

**Plenary Talk**

PLV XI Fri 8:30 HSZ 01

**Physics in Nanopores: From Data storage to DNA/RNA analysis** — ●ULRICH KEYSER — Cavendish Laboratory, University of Cambridge, JJ Thomson Ave, Cambridge, CB3 0HE, UK

DNA and RNA are the molecules of life. Their sequence encodes the blueprints from cells to viruses. Both polymers store information in their three-dimensional structure.

RNA and DNA are often analysed by translocating single molecules through small holes known as nanopores. An accurate understanding of the translocation dynamics is essential for the read out of polymer structure, including the localization of binding sites or sequences. Here we use synthetic nanopores and nanostructured DNA molecules

to directly measure the velocity profile of driven polymer translocation through synthetic nanopores. We adjust nanopore geometry and translocation direction to resolve individual nanostructures only 7 nm apart and with a surface-to-surface gap distance of 2 nm. We then discuss the potential and challenges of our super-resolution nanopore sensing for future DNA data storage.

In the second part of the talk, we use our insights on polymer dynamics in nanopore confinement to analyse RNA molecules. We identify target RNA through making distinct three-dimensional structures with designed RNA:DNA interactions. Finally, we highlight multiplexed detection of RNA viruses - like SARS-CoV-2 and its variants - as one exciting application of nanopore sensing and DNA nanotechnology.