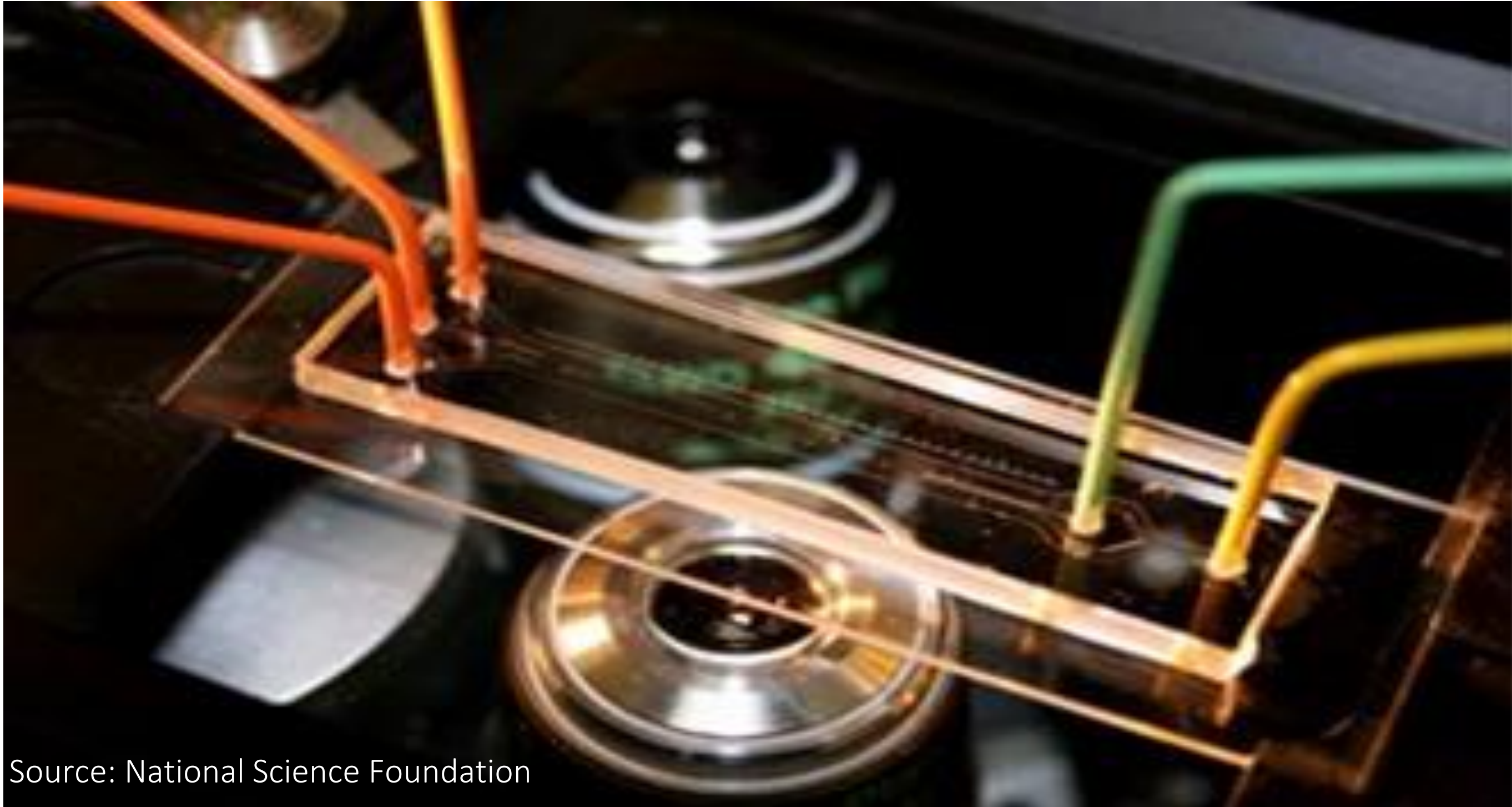


Low Cost Microscope for Microfluidic Devices



Source: National Science Foundation

Robert Williams, Chemical Engineering, Santa Barbara City College

Mentor: Eric Terry, Mechanical Engineering, UCSB

Advisor: Carl Meinhart, Mechanical Engineering, UCSB

