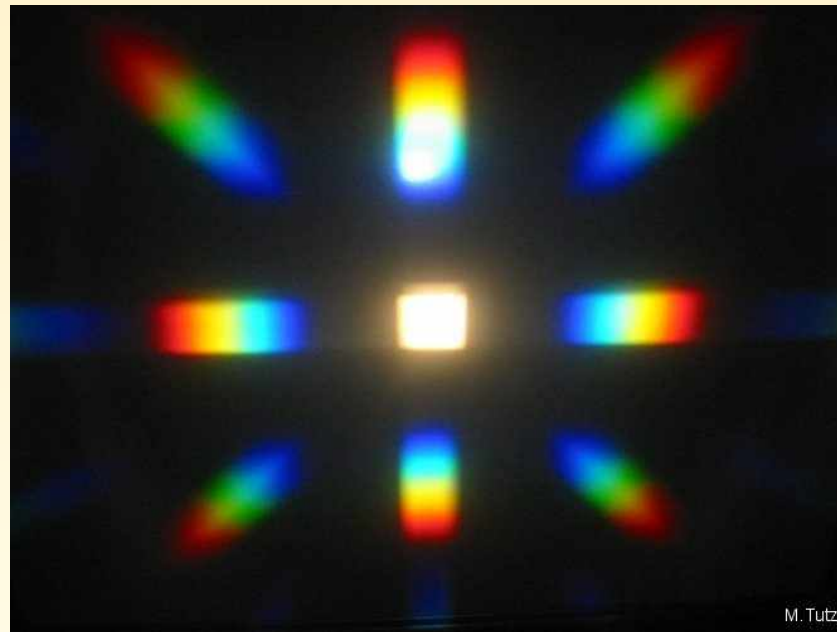


1.3. Wave Optics – Diffraction

bending of light due to obstacles in light path



What else do we observe here, apart from colors:



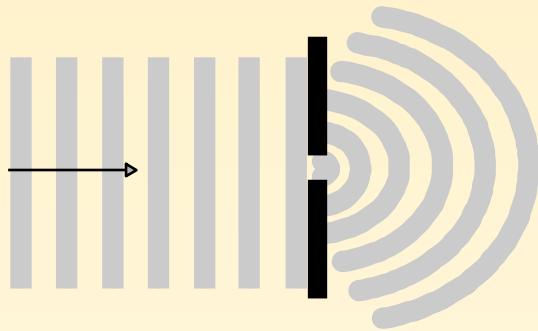
... diffraction orders

1.3. Wave Optics – Diffraction

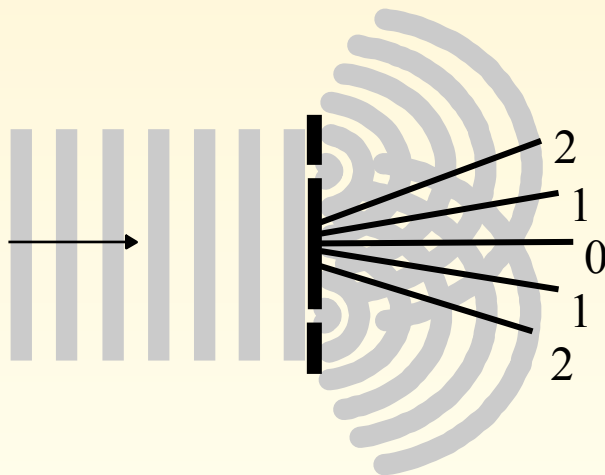
bending of light due to obstacles in light path



