Department of Physics
Condensed Matter Physics
Clarendon Laboratory, Parks Road, Oxford OX1 3PU

UNIVERSITY OF OXFORD

CONDENSED MATTER SEMINAR

Thursday 14 November at 2.15pm

"Revealing biophysical principles of bacterial morphogenesis using advanced light microscopy"

Dr Seamus Holden
Newcastle University

One of the most remarkable properties of life is its capacity to spontaneously assemble complex structures. We study the principles of molecular self-assembly using the process of Bacillus subtilis bacterial cell division as an in vivo model system. During this process, nanoscale cell wall synthesis proteins build a microscale partition wall across the middle of the cell. The basic mechanisms of bacterial cell division remain unclear, despite 25 years of genetic and structural characterization of the components, due to the difficulty in observing an inherently single molecule driven process in vivo at sufficient resolution.
We recently developed Vertical Cell Imaging by Nanostructured Immobilization (VerCINI), which resolves this technological barrier by rotating the cell division plane into an orientation optimal for high resolution imaging. Using this approach, we discovered that the essential cytoskeletal protein FtsZ forms motile treadmilling polymers in live B. subtilis cells, which circle around the division site [1]. Together with collaborators, we found that FtsZ treadmilling guides the cell wall synthesis proteins which build the B. subtilis division crosswall. We are currently using VerCINI, combined with super-resolution microscopy, to investigate how FtsZ treadmilling drives and regulates division, the organization of FtsZ and other key divisome proteins at the septum, and the spatiotemporal regulation of B. subtilis cell division.
[1] A.W. Bisson-Filho et al., Science 355 (2017) 739–743.

Host: Prof Paolo Radaelli

Simpkins Lee Room, Beecroft Building