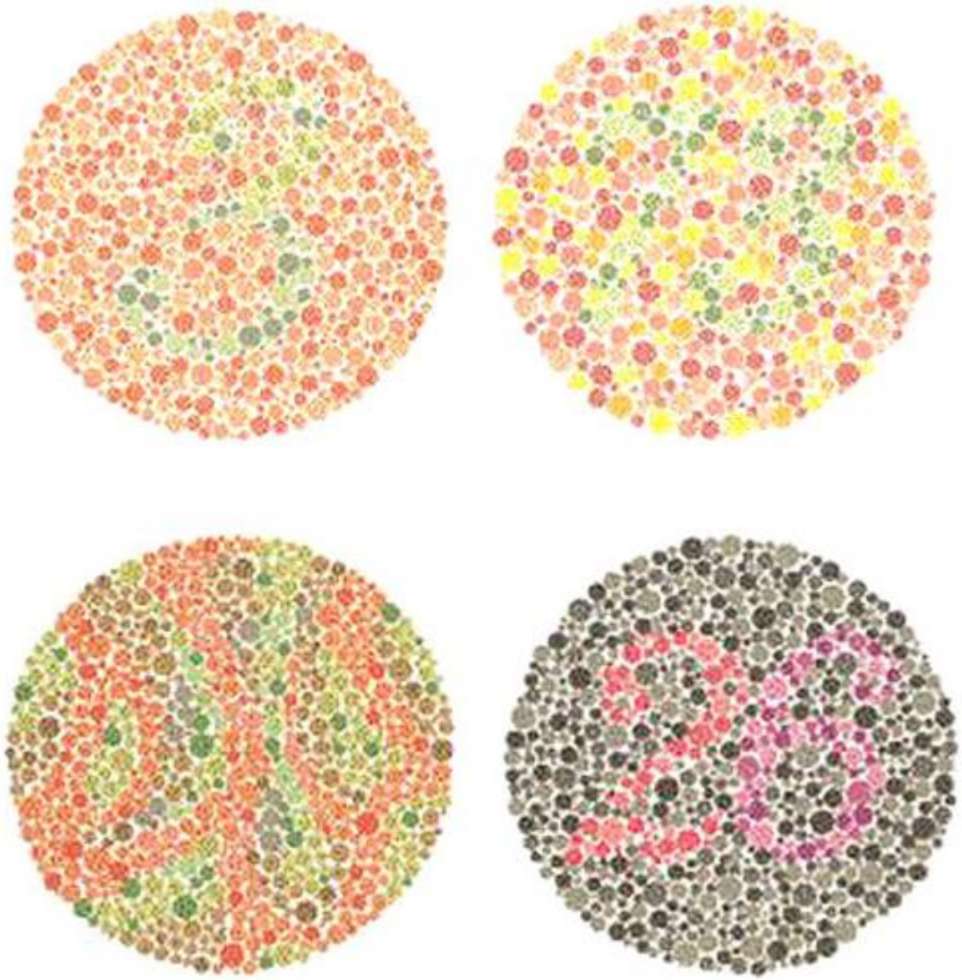
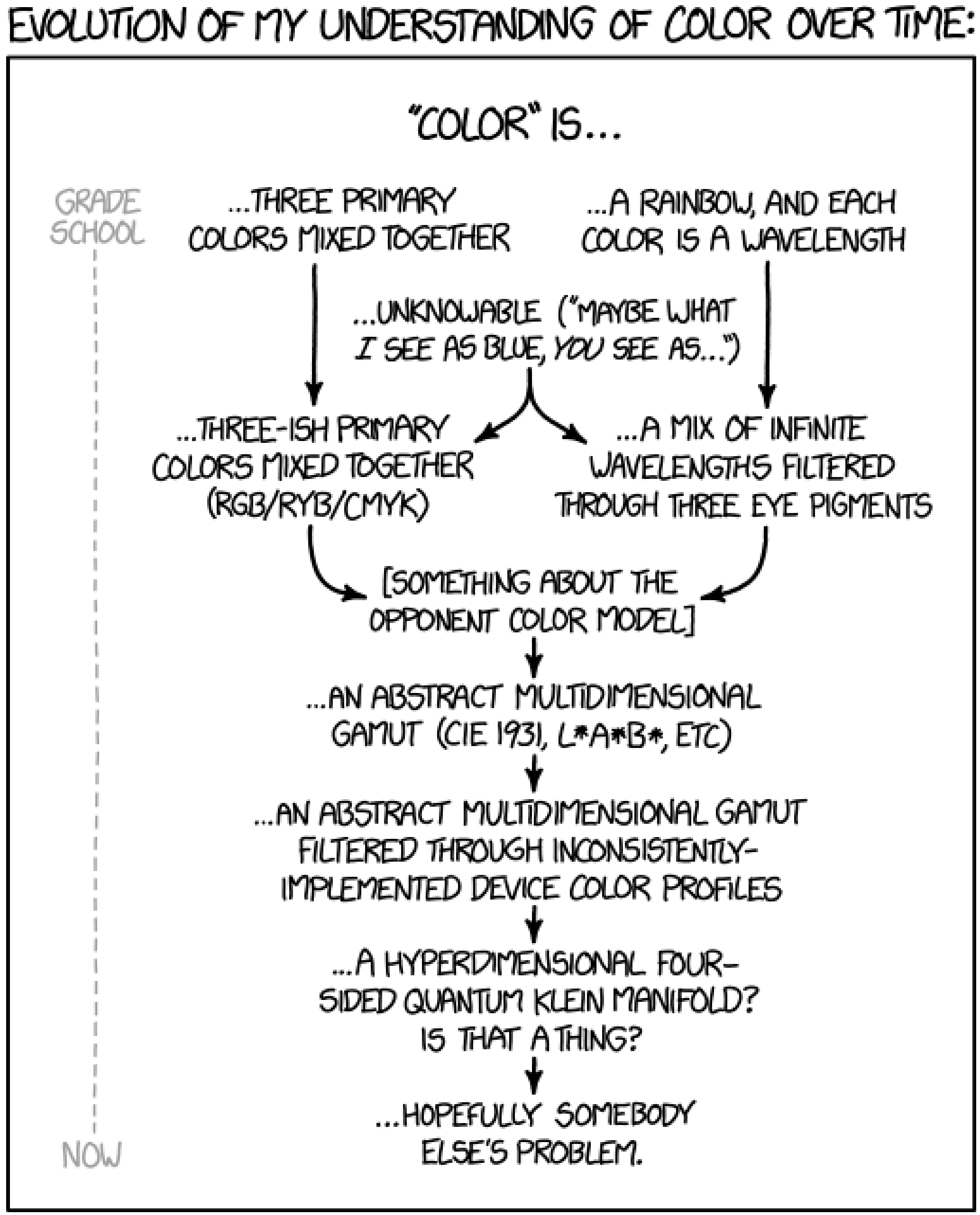
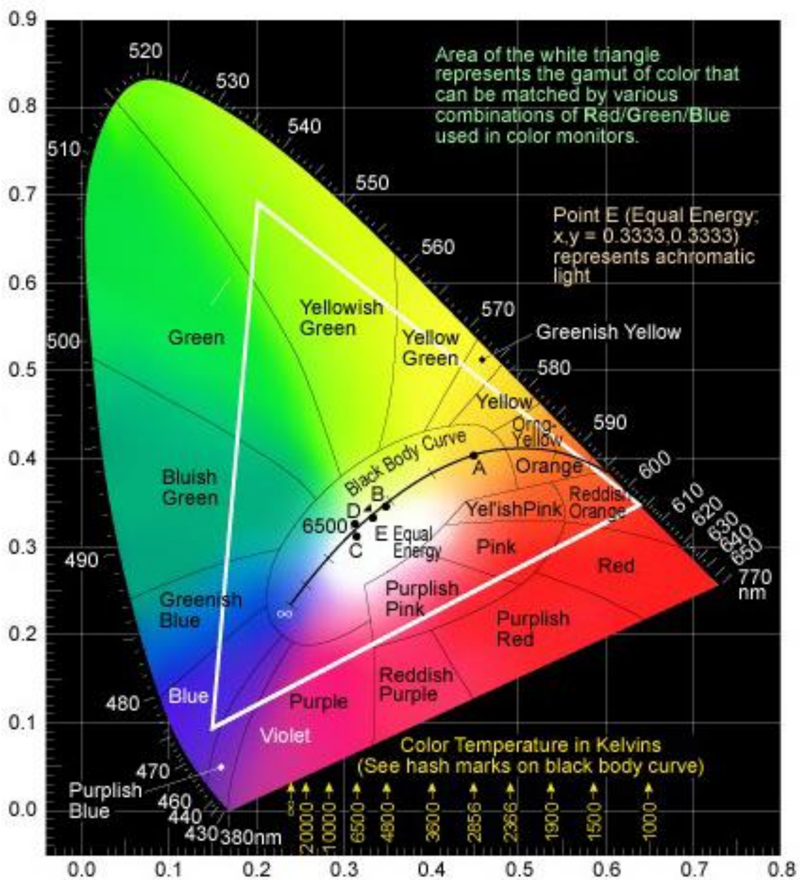


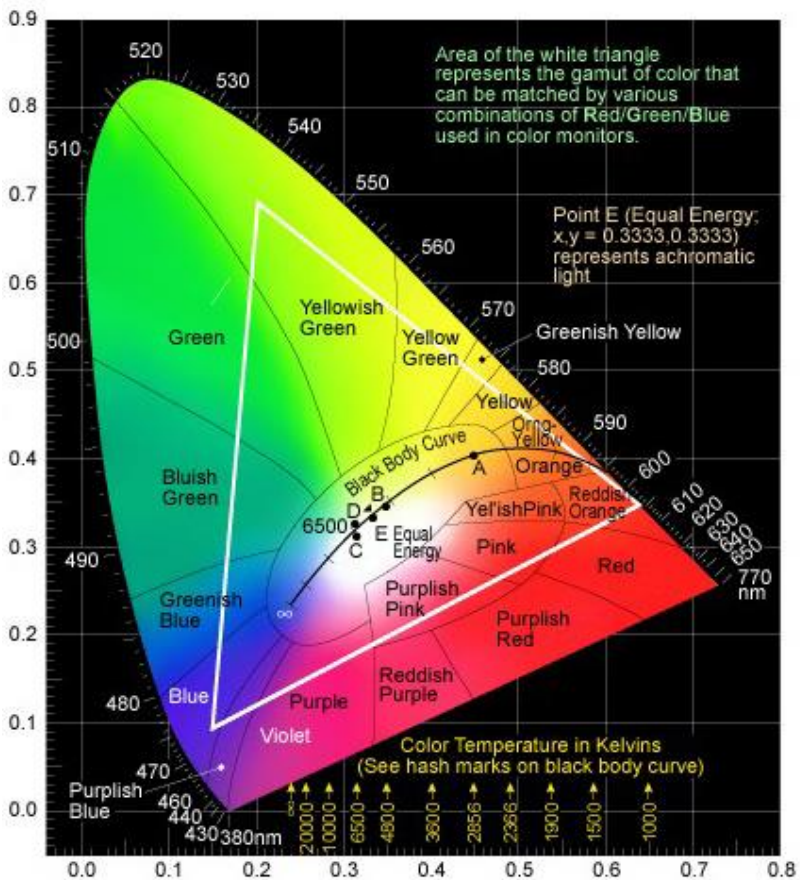

EVOLUTION OF MY UNDERSTANDING OF COLOR OVER TIME:
"COLOR" IS...
GRADE SCHOOL
...THREE PRIMARY COLORS MIXED TOGETHER
...A RAINBOW, AND EACH COLOR IS A WAVELENGTH
...UNKNOWABLE ("MAYBE WHAT I SEE AS BLUE, YOU SEE AS...")
...THREE-ISH PRIMARY COLORS MIXED TOGETHER (RGB/RYB/CMYK)
...A MIX OF INFINITE WAVELENGTHS FILTERED THROUGH THREE EYE PIGMENTS
[SOMETHING ABOUT THE OPPONENT COLOR MODEL]
...AN ABSTRACT MULTIDIMENSIONAL GAMUT (CIE 1931, L*A*B*, ETC)
...AN ABSTRACT MULTIDIMENSIONAL GAMUT FILTERED THROUGH INCONSISTENTLY-IMPLEMENTED DEVICE COLOR PROFILES
...A HYPERDIMENSIONAL FOUR-SIDED QUANTUM KLEIN MANIFOLD? IS THAT A THING?
...HOPEFULLY SOMEBODY ELSE'S PROBLEM.
NOW


400
500
600
700 nm


400
500
600
700 nm


Area of the white triangle represents the gamut of color that can be matched by various combinations of Red/Green/Blue used in color monitors.
Point E (Equal Energy; x,y = 0.3333,0.3333) represents achromatic light
Green
Yellowish Green
Yellow Green
Greenish Yellow
Yellow
Orng-Yellow
Orange
Reddish Orange
Bluish Green
Black Body Curve
Yel'ishPink
Pink
Red
Greenish Blue
Purplish Pink
Purplish Red
Blue
Purple
Reddish Purple
Violet
Purplish Blue
E Equal Energy
Color Temperature in Kelvins
(See hash marks on black body curve)
380nm
770 nm


