The Special Senses -1432

Vision – 3

Color Vision

DR ABDUL MAJEED AL-DREES

Objectives:

- Define color vision
- Identify and describe the mechanism of color vision and the three types of cones, including the range of spectral sensitivity and color blindness
- Identify color vision theory
- Compare different types of color blindness

Color (Photopic) Vision

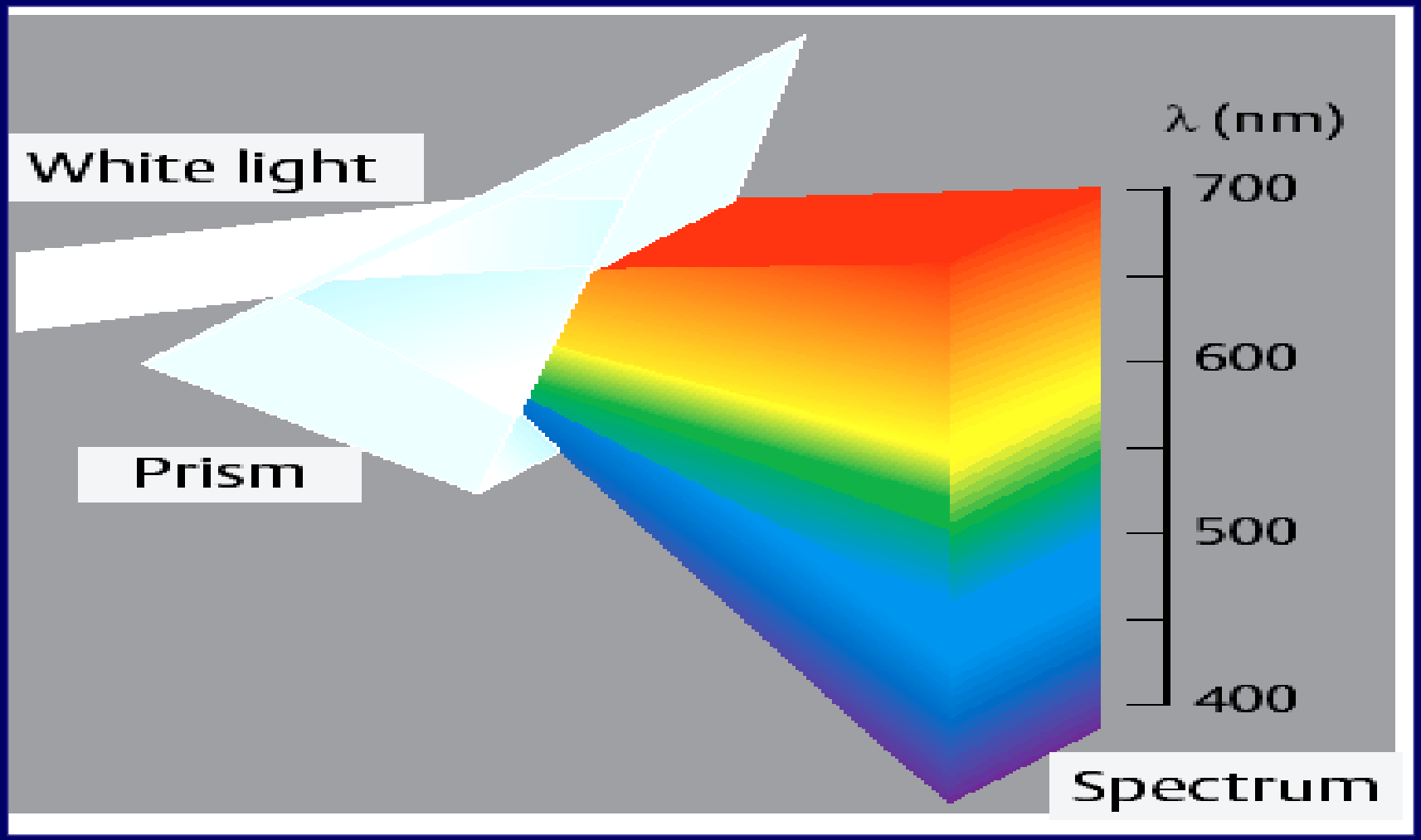

$3.4
LB
FARMER BELLA


Field Of Tulips

History of color vision

Newton (1704) used a prism to show that sunlight was composed of light with all colors in the rainbow. He defined it as the **spectrum**.

