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Hopping Conduction and Bacteria: Transport Properties of Disordered Reaction-Diffusion Systems ANDREW MISSEL, KARIN DAHMEN, University of Illinois, Urbana-Champaign — Reaction-diffusion (RD) systems are used to model everything from the formation of animal coat patterns to the spread of genes in a population to the seasonal variation of plankton density in the ocean. In all of these problems, disorder plays a large role, but determining its effects on transport properties in RD systems has been a challenge. We present here both analytical and numerical studies of a particular disordered RD system consisting of particles which are allowed to diffuse and compete for resources ($2A \to A$) with spatially homogeneous rates, reproduce ($A \to 2A$) in certain areas ("oases"), and die ($A \to 0$) everywhere else (the "desert"). In the low oasis density regime, transport is mediated through rare "hopping events" in which a small number of particles diffuse through the desert from one oasis to another; the situation is mathematically analogous to hopping conduction in doped semiconductors, and this analogy, along with some ideas from first passage percolation theory, allows us to make some quantitative predictions about the transport properties of the system on a large scale.

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