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TECHNOLOGIECAMPUS GENT

LIGHT&LIGHTING LABORATORY

HELDERHEID VAN LICHT: ENKELE VERHELDERENDE INZICHTEN

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ESAT/Light&Lighting Laboratory, KU Leuven, BE

Mini-symposium RWS n.a.v. 40 jaar dienst Willem Zandvliet
Amsterdam, 7 januari 2020

Waarom?

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Why is it important to predict brightness?
Safety, readability, visibility, comfort, glare

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Safety, readability, visibility, comfort, glare

Night

Day

Hoe?

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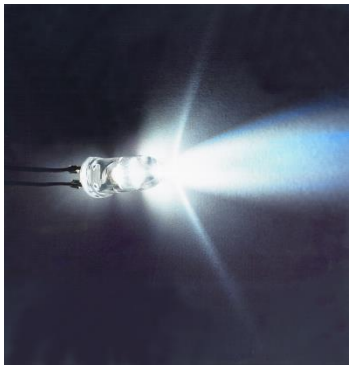
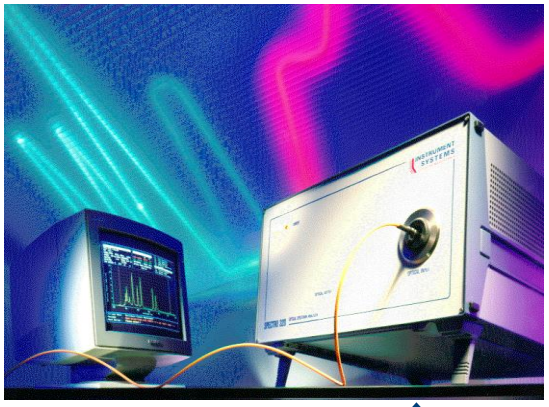
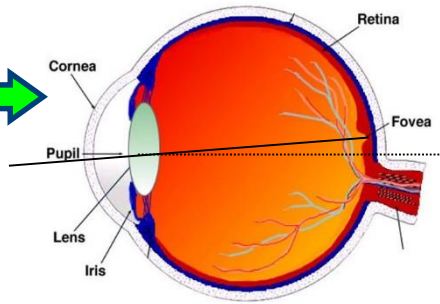
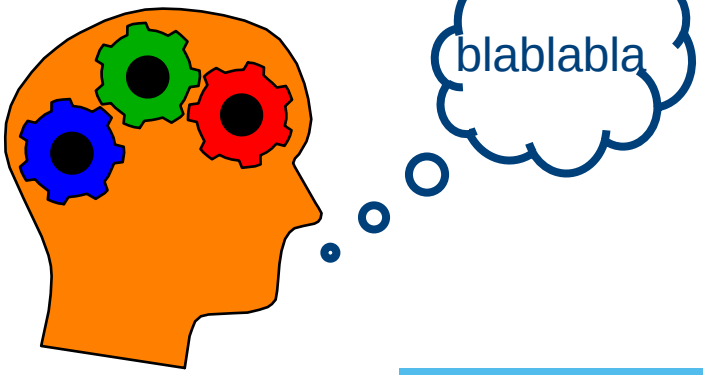
How?
Optical versus observer