- **Colour vision is the ability to discriminate different wavelengths that constitute the visible spectrum**

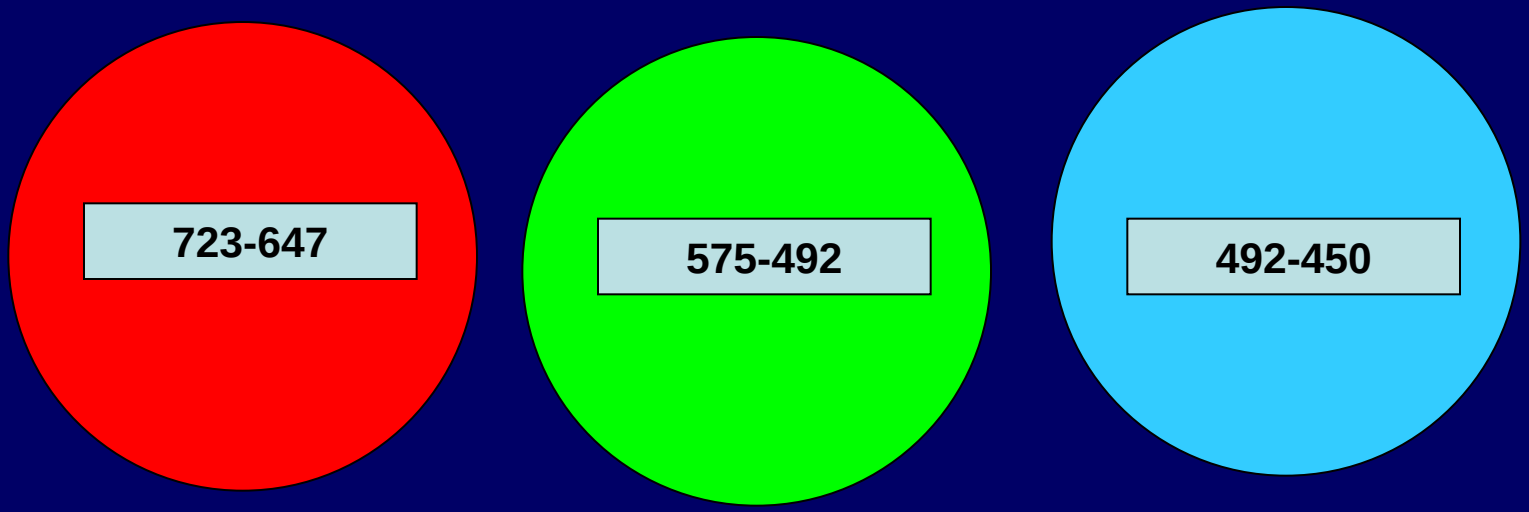


COLOUR VISION

- **Our perception of light is related to wavelengths of light that are transmitted, reflected or absorbed by objects of our visual world.**

