# Statistical Physics and Anomalous Dynamics of Foraging

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The title of my talk was the topic of an *Advanced Study Group* for which I was convenor last year [1]. In my talk I will give a brief outline about our respective research activities. It should be understandable to a rather general audience.

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. A famous paradigm in this field is the *Lévy flight 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 very controversially in the current literature [2]. After briefly introducing the stochastic processes of Lévy flights and Lévy walks I will review examples and counterexamples of experimental data and their analyses confirming and refuting the Lévy flight hypothesis. This debate motivated own work on deriving a fractional diffusion equation for an n-dimensional correlated Lévy walk [3], studying search reliability and search efficiency of combined Lévy-Brownian motion [4], and investigating stochastic first passage and first arrival problems [5].
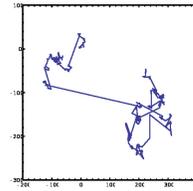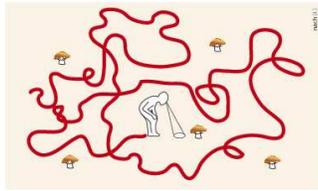
[1] www.mpipks-dresden.mpg.de/˜asg_2015

[2] R.Klages, *Search for food of birds, fish and insects*, invited book chapter in: A.Bunde, J.Caro, J.Kaerger, G.Vogl (Eds.), *Diffusive Spreading in Nature, Technology and Society.* (Springer, Berlin, 2017).

[3] J.P.Taylor-King, R.Klages, S.Fedotov, R.A.Van Gorder, Phys.Rev.E 94, 012104 (2016).

[4] V.V.Palyulin, A.Chechkin, R.Klages, R.Metzler, J.Phys.A: Math.Theor. 49, 394002 (2016).

[5] G.Blackburn, A.V.Chechkin, V.V.Palyulin, N.W.Watkins, R.Klages, tbp.

Date and Time: Tuesday, 27/09/2016, 16-17h

Location: Room M103, first floor of the Mathematical Sciences Building; tea is available from 15:30h in the common room M303, third floor.