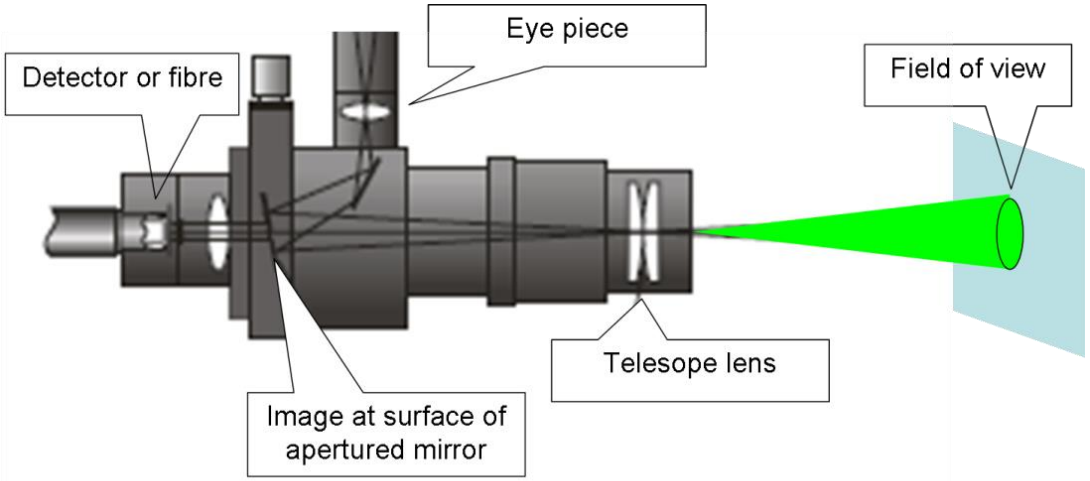




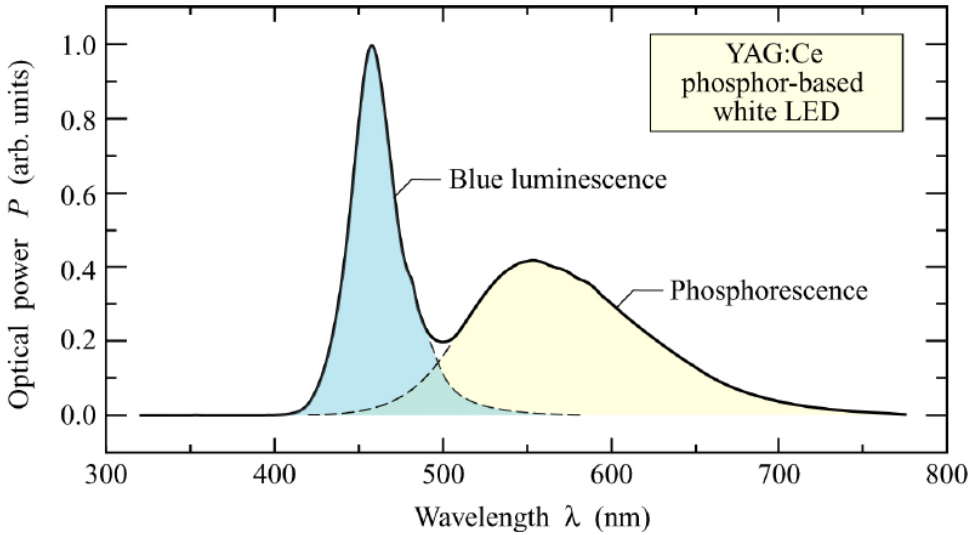




How?
Optical versus observer

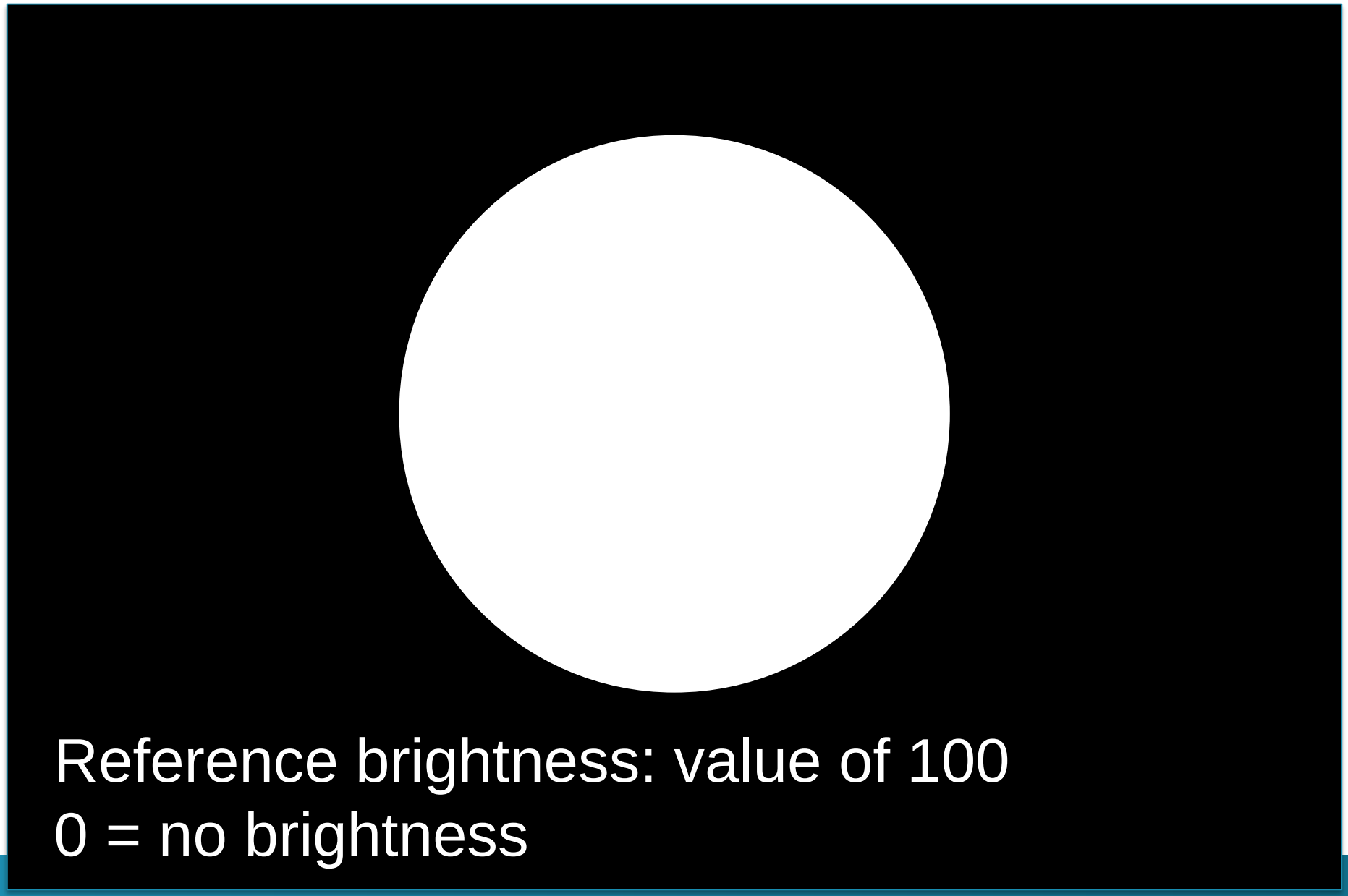


$L_{e,\lambda}(\lambda)$



Spectral radiance

Luminance (cd/m^2)