Single slit



... a spherical wave radiating from a single point



... Interference between waves radiating from two points

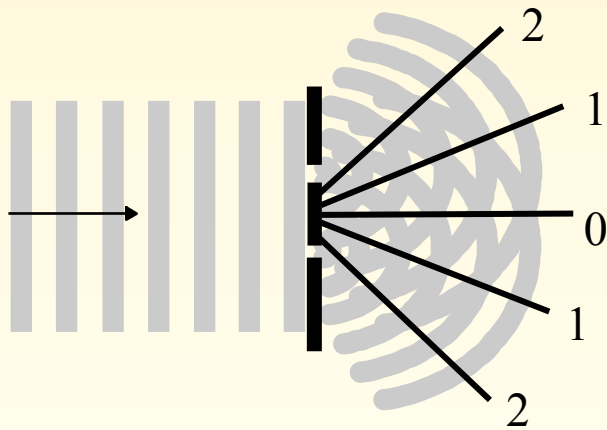
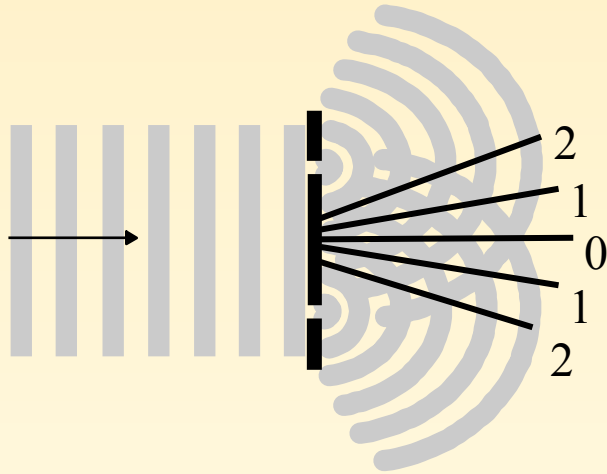
Double slit

1.3. Wave Optics – Diffraction

bending of light due to obstacles in light path



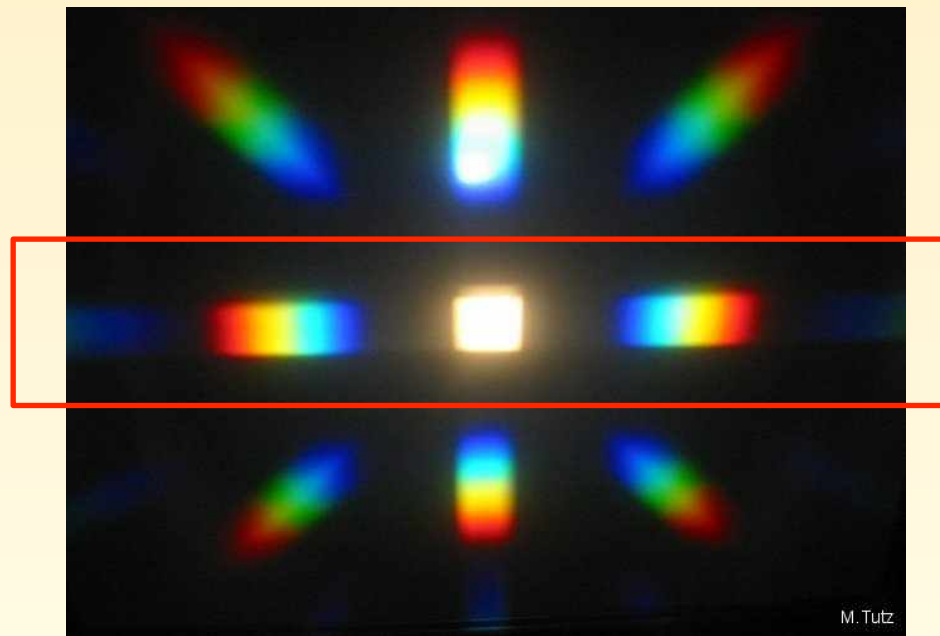
Double slit



... two more closely spaced points
→ stronger diffraction

1.3. Wave Optics – Diffraction

bending of light due to obstacles in light path



2nd 1st 0th 1st 2nd diffraction orders

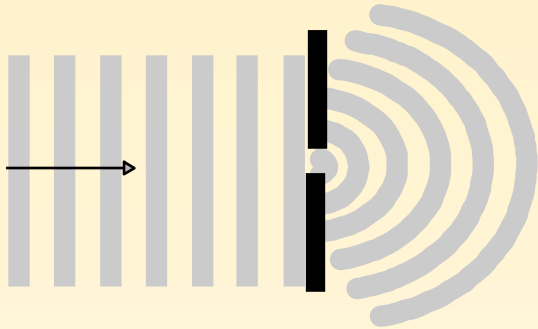
... but why colors?

