Neutral evolution and the acceleration of the molecular clock

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Large sets of genotypes give rise to the same phenotype because phenotypic expression is highly redundant. Accordingly, a population can accept mutations without altering its phenotype, as long as the genotype mutates into another one on the same set. By linking every pair of genotypes that are mutually accessible through mutation, genotypes organize themselves into neutral networks (NN). These networks are known to be heterogeneous and assortative, and these properties affect the evolutionary dynamics of the population. By studying the dynamics of populations on NN with arbitrary topology we analyze the effect of assortativity, of NN (phenotype) fitness, and of network size. We find that the probability that the population leaves the network is smaller the longer the time spent on it. This progressive "phenotypic entrapment" entails a systematic increase in the overdispersion of the process with time and an acceleration in the fixation rate of neutral mutations.