Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Chiral pattern formation in compact microbial colonies KIRILL KOROLEV, ASHISH BINO GEORGE, Boston University — Chirality is ubiquitous in biology from single molecules to entire populations. Yet, we are still lacking a detailed understanding of how chiral patterns emerge from cell competition and growth, even in simple microbial colonies. Although many microbes grow as dense colonies with no apparent chirality, recent experiments with Escherichia coli have demonstrated that internal dynamics in such populations can be in fact chiral. We show that there is a unique way to extend the commonly-used reaction-diffusion models of colony growth to account for the emergent chirality. This new model connects microscopic and macroscopic chirality and explains the origin of logarithmic spirals separating different sub-populations in a colony. We also show that chirality is substantially enhanced by the cooperation among the cells at the expansion frontier. In heterogeneous populations composed of strains with different chiralities and growth rates, our model predicts a very rich set of possible dynamics. For example, different chiralities can result in either sharp boundaries between the strains or promote their intermixing depending on the preferred twisting directions of the strains.

Kirill Korolev
Boston University

Date submitted: 20 Oct 2015 Electronic form version 1.4