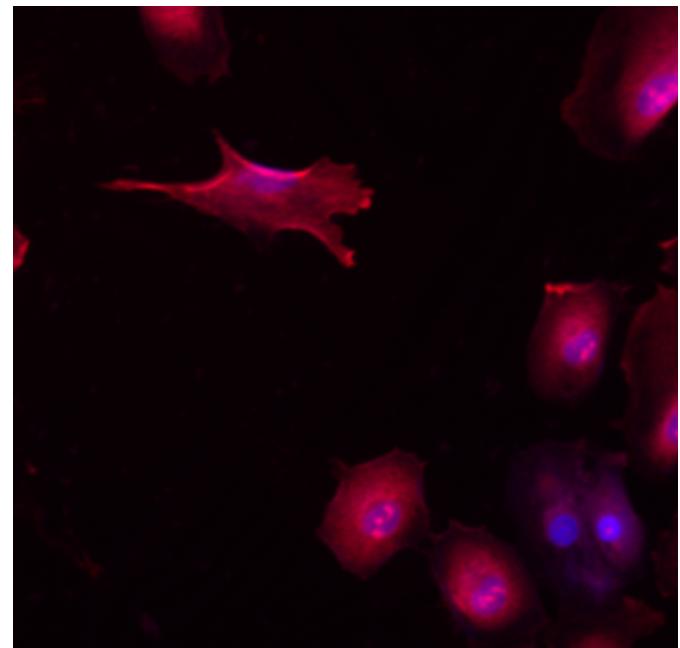
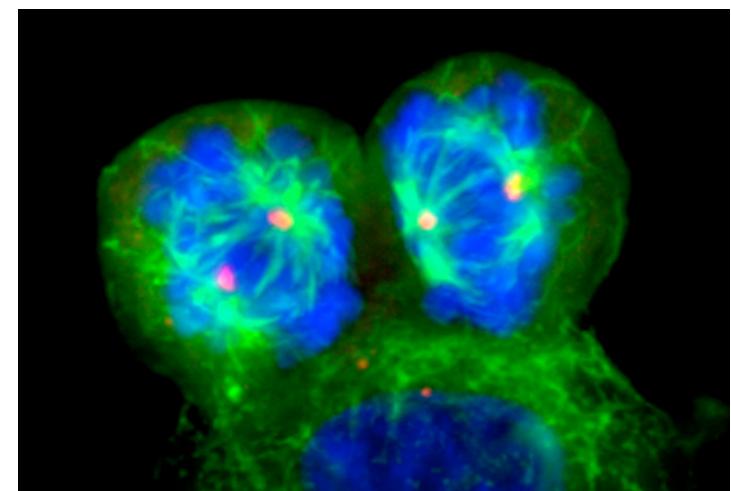
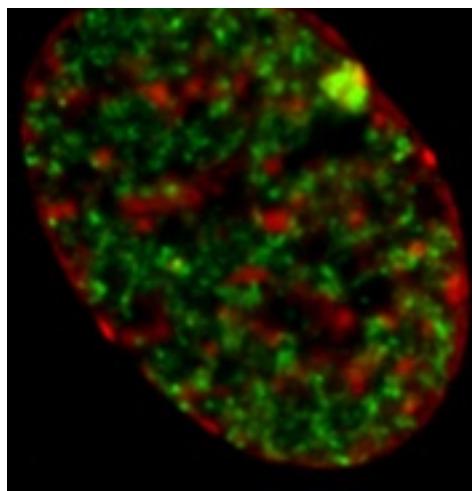
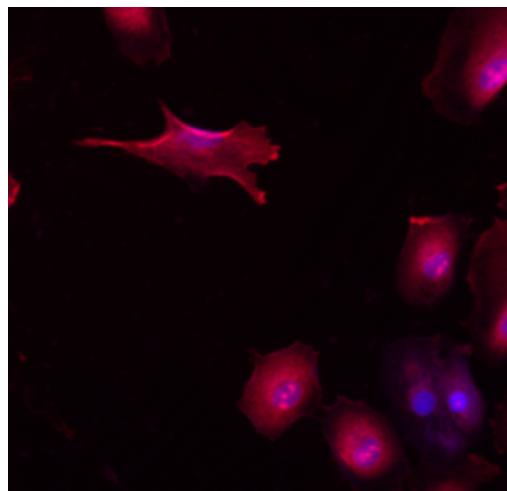
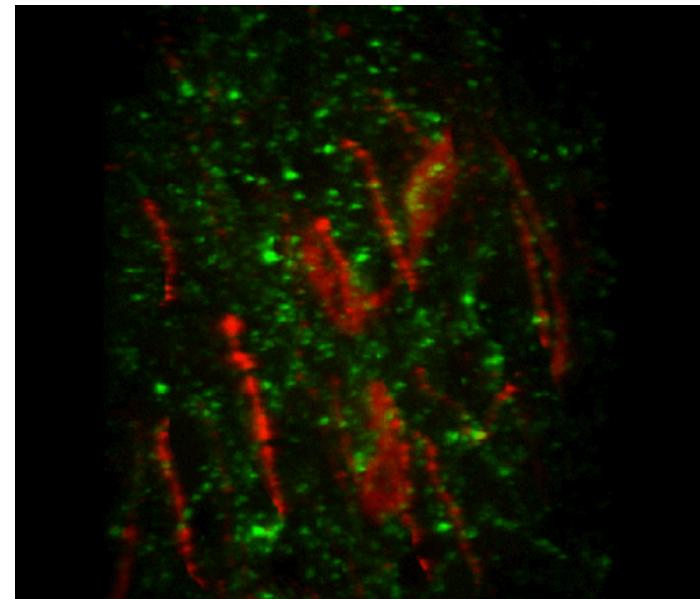
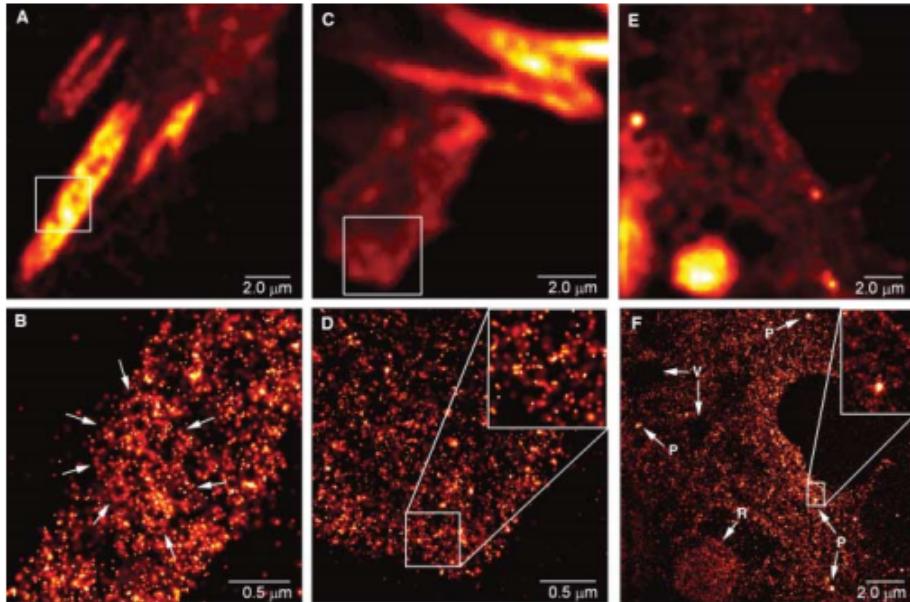


