

# The Beauty and Magic of Polarized Light

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- Polarized light is all around us
- Demonstrations
- How we use polarized light

# Polarization sensitive eyes



Cuttlefish



Monarch butterfly



but, alas, not the human eye



Julien de Groot





↑ ↓



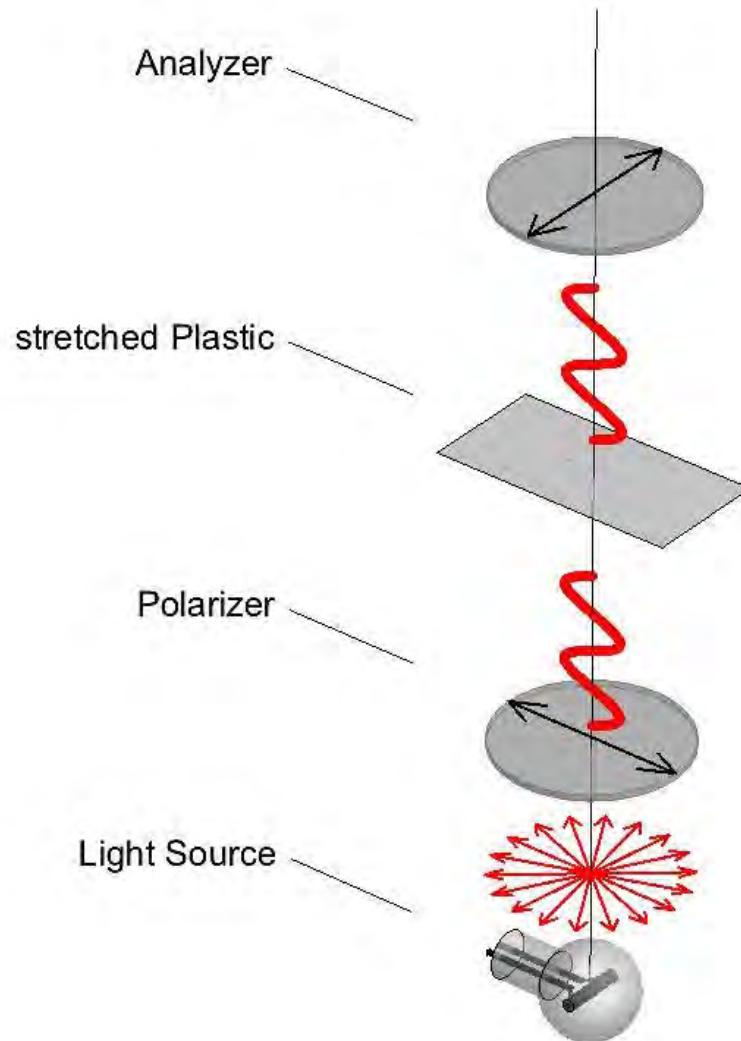




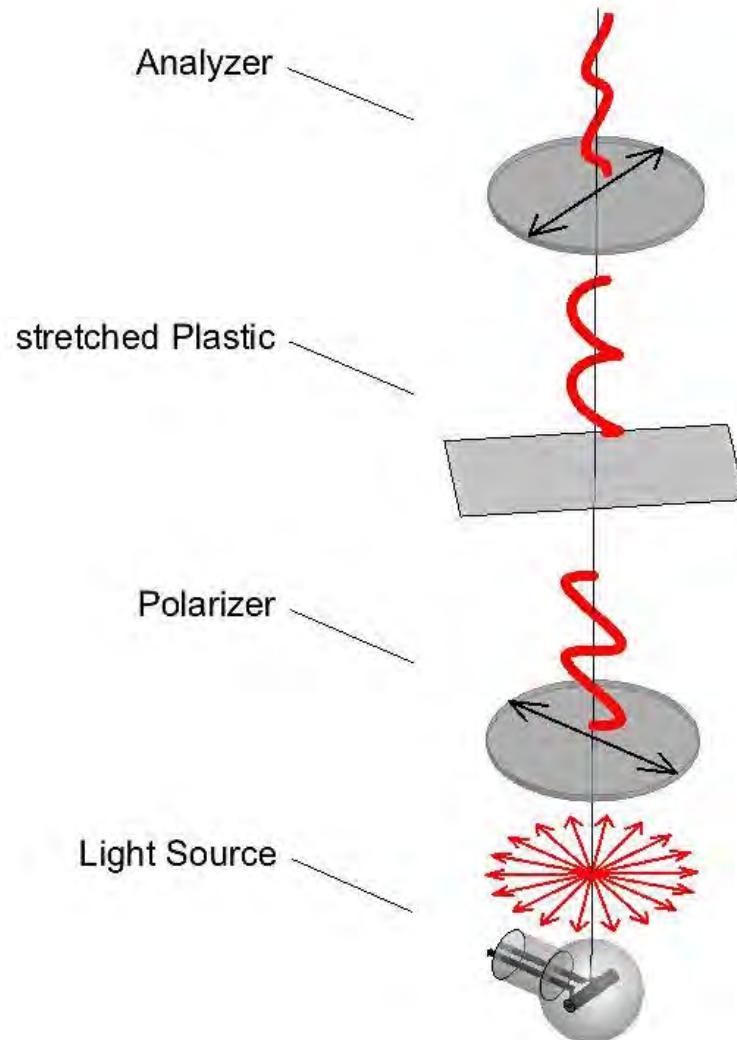


*Demos*