Reference brightness: value of 100
0 = no brightness


Brightness?

Maar . . .

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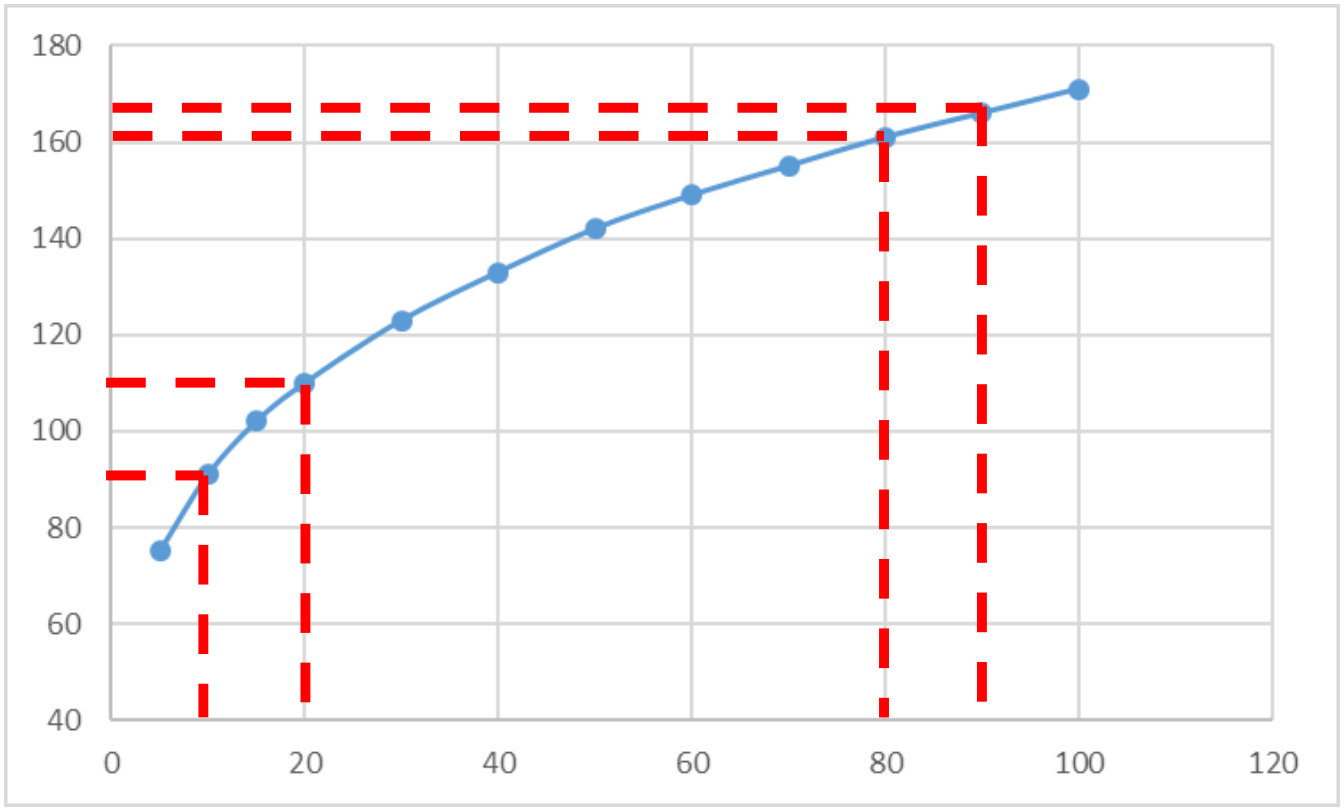
Brightness and luminance are not linear



