

Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Precise adaptation in chemotaxis through “assistance neighborhoods”¹ ROBERT ENDRES, NED WINGREEN, Princeton University — The chemotaxis network in *Escherichia coli* is remarkable for its sensitivity to small relative changes in the concentrations of multiple chemical signals over a broad range of ambient concentrations. Key to this sensitivity is an adaptation system that relies on methylation and demethylation/deamidation of specific modification sites of the chemoreceptors by the enzymes CheR and CheB, respectively. These enzymes can access 5-7 receptors once tethered to a particular receptor. Based on these “assistance neighborhoods”, we present a model for precise adaptation of mixed clusters of two-state chemoreceptors. In agreement with experiment the response of adapted cells to addition/removal of attractant scales with the free-energy change at fixed ligand affinity. Our model further predicts two possible limits of precise adaptation: either the response to further addition of attractant stops through saturation of the receptors, or receptors fully methylate before they saturate and therefore stop adapting.

¹We thank for financial support from HFSP.

Robert Endres
Princeton University

Date submitted: 12 Jan 2006

Electronic form version 1.4