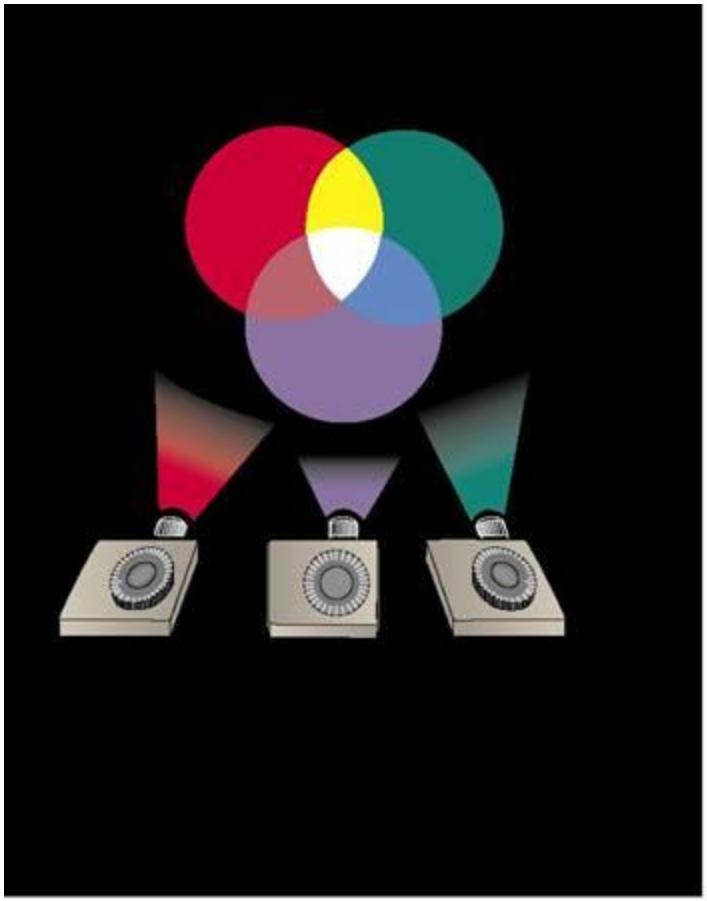
History of color vision

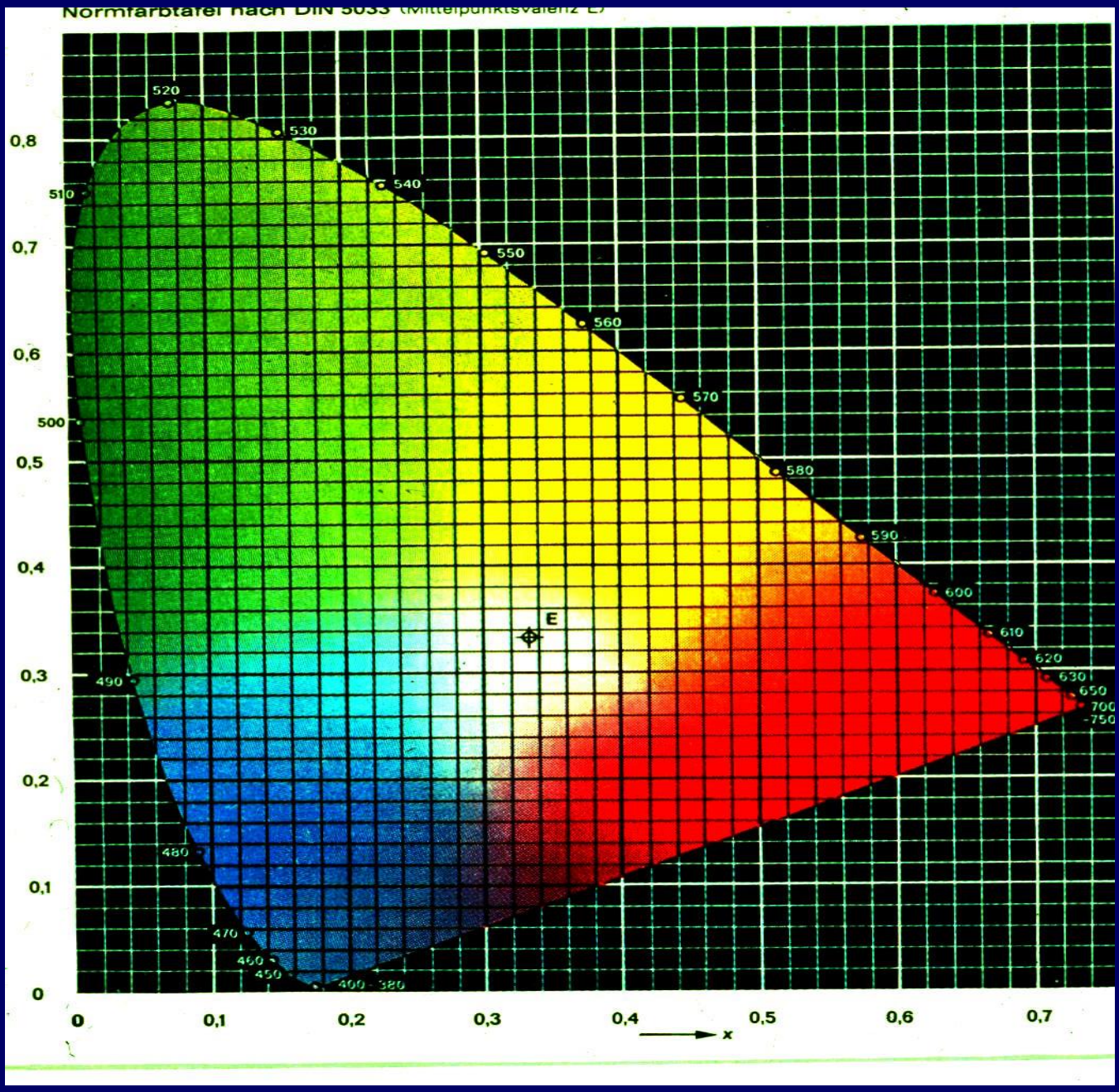
Primary colors:



