



# Lecture Three

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Questions

This week:

Kohler

Assn 3 – Making photomicrographs

# Quiz one

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- Name one important pioneer of scientific photography?
- List the theories of energy travel
- List 5 light behaviors

# Refractive errors

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- Lead to image defects
- Low contrast
- Spherical aberration
- Low Visibility

# Diffraction

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- Effects resolution of image
- Change to energy when forced through a small opening

Diffraction is required optical to  
create optical resolution

# Sample role

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Sample is a diffraction gradient.

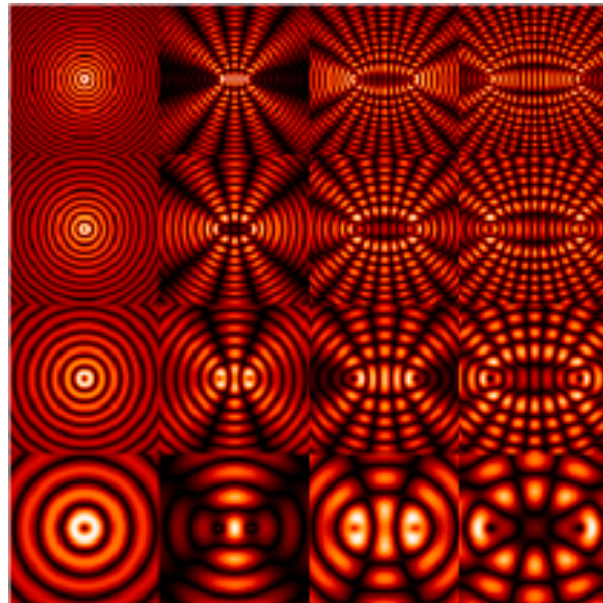
It has much fine detail

& hard often difficult to resolve

# Interference

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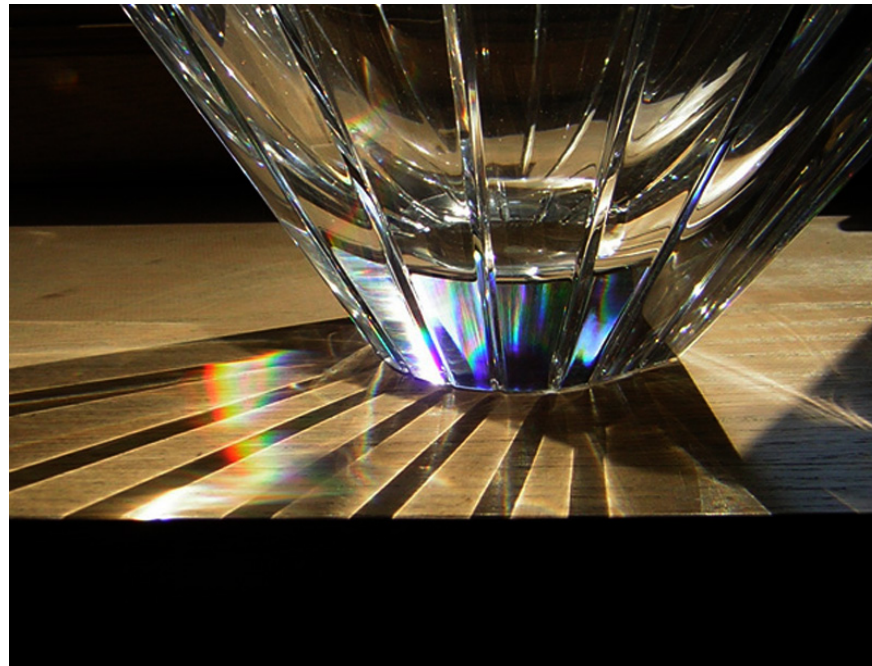
- Constructive
- Destructive