Funded By: The National Institutes of Health

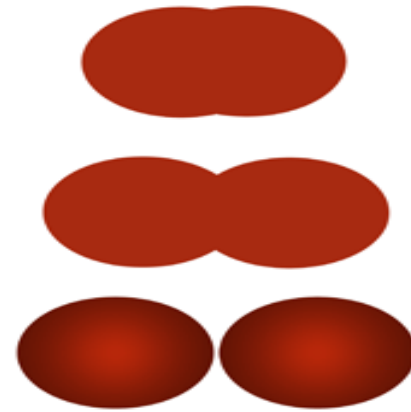
Microscopes Currently In Use



Source: Olympus Microscopy

Performance Requirements

- Resolution $\leq 1 \mu m$



- Depth of field(DOF) $\geq 50 \mu m$

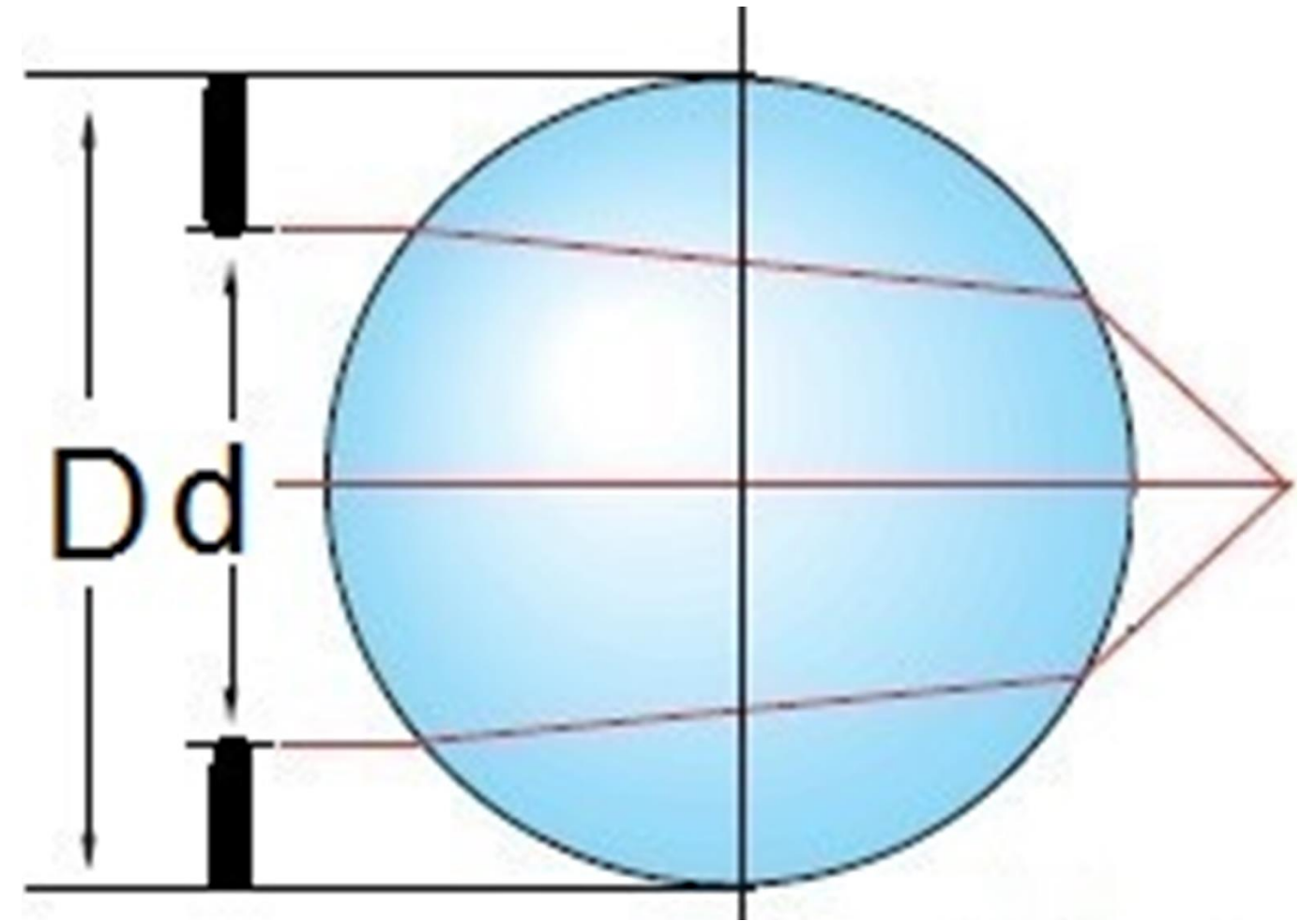


- Low-cost (\$50 - \$100)



