



# The Physics of Soft and Biological Matter

## **(invited) Single molecule studies of protein aggregation**

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Small soluble protein aggregates are thought to play a key role in the initial development of neurodegenerative diseases, such as Alzheimer's and Parkinson's disease, but are difficult to study using conventional methods due to their low concentration and dynamic and heterogeneous nature. We have developed single molecule fluorescence based methods to detect and analyse the protein oligomers formed during an aggregation reaction, with time, and to study how these oligomers interact with the membrane of live neuronal cells. I will present recent work from our laboratory on beta amyloid, tau and alpha synuclein oligomers to show how such quantitative studies can provide new insights into both the aggregation pathway and also the molecular mechanism of cellular damage, allowing us to put forward a model for the disease onset.