A QUICK INTRODUCTION TO BIOIMAGING

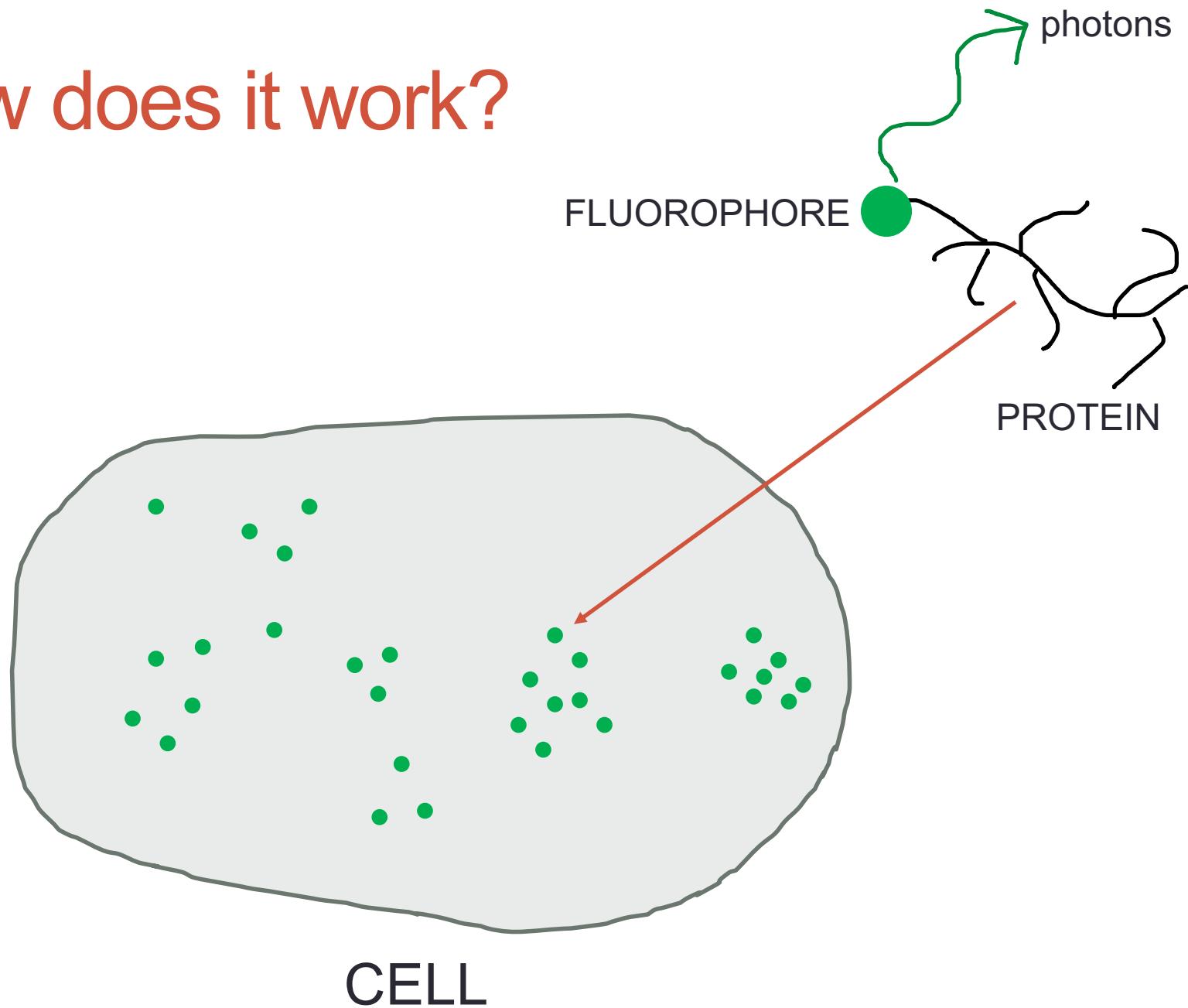
Ed Cohen



Fluorescence Microscopy



How does it work?





