Ackert Hall, Room 120
Wednesday, October 22, 2025
4:00 P.M.

Coffee and Cookies
Chalmers Hall, Room 168
3:45 P.M.

Biochemistry & Molecular Biophysics Seminar

Transcriptional regulators of elongation growth and glucosinolate biosynthesis in the plant epidermis

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Homeodomain leucine-zipper IV (HD-Zip IV) transcription factors are developmental regulators that control biomass, drought tolerance and other valuable traits in agricultural crops. These proteins contain an evolutionarily conserved lipid sensor, START, that binds lysophospholipids, while the function of the C-terminal START Adjacent Domain (STAD) is not understood. *Arabidopsis thaliana* MERISTEM LAYER1 (ATML1) is a HD-Zip IV member that drives cell differentiation and elongation growth in giant cells of the epidermis. In this talk, I will describe the identification of a transcriptional adapter protein, GIR1, that physically interacts with both the ATML1 transcription factor and TOPLESS RELATED (TPR) corepressors involved in chromatin remodeling. Mutant analysis in conjunction with yeast two-hybrid and co-immunoprecipitation assays revealed that a putative zinc finger in GIR1 interacts with ATML1 through STAD. Simultaneously, GIR1 interacts with TPR proteins through its EAR motif. The giant cell phenotype of *gir1* mutant sepals suggests its function as a negative regulator of ATML1. We hypothesize that GIR1 acts as an adaptor protein to aid in the transcriptional repression of ATML1 target genes. RNA sequencing identified multiple glucosinolate pathway genes that are upregulated in *gir1* mutant sepals but downregulated in *atml1* mutants compared to wild type. Glucosinolates are secondary metabolites with pesticidal activities in *Arabidopsis* and other members of the Brassicales, and they are known for their functions as dietary anticancer and anti-inflammatory compounds. Chemical analysis along with mass spectrometry imaging confirmed the relative increase of glucosinolates in *gir1* mutant sepals compared to wild type. Our ongoing work dissects how the ATML1-GIR1-TPR complex integrates developmental and environmental signals to orchestrate gene expression in the epidermis. The discovery of this novel molecular mechanism to control glucosinolate production could be leveraged for agricultural applications and facilitate the development of improved superfoods in disease prevention.