

Abstract Submitted
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Searching strategies in Dictyostelium LIANG LI, Department of Physics, Princeton University, EDWARD COX, Department of Molecular Biology, Princeton University — Levy walks are known to be the best strategy for optimizing non-destructive search times, while an intermittent two-state searching process optimizes the destructive case. Here we ask about hunting strategy in Dictyostelium amoebae when they cannot know where their food is. We show that correlated random walks with two typical correlation time scales bias their search, improving the search outcome. Further analysis indicates that cell trajectories consist of runs and turns. Strikingly, amoebae remember the last turn, and have a strong turning preference away from the last turn. Autocorrelation analysis of turn sequences indicates that this tendency does not persist beyond the $n+1$ turn. Computer simulations reveal that this bias contributes to the longer of the two correlation times. The search rules are essentially the same when cells are continuously stimulated by cAMP, with different persistence times and lengths. Interestingly, new pseudopods form in an orientation opposite to the following turn. One of the correlation timescales is approximately 30 seconds in all cases, thus indicating a short-lived cellular process, while the other is 9 to 15 minutes suggesting a process sensitive to external signals, perhaps pseudopod extensions during turning.

Liang Li
Department of Physics, Princeton University

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