Principle of Excitation and Emission

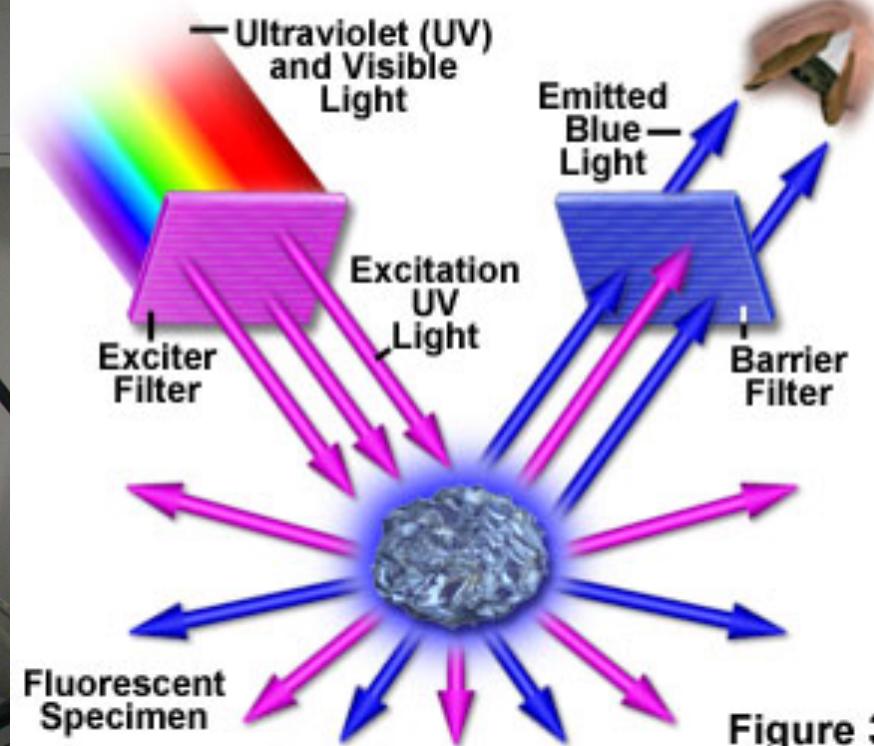
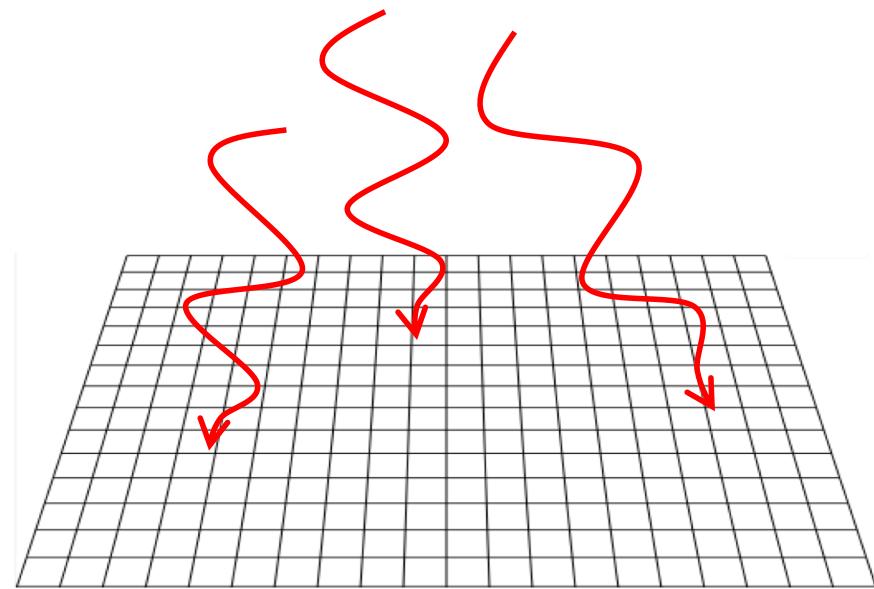
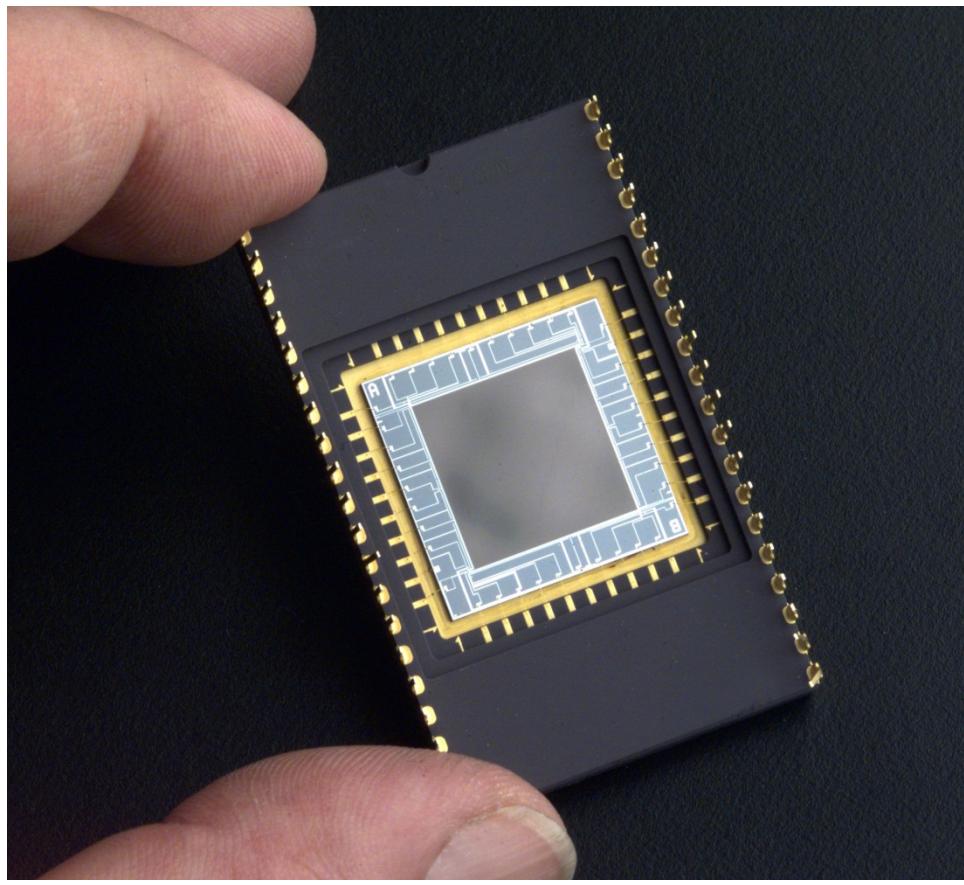


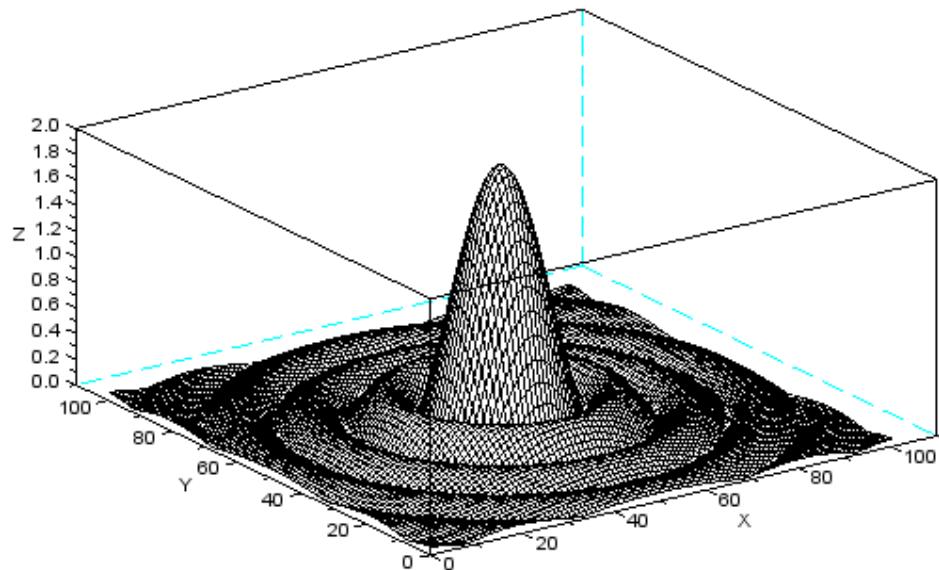
Figure 3



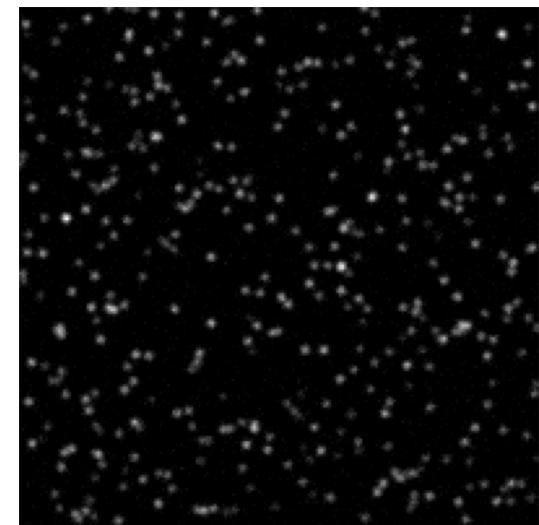
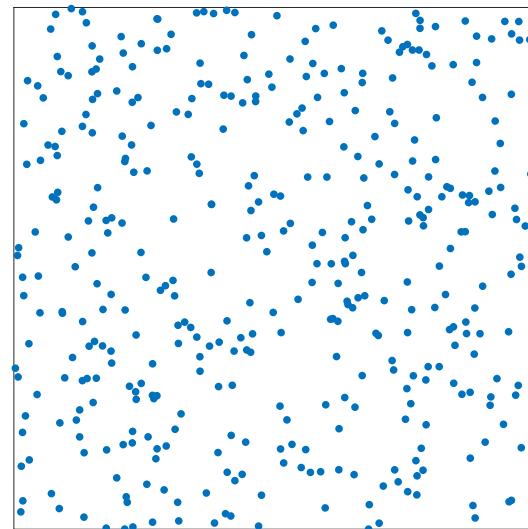
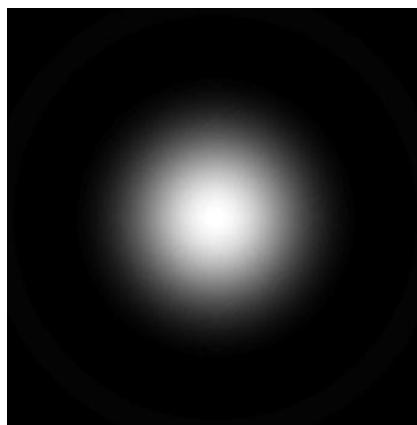
$$\begin{pmatrix} n_{11} & \cdots & n_{1p} \\ \vdots & \ddots & \vdots \\ n_{p1} & \cdots & n_{pp} \end{pmatrix}$$

