

## **Evolution of Genes with Age and Cell-specific expression in a social insect**

The Institute of Organismic and Molecular Evolution, in the Johannes Gutenberg University of Mainz, is offering a 3.5 year PhD position (E13 65%) on the molecular evolution of ageing in ants, as part of the GenEvo research training group: 'Gene Regulation in Evolution: From Molecular to Extended Phenotypes'.

Ageing is a central focus in medical research, but understanding why it evolves and how it manifests at the molecular level requires appropriate model systems. Social insects provide an exceptional opportunity in this context, as their reproductives often exhibit remarkably long lifespans. When organisms age, the strength of selection acting against traits associated with senescence declines. This weakening, referred to as the *selection shadow* in evolutionary theory, can be quantified by measuring the intensity of purifying selection on protein-coding genes with age-biased expression. The ant *Cardiocondyla obscurior* represents an excellent model for studying ageing in social insects due to its short lifespan, tractable laboratory breeding, and available molecular resources. By integrating demographic analyses, transcriptomics, and bioinformatics, this project aims to (i) generate the first single-cell RNA-seq atlas of ageing in a social insect, (ii) test whether social insect reproductives experience stronger purifying selection over an extended part of their lifespan compared to solitary species, and (iii) characterize cell type-specific senescence profiles.

Your PhD project will centre on uncovering how aged-biased expression is linked to gene evolution in social insects through an integrative approach. You will establish age-controlled queen cohorts to (i) collect high-quality RNA samples from key tissues (e.g., brain, reproductive tissue, fat body), (ii) identify tissue- and age-specific transcriptional signatures, and (iii) quantify the strength of selection across the lifespan. These results will be compared with patterns observed in both solitary and social species, providing novel insights into how sociality modulates the evolution of ageing.

### **Required qualifications:**

- Master's degree in biology, evolutionary biology, ecology, genetics, bioinformatics, entomology or related fields
- Strong written and spoken English skills

### **Advantageous qualifications:**

- Background in evolutionary biology, genomics, or behavioural research
- Experience with insect rearing and/or behavioural observations
- Proficiency in molecular techniques
- Experience with bioinformatic tools for transcriptomic and gene evolution analyses

The project is supervised by Dr. Luisa M. Jaimes Niño, Prof. Susanne Foitzik, and Prof. Shuqing Xu at the Institute of Organismic and Molecular Evolution, Johannes Gutenberg University in Mainz. In GenEvo [Gene Regulation in Evolution](#), scientists are working together on the core question of how complex and multi-layered gene regulatory systems have evolved. Experts in the field of molecular & evolutionary biology support & train our PhD students in their interdisciplinary research as well as their personal development. This PhD project offers an exceptional opportunity to develop a strong interdisciplinary research profile at the interface of evolutionary biology, genomics, and bioinformatics—providing an ideal foundation for a successful career in academia or in cutting-edge fields of molecular and evolutionary research beyond.

Application:

Please submit a CV, a one-page motivation letter outlining your research interests and contact details for two referees, [ljaimesn@uni-mainz.de](mailto:ljaimesn@uni-mainz.de)

Application Deadline: From Nov 1<sup>st</sup> 2025, until position is filled

Starting Date: as soon as possible

More information about the GenEvo Research Training Group:

<https://www.genevo-rtg.de/>

For further inquiries, contact Luisa Jaimes [ljaimesn@uni-mainz.de](mailto:ljaimesn@uni-mainz.de)