The Most Important Optical Characteristic Numerical Aperture

$$NA = \frac{2d(n - 1)}{nD}$$



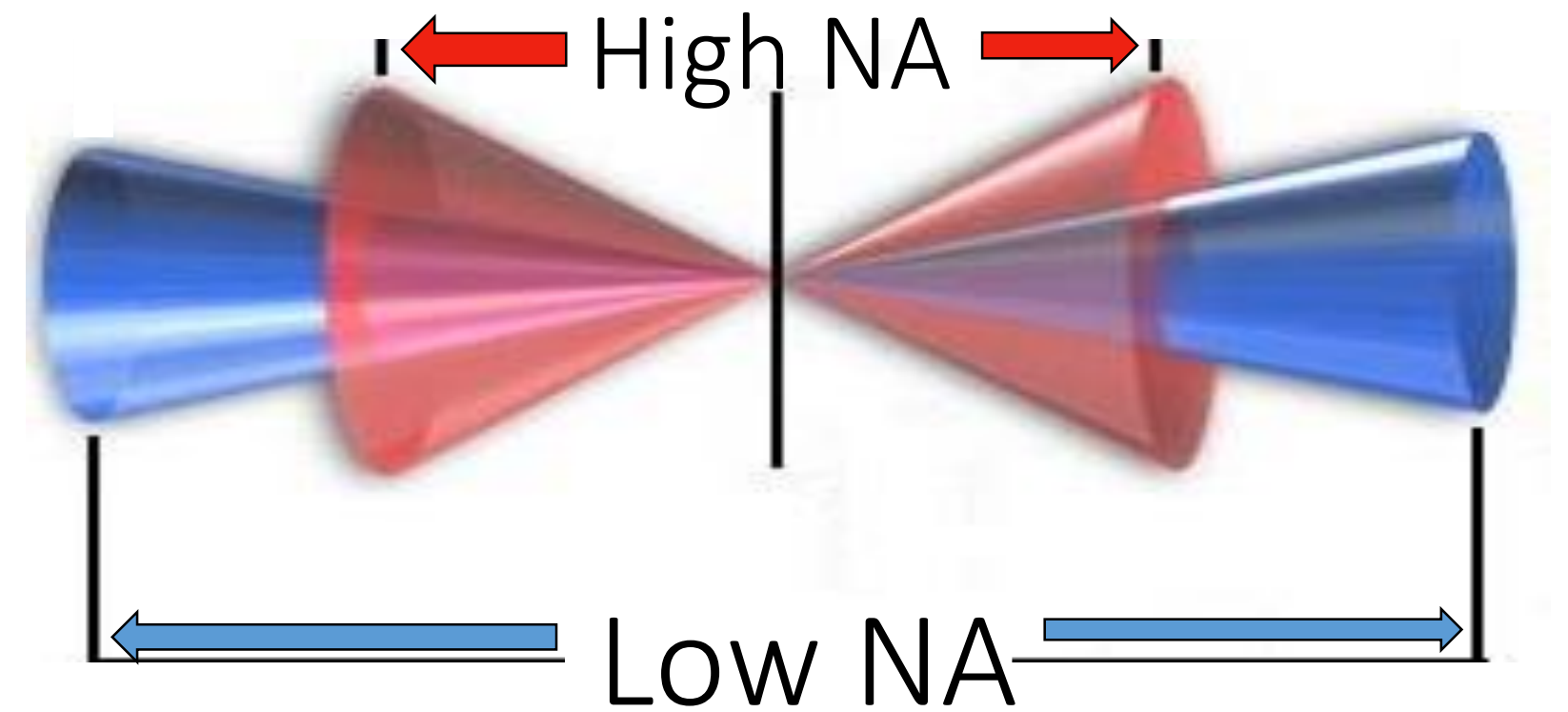
How NA Affects Resolution

- Resolution is the minimum point where two light sources become distinguishable.
- Resolution depends on wavelength of light sources and NA of lens.

