

# **Super resolution microscope**

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**04/08/2016**

# What is super resolution?

- Due to Rayleigh criterion

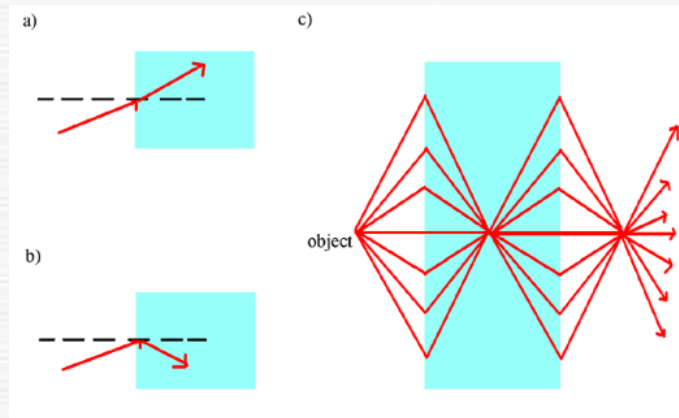
$$\Delta \ell = 1.220 \frac{f \lambda}{D}$$

normal microscope resolution is ~200nm

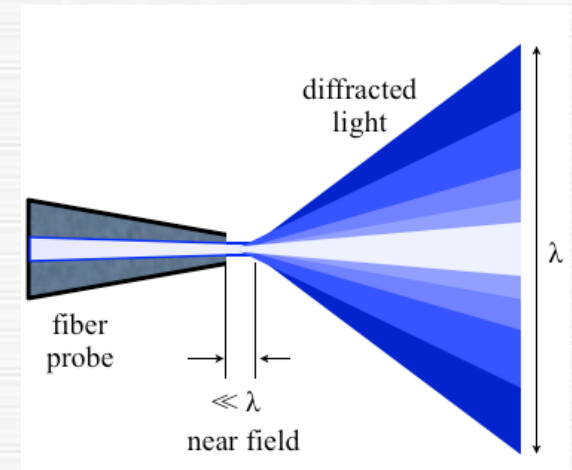
- For super resolution microscope, resolution can go to 50pm.

# How to realize super resolution?

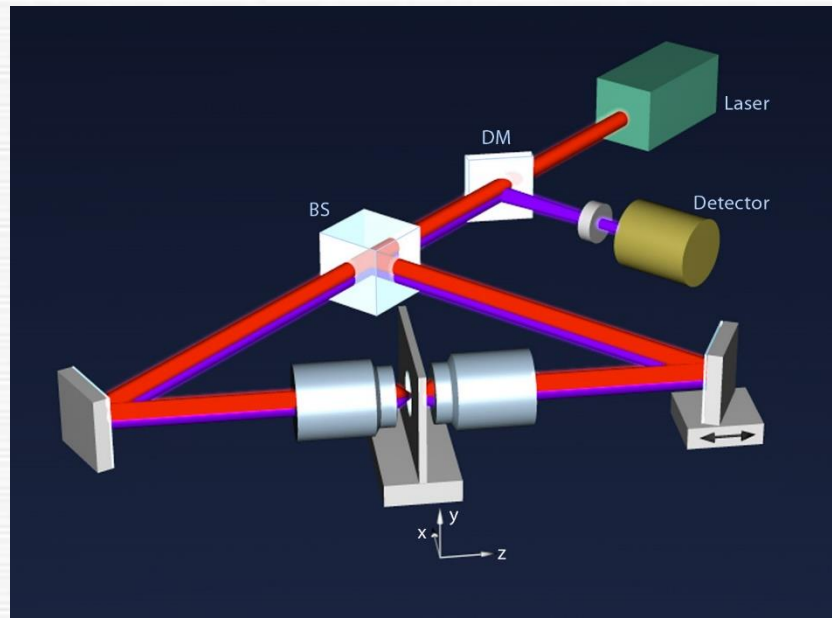
- [Pendry Superlens](#)



- [near field scanning optical microscopy](#)



- 4pi microscope



- SIM

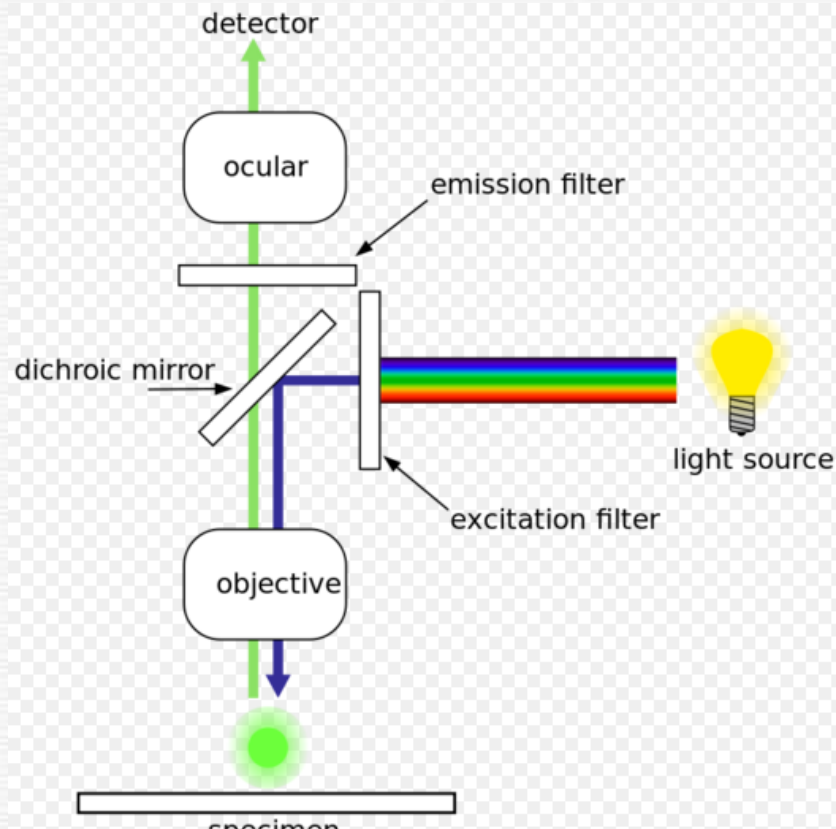
# Functional divides

- There are two major groups of methods for functional super-resolution microscopy:[\[3\]](#)
- Deterministic super-resolution: The most commonly used emitters in biological microscopy, [fluorophores](#), show a nonlinear response to excitation, and this nonlinear response can be exploited to enhance resolution. These methods include [STED](#), [GSD](#), [RESOLFT](#) and SSIM.
- Stochastic super-resolution: The chemical complexity of many molecular light sources gives them a complex temporal behavior, which can be used to make several close-by fluorophores emit light at separate times and thereby become resolvable in time. These methods include [Super-resolution optical fluctuation imaging](#) (SOFI) and all single-molecule localization methods (SMLM) such as [SPDM](#), [SPDMphymod](#), [PALM](#), FPALM, STORM and dSTORM.

# Noble Prize: the development of super-resolved fluorescence microscopy

- 2014 [Nobel Prize in Chemistry](#)
- [Eric Betzig](#), [W.E. Moerner](#) and [Stefan Hell](#)

- **fluorescence microscopy**



STORM by Dr. Xiaowei Zhuang

<https://www.youtube.com/watch?v=8c4Egih4zYY>