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## Three “Insect Infect” PhD positions, Berlin, Germany

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We are advertising three doctoral candidate positions as part of the [“Insect Infect” Research Unit FOR 5026](#) funded by the DFG, which brings together the fields of host-microbiota interactions, insect innate immunity, and bacterial resistance evolution. The Research Unit gives the opportunity to interact with a diverse group of doctoral candidates, post-docs, and PIs, to obtain methodological training, and to receive statistical and bioinformatics support. Furthermore, the projects will entail close collaboration with theoreticians. There will be yearly retreats and access to a graduate training programme. **The deadline for applications is 29.03.2024** and the positions will start in early summer 2024 or as soon as possible thereafter. The positions are fixed term and available for **4 years**.

**Position 1: Decomposing virulence: host, pathogen, and microbiota contributions**

**Position 2: Parasite life history trade-offs and the evolution of virulence – a test of the trade-off hypothesis**

**Position 3: Evolution of symbiont, pathogen and immune system interactions in Blattodea**



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### Position 1: Decomposing virulence: host, pathogen, and microbiota contributions

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The Evolution and Ecology of Insect Defences group (<https://armitagelab.com/>) at the Institute of Biology, Freie Universität (FU) Berlin, Germany, would like to invite applications for the research project: **Decomposing virulence: host, pathogen, and microbiota contributions**.

Project background:

Our research lies in the field of eco-evo-immunology. Virulence describes the negative health or fitness effect of a pathogen, and there is long-standing interest in understanding how virulence changes over evolutionary time. Virulence will be determined by pathogen<sup>1,2</sup> and host factors<sup>3</sup>, but it is not trivial to understand the degree to which each partner affects virulence patterns. Nonetheless, we can start to understand the drivers of virulence changes by “decomposing” virulence into pathogen and host components (e.g. <sup>1,2</sup>). More recently there has been a blossoming of interest in the tripartite interaction between host, pathogen and microbiota, and the role that microbiota play in pathogen virulence evolution<sup>4</sup>. In the project we will decompose virulence into host and pathogen components, whilst taking the interaction with microbiota into account. Experimentally evolved pathogens will be used in this project. Infection assays and measures such as bacterial load, survival and transcriptomics will be used. This project will give insight into the generalisability of virulence patterns, it will help us to uncover hidden drivers of virulence, and it will give insight into the generalisability of the components of virulence. The host organism will be *Drosophila melanogaster*

and the pathogen and microbiota will be bacteria. The position is fixed term and available for 4 years, paid according to TV-L E13, 65 %, and will start in early summer or as soon as possible thereafter.

The project will involve:

- Literature research
- Experimental design and hypothesis formulation
- Preparation and execution of experiments, including infection of insects (*Drosophila melanogaster*) with bacteria, molecular biology (RNA extractions), and analysis of host fitness
- Statistical data analysis, including transcriptomic data analysis and manuscript writing
- Collaboration with researchers of the InsectInfect research group

Essential criterion:

- A completed University master's degree in biology, microbiology, or similar topic

Desirable criteria:

- We would like applications from enthusiastic students with a background/interest in evolutionary ecology, e.g., in host-microbiota-pathogen interactions and virulence evolution
- Laboratory experience with bacteria and insects
- Experience with molecular biology or transcriptomic analyses
- Good basic knowledge of statistics (e.g., using "R") and experimental design
- Proficient in spoken and written English
- Good team-working and communication skills and ability to work independently
- Completed projects/internships on topics relevant to the research area are advantageous

**How to apply:** Applications should be written in English, submitted as **one single PDF**, and include the following documents:

(1) a one-page (maximum) letter of motivation with details of previous research experience and future goals, (2) your CV (if applicable, including any publications). Please include the names of 2-3 possible contact people who can provide a reference for you and explain why you have named them (e.g., they were your MSc thesis supervisor), (3) An abstract/short summary of your MSc thesis, (4) A copy of your BSc and MSc certificates.

Please send the application to [sophie.armitage@fu-berlin.de](mailto:sophie.armitage@fu-berlin.de), with the following identifier in the subject field: **WiMi\_InsectInfect2\_SA**. The deadline for applications is **29.03.2024**. Interviews will take place as soon as possible after this date. The working language of the group is English. For further information, please contact Sophie Armitage.

Relevant background reading

1. Acuña Hidalgo B\*, Silva LM\*, Franz M\*, Regoes RR, Armitage SAO. (2022) Decomposing virulence to understand bacteria clearance in persistent infections. *Nat Commun* 13:5023. \*Joint first authors. <https://doi.org/10.1038/s41467-022-32118-1>.
2. Franz M, Armitage SAO, Rolff J, Regoes RR. (2023) Virulence decomposition for bifurcating infections. *Proc Roy Soc B* 290:20230396. <https://doi.org/10.1098/rspb.2023.0396>.
3. Kutzer MAM, Kurtz J, Armitage SAO. (2019) A multi-faceted approach testing the effects of previous bacterial exposure on resistance and tolerance. *J Anim Ecol* 88: 566-579. <https://doi.org/10.1111/1365-2656.12953>.
4. Armitage SAO, Genersch E, McMahon DP, Rafaluk-Mohr C, Rolff J. (2022) Tripartite interactions: how immunity, microbiota and pathogens interact and affect pathogen virulence evolution. *Curr Op Ins Sci* 50: 100871. <https://doi.org/10.1016/j.cois.2021.12.011>.



