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Theory of cooperation in a micro-organismal snow-drift game¹ ZHENYU WANG, NIGEL GOLDENFELD, Department of Physics, Center for the Physics of Living Cells and Institute for Genomic Biology, University of Illinois at Urbana-Champaign — We present a mean field model for the phase diagram of a community of micro-organisms, interacting through their metabolism so that they are, in effect, engaging in a cooperative social game. We show that as a function of the concentration of the nutrients glucose and histidine, the community undergoes a phase transition separating a state in which one strain is dominant to a state which is characterized by coexisting populations. Our results are in good agreement with recent experimental results, correctly predicting quantitative trends and the phase diagram.

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