Abstract Submitted
for the DFD09 Meeting of
The American Physical Society

Swarming dynamics in bacterial colonies HEPENG ZHANG, AVRAHAM BE'ER, RACHEL SMITH, E.-L. FLORIN, HARRY L. SWINNEY, Univ. of Texas at Austin — Swarming is a widespread phenomenon observed in both biological and non-biological systems. Large mammal herds, fish schools, and bird flocks are among the most spectacular examples. Many theoretical and numerical efforts have been made to unveil the general principles of the phenomenon, but systematic experimental studies have been very limited. We determine the characteristic velocity, length, and time scales for bacterial motion in swarming colonies of *Paenibacillus dendritiformis* growing on semi-solid agar substrates. The bacteria swim within a thin fluid layer, and they form long-lived jets and vortices. These coherent structures lead to anisotropy in velocity spatial correlations and to a two-step relaxation in velocity temporal correlations. The mean squared displacement of passive tracers exhibits a short-time regime with nearly ballistic transport and a diffusive long-time regime. We find that various definitions of the correlation length all lead to length scales that are, surprisingly, essentially independent of the mean bacterial speed, while the correlation time is linearly proportional to the ratio of the correlation length to the mean speed.

Hepeng Zhang
Univ. of Texas at Austin

Date submitted: 27 Jul 2009 Electronic form version 1.4