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Escaping an infestation of parasites by outrunning them: insights from a simple stochastic model JIAJIA DONG, Dept. of Physics & Astronomy, Bucknell University, BRIAN SKINNER, Argonne National Laboratory, NYLES BREECHER, Dept. of Mathematics, University of Wisconsin, Milwaukee, BEATE SCHMITTMANN, Dept. of Physics & Astronomy, Iowa State University, ROYCE K.P. ZIA, Dept. of Physics, Virginia Tech / Dept. of Physics & Astronomy, Iowa State University — Coexistence of multiple species abounds in ecological systems as a consequence of various interactions. Unlike predator-prey, the latter is not killed by the former in a parasite-host system. We study a simple lattice model, in which parasites wander randomly and die, giving birth only when they land on a square with the host. For a stationary host with certain boundary conditions, the stochastic process can be solved and the results match well to Monte Carlo simulations. In non-trivial stationary states, the characteristics of the "parasite-cloud" around the host are well understood. If the host moves with uniform velocity, solving the problem becomes much more challenging. Instead, we consider a stationary host with parasites performing *biased* diffusion, for which our theoretical predictions (with no fitting parameters) also agree with simulation results. In the appropriate continuum limit, the two processes are identical but interesting differences emerge in our lattice model. The most notable phenomenon is that the stationary parasite population generally increases with the bias, reaching a maximum before vanishing at some critical value. These and other features will be illustrated by examples with realistic Verhulst factors, which model finite carrying capacities.

Jiajia Dong
Department of Physics and Astronomy, Bucknell University

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