Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Signal Relay During Cell Migration CAN GUVEN, Department of Physics, University of Maryland, ERIN RERICHA, School of Medicine, Vanderbilt University, EDWARD OTT, WOLFGANG LOSERT, Department of Physics, University of Maryland — We developed a signal relay model to quantify the effect of intercellular communication in presence of an external signal, during the motion of groups of Dictyostelium discoideum cells. A key parameter is the ratio of amplitude of the cAMP (cyclic adenosine monophosphate) a signaling chemical secreted from individual cells versus the external cAMP field, which defines a time scale. Another time scale is set by the degradation rate of the cAMP. In our simulations, the competition between these two time scales results rich dynamics including uniform motion, as well as streaming and clustering instabilities. The simulations are compared to experiments for a wide range of different external signal strengths for both cells that secrete cAMP and a mutant which cannot relay cAMP. Under different strength of external linear cAMP gradient, the wild type cells form streams and exhibit clustering due to the intercellular signaling through individual cAMP secretion. In contrast, cells lacking signal relay move relatively straight. We find that the model captures both independent motion and the formation of aggregates when cells relay the signal.

Can Guven
Department of Physics, University of Maryland

Date submitted: 09 Nov 2011 Electronic form version 1.4