Graduate School Event

Thesis Defense: Root System Plasticity under Nutrient Limitation: Investigating Hormonal and Molecular Drivers in Arabidopsis thaliana and Coffea species

Stefan Riegler (Benkova Group)

Benkova Group

Host: Beatriz Vicoso

Due to their sessile nature, plants have evolved astounding developmental plasticity, which allows them to respond to environmental fluctuations by adapting their growth and architecture. This adaptability is the result of the interplay between numerous hormonal and nutrient-sensing processes. By adjusting their internal signaling pathways, plants can optimise their resource acquisition and defense strategies, ensuring their survival and productivity in diverse habitats.The first part of this work is centered on the gene SYNERGISTIC ON AUXIN AND CYTOKININ1 (AtSYAC1) in Arabidopsis thaliana. Despite often antagonistic interactions between auxin and cytokinin, AtSYAC1 exhibits a massive, non-additive induction upon simultaneous exogenous hormone treatment. This research identifies the first biologically relevant context that induces AtSYAC1 expression in roots, specifically, phosphate starvation and plant-fungal interaction. We proceed to investigate the spatiotemporal expression patterns and cellular localization of AtSYAC1 in response to these cues, discovering its specific induction in root hair cells and its potential role in root hair tip growth. By investigating the plant-fungal relationship we highlight the high environmental sensitivity of such interactions.The second part of this thesis, as part of the Horizon Europe BOLERO project, addresses the development of resilient coffee rootstocks to support sustainable, lowinput farming systems. Using high-throughput phenotyping and transcriptomic analyses, the study evaluates the root system plasticity of cultivated and wild Coffea species under contrasting nitrogen supply. We identify the molecular basis of high root system plasticity in C. canephora and C. congensis, and observe a curious response to low nitrogen availability in C. brevipes. Furthermore, physiological and hormonal profiling of grafted plants identifies promising rootstock-scion combinations and provides a molecular and phenotypic foundation for breeding Coffea varieties with enhanced nutrient-use efficiency and environmental resilience.

Tuesday, February 10, 2026 09:00am - 10:00am

Zoom

This invitation is valid as a ticket for the ISTA Shuttle from and to Heiligenstadt Station. Please find a schedule of the ISTA Shuttle on our webpage: https://ista.ac.at/en/campus/how-to-get-here/ The ISTA Shuttle bus is marked ISTA Shuttle (#142) and has the Institute Logo printed on the side.