# Stretched plastic film

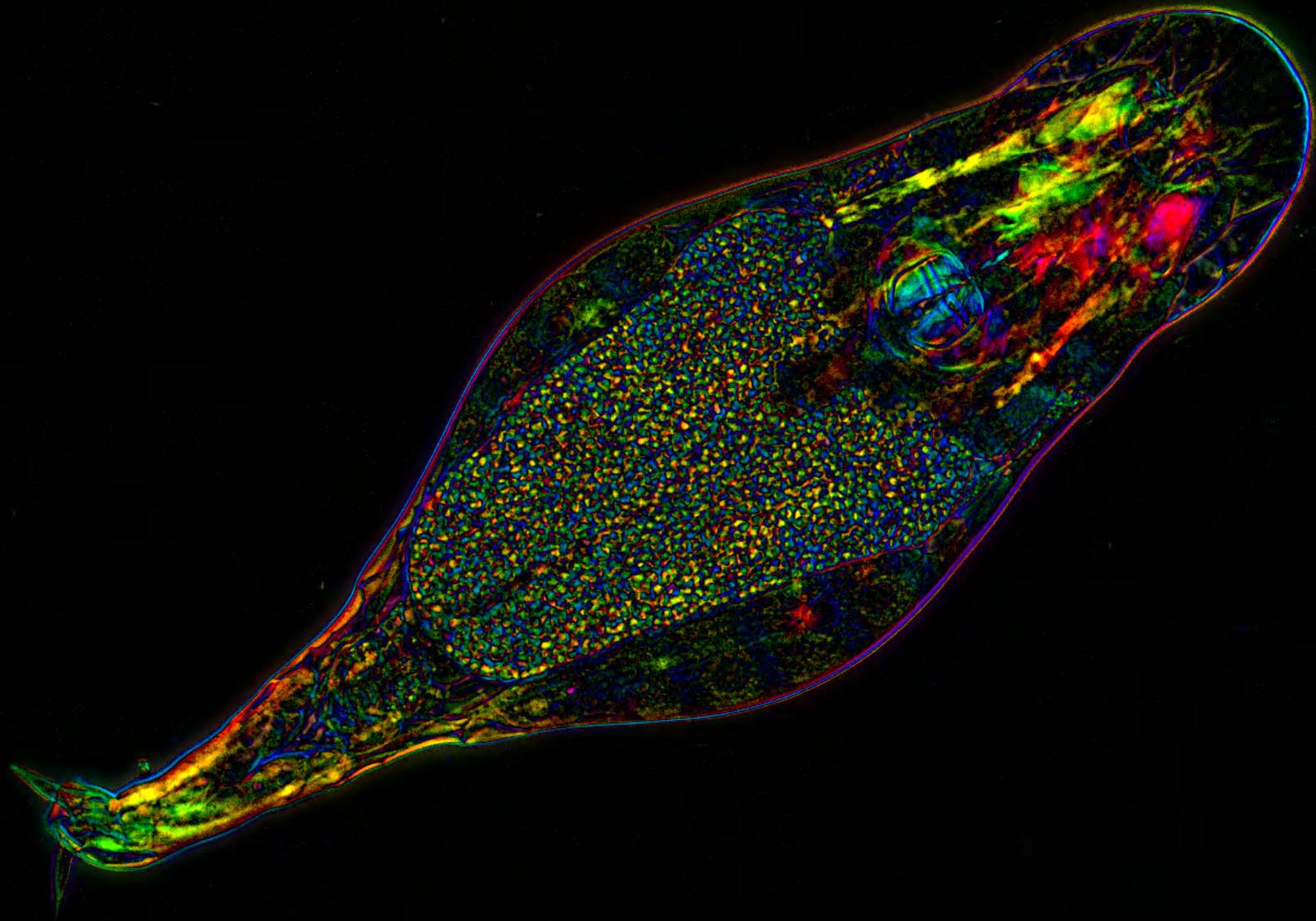


# Stretched plastic film





Megalops larval crab, Chris Rieken

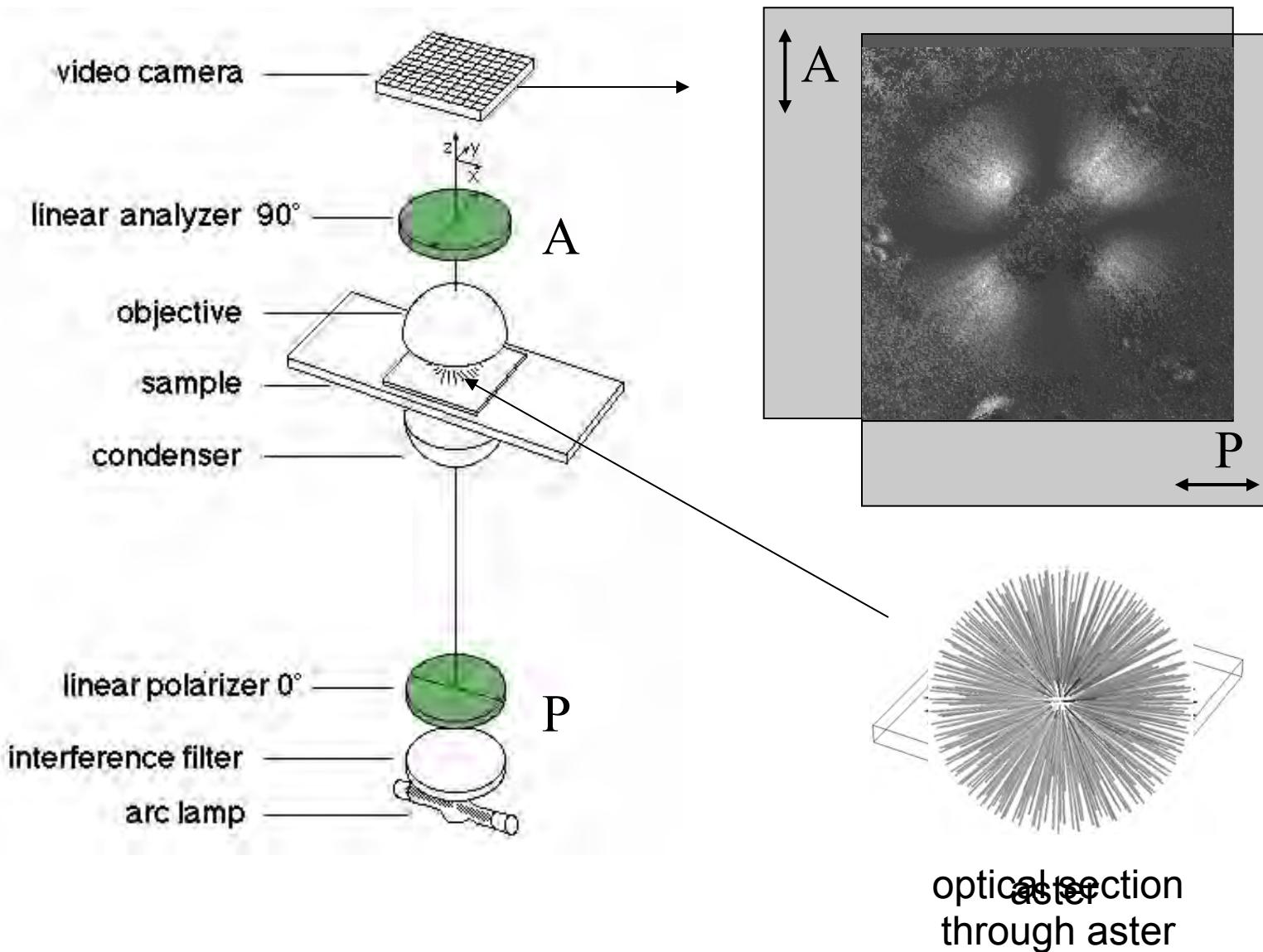


Bdelloid rotifer, Michael Shribak and Irina Arkhipova