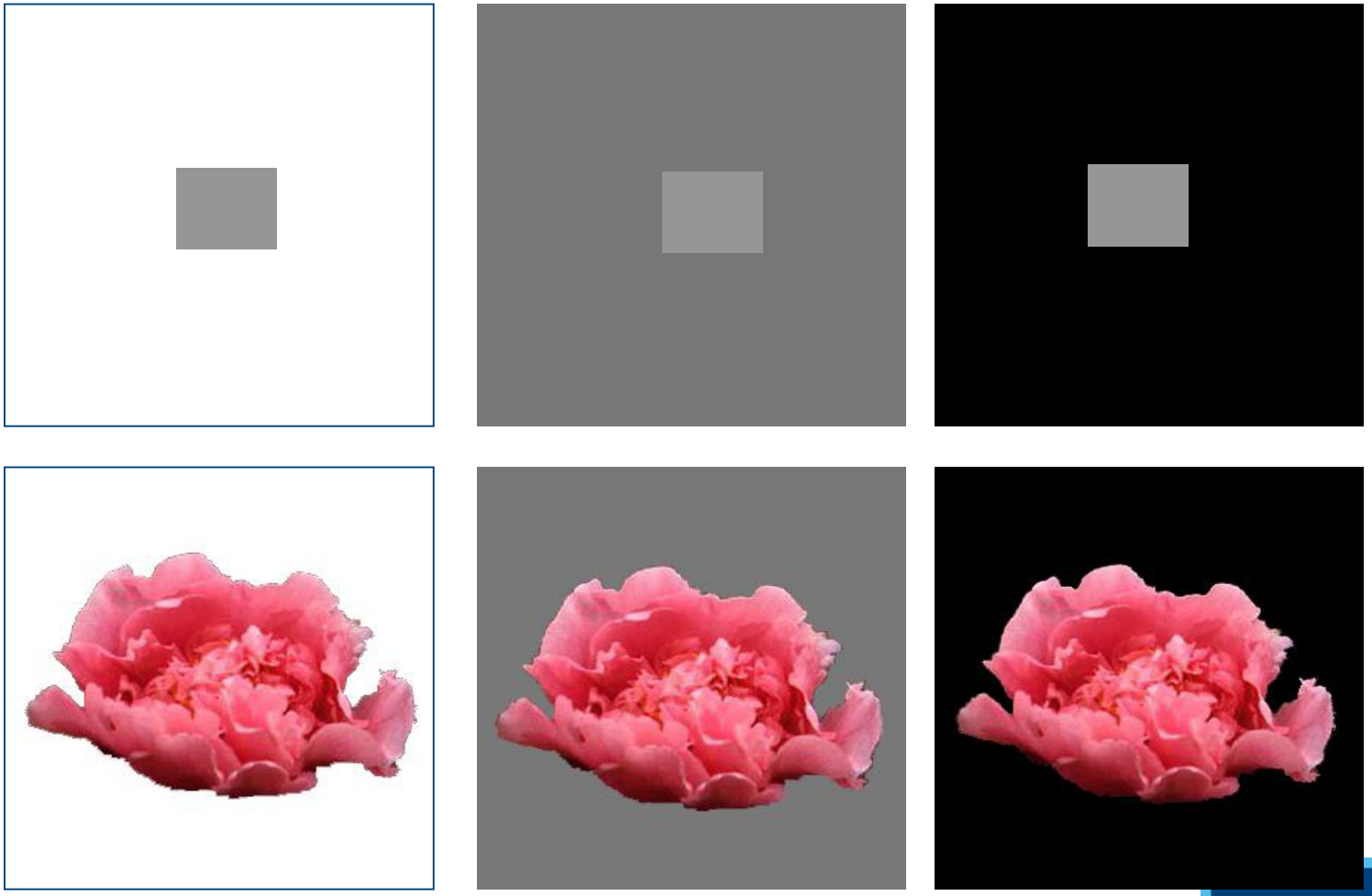
Brightness also depends on colour and saturation