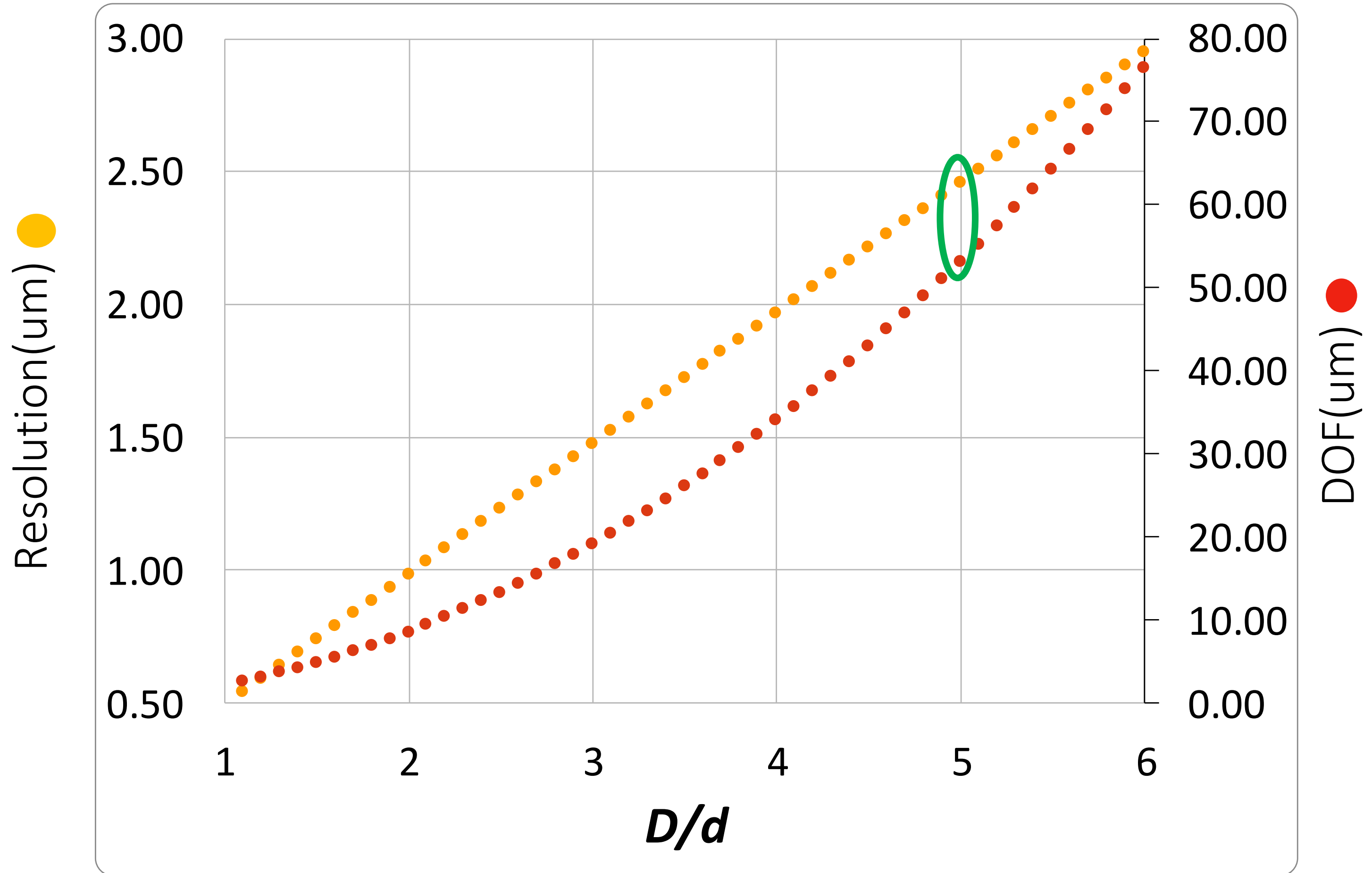
$$R = \frac{0.61\lambda}{NA}$$

How NA Affects Depth of Field

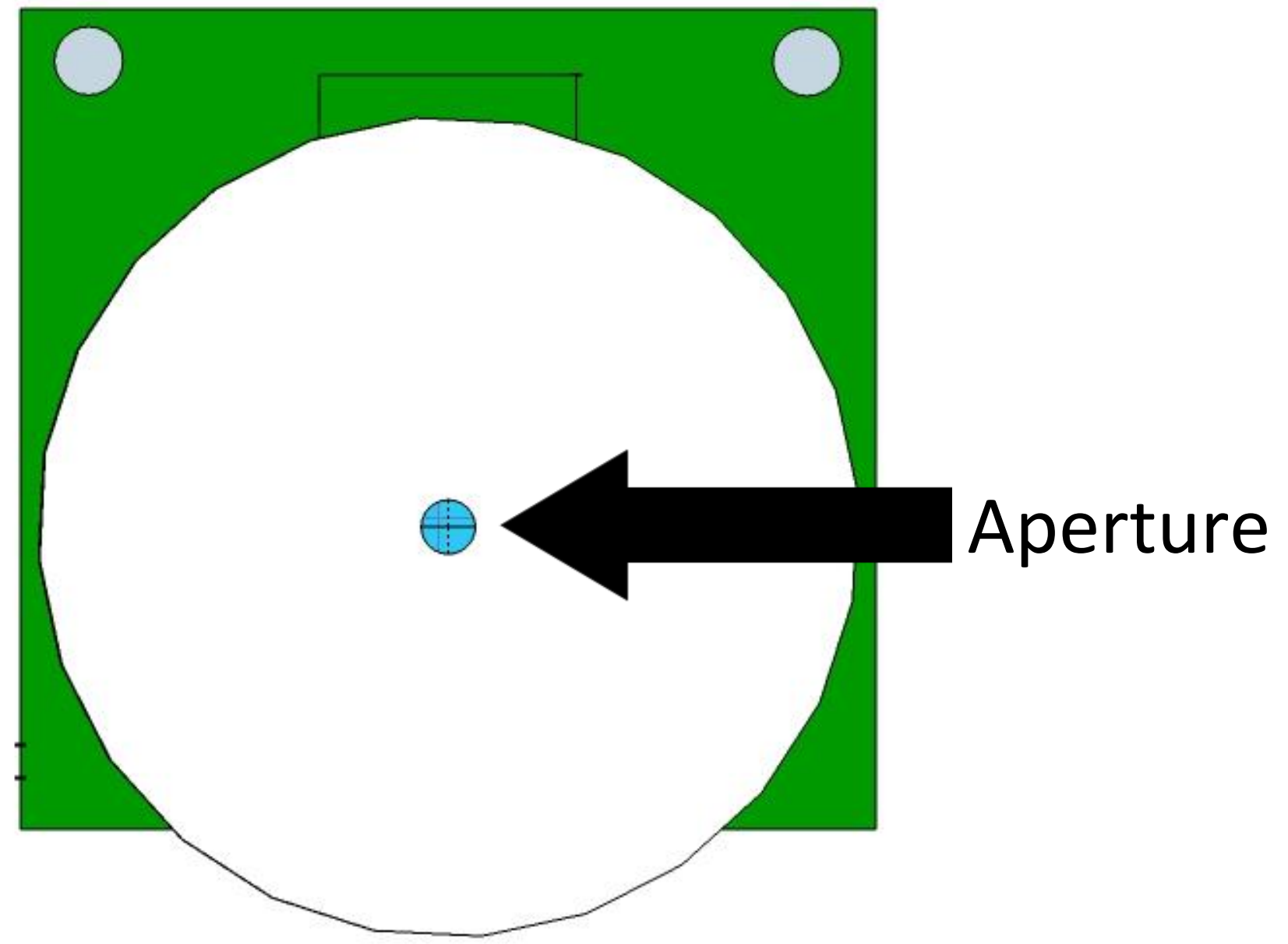
