

Towards real-time single-molecule biology

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Biological processes which are performed by proteins interacting with the DNA and RNA are key to life. Insights into these processes provide essential information for understanding the molecular basis of life and the pathological conditions that develop when such processes go awry. The next scientific breakthrough consists in the actual, direct, real-time observations and measurements of the individual processes to validate and improve the current biological models.

Single molecule technologies offer an exciting opportunity to meet these challenges and study protein function and mechanisms in real-time and at the single-molecule level. Here we present our efforts and recent technological advancements in the development of a turn-key instrument combining ultra-high resolution optical tweezers and single-molecule super-resolution fluorescence microscopy.

This novel instrument is a promising approach to investigate molecular interactions because of its unique ability to simultaneously manipulate, sense and visualize individual proteins with exquisite sensitivity and resolution.

During this seminar, we will discuss the latest applications of this single-molecule approach and how it can enhance our understanding in the field of DNA/RNA-protein interactions, molecular motors, protein folding, cell membranes and genome structure.