

Friedrich Schiller University Jena

Matthias Schleiden Institute - Genetics

Bachelor or Master Thesis



Evolutionary dynamics of MADS-box genes in fungi

MADS-box genes encode for crucial transcription factors in plants, animals and fungi (see references). While this gene family has greatly expanded in plants such that many plant species have more than 100 MADS-box genes, the number of MADS-box genes basically remained static at two to five MADS-box genes per species in animals. Our preliminary data from fungi suggests that the evolutionary dynamics of MADS-box genes in fungi is considerably different from that of both plants and animals.

The project offered aims to corroborate our findings and to prepare a publication. Using toolkits of comparative genomics and bioinformatics, MADS-box genes will be identified in published fungal genomes. Based on these data phylogeny reconstructions will be carried out using different methods (Maximum Likelihood, Bayesian inference etc.). Moreover, the selection regimes under which the genes evolved will be determined, as well as aspects of the evolution of their exon-intron structures, expression patterns and functions. The results will lead to a better understanding of the evolutionary trajectory of MADS-box genes in fungi as compared to that of animals and plants, and, eventually, will help us to better understand fungi.

The project is suitable for **students of biology, bioinformatics or biochemistry** with adequate computer skills and basic knowledge in molecular evolution.

In case of interest, please contact Lydia Gramzow (lydia.gramzow@uni-jena.de), Florian Rümpler (florian.ruempler@uni-jena.de) or Günter Theißen (guenter.theissen@uni-jena.de).

References:

- Gramzow, L., et al. (2010). *Trends Genet.* **26**, 149-153.
- Banks, J.A., et al. (2011). *Science* **332**, 960-963.
- Nystedt, B., et al. (2013). *Nature* **497**, 579-584.
- Gramzow, L., Theißen, G. (2013). *Biology* **2**, 1150-1164.
- Gramzow, L., et al. (2014). *Annals of Botany* **114**, 1407-1429.
- Gramzow, L., Theißen, G. (2015). *J. Exp.Zool. (Mol. Dev. Evol.)* **324B**, 353-362.
- Nishiyama, T., et al. (2018). *Cell* **174**, 448-464.
- Hoffmeier, A., et al. (2018). *Mol. Biol. Evol.* **35**, 2618-2638.