Thomas Young 1807:
primary colors: when mixed >>>
white or any other color

Mixing colors




Normfarbtafel nach DIN 5033 (Mittelpunktsvalenz E)
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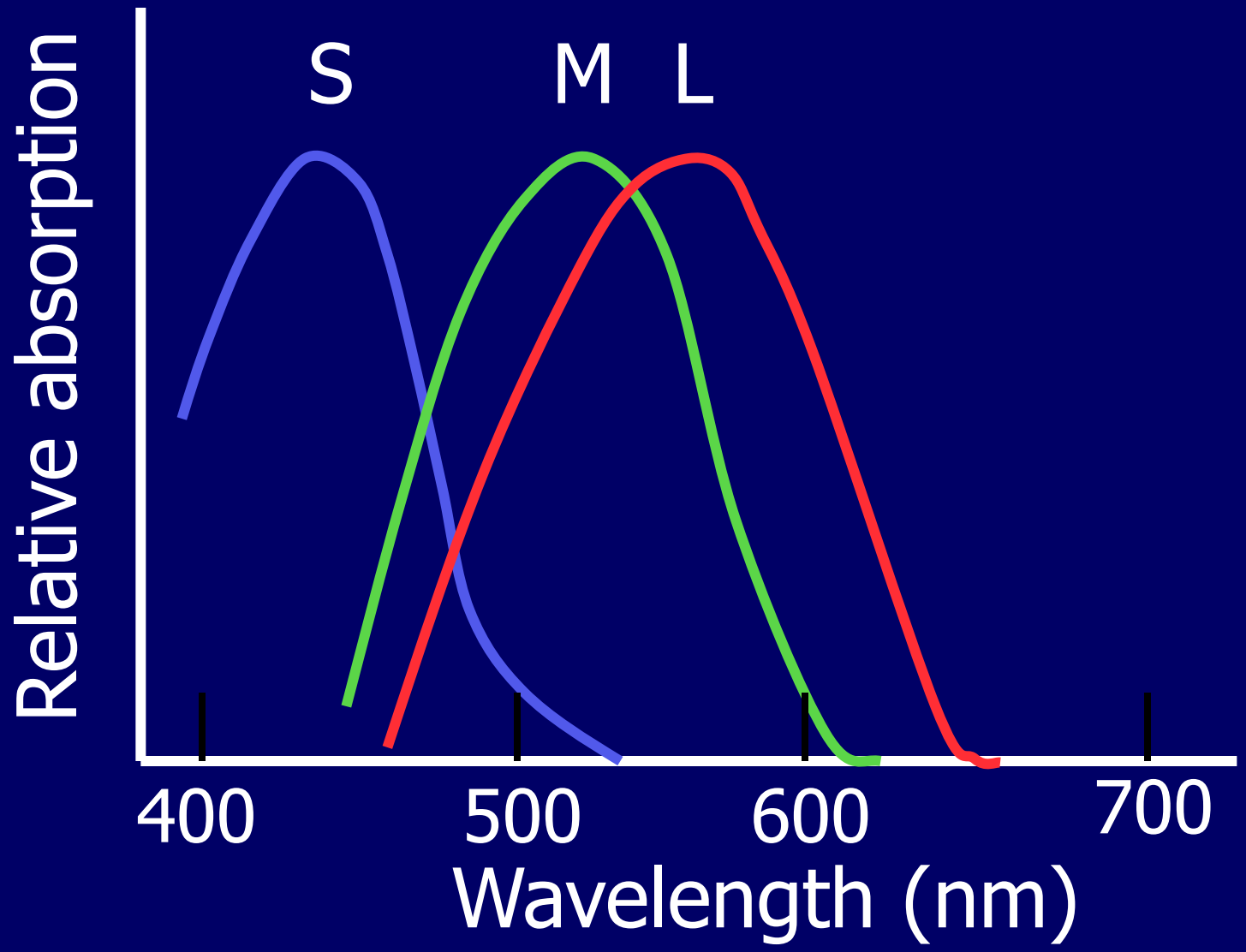
Photopic vision (CONES)

Helmholtz ..1860:

