

Abstract Submitted
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Migration in asymmetric, random environments MICHAEL DEEM, DONG WANG, Rice University — Migration is a key mechanism for expansion of communities. As a population migrates, it experiences a changing environment. In heterogeneous environments, rapid adaptation is key to the evolutionary success of the population. In the case of human migration, environmental heterogeneity is naturally asymmetric in the North-South and East-West directions. We here consider migration in random, asymmetric, modularly correlated environments. Knowledge about the environment determines the fitness of each individual. We find that the speed of migration is proportional to the inverse of environmental change, and in particular we find that North-South migration rates are lower than East-West migration rates. Fast communication within the population of pieces of knowledge between individuals, similar to horizontal gene transfer in genetic systems, can help to spread beneficial knowledge among individuals. We show that increased modularity of the relation between knowledge and fitness enhances the rate of evolution. We investigate the relation between optimal information exchange rate and modularity of the dependence of fitness on knowledge. These results for the dependence of migration rate on heterogeneity, asymmetry, and modularity are consistent with existing archaeological facts.

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