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From DNA to Chromosomes – the Structure and Function of SMC Complexes

SMC (Structural Maintenance of Chromosomes) complexes are key chromosome architects in all living organisms. These ring-shaped multi-subunit ATPases topologically entrap one or more DNAs to establish chromatin domains and provide sister chromatid cohesion (the cohesin complex), as well as build mitotic chromosomes (the condensin complex). Recently, in addition to topologically entrapping DNA, SMC complexes have been observed to be DNA motors that actively extrude DNA loops. The molecular mechanisms for both topological loading and DNA loop extrusion have remained a long-standing mystery. – I will present the high-resolution cryo-EM structure of the cohesin complex, trapped in an ATP-bound DNA gripping state, during its topological loading onto DNA. Together with biophysical experiments, the structure allows us to trace the DNA trajectory into the cohesin ring. The structure also suggests how a small tweak during gripping state assembly leads, instead of topological loading, to extrusion of a DNA loop. I will discuss our approaches to decipher the relative contributions of topological loading and loop extrusion to chromosomal SMC complex function.

Host: Patrick Cramer



Thursday / 15.04.2021 / 13:00

zoom access data will be mailed before the seminar!