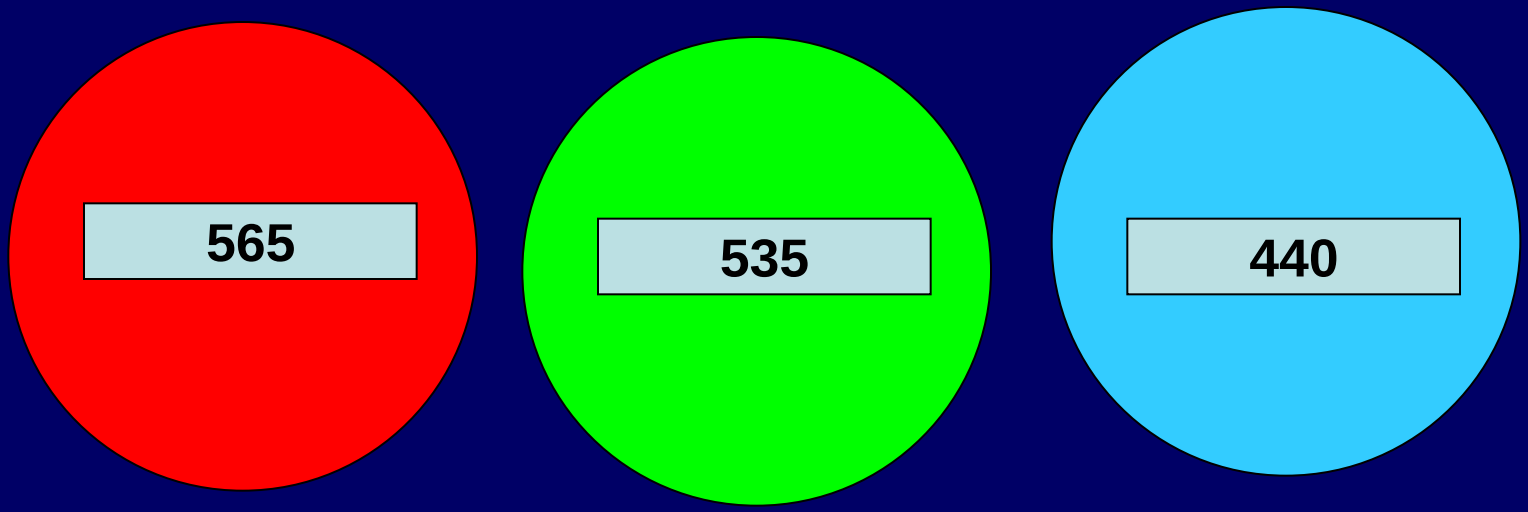
The three primary colors are perceived by three photoreceptor pigments (with broad absorption curves)

Cone wavelength ranges



Photopic vision (CONES)

Cone pigments: three kinds



Photopic vision

Young Helmholtz theory

Color vision is subserved by

three types of cones, each containing a photoreceptor pigment most sensitive to one primary color

1. Cones (contain red-sensitive pigment)
2. Cones (contain green-sensitive pigment)
3. Cones (contain blue-sensitive pigment)

COLOUR VISION

- Colour vision is cone-mediated function
- explained by Trichromatic Theory):
- There are 3 types of cones; according to their sensitivity to a certain light wavelength:

