Abstract for an Invited Paper
for the MAR10 Meeting of
The American Physical Society

Bacterial Swarming: social behaviour or hydrodynamics?[1]

JAN VERMANT, dept. Chemical Engineering, K.U. Leuven,

Bacterial swarming of colonies is typically described as a social phenomenon between bacteria, whereby groups of bacteria collectively move atop solid surfaces. This multicellular behavior, during which the organized bacterial populations are embedded in an extracellular slime layer, is connected to important features such as biofilm formation and virulence. Despite the possible intricate quorum sensing mechanisms that regulate swarming, several physico-chemical phenomena may play a role in the dynamics of swarming and biofilm formation. Especially the striking fingering patterns formed by some swarmer colonies on relatively soft sub phases have attracted the attention as they could be the signatures of an instability. Recently, a parallel has been drawn between the swarming patterns and the spreading of viscous drops under the influence of a surfactant, which lead to similar patterns [1]. Starting from the observation that several of the molecules, essential in swarming systems, are strong biosurfactants, the possibility of flows driven by gradients in surface tension, has been proposed. This Marangoni flows are known to lead to these characteristic patterns. For *Rhizobium etli* not only the pattern formation, but also the experimentally observed spreading speed has been shown to be consistent with the one expected for Marangoni flows for the surface pressures, thickness, and viscosities that have been observed [2]. We will present an experimental study of swarming colonies of the bacteria *Pseudomonas aeruginosa*, the pattern formation, the surfactant gradients and height profiles in comparison with predictions of a thin film hydrodynamic model.

[1] Matar O.K. and Troian S., Phys. Fluids **11** : 3232 (1999)
[2] Daniels, R et al., PNAS, **103** (40): 14965-14970 (2006)

[1]IDO-project K.U. Leuven