MINFLUX Nanoscopy: Superresolution post Nobel

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The 2014 Nobel Prize in Chemistry was awarded "for the development of super-resolved fluorescence microscopy". More than 125 years after Ernst Abbe's definition of the supposedly insurmountable diffraction resolution limit, fluorescence "microscopes crossed the threshold", as the Nobel poster put it. The result has been the breathtaking development of far-field optical super-resolution microscopy or, in short, 'nanoscopy' as an entire field over the past years.

A fresh look at the foundations [1] shows that an in-depth description of the basic principles of nanoscopy spawns new powerful concepts such as MINFIELD [2], MINFLUX [3] and DyMIN [4]. Although they differ in some aspects, these concepts harness a local intensity minimum (of a doughnut or a standing wave) for determining the coordinate of the fluorophore(s) to be registered. Most strikingly, by using an intensity minimum of the excitation light to establish the fluorophore position, MINFLUX nanoscopy has obtained the ultimate (super)resolution: the size of a molecule [3]. The talk will highlight recent developments.

[1] Hell, S.W. Far-Field Optical Nanoscopy. **Science** 316, 1153-1158 (2007).

[2] Göttfert, F., Pleiner, T., Heine, J., Westphal, V., Görlich, D., Sahl, S.J., Hell, S.W. Strong signal increase in STED fluorescence microscopy by imaging regions of subdiffraction extent. **PNAS** 114, 2125-2130 (2017).

[3] Balzarotti, F., Eilers, Y., Gwosch, K. C., Gynnå, A. H., Westphal, V., Stefani, F. D., Elf, J., Hell, S.W. Nanometer resolution imaging and tracking of fluorescent molecules with minimal photon fluxes. **Science** 355, 606-612 (2017).

[4] Heine, J., Reuss, M., Harke, B., D'Este, E., Sahl, S.J., Hell, S.W. Adaptive-illumination STED nanoscopy. **PNAS** 114, 9797-9802 (2017).