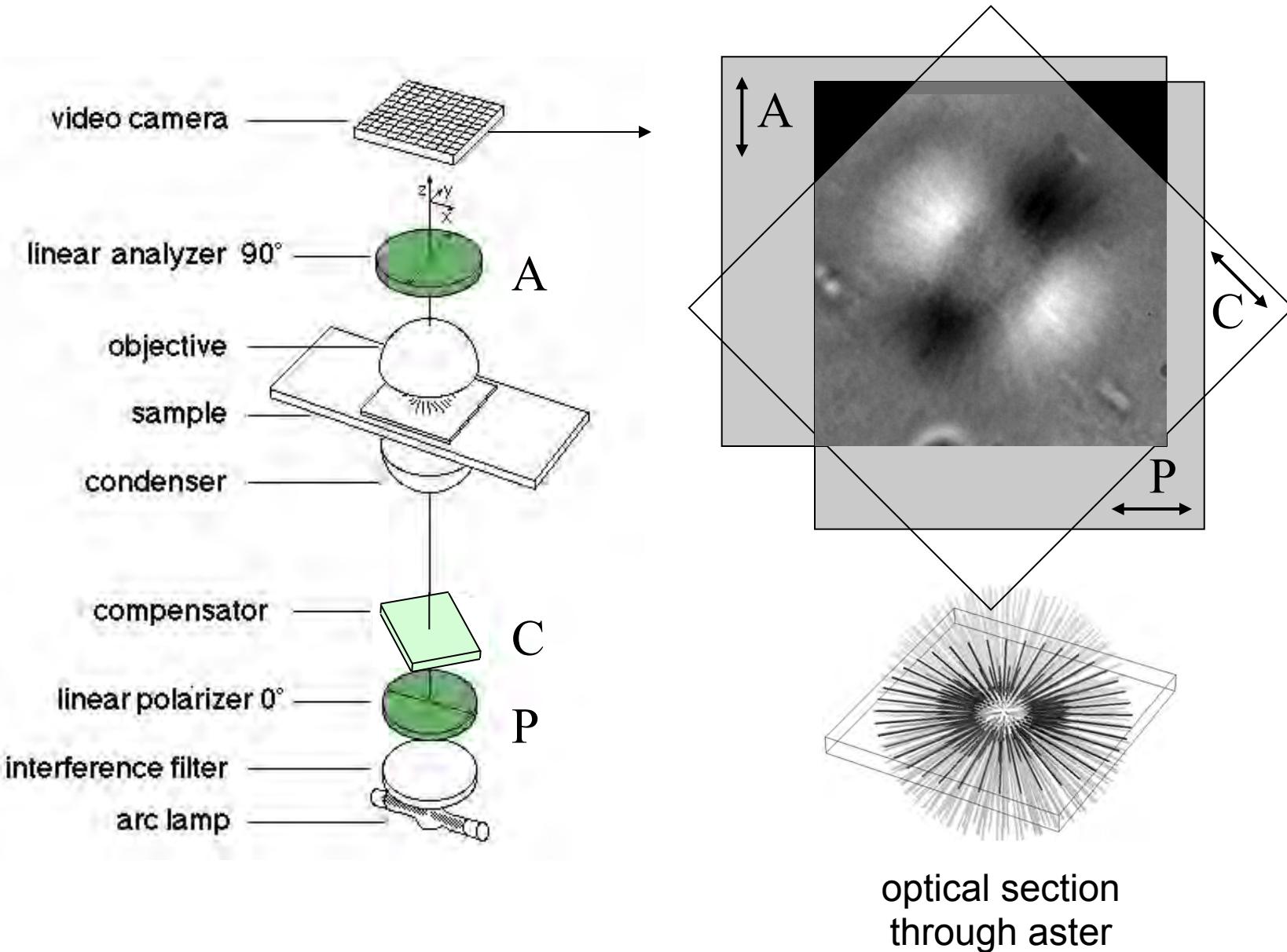


Spermatocyte, Rudolf Oldenbourg and James LaFountain

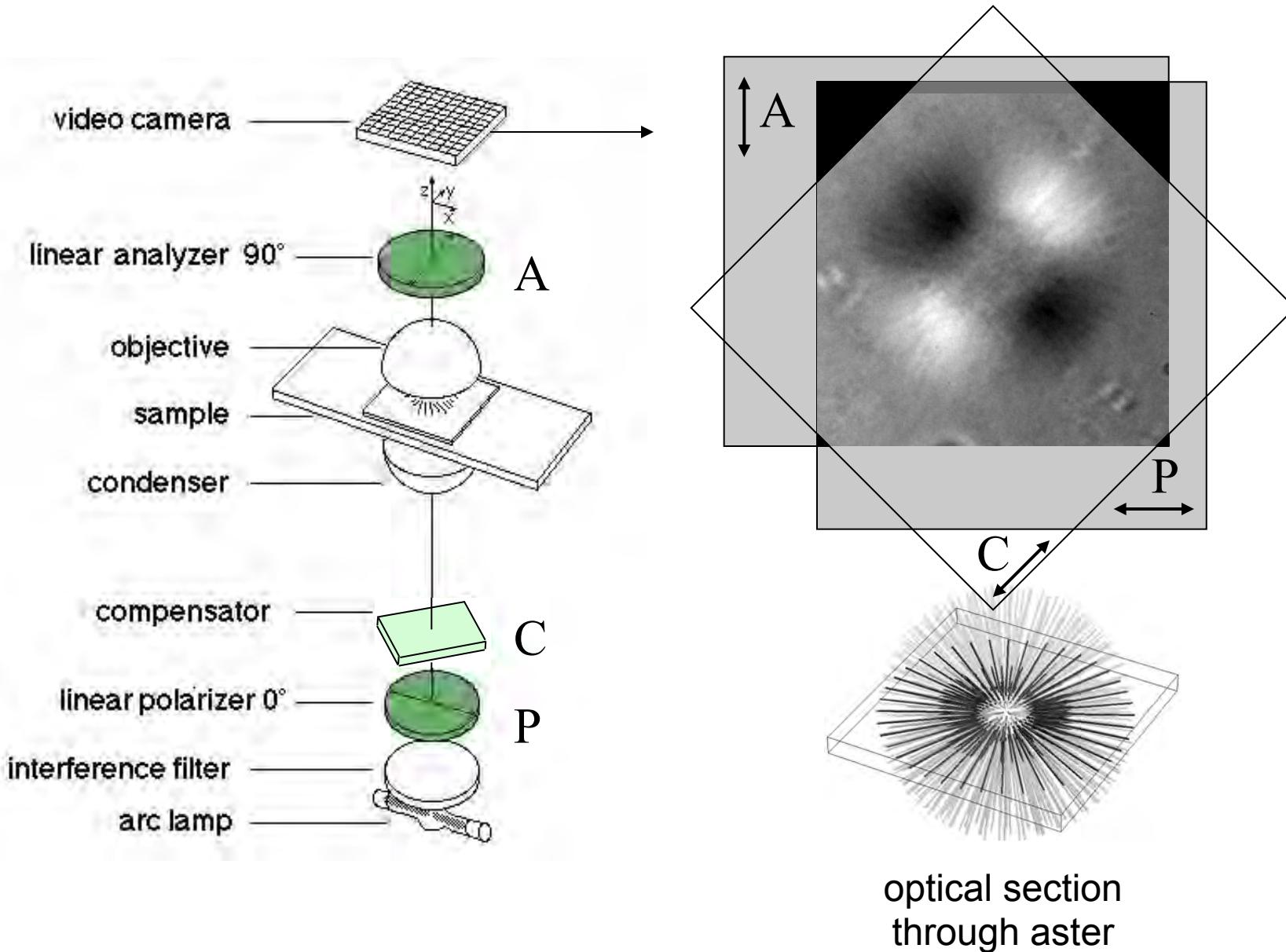
# Orientation dependent contrast in traditional polarizing microscope