$$n_{ij} = s_{ij} + b_{ij} + r_{ij}$$

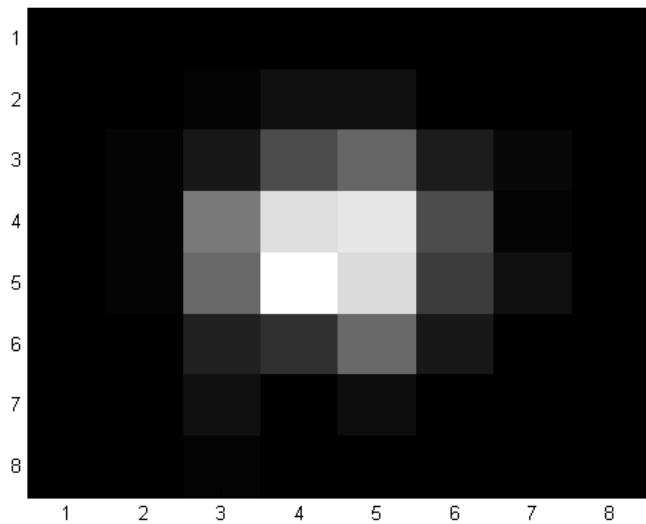
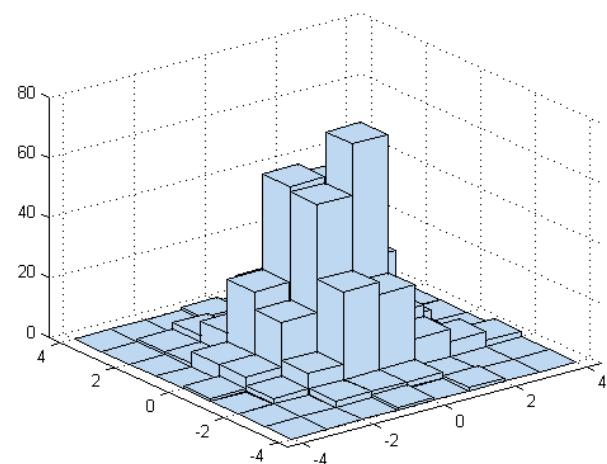
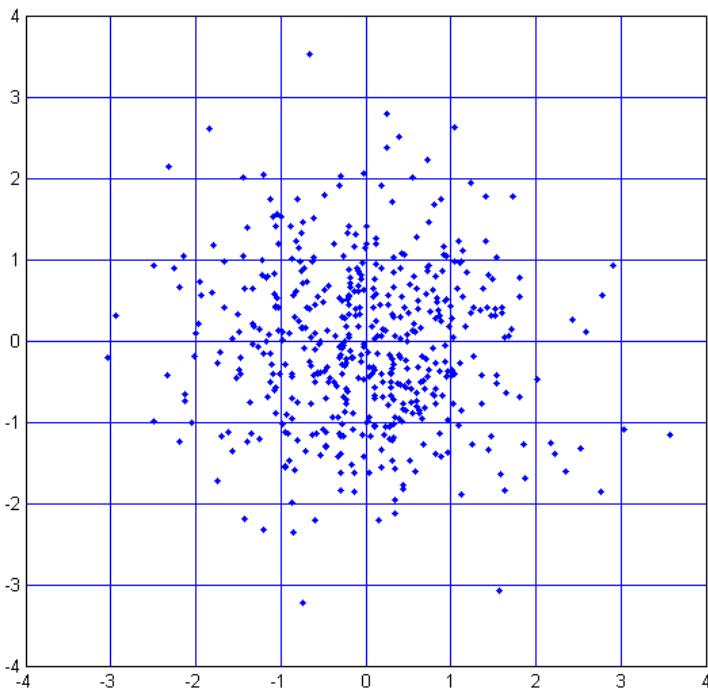
Point Spread Function



$$I(x) = O(x) * PSF(x)$$

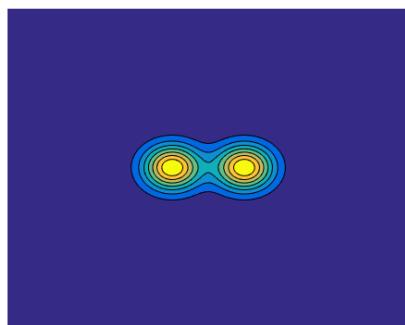
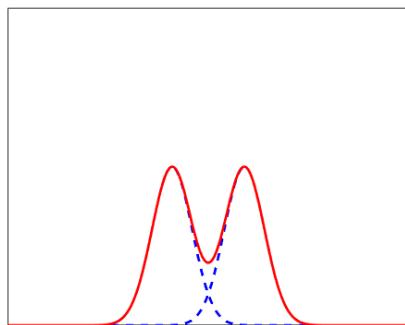


What happens to the image of a fluorophore?

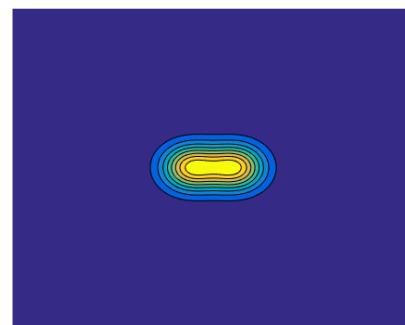
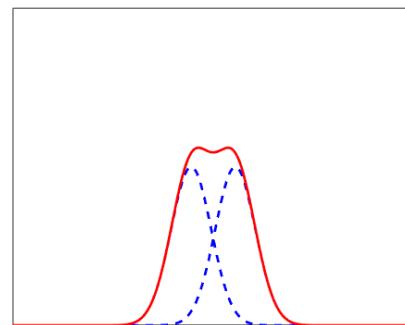


Resolution

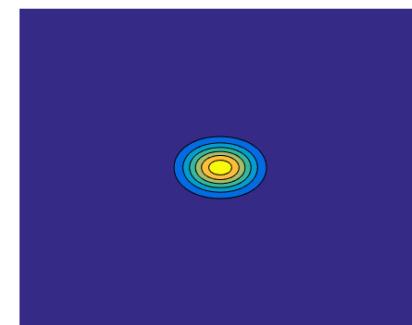
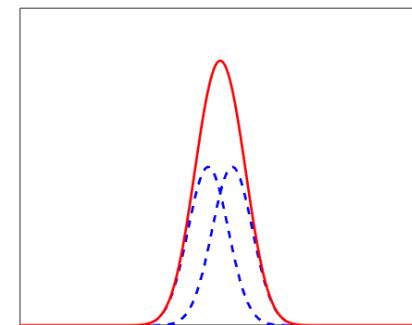
Resolved



