

UK-Japan Symposium for Mechanochemical Cell Biology

23-24 August 2012, Scarman House, University of Warwick

Invited Speakers:

Toshio Yanagida (Osaka University , RIKEN QBiC)	Simon Bullock (MRC-LMB, Cambridge)
Masahiro Ueda (Osaka University , RIKEN QBiC)	Bungo Akiyoshi (University of Oxford)
Yasushi Okada (RIKEN QBiC) o	Laura Machesky (Beatson Institute, Glasgow)
Toshio Ando (Kanazawa University) o	Jonathan Millar (University of Warwick)
Junichiro Yajima (University of Tokyo) o	Rob Cross (University of Warwick)
Shin'ichi Ishiwata (Waseda University) o	Andrew McAinsh (University of Warwick)
Takahide Kon (Osaka University) o	Anne Straube (University of Warwick)
Justin Molloy (NIMR, London)	Nick Carter (University of Warwick)
Carolyn Moores (Birkbeck College, London)	Masanori Mishima (University of Warwick)
Andrew Carter (MRC-LMB, Cambridge)	

Objective of Symposium and Outline:

Mechanochemical cell biology is an emerging interdisciplinary science at the cross-section of biology, chemistry and physics, trying to understand how a cell works in more quantitative languages. Recent rapid progress in various microscopy techniques has been a key for this movement. The UK-Japan Symposium for Mechanochemical Cell Biology was aimed at the further development of this field through stimulating international collaborations. We discussed topics ranging from single molecule dynamics of molecular motors to their cellular functions in 19 oral and 13 poster presentations.

The symposium began on Thursday 23rd August with opening remarks from Professor Aldrich (University of Warwick) and Professor Hiramatsu (JSPS), followed by 7 scientific sessions, in which each invited speaker gave a 25 minute talk followed by a 5 min Q&A session. We also had a session for promotion of the activities of JSPS and a poster session.

In “Session 1:Mechanics of Kinesins 1”, Professor Cross presented their data on the mechanochemistry of kinesin-1 motor. Dr. Moores presented the structures of microtubule-bound human kinesin-5 in different nucleotide states determined by cryo-electron microscopy. In “Session 2: Dynamics of Actomyosin Systems”, Professor Yanagida (Osaka University/RIKEN QBiC) discussed the importance of the spontaneous fluctuation at different scales covering the motility of Myosin-VI motor along the actin-filament, image perception in human brain and the large scale telecommunication network. Dr. Molloy (MRC-NIMR) presented their data on the population behaviour of actin filaments driven by myosin-II motor. Professor Ando (Kanazawa University) discussed development and various applications of the high-speed atomic force microscope including the direct real-time observation of the hand-over-hand movement of myosin-V motor along actin filament.

After lunch, in the JSPS promotion session, Ms. Watson and Mr. Kumagai introduced the various schemes available from JSPS to support UK-Japan collaborations at institution, group and individual levels. Professor Sandra Chapman (University of Warwick) gave a talk about her experience in Japan as a JSPS fellow. In “Session 3:Mechanics of Dynein”, Dr. Kon (University of Osaka) and Dr. Carter (MRC-LMB) presented atomic structures of dynein heavy chains from *Dictyostelium* and yeast *S. cerevisiae*, respectively, and discussed the mechanochemical mechanism of force-generation by dynein.

Following a poster session , in which 13 posters were presented by the meeting attendees from University of Warwick and other UK institutions, we had two sessions on mechanochemistry of cell division. Dr. McAinsh (University of Warwick) discussed a new mechanism of the oscillation of kinetochores during mitosis. Dr. Akiyoshi (University of Oxford) discussed biophysical analyses of biochemically isolated yeast kinetochores and identification of kinetochore components in

Trypanosome. Professor Millar (University of Warwick) presented their data on the tension-sensing mechanism at kinetochores that controls the spindle assembly checkpoint in yeast. Professor Ishiwata (Waseda University) discussed micro-mechanics of cell division and chromosome segregation. Dr. Mishima (University of Warwick) presented their data on the mechanical robustness of the central spindle by the interaction between two different types of microtubule-bundling proteins. The first day closed with a networking conference dinner.

The second day of the meeting started with “Session 6: Mechanics of Kinesins 2”. Dr. Carter (University of Warwick) discussed nanometry of the motility of kinesins by optical tweezers and the development of the WOSM open source microscope project. Dr. Yajima (University of Tokyo) discussed the role of the neck linker in the corkscrew motion of microtubules by non-processive motors. Dr. Okada (RIKEN QBiC) discussed a mechanism of specific targeting of Kinesin-1 to the axon in neuronal cells. In the following “Session 7: Cell Motility/Intracellular Transport”, Dr. Bullock (MRC-LMB) presented their data on the intracellular transport of mRNA by multiple microtubule motors. Professor Ueda (Osaka University/RIKEN QBiC) discussed self-organization of signaling network in chemotaxis of *Dictyostelium* cells. Dr. Straube (University of Warwick) discussed the role of kinesin-dependent vesicle transport in stabilisation of trailing focal adhesions in migrating cells. Professor Machesky (Beatson Institute) presented their data on the role of WASP family proteins in invasion and migration of tumor cells in 3D culture. The meeting was closed by lunch and an optional tour to the Mechanochemical Cell Biology Building. Afterwards, the guest speakers from Japan and the speakers from Warwick visited Stratford-upon-Avon.

Overall, the meeting was very successful. This meeting provided a special opportunity to gather people from different backgrounds (in vitro biophysics vs in vivo cell biology, UK vs Japan) and encourage them to take part in detailed discussion on mutual topics of research interests. Thus this event had a big impact on the development of the field of ‘mechanochemical cell biology’, a newly emerging interdisciplinary science. On Saturday 25th August, Dr. Yajima and Dr. Okada, Professor Cross and Dr. Mishima had long discussions about their ongoing projects resulting in plans for exciting, new collaborations. Professor Cross has been invited to visit Japan for the opening ceremony of RIKEN QBiC, which is directed by Professor Yanagida. A plan for a second meeting, possibly in Japan, has also been discussed.

-Dr. Masanori Mishima, Centre for Mechanochemical Cell Biology, Warwick Medical School, Warwick University



Symposium attendees