EPIGENETIC INFLUENCES ON PLANT GROWTH RESPONSE, AND POTENTIAL FOR ENHANCING STRESS RESILIENCE IN TREE SPECIES

Sally A. Mackenzie[1], Hardik Kundariya[1], Robersy Sanchez[1], Xiaodong Yang[1], Ha Eun Jeh[2], Isaac Dopp[2]

[1] Departments of Biology and Plant Science, Penn State University (sam795@psu.edu);
[2] Plant Biology Graduate Program, Penn State University, University Park, PA 16802

Understanding plant environmental response, and the heritability of that response, may prove vital to dissecting modes of plant adaptation. Our group has developed a system for investigating plant epigenetic behaviors that centers on plastid triggers of epigenetic reprogramming. These plastid-based epigenetic effects appear to be well conserved in plants and rely on histone modifying, DNA methylation and small RNA components. Implementation of epigenetic reprogramming in grafting experiments permits the identification of RNA-directed DNA methylation targets within the genome that involve graft transmissible and transgenerational signaling and lead to enhanced fitness phenotype changes. Two of the genetic components of this system, MSH1 and PPD3, were first identified and characterized in Arabidopsis, but are conserved in plants and offer important potential strategies for enhancement of growth potential and resilience in tree species. We have developed a model for plant environmental response that may apply to both seasonal and perennial growth habits, with a plan for implementation in poplar for identifying environmentally altered gene networks and alignment with longer-term genome evolutionary paradigms.