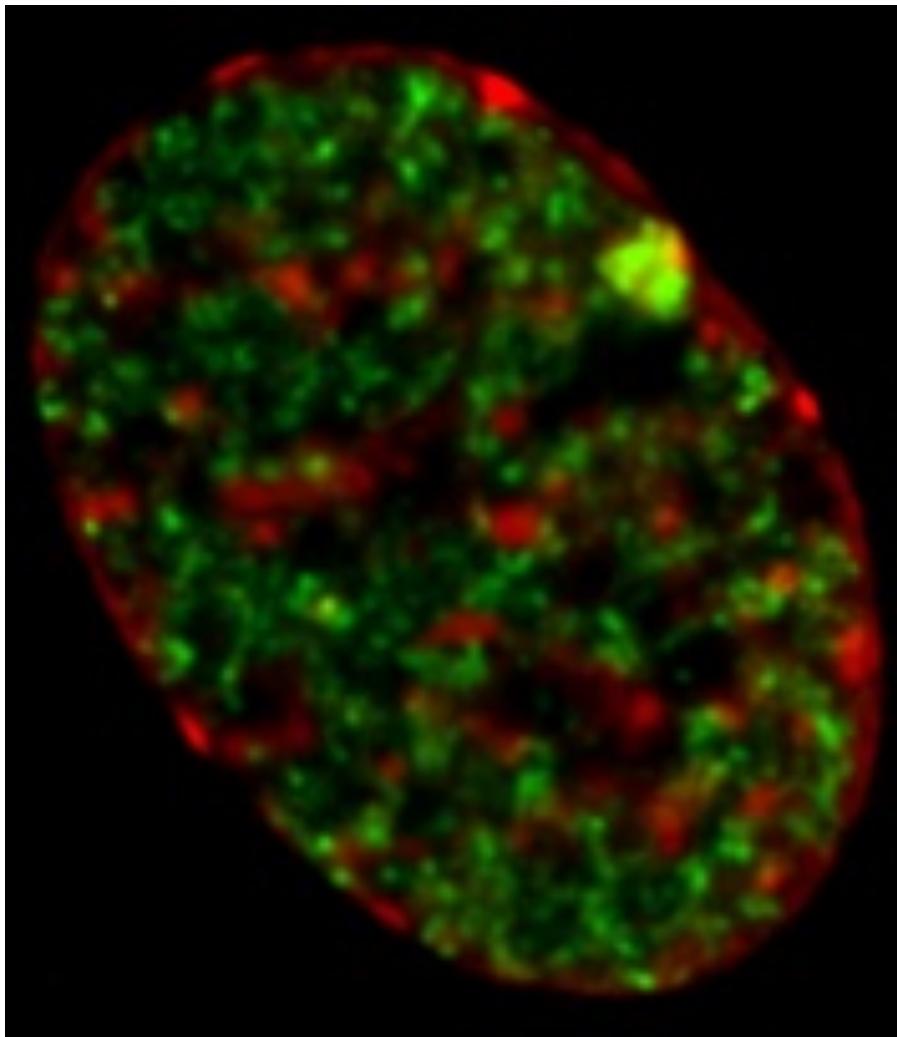
Rayleigh's Criterion



Unresolved

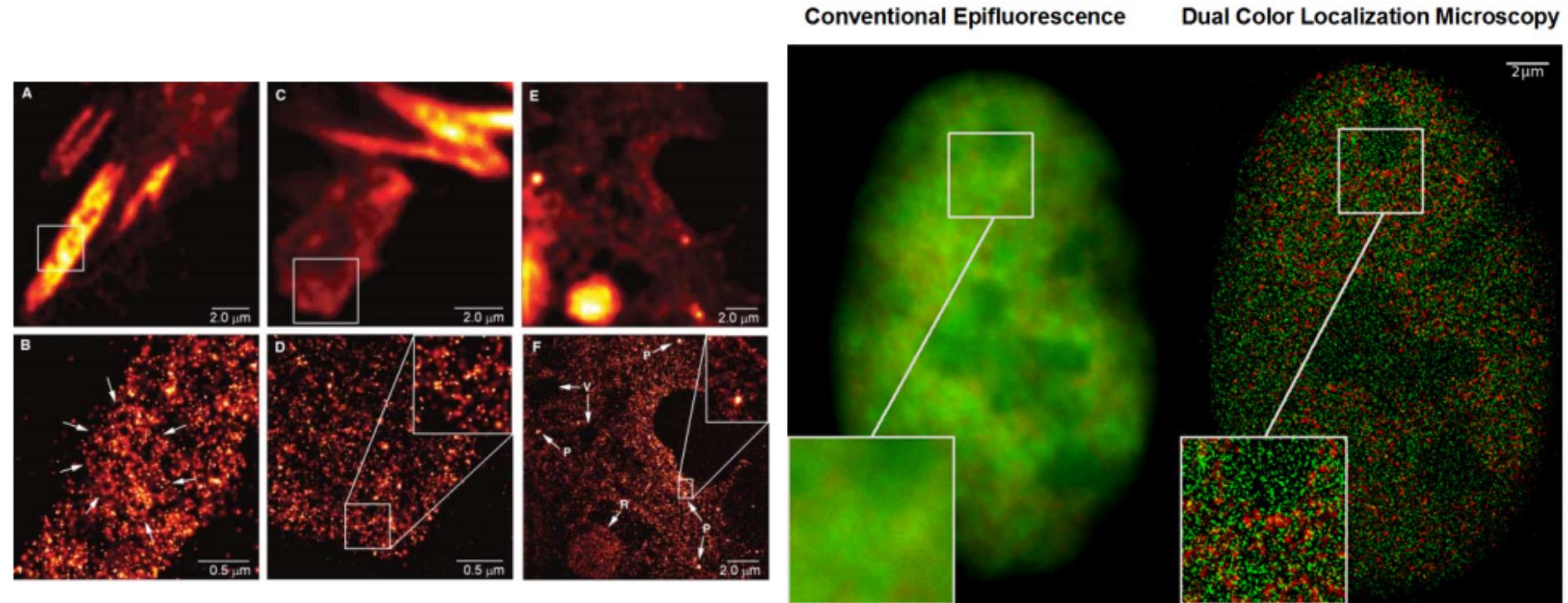


Resolution Limited Microscopy



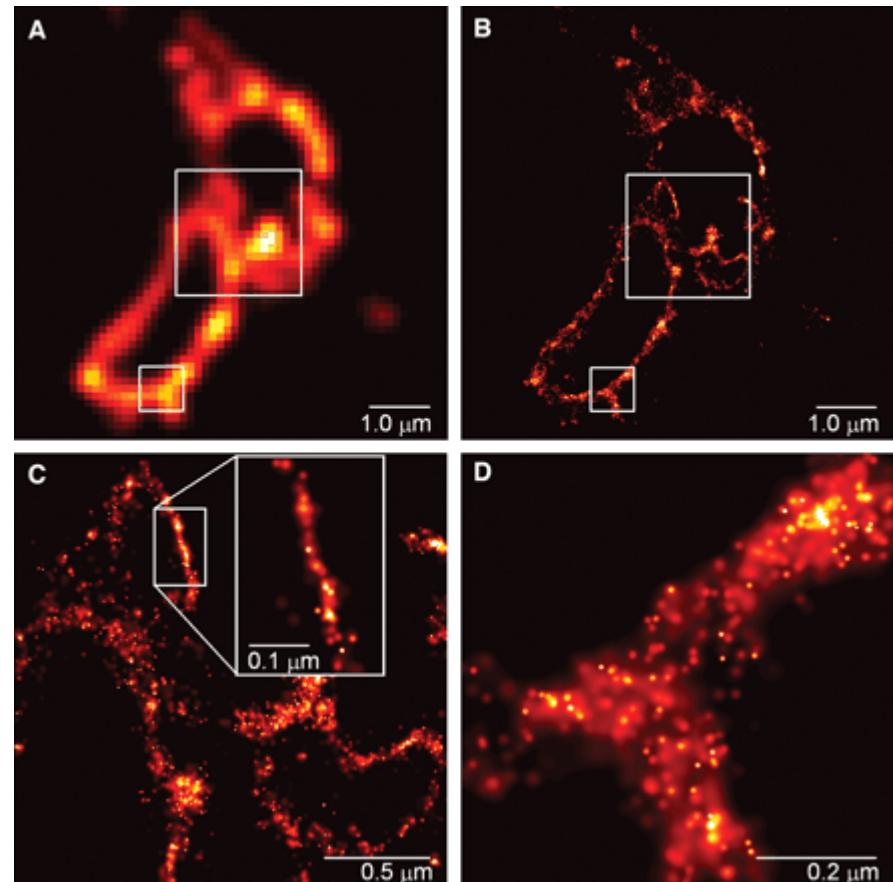
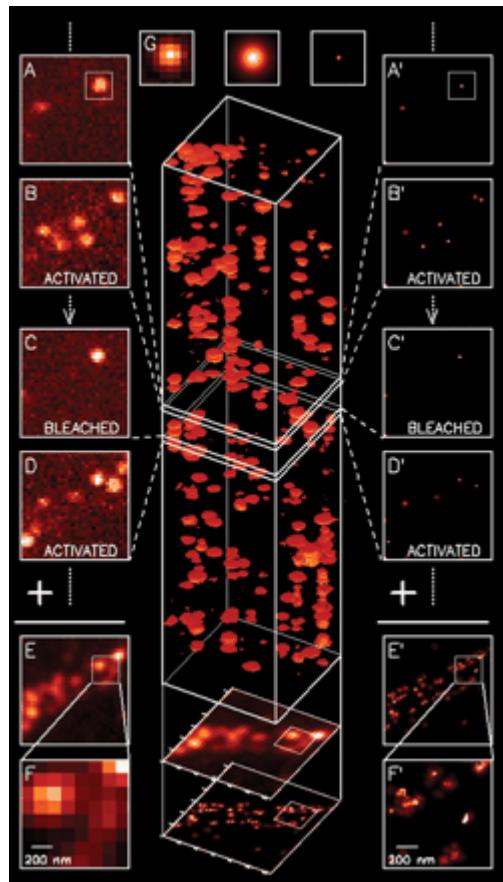
