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1003-92-1523 **Joshua S Weitz*** (jsweitz@princeton.edu), Dept. of Ecology and Evolutionary Biology, Princeton University, Princeton, NJ 08540, and **Hyman Hartman** and **Simon A Levin**.

Coevolutionary arms races between bacteria and bacteriophage.

We present a theoretical and computational study of rapid coevolutionary dynamics in their ecological context. Our aim is to predict and test the dynamics of bacteria and bacteriophage diversity in ecosystems where both the molecular biology and population dynamics are well characterized. An evolutionary ecology model incorporating trait adaptations is analyzed via the framework of adaptive dynamics. The phenotypic traits include the efficiency of resource use as well as the susceptibility/specificity of adsorption by phage. We solve the evolutionary ecology model and find the conditions for bifurcations leading to coexistence of distinct quasispecies. We find that a necessary condition for multi-strain coexistence is for the host-range specificity of bacteriophage to exceed the specificity of bacteria at uptake of nutrients. We confirm this heuristic via stochastic Monte Carlo simulations of populations evolving in a chemostat with biologically meaningful parameters. In addition we find parameter regimes for which sequential coevolutionary bifurcations lead to stable, multi-strain communities. Finally, we discuss means to test the predictions of this model and incorporate alternative life-history modalities for bacteriophage, i.e. bacteriophage as predator or as parasite. (Received October 05, 2004)