Abstract Submitted
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Noise places constraints on eukaryotic gradient sensing and chemotaxis[1] BO HU, DANNY FULLER, WILLIAM LOOMIS, University of California - San Diego, WEN CHEN, University of Maryland - College Park, WOUTER-JAN RAPPEL, HERBERT LEVINE, University of California - San Diego — Chemotaxis is characterized by the directional cell movement following external chemical gradients. It plays a crucial role in a variety of biological processes including neuronal development, wound healing and cancer metastasis. Ultimately, the accuracy of gradient sensing is limited by the fluctuations of signaling components, e.g. the stochastic receptor occupancy on cell surface. We use concepts and techniques from statistical physics, estimation theory, and information theory to quantify the stochastic and nonlinear information processing in eukaryotic chemotaxis. We mainly address the following questions: (1) What are the physical limits of eukaryotic spatial gradient sensing? (2) How to characterize the movements of chemotactic cells? (3) How much gradient information can be reliably gained by a chemotactic cell? By answering those questions, we expect to derive new insights for general biological signal processing systems.

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