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18 May 2015 (Monday), 11am
The Auditorium (Level 1)

A molecular network that integrates multiple hormonal and environmental signals for growth regulation in plants

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Eunkyoo Oh obtained his Ph.D. in Biological Science at KAIST (Korea) under the supervision of Prof. Giltsu Choi. His thesis work was focused on a light signaling pathway in Arabidopsis and demonstrated that PIL5 is a key negative regulator in the light mediated seed germination. In 2009, he joined Zhiyong Wang's lab at Carnegie Institution for Science (USA) as a postdoc and identified molecular mechanisms of how multiple hormonal and environmental signaling pathways are integrated into plant growth regulation.

In plants, cell elongation and seedling morphogenesis are controlled by multiple environmental factors and endogenous hormones. How these signals regulate largely overlapping cellular and physiological responses through distinct signalling pathways remains an outstanding question in plant biology. I will illustrate a molecular network that integrates all major growth-regulating signals, including auxin, Brassinosteroid (BR), gibberellin (GA), light, and temperature. Analyses of genome-wide targets, genetic and biochemical interactions demonstrate that the auxin-response factor ARF6, the light/temperature-regulated transcription factor PIF4, and the BR-signaling transcription factor BZR1, interact with each other, and cooperatively regulate large numbers of common target genes and hypocotyl elongation. However, their DNA-binding activities are blocked by the GA-inactivated repressor RGA and GA-promoted hypocotyl elongation requires these transcription factors activities. In the downstream of the ARF6-PIF4-BZR1 module, the PRE family helix-loop-helix factors promote hypocotyl elongation. These results demonstrate a central molecular network that integrates multiple hormonal and environmental signals for regulating cell elongation in the Arabidopsis hypocotyl.

Recent Publications:

1. **Oh, E**.*, Zhu, J.Y.*, Ryu, H., Hwang, I., and Wang, Z.Y. (2014). TOPLESS mediates brassinosteroid-induced transcriptional repression through interaction with BZR1. Nature communications 5, 4140 (*equal contribution)
2. **Oh, E**., Bai, M.Y., Zhu, J.Y., Arenhart, R., Sun, Y., and Wang, Z.Y. (2014). Cell elongation is controlled through a central molecular circuit in Arabidopsis hypocotyls. eLife 3:e03031.
3. **Oh, E.,** Zhu, J.Y., Wang, Z.Y. (2012). Interaction between BZR1 and PIF4 integrates brassinosteroid and environmental responses.Nature cell biology (Articles) 14, 802-809