Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Selective advantage for sexual reproduction[1] EMMANUEL TANNENBAUM, Ben-Gurion University of the Negev — We develop a simplified model for sexual replication within the quasispecies formalism. We assume that the genomes of the replicating organisms are two-chromosomed and diploid, and that the fitness is determined by the number of chromosomes that are identical to a given master sequence. We also assume that there is a cost to sexual replication, given by a characteristic time τ_{seek} during which haploid cells seek out a mate with which to recombine. If the mating strategy is such that only viable haploids can mate, then when $\tau_{seek} = 0$, it is possible to show that sexual replication will always outcompete asexual replication. However, as τ_{seek} increases, sexual replication only becomes advantageous at progressively higher mutation rates. Once the time cost for sex reaches a critical threshold, the selective advantage for sexual replication disappears entirely. The results of this talk suggest that sexual replication is not advantageous in small populations per se, but rather in populations with low replication rates. In this regime, the cost for sex is sufficiently low that the selective advantage obtained through recombination leads to the dominance of the strategy. In fact, at a given replication rate and for a fixed environment volume, sexual replication is selected for in high populations because of the reduced time spent finding a reproductive partner.

[1]Israel Science Foundation

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Date submitted: 28 Nov 2005 Electronic form version 1.4