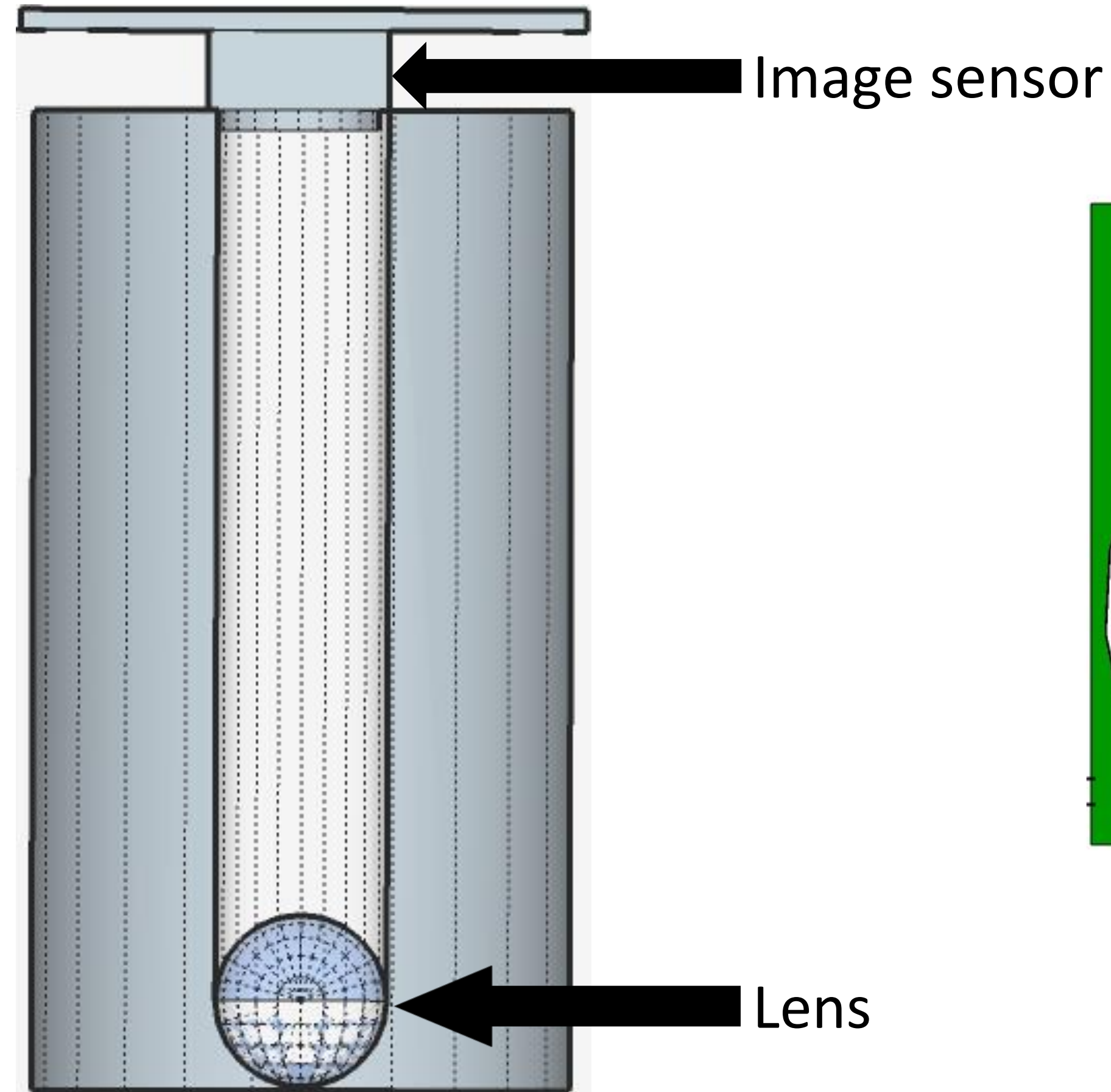
$$DOF = \frac{\lambda n (M + 0.61)}{M (NA)^2}$$



Optimizing DOF and Resolution



3D Model of New Microscope



TO BE CONTINUED...→

✓ Build



○ Test performance

○ Make improvements



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