



Delft University of Technology
Friday, 26 May 2023

Plenary Lecture

Speaker: Nynke Dekker (TU Delft)

Title: Adventures in DNA replication using single-molecule biophysics

Abstract:

Adventures in DNA replication using single-molecule biophysics

Many transactions on DNA are carried out by molecular machines that operate at the nanometer-scale. How they do so effectively is a question of long-standing interest. We are particularly interested in studying the dynamics of these molecular machines using single-molecule techniques. I will briefly highlight how the field of single-molecule biophysics has advanced such techniques over the past decades, allowing the dynamics of diverse motor proteins to be accurately followed.

I will next describe how single-molecule techniques are being used to tackle new challenges, including the probing of complex molecular machines built up from many different components. The replisome that copies DNA is such a complex machine. While the overall outline of replisome assembly in eukaryotes such as ourselves is understood, little is known about the dynamics of the individual proteins on the DNA and how these contribute to the formation of proper replisomes. I will show that using integrated optical trapping and confocal microscopy, one can dissect how protein binding, diffusion, sequence recognition, and protein-protein interactions play important roles in replisome assembly. And I will then describe how we can now follow the motion of the replicative helicase, and close by presenting an outlook for the future.

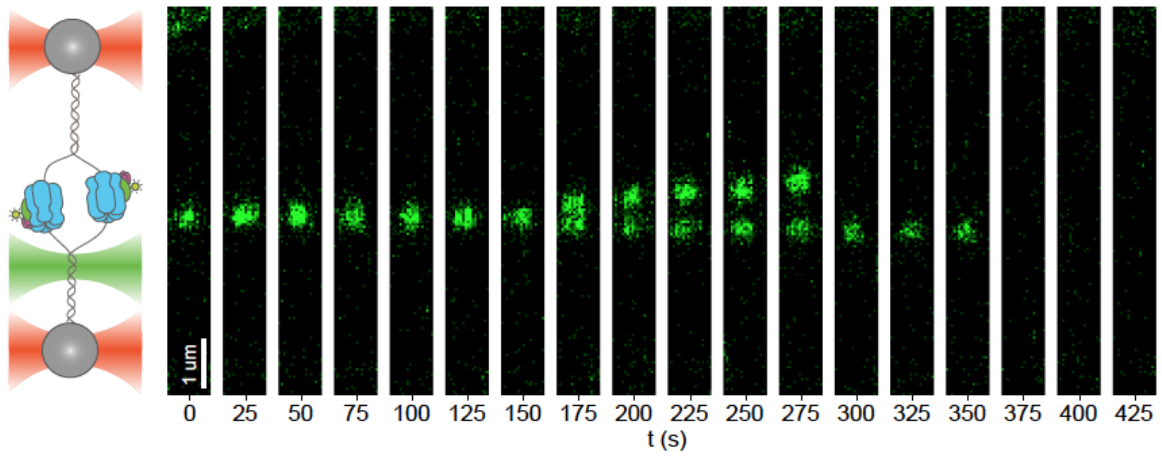


Figure 1. Time series showing motion of the reconstituted replicative helicase on an individual DNA molecule. Data acquired by Daniel Ramírez Montero (Nynke Dekker Lab, TU Delft).