400
500
600
700 nm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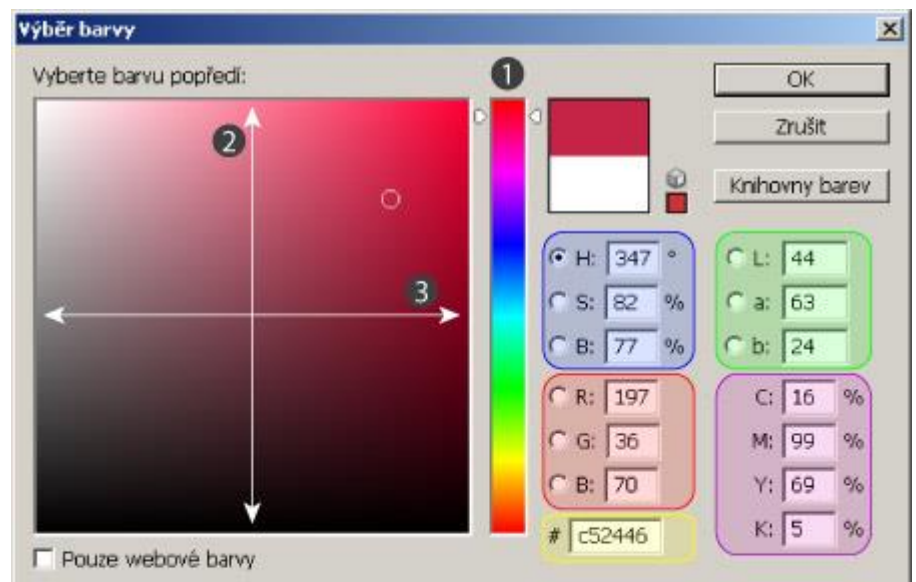
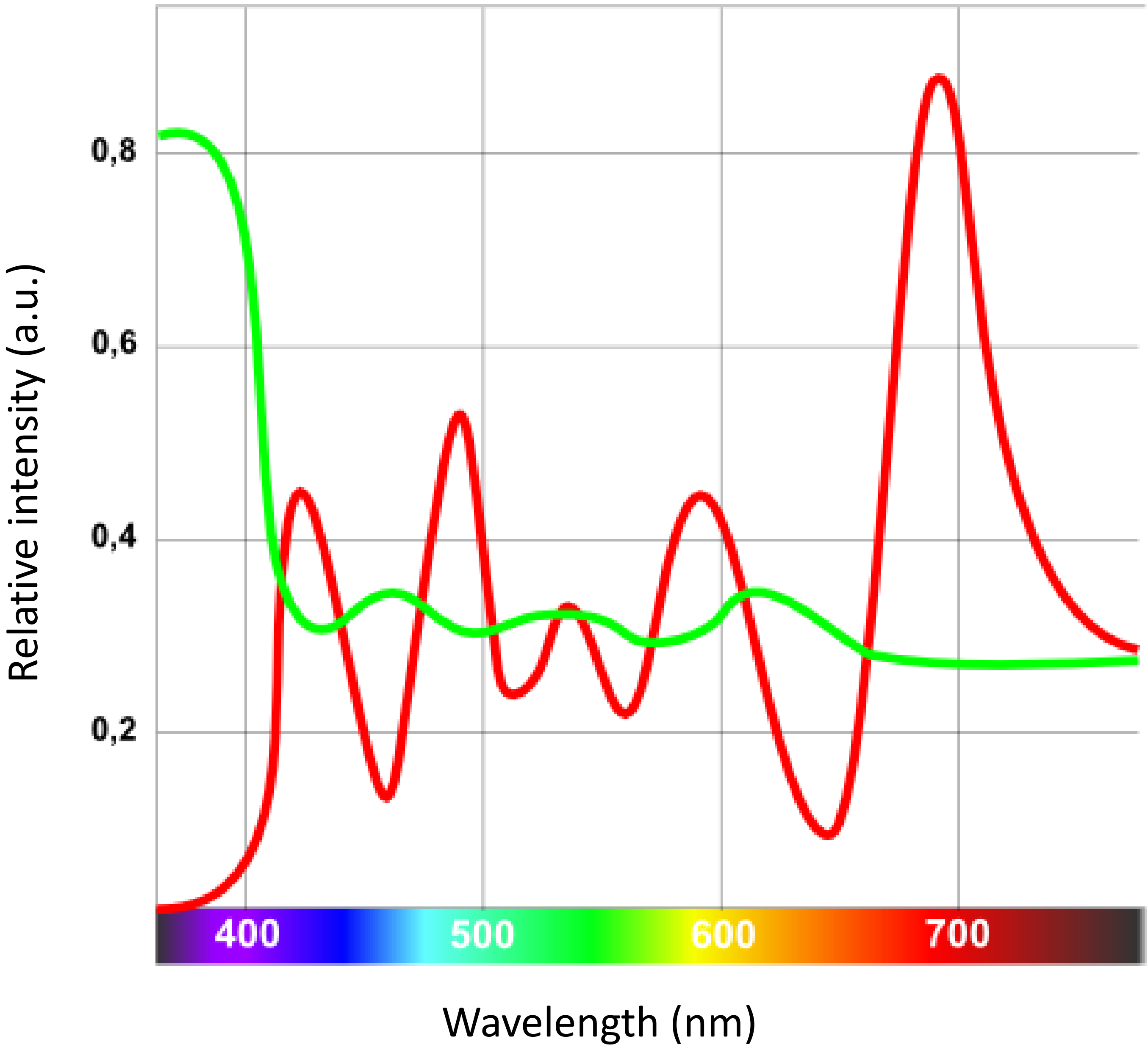
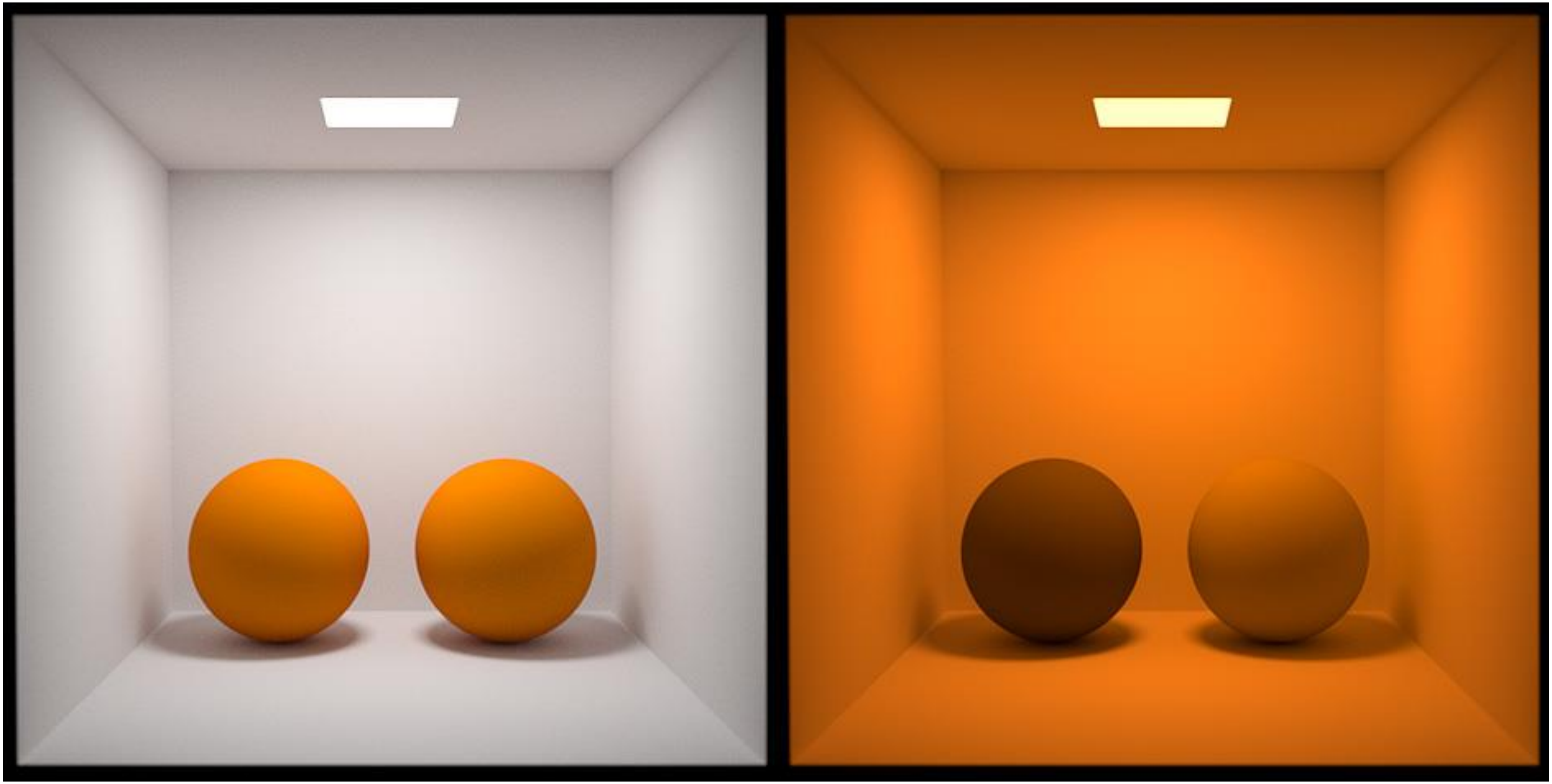
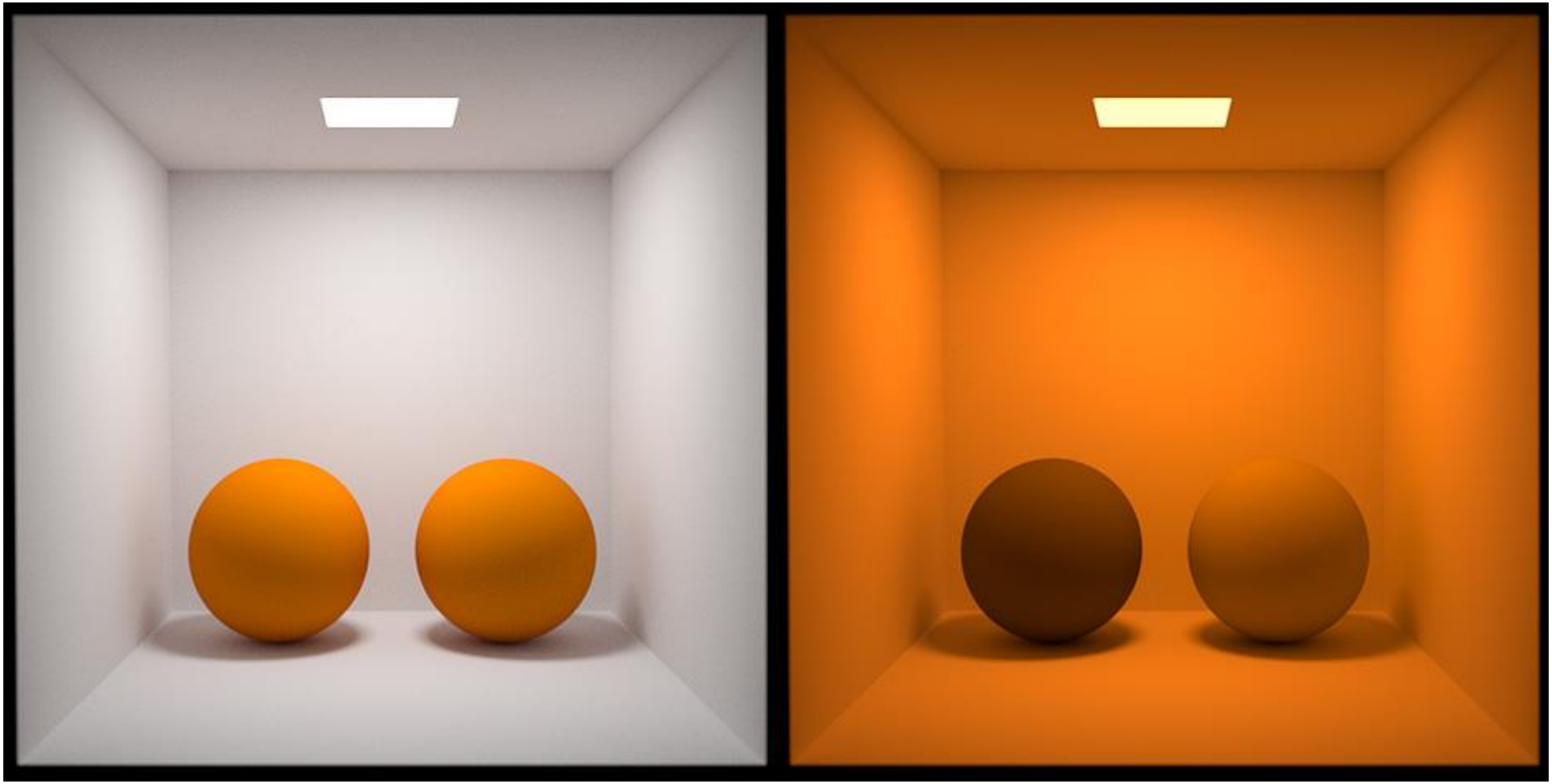
Green
Yellowish Green
Yellow Green
Greenish Yellow
Yellow
Orng-Yellow
Orange
Reddish Orange
Bluish Green
Black Body Curve
Yel'ishPink
Pink
Red
Greenish Blue
Purplish Pink
Purplish Red
Reddish Purple
Purple
Blue
Violet
Purplish Blue
E Equal Energy
6500
Color Temperature in Kelvins
(See hash marks on black body curve)
380nm
770 nm
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9

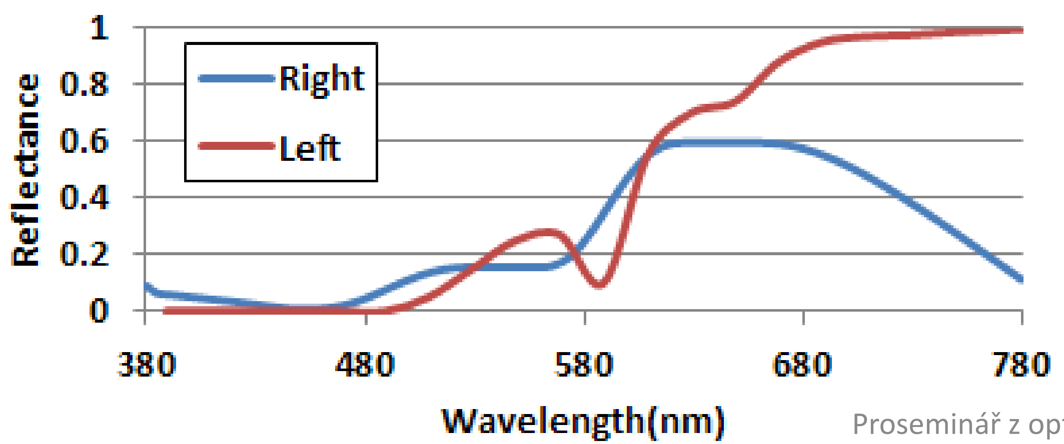

Výběr barvy
Vyberte barvu popředí:
OK
Zrušit
Knihovny barev
H: 347 °
S: 82 %
B: 77 %
L: 44
a: 63
b: 24
R: 197
G: 36
B: 70
C: 16 %
M: 99 %
Y: 69 %
K: 5 %
c52446
Pouze webové barvy

