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MPI-NAT SEMINAR SERIES

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Super-resolution imaging approaches to dissect 3D genome organization and looping in somatic and stem cells

Dissecting the 3D-chromatin organization in cell physiology is a key area of investigation. By using quantitative super-resolution nanoscopy, we identified a novel chromatin fiber assembly and its relation with naïve pluripotency. Nucleosomes are arranged in groups of various sizes, the nucleosome clutches, which control gene function. Additionally, using super-resolution imaging, we visualized the structure of cohesin-mediated loops in human cells and discovered that transcriptional-dependent supercoiling controls loop formation and 3D-genome organization. Starting from these discoveries, we recently developed Artificial Intelligence of the Nucleus (AINU), a deep learning method capable of identifying specific nuclear signatures at the nanoscale resolution. Coupled with super-resolution microscopy of nuclear structures, AINU provides a robust tool for the precise detection of cellular heterogeneity, offering significant potential for advancing diagnostics and therapies in regenerative medicine, virology, and cancer biology. Overall, by combining super-resolution microscopy with genomic and modeling methods, we dissected the functional role of transcription-mediated supercoiling and the nucleosome level structure of genes, which ultimately are key features controlling gene activity.

Thursday, 23.01.2025, 1:00 pm

Host: Kristina Žumer

Faßberg Campus
Ludwig Prandtl Hall

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