Open PhD position – Human retinal organoids for disease modelling

Human induced pluripotent stem cells form embryoid bodies (left), develop into retinal organoids (center) with photoreceptors (right).

Can we used induced pluripotent stem cells to model retinal neuropathies?

We are looking for a highly motivated PhD candidate to join the Serwane lab, LMU, Munich. The Serwane lab uses retinal organoids (i) to investigate the role of mechanics for the formation of neuronal tissues and (ii) to develop test beds for future therapeutics, including mRNA and gene therapy. To tackle this challenge, we combine stem cell technology and biophysical tools: to grow accessible 3D cell systems *in vitro*, we use human organoids as a model system. We quantify forces and mechanical properties which guide the organoid's self-organization[1] by using ferrofluid droplets as mechanical actuators[2]. To quantify electrical functionality, we record organoid electrophysiology by our custom-built lightsheet microscope[3].

Your task will be establishing human retinal organoids for modelling hereditary photoreceptor neuropathies. To induce disease phenotypes, you will CRISPR-edit a human induced pluripotent stem cell line (iPSC), together with our collaborators. As a next step you will quantify changes in gene expression via spatial genomics technology (10x) and explore how retina cell electrical functionality is impacted using lightsheet microscopy[3]. As a final step you will be able to test a gene therapy developed by our collaborator in the organoid model.

The ability to study retinal disease, all in a Petri dish, opens up exciting avenues for fundamental research and application.
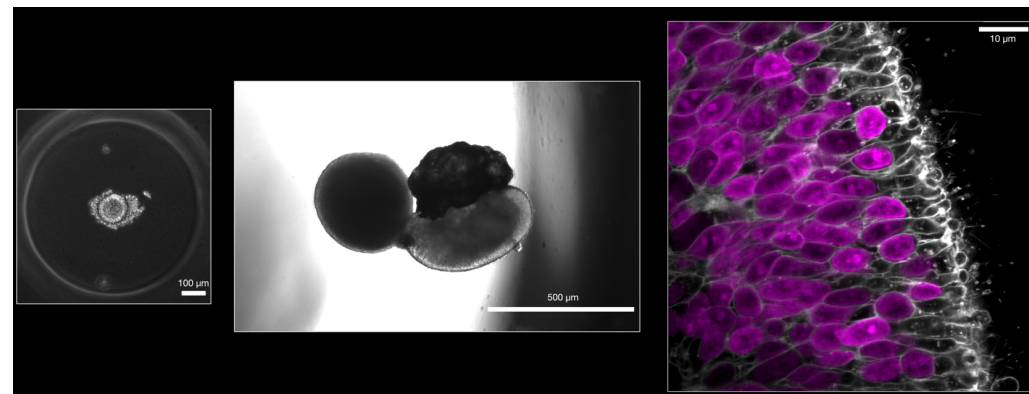
You will make a distinctive contribution within a small, interdisciplinary research team comprised of biologists and physicists. The project is funded by the ERC Starting Grant initially for 3 years.

Keywords:
Retinal organoids, lightsheet microscopy, stem cells, disease model

Requirements:
A Master in the field of biology/neuroscience is preferred. We are looking for a passionate candidate for the position, driven to learn new techniques. The project offers the opportunity to learn human organoid culture (with guidance from other team members), perform 3D live imaging, biochemical characterization, image processing and quantitative data analysis.

Our institute is located in the heart of Munich, Germany. We encourage applications from all ethnic groups and gender.

Earliest start date: 1.3.2024

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[1]Salbaum et al., *Retina organoids: Window into the biophysics of neuronal systems*, Biophysics Review 3, 2022
[2]Serwane et al., *In vivo quantification of spatially varying mechanical properties in developing tissues*, Nature Methods 14, 2017
[3]Wysmolek et al., *A minimal-complexity light-sheet microscope maps network activity in 3D neuronal systems*, Scientific Rep 12, 2022