Understanding molecular interactions using NC-AFM

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Both NC-AFM and STM have been used to great success in understanding the role of molecule-molecule interactions on surfaces, and recently impressive results have been obtained showing sub-molecular resolution during the imaging of single molecules by the controlled functionlisation of a scanning probe tip with inert molecular and atomic species [1-3]. Measurement of intermolecular interactions has also been shown by using 'inverse' imaging, that is, functionalising the tip with the molecule of interest and 'inverse' imaging the adsorbed molecule with both well characterised surface features and other adsorbed molecules [4-5]. Using these techniques allows for the exciting possibility of directly probing intermolecular interactions in three dimensions with sub-molecular resolution. Such experiments might offer a fascinating insight into molecular interactions, but a key issue in interpreting data produced in such 'tip-functionalised' experiments remains that the orientation of the tip adsorbed molecule is (in general) unknown. In this talk I will offer an overview of molecule-on-molecule interactions measured using NC-AFM at cryogenic temperatures, and suggest possible routes by which the tip molecule orientation might be determined.

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[3] G Kichin et al, *PRB* **87**, 081408 (2013).
[4] G Schull et al, *Nat. Nano* **6**, 23 (2010).
[5] C Chiutu et al, *PRL* **108**, 268302 (2012).