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Balls and urns: a general framework that captures essential features of multilevel selection

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The conflict between traits that are beneficial at a local individual scale and traits that are beneficial at a larger group scale is pervasive throughout biology. Well-studied examples include the production of a beneficial public good in host-pathogen and microbe systems, leaf size in stands of plants, and male mating restraint in insects and fish. Many of these systems are fascinating to study their own right, yet they share the common feature of multiple and opposing levels of selection. I will present a unifying mathematical framework for this common feature which enhances our understanding of antagonistic multilevel selection beyond what would be achieved from a system-specific model. In particular, this framework demonstrates that while antagonistic multilevel selection manifests itself in a variety of biological contexts, there are several 'rules of thumb' which we expect to hold universally.