

# Enhancing far-field super resolution fluorescence microscopy towards 3D imaging of thick scattering specimens and variations on the theme at the nanoscale

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## **Abstract:**

It is well known and established that, for the most popular imaging mode in optical microscopy, i.e. fluorescence; the diffraction barrier does no longer provide an unsurpassable limitation for resolution and localization accuracy. Furthermore, the terms "super resolution" and "optical nanoscopy", coined earlier, have been implemented in real far field optical microscopes, nowadays available for everyone to use without extreme complexity. Here, we will discuss some developments towards 3D imaging of thick scattering specimens utilising both targeted and stochastic readout methods within single and multiphoton excitation regimes. Individual molecule localization (IML) implemented within selective plane illumination microscopy (SPIM), NSTORM and SW-2PE-STED will be addressed towards 3D super resolution imaging. Particular attention will be also given to the intensity issues related to the depletion process. Moreover, variations on the theme will be addressed as Nanoscale Lithography and AFM-STED. So far, a variety of architectures will be outlined in regard to specific applications demanding for nanoscale investigations.