

Anomalous transport and efficiency of search processes

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Search processes combining more than one search mechanism are generally more efficient. A prime example is the search of binding proteins for their specific target sequence on DNA. In classical models, this search has been described as bulk diffusion of the protein, plus a one-dimensional sliding motion along the protein. An additional mechanism are so-called intersegmental jumps at points where the DNA folds back on itself, such that the protein finds a shortcut. This is like carrying a canoe across a narrow ridge instead of paddling a long stream meander. In fact, the resulting jump events correspond to Lévy flights in the chemical coordinate. I will discuss in detail the rich behaviour exhibited by this combined search process and show first experimental results corroborating our model (Phys. Rev. Lett. **95**, 260603 (2005)).

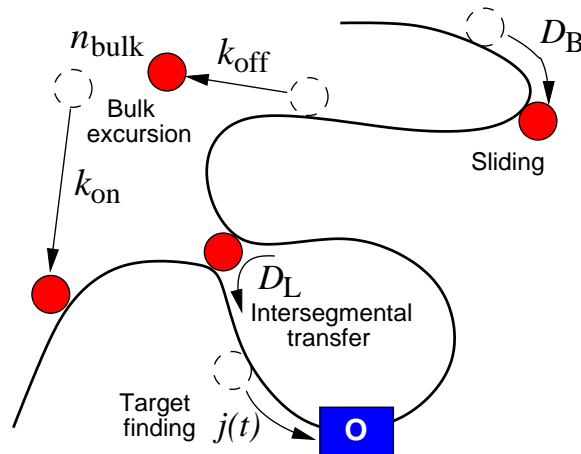


FIG. 1: Search mechanisms of a binding protein searching for its specific target sequence on DNA.