Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Noise and the statistical mechanics of distributed transport in a colony of interacting agents ELENI KATIFORI, Department of Physics and Astronomy, University of Pennsylvania, JOHANNES GRAEWER, Max Planck Institute for Dynamics and Self-Organization, HENRIK RONELLENFITSCH, Department of Physics and Astronomy, University of Pennsylvania, MARCO G. MAZZA, Max Planck Institute for Dynamics and Self-Organization — Inspired by the process of liquid food distribution between individuals in an ant colony, in this work we consider the statistical mechanics of resource dissemination between interacting agents with finite carrying capacity. The agents move inside a confined space (nest), pick up the food at the entrance of the nest and share it with other agents that they encounter. We calculate analytically and via a series of simulations the global food intake rate for the whole colony as well as observables describing how uniformly the food is distributed within the nest. Our model and predictions provide a useful benchmark to assess which strategies can lead to efficient food distribution within the nest and also to what level the observed food uptake rates and efficiency in food distribution are due to stochastic fluctuations or specific food exchange strategies by an actual ant colony.

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Date submitted: 10 Nov 2016 Electronic form version 1.4