

MALVISTA: Engineering a human Blood–Retinal Barrier Model to Understand Cerebral Malaria

Viola Introini Lab – Vascular Infection Group

Max Planck Institute for the Science of Light (MPL) & Max-Planck-Zentrum für Physik und Medizin (MPZPM), Erlangen, Germany

About the project

The Introini Lab <https://mpzpm.mpg.de/research/viola-introini> is seeking an outstanding and highly motivated PhD candidate to join the newly established research group at the interface of physics, engineering, vascular biology, and infection biology.

The successful candidate will work on the project MalVISTA aimed at developing a physiologically relevant **3D human inner blood–retinal barrier model** to investigate malaria retinopathy, the most reliable clinical hallmark of cerebral malaria.

Despite effective antimalarial therapies, cerebral malaria remains responsible for substantial mortality and long-term neurological disability in children. Current treatments eliminate the parasite but fail to protect the vasculature, highlighting the urgent need for host-directed therapeutic strategies.

The retina provides a unique and clinically accessible window into cerebrovascular pathology. MalVISTA will combine tissue engineering, microfluidics, vascular biology, and malaria biology to understand how vascular architecture, blood flow, and cellular interactions contribute to vascular occlusion, barrier breakdown, and neurological injury during infection.

Research objectives

The successful candidate will develop a human 3D blood–retinal barrier model to investigate how *Plasmodium falciparum* infection causes vascular occlusion and barrier dysfunction during cerebral malaria. The project combines soft lithography, microfluidics, tissue engineering, vascular biology, microscopy, and single-cell transcriptomics to recreate clinically relevant retinal microvascular networks and identify the physical and molecular mechanisms driving vascular injury.

The PhD candidate will design and fabricate microvessels, culture and characterise multiple retinal cell types, perform infection experiments with malaria parasites, and analyse vascular function using imaging, computational modelling, and transcriptomic approaches.

Research environment

The project will be conducted in the Introini Lab at the Max-Planck-Zentrum für Physik und Medizin in Erlangen, Germany.

The laboratory develops next-generation human vascular models to study host–pathogen interactions and neurovascular diseases through an interdisciplinary approach.

The Max Planck Zentrum für Physik und Medizin (MPZPM) is an interdisciplinary, joint research centre of the Friedrich-Alexander-University Erlangen-Nuremberg (FAU), the Universitätsklinikum Erlangen (UKER) and the Max Planck Institute for the Science of Light (MPL). Research at the MPZPM focuses on the study of cells in the context of their physical microenvironment and mechanics in a tissue.

The PhD candidate will interact closely with researchers from physics, engineering, medicine, computational biology, and vascular biology and will have access to state-of-the-art facilities in microfabrication, microscopy, sequencing, and bioengineering.

Keywords

Microfluidics, Tissue engineering, Bioengineering, 3D *in vitro* models, Vascular Biology

Required qualifications

We are looking for a highly motivated candidate who is excited to tackle fundamental biomedical questions using quantitative biological and engineering approaches.

- Excellent Master's degree (or equivalent international qualification) with a final grade equivalent to ≤ 1.7 in the German grading system.
- Degree in Physics, Biophysics, Bioengineering, Tissue engineering, Biotechnology or a related discipline.
- Strong quantitative and analytical skills.
- Previous research experience in at least one of the following areas:
 - Microfluidics
 - 3D *in vitro* models (preferred retinal or brain)
- Excellent written and spoken English
- Ability to work independently and collaboratively in an interdisciplinary environment.

Desirable qualifications

- Experience with 3D human cell culture systems.
- Experience with CAD software (e.g. Fusion 360, SolidWorks, AutoCAD) and COMSOL Multiphysics.
- Experience with image analysis (ImageJ/Fiji, Python, MATLAB, or R).
- Experience with transcriptomics or single-cell RNA sequencing analysis.
- Interest in retinal biology, vascular biology, neuroscience, host-pathogen interaction

Previous experience in malaria research is not required. Candidates with strong quantitative, engineering, or biophysical backgrounds are particularly encouraged to apply.

What we offer

- The position is funded 3 + 1 year. The initial contract is issued for one year and extended upon satisfactory progress.
- Salary according to TVöD-L E13 (75%).
- Funding through the Hector Fellow Academy Doctoral Researcher Programme.
- Research funding of up to €9,500 per year.
- Annual participation in a management module of the HECTOR School of Engineering & Management MBA Fundamentals Programme.
- Participation in the Hector Fellow Academy training and networking programme.
- Opportunities to collaborate with leading researchers across the Hector Fellow Academy network.

Location

Viola Introini Lab – Vascular Infection Group, Max Planck Institute for the Science of Light (MPL) & Max-Planck-Zentrum für Physik und Medizin (MPZPM), Erlangen, Germany

Expected start date

from November 2026 - January 2027

How to apply

Please apply via the [Hector Fellow Academy application portal](#).

Hector RCD Awardee Viola Introini will arrange interviews via zoom and/or in-person with the most promising applicants.

Application Deadline

September 1st, 2026

Equal opportunities

The Max Planck Society strives to ensure a workplace that embraces diversity and provides equal opportunities irrespective of gender, nationality or disabilities of the applicants. Furthermore, the Max Planck Society is committed to increasing the number of individuals with disabilities in its workforce and therefore encourages applications from such qualified individuals.

Enquiries

For informal enquiries regarding the project, please contact:

Dr. Viola Introini: viola.introini@mpzpm.mpg.de

For questions related to the application process or the application portal, please contact Hector Fellow Academy Office: application@hector-fellow-academy.de or www.hector-fellow-academy.de