Standard
Resolution Limited
Microscopy

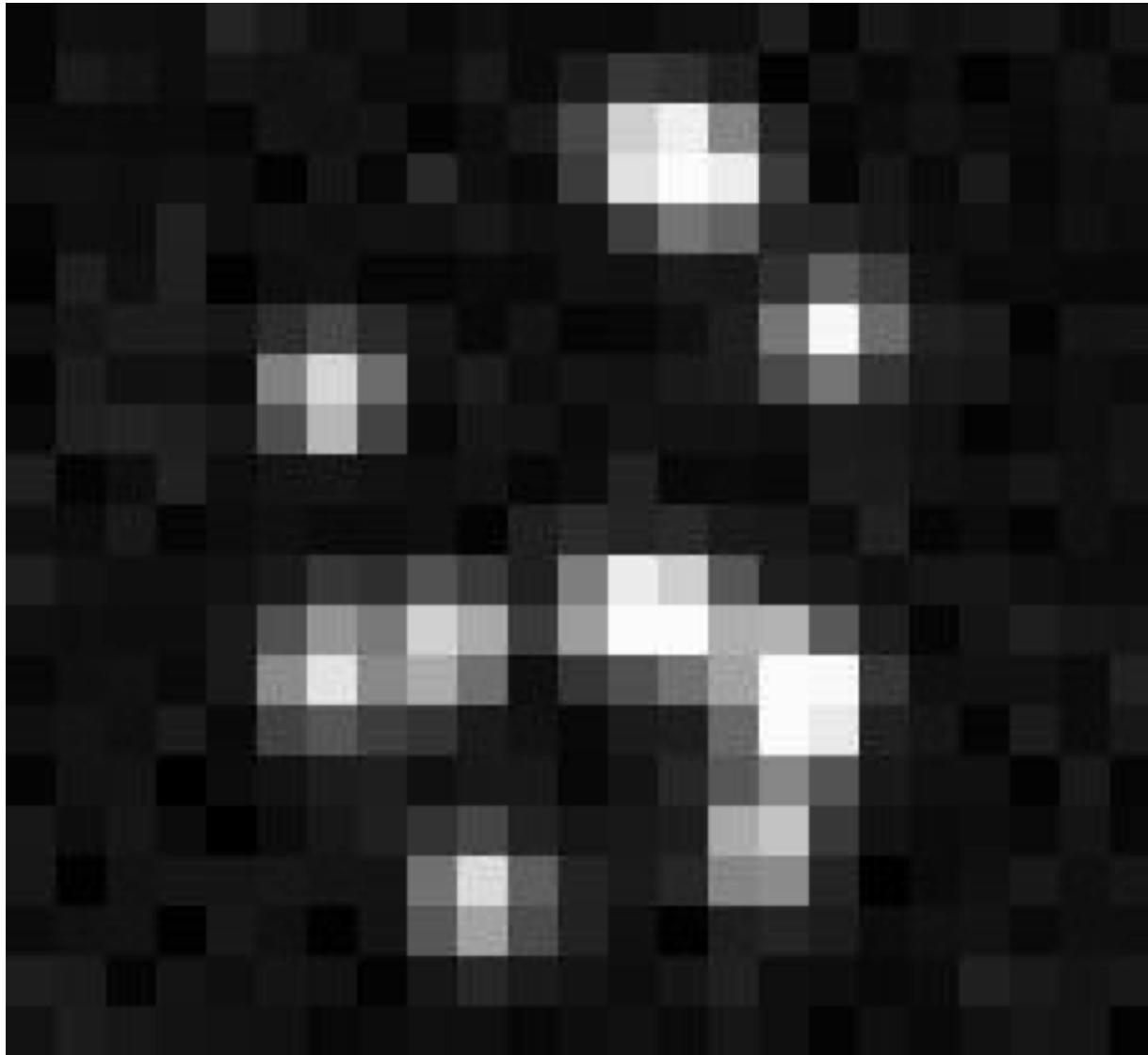
Super-Resolution Microscopy



How do we get images that overcome the classical resolution limit?

Betzig et al, Science 2006.





