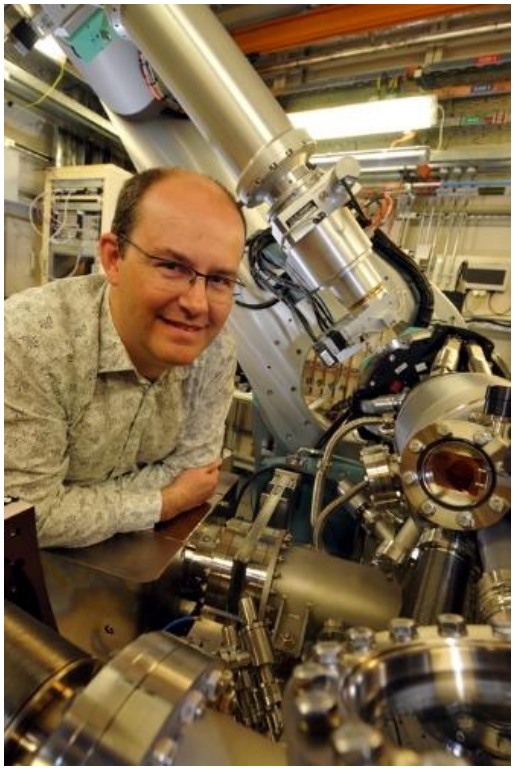
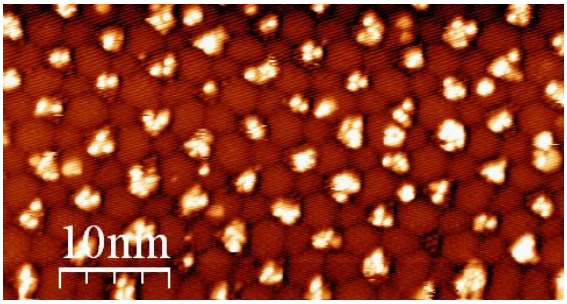
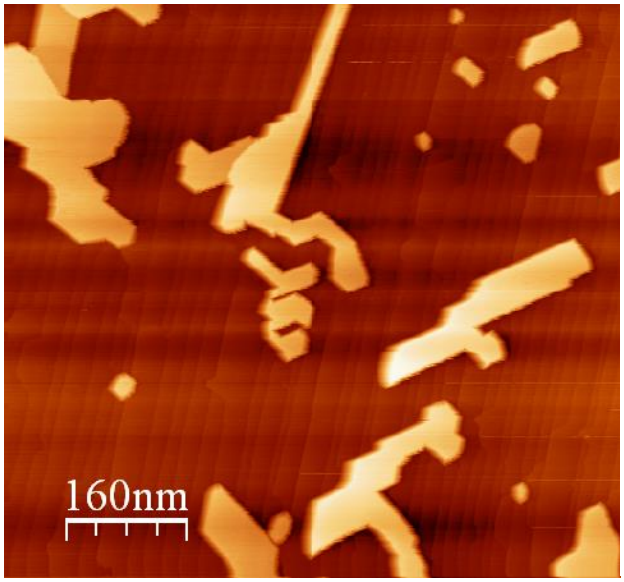
Dr Roger A. Bennett, Associate Professor in Nanostructured Surfaces, Department of Chemistry, University of Reading.

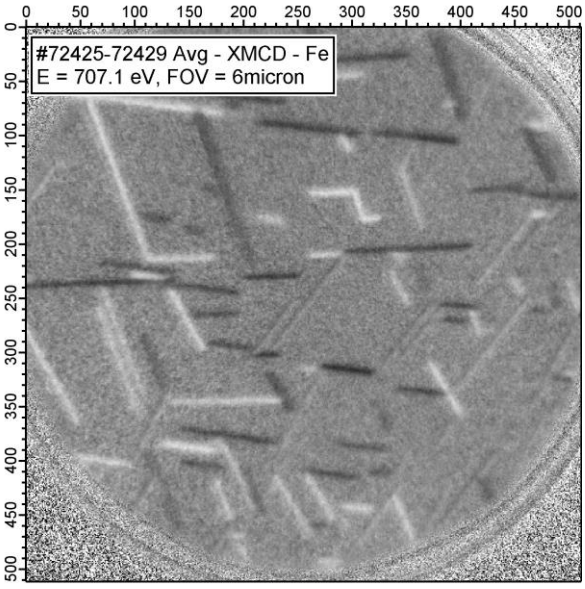


My research interests relate to understanding the physical properties and applications of materials reduced to small dimensions. Notably this leads to properties that are not well described by continuous models but are rather constrained by quantum mechanical confinement effects. Materials in 2 dimensions such as films or surfaces form the bulk of my recent research as they can be probed spectroscopically without the need for lateral spatial resolution. One and zero dimensional materials (nano-wires and dots) can be probed spectroscopically if they are formed identically on a supporting surface or on a per object basis if spatially resolved. To this end I have recently embarked on spatially resolved spectroscopy at synchrotron sources (beamline I06 STFC SI75, SI595, SI9309-1 and 2, NT5905-1) and coupled this to research undertaken in house using scanning tunneling microscopes for atomic resolution imaging. We also make use of beamline I07 (SI7133-1) for surface structure analysis.

A good example of this multi-technique approach is in the study of ultra-thin iron oxide films grown of Re(0001). Here we find the formation of nanowires, wedges and islands which are shown to be single domain ferromagnetic $Fe_3O_4$ by x-ray absorption and magnetic circular dichroism on beamline I06. The STM show the atomic scale ordering and classic bi-phase termination as seen on bulk $Fe_3O_4$ crystal surfaces. In a recently developed collaboration with Prof Martin Castell (Oxford) we have been also growing these films on Au(111).



