

Random Walks and Geometry

Proceedings of a Workshop at the Erwin Schrödinger Institute, Vienna, June 18 - July 13, 2001

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Preface

This volume is an outcome of the special semester 2001 - *Random Walks* held at the Schrödinger Institute in Vienna, Austria, from February until July 2001. It was dedicated to various problems related to stochastic processes on geometric and algebraic structures, with an emphasis on their interplay, and also on their interaction with theoretical physics. Some of the focal points were: probability on groups; products of random matrices and the Lyapunov spectrum; boundary behaviour, harmonic functions and other potential theoretic aspects; Brownian motion on manifolds; combinatorial and spectral properties of random walks on graphs; random walks and diffusion on fractals. There were two separate main periods of activity in the first (February/March) and in the second (May/June/July) halves of the semester. The first period started with a two-week workshop with the general theme *Random Walks and Statistical Physics* (February 19–March 2). Towards the end of the second period there was another workshop with the general theme *Random Walks and Geometry* which lasted for almost a month (June 18–July 13).

The papers collected in this volume are (with a couple of exceptions) contributed by the participants of the second workshop and show how the ideas connected with Markov chains on geometric and algebraic structures permeate such different subjects as hyperbolic geometry, Lie groups, geometric group theory, cellular automata, graph theory, random number generators, percolation, and statistical physics. Among these papers are both surveys and original research articles. All of them have been thoroughly refereed and proofread.

Fruitful complementary interaction between the geometry and randomness is a common feature and unifying link between all the contributions, and we are glad to present this panorama of recent work in the rapidly growing area at the crossroads of several mathematical disciplines.

We are grateful to the Erwin Schrödinger International Institute for Mathematical Physics in Vienna for generous financial support and for creating excellent working atmosphere during our special semester.

When the work on this volume was almost finished we learned about the untimely death of Martine Babillot caused by a foudroyant and devastating disease. Martine's bright personality, with her ability to synthesize different points of view and approaches, was very close to the spirit of our program, of which she was an active participant. She finished proofreading her contribution to the Proceedings just several weeks before passing away. We dedicate this volume to her memory.

March 2004

Vadim A. Kaimanovich, Klaus Schmidt and Wolfgang Woess