Optical superresolution microscopy of molecular mechanisms of disease

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The self-assembly of proteins into ordered macromolecular structures is fundamental to a variety of diseases, for example in neurodegeneration, where misfolded proteins aggregate into toxic fibrillar shapes, or during virus replication, where the assembly of functional virions in the host cell is a tightly organized process.

In this talk, I will give an overview of optical imaging techniques (1-3) that allow us to gain insights into protein self-assembly reactions *in vitro* (4 - 7), in cells (8 - 10), and in live model organisms of disease (11). In particular, we wish to understand how proteins nucleate to form functional or toxic structures and to correlate such information with biological phenotypes. I will show how single molecule localization microscopy, and developments in high speed structured illumination microscopy are capable of tracking the aggregation of proteins *in vitro* and *in vivo*, and how such data are interpreted in the context of disease (11-17).

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