60 cd/m²

218 cd/m²

Brightness of stimulus also depends on background

L= 5 cd/m^2 L= 5 cd/m^2 L= 5 cd/m^2



Brightness of stimulus also depends on background

Daarom: een nieuw *Colour Appearance Model (CAM18sl)*

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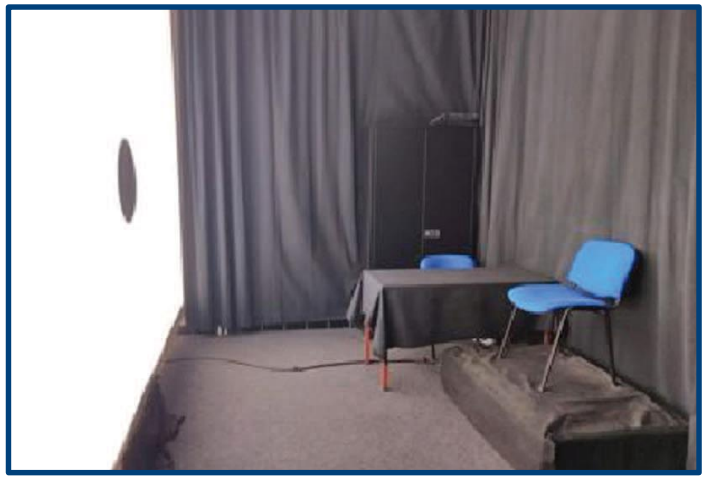

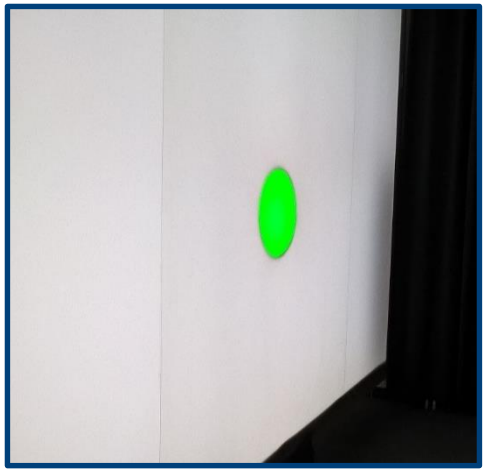

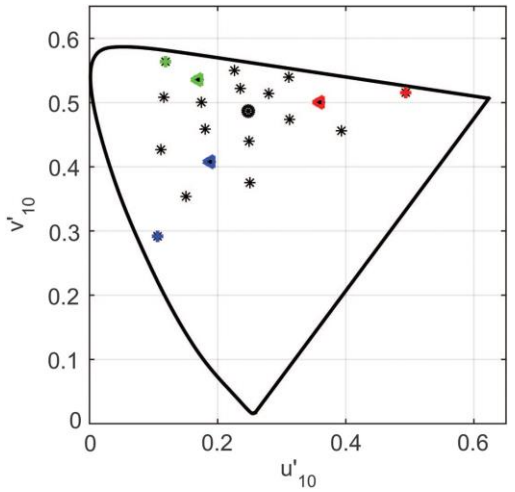

Background:

- L_{10} = 0 to 500 cd/m^2 (5 levels)
- CCT= 3880 K fixed
- 100° x 70° FOV

Stimulus:

