Understanding mechanisms of response to complex environmental conditions using model and non-model plants

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Abstract

Understanding how organisms are able to respond to environmental challenges at different time scales is an essential component of deciphering the impact and long-term consequences of changing environment. This session on "Epigenetics, phenotypic plasticity and physiological ecology" provides examples of a variety of studies using classic experimental design to examine the importance of phenotypic plasticity and divergence under different conditions. In particular, the session highlights ecophysiological responses such as response to nutrient, temperature, light, and seasonality. Several studies describe the complexity of multiple environmental stressors and take advantage of the context of biological invasions or other components of global change. As an introduction, I will briefly show how our work uses similar experimental design to investigate the molecular level response to complex environmental challenges. Our recent studies rely on rapidly developing genomic tools from model plants grown in controlled conditions, which can now be used to examine the mechanisms of phenotypic response in a broad array of wild organisms and biologically relevant conditions. My lab group uses reduced representation bisulphite sequencing and transcriptomic approaches to explore the potential role of genetic and epigenetic processes in natural and controlled studies of native and invasive salt marsh species like *Spartina alterniflora* and Japanese knotweed. We also leverage the power of the eudicot *Arabidopsis* and monocot *Brachypodium distychum* model plant species to confirm our findings in these non-model plants. Combined these studies will enhance our understanding of how genetic and epigenetic variation interact in response to environment on different time scales, and ultimately contribute to adaptation.

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