

Abstract Submitted
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Limits of Gradient Sensing and Information Transmission in Eukaryotic Cells¹ BO HU, WEN CHEN, CTBP, UCSD, HERBERT LEVINE, CTBP,UCSD, WOUTER-JAN RAPPEL, CTBP, UCSD — Eukaryotic cells are able to direct their movements by sensing chemical gradients. The accuracy of such chemotactic response relies on the ability of cells to infer gradients from a heterogeneous distribution of ligand-bound receptors on the membrane. Here, we use two different approaches, the maximum likelihood estimate (MLE) method and the partition function calculation, to explore the physical limits of eukaryotic gradient sensing. We further characterize the chemotaxing cell as a Markovian information processing system, and analytically derive the upper bounds on the cell capacity of information transmission. Our results suggest that both external and internal fluctuations are important limiting factors to chemotactic efficiency.

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