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12 January 2021 (Tuesday), 3.30pm
Hosted by: Dr Yin Zhongchao

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Epigenetic-mediated thermal memory & forgetting in Arabidopsis

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Dr Toshiro Ito received his Ph.D from Kyoto University, Japan and worked for California Institute of Technology, USA as a postdoctoral fellow (1997-2003) and as a senior research fellow (2003-2005). He worked for Temasek Life Sciences Laboratory, Singapore (2005-2017) to lead the Plant Systems Biology Group. In 2015, he started the Plant Stem Cell Regulation and Floral Patterning Laboratory in Nara Institute of Science and Technology.

Global warming threatens agricultural production worldwide. Natural heat stress is often recurring and fluctuating. After plants have encountered a mild heat stress, they acquire heat tolerance for better adaptation to future heat stress. Although epigenetic regulation of plant gene expression is well studied, how plants maintain a memory of environmental changes over time and further how plants lose the memory when unnecessary remain unclear. Here, we show that JUMONJI (JMJ) proteins, demethylases involved in histone H3 lysine 27 trimethylation (H3K27me3), are necessary for Arabidopsis thaliana heat acclimation. Acclimation induces sustained H3K27me3 demethylation at key *HEAT SHOCK PROTEIN (HSP)* loci by JMJs, poising the *HSP* genes for subsequent activation. The *jmj* mutants fail to maintain heat memory under fluctuating field temperature conditions. Our findings of an epigenetic memory mechanism involving histone demethylases may have implications for environmental adaptation of field plants. I will also present our other approach to reveal the molecular mechanisms of plant memory and forgetting.

Recent Publications

1. Yamaguchi N, Matsubara S, Yoshimizu K, Seki M, Hamada K, Kamitani M, Kurita Y, Inagaki S, Suzuki T, Gan E-S, To T, Kakutani T, Nagano AJ, Satake A, **Ito T.** (2020) "Removal of repressive histone marks creates epigenetic memory of recurring heat in Arabidopsis" bioRxiv doi 10.1101/2020.05.10.086611 (Nature Comm in revision)
2. Wang, Y., Kumaishi, K., Suzuki, T., Ichihashi, Y., Yamaguchi, N., Shirakawa, M., and **Ito, T.** (2020) "Morphological and Physiological Framework Underlying Plant Longevity in Arabidopsis thaliana" **Front. Plant Sci.**, <https://doi.org/10.3389/fpls.2020.600726>
3. Sun, B., Zhou, Y., Caia, J., Shanga, E., Yamaguchi, N., Xiao, J., Looi, L-S., Wee, W-Y. Gao, X., Wagner D., and **Ito, T.** (2019) "Integration of transcriptional repression and Polycomb-mediated silencing of WUSCHEL in floral meristems" **Plant Cell** doi.org/10.1105/tpc.18.00450