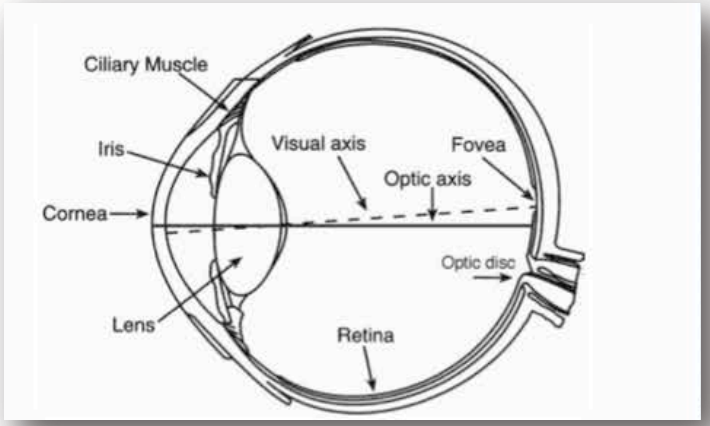
Lecture Two

- Questions?
- Please commit to memory one fact from Monday's lecture
- Blog is live. Please confirm you can access it

Human Vision & Microscopy

Human Vision



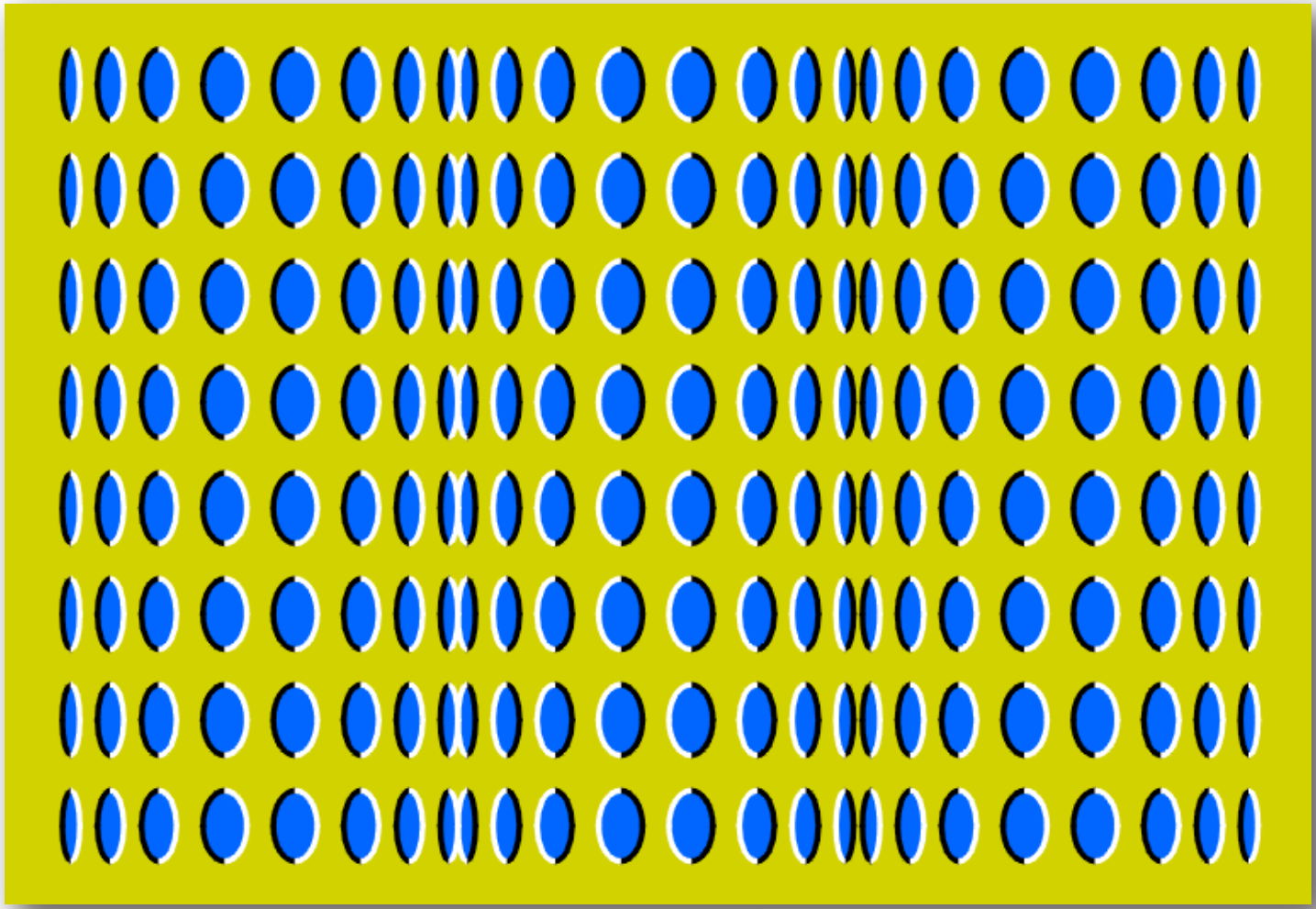
Complex system

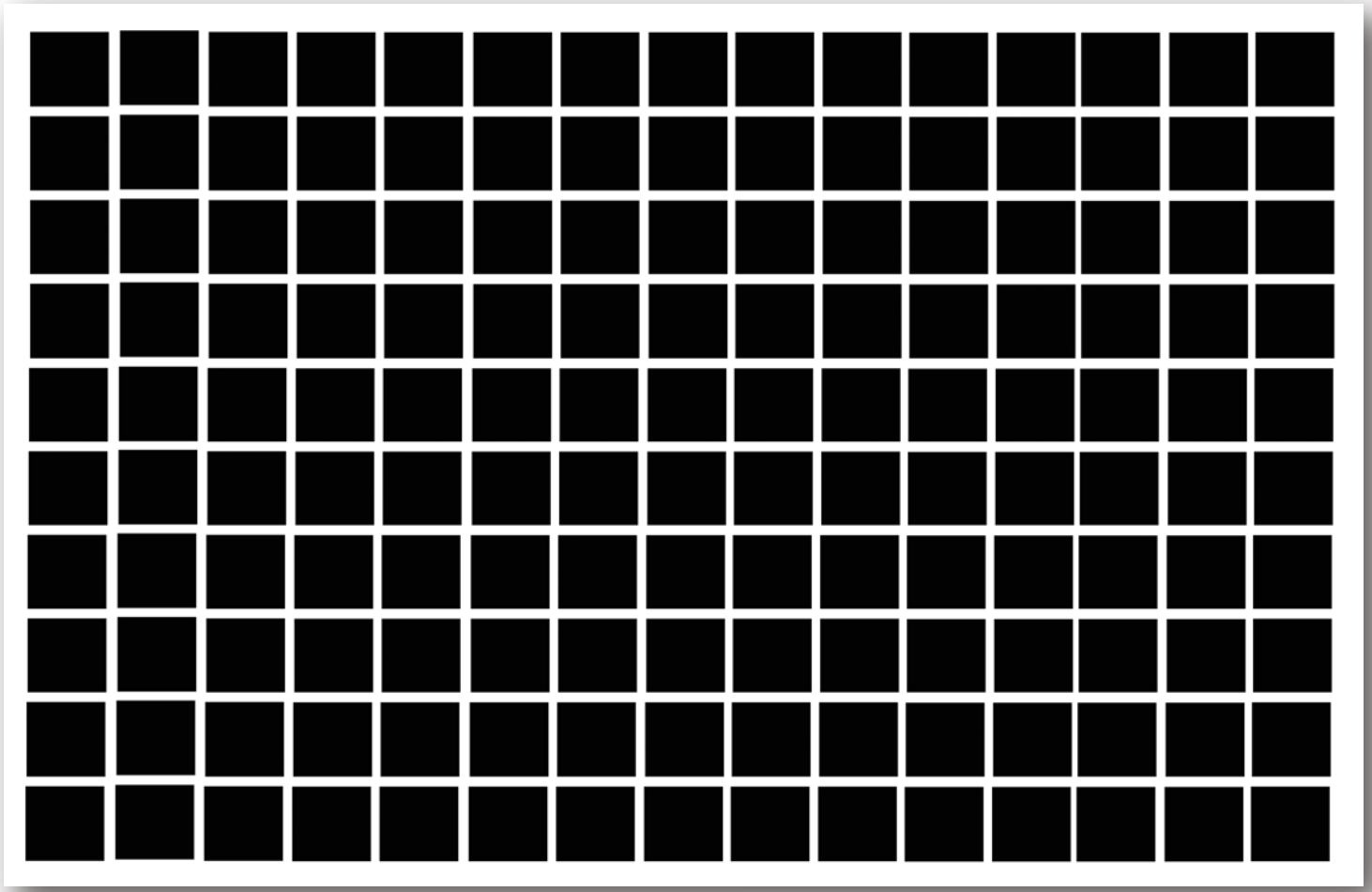
Microscope produces aerial image

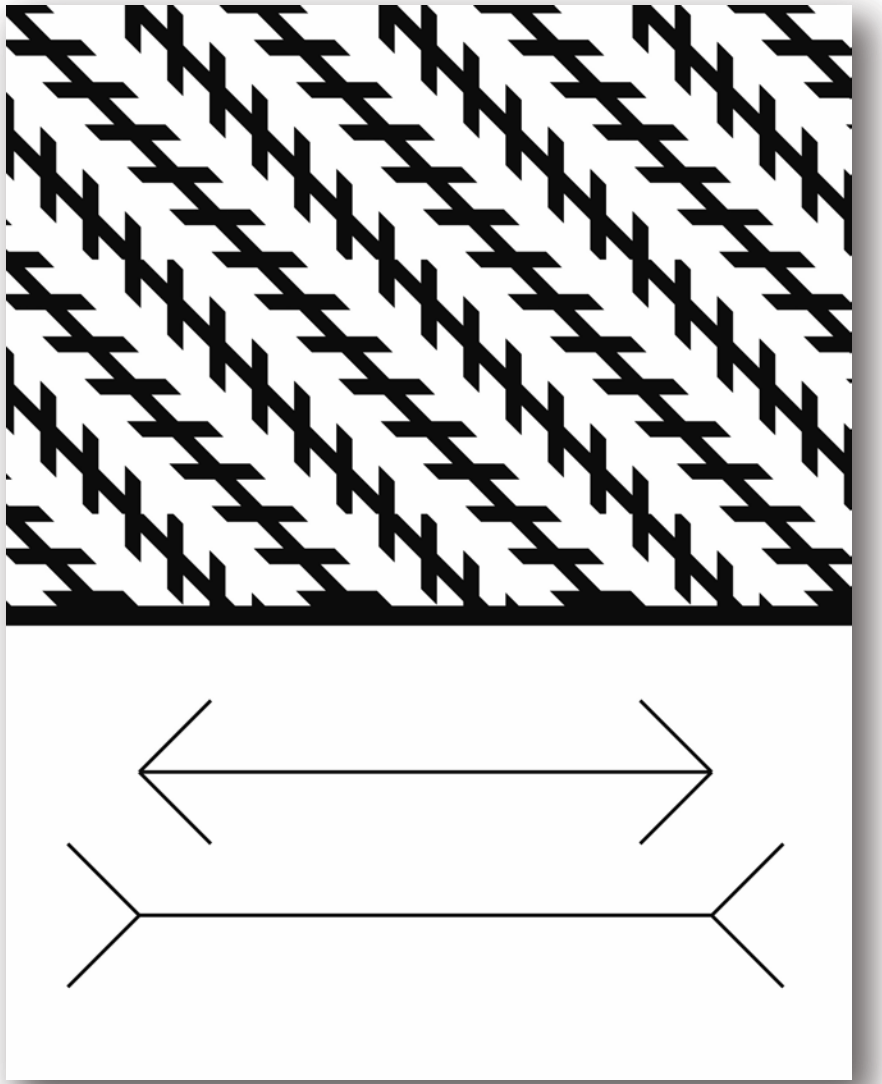
Pupil plays a role in seeing

Screen is an electronic display

Adaptation & Environment







Look at the chart and say the COLOUR not the word

YELLOW BLUE ORANGE
BLACK RED GREEN
PURPLE YELLOW RED
ORANGE GREEN BLACK
BLUE RED PURPLE
GREEN BLUE ORANGE

Left – Right Conflict

Your right brain tries to say the colour but your left brain insists on reading the word.

Perception and Interpretation

The pweor of the hmuan mnid. Aoccdrnig to a rscheearch at Cmabrigde Uinervtisy, it deosn't mtta in waht oredr the ltteers in a wrod are, the olny iprmoetnt tihng is taht the frist and lsat ltteer be at the rghit pclae. The rset can be a total mses and you can sitll raed it wouthit porbelm. Tihs is bcuseae the huamn mnid deos not raed ervey lteter by istlef, but the wrod as a wlohe.