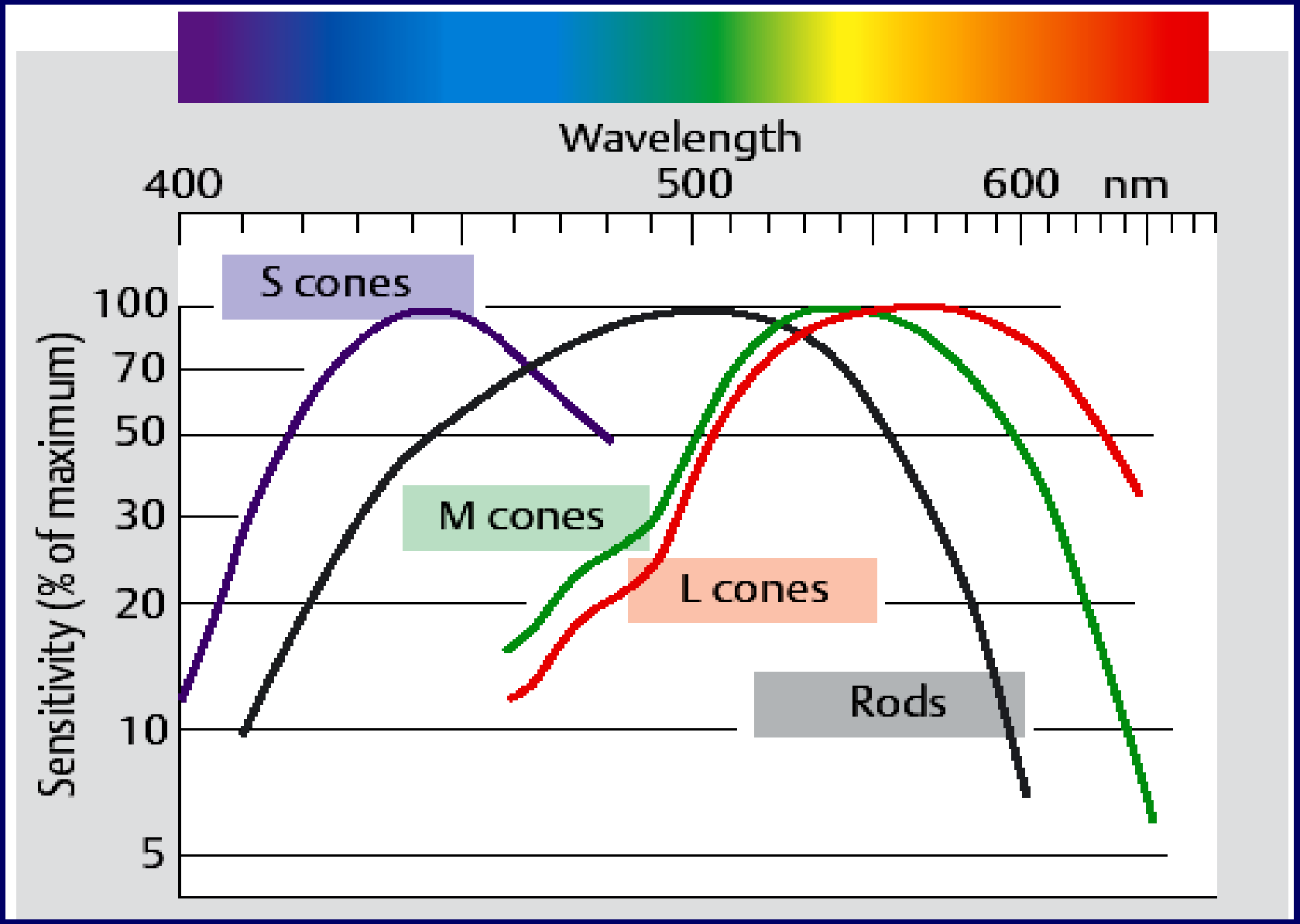
➢ S-cones most sensitive (maximally absorb & respond optimally) to short wavelength (peak absorption at 420nm; perception of blue,

➢

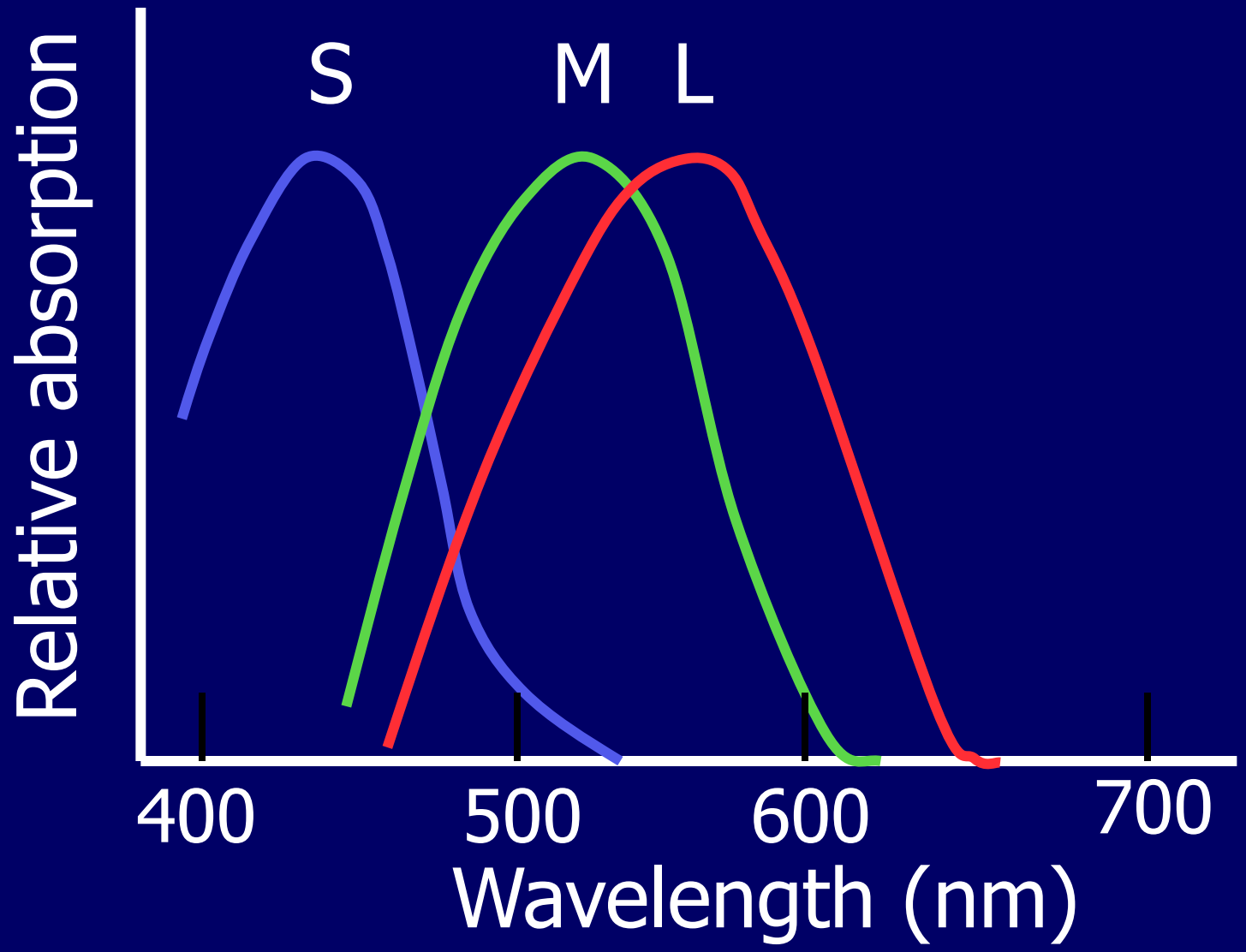
- **M-cones most sensitive to medium wavelength (530nm; perception of green, greatest in central fovea)**