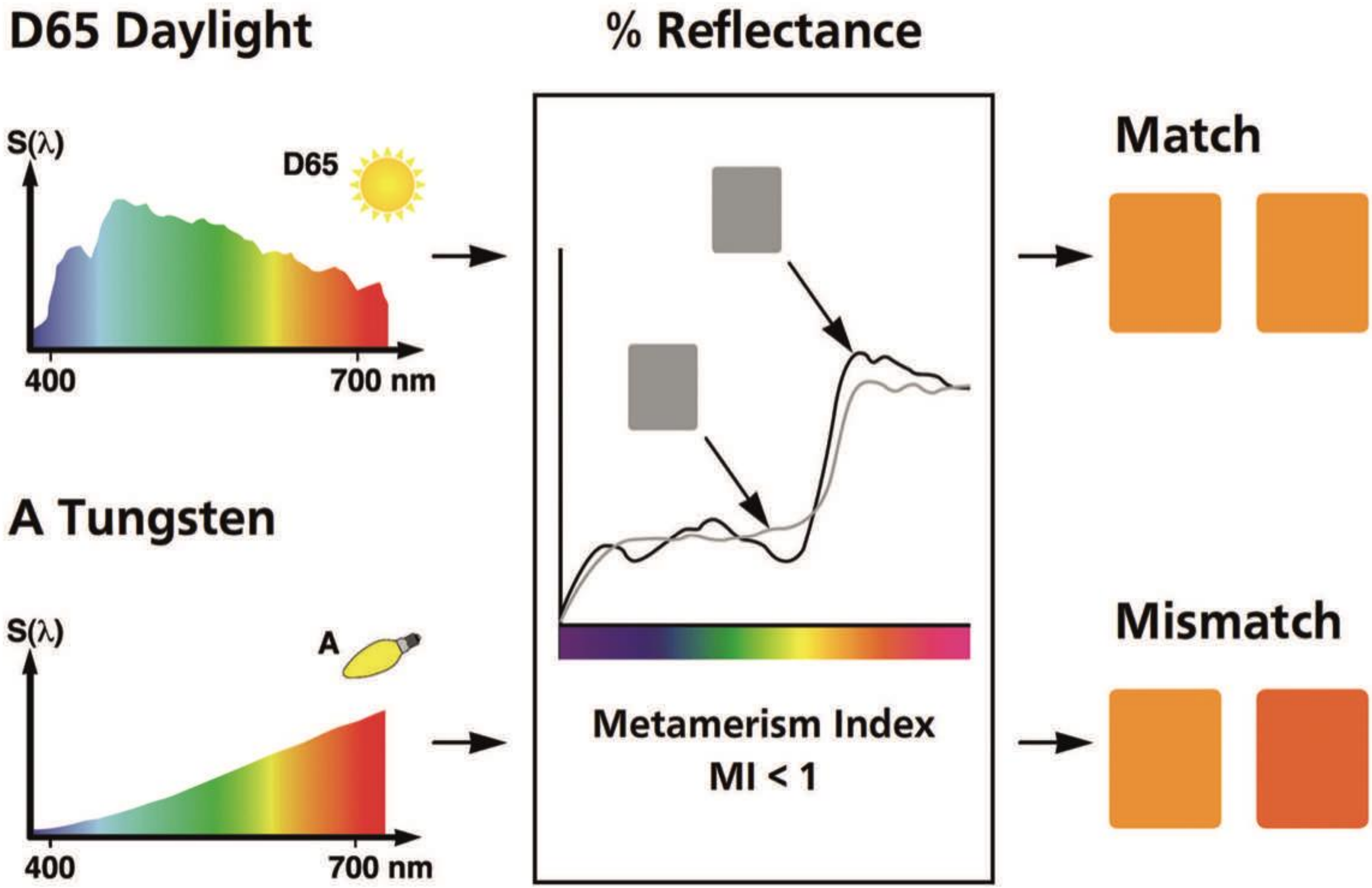


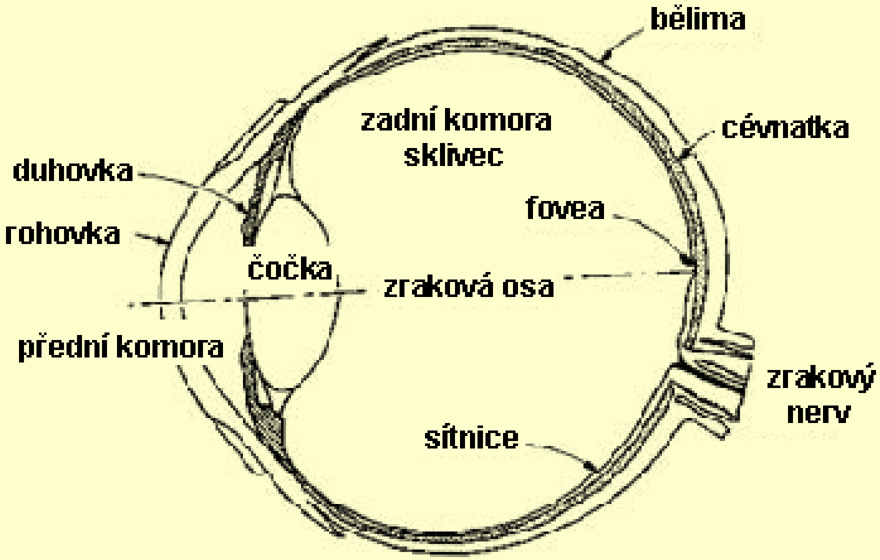
Relative intensity (a.u.)
0,8
0,6
0,4
0,2
400
500
600
700
Wavelength (nm)

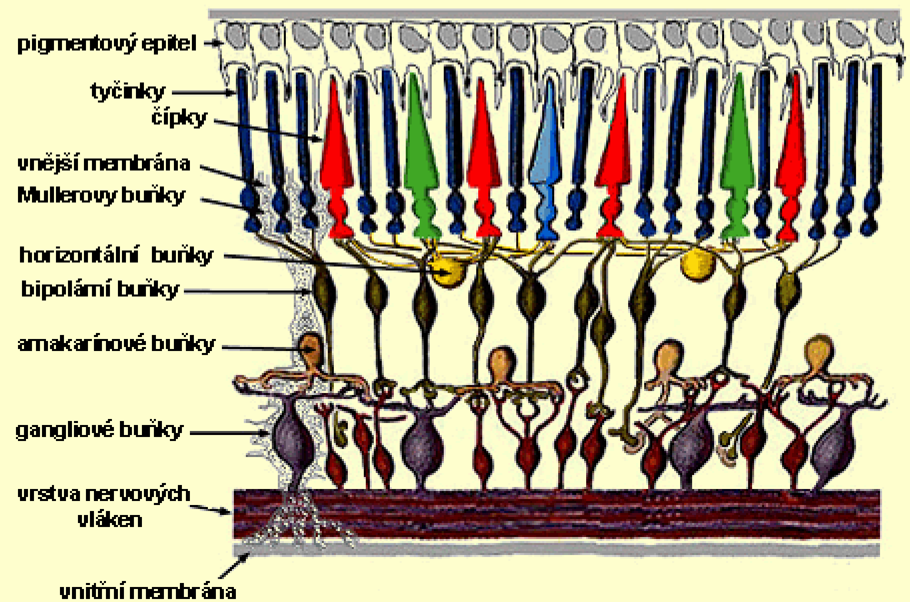


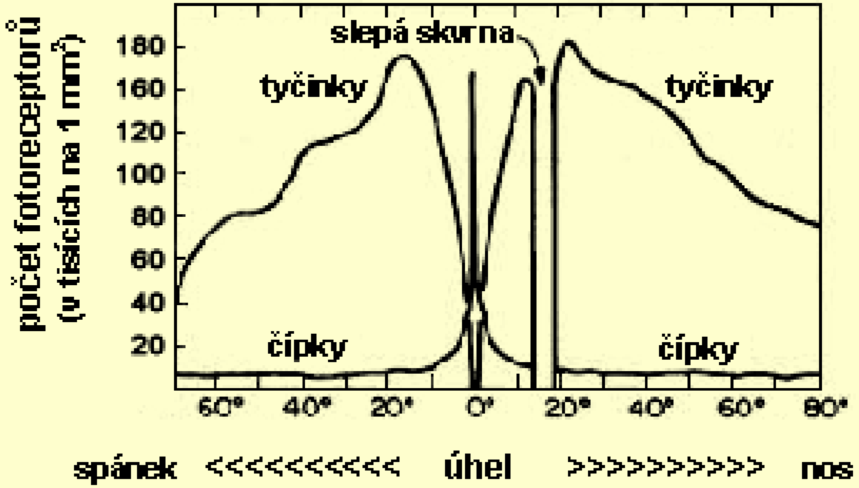


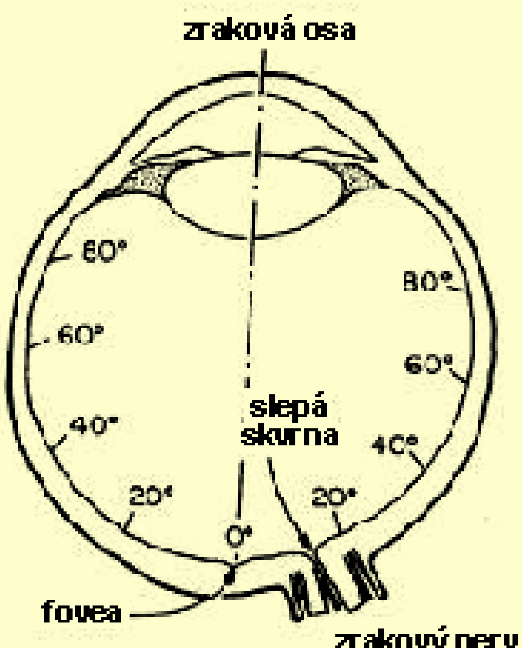

Right
Left
Reflectance
1
0.8
0.6
0.4
0.2
0
380
480
580
680
780
Wavelength(nm)

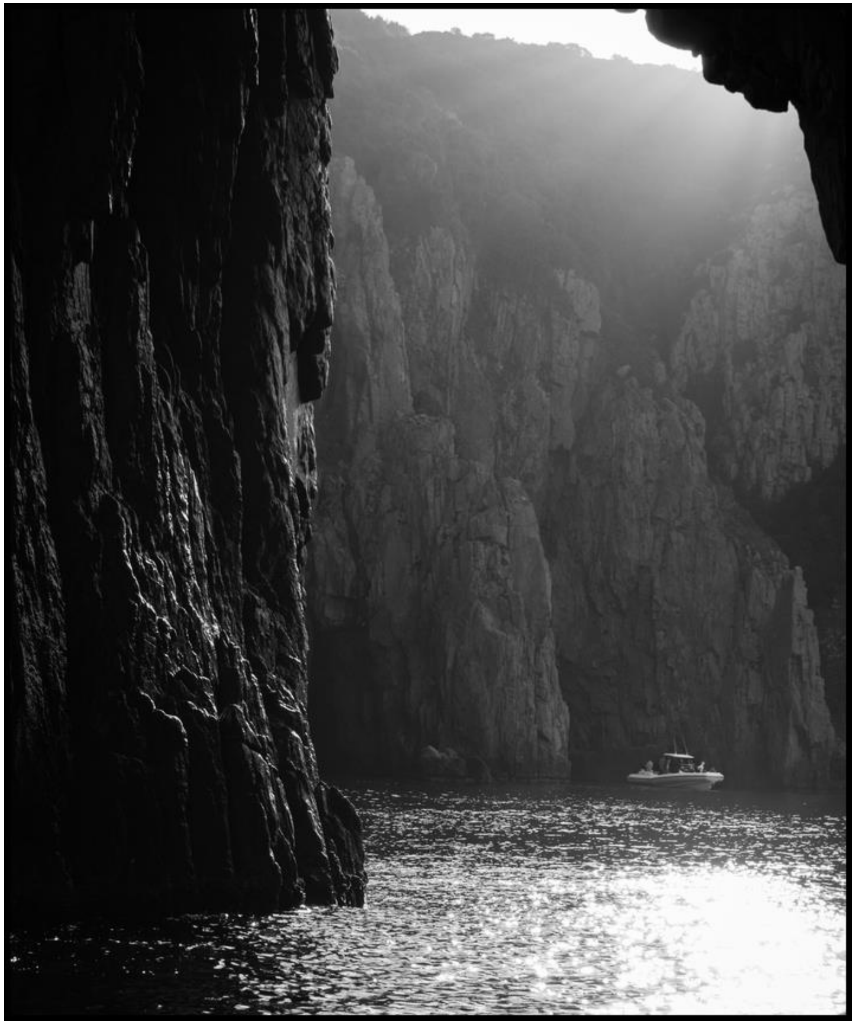

D65 Daylight
S(λ)
D65
400
700 nm
A Tungsten
S(λ)
A
400
700 nm
% Reflectance
Metamerism Index
MI < 1
Match
Mismatch

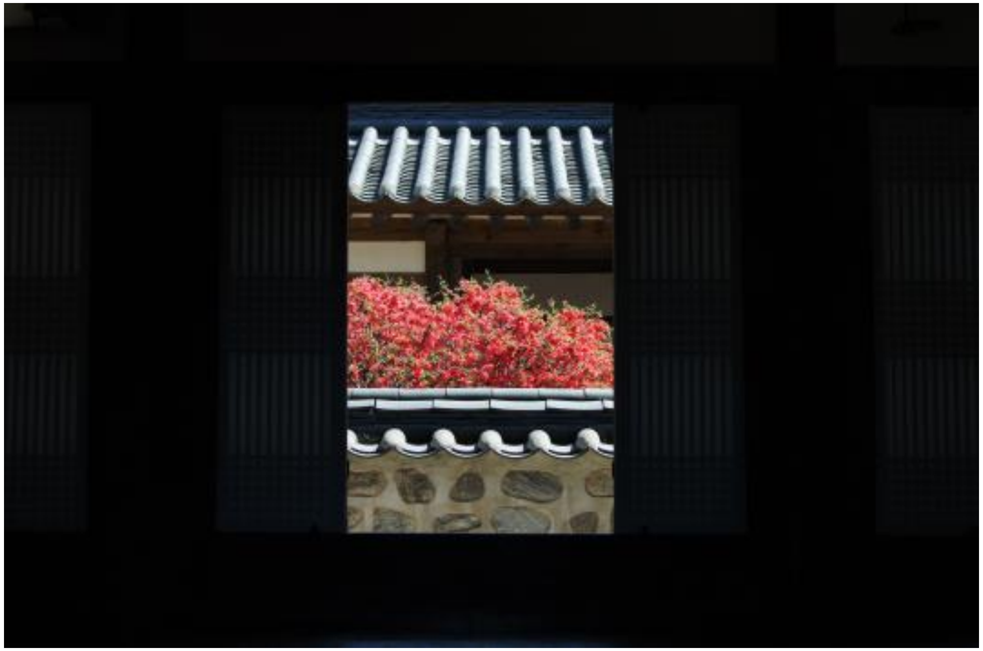

bělima
zadní komora
sklivec
cévnatka
duhovka
fovea
rohovka
čočka
zraková osa
přední komora
zrakový
nerv
sítnice