1.3. Wave Optics – Diffraction

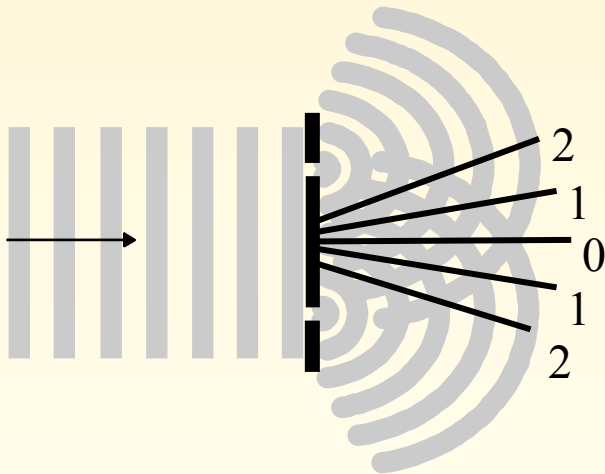
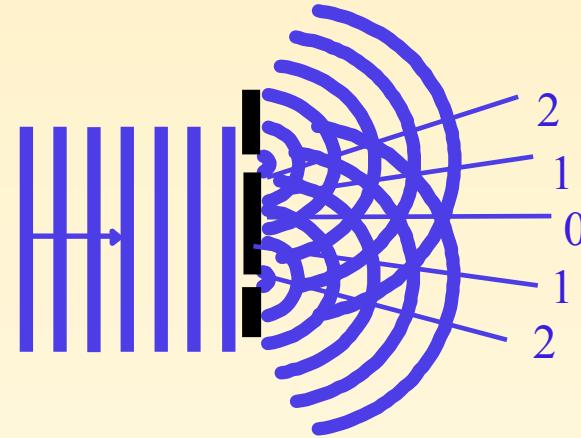
bending of light due to obstacles in light path



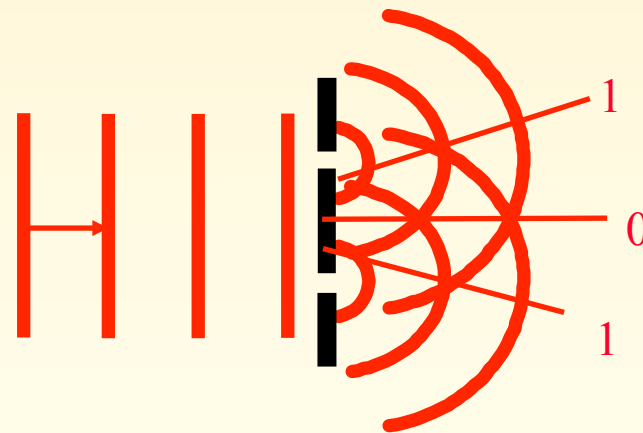
Single slit



smaller diffraction angles, blue light



Double slit



larger diffraction angles, red light

1.3. Wave Optics – Diffraction

bending of light due to obstacles in light path



Diffraction occurs whenever light encounters any kind of obstacle

Diffraction also occurs at the *specimen*

The image of a light absorbing specimen is formed due to diffraction.

The specimen is seen by the light as a complex superposition of gratings with varying grating constants and holes.