- **L-cones most sensitive to long wavelength (560nm, perception of red)**

Colour-sensitive Cones



Cone wavelength ranges



Photopic vision

Sensation of any color determined by:

a-wavelength of light

b-amount of light absorbed by each type of cones

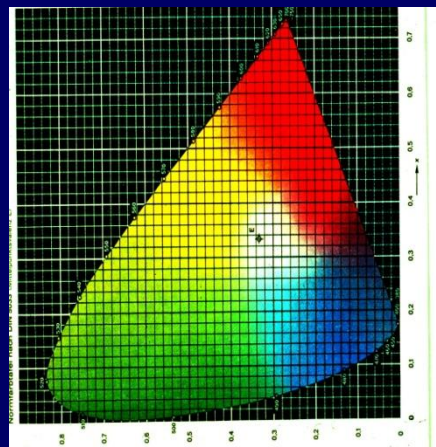
c-frequency of impulses from each cone system to ganglion cells which is determined by wave length of light.

Photopic vision

perception of white is due to:
equal stimulation of

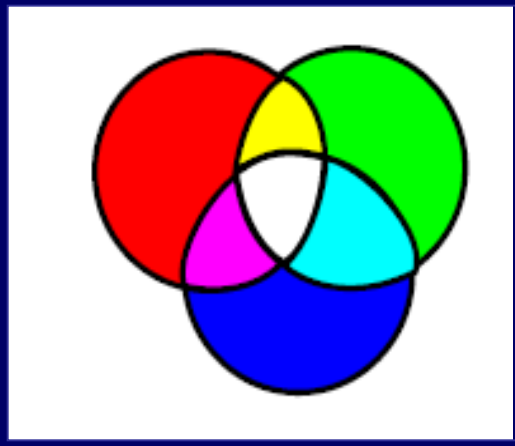
blue & red & green cones.

(white is a combination of all wave lengths)



COLOUR VISION

- **Although each type of cones is stimulated maximally by a certain wavelength but still can be stimulated by other but at a less degree**
- **When red & green cones are stimulated equally, one sees yellow**
- **When all 3 types are equally stimulated →perception of white**



Color Blindness

Weakness or total blindness in detecting a primary color:

Definitions:

1. Trichromats: see the 3 colors
2. Dichromats: blind to one color
3. Monochromats: have no color pigment

Color Blindness -cont.

