

Curriculum Vitae – Ursel Bangert

Personal details: Dr rer nat, MInstP, CPhys; of German nationality, married, 4 children;

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Ursel Bangert is newly appointed Bernal Chair in Microscopy and Imaging at the University of Limerick, following positions of Reader and Lecturer at the Universities of Manchester and Surrey, and a career of ~30 years in the area of electron microscopy. ***She is currently building up an International Centre for Ultra-High Resolution Imaging and Characterisation at the University of Limerick, where she obtained funding for a world-class Titan Themis double corrected, monochromated, analytical transmission electron microscope.*** This TEM, one of a handful in the world, enables imaging and spectroscopy on the atomic scale. It will immensely further research carried out in areas of nano- and novel 2-D materials through addition/development of TEM holders for sample treatments and manipulation carried out directly in the TEM. The UL TEM Centre is collaborating with world-renowned Centres, with respect to provision of global facilities and technical competence, as well as regarding provision of complementary techniques/measurements; these Centres include, the Ernst-Ruska Centre for Microscopy and Spectroscopy with Electrons in the Peter Gruenberg Institute in the Research Centre Juelich and the National UK SuperSTEM facility at Daresbury.

At Manchester University, apart from overseeing the Manchester electron optical facilities, she has been heavily involved, since their inception, with the STEM facilities at Liverpool (NorthWest STEM; Co-I) and at Daresbury (SuperSTEM; Co-I). In this role she has become familiar with the management of large, collaborative grants. She has participated in creating Euro ~23M of research funding (as PI or Co-I) from research funding agencies to industrial sponsorship. She has pioneered low loss electron energy loss (EEL) spectroscopy for highly spatially resolved electronic structure studies in wide bandgap semiconductors and diamond as well as single atom spectroscopy of carbon nanotubes. ***Since its discovery she has worked on graphene (and other 2-Ds discovered shortly thereafter), carrying out electron microscopy in the Manchester Graphene Group (A. Geim), and was first to conduct atomic resolution HAADF, morphology studies via electron diffraction, and EEL spectroscopy on graphene.*** Her research activities encompass furthermore microstructure and hetero-microstructure, self-organized growth phenomena and plasmonics in semiconductors. She is also an active promoter of gender equality in science (in outreach activities and on Athena SWANN steering committee).

Employment history:

Since 2014: Bernal Professor in the Department of Physics and Energy, University of Limerick, Limerick, Ireland

2009-2014: Reader in the School of Materials at the University of Manchester

2005-2009: Senior Lecturer in the School of Materials at the University of Manchester

1993-2005: Lecturer in the Department of Physics at UMIST (Senior Lecturer since 1998)

1992-1993: Lecturer in the Department of Physics at the University of Surrey

1988-1992: Advanced SERC Fellow in Information Technology in the Department of Physics at Surrey University

1982-1988: Research Fellowships at Surrey University in the Departments of Elec. Eng., Mat. Sci. Eng. and Physics

1976-1982: Full time and part time research assistantships at Köln University in the Departments of Nuclear Physics and Nuclear Chemistry

1974-1976: Part time teacher High School teacher in Köln-Deutz, Thusneldastrasse (during undergraduate degree)

Qualifications & Education:

1881: Dr. rer. nat. (eqv. to PhD)

1978: Diplom der Physik (eqv. to MSc)

10 selected publications (out of > 180) marking research break-throughs (reverse chronological order)

