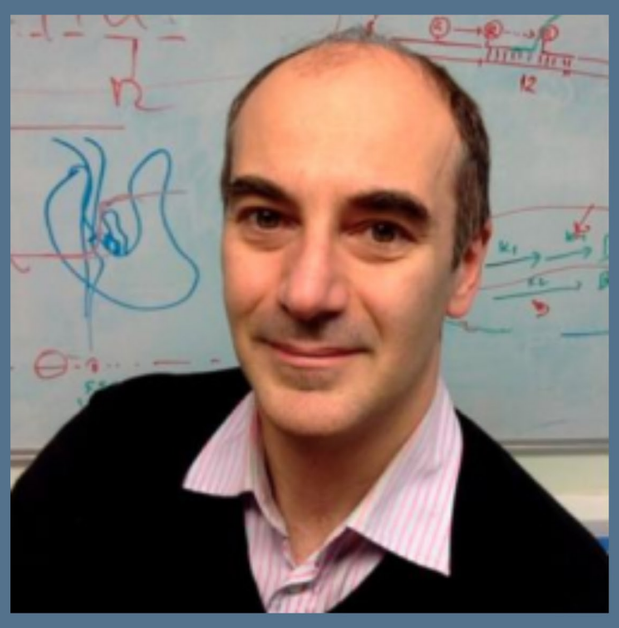
RESEARCH INSTITUTE FOR FUNDAMENTAL SCIENCES

Interdisciplinary Seminar Series

Unlocking Gene Expression Mechanisms and Detecting Viruses via Single-Molecule Imaging

Virtual Venue: April 29 2021, 19:00 - 20:00 (GMT +3), Zoom Meeting ID: 972 1966 5924



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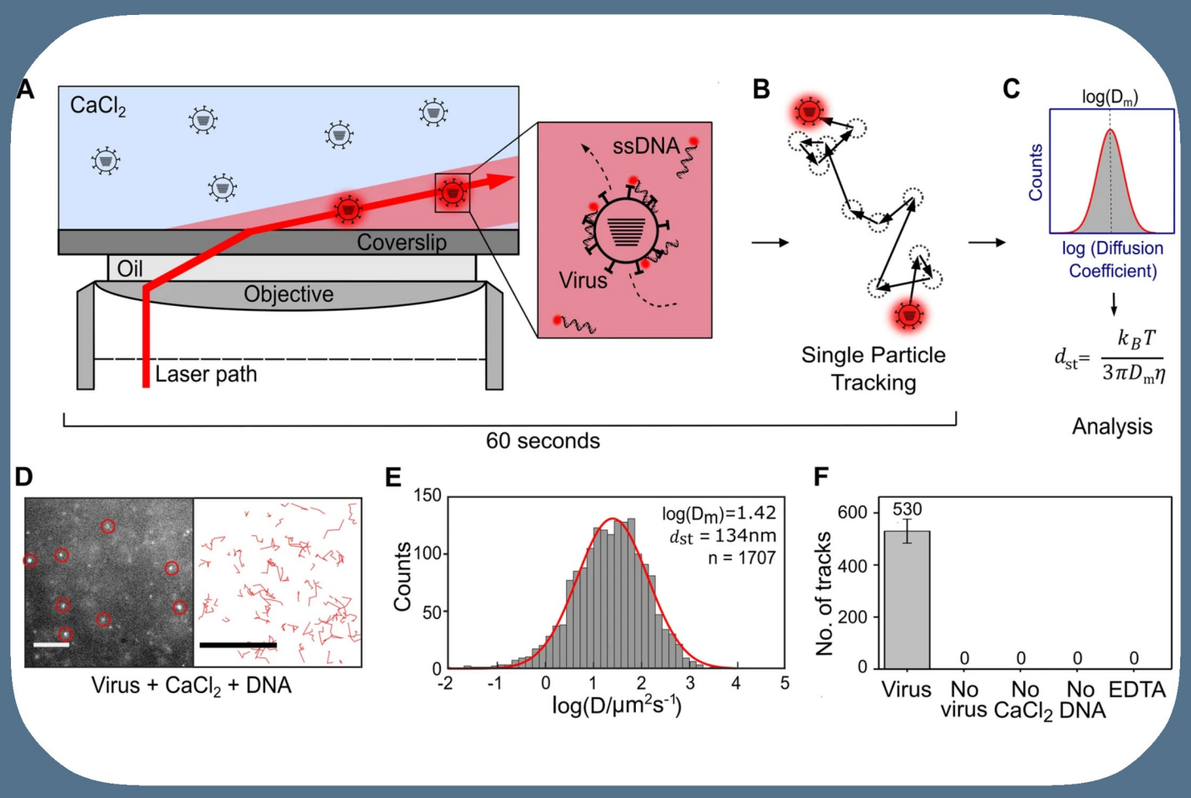

Single-molecule studies offer unprecedented direct access to biologically important heterogeneity and dynamics; this holds true for reactions involving purified biochemical components, as well as for reactions inside the complex biological milieu of living cells. During the past few years, we have developed and used such methods (single-molecule FRET, super-resolution imaging, and single-particle tracking) to answer long-standing questions in gene expression and repair. Here, I will discuss examples of our in vitro work focusing on the discovery and sequence-dependence of pausing during initial transcription, and the elucidation of the intricate sequence of conformational changes that allow RNA polymerase to open the promoter DNA for initiating transcription of genes in bacteria. I will also discuss examples of our in vivo single-molecule work inside living bacteria, including the exploration of the relation between chromosome organization and gene expression, as well as the importance of transient non-specific interactions of DNA-binding proteins with the chromosome. Our methods and biological observations are general and should apply to many other biological systems and organisms; as an example, I will also present our single-molecule work on the rapid detection of enveloped viruses, including the influenza virus and novel coronavirus SARS-CoV-2.

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Live Stream:
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