Session 1SBP: ASB-BSJ Joint Symposium—current challenges in biophysics centering on biomolecular interactions and the underlying forces

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The afternoon session entitled “Current challenges in biophysics centering on biomolecular interactions and the underlying forces” on Tuesday, September 24, 2019, was held as a joint Biophysical Society of Japan (BSJ) and Australian Society for Biophysics symposium to foster new collaborations between Japanese and Australian scientists as well as cement many of the existing strong collaborating links created since the first joint session at the 43rd Annual Meeting of BSJ held in Sapporo in Hokkaido island, Japan. The present session marks the 6th symposium since then and was chaired by Prof Takayuki Nishizaka from Gakushuin University in Tokyo, an experimental biophysicist focussed on force generation in microbial systems (Nakane and Nishizaka 2017; Yajima et al. 2008) and Prof Marc Kvansakul from La Trobe University, Melbourne, a structural biologist focussed on host-pathogen interactions (Banjara et al. 2017; Kvansakul et al. 2016). The presentations featured an exciting selection of contemporary biophysics-focussed research covering current challenges in measuring biomolecular interactions and forces as well as their impact on biological systems such as microbes. The session was opened by the Chair Prof Takayuki Nishizaka, who presented some of his recent advances on microscopic measurements of force and taxis in bacteria and archaea. Approaches featured included single-molecule measurements, which were applied to the rotary ATP driven motor from

Halobacterium salinarum (Iwata et al. 2019) as well as to rotary motors in *Mycoplasma mobile* (Kinosita et al. 2018). The next speaker was Prof Elena Ivanova from RMIT University in Melbourne, who shared some of her latest work on designing and fabricating titanium substrate nanostructures inspired by nature (Bhadra et al. 2015; Linklater et al. 2017) to prevent the formation of bacterial biofilms. Her latest designs showed remarkable efficacy in the prevention of biofilms (Webb et al. 2013) and may deliver substantial benefits in the medical and biotechnological sector. This was followed by Prof Norio Fukuda from Jikei University, Tokyo, who revealed cutting edge imaging results of cardiac tissue as well as cardiac cells that revealed novel insights into force generation in the heart (Shimozawa et al. 2017). His data detailed remarkable movement patterns in the sarcomeres, thus providing new mechanisms to describe force generation in cardiac tissues (Kagemoto et al. 2018). The focus on the biophysics of the cardiac system was continued by Prof Cris dos Remedios from the University of Sydney, who shared the story of his establishment of a cardiac tissue bank (Dos Remedios et al. 2017), which has now developed into a remarkable resource for scientists worldwide to access high-quality cardiac tissue samples for research. Notably, Prof dos Remedios had been a speaker in the inaugural joint session held by the BSJ and ASB fourteen years ago and has worked tirelessly to foster engagement between the two societies in the intervening years. The focus of the session then shifted to the plasma membrane, with the next speaker, Prof Hye-Won Shin, from Kyoto University discussing her latest research on the mechanism of action of flippases to ensure correct phospholipid asymmetry in the plasma membrane. A highlight was her recent work on the control of membrane curvature via the action of P4-ATPases (Takada et al. 2018; Tone et al. 2019). The final speaker was the co-chair Prof Marc Kvansakul, who shared recent findings on the mechanism of action of innate immunity effectors from the defensin superfamily. He

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described the first atomic resolution structure of a defensin membrane attack complex (Jarva et al. 2018a) and showed that key phospholipid targets for defensins are conserved between plants and humans (Jarva et al. 2018b).

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