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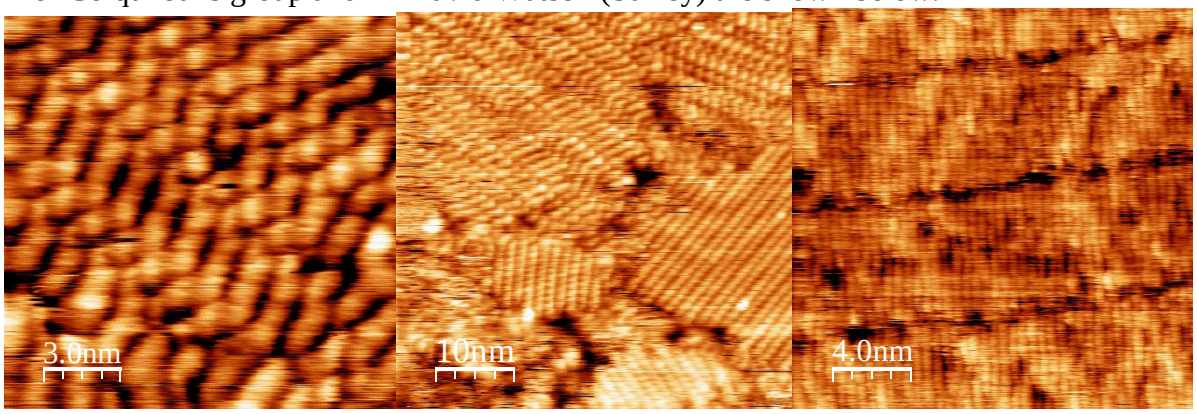
While I have a particular interest in transition metal oxide ultra-thin films and surfaces, I also have interests in self assembly. The growth of materials and molecular assembly is a rich area for exploitation and we have recently acquired the capability to deposit large macromolecules by molecular spray deposition. Some examples of recent images acquired in collaboration with Prof Colquhouns group and Dr David Watson (Surrey) are shown below.




Lastly, but certainly not least, I enjoy collaborations with theoreticians and have had very fruitful collaborations with Drs Simon Elliott and Michael Nolan at Tyndall Institute, Cork on the fundamental properties of rutile $TiO_2$. A significant proportion of this work was in developing experimental methodologies to provide data that can benchmark calculations – for example in establishing the semi-empirical value of the Hubbard correction to density functional theory based simulations of this important material. Most recently I have established a new collaboration with Dr Stephen Jenkins at Cambridge in the analysis of the chiral terraces exposed by the racemic Re(11$\bar{2}$1) surface, with the work just being published as open access and with striking cover art.


## Selected Publications

Etman, H.A., Held, G., Jenkins, S.J. and Bennett, R. A. (2013) *Structure and stress of Re(11%21); chiral terraces at a racemic surface.* Physical Chemistry Chemical Physics, 15 (48). pp. 20823-20829. ISSN 1463-9076 doi: 10.1039/c3cp53165a

Bennett, R. A., Mulley, J. S., Etman, H. A., Sparkes, A., Eralp, T., Held, G., Cavill, S. A. and Dhesi, S. S. (2012) *Chromium nanostructures formed by dewetting of heteroepitaxial films on W(100).* Physical Review B, 86 (4). 045454. ISSN 1098-0121 doi: 10.1103/PhysRevB.86.045454

Etman, H. A., Zheleva, Z. V., Held, G. and Bennett, R. A. (2011) *Epitaxial growth of ultrathin palladium films on Re{0001}.*The Journal of Physical Chemistry C, 115 (10). pp. 4191-4199. ISSN 1932-7447 doi: 10.1021/jp112136f

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Mulheran, P. A., Nolan, M., Browne, C. S., Basham, M., Sanville, E. and Bennett, R. A. (2010) *Surface and interstitial Ti diffusion at the rutile TiO2(110) surface.* Physical Chemistry Chemical Physics, 12 (33). pp. 9763-9771. ISSN 1463-9076 doi: 10.1039/C002698K

Bennett, R. A., Mulley, J.S., Basham, M., Nolan, M., Elliott, S.D. and Mulheran, P.A. (2009) *Non-stoichiometric oxide and metal interfaces and reactions.* Applied Physics A, 96 (3). pp. 543-548. ISSN 0947-8396 doi: 10.1007/s00339-008-5066-1

Nolan, M., Mulley, J. S. and Bennett, R. A. (2009) *Charge transfer in Cr adsorption and reaction at the rutile TiO2(110) surface.* Physical Chemistry Chemical Physics, 11. pp. 2156-2160. ISSN 1463-9076 doi: 10.1039/b819724e

Bowker, M. and Bennett, R.A. (2009) *The role of Ti3+ interstitials in TiO2(110) reduction and oxidation.* Journal of Physics-Condensed Matter, 21 (47). p. 9. ISSN 0953-8984 doi: 10.1088/0953-8984/21/47/474224

Nolan, M., Elliott, S. D., Mulley, J. S., Bennett, R. A., Basham, M. and Mulheran, P. (2008) *Electronic structure of point defects in controlled self-doping of the TiO2 (110) surface: Combined photoemission spectroscopy and density functional theory study.*Physical Review B, 77 (23). 235424. ISSN 1098-0121 doi: 10.1103/PhysRevB.77.235424