Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Range expansions transition from pulled to pushed waves with increasing cooperativity in an experimental microbial population SAURABH GANDHI, EUGENE YURTSEV, Massachusetts Inst of Tech-MIT, KIRILL KOROLEV, Boston University, JEFF GORE, Massachusetts Inst of Tech-MIT —
Range expansions are becoming more frequent due to environmental changes and rare long distance dispersal, often facilitated by anthropogenic activities. Simple models in theoretical ecology explain many emergent properties of range expansions, such as a constant expansion velocity, in terms of organism-level properties such as growth and dispersal rates. Testing these quantitative predictions in natural populations is difficult because of large environmental variability. Here, we used a controlled microbial model system to study range expansions of populations with and without intra-specific cooperativity. For non-cooperative growth, the expansion dynamics were dominated by population growth at the low-density front, which pulled the expansion forward. We found these expansions to be in close quantitative agreement with the classical theory of pulled waves by Fisher and Skellam, suitably adapted to our experimental system. However, as cooperativity increased, the expansions transitioned to being pushed, i.e. controlled by growth in the bulk as well as in the front. Although both pulled and pushed waves expand at a constant velocity and appear otherwise similar, their distinct dynamics leads to very different evolutionary consequences. Given the prevalence of cooperative growth in nature, understanding the effects of cooperativity is essential to managing invading species and understanding their evolution.

Saurabh Gandhi
Massachusetts Inst of Tech-MIT

Date submitted: 06 Nov 2015 Electronic form version 1.4