# Dispersion

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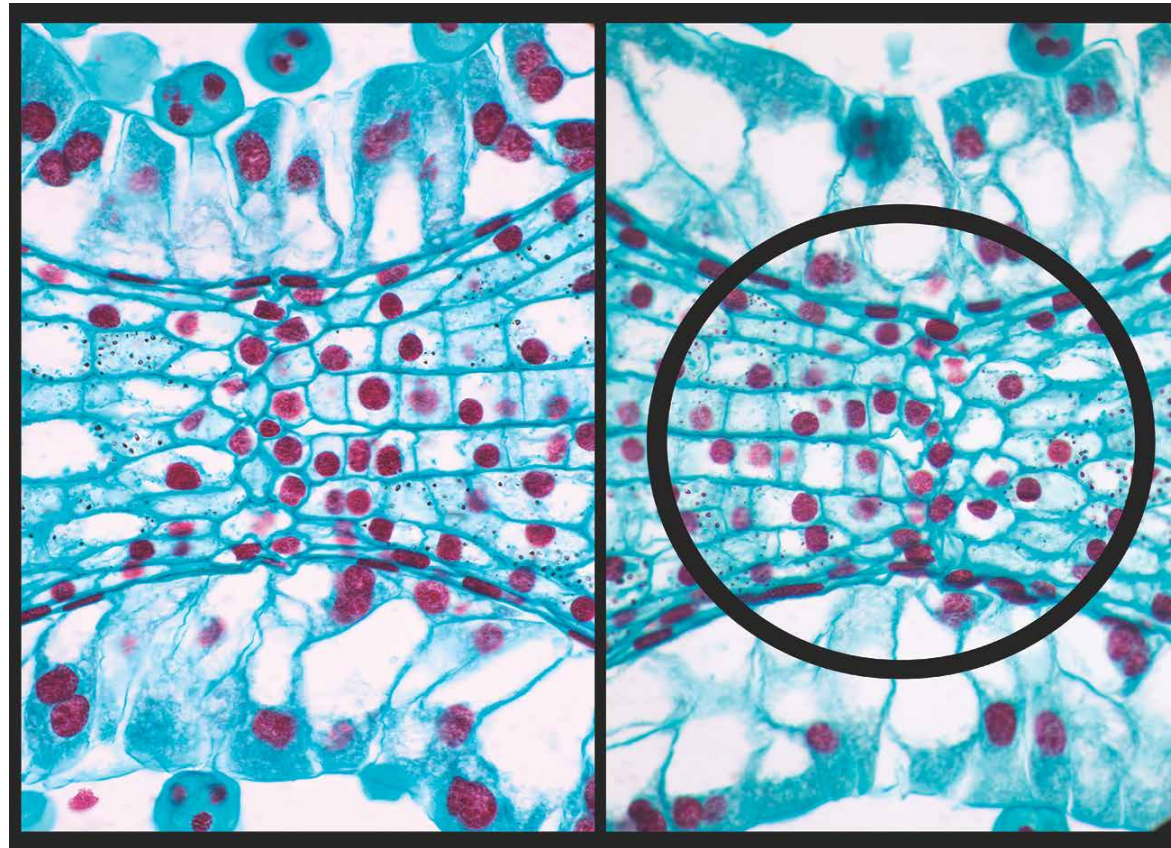


# Aberrations

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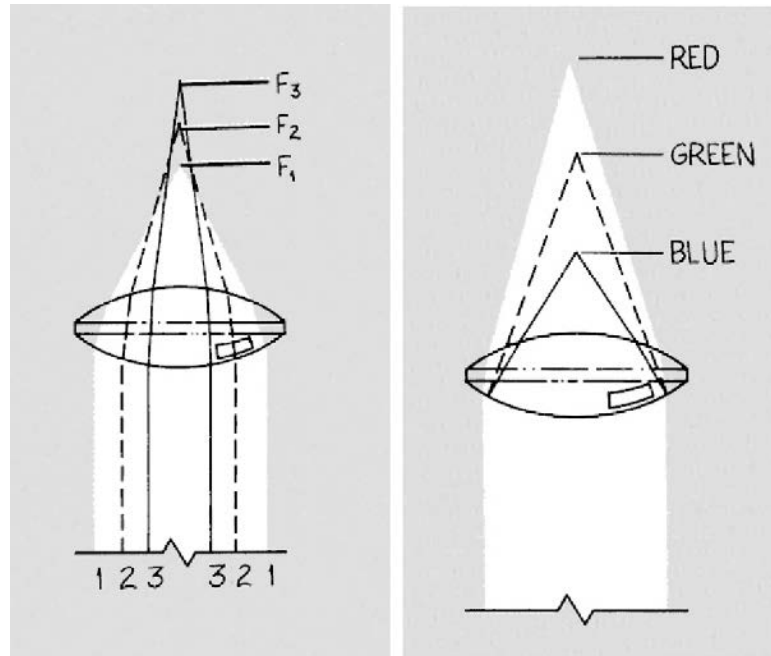
Spherical  
Chromatic  
Astigmatism  
Flatness of Field

