

3D and live-cell multicolor super-resolution microscopy for cell biological research

Joerg Bewersdorf

**Department of Cell Biology and Department of Biomedical Engineering, Yale University,
New Haven, CT 06520, United States**

E-mail: joerg.bewersdorf@yale.edu

KEY WORDS: STED, single-molecule switching nanoscopy, single-molecule localization microscopy.

Cell biological research relies heavily on the capabilities of light microscopes to resolve structures or processes of interest [1]. My research group is developing super-resolution technology that pushes these capabilities in particular with respect to 3D resolution, speed, live-cell compatibility and depth penetration.

In this presentation, I will report on my lab's recent progress on imaging whole cells at sub-20 nm 3D resolution and on live-cell imaging at 50 nm resolution and below. I will summarize published work [2, 3] as well as present recent, unpublished results. Technology and method development will be present in the context of cell biological applications and discoveries.

[1] D. Baddeley, J. Bewersdorf "Biological Insight from Super-Resolution Microscopy: What We Can Learn from Localization-Based Images", *Annu. Rev. Biochem* 2018, in press
<http://www.annualreviews.org/doi/abs/10.1146/annurev-biochem-060815-014801>

[2] F. Huang, G. Sirinakis, E.S. Allgeyer, L.K. Schroeder, W.C. Duim, E.B. Kromann, T. Phan, F.E. Rivera-Molina, J.R. Myers, I. Irnov, M. Lessard, Y. Zhang, M.A. Handel, C. Jacobs-Wagner, C.P. Lusk, J.E. Rothman, D.K. Toomre, M.J. Booth, J. Bewersdorf "Ultra-high resolution 3D imaging of whole cells", *Cell* 2016
[http://www.cell.com/cell/fulltext/S0092-8674\(16\)30745-0](http://www.cell.com/cell/fulltext/S0092-8674(16)30745-0)

[3] F. Bottanelli, E.B. Kromann, E.S. Allgeyer, R.S. Erdmann, S. Wood Baguley, G. Sirinakis, A. Schepartz, D. Baddeley, D.K. Toomre, J.E. Rothman, J. Bewersdorf "Two-colour live-cell nanoscale imaging of intracellular targets", *Nature Communication* 2016
<https://www.nature.com/articles/ncomms10778>