Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Fitness in fluctuating environments SORIN TANASE NICOLA, ILYA NEMENMAN, Emory University — Often environments change faster than the time needed to evolve optimal phenotypes through cycles of mutation and selection. We focus on this case, but assume that environmental oscillations are slower than an individual's lifetime. This is relevant, for example, for bacterial populations confronted with daily environmental changes. We analyze a resource-limited competition between a mutant phenotype and the ancestor. Environmental dynamics is represented by periodically varying, off-phase parameters of the corresponding Lotka-Volterra model. For the very slow dynamics (but still faster than the fixation time scale) the strength and the sign of selection are functions of the birth/death rates averaged over all of the environmental states and independent of the period of the fluctuations. For faster fluctuations, selection depends on the particular sequence of the successive environmental states. In particular, a time reversal of the environmental dynamics can change the sign of the selection. We conclude that the fittest phenotype in a changing environment can be very different from both the optimal phenotype in the average environment, and the phenotype with the largest average fitness.

Sorin Tanase Nicola
Emory University

Date submitted: 27 Dec 2010 Electronic form version 1.4