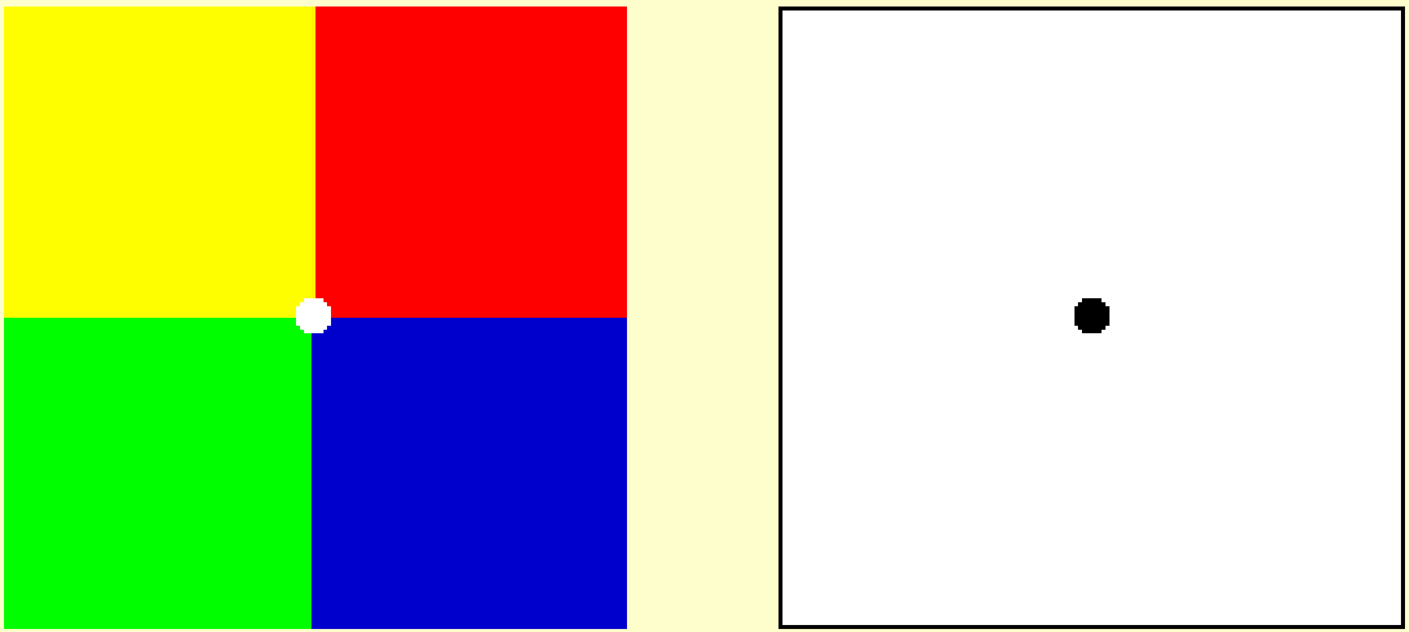

pigmentový epitel
tyčinky
čípky
vnější membrána
Mullerovy buňky
horizontální buňky
bipolární buňky
amakrinové buňky
gangliové buňky
vrstva nervových
vláken
vnitřní membrána

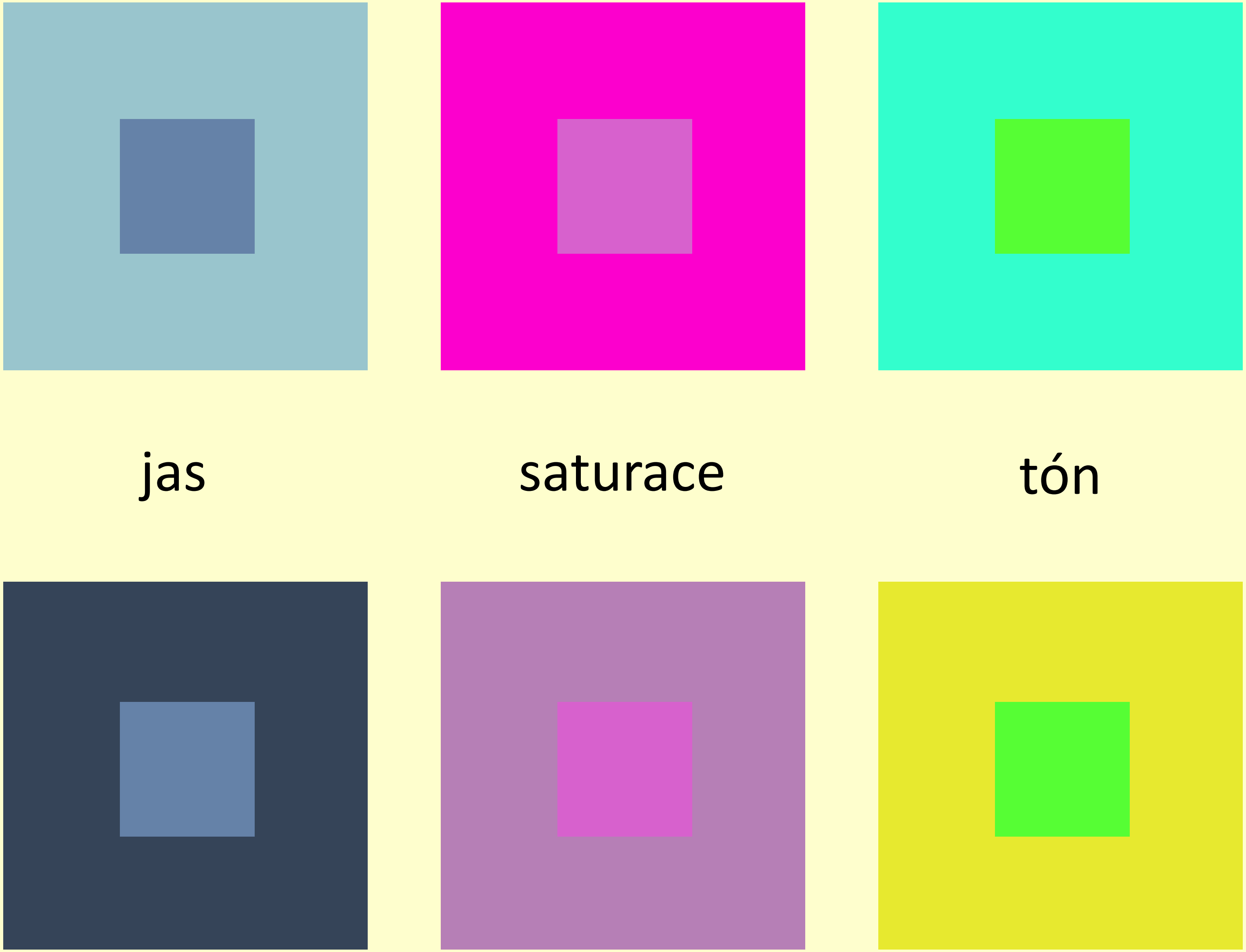

počet fotoreceptorů
(v tisících na 1 mm²)
180
160
120
100
80
60
40
20
slepá skvrna
tyčinky
tyčinky
čípky
čípky
60°
40°
20°
0°
20°
40°
60°
80°
spánek <<<<<<<<<< úhel >>>>>>>>>> nos

