Ophir Flomenbom

Heterogeneous Walkers in Rich Environments

Heterogeneous Walkers in Rich Environments: single walkers and many walkers
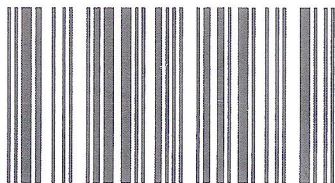
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Various new stochastic processes are addressed. Firstly, it is shown that the anomaly in single anomalous random walkers in a random environment has two different origins, where only the one resulting in the slower dynamics determines the anomaly. Secondly, addressed are dynamics of many walkers in a channel (this process is at times called single file dynamics or the exclusion process). It is shown that the mean square displacement, MSD, of a walker in normal heterogeneous files scales like, MSD~t^μ where $\mu=(1-g)/[2/(1+a)-g]$; 'a' is related with the initial density of the walkers and 'g' with their distribution in diffusion coefficients. Finally, studied are anomalous walkers in a file. These exhibit rich behaviors. Synchronized anomalous walkers and independent anomalous walkers are different, where the later actually form clusters causing a phase transition, and the former scale compactly with normal files. We think that the results in this book can help both mathematical scientists and experimentalists in various fields. The new results presented in this book are based on papers that we have written in the years 2008-2011.

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Born, 1974. PhD with excellence in mathematical biophysics, Tel Aviv University, 2005. Post-doctoral, MIT, USA, 2005-2008. Founded a scientific company, Flomenbom-BPS Ltd (registered in Israel in 2009), for solving scientific problems in biophysics and stochastic processes and in writing software for scientists in these fields.