Type of presentation: Invited

LS-12-IN-6088 Visualizing the genome in living cells

Misteli T.[1]

[1]National Cancer Institute, NIH

Email of the presenting author: mistelit@mail.nih.gov

In higher organisms, genomes are housed and function in the cell nucleus. While we have learnt a great deal in recent years about the sequence of genomes and the machinery that reads genome information, insights into how genomes function in the context of the architectural framework of the cell nucleus in a living cell are only now emerging. Several key concepts such as the existence of nuclear architectural proteins, the presence of distinct nuclear compartments, the non-random organization of genomes, and the dynamic nature of nuclear architecture are now recognized as driving genome function. Importantly, aberrations in nuclear architecture are now known to lead to diseases ranging from cancer to pre-mature aging. We are using various imaging modalities to elucidate the cell biological properties of the genome including mapping of the genome in 3D space, development of diagnostic applications based on genome organization and the visualization of genome function in living cells. In particular we have developed a novel diagnostic approach for breast cancer based on changes in higher order genome organization. We have also used Deep Imaging methods to follow the formation of chromosome translocations in living cells. Our observations establish a spatial and temporal framework for the formation of chromosome translocations and they identify several molecular pathways as contributors to translocation etiology. They also represent a illustrative example of the power of Deep Imaging as a new tool in cell biology.