

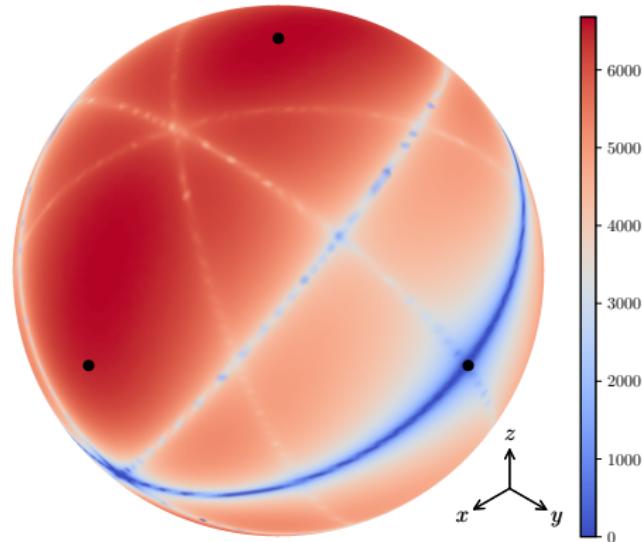
Progress Report On 3D Orientation Determination

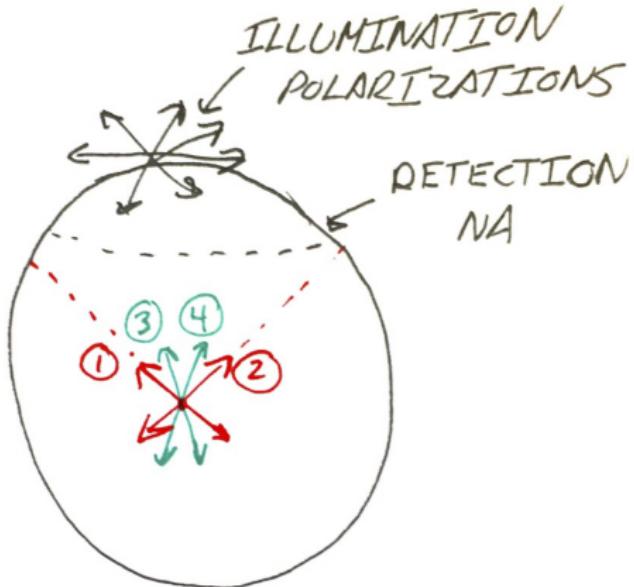
Talon Chandler

October 18, 2017

Log-likelihood as a function of the estimate orientation

True orientation: $\Theta = 0, \Phi = 0$



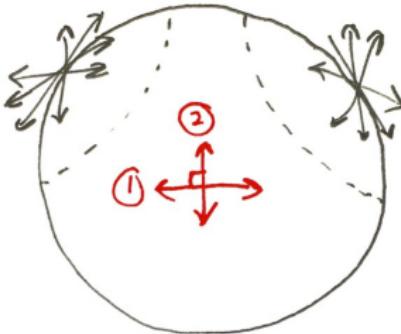


① & ② ARE INDISTINGUISHABLE

③ & ④ "

HEMISPHERES "

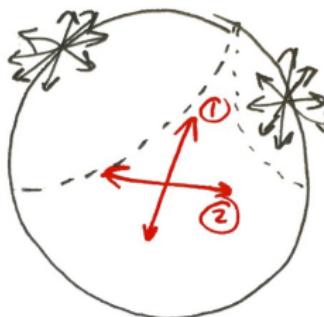
SYMMETRIC d -SPIN



ONLY ① \neq ② ARE INDISTINGUISHABLE

ORTHOGONAL

A SYMMETRIC diSPIM



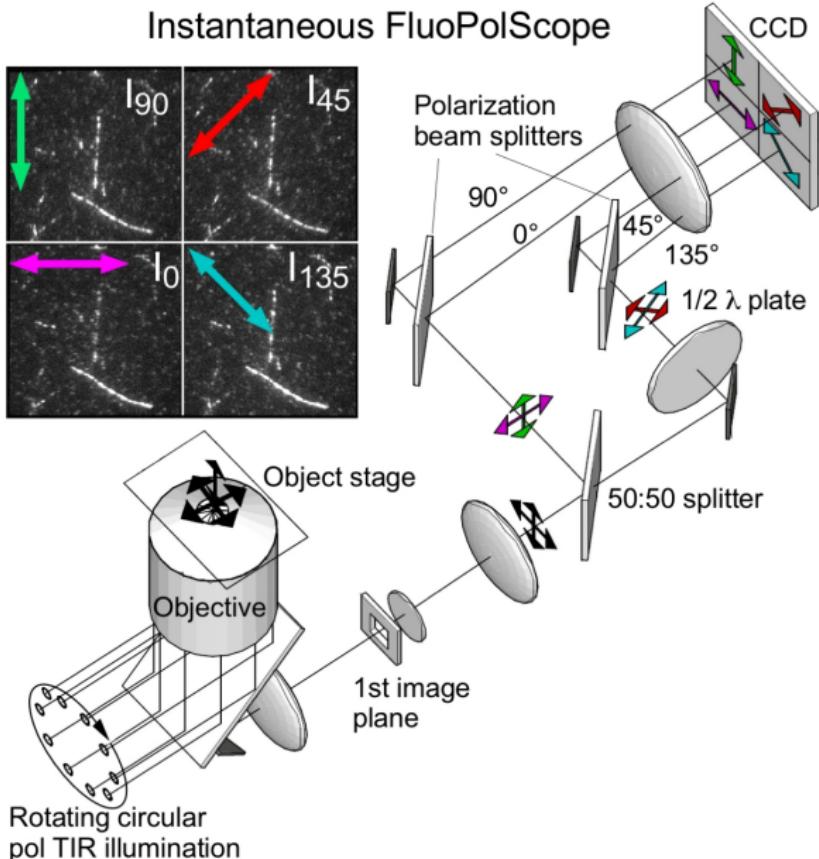
ONLY $\textcircled{1} \neq \textcircled{2}$ ARE INDISTINGUISHABLE

