

The University of Cologne invites applications from motivated and energetic candidates for a PhD position in the research group of Prof. Juliette de Meaux in the faculty of Natural Sciences.

1 PhD position
for regional adaptation in *Arabidopsis*
thaliana
Lab. J. de Meaux

In this project, the PhD candidate will decipher the molecular basis of plastic responses in the model species *A. thaliana*, that have provided regional adaptation in plant growth in the presence of distinct light cues. The candidate will grow *A. thaliana* plants originating from various European regions side-by-side next to plants originating from China, which form an outgroup. Plants will be exposed to various light and temperature regimes and both their growth and their transcriptome will be compared. The importance of several plastic responses for regional adaptation. With this project, the PhD candidate will acquire skills ranging from genomics to molecular genetics and ecology.

The applicant must hold a Master degree in Evolutionary Biology, Genetics, Genomics or Bioinformatics and prove interest in plant molecular, population or ecological genetics. Experience in statistical analysis of quantitative data is required. This position is open to applicants of all nationalities but the language in the lab is English. Applications or questions regarding the position should be sent by mail to jdemeaux@uni-koeln.de, with the following subject line - PhD application Regional adaptation thaliana - de Meaux lab. A letter of motivation, a CV and the contact to 2 independent referees should be provided, all in a **single** pdf file. Revision of applications will begin on Feb. 15th, 2016 and continue until the position is filled. Funding is for 3-4 years with starting date in between May and July. For more information on our lab and research visit our website <http://www.botanik.uni-koeln.de/1146.html>. Interested students currently completing their Master thesis are encouraged to informally contact the PI if they have questions concerning the position.

Cologne is Germany's vibrant Metropolis on the Rhine. The city is well known for its wild carnival, its famous Kölsch beer, its Cathedral and its vivid contemporary art and musical scene. Cologne is the fourth biggest city in Germany with over a million inhabitants from all over the world and an interesting mix of restored historic buildings and modern post-war architecture. Most importantly, Cologne University is one of the oldest and largest Universities in the Country. Our research group is hosted at the Biological Center of the University of Cologne and associated to the Excellence Research Cluster CEPLAS (<http://ceplas.eu/de/>), which fosters active interactions between plant scientists of the Universities of Cologne, Düsseldorf and the Max Planck Institute of Plant Breeding Research. In this context, our PhD students are assured to start their scientific career in a world-class scientific environment.

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Genetic adaptation is often shown to proceed by the appearance of a mutation with a large effect that gets quickly fixed in the population. But these mutations do not explain the whole of adaptation. We believe that a significant part of adaptation occurs by the accumulation of small effect mutations, akin to those postulated by Fisher in his infinitesimal model. Can we understand new aspects of adaptation if we dissect the molecular origin of these mutations? This is the question we are addressing in our laboratory.

In this project, the PhD candidate will decipher the molecular basis of adaptive plastic responses in the model species *A. thaliana*. Using classical Qst/Fst approaches, the candidate will evaluate the importance of several plastic responses for regional adaptation. This approach will be complemented by an analysis of regional cis-regulatory divergence with the help of F1 hybrids, an approach pioneered by our lab. This approach allows drawing the distribution of cis-regulatory mutations throughout the genome. Molecular systems (e.g. GO categories, or clusters of co-expressed genes) regionally enriched in cis-acting mutations are likely target of region-specific selection. These targets can subsequently be validated in the lab, or in the field. With this project, the PhD candidate will acquire skills ranging from genomics to molecular genetics and ecology.

The PhD will precisely address those 3 questions:

- i) Do modifications in the temperature regime trigger phenotypic responses of importance for local adaptation in *A. thaliana*?
- ii) Are cis-acting differences activated after modification of the temperature regime enriched in specific molecular functions in each region?
- iii) Do these molecular functions provide an adaptive advantage in each region?

The applicant must hold a Master degree in Biology or Bioinformatics and prove interest in plant molecular, population or ecological genetics. Experience in statistical analysis of quantitative data is welcome. Some background in Evolutionary Biology is a must. This position is open to applicants of all nationalities but the language in the lab is English. Applications or questions regarding the position should be sent by mail to jdemeaux@uni-koeln.de, with the following subject line - PhD application Polygenic adaptation thaliana - de Meaux lab. A letter of motivation, a CV and the contact to at least 2 independent referees should be provided, all in a single pdf file. Revision of applications will begin on April 7th and continue until the position is filled. Funding is for 3-4 years starting in September 2015. For more information on our lab and research visit our website <http://www.botanik.uni-koeln.de/1146.html> Interested students currently completing their Master thesis are encouraged to informally contact the PI if they have questions concerning the position.

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