# A local coupling model and compass parameter for eukaryotic chemotaxis

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Chemotaxis is a cellular sensing mechanism that guides immune cells to sites of infection and leads fibroblasts to sites of injury. Here, we show in migrating primary dendritic cells and fibroblasts that the leading edge is not a uniform signaling entity, but instead consists of independent coupling units in which transient activation of PI3-kinase links to local lamellipod extension and small discrete turns in the direction of migration. These findings led to a model in which global cell polarization is independent from the chemotaxis mechanism. In this model, chemotaxis does not require spatial integration but is instead a stochastic process in which each receptor binding event within the leading edge triggers a local lamellipod extension and a small turn in the direction of migration. We show that this model and a derived "compass parameter" are sufficient to simulate the observed random migration, biased random walk, and persistent chemotactic behaviors of eukaryotic cells.

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