Statistical Physics and Anomalous Dynamics of Foraging

Rainer Klages

Queen Mary University of London, School of Mathematical Sciences

Institute for Theoretical Physcs, University of Cologne and

Institute of Theoretical Physcs, Technical University of Berlin

A question that attracted a lot of attention in the past two decades is whether biologically relevant search strategies can be identified by statistical data analysis and mathematical modeling [1]. A famous paradigm in this field is the *Lévy Flight Foraging Hypothesis*. It states that under certain mathematical conditions Lévy dynamics, which defines a key concept in the theory of anomalous stochastic processes, leads to an optimal search strategy for foraging organisms. This hypothesis is discussed controversially in the current literature. I will review examples and counterexamples of experimental data and their analyses confirming and refuting it. Related to this debate is own work about biophysical modeling of bumblebee flights under predation threat [3] and biological cell migration [4], both based on experimental data analysis, which I briefly outline.

[1] R. Klages, *Search for food of birds, fish and insects*, chapter in: A.Bunde et al. (Eds.), Diffusive Spreading in Nature, Technology and Society (Springer, Berlin, 2018); in print

[2] F.Lenz et al., Phys. Rev. Lett. **108**, 098103 (2012)

[3] P.Dieterich et al., PNAS **105**, 459 (2008)