• U. Bangert, R. Zan, 'Electronic functionalisation of graphene via external doping and dosing assessed by imaging and spectroscopic techniques' International Materials Reviews 60(3) 133 (2015) • U. Bangert, W. Pierce, D. M. Kepaptsoglou, Q. Ramasse, R. Zan, M. H. Gass, J. A. Van den Berg, C. B. Boothroyd, J. Amani, H. Hofsäss, 'Ion implantation of graphene - towards IC compatible technologies', Nano Lett. 13 (10), 4902 (2013) • Q M Ramasse, C. R. Seabourne, R. Zan, D. M. Kepaptsoglou, U. Bangert, A. J. Scott, 'Probing the bonding and electronic structure of single atom dopants in graphene with electron energy loss spectroscopy', Nano Lett. Nano Lett. 2013, **13**, 498, [http:// doi: 10.1021/nl304187e](http://doi:10.1021/nl304187e) (2012) • Q M Ramasse, R Zan, U Bangert, D W Boukhvalov, Y-W Son and K S Novoselov, 'Direct experimental evidence of metal-mediated graphene etching', ACS Nano, 2012, 6 (5), 4063 • R Zan, U Bangert, Q Ramasse, K S Novoselov, 'Graphene re-knits its holes', Nano Lett. 12, 3936 (2012) • M H Gass, U Bangert, A L Bleloch, P Wang, R R Nair & A K Geim, 'Free-standing graphene at atomic resolution', Nature Nanotech. vol **3** NOVEMBER 2008; doi: 10.1038/nnano.2008.280. (2008) • T Eberlein, U Bangert, R R Nair, R Jones, M Gass, A L Bleloch, K S Novoselov, A Geim, P R Briddon, 'Plasmon spectroscopy of free standing graphene films', Phys Rev B **77**, 233406 (2008) • Y Chao, L Siller, S Krishnamurthy, P R Coxon, U Bangert, M Gass, L Kjeldgaard, S N Patole, L H Lie, N O'Farrell, T A Alsop, A Houlton, B R Horrocks 'Evaporation and Deposition of Alkyl-capped Si Nanocrystals in Ultra-high Vacuum' Nature Nanomaterials, vol 224 July (2007) • U Bangert, A J Harvey, R Jones, C J Fall, A

T Blumenau, R Briddon, M Schreck, and F Hoermann, 'Dislocation induced electronic states and point defect atmospheres evidenced by electron energy loss imaging', *New J Phys* **6** 184 (2004) • A Gutierrez-Sosa, U Bangert, A J Harvey, C J Fall, R. Jones, P R Briddon, M I Heggie, 'Bandgap related energies of threading dislocations and quantum wells in group III nitride films as derived from electron energy loss spectroscopy', *Phys Rev B* **66**, 035303 (2002)

Books and book chapters

• Book contract with Wiley: 'Atlas of TEM images and EEL spectra' • U Bangert, M H Gass, R Zan, C-T Pan, 'Scanning Transmission Electron Microscopy and Spectroscopy of Suspended Graphene', in: "Physics and Applications of Graphene – Experiments", ed. S Mikhailov, InTech open access publisher (2011) • A Seepujak, U Bangert, A J Harvey, A Bleloch, V D Blank, B A Kulnitskyi, D A Batov, E V Polyakov, 'Nitrogen doping into carbon nanotubes using electron-loss spectroscopy' in: 'Carbon Nanotubes and related Structures', eds V Blank, A Kulnitskyi, Research Signpost (2008)
• M Milosavljevic, N Bibic, D Perusko, C Jeynes, U Bangert, 'The Effects of implanted Arsenic on Ti-Silicide Formation' in: 'Special Defects in Semiconducting Materials', ed. R P Agarwala, Trans Tech Publ, Switzerland, (1999) • U Bangert, 'Transmission electron microscopy of GaAs', in *emis data review series 16: 'Properties of GaAs'*, eds Brozel & Stillman, Short Run Press, Exeter (1996) • U Bangert 'Transmission Electron Microscopy of Aged Buried Heterostructure Lasers', in 'The Handbook of Advanced Materials Testing', eds Cheremisinoff & Cheremisinoff, Dekker, N.Y., Basel, H.K., (1995)

Selected invited and plenary talks (out of >30, reverse chronological order)