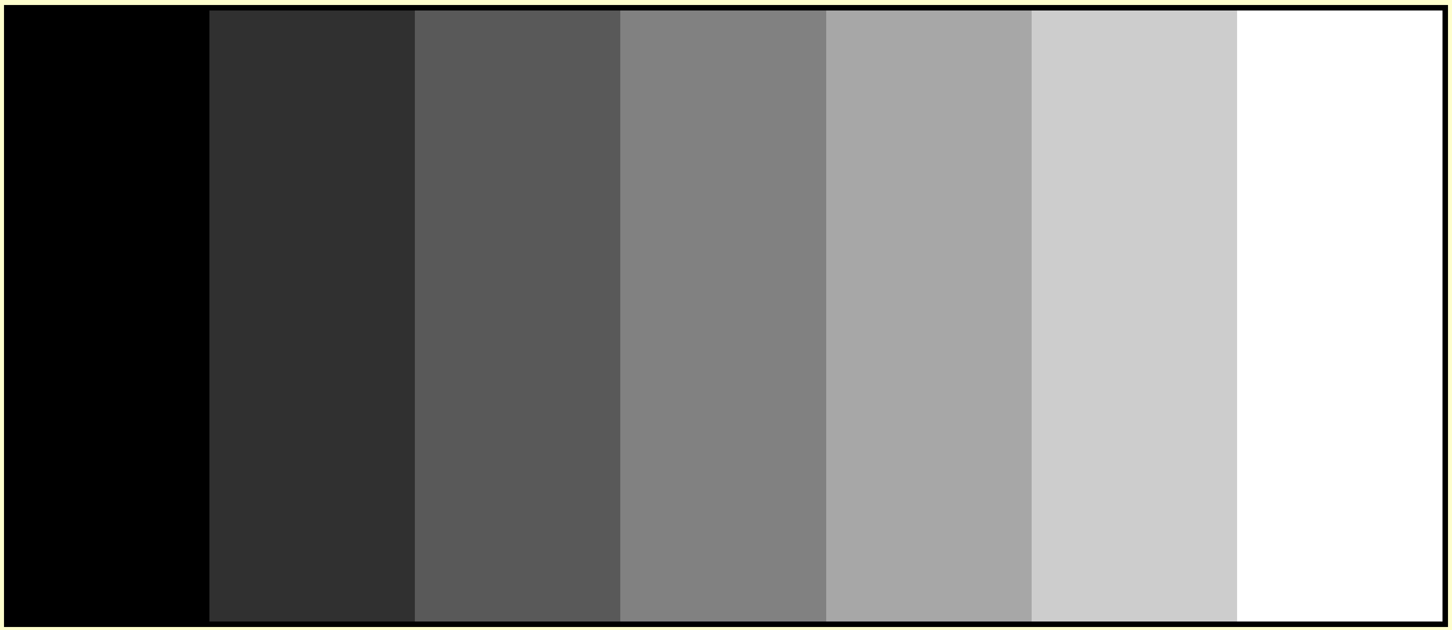

zraková osa
80°
80°
60°
60°
40°
40°
20°
20°
0°
slepá
skvrna
fovea
zrakový nerv

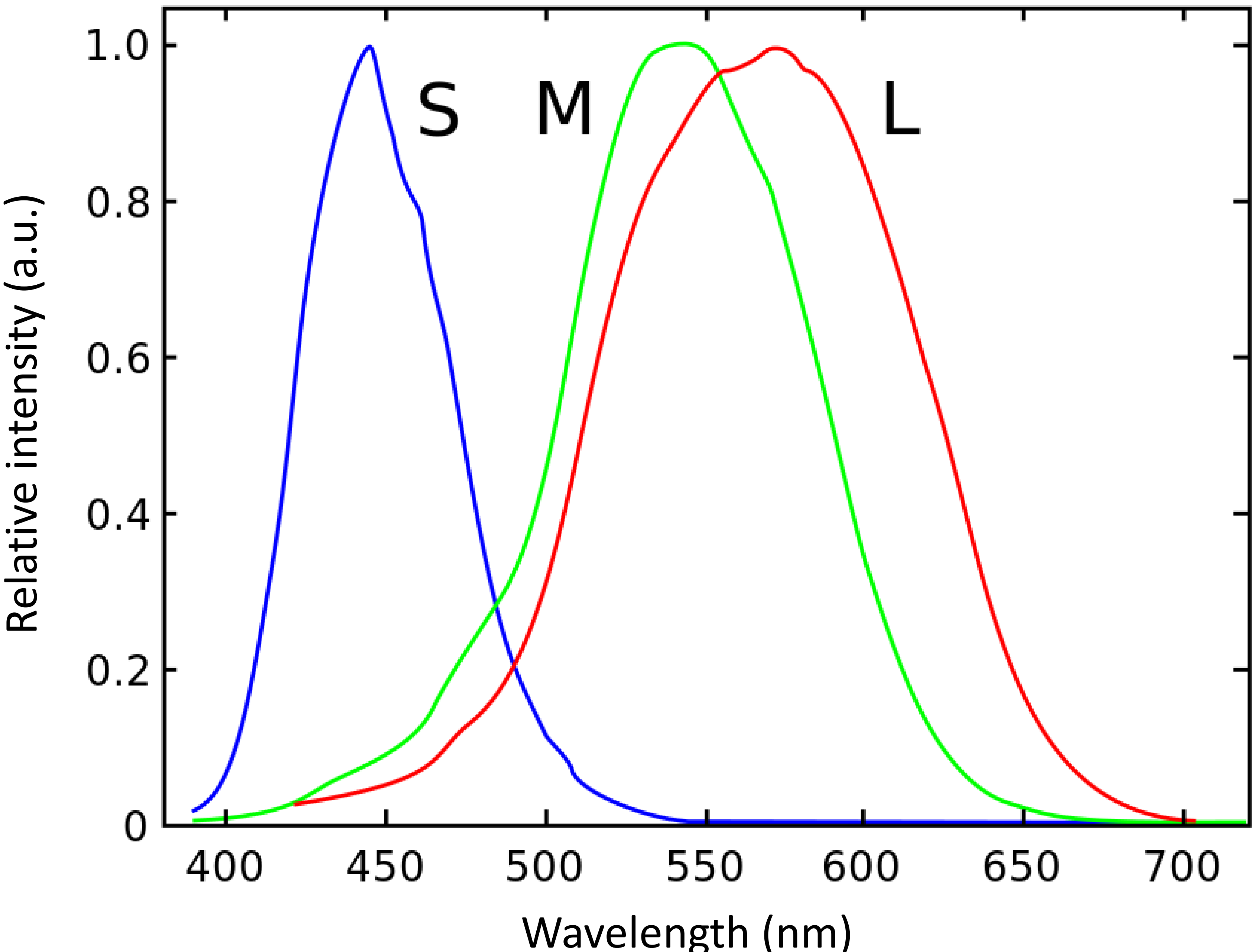




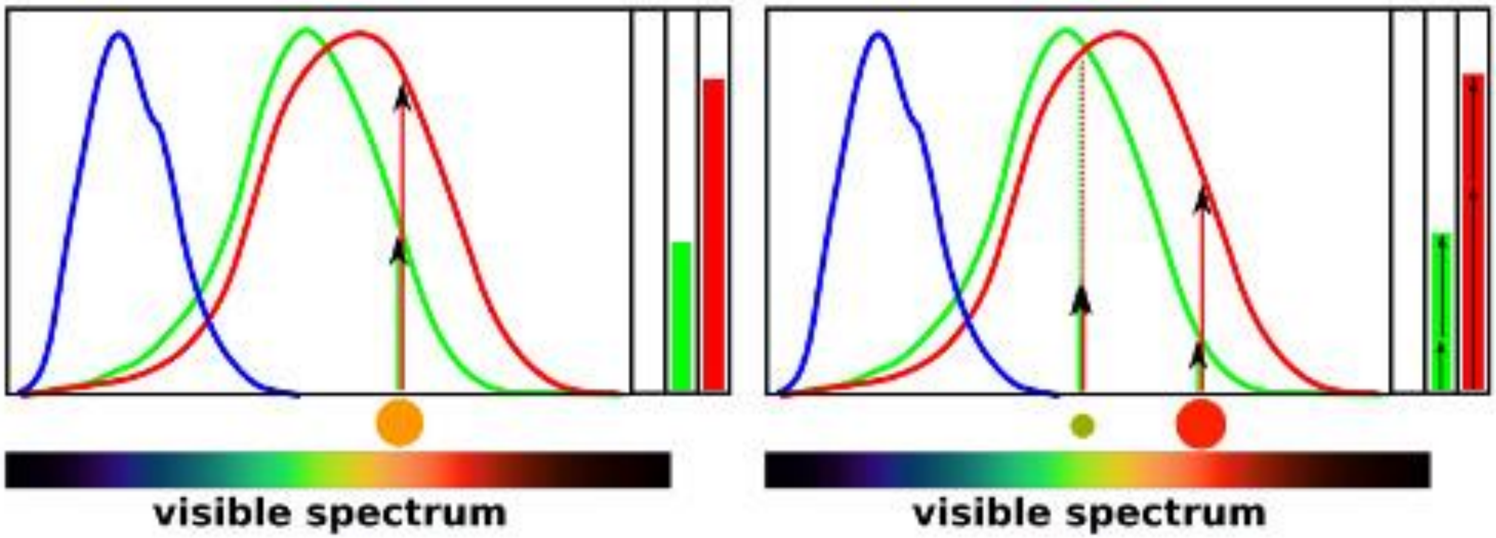



jas
saturace
tón

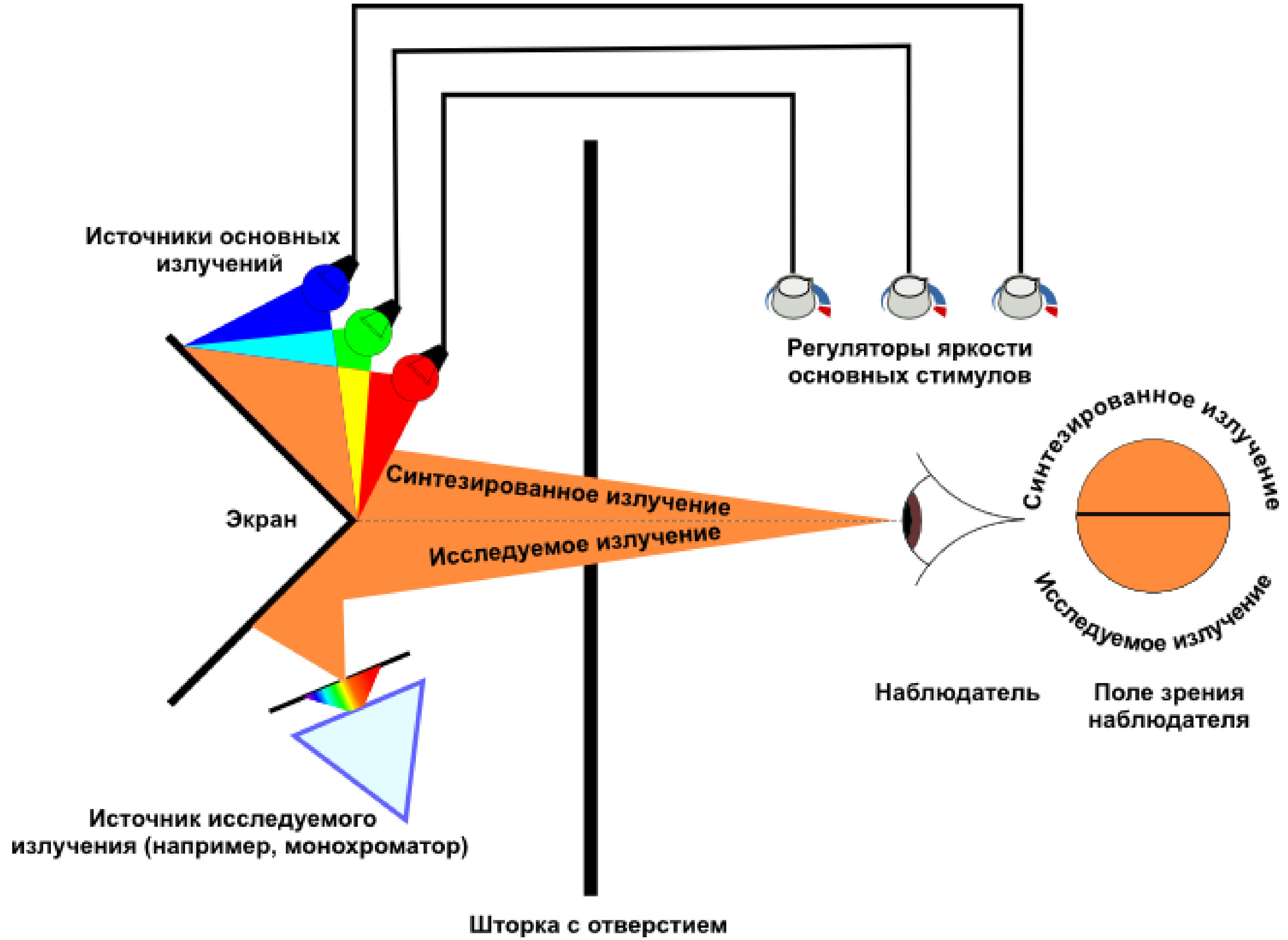




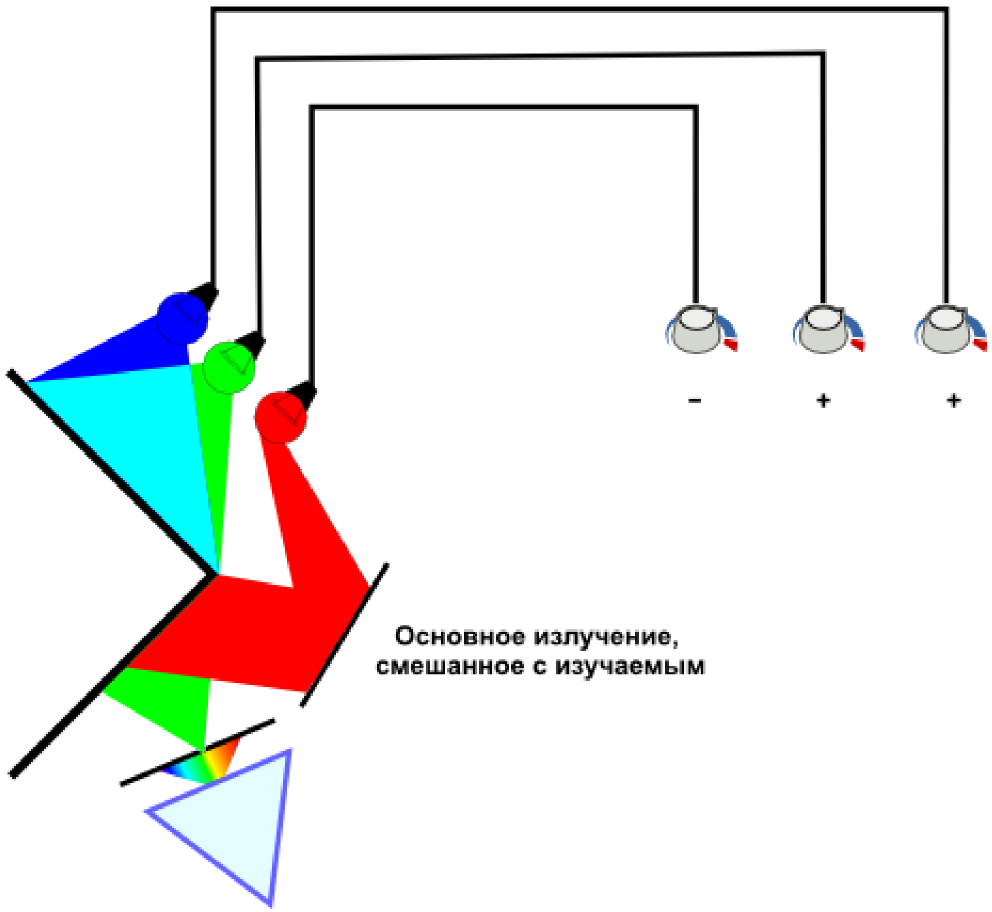
S
M
L
1.0
0.8
0.6
0.4
0.2
0
400
450
500
550
600
650
700
Relative intensity (a.u.)
Wavelength (nm)