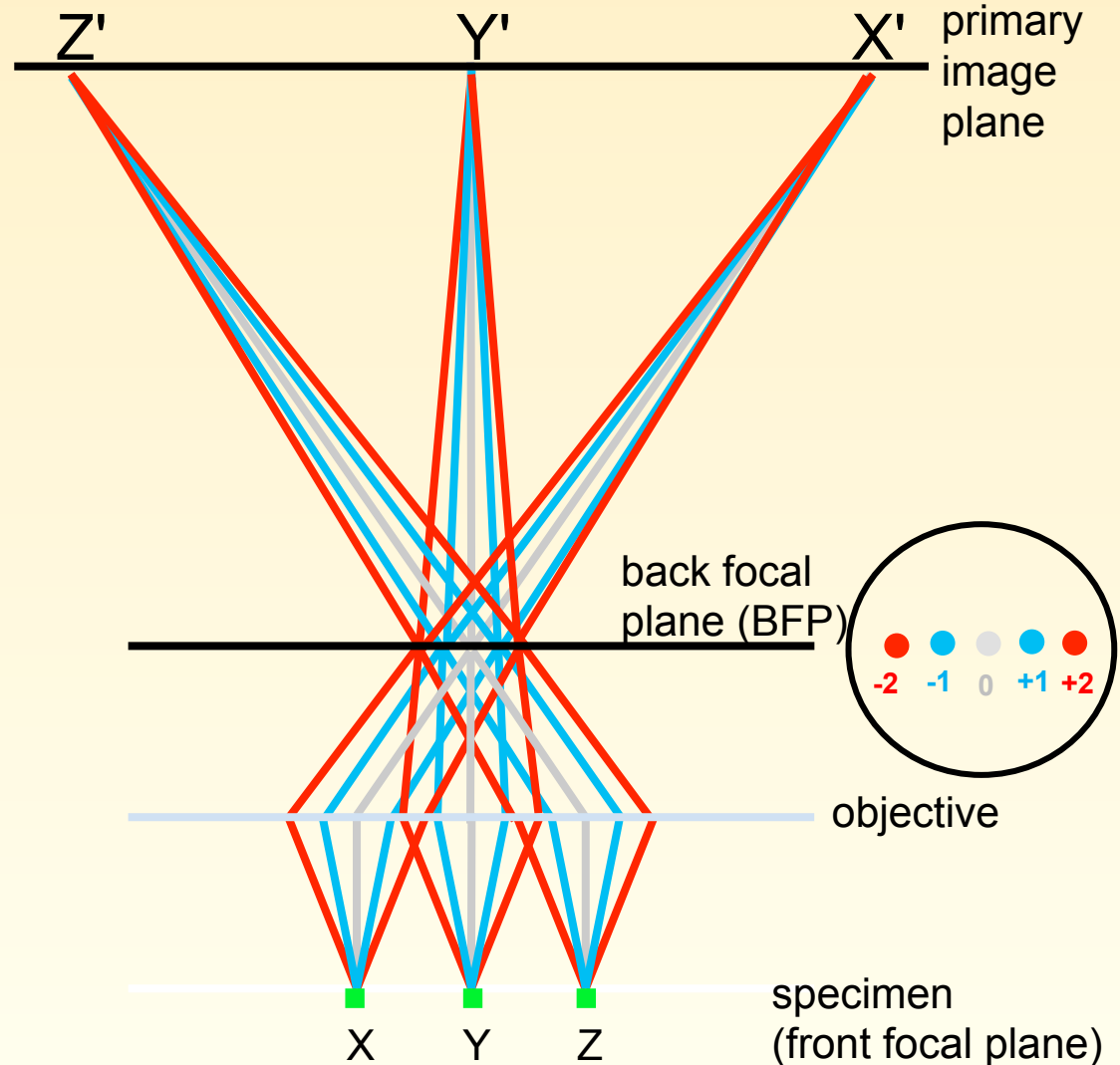
Some of the light will pass through the specimen undeviated and will only give rise to a uniformly bright image.

The deviated (diffracted) light carries the information about the structures in the specimen.

