

Joint iNANO & DANDRITE Topical Seminar
by guest researcher Arek Kulczyk

Thursday 30 April 2015
13.15 - 14.00

The iNANO Auditorium
The Interdisciplinary Nanoscience Center
Aarhus University, Gustav Wieds Vej 14, 8000 Aarhus C



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Single-molecule studies of the replisome structure and dynamics

We present the first structures of a replisome assembled on DNA resembling a replication fork. The four structures determined by single-particle cryo-electron microscopy (cryo-EM) represent different functional states of the megadalton-sized bacteriophage T7 replisome. The replisome consists of DNA helicase, RNA primase, and two DNA polymerase molecules. The two molecules of DNA polymerase adopt different spatial arrangement at the replication fork reflecting their roles in leading- and lagging-strand synthesis. Structures in combination with biochemical data reveal fundamental molecular mechanisms for leading-strand synthesis, formation and release of the lagging-strand replication loop, and coordination of leading- and lagging-strand synthesis.

Using the single-molecule microscopy methods we identified interactions between the replication proteins that orchestrate exchange of DNA polymerases at the replication fork. Since mechanisms of DNA replication are highly conserved the observations are relevant to other replication systems.

In collaboration with Arne Moeller, we plan to refine structures of the replisome to high resolution using the state-of-the-art cryo-EM facility in the Interdisciplinary Nanoscience Center.

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Host: Arne Möller, Team Leader at DANDRITE and Assistant Professor at iNANO, Aarhus University