Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Evolution of Bacterial Suicide[1] MARTIN TCHERNOOKOV, Physics Department, Emory University, ILYA NEMENMAN, Departments of Physics and Biology and Computational and Life Sciences Initiative, Emory University — While active, controlled cellular suicide (autolysis) in bacteria is commonly observed, it has been hard to argue that autolysis can be beneficial to an *individual* who commits it. We propose a theoretical model that predicts that bacterial autolysis is evolutionarily advantageous to an *individual* and would fixate in physically structured environments for stationary phase colonies. We perform spatially resolved agent-based simulations of the model, which predict that lower mixing in the environment results in fixation of a higher autolysis rate from a single mutated cell, regardless of the colony's genetic diversity. We argue that quorum sensing will fixate as well, even if initially rare, if it is coupled to controlling the autolysis rate. The model does not predict a strong additional competitive advantage for cells where autolysis is controlled by quorum sensing systems that distinguish self from nonself. These predictions are broadly supported by recent experimental results in *B. subtilis* and *S. pneumoniae.*

[1]Research partially supported by the James S McDonnell Foundation grant No. 220020321 and by HFSP grant No. RGY0084/2011.

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Date submitted: 19 Nov 2012 Electronic form version 1.4