Charge density wave materials: experimental and computational challenges

Professor Daniel Wolverson

Department of Physics, University of Bath

The family of layered van der Waals materials (notably the transition metal dichalcogenides, TMDs) includes insulators, semiconductors, metals, superconductors, and charge density wave (CDW) materials. This last category is the most poorly understood and least familiar group amongst the TMDs, so will be reviewed briefly before looking at recent experimental and computational work on some typical examples of TMD CDWs.

I will focus on Raman and angle-resolved photoemission spectroscopies, and particularly on how the time-resolved variants of these are beginning to reveal the nature of the CDW phase. I will also show some of the experimental and computational challenges concerning these materials with (if time allows) a cautionary tale that may interest anyone using Raman microscopy as a characterisation tool.