

Preface

The thesis comprises two topics from nonequilibrium statistical physics I was particularly interested in during my Ph.D. studies (2010–2014) at the Department of Macromolecular Physics of the Faculty of Mathematics and Physics of Charles University in Prague. Both problems are complex enough to exhibit a rather non-trivial physics, yet still simple enough so they could be confronted with paper and pencil. The first model originated from biophysics as a model for ion transport through narrow channels in cell membranes. The second model belongs to a newly emerging field of stochastic thermodynamics, where a Brownian particle diffusing in an optical trap has become a paradigm for both theory and experiment.

Before going deeper with a discussion, I would like to thank many people whose support served as a vital propelling force driving me through my studies. First of all, I would like to thank Prof. RNDr. Petr Chvosta, CSc., for his guidance and for many stimulating debates. I thank RNDr. Viktor Holubec, Ph.D. and Ján Šomvářsky, CSc., my colleagues at the department, for various enlightening discussions. I am deeply indebted to co-workers from the group of statistical physics at Universität Osnabrück for their kind hospitality during my stays there and for their help with numerics. My work would be impossible without permanent support from my family, friends and, of course, Dagmar, whose tolerance and encouragement were indispensable to the completion of this thesis.

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