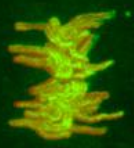
Light-Sheet Microscopy in the Study of Embryogenesis

Thursday, December 14th, 2023



Join us and special guest speaker Marina Makharova from EMBL Heidelberg, Germany, for this webinar on real-time imaging of mitotic chromosomes in early mouse embryos using light-sheet microscopy.

Bruker's light-sheet microscopes provide the ideal solution for the visualization of dynamic biological processes, such as embryogenesis and neurogenesis in developmental biology, oncology, and vasculature studies. Environmental control options allow imaging of live specimens over hours and days without altering their biology. The Selective-Plane Illumination Microscopes (SPIM) avoids sample phototoxicity by sequentially illuminating stacked thin slices of the organism, allowing scientists to observe samples over extended periods of time without photodamage.

In her talk, Marina Makharova will provide an insight into her work and an overview of imagining mitotic cells in preimplantation embryos, mitotic chromosome scaling, and the molecular mechanisms involved.

Program – Thursday, December 14th, 2023
17:00 CET | 8:00 AM PST | 11:00 AM EST

17:00 **Welcome & Introduction**
Malte Wachsmuth, Managing Director & Head of Application, Bruker LUXENDO Light-Sheet

17:05 **Studying Mitotic Chromosome Architecture in the Preimplantation Mouse Embryo.**
Marina Makharova, EMBL Heidelberg, Germany

17:50 **Q&A**

18:00 **End**

Please don't hesitate to contact us at productinfo.emea@bruker.com if you have any questions.

Abstract and Biography

Real-Time Imaging of Mitotic Chromosomes in Early Mouse Embryos using Light-Sheet Microscopy

Marina Makharova, EMBL Heidelberg, Germany

The first embryonic divisions in mammals are surprisingly error-prone, leading to spontaneous abortion, congenital disease, and limiting fertility. In non-mammalian model organisms, it has been shown that mitotic chromosomes adapt to the dramatic reduction in cell size with each cleavage division of the embryo - a process known as mitotic chromosome scaling, which has been hypothesized to protect genome integrity. However, it is unknown if chromosome scaling occurs in mammals and what the molecular mechanism is that shortens mitotic chromosomes in early embryos.

In this study, we imaged mitotic cells in preimplantation embryos to measure changes in mitotic chromosome dimensions during the first divisions after fertilization. In addition, we quantitatively analyzed the key protein complexes most likely to drive shortening, i.e. Condensin loop extruders, using single molecule fluctuation calibrated confocal imaging. Our results show that mammalian embryos exhibit pronounced chromosome scaling and that early embryonic chromosomes are bound by much higher amounts of Condensin loop extruders compared to somatic cells.

Our quantitative imaging assays using light sheet microscopy will allow us to gain a mechanistic understanding of mitotic chromosome scaling in the future, by combining high-throughput, real-time imaging of live embryos with acute perturbation of the activity of Condensins.

The focus of Marina Makharova's research is on understanding the principles of mitotic chromosome organization. After completing her Master's at Skoltech Institute, Moscow, she joined Jan Ellenberg's Group (Cell division and nuclear organisation) at EMBL, Heidelberg, Germany, to work on mitotic chromosome compaction in pre-implantation mouse embryos. She combines various imaging techniques to characterize mitotic chromosome architecture and identify key players in mitotic chromosome scaling in cleavage-stage mammalian embryos.