous Markov chains whose transition probabilities are in some way adapted to a given geometric-algebraic-combinatorial structure of the underlying state space. In this context, many tools from potential theory, graph theory, harmonic analysis and Fourier analysis are available.

The focus of this workshop was on a quite different area of current research on RWs. This is what the term "non-classical" in the title refers to. Some of the RWs, which are currently heavily investigated, are quite "irregular": Some are not Markovian, but are influenced by their own past. Others are Markovian, but interact with a possibly random environment, which influences the transitions of the walk. Many of the tools used in the more traditional settings of RWs fail in this context.

The main models considered in this workshop were RWs in random environments (RWRE) with talks mainly on Monday, RWs in random potential and random polymers on Tuesday, excited RWs on Wednesday morning, followed by an exciting open problem session in the evening, reinforced RWs on Thursday and various other RWs on Friday. The programme consisted in total of 23 talks of about 50 minutes each and the open problem session. On most days a long lunch break from 12:30 to 16:00 gave plenty of opportunity for interaction between the participants. Following the reinforcement by previous workshops and in spite of the title of the current workshop, on Wednesday afternoon most participants took part in the classical interacting non-random walk to St. Roman.