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"The physiological ecology of drought adaptation: macro- and micro-evolutionary perspectives"

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ABSTRACT:
Physiological traits define the niches that plants occupy and strongly influence ecosystem function. Though variation in physiology is often assumed to be adaptive, much of our understanding of how natural selection has shaped the evolution of physiology is derived from correlations between physiological variation and environmental resource gradients. Though valuable, this approach does not directly identify the causes or targets of natural selection. I describe two projects that test hypotheses about the evolution of plant physiology. First, I use phylogenies and the comparative method to test whether increased resistance to xylem cavitation in angiosperms and gymnosperms evolved in response to aridity. Second, I use phenotypic selection analysis to test whether drought escape in Mediterranean annuals is facilitated by enhanced biochemical photosynthetic capacity and leaf gas exchange. I will highlight the novel insights that can be gained from explicitly incorporating phylogenies into comparative physiological studies and linking variation in physiology to fitness.