- L_{10} = 50 to 300 cd/m^2
- 21 chromaticity values
- 10° FOV

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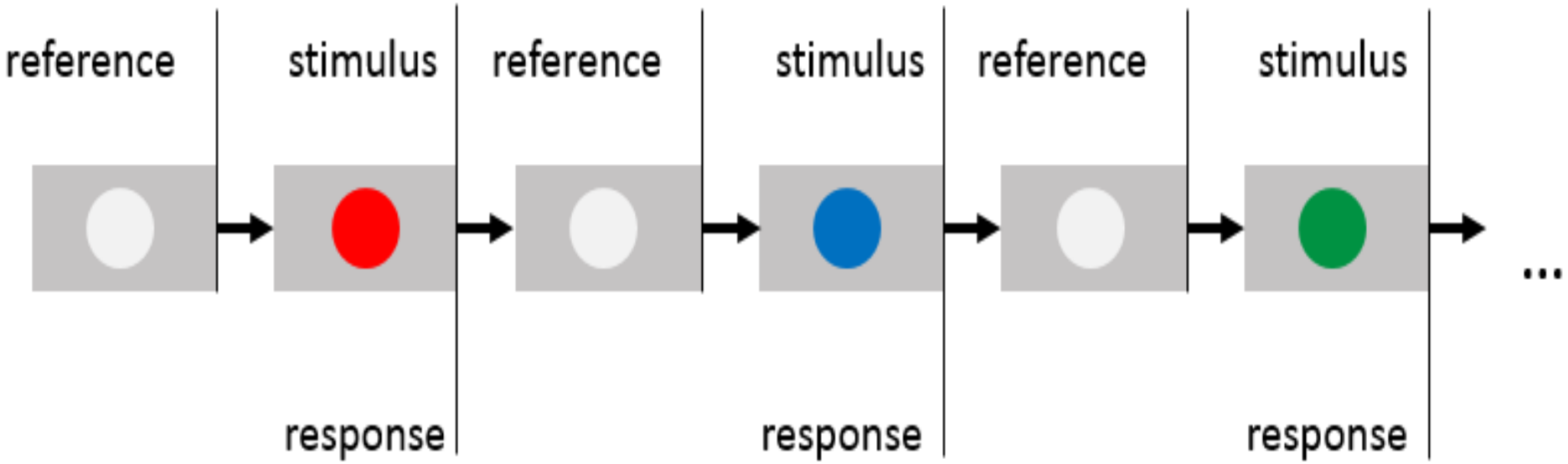
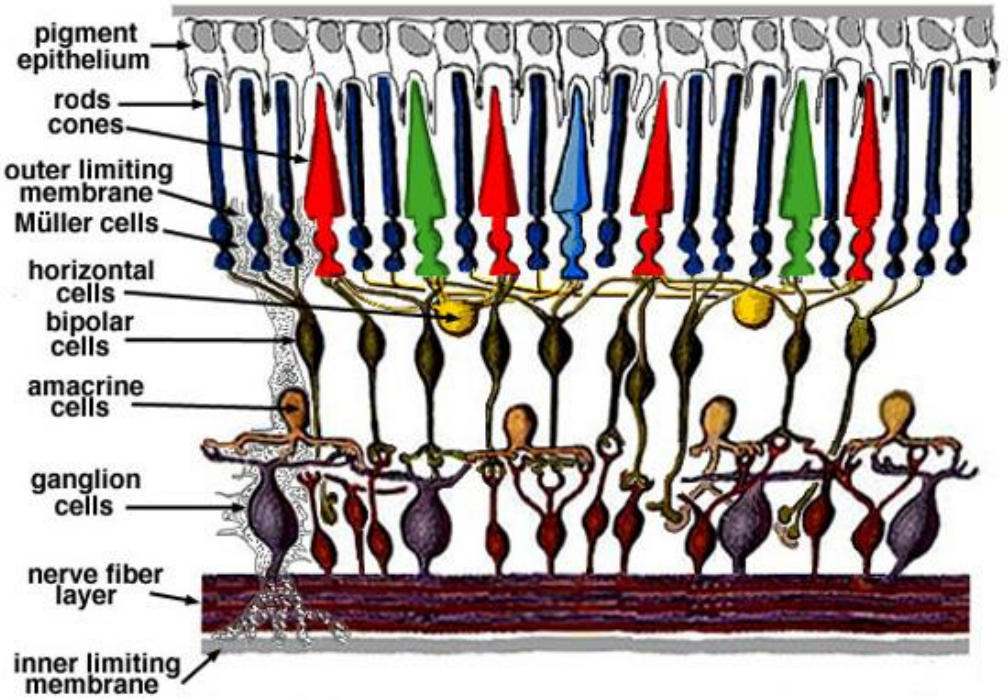
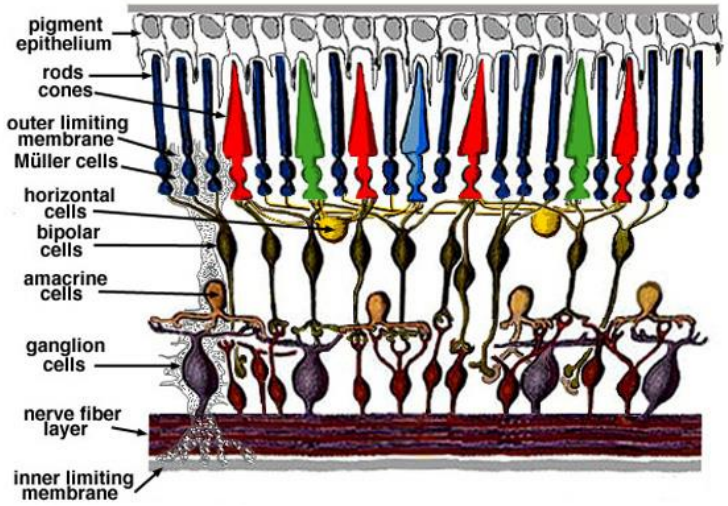
Brightness estimation

