

Robert A. Cross

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Born 16.04.57, Duffield, Derbyshire, UK



EDUCATION

1983 PhD in Protein Biophysics (University of Nottingham)
1979 BSc in Biochemistry (University of Nottingham)

POSITIONS

2015- Wellcome ERG on Molecular Basis of Cell Function
2014- Wellcome Senior Investigator, Warwick Medical School
2009- Professor of Mechanochemical Cell Biology, Warwick Medical School
1991 - 2009 Leader, Molecular Motors Group, Marie Curie Research Institute, UK
1988 - 1991 Research Staff, MRC LMB, Cambridge, UK
1986 - 1988 MDA Fellow MRC LMB, Cambridge, UK
1984 - 1986 EMBO Fellow OAW IMB, 5020 Salzburg, Austria

FELLOWSHIPS

1986 - 1988 MDA Fellow MRC LMB, Hills Rd, Cambridge CB2 2QH
1984 - 1986 EMBO Fellow OAW IMB, 5020 Salzburg, Austria

CURRENT SUPPORT

2016 - 2020 **Leverhulme Trust** £256K – with Anne Straube & Marco Polin
2015 - **BBSRC ALERT14** £0.74M – with Royle (PI), McAinsh/Smith/Cross/Frigerio
2014 - 2019 **Wellcome Trust** £1.2M *Senior Investigator award*
2013 - 2017 **WPHCT** £100K *Warwick Open Source Microscope* (<http://WOSMic.org>)
2013 - 2017 **BBSRC** £0.55M *Chemical Biology of Microtubules* (IPA with Syngenta)

CONFERENCE ORGANISATION

2017 **Wellcome Mechanobiology at the Shard** (with M. Gautel)
2013 **BSCB** Spring meeting *Mechanochemical Cell Biology*
2012 **JSPS** Japan-UK international symposium on *Mechanochemical Cell Biology*
2008 **MCRI** Spring Workshop *Microtubule Dynamics*
2005 **EMBO** workshop / Harden Conference *Molecular Motors* Cambridge
1993 - 2008 **Marie Curie** international workshops on *Molecular Motors*
1998 **FEBS** Advanced Course at MCRI, *Molecular Motors*
1993 **EMBO** workshop in Cambridge, UK *Molecular Motors*
1991 **Wellcome Trust** Frontiers in Science congress *Molecular Motors*
1990 **EMBO** workshop in Maria Alm, *Smooth Muscle Contraction*

RECENT INVITATIONS

2016 **Biophysical Society** Vancouver *Engineering Molecular Motors*
2016 **EMBO** microtubules meeting Heidelberg
2016 **JSPS** international workshop (Leicester) invited speaker
2016 **Alpbach** meeting *Myosins and other motors* Session chair

SCIENTIFIC INTERESTS & CURRENT RESEARCH

My lab studies the mechanisms by which kinesins and microtubules generate force. We also engineer new types of microscope and are currently developing the Warwick Open Source Microscope, a hardware platform for advanced optical microscopy, aiming to benefit the global open microscopy community (www.wosmic.org). I am the founding director of the Centre for Mechanochemical Cell Biology (CMCB) at Warwick (www.mechanochemistry.org), a small, focussed grouping of currently 14 PIs who are combining *in vivo* cell biological approaches to molecular motor-driven processes with physical sciences approaches, including *in vitro* reconstitution and mathematical modelling. Within the last 3 years, 4 of the PIs in our centre have won Wellcome Investigator awards.

SCIENTIFIC BIOSKETCH

I did my PhD at Nottingham University and then moved to Salzburg as an EMBO fellow, to work with Vic Small and Apolinary Sobieszek on the structure and mechanisms of smooth muscle. I discovered that a C-terminal sequence of myosin II is essential for its self-assembly and that the self-assembly of myosin II molecules is dynamically controlled via nucleotide trapping in their active sites. In 1986 I moved to MRC-LMB as an MDG fellow and, with John Kendrick Jones, Clive Bagshaw and Mike Geeves, worked out an explicit mechanism for myosin II self-assembly. In 1991 I moved to start my own lab at Marie Curie Cancer Research. With Linda Amos and Keiko Hirose at LMB, we obtained the first EM views of microtubule-bound kinesin (Nature, 1995). Subsequently, we discovered that at high load, kinesins can walk processively backwards (Nature, 2005), that ATP binding controls their walking action (Science, 2007), that their force generation mechanism generates torque (Nature Chemical Biology, 2005) and that kinesins can sort and parallelise microtubules (Nature Cell Biology, 2009). In 2010, I moved to Warwick University, to co-found the CMCB, a new interdisciplinary centre for mechanochemical cell biology. During the last 5 years, we have shown that kinesin motors are electrostatically steered (PLOS Biology, 2011), that microtubule seams are hotspots of instability (Nature Communications, 2014), that kinesin can be programmed using DNA (Nature Nanotechnology, 2015) and that kinesin-5 has a proximity sensing mechanism that reverses its stepping direction (PNAS, 2016). Most recently, we have shown that kinesin binding radically changes the conformation and mechanics of GDP-microtubules (<https://t.co/BeHNbkQaVG>). I am a Wellcome Senior Investigator and a member of the Wellcome Expert Review Group in the Molecular Basis of Cell Function.

PUBLICATIONS

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- (102) M. Britto, A. Goulet, S. Rizvi, O. von Loeffelholz, C. A. Moores, and R. A. Cross (2016)
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- (101) Cross, R.A. (2016)
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- (99) Hussmann, F., Drummond, D.R., Peet, D.R., Martin, D.S., Cross, R.A. (2016)
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- (98) Cross, R.A. (2015)
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- (97) Wollman A.J., Sanchez-Cano, C., Carstairs, H.M.J., Cross, R.A. & Turberfield A.J. (2015)
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- (95) Katsuki, M., Drummond, D.R. & Cross R.A. (2014)
Ectopic A-lattice seams destabilise microtubules
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- (94) Klejnot, M., Falnikar, A., Ulaganathan, V., Cross, R.A., Baas, P.W., Kozielski, F. (2013)
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S. pombe kinesins-8 promote both nucleation and catastrophe of microtubules
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Purification of Tubulin from the Fission Yeast Schizosaccharomyces pombe.
Methods in Molecular Biology, **777** 29-55

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Nature Struc. Mol. Biol.**15** 1102-8
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A torque component in the kinesin-1 power stroke

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The kinetic mechanism of kinesin

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- (55) Drummond, D.R. & Cross R.A. (2000)
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- (52) Cross R.A. (2000)
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An improved microscope for bead and surface based motility assays
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- (49) Cross R.A. (2000)
The mechano-biochemistry of molecular motors
Introductory article to Molecular Motors Essays in Biochemistry **35**
- (48) Cross, R.A. (1999)
Walking Talking heads (dispatch)
Current Biology **9** R854-R856
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