

Bachelor's/Master's Thesis Opportunity in Plant Molecular Biology

Project title: Comparing developmental plasticity to warm temperature between *Arabidopsis thaliana* and *Capsella rubella*

Project Summary

Plants constantly adjust their growth and development in response to their environment. In particular, warm temperatures can accelerate growth and flowering—a set of responses known as **thermomorphogenesis**.

But how do plants sense temperature at the molecular level, and how can genetic variation alter their ability to respond to different climates?

In this project, you will investigate **temperature-dependent growth and molecular responses in the plant genus *Capsella***. We are particularly interested in the role of temperature-sensitive protein domains (Prion-related Domains, PrDs) and how natural variation in these proteins may contribute to differences in temperature responsiveness and adaptation.

Research Questions

- What is the suite of thermomorphogenic responses in the species *Capsella*?
- How does genetic variation affect temperature-responsive growth?

What will you do?

-  **Plant growth and temperature experiments**
-  **Phenotyping** of temperature-dependent growth and developmental traits
-  **CRISPR-Cas9 genome editing** and analysis of genetically modified plants
-  **Molecular biology**, including PCR, cloning and DNA analysis
-  **Genotyping and protein analysis**, including Western blotting
-  **Confocal microscopy** to investigate protein localisation and temperature-dependent protein behaviour
-  Analysis of **candidate genes and proteins involved in temperature sensing**

Who can apply?

We are looking for motivated Bachelor's or Master's students interested in:

- Plant biology and plant development
- Genetics and molecular biology
- Genome editing
- Microscopy and cell biology
- Evolution and adaptation

Previous experience with all techniques is not required. You will receive training in the methods relevant to your project.

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What will you gain?

This project offers hands-on experience at the interface of **plant biology, genetics, molecular biology, microscopy and evolutionary biology**, with the opportunity to learn and apply modern experimental approaches such as **CRISPR-Cas9 genome editing and confocal microscopy**.

Relevant papers:

1. A prion-like domain in ELF3 functions as a thermosensor in Arabidopsis. Jung JH, Barbosa AD, Hutin S, Kumita JR, Gao M, Derwort D, Silva CS, Lai X, Pierre E, Geng F, Kim SB, Baek S, Zubieta C, Jaeger KE, Wigge PA. *Nature*. 2020 Sep;585(7824):256-260. doi: 10.1038/s41586-020-2644-7. Epub 2020 Aug 26. PMID: 32848244
2. Temperature Sensing in Plants. Kerbler SM, Wigge PA. *Annu Rev Plant Biol*. 2023 May 22;74:341-366. doi: 10.1146/annurev-arplant-102820-102235. Epub 2023 Feb 28.
3. M. S. Box, et al., ELF3 controls thermoresponsive growth in Arabidopsis. *Curr. Biol*. 25 (2015).

Project type: Bachelor's / Master's thesis

Research area: Plant Molecular Biology, Genetics, Thermomorphogenesis

Location: Leibniz Institute for Horticultural Sciences (IGZ)

Supervisor: Prof. Philip Wigge

Start date: Flexible

Contact: wigge@igzev.de; nikose@igzev.de

The project is part of the DFG-funded Collaborative Research Centre on phenotypic plasticity in plants (CRC1644). Collaborative Research Centre 1644: <https://www.unipotsdam.de/en/ppp/>

ADAPT 1: Temperature Sensing in Plants: <https://igzev.de/en/research/research-groups/adapt-1>

 **Join us to discover how plants “feel the heat” — and how their ability to respond to temperature evolves.**

Please send us a short email explaining why you would like to join, along with your contact information, to: wigge@igzev.de; nikose@igzev.de