visible spectrum
visible spectrum

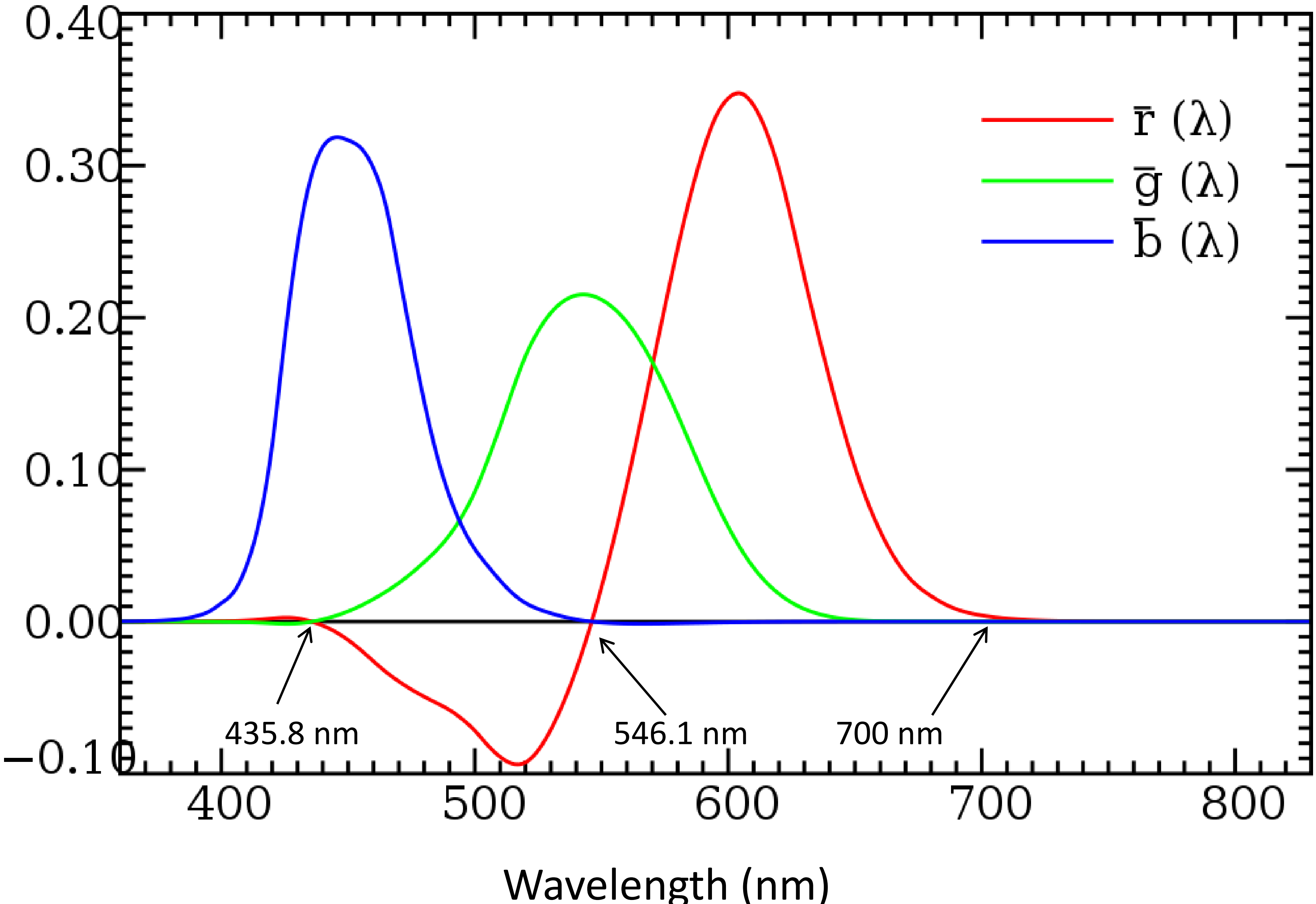
CIE 1931 2°

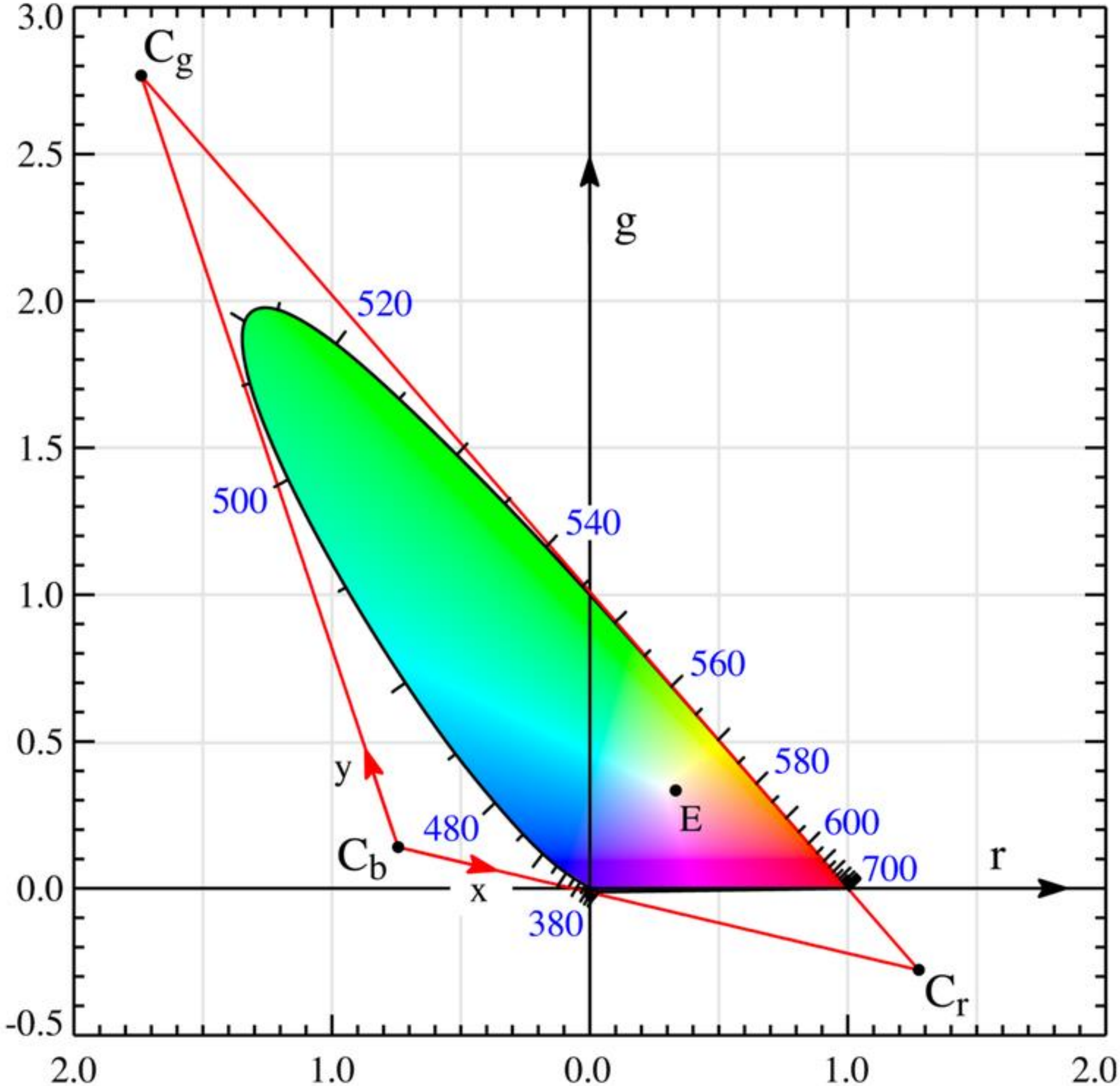


Источники основных излучений
Регуляторы яркости основных стимулов
Синтезированное излучение
Экран
Синтезированное излучение
Исследуемое излучение
Исследуемое излучение
Наблюдатель
Поле зрения наблюдателя
Источник исследуемого излучения (например, монохроматор)
Шторка с отверстием

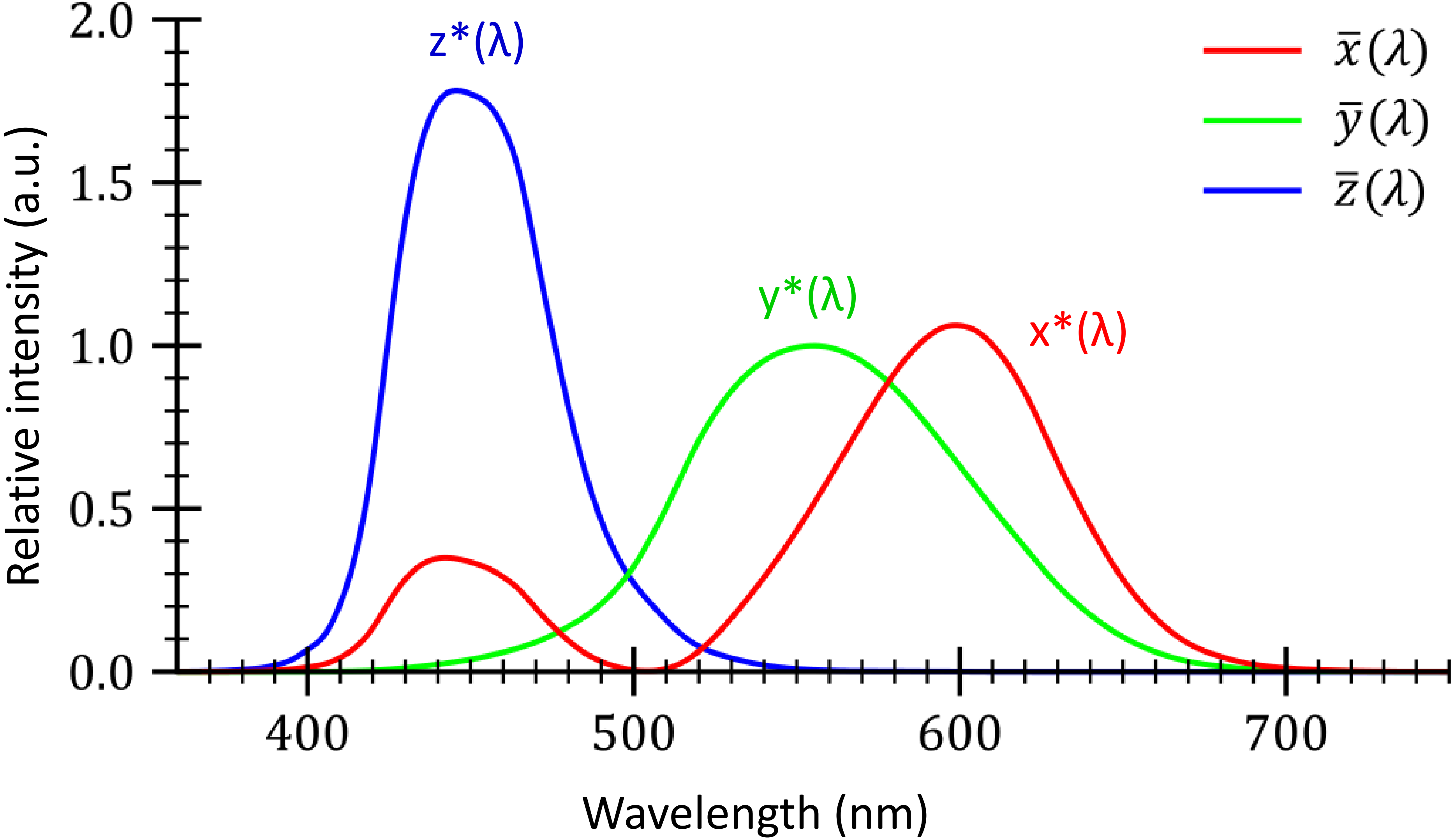


–
+
+
Основное излучение,
смешанное с изучаемым


0.40
0.30
0.20
0.10
0.00
−0.10
r̄ (λ)
ḡ (λ)
b̄ (λ)
435.8 nm
546.1 nm
700 nm
400
500
600
700
800
Wavelength (nm)



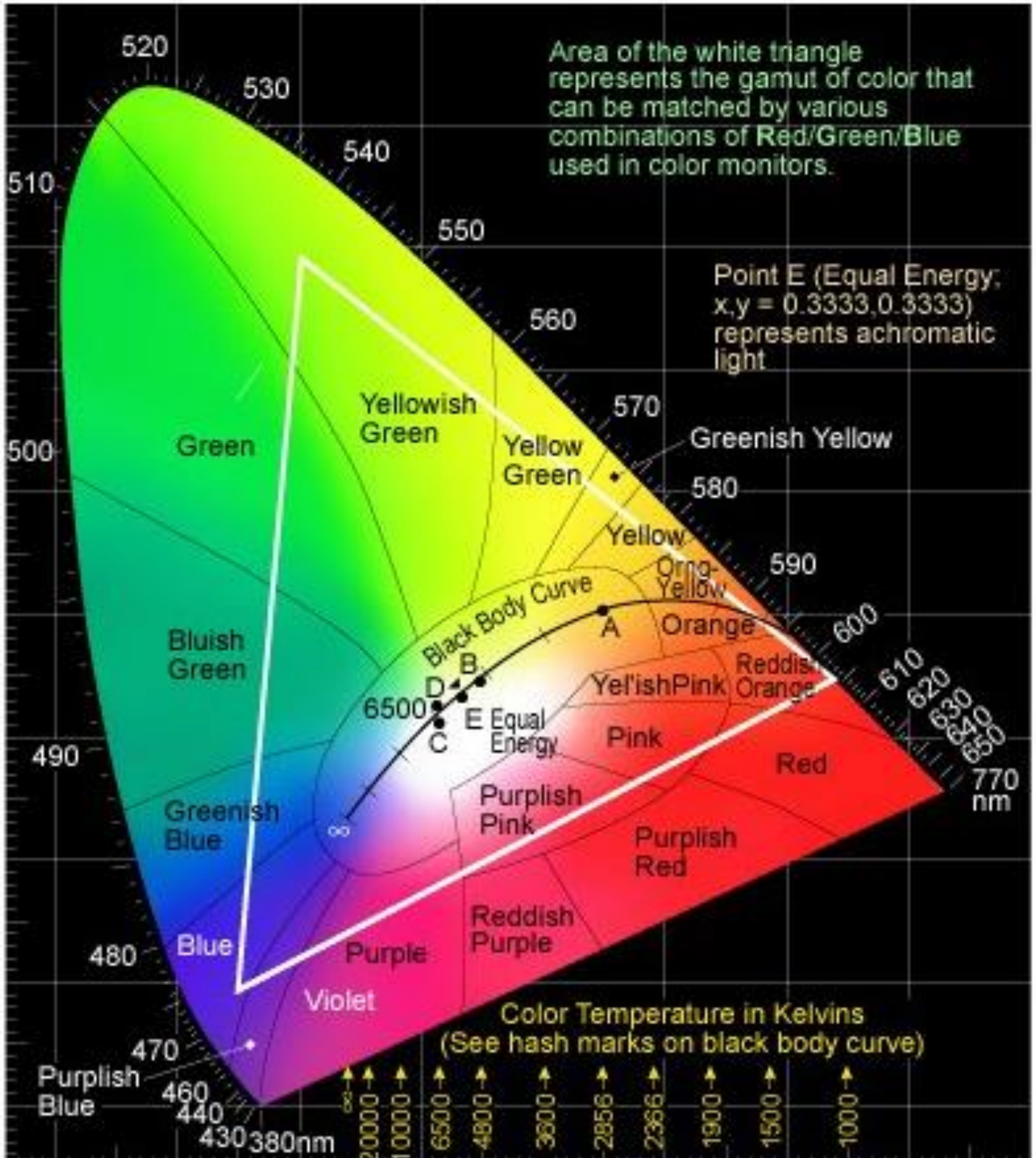
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
2.0
1.0
0.0
1.0
2.0
C_g
C_b
C_r
g
r
x
y
E
520
500
540
560
580
600
700
480
380



Relative intensity (a.u.)
2.0
1.5
1.0
0.5
0.0
400
500
600
700
Wavelength (nm)
z*(λ)
y*(λ)
x*(λ)
$\bar{x}(\lambda)$
$\bar{y}(\lambda)$
$\bar{z}(\lambda)$