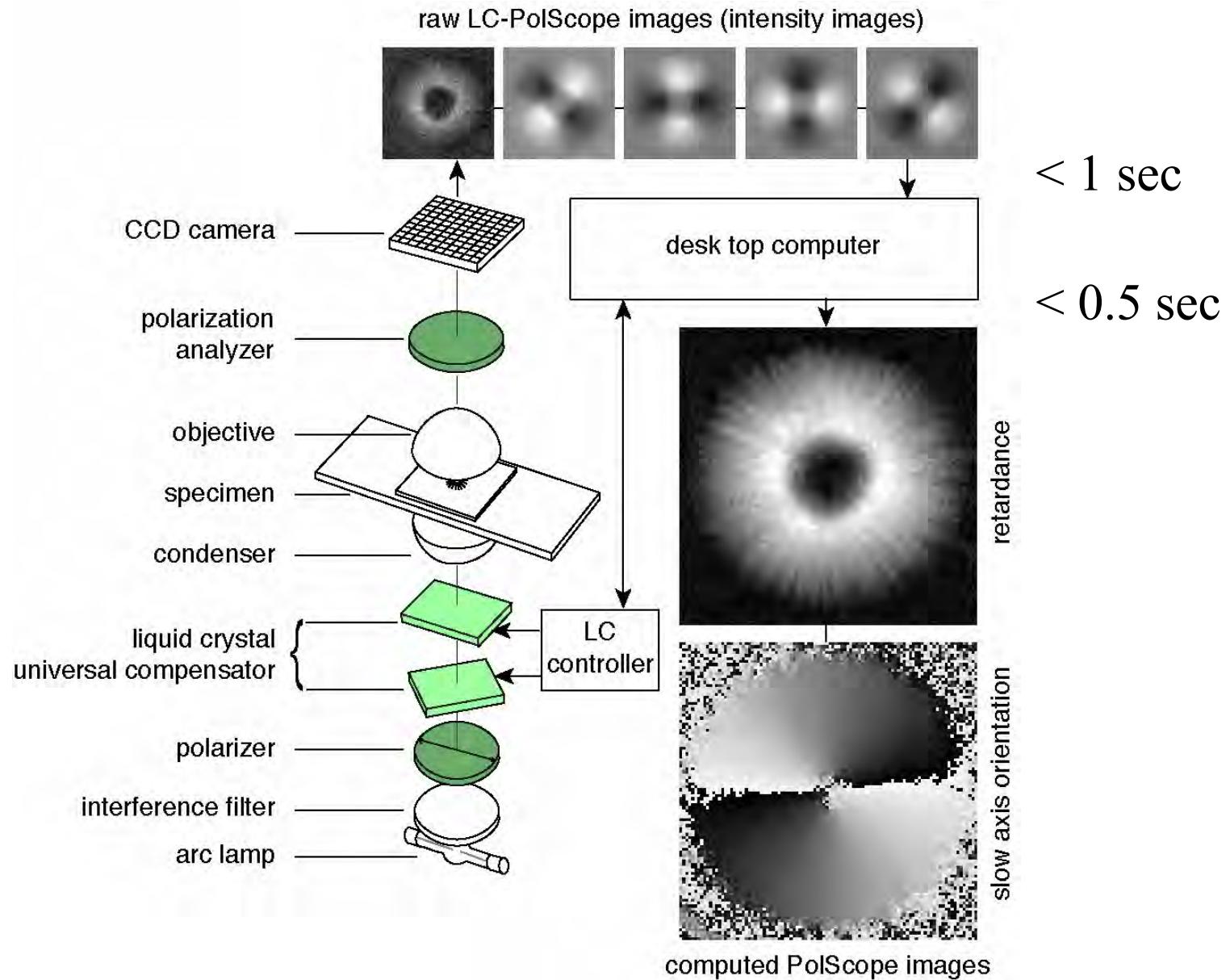
# Orientation dependent contrast in traditional polarizing microscope