• 'Effect of instrument development on electron microscopy of 2D materials', SuperSTEM3 inauguration 2015 • 'Atomic-scale insights into 1D and 2D nano-materials', University of Exeter 2015 and SMG&IMS conference Glasgow 2014 • 'What can electron microscopy reveal?' talks at Tyndall Institute, Analog and Intel 2014 • 'Graphene and other 2-D's: atomic-scale landscapes and chemistry revealed by electron microscopy and spectroscopy', University of Goettingen 2013 • 'Ion implantation of graphene - towards IC compatible technologies', Nanotech, Surrey University, 2013 • 'Graphene and other 2-D's: atomic-scale landscapes, single atom action and collective electron motion revealed by electron microscopy and spectroscopy' Carbonhagen, Denmark, 2013 • 'When atoms go skiing and electrons do the hokey cokey- electron microscopy and spectroscopy of graphene', ER-C Research Center Juelich, Germany 2012 & Key note talk at the opening of the Warwick Microscopy Centre 2012 • 'Annular dark field microscopy in carbon characterisation', NanoteC, Nantes, France 2011 • 'Electron Microscopy and Spectroscopy of Graphene: Atomic-scale Landscapes', Graphene week, Maryland US 2010 • 'Electron Microscopy and Spectroscopy of Carbon Nanotubes and Graphene: Atomic Landscapes and Collective Motion', TUS, Tokyo, Japan 2009 • 'Atom-by-atom account' of structure and chemistry in nano-materials' Braga University, Portugal 2008 • 'Advanced electron energy loss spectroscopy', Workshop EMPA Switzerland 2007 • 'Ion implantation in carbon nanotubes- can we see single implanted atoms?', IBC workshop Surrey University 2006 • 'Electron Energy Loss Spectroscopy of dislocations in GaN and Diamond: a comparison between experiment and calculation', ONR workshop, Virginia US 2003

Organising duties and other evidence of academic and professional standing

• organiser of 'Scanned probe microscopy workshop', London 1996 • organiser of 'Functional Materials' session and poster-sessions at EMAG, Sheffield 1999 • local organiser of 'TEM&TOM workshop', Manchester 2007 • chairperson of the Electron Optics Group (since 2007) • overseeing the running, maintenance and up-grading of the electron optics facilities in the Materials Science Centre (since 2007) • session organiser of the European Microscopy Conference EMC2012 and EMC2016 • member of the local organisation committee of EMC 2012 • member of the local organising committee of the IUVISTA workshop (High temperature amorphous and nanostructured ceramic coatings: challenges and opportunities) 2012 • frequent referee duties (for the Swiss National Science Foundation, for the NSF, for international journals, e.g. for *Phys Rev*, *J Appl Phys*, *Carbon*, *Ultramicroscopy*, *Diamond and Related Materials*, *Materials Science& Engineering*, *ACS journals*, *Nature*, *Nanoletters*) • organiser of MSI conference at UL 2015

Memberships of professional bodies

• co-chair of the FLAG-ERA evaluation panel (since 2015) • member of the Athena Swann steering committee, University of Limerick (since 2014) • member of the Microscopy Society of Ireland (since 2014) • member of the National EPSRC SuperSTEM Facility steering committee (since 2007) • member of the Royal Microscopical Society Electron EM committee (since 2007) • Fellow of the Royal Microscopical Society • member of the EPSRC Peer Review panel (since 2006) member of the EMAG committee (1997-2000) • member of the Institute of Physics

Public, inter- and intra-University Outreach

• partaking in the design and manning of the exhibit: 'Graphene- unexpected Science in a Pencil Line' at the Royal Society Summer Science Exhibition 2011 • conducting a monthly TEM forum at Manchester University, open to all
• designing an electron microscopy exhibit, the *Virtual Microscope* for the Royal Society Summer Science Exhibition, to be permanently installed in the Museum of Science and Industry at Manchester (also downloadable from the App Store for iPad and Android) • making the *Virtual Microscope* into a movie for the Royal Microscopical Society and the Manchester University websites • partaking in an episode of the BBC4 series: 'The Secret World of Materials' as well as ITV1 News • partaking in 'UL talks' on the UL website