"you see what you are looking for"

Other components to Human Vision

Stereo
Color
Low Light
Critical and Distinct Vision
Dominant Eye
Interpretation

Adaptation

Light
Dark
Color
Persistence of vision
Flicker
Afterimage

Microscopy & Aerial Images

- Heisenberg Uncertainty Principle

https://en.wikipedia.org/wiki/Quantum_fluctuation

For Human Vision to see tiny things, 4 conditions must be created

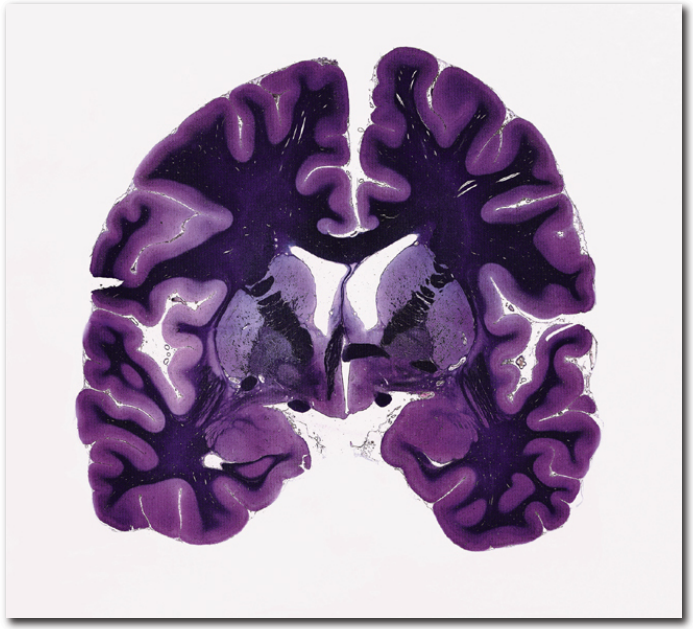
[magnification]
Microscopy produces a enlarged image of the object

[resolution]
Microscopy must separate the details in the image

[contrast]
Microscopy must render the details visible to the eye or imaging device

[interpretation]

The standard viewer must be able to see the data



magnification

m = image distance/focal length

image distance = 250mm

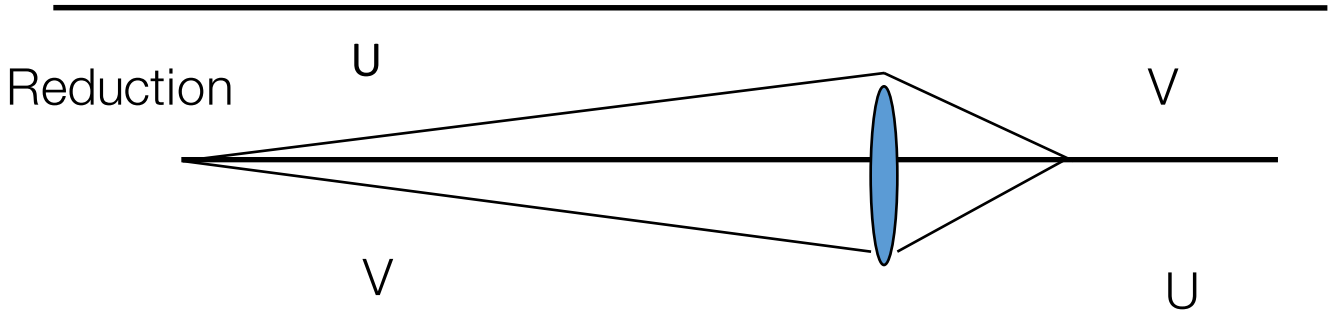
250mm was adopted because it was determined to be the location of highest distinct vision

Increasing magnification

Requires the use of a shorter focal length

photomacrography

$$1/f = 1/u + 1/v$$



Magnification

It does NOT have to be difficult

Scientific Methods & Workflow

effective sample Preparation
effective Illumination
proper Magnification
use of Optics & Resolution
optimal Image Formation
accurate Color Management
effective Digital Capture
ethical and appropriate Image Processing
effective Digital Display

