

# Mapping and exploring trait spaces across the tree of life

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Rapid environmental changes threaten biodiversity and ecosystem functioning, making it crucial to understand their effects. A key point in this respect is that not all organisms are functionally equivalent. From tiny shrews and duckweeds to gigantic whales and sequoias, different solutions in the struggle for existence have led to an extraordinary diversity of forms among organisms on Earth. These differences depend on functional traits—features of individual organisms related to their responses to environmental conditions and their effect on ecosystem processes. Despite all this functional diversity, species' ecological strategies resulting from trait combinations are constrained by physiological limits set by evolutionary history and trade-offs in resource allocation. Aiming to understand what the main dimensions of functional variation are and how species are organized within them, ecologists have recently started mapping the functional spaces of different taxonomic groups. I will provide an overview of our most recent research undertakings, which include developing methods to characterize functional structure, incorporating fine root traits in the global spectrum of plant form and function, sketching functional spaces for vertebrates, and estimating how future extinctions will erode functional diversity at different scales.

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