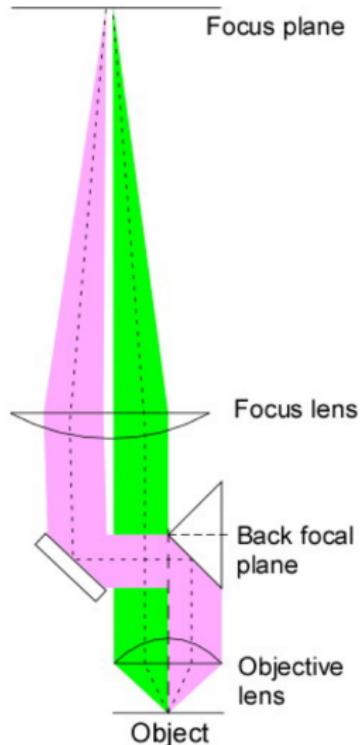
NOT ORTHOGONAL

Workarounds

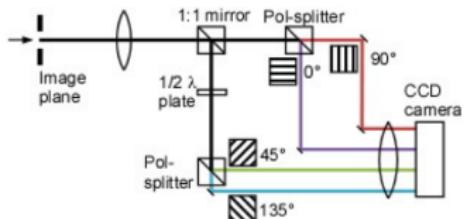
- ▶ Block half of one aperture
- ▶ Add a third view (bottom view, microlenses)
- ▶ Assume fluorophores are never oriented in one of the degenerate directions

Instantaneous FluoPolScope

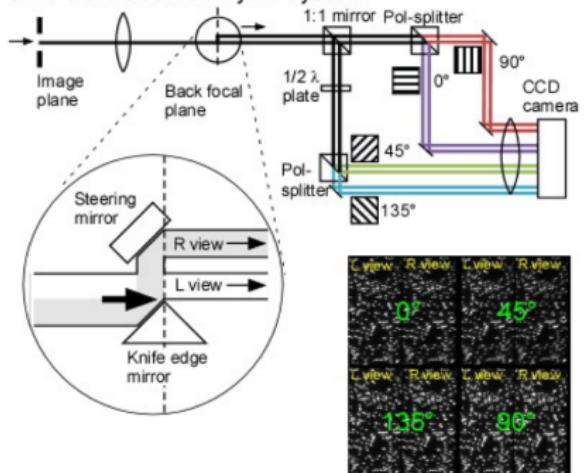




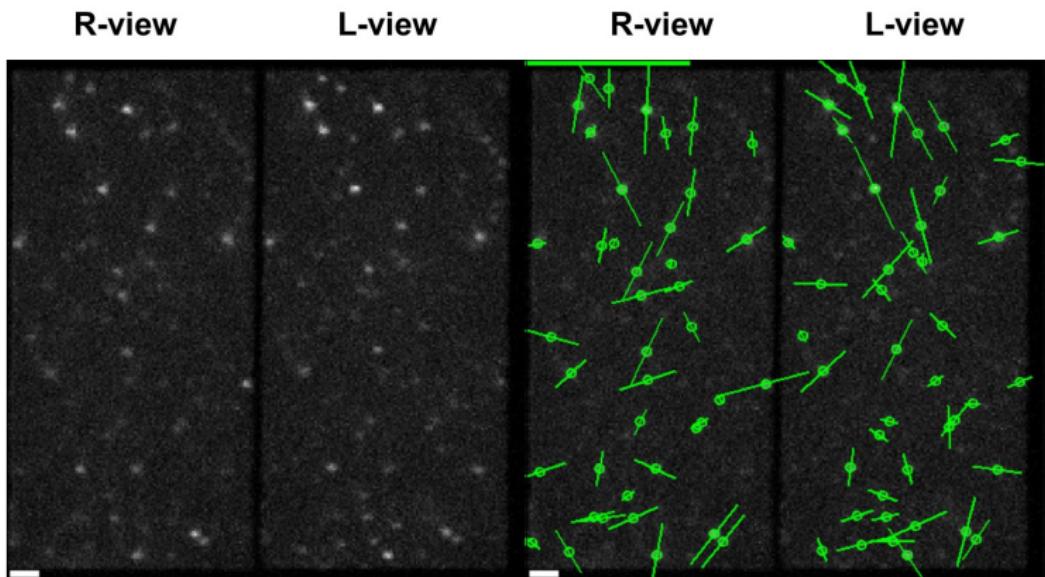
2D polarization analysis system



3D Polarization analysis system



3D orientation of single GFP molecules *in vitro*



Reconstructed 3D orientation from split-aperture instant FluoPolScope