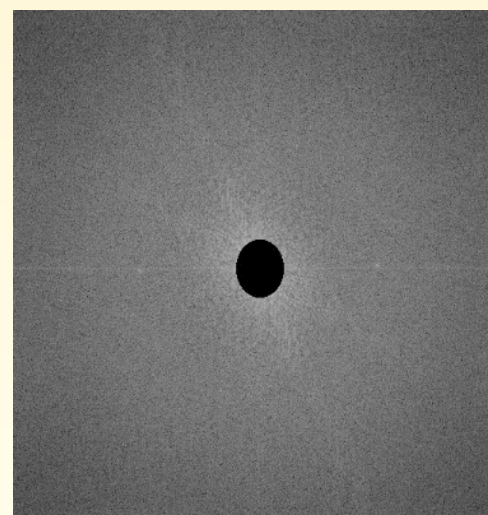
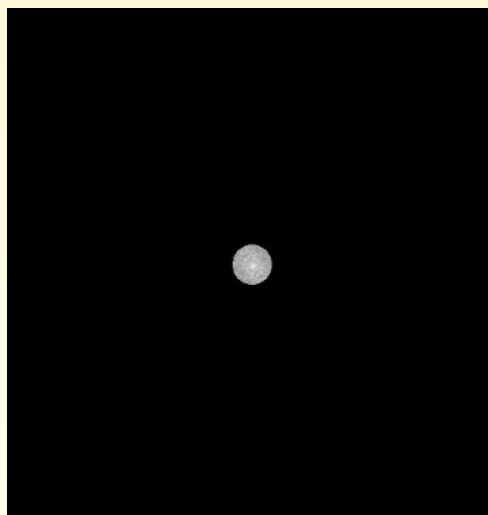
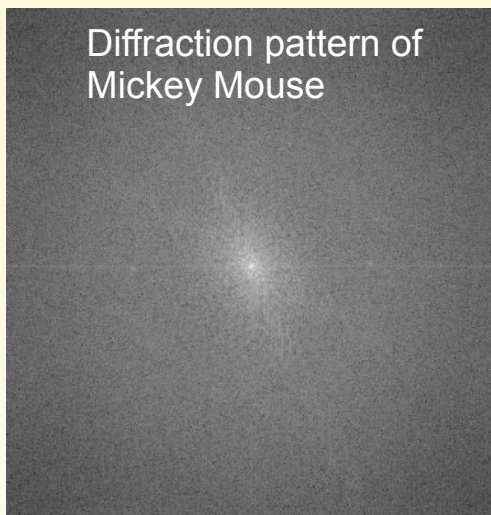
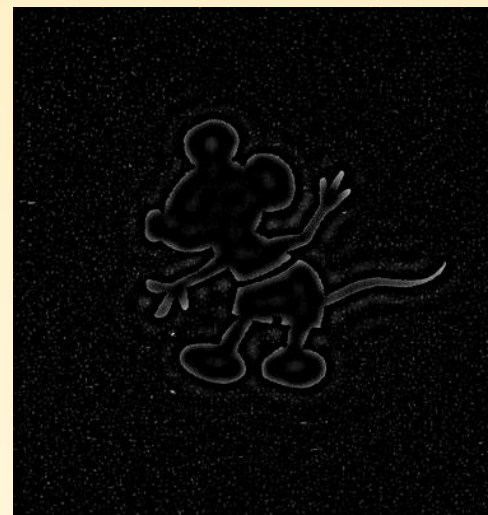
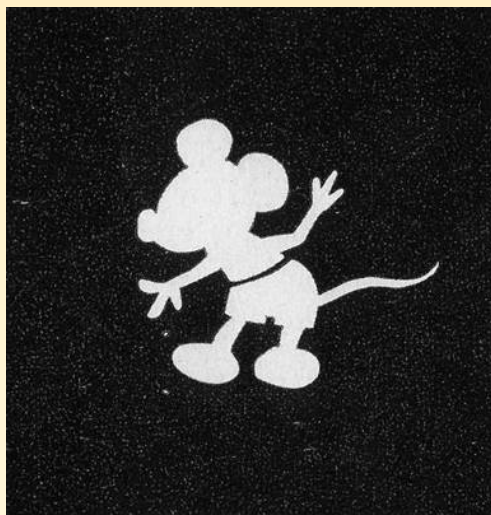
1.3. Wave Optics - Diffraction



5. Beams proceed up the microscope to the primary image plane, where they form the image
4. Diffracted beams are brought to focus at various positions in the BFP of the objective
3. Some – but not all – of these diffracted beams enter the objective
2. The object diffracts light – finer detail more obliquely than coarser detail
1. The undiffracted - direct - light enters the objective as parallel rays which meet in one focal point in the backfocal plane (BFP)
→ **0. diffraction order**



1.3. Wave Optics - Diffraction



1.3. Wave Optics - Diffraction



Try yourself

Light source:

- remove condensor
- close illuminated field diaphragm (provides almost a point source)

To see diffraction pattern in back focal plane:

- remove eye piece
- use telescope
- Bertrand lens

Objective:

- Try several objectives

Specimen:

- Diatoms
- plastic samples