Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Fundamental limits to the precision of multicellular sensing ANDREW MUGLER, Department of Physics, Emory University, MATTHEW D. BRENNAN, Department of Biomedical Engineering, Johns Hopkins University, ANDRE LEVCHENKO, Department of Biomedical Engineering and Systems Biology Institute, Yale University, ILYA NEMENMAN, Department of Physics and Department of Biology, Emory University — Recent experiments suggest that connected cells detect shallower chemical gradients together than alone, and that this enhanced sensitivity is lost when cell-to-cell communication is blocked. Here we derive the fundamental limits to the precision of gradient sensing by a chain of communicating cells. We show using linear response theory how precision is limited by the external diffusion of signaling molecules, by the exchange of messenger molecules between cells, and by the number of cells in the chain. We discuss how our predictions could be compared with ongoing experiments.

Andrew Mugler
Department of Physics, Emory University

Date submitted: 15 Nov 2013 Electronic form version 1.4