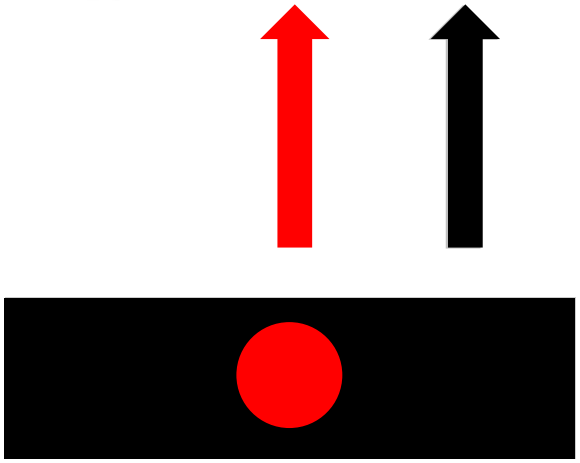
Reference stimulus presented (15 s) followed by the actual stimulus (15 s)



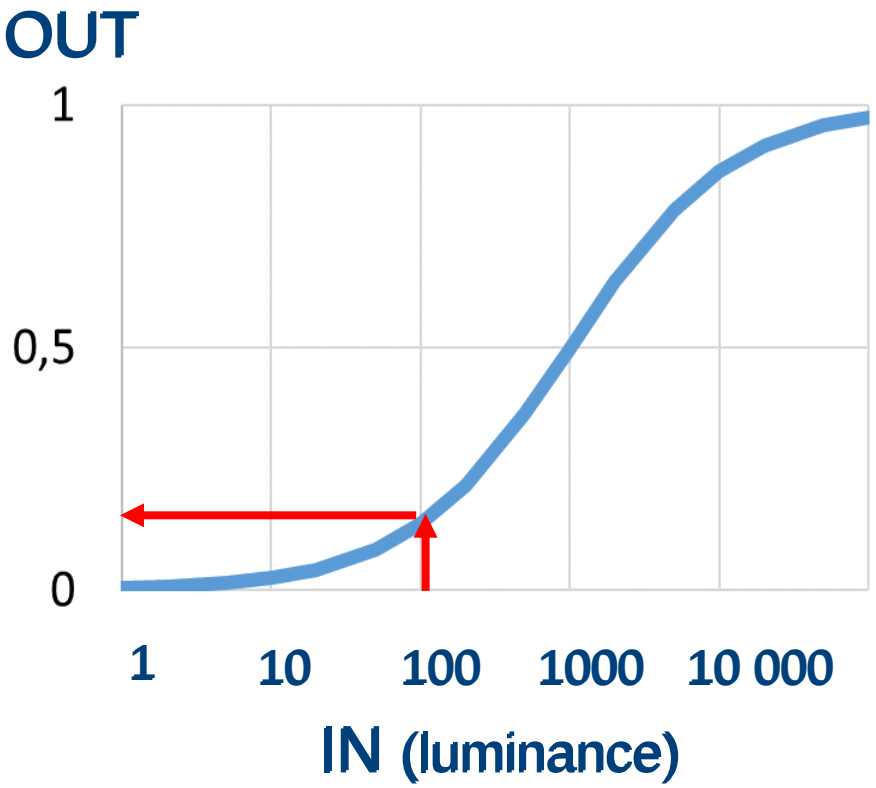
Colour Appearance Models (CAM) are mimicking some processes in the retina





