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Nature provides countless examples of many-particle systems maintained far from thermodynamic equilibrium. Perhaps the simplest condition we can expect to find such systems in is that of a nonequilibrium steady state; these already present a much more varied and complex picture than equilibrium states. Their instabilities, variously described as nonequilibrium phase transitions, bifurcations, and synergies, are associated with pattern formation, morphogenesis, and self-organization, which connect the microscopic level of simple interacting units with the coherent structures observed, for example, in organisms and communities.

Nonequilibrium phenomena have naturally attracted considerable interest, but until recently were largely studied at a macroscopic level. Detailed investigation of phase transitions in lattice models out of equilibrium has blossomed over the last decade, to the point where it seems worthwhile collecting some of the better understood examples in a book accessible to graduate students and researchers outside the field. The models we study are oversimplified representations or caricatures of nature, but may capture some of the essential features responsible for nonequilibrium ordering in real systems.

Lattice models have played a central role in equilibrium statistical mechanics, particularly in understanding phase transitions and critical phenomena. We expect them to be equally important in nonequilibrium phase transitions, and for similar reasons, they are the most amenable to precise analysis and allow one to isolate specific features of a system and to connect them with macroscopic properties. Equilibrium lattice models are typically specified by their energy function or Hamiltonian on configuration space; here, the models (we restrict our attention to lattice Markov processes or particle systems) are defined by a set of transition probabilities. Unlike in equilibrium, the stationary probability distribution is not known *a priori*.