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**Modularity Enhances the Rate of Evolution in a Rugged Fitness Landscape** DONG WANG, Rice University, JEONG-MAN PARK, Rice University and The Catholic University of Korea, MAN CHEN, MICHAEL DEEM, Rice University — Biological systems are modular, and this modularity affects the evolution of biological systems over time and in different environments. We here develop a theory for the dynamics of evolution in a rugged, modular fitness landscape. We show analytically how horizontal gene transfer couples to the modularity in the system and leads to more rapid rates of evolution at short times. The model, in general, analytically demonstrates a selective pressure for the prevalence of modularity in biology. We use this model to show how the evolution of the influenza virus is affected by the modularity of the proteins that are recognized by the human immune system. A modular model of the fitness landscape of the virus better fits the observed virus evolution data.

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