Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Experimental studies of large-scale collective swimming in dense suspensions of bacteria[1] ANDREY SOKOLOV, Illinois Institute of Technology/Argonne National Laboratory, IGOR ARANSON, Argonne National Laboratory, RAYMOND GOLDSTEIN, JOHN KESSLER, University of Arizona — We conducted experimental investigation of large-scale collective swimming in dense suspensions of *Bacillus subtilis*. This microorganism is flagellated, rod-shaped objects, 5-10 microns long and capable of swimming up to 20 microns/second. The hydrodynamic and chemical interactions between individual cells results in remarkably rich collective behavior; self-concentration due to gradients of dissolved oxygen or pH level; phase transitions and self-organization in confined geometries. The self-organization often takes the form of coherent structures with typical sizes that are many times larger than those of the individual bacteria. The studies were performed in thin liquid film with controlled thickness. We explored experimentally the dependence of the scales of large-scale flow structures on the concentration of cells. The experimental results are compared with the predictions of continuum mathematical model of this phenomenon.

[1]This research was supported by US DOE, contract #W-31-109-ENG-38

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Date submitted: 29 Nov 2005 Electronic form version 1.4