Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Predicting community composition from pairwise interactions JONATHAN FRIEDMAN, Phyiscs, MIT, LOGAN HIGGINS, Microbiology, MIT, JEFF GORE, Phyiscs, MIT — The ability to predict the structure of complex, multispecies communities is crucial for understanding the impact of species extinction and invasion on natural communities, as well as for engineering novel, synthetic communities. Communities are often modeled using phenomenological models, such as the classical generalized LotkaVolterra (gLV) model. While a lot of our intuition comes from such models, their predictive power has rarely been tested experimentally. To directly assess the predictive power of this approach, we constructed synthetic communities comprised of up to 8 soil bacteria. We measured the outcome of competition between all species pairs, and used these measurements to predict the composition of communities composed of more than 2 species. The pairwise competitions resulted in a diverse set of outcomes, including coexistence, exclusion, and bistability, and displayed evidence for both interference and facilitation. Most pair outcomes could be captured by the gLV framework, and the composition of multispecies communities could be predicted for communities composed solely of such pairs. Our results demonstrate the predictive ability and utility of simple phenomenology, which enables accurate predictions in the absence of mechanistic details.

Jonathan Friedman
Phyiscs, MIT

Date submitted: 06 Nov 2015 Electronic form version 1.4