C_g

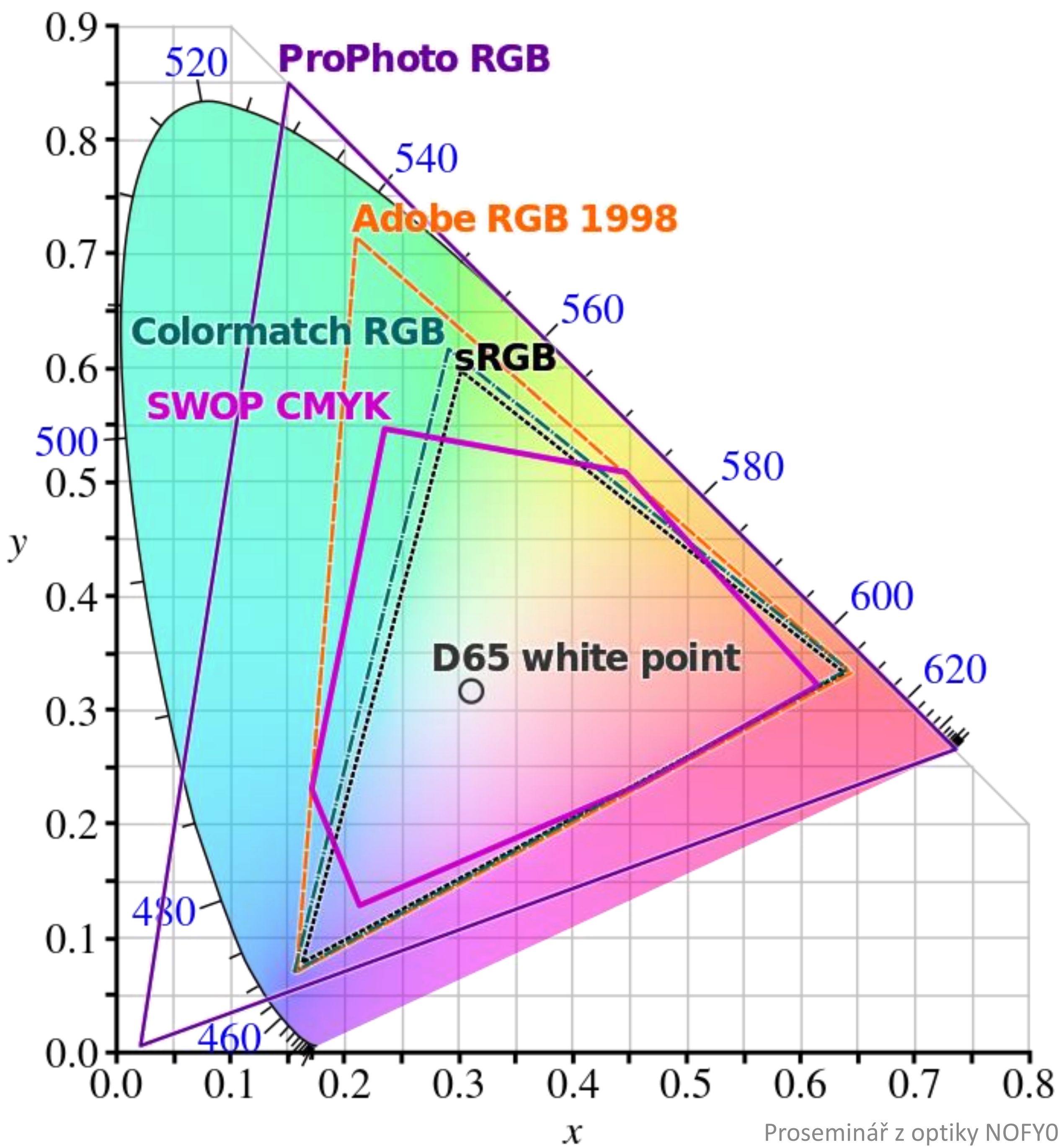
y


Area of the white triangle represents the gamut of color that can be matched by various combinations of Red/Green/Blue used in color monitors.
Point E (Equal Energy; x,y = 0.3333,0.3333) represents achromatic light
520
530
540
550
560
570
580
590
600
610
620
630
640
650
770 nm
510
500
490
480
470
460
440
430
380nm
Green
Yellowish Green
Yellow Green
Greenish Yellow
Yellow
Orng-Yellow
Orange
Reddish Orange
Bluish Green
Black Body Curve
A
B
D
6500
C
E Equal Energy
Yel'ishPink
Pink
Red
Greenish Blue
Purplish Pink
Purplish Red
Blue
Purple
Reddish Purple
Violet
Purplish Blue
Color Temperature in Kelvins
(See hash marks on black body curve)
∞
20000
10000
6500
4800
3600
2856
2366
1900
1500
1000

C_b

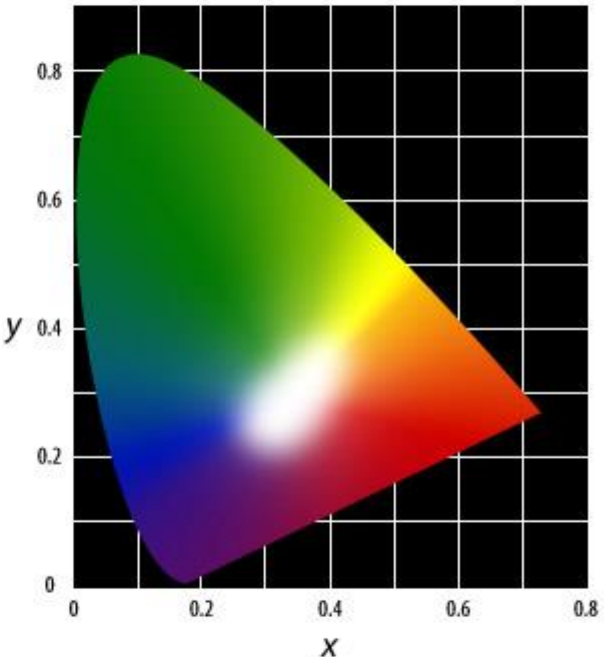
x

C_r

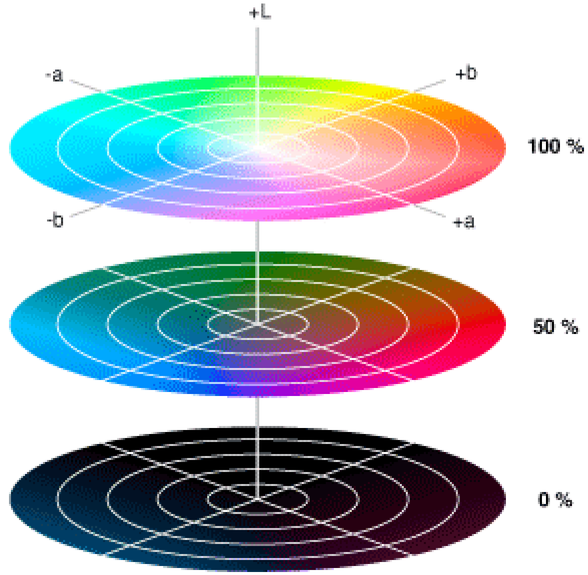


0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
y
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
x
520
540
560
580
600
620
500
480
460
ProPhoto RGB
Adobe RGB 1998
Colormatch RGB
sRGB
SWOP CMYK
D65 white point

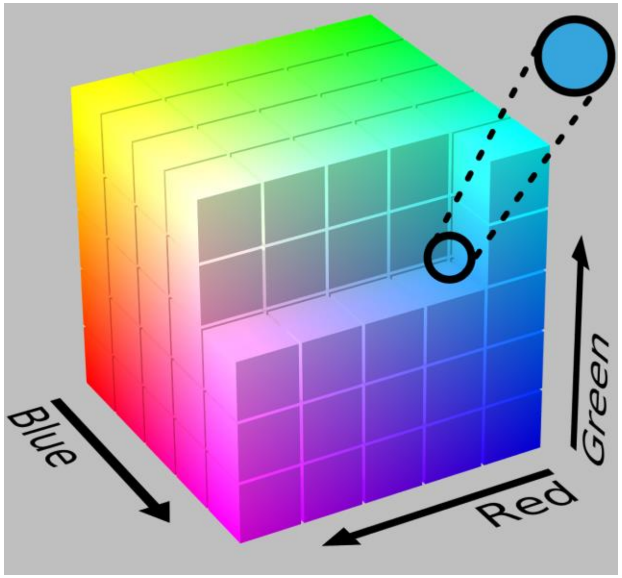
CIE XYZ



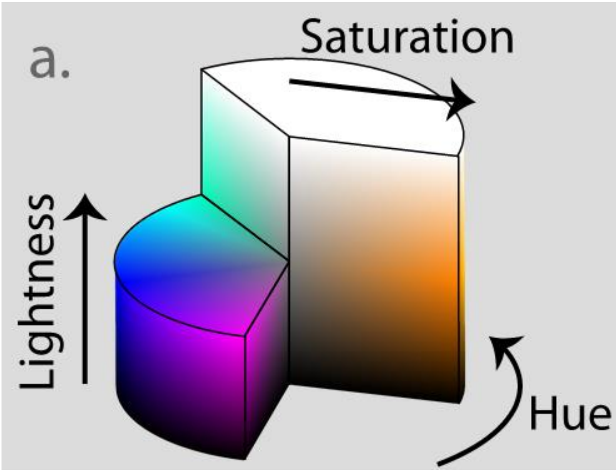
CIE LAB



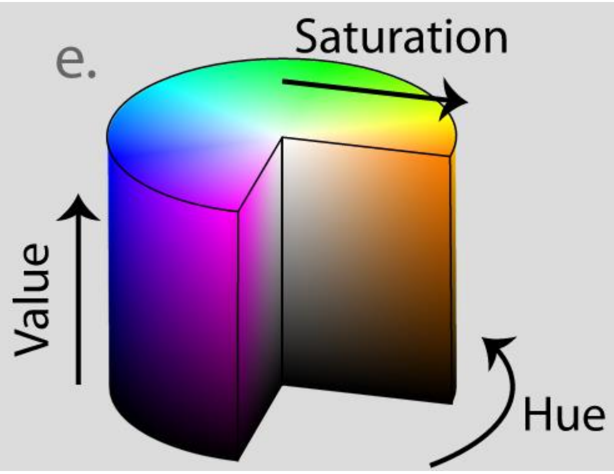
(s) RGB



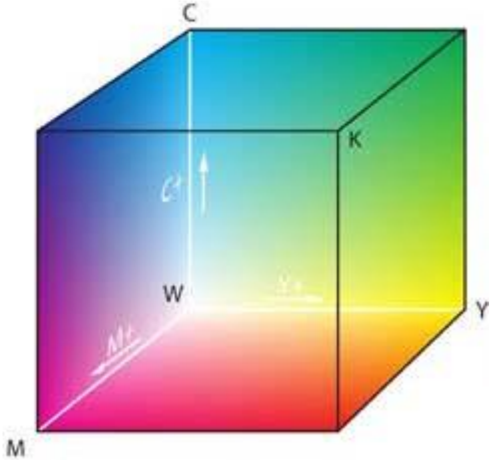
HSL/HSI



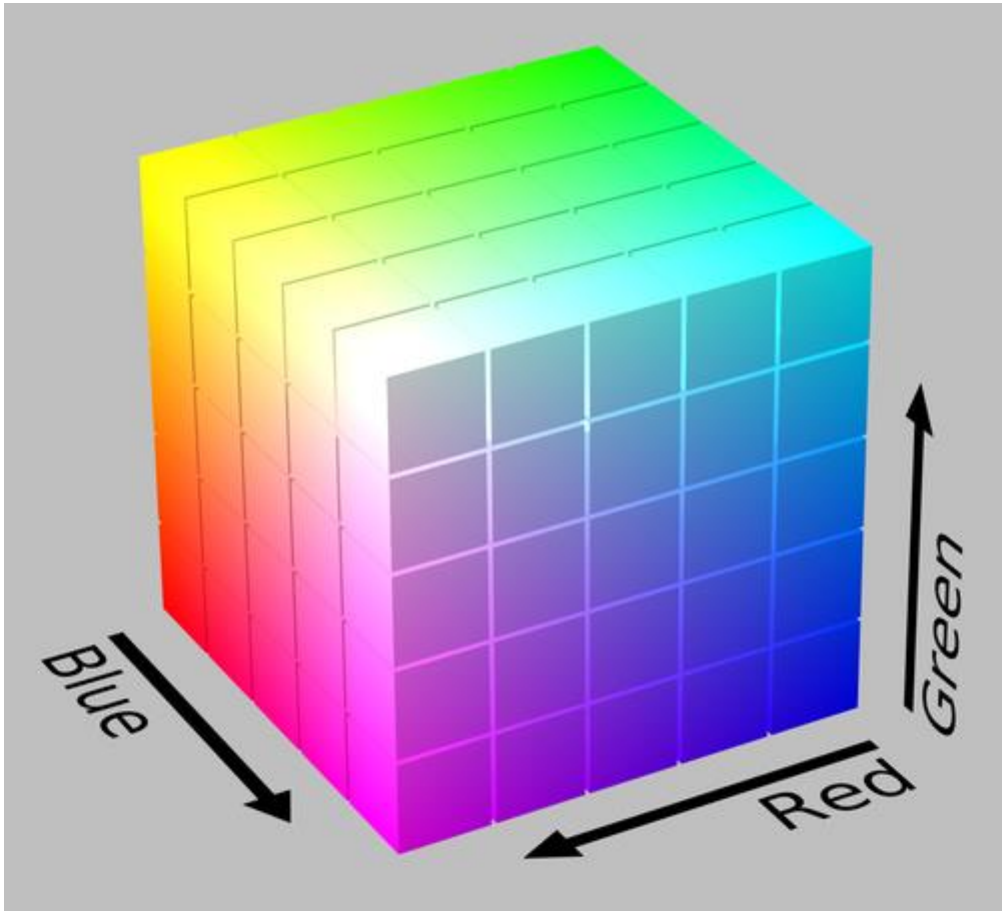
HSB/HSV



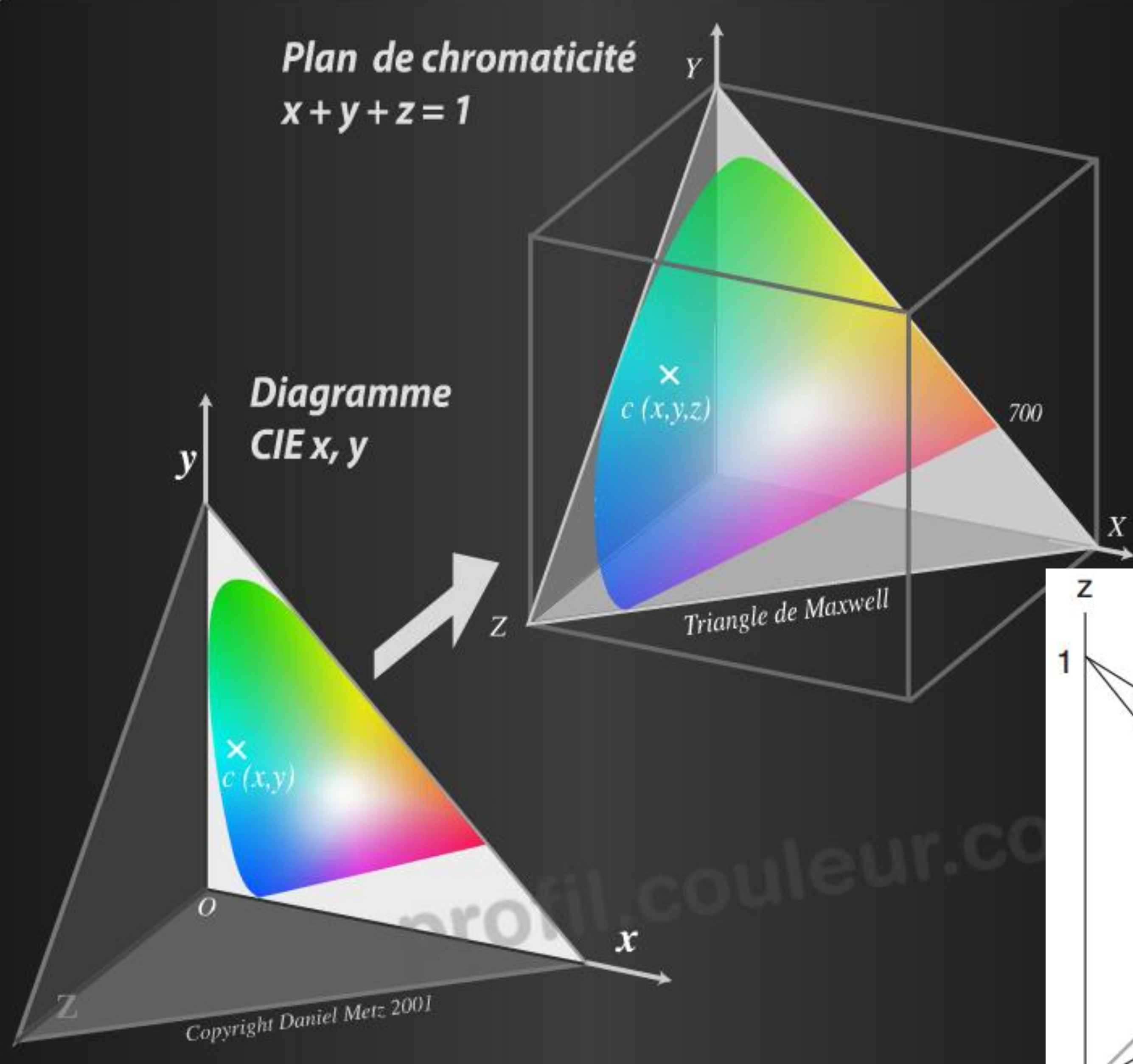
CMY(K)



