Imaging the cell

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In the ‘Imaging the cell’ session, we explore a range of biological questions that have been addressed at the level of single cells using cutting-edge imaging tools. The scope for emergent biophysical technologies in this area is broad, capturing exciting techniques such as state-of-the-art high-precision structural methods (Fernandez-Fernandez et al. 2017; Pérez-Berná et al. 2016) and innovative light microscopy approaches (Wollman et al. 2015a; Chiu et al. 2011) in particular, often pushing the limits of detection sensitivity to the single-molecule level (Leake 2012; Lenn et al. 2012). To start our session, we have an invited talk from Martin Booth (University of Oxford, UK) concerning advances in adaptive optics for microscopy and nanoscopy, which have enabled valuable progress in imaging cells deep in tissues to super-resolution precision (Booth et al. 2015). Our second invited speaker, John

Briggs (EMBL, Germany), will discuss the use of cryo-electron tomography to determine protein structures within complex environments, an imaging technology which has enabled unprecedented insight into the architecture of macromolecular machines in the complex milieu of cells (Dodonova et al. 2017). Our first contributed talk in the session is then from Lóránd Kelemen (Biological Research Centre, Hungary), who will tell us about the application of indirect optical micromanipulation in fluorescent 3D live-cell imaging, an interesting new approach which enables 3D reconstruction of single cells by imaging them at different orientations (Aekbote et al. 2015). Our third invited speaker is James McNally (Helmholtz-Zentrum Berlin, Germany), who will talk on the topic of cryo X-ray tomography to enable 3D cellular imaging of the ultrastructure of intact cells without the use of fixation or staining (Schneider et al. 2010). Our second contributed talk then comes from Sviatlana Shashkova (University of York, UK), who will discuss how clusters of transcription factor regulate gene expression in single cells, explored using high-speed, live-cell, single-molecule fluorescence microscopy (Miller et al. 2015; Wollman et al. 2015b; Shashkova and Leake 2017). Our session then ends with a contributed talk from Eva Arnspang (University of Southern Denmark, Denmark), who will talk to us about aquaporin water channels studied using pair correlation analysis of fixed PALM and live PALM (Arnspang et al. 2016). A must-see session!

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Compliance with ethical standards

Conflict of interest José L. Carrascosa declares that he has no conflict of interest. Mark C. Leake declares that he has no conflict of interest.

Ethical approval This article does not contain any studies with human participants or animals performed by any of the authors.

References

- Aekbote BL et al (2015) *Biomed Opt Express* 7(1):45–56
- Amspang EC et al (2016) *Int J Mol Sci* 17(11):E1804
- Booth M et al (2015) *Microscopy (Oxf)* 64(4):251–261
- Chiu SW et al (2011) *Int J Mol Sci* 12(4):2518–2542
- Dodonova SO et al (2017) *eLife* 6:e26691
- Fernandez-Fernandez MR et al (2017) *J Cell Sci* 130(1):83–89
- Leake MC (2012) *Philos Trans R Soc Lond B Biol Sci* 368(1611):20120248
- Lenn T et al (2012) *Open Biol* 2(6):120090
- Miller H et al (2015) *Methods* 88:81–88
- Pérez-Berná AJ et al (2016) *ACS Nano* 10(7):6597–6611
- Schneider G et al (2010) *Nat Methods* 7(12):985–987
- Shashkova S, Leake MC (2017) Single-molecule fluorescence microscopy review: shedding new light on old problems. *Biosci Rep* 37(4):BSR20170031
- Wollman AJM et al (2015a) *Open Biology* 5(4):150019
- Wollman AJM et al (2015b) *Faraday Discuss* 184:401–424