

Abstract Submitted
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A slowly evolving host moves first in symbiotic interactions

JAMES DAMORE, JEFF GORE, MIT — Symbiotic relationships, both parasitic and mutualistic, are ubiquitous in nature. Understanding how these symbioses evolve, from bacteria and their phages to humans and our gut microflora, is crucial in understanding how life operates. Often, symbioses consist of a slowly evolving host species with each host only interacting with its own sub-population of symbionts. The Red Queen hypothesis describes coevolutionary relationships as constant arms races with each species rushing to evolve an advantage over the other, suggesting that faster evolution is favored. Here, we use a simple game theoretic model of host- symbiont coevolution that includes population structure to show that if the symbionts evolve much faster than the host, the equilibrium distribution is the same as it would be if it were a sequential game where the host moves first against its symbionts. For the slowly evolving host, this will prove to be advantageous in mutualisms and a handicap in antagonisms. The model allows for symbiont adaptation to its host, a result that is robust to changes in the parameters and generalizes to continuous and multiplayer games. Our findings provide insight into a wide range of symbiotic phenomena and help to unify the field of coevolutionary theory.

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