Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

An experimental-computational platform for investigating microbial interactions and dynamics in communities with two codependent species MIGUEL FUENTES-CABRERA, Oak Ridge National Lab, JOHN D. ANDERSON, University of Tennessee, JARED WILMOTH, Oak Ridge National Lab, MARTA GINOVART, CLARA PRATS, Polytechnic University of Catalonia, XAVIER PORTELL-CANAL, French National Institute for Agricultural Research, SCOTT RETTERER, Oak Ridge National Lab — Microbial interactions are critical for governing community behavior and structure in natural environments. Examination of microbial interactions in the lab involves growth under ideal conditions in batch culture; conditions that occur in nature are, however, characterized by disequilibrium. Of particular interest is the role that system variables play in shaping cell-to-cell interactions and organization at ultrafine spatial scales. We seek to use experiments and agent-based modeling to help discover mechanisms relevant to microbial dynamics and interactions in the environment. Currently, we are using an agent-based model to simulate microbial growth, dynamics and interactions that occur on a microwell-array device developed in our lab. Bacterial cells growing in the microwells of this platform can be studied with high-throughput and high-content image analyses using brightfield and fluorescence microscopy. The agent-based model is written in the language Netlogo, which in turn is "plugged into" a computational framework that allows submitting many calculations in parallel for different initial parameters; visualizing the outcomes in an interactive phase-like diagram; and searching, with a genetic algorithm, for the parameters that lead to the most optimal simulation outcome.

Miguel Fuentes-Cabrera
Oak Ridge National Lab

Date submitted: 10 Nov 2016 Electronic form version 1.4