- Prot …… Red
- Deuter …. Green
- Trit …… Blue
- Anamoly …weakness

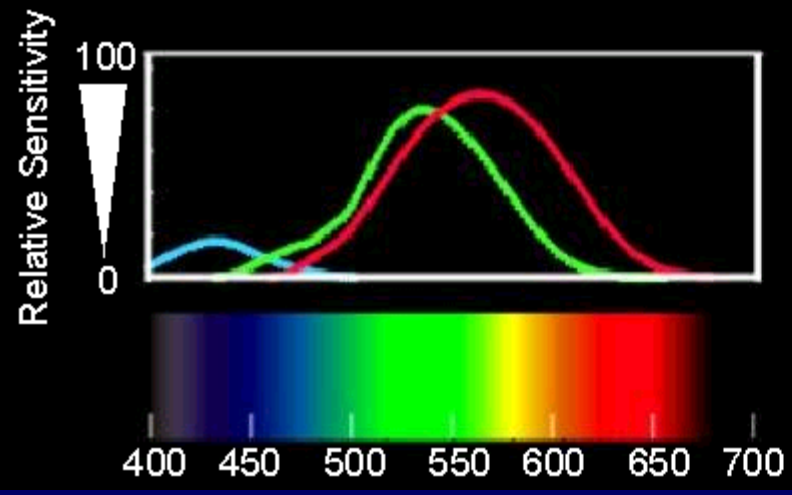
- Protanamoly
- Deuteranamoly
- Tritanamoly

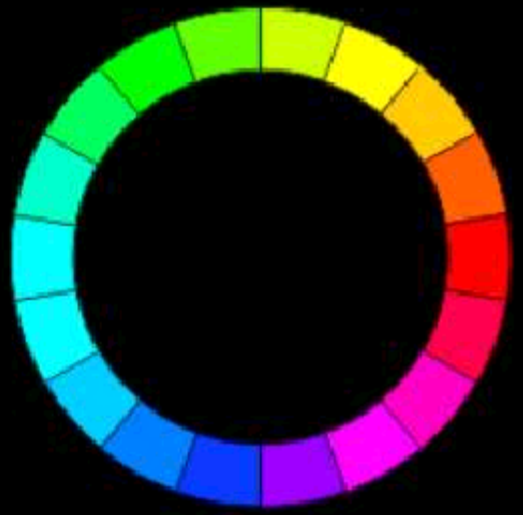
Color Blindness -cont.

- Anamoly …weakness
- Anopia …. Total loss

- Protanopia
- Deuteranopia
- Tritanopia

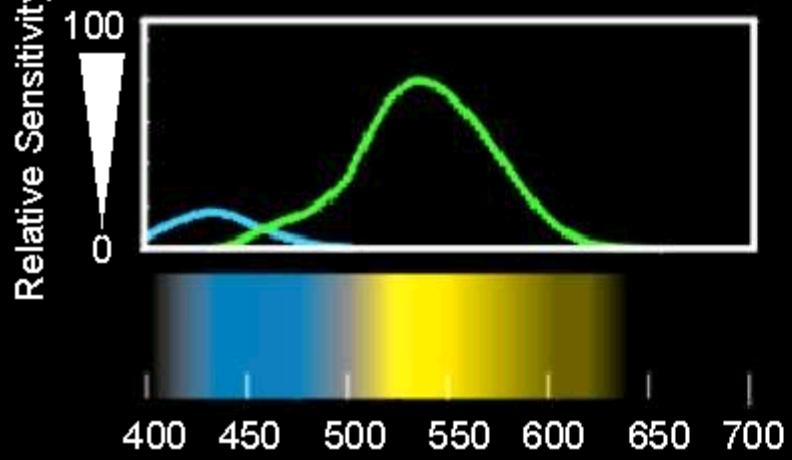
Trichromatic Vision

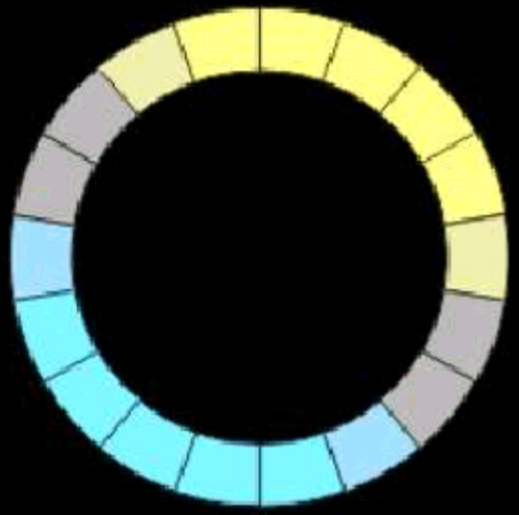




Dichromatic Vision

Protanope – severe red/green color deficiency





atic color vision

Color Blindness -cont.

- Prevalence:

  males ……..8%

  females …. 0.4%

Inheritance:

THANK YOU