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Adaptation to Changing Climate in Arabidopsis Thaliana

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ABSTRACT

Whether and how natural populations will adapt fast enough to persist in the face of rapid climate change is a critical question for 21st century evolutionary biology. The annual plant Arabidopsis thaliana provides a model system for investigating and predicting patterns of climate adaptation. Extensive genomic data exist from many accessions collected across the species' climate range. These data can be combined with phenotypic data from common garden experiments using GWAS to identify traits and loci associated with real-time fitness in different climates, and to test for a geographic signature of adaptation to climate in the site of origin. Genetic resources such as mutants and mapping populations make it possible to examine how perturbation of specific developmental pathways will affect life history expression in dynamic real-world environments. Experimental data can be used to parameterize process-based models to predict life history responses to climate change. Genomic selection methods combined with simulation of evolutionary trajectories make it possible to explore the dynamics of phenotypic and genotypic evolution in replicated scenarios of climate change.

BIO:

Johanna Schmitt is a Distinguished Professor in the Department of Evolution and Ecology at University of California, Davis. Previously she was at Brown University, where she served as Director of the Environmental Change Initiative from 2008-2012. She is an elected member of the National Academy of Sciences and the American Academy of Arts and Sciences and a Fellow of the American Association for the Advancement of Sciences. She is a recipient of the Alexander von Humboldt Research Award (2007) and the Molecular Ecology Prize (2014). In 2013 she served on the National Research Council Study Group on Understanding and Monitoring Abrupt Climate Change. Her research examines the ecological mechanisms and genetic basis of adaptation to heterogeneous environments, combining field experiments, genetic and environmental manipulations, genomic analysis, and climate data. Recent work has dissected the genetic basis of complex life history traits in natural environments, modeled phenological responses to changing climate, and revealed the signature of local adaptation to climate in the model plant Arabidopsis thaliana.