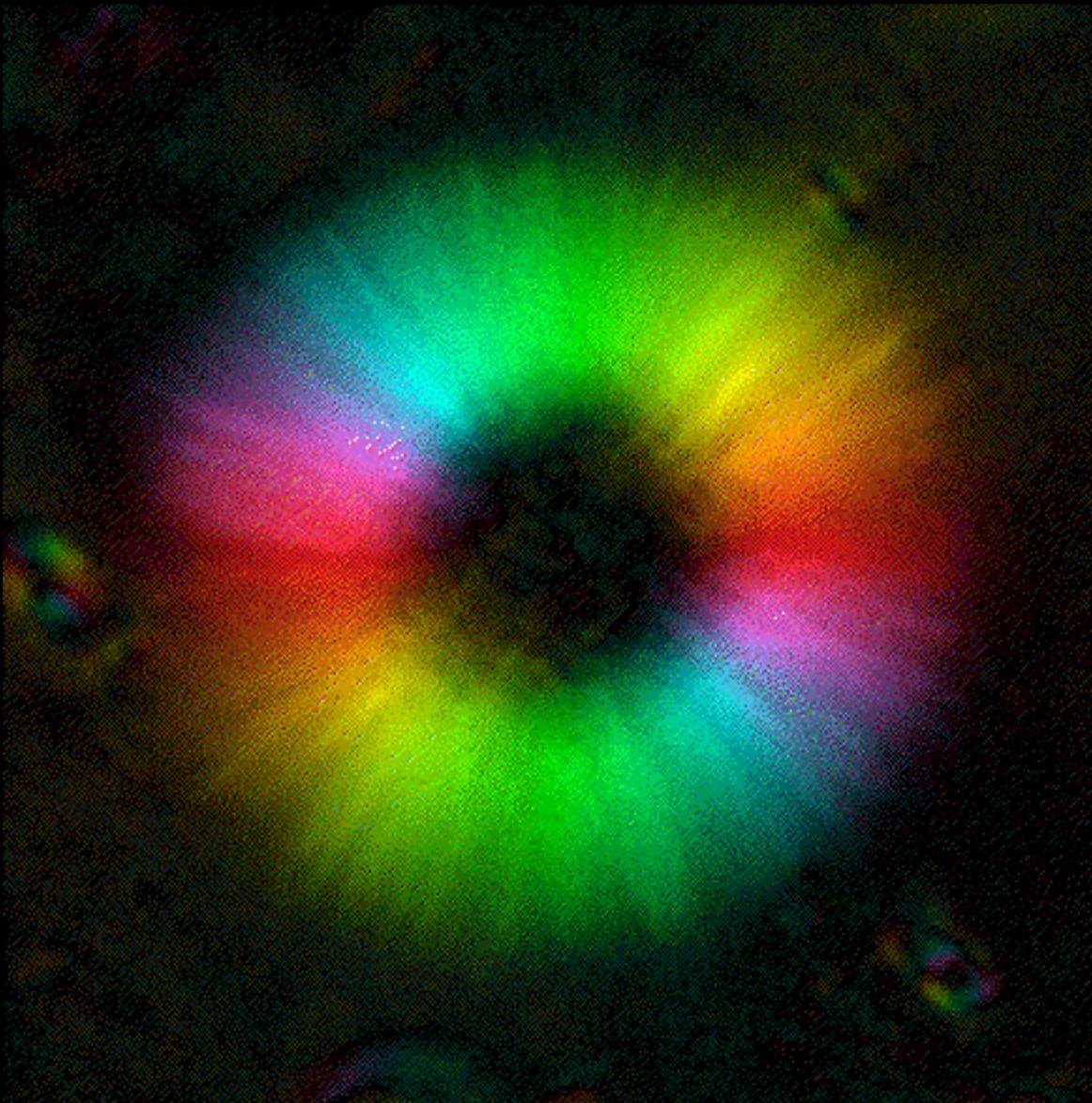
# Orientation dependent contrast in traditional polarizing microscope



# Birefringence Imaging with the LC-PolScope



Aster, retardance and slow axes color encoded



Calcite film

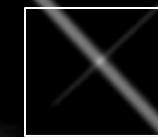
calcite film by Dirk Volkmer, University of Ulm, Germany

# Meiosis I



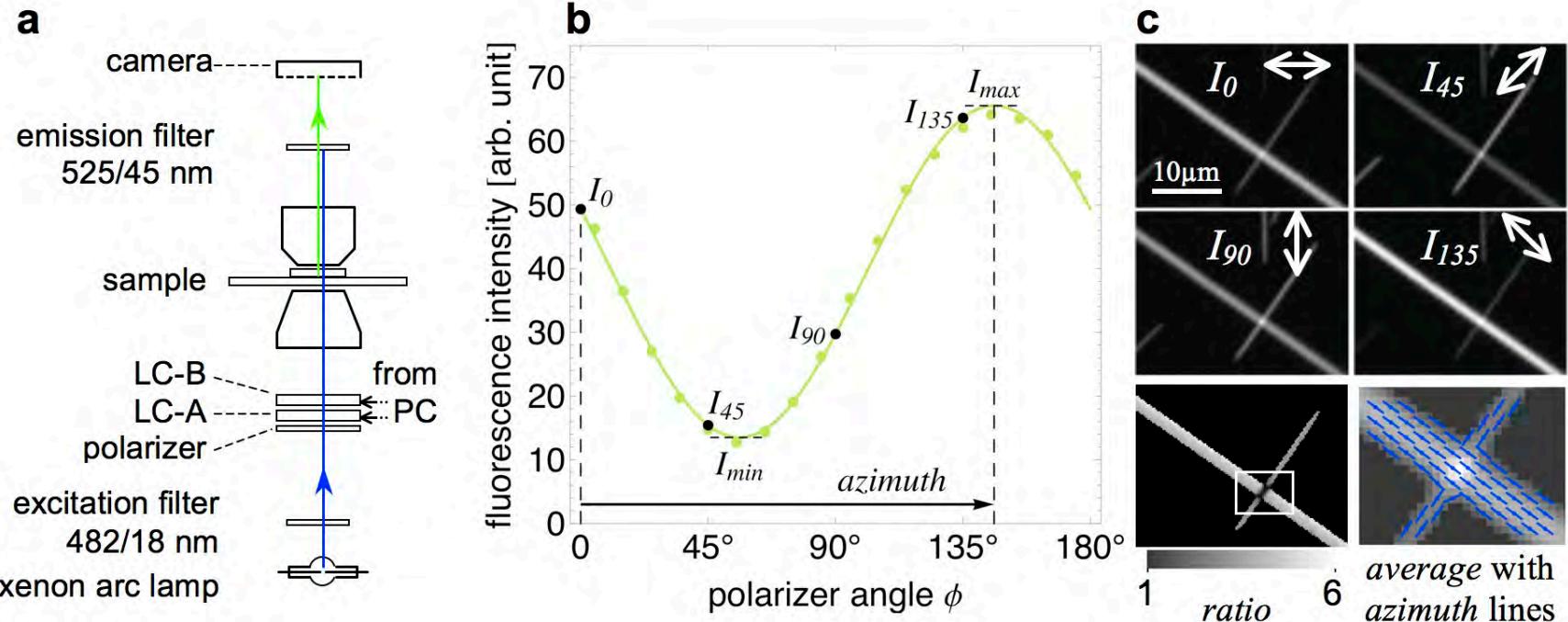
cell preparation by James R. LaFountain, University at Buffalo