Video courtesy of Ricardo Enrique, Quantitative and Nanobiophysics Group UCL

Localising Single Molecules

Fitting Single-Molecule Pixel Data to a Gaussian Function

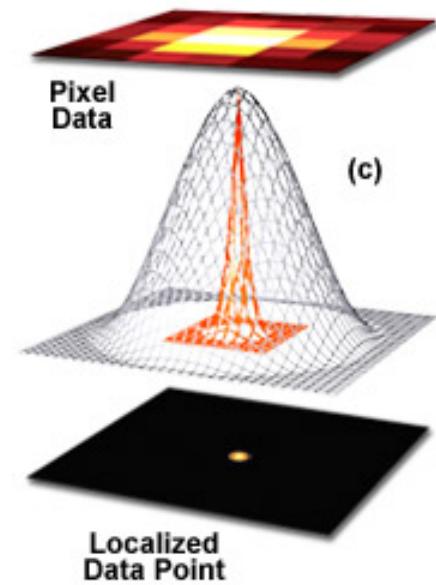
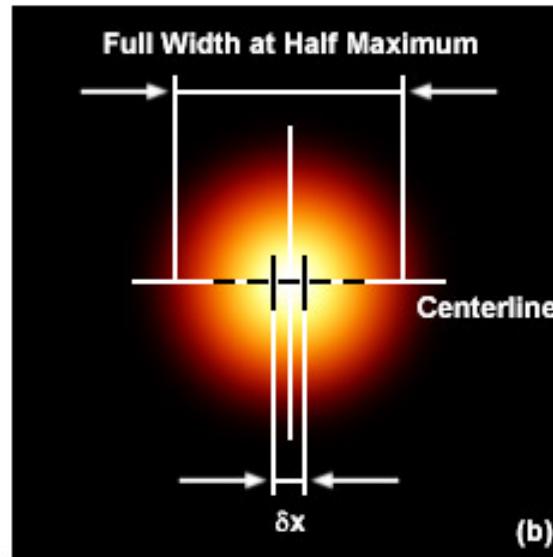
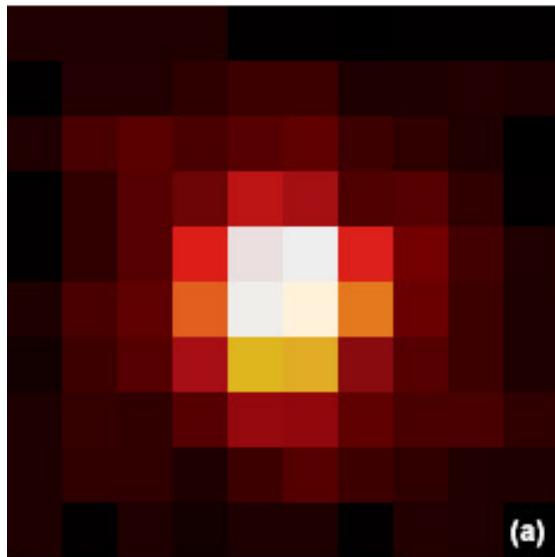
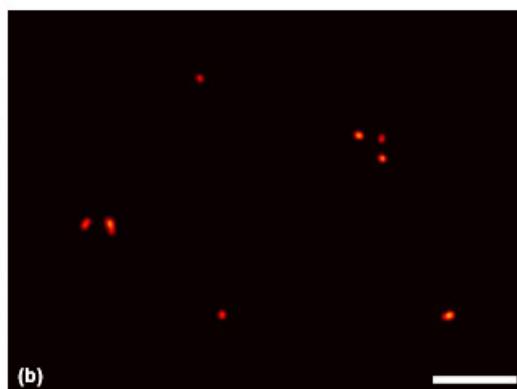
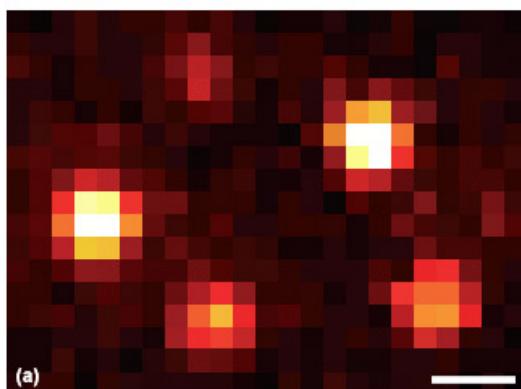