Image FORMATION

Applied Physics
Create optical and object contrast and visibility

Microscopy is *Applied Physics*

- The sample plays a role in image formation

Radiated Energy - photon

Wave theory

Particle theory

Quantum theory

String Theory

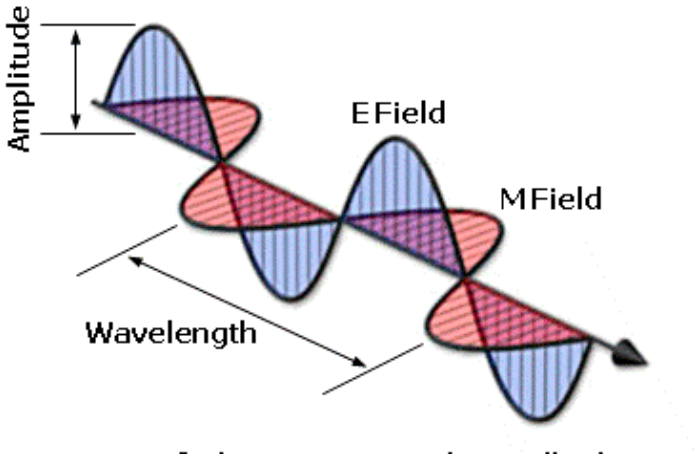
Wave theory

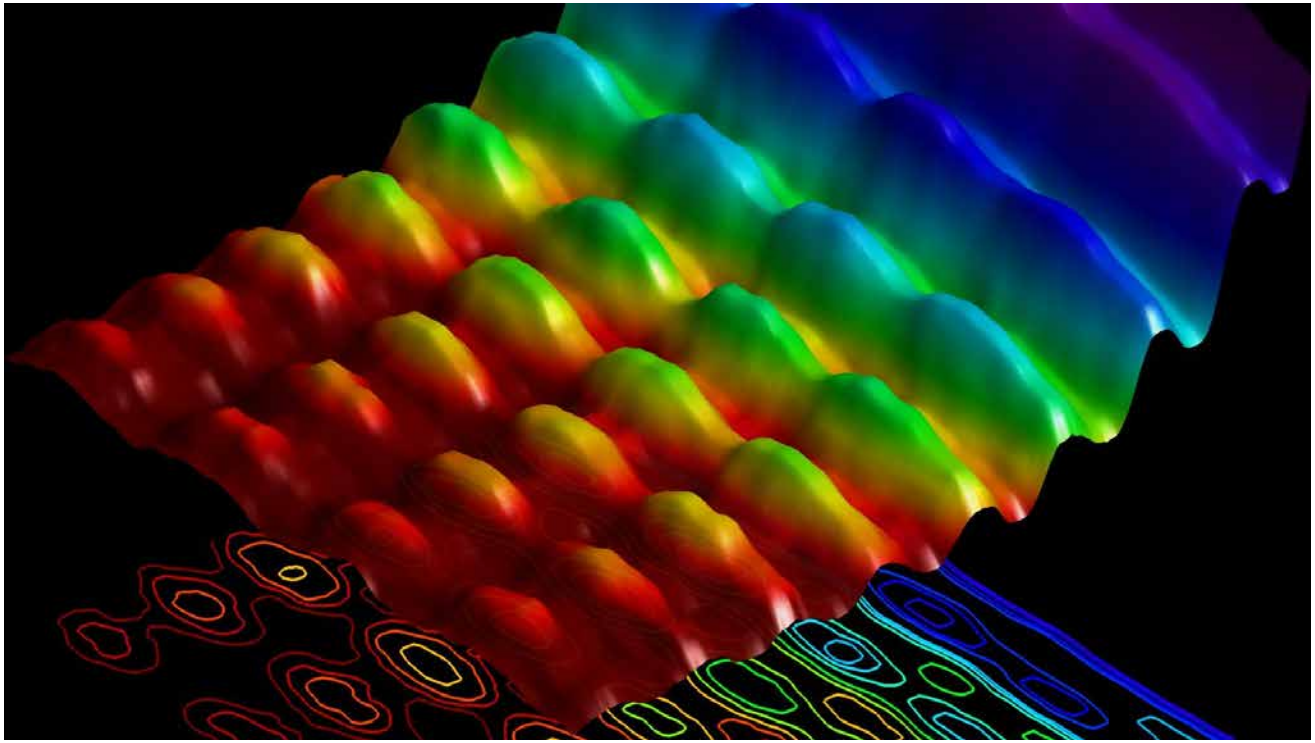
Wave length - color

Amplitude - intensity

Frequency - cycles/sec

Velocity - speed m/sec





Light simultaneously showing spatial interference and energy quantization

