Origin of the latitudinal species richness gradient in the New World

Introduction
Spatial variation in richness patterns must be due to variation in rates of speciation, extinction, immigration and emigration\(^1,2\). Hotspots of diversity can occur either because they are hotspots of speciation (cradles) or cold spots of extinction (museums)\(^3\) – two major hypotheses that make contrasting predictions for the phylogenetic structure of communities. We test these hypotheses by comparing centers of species richness and phylogenetic clustering for vascular plants in the New World.

Methods
Range maps for 88,417 plant species were extracted from the Botanical Information and Ecology Network (BIEN) database and combined with the BIEN mega phylogeny of \(>80,000\) species. We calculated the Phylogenetic Diversity Index (PDI) and Net Relatedness Index (NRI) for each cell in a \(100\times100\) km grid using a new computationally efficient algorithm. Species richness patterns were compared to patterns of PDI and NRI.

Results and conclusion
We found that:
1) for all vascular plants, high species richness is associated with high phylogenetic clustering, supporting a “cradle” model of biodiversity hotspots.
2) there is marked variation across plant families, which may be explained by variation in lifespans and growth forms.

References