Figure 3

Single-Molecule Superresolution Microscopy for Precise Localization

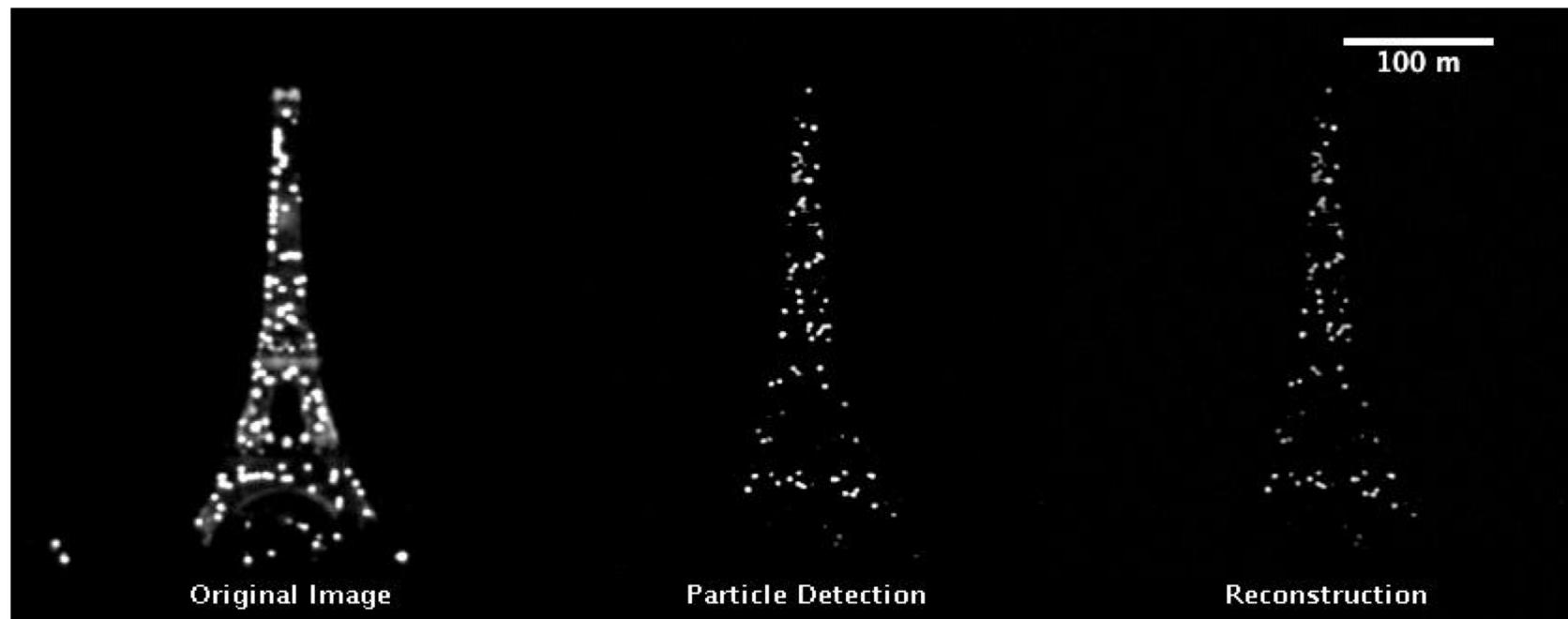


Images from Zeiss

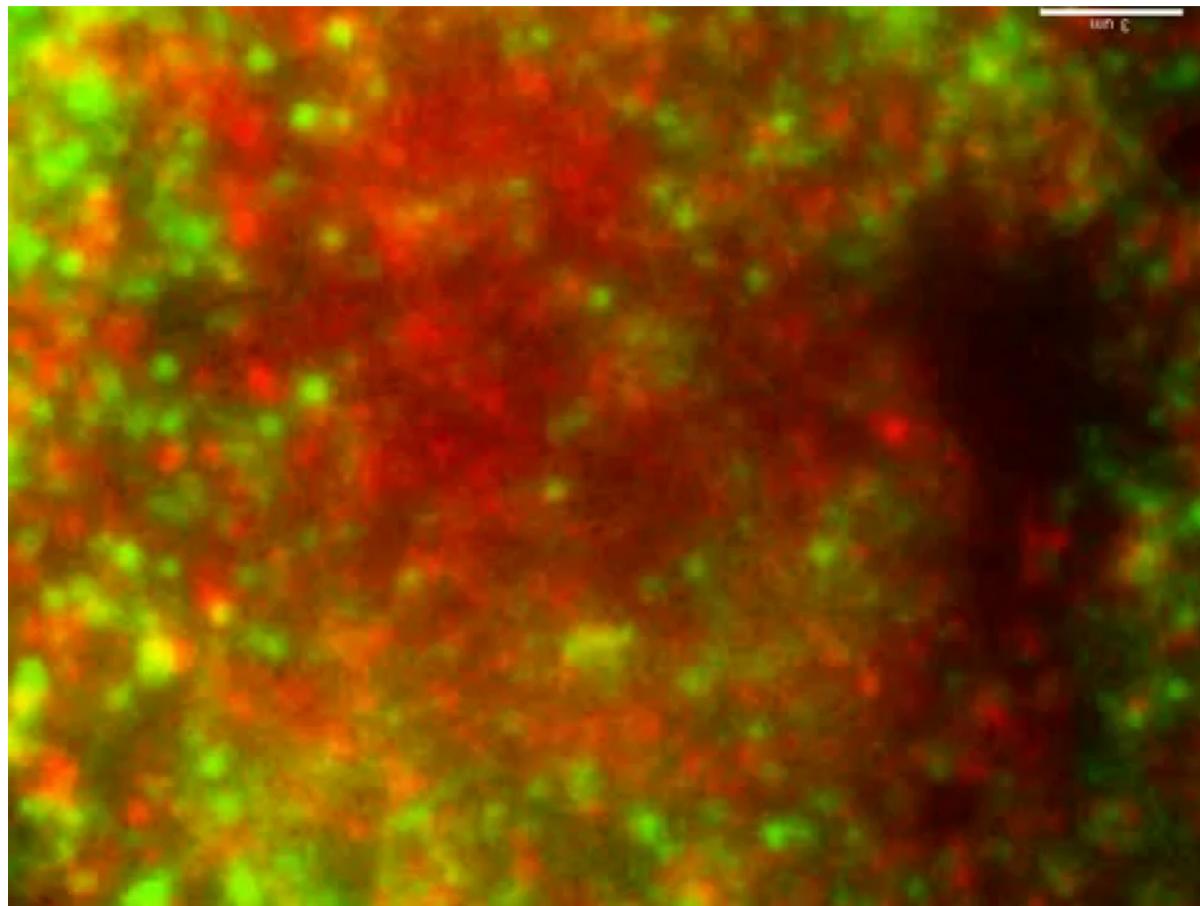
Figure 1



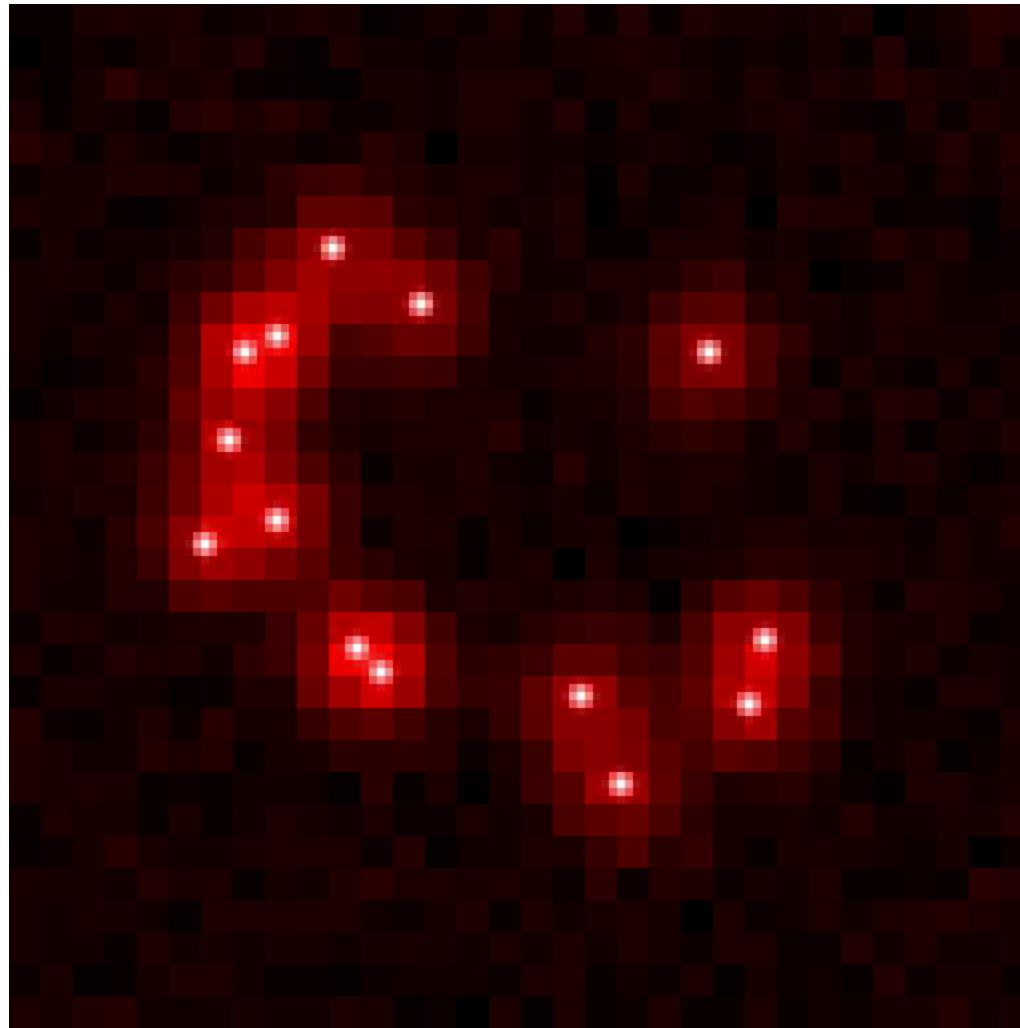
Video courtesy of Ricardo Enrique, Quantitative and Nanobiophysics Group UCL



Video courtesy of Ricardo Enrique, Quantitative and Nanobiophysics Group UCL



Video courtesy of Ricardo Enrique, Quantitative and Nanobiophysics Group UCL



Video courtesy of Ricardo Henrique, Quantitative and Nanobiophysics Group UCL

Spatial point pattern analysis