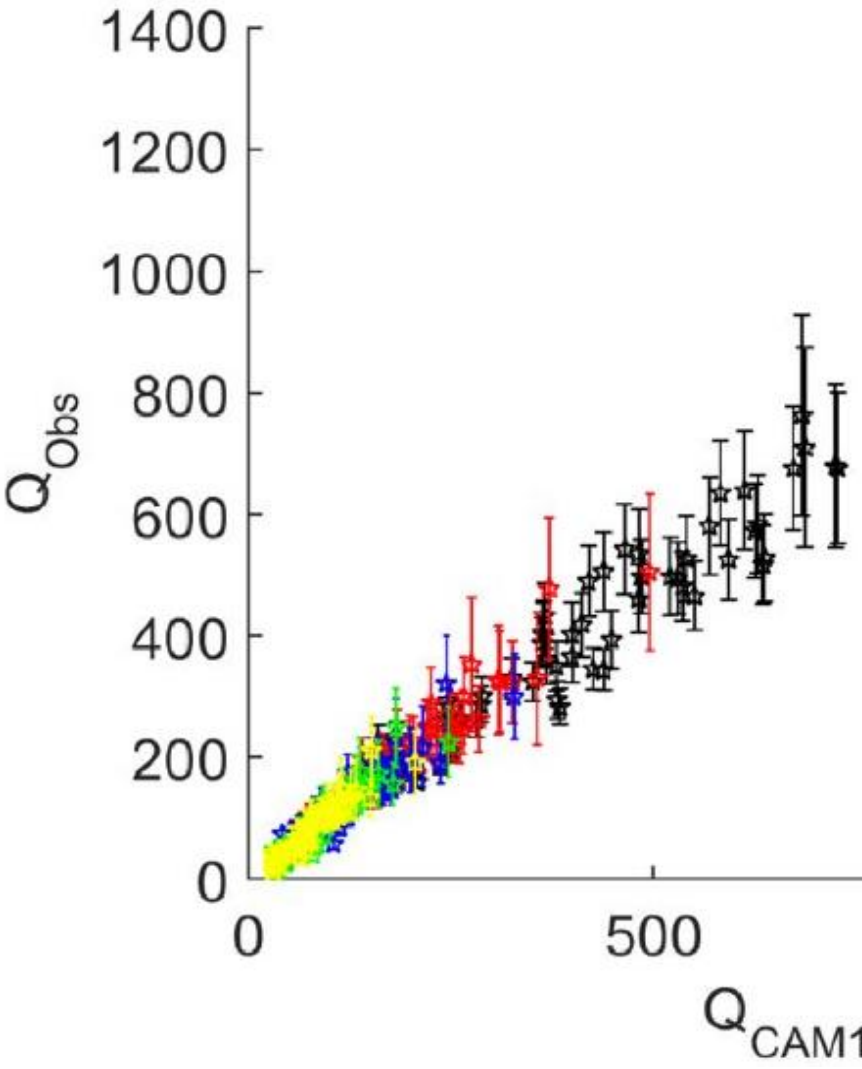


IN



$$I_a = g.\frac{I^n}{I^n + \sigma^n}$$

A new CAM
Performance CAM18sl



L_b [cd/m²]	RMSE	R2	STRESS
0 (black)	51	0.93	0.11
50 (red)	25	0.93	0.11
150 (blue)	23	0.89	0.16
300 (green)	28	0.90	0.17
500 (yellow)	15	0.88	0.17

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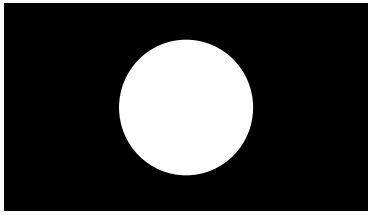
1 *bright* = the apparent brightness of a 10° spectral equal-energy self-luminous stimulus having a CIE 2006 10° luminance of 100 cd/m^2 and surrounded by a dark background of 0 cd/m^2.



Ls= 100 cd/m^2

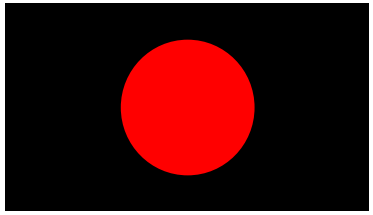
Lb= 0 cd/m^2

Q=1 bright

Ls= 100 cd/m^2

Lb= 300 cd/m^2

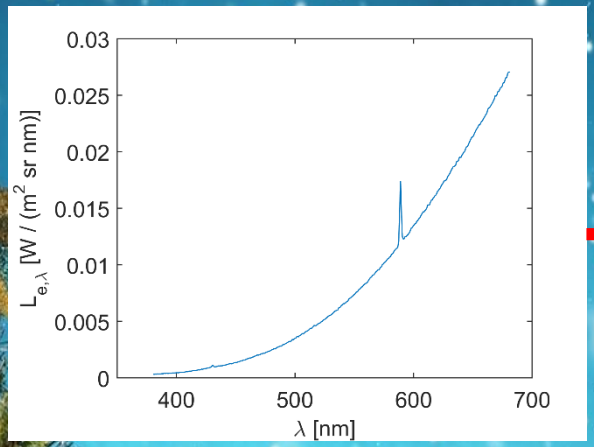
Q=0.29 bright



Ls= 100 cd/m^2

Lb= 0 cd/m^2

Q=3.68 bright



$CAM18_{sl}$

Q = 2.5 bright

L_B = 150 cd/m^2

$CAM18_{sl}$

Q = 1.4 bright

Night

Day

HELDERHEID VAN LICHT:

***HOPELIJK* ENKELE VERHELDERENDE INZICHTEN**

Dank voor uitnodiging

Dank voor luisterbereidheid

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