# Needle-shaped Crystals of Green Fluorescent Protein



crystal preparation by Naoki Noda, with Osamu Shimomura

# Fluorescence LC-PolScope

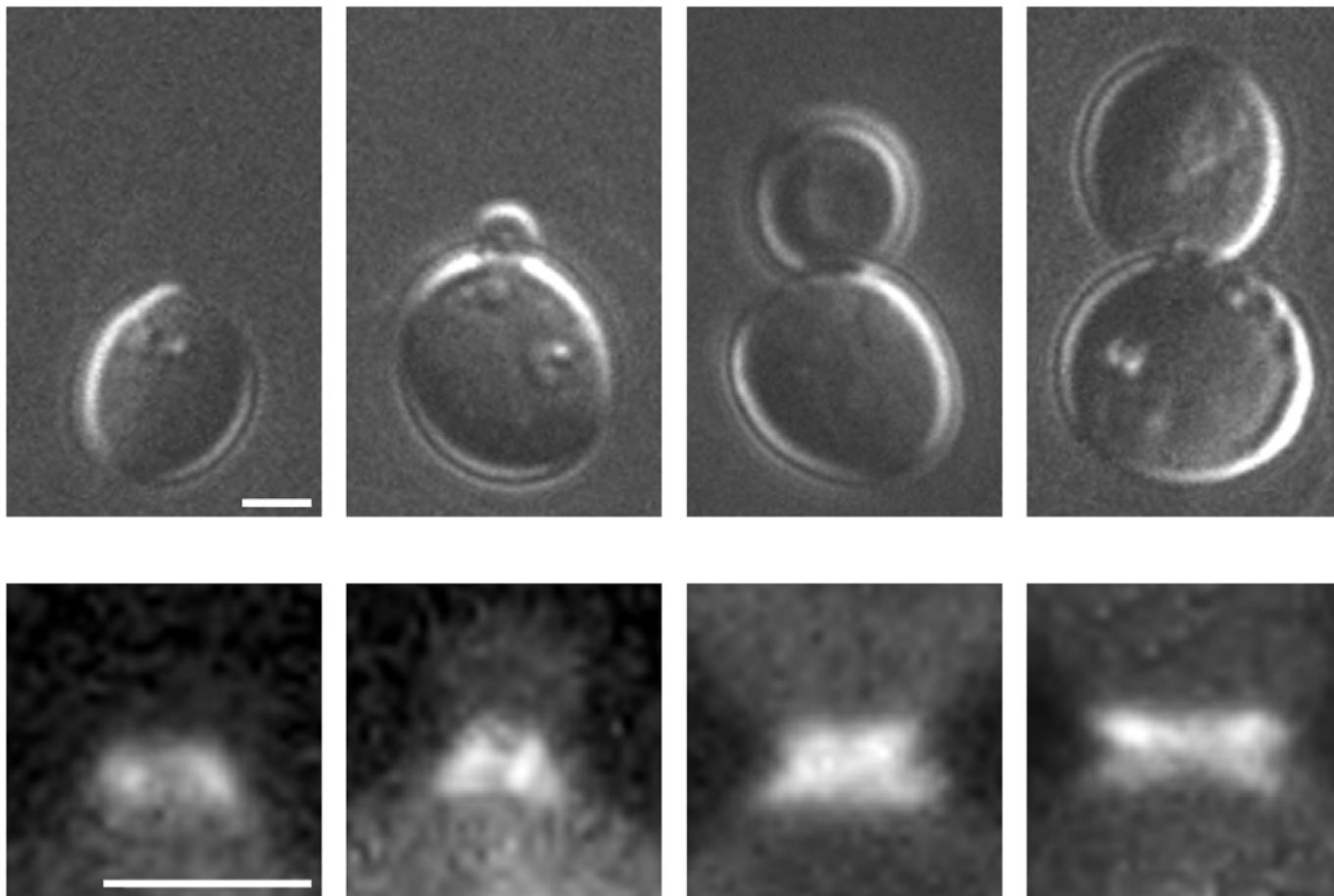


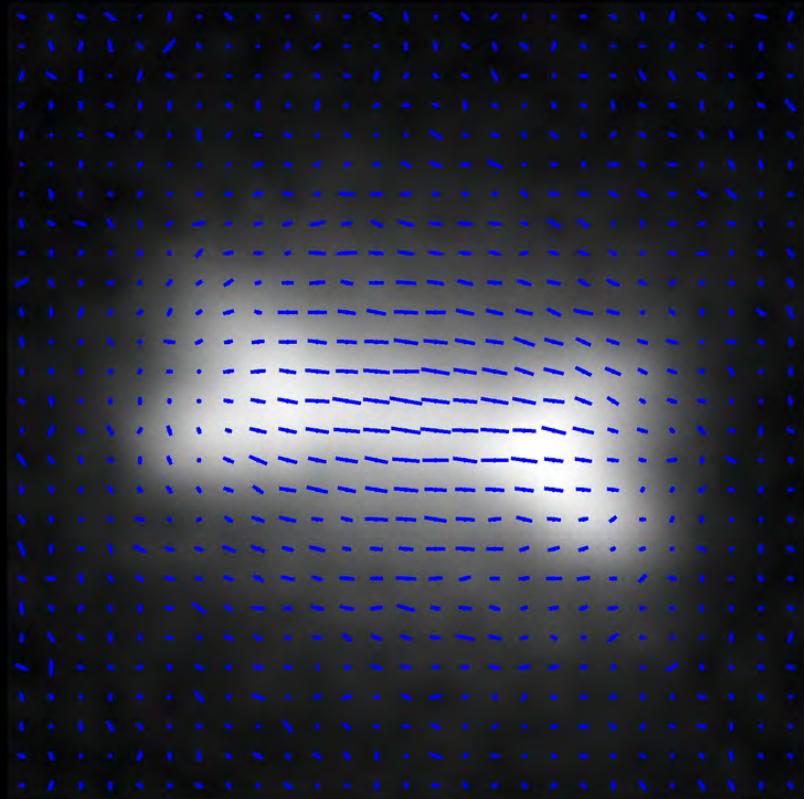
$$I = \frac{(I_{\max} + I_{\min} + (I_{\max} - I_{\min}) \cos(2(\phi - \text{azimuth})))}{2}$$

$$a = (I_0 - I_{90}), \quad b = (I_{45} - I_{135}), \quad c = (I_0 + I_{45} + I_{90} + I_{135})$$