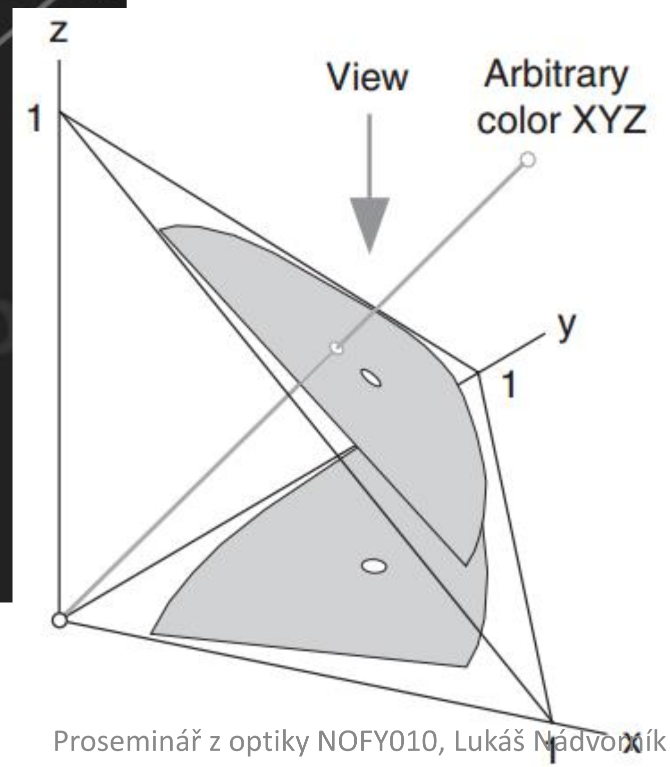
(CIE/s/Adobe…) RBG



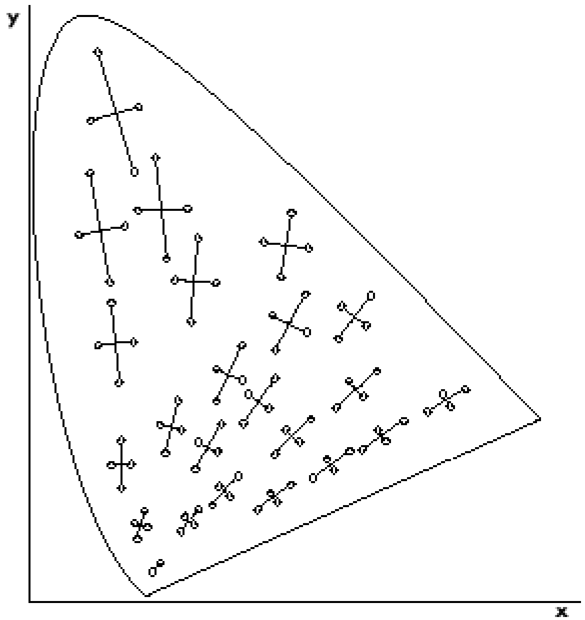
CIE XYZ



Plan de chromaticité
x + y + z = 1
Y
X
Z
700
c (x,y,z)
Triangle de Maxwell
Diagramme
CIE x, y
y
x
O
Z
c (x,y)
profil.couleur.co
Copyright Daniel Metz 2001



z
1
View
Arbitrary
color XYZ
y
1
1
x



$$L^* = 116\left(\frac{Y}{Y_n}\right)^{1/3} - 16, \qquad \frac{Y}{Y_n} > 0,008856$$

$$L^* = 903,3\,\frac{Y}{Y_n}, \qquad \frac{Y}{Y_n} \leq 0,008856$$

$$u^* = 13L^*(u' - u'_n) \qquad u^* = 13L^*(u' - u'_n)$$

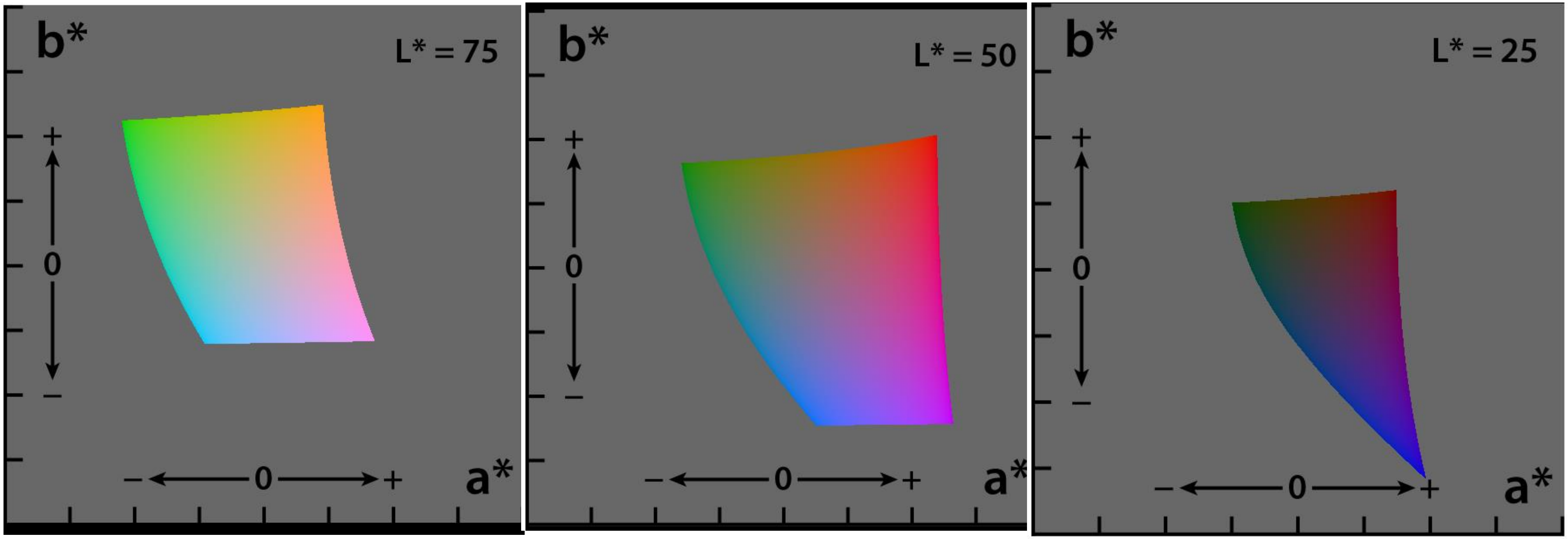
$$u' = \frac{4X}{X + 15Y + 3Z} \qquad v' = \frac{9Y}{X + 15Y + 3Z}$$

$$u'_n = \frac{4X_n}{X_n + 15Y_n + 3Z_n} \qquad v'_n = \frac{9Y_n}{X_n + 15Y_n + 3Z_n}$$

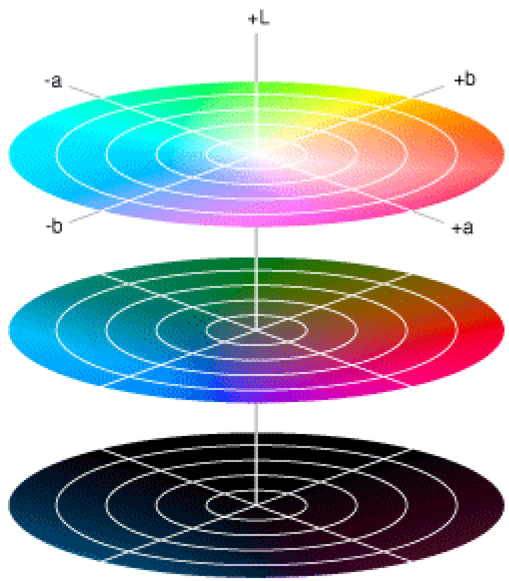
$$a^* = 500\left[f\left(\frac{X}{X_n}\right) - f\left(\frac{Y}{Y_n}\right)\right] \qquad b^* = 500\left[f\left(\frac{Y}{Y_n}\right) - f\left(\frac{Z}{Z_n}\right)\right]$$

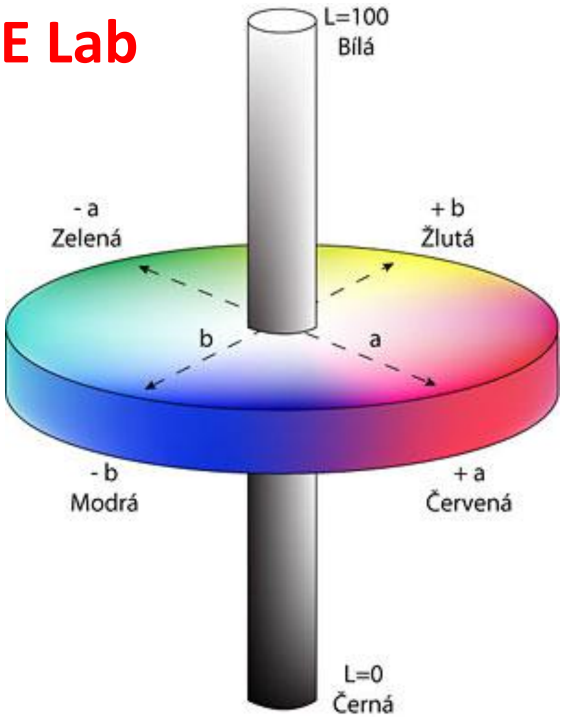
$$f(t) = t^{1/3} \qquad t > 0,008856$$

$$f(t) = 7,787\,t + \frac{16}{116} \qquad t \leq 0,008856$$



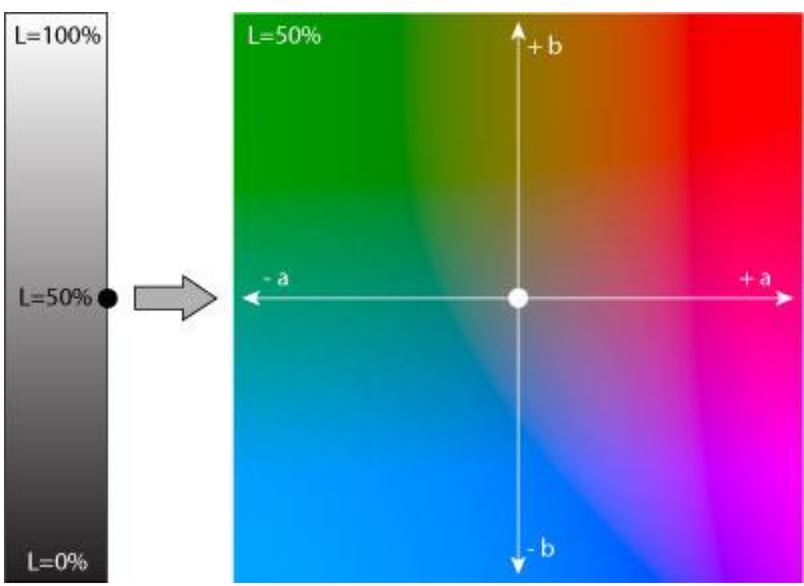
CIE Lab





jas

chromatičnost




BEFORE

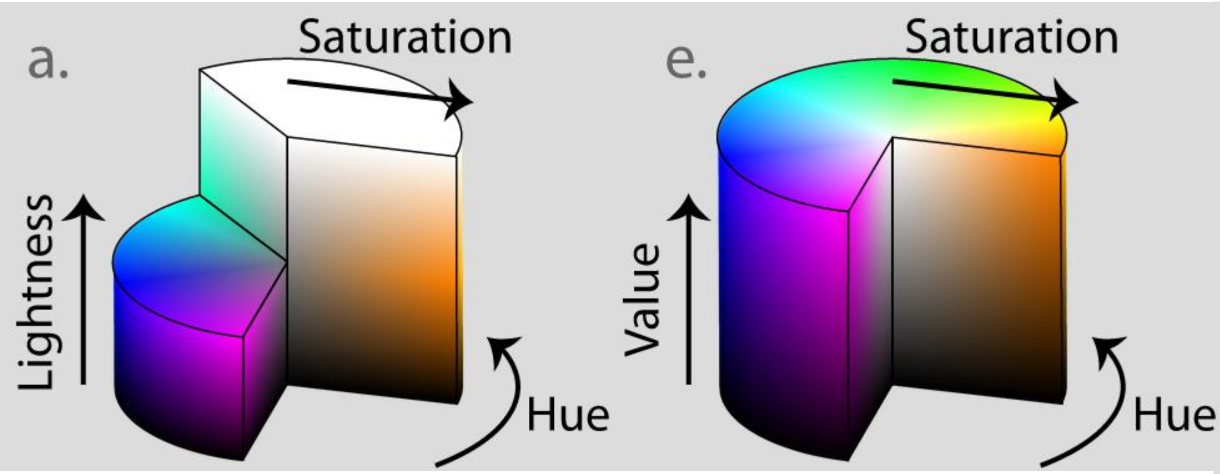

RGB
AFTER

