PHYSIK

PHYSIKALISCHES KOLLOQUIUM

UNIVERSITÄT DES SAARLANDES

Prof. Dr. Friedhelm Serwane

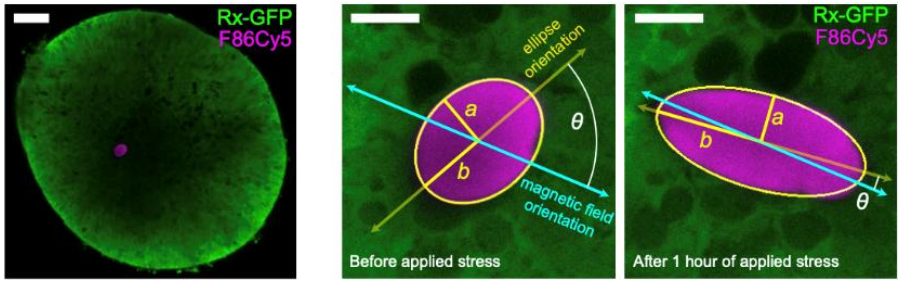
Ulm University

Biophysics of retinal organoids

Thursday, 18.12.2025, at 2.00 p.m. **c. t.**
Building C6.4, Lecture Hall II (00.9)

The bottom-up assembly of complex systems in physics often enables researchers to study them at a fundamental level. For neuronal systems such as the brain or the retina, however, this is still beyond our experimental reach. In recent years, researchers have engineered multicellular 3D systems, termed organoids, which share the same cell types and tissue organization as their *in vivo* counterparts. In the near future, these models will provide an opportunity to glimpse how neuronal networks self-organize and how mechanical forces guide the formation of their shape, structure, and function.

In this talk, I will present our research on quantifying tissue mechanics in retinal organoids. To this end, we build on our expertise in mechanical characterization of developing tissues[1,2] and retinal organoid technology[3,4]. We find that forces in the developing retina remodel the tissue in a scale-free manner across several developmental stages. This raises the question of how the system balances high packing density and flexibility to accommodate tissue growth. Quantifying the mechanics of neuronal systems might promote a biophysical understanding of how neuronal networks form and how their function might be tuned via physical cues.



Adapted from: https://www.biorxiv.org/content/10.1101/2024.10.21.619491

1 Serwane F. et al., *In vivo quantification of spatially-varying mechanical properties in developing tissues*, Nature Methods, 14, 181–186, 2017.
2 Mongera A. et al., *A fluid-to-solid jamming transition underlies vertebrate body axis elongation*, Nature, 561, 401–405, 2018.
3 Rogler T.S. et al., *3D Quantification of Viral Transduction Efficiency in Living Human Retinal Organoids*, Small Methods, e2401050, 2025.
4 Shelton E.R. et al., *Scale invariance of mechanical properties in the developing mammalian retina*, bioRxiv, 2024.10.21.619491, 2025.

You can participate online via MS Teams: https://shorturl.at/4pc5R

Interested people are cordially invited.

Coffee and cookies are served at 2.00 p.m. in front of the Lecture Hall

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