$$\text{anisotropy} = \frac{\sqrt{a^2 + b^2}}{c} \quad \text{azimuth} = \frac{1}{2} \arctan\left(\frac{b}{a}\right)$$

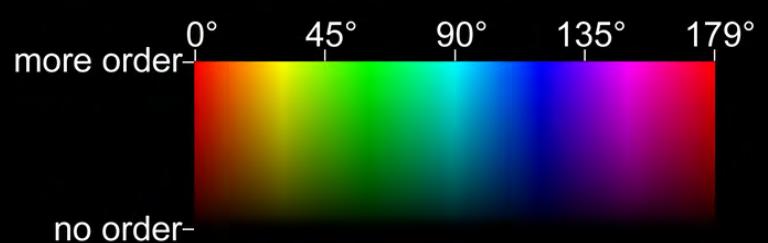
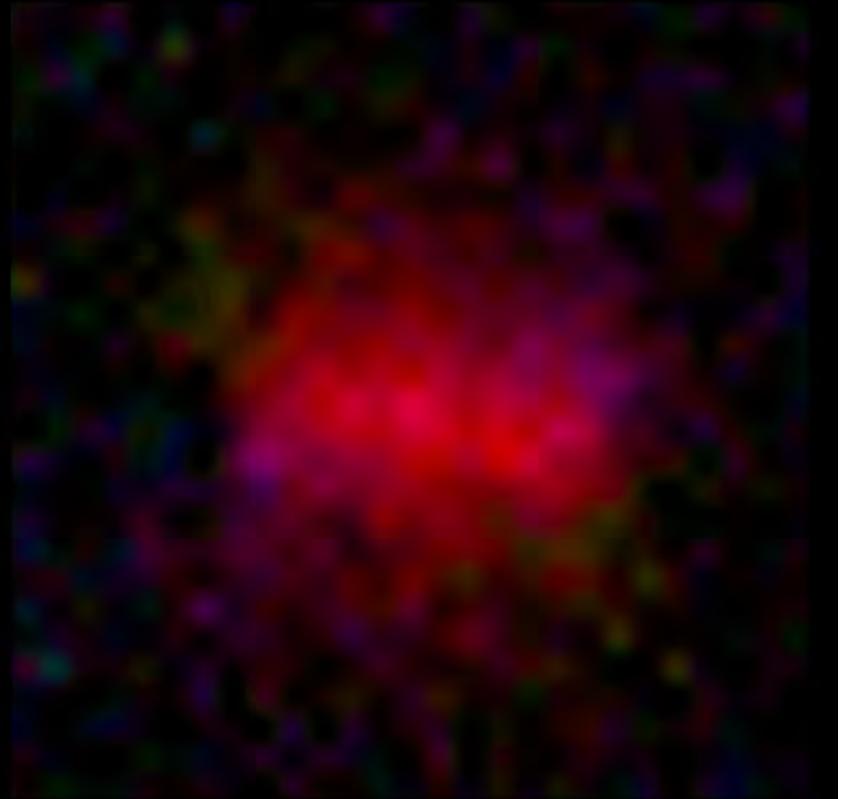
# Septin rearrangement in yeast bud neck





0.50 $\mu$ m

t = 00 min





YouTube video of polarized rainbow by Phil Plait, BadAstronomy.com



Wikipedia

# Bibliography

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