



# School of Medical Sciences 2019 Seminar Series

Wednesday 21<sup>st</sup> of August  
3:00 – 4:00pm, Kirby Seminar Room

**Who:** Katharina Gaus<sup>1,2</sup>

<sup>1</sup>EMBL Australia Node in Single Molecule Science and <sup>2</sup>ARC Centre of Excellence in Advanced Molecular Imaging, University of New South Wales, Sydney, Australia

**When:** Wed 21 August, 3pm – 4pm, followed by drinks and nibbles

**Where:** Level 6, Kirby Seminar Room, Wallace Wurth Building

## “Single molecule imaging of T cell receptor signalling”

New imaging technology such as single-molecule localization microscopy (SMLM) can provide a truly molecular image of complex biological processes. We aimed to better understand how the T cell receptor (TCR) translates antigen binding into intracellular signals on which T cell fate decisions are based. We develop imaging approaches and novel analyses to determine how spatial organization regulates signal initiation and propagation. For example, we used SMLM data to map the organization of TCR-CD3 complexes into nanoscale clusters and found that the spatial organization determines signaling efficiency. This led us to propose a model in which antigen



recognition is first translated into receptor clustering and then the density of receptor nanoclusters is translated into signaling (Pigeon et al. PNAS 2016). We also developed novel FRET sensors to monitor the rate of receptor clustering (Ma et al. Nat Commun 2017) and a sensor that reports membrane charges (Ma et al. Nat Biotech 2017) to understand how biophysical properties of the plasma membrane contribute to TCR signaling. More recently, we developed an improved single molecule microscope that achieves ~2-3 nm localization precisions and thus enables direct distance measurements between membrane proteins. Taken together, single molecule data provides an experimental framework to better understand the molecular mechanisms of receptor signaling.

**Bio:** Scientia Professor Katharina Gaus is an NHMRC Senior Research Fellow at the University of New South Wales and Head of the EMBL Australia Node in Single Molecule Science. She is also the Deputy Director of the ARC Centre of Excellence in Advanced Molecular Imaging (2014-2020). Katharina received her PhD from the University of Cambridge in 1999 and has led an independent research group since 2005. Her group investigates signal transduction processes in T lymphocytes with advanced fluorescence microscopy approaches. She was awarded the Young Investigator Award from the Australia and New Zealand Society for Cell and Developmental Biology (2010), the Gottschalk Medal from the Australian Academy of Science (2012), the New South Wales Science and Engineering Award for Excellence in Biological Sciences (2013) and the Khwarizmi International Award (2018).

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