Adaptative peak shifts with stress-induced mutagenesis // Population genetics of adaptation with stress-induced mutagenesis // Stress-induced mutagenesis on rugged adaptive landscapes // Stress-induced mutagenesis on rugged fitness landscapes

Yoav Ram and Lilach Hadany

In 1931 Sewall Wright presented a classic problem: given that the selective value of two or more loci are under positive epistasis, how can a population evolve from one allele combination to a fitter? Wright's problem is still an open question in evolutionary biology despite his own "shifting-balance theory" and others' attempts to resolve it.

Stress-induced mutagenesis, the process in which maladapted individuals increase their mutation rate, has been evidenced in numerous species, both prokaryote and eukaryote. In addition, we have previously demonstrated that stress-induced mutagenesis should evolve by natural selection and that it increases the mean fitness of populations.

Here we analyze a population genetic model of a rugged adaptive landscape. We derive analytical expressions that show that stress-induced mutagenesis increases the adaptation rate and present the results of stochastic simulations that validate our analysis. Our results suggest that stress-induced mutagenesis can increase the capacity of populations to adapt, in particular in the case of complex adaptations.