Radiated energy characteristics & patterns

Reflection

Refraction

Dispersion

Interference

Diffraction

Optical Principles

Air/glass interfaces

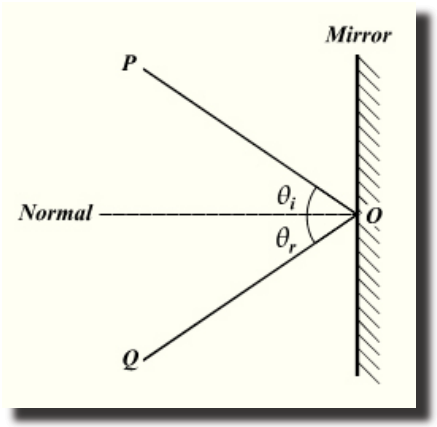
Reflection

Absorption

Refraction

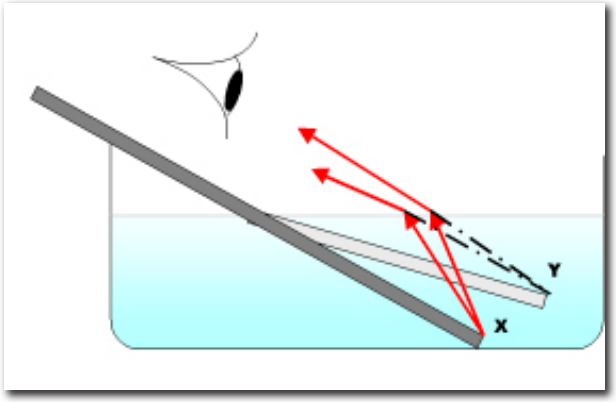
Reflection

Non image forming light - flare



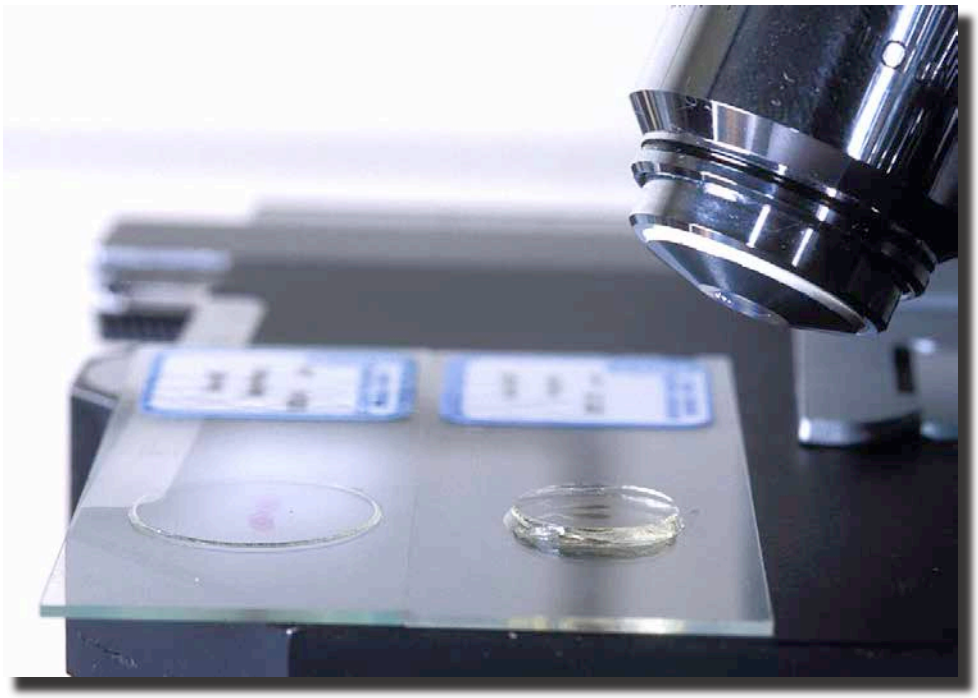
Refraction

Light bending caused by a speed change when a media of different refractive index is encountered




FORMULA
CONFORMS TO

Cover slips



Refraction