Flatness of field

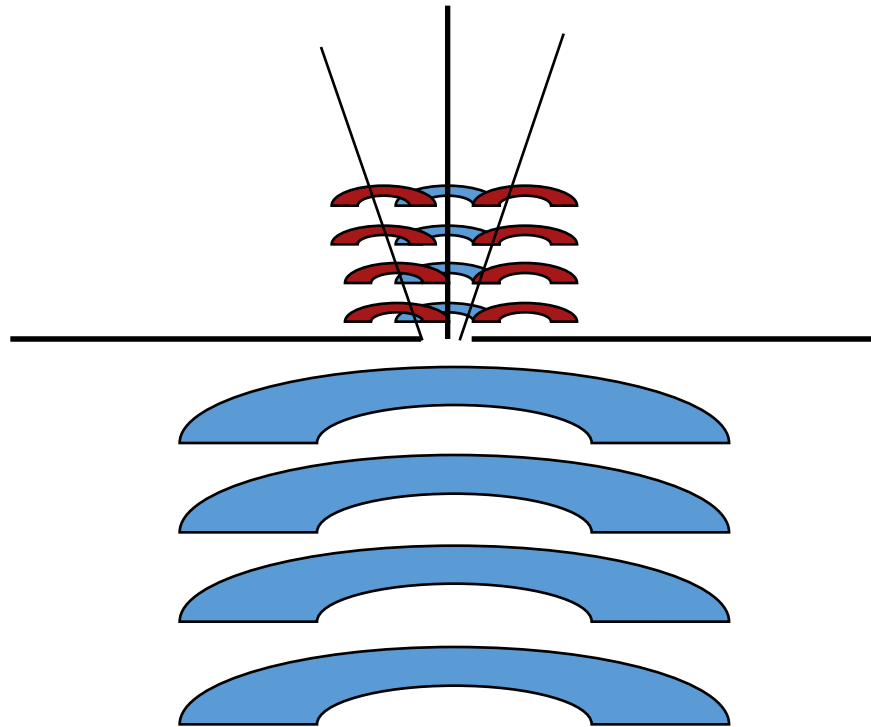


# Spherical & Chromatic aberration

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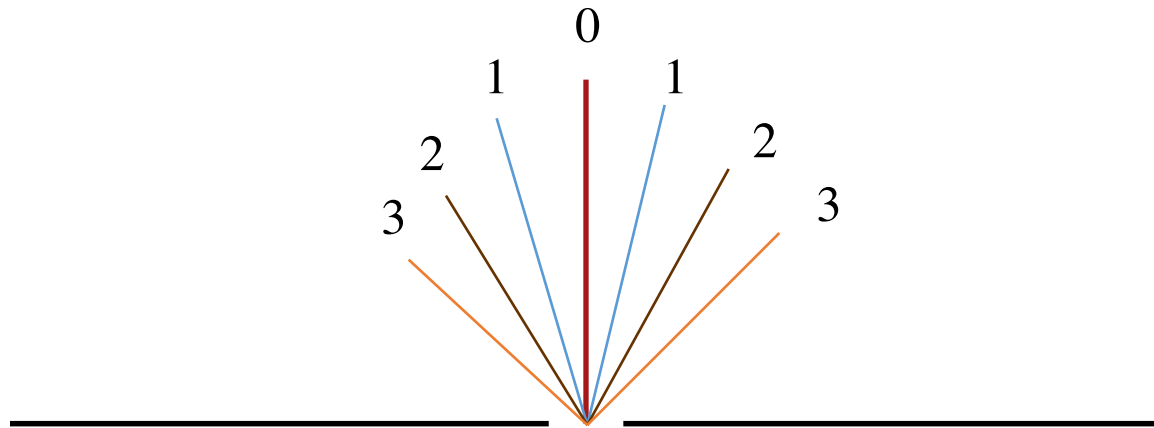
# Diffraction





Berenice Abbott, ca1956

Specimen is a diffraction gradient



Frequency remains the same  
Amplitude is reduced

# Apertures

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smaller apertures = more diffraction



# Interference

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- Energy can be described as **coherent or incoherent** which defines the **PHASE** of the energy's travel.

# Optical resolution

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- Separation of 2 points. To occur an Objective must gather - at a minimum - 2 orders of diffracted rays to resolve structure.

# Numerical Aperture - NA

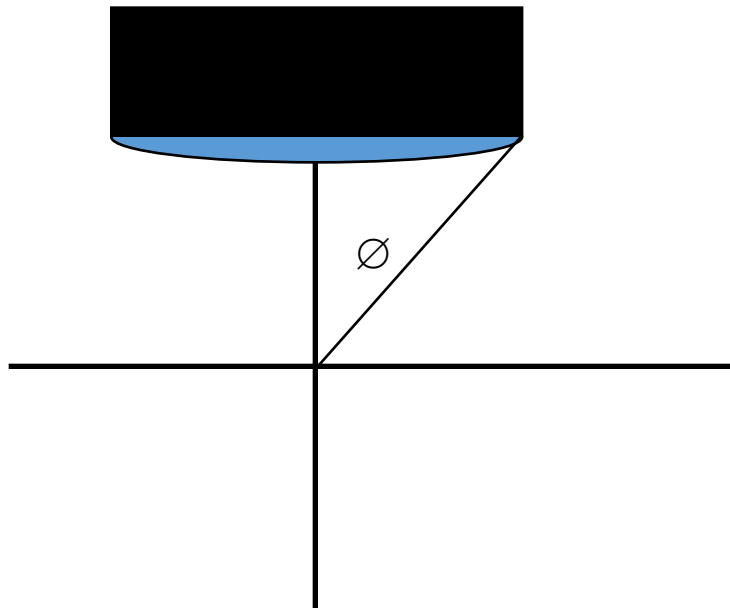
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- Light gathering ability of the objective

# Numerical Aperture

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$$NA = n \text{ Sine } \varnothing$$



# Common Refractive Indexes

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AIR - 1.00

Water – 1.33

Immersion oil – 1.53

# Photography through the microscope

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- Microphotography
- Microscopy
- Photomicroscopy
- Photomicrography

