Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Population dynamics of microbial communities in the zebrafish gut MATTHEW JEMIELITA, MICHAEL TAORMINA, Department of Physics, University of Oregon, ADAM BURNS, Institute of Ecology and Evolution, University of Oregon, JENNIFER HAMPTON, ANNAH ROLIG, TRAVIS WILES, KAREN GUILLEMIN, Institute of Molecular Biology, University of Oregon, RAGHUVEER PARTHASARATHY, Department of Physics, University of Oregon
— The vertebrate intestine is home to a diverse microbial community, which plays a crucial role in the development and health of its host. Little is known about the population dynamics and spatial structure of this ecosystem, including mechanisms of growth and interactions between species. We have constructed an experimental model system with which to explore these issues, using initially germ-free larval zebrafish inoculated with defined communities of fluorescently tagged bacteria. Using light sheet fluorescence microscopy combined with computational image analysis we observe and quantify the entire bacterial community of the intestine during the first 24 hours of colonization, during which time the bacterial population grows from tens to tens of thousands of bacteria. We identify both individual bacteria and clusters of bacteria, and quantify the growth rate and spatial distribution of these distinct subpopulations. We find that clusters of bacteria grow considerably faster than individuals and are located in specific regions of the intestine. Imaging colonization by two species reveals spatial segregation and competition. These data and their analysis highlight the importance of spatial organization in the establishment of gut microbial communities, and can provide inputs to physical models of real-world ecological dynamics.

Matthew Jemielita
Department of Physics, University of Oregon

Date submitted: 13 Nov 2014 Electronic form version 1.4