Research Seminar

Date 2pm Tuesday 15th December 2015

Room: JA5.07

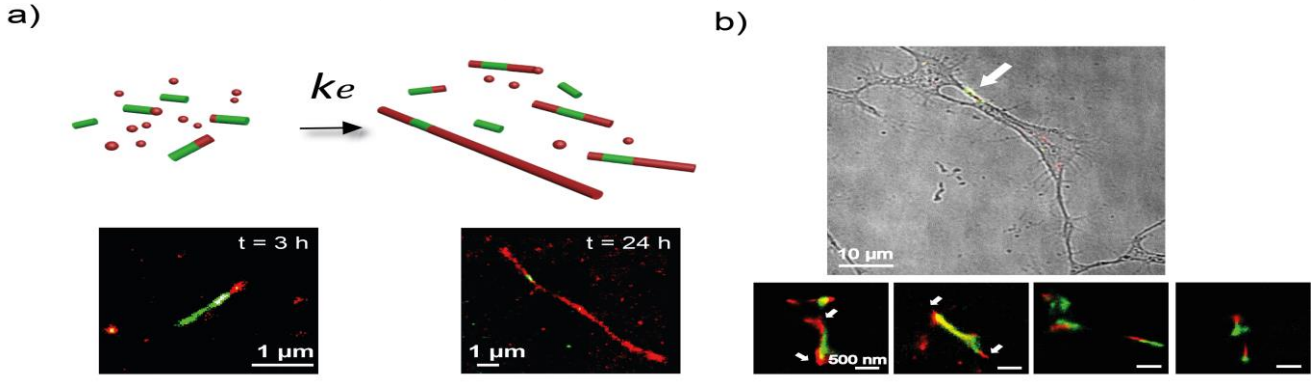
DEPARTMENT OF PHYSICS

University of Strathclyde Science

Photonics for Probing Nanoscale Processes in Inorganic & Organic Materials

Visualising molecular self-assembly has emerged as one of the great challenges in modern biophysics and nanoscience. The automatic or directed assembly of molecular building blocks into supramolecular structures is highly relevant to a broad set of exciting research topics, ranging from the formation of molecular machineries inside living organisms to nanotechnological systems - with applications in disease research, molecular medicine, as well as bio-inspired and inorganic material science.

In this talk I will show how we have developed and utilised techniques and methods from photonics in order to visualise and explore nanoscale processes in both semiconductor and biological systems. Starting from the investigation of the interaction between a single photon and a quantum emitter, I will show how we have controlled fundamental properties of a semiconductor self-assembled quantum dot (QD). In particular, we can tune its emission spectrum, charge and spin state via coupling to a photonic crystal (PhC) cavity mode which is of great importance for quantum information processing schemes.



I will then discuss how optical techniques can be employed to probe nanoscale processes of biomolecules in vitro and in living systems. In particular, I will focus on the application of optical single-molecule localisation microscopy techniques which shed new light on the molecular mechanisms underlying the self-assembly of proteins directly linked to neurodegenerative diseases (Alzheimer's and Parkinson's diseases). Finally, I will elucidate the existence of a structure-specific fluorescence in self-assembled peptide nanostructures rich in hydrogen bonds, which offers straightforward possibilities to probe self-assembly processes without the use of potentially disrupting external labels.

Dorothea Pinotsi, University of Cambridge