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Inferring biodiversity maintenance mechanisms from ecological pattern¹

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Among a set of competitors for a single common resource, the best will simply exclude the others. Yet in nature we can see astounding diversity of competing species. Do close similarities in species' response to the local environment primarily explain their coexistence? Or is this diversity possible because of differences between species that stabilize their coexistence? And if so, what particular differences between species are important in particular communities? Some ecological communities lend themselves to experimental manipulation to begin to answer these questions. Yet for many other communities, such as tree species in forests, the logistical hurdles to this approach are daunting. Faster progress could be made in ecology if insight into biodiversity maintenance mechanisms could be gained from patterns exhibited in local ecological communities, such as how coexisting species are distributed in their ecological traits and relative abundance. Hurdles that we need to overcome to be able to gain such insight include: 1) further developing neutral theory, a quantitative process-based null model of community pattern resulting when species similarities are what allow their coexistence, and 2) better understanding what patterns to expect when species differences dominate instead, particularly in the context of stochasticity and immigration. I will describe our ongoing research to overcome these hurdles, to provide better tools for analyzing observed pattern.

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