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## Position 2: Parasite life history trade-offs and the evolution of virulence – a test of the trade-off hypothesis

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Within the DFG Insect Infect research group, I am looking for a PhD student for a four-year project to investigate the relative rolls of parasite life history trade-offs and host microbiota on the evolution of parasite virulence. The project will use an insect host (*Tribolium castaneum*) fungal parasite (*Metarhizium spp.*) system. Experimental work will involve evolution experiments selecting for different defined levels of parasite virulence in the presence and absence of host microbiota followed by phenotypic and genomic analysis of evolved material and some mathematical modelling. The position is fixed term and available for 4 years, paid according to TV-L E13, 65 %, and will start in early summer or as soon as possible thereafter.

Work as part of this project will include:

- Literature research
- Formulating hypotheses, designing, and carrying out experiments
- Preparation and execution of experiments, including infection of insects (*Tribolium castaneum*) with fungal pathogens, evolution experiments, phenotypic and genomic analysis of evolved material.
- Statistical analysis and bioinformatic analysis of long-read genomic data
- Writing of manuscripts
- Collaboration with researchers of the InsectInfect research group

Essential criterion:

- Masters degree or equivalent in Biology, Microbiology or a related subject

Desired criteria:

- A deep interest in evolutionary ecology particularly host-microbiota-pathogen interactions and virulence
- Laboratory experience, particularly in microbiology and/or working with insects.
- Experience with molecular biology or bioinformatics.
- Statistical knowledge, particularly the use of R and experimental design
- Fluency in written and spoken English.
- Good teamwork and communication skills
- Ability to work independently.
- Completed projects or internships on research-relevant topics are an advantage.

**How to apply:** Applications should be written in English, submitted as **one single PDF**, and include the following documents:

(1) a one-page (maximum) letter of motivation with details of previous research experience and future goals, (2) your CV (if applicable, including any publications). Please include the names of 2-3 possible contact people who can provide a reference for you and explain why you have named them (e.g. they were your MSc thesis supervisor), (3) An abstract/short summary of your MSc thesis, (4) A copy of your BSc and MSc certificates.

Please send the application to [charlotte.rafaluk-mohr@fu-berlin.de](mailto:charlotte.rafaluk-mohr@fu-berlin.de), with the following identifier in the subject field: **WiMi\_InsectInfect2\_CRM**. The deadline for applications is **29.03.2024**. Interviews will take place as soon as possible after this date. The working language of the group is English. For further information, please contact Charlotte Rafaluk-Mohr.



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### **Position 3: Evolution of symbiont, pathogen and immune system interactions in Blattodea**

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**PhD student (m/f/d) in the field of biology, bioinformatics, biochemistry or comparable.** Within the DFG Insect Infect research group, we are looking for a PhD student for a four-year project to work on the evolution of symbiont, pathogen and immune system interactions in Blattodea. This project has the overarching goal of exploring how symbiont transitions have shaped pathogen defenses and immune systems in Blattodea.

The project will involve:

- Identification and testing of immune genes involved in the regulation of symbionts and exploration of how they have evolved
- Tissue-specific transcriptomics in conjunction with microbiota and symbiont manipulation experiments
- Insect field sampling
- Use of available high-quality genomes to characterize immune genes and to better understand evolutionary changes between hosts and their symbionts
- Collaboration with project partners to quantitatively analyze genome, microbiota and pathogen data
- Active contribution to the DFG research group "Insect Infect (FOR 5026)"
- Writing scientific articles for publication in peer-reviewed journals
- Writing a doctoral thesis
- Presentation of project results at international scientific conferences

Your qualifications:

- Successfully completed scientific university degree (master's degree or equivalent) in the field of biology, bioinformatics, biochemistry or comparable
- Practical experience with insects and microbes
- Very good knowledge and experience in molecular biology
- In-depth knowledge of evolutionary biology and genetics
- Experience in the quantitative and statistical analysis of data with Python, R, or similar
- Knowledge of computer-based analysis of large data sets, especially nucleotide sequences
- Willingness to collaborate across disciplines
- Excellent written and spoken English skills
- Good communication and information processing, goal-oriented and structured way of working, ability to work in a team and willingness to cooperate

**How to apply:** Applications should be written in English, and include the following documents:

(1) a one-page letter of motivation with details of previous research experience and future goals, (2) your CV (if applicable, including any publications). Please include the names of 2-3 possible contact people who can provide a reference for you and explain why you have named them (e.g. they were your MSc thesis supervisor), (3) An abstract/short summary of your MSc thesis, (4) A copy of your BSc and MSc certificates.

We welcome applications via the online vacancies portal of BAM: <https://www.bam.de/umantis/EN/1837.html> . Job reference 39/24-4.6. The deadline for applications is **29.03.2024**. For informal inquiries, please contact [dino.mcmahon@fu-berlin.de](mailto:dino.mcmahon@fu-berlin.de), with the following identifier in the subject field: 39/24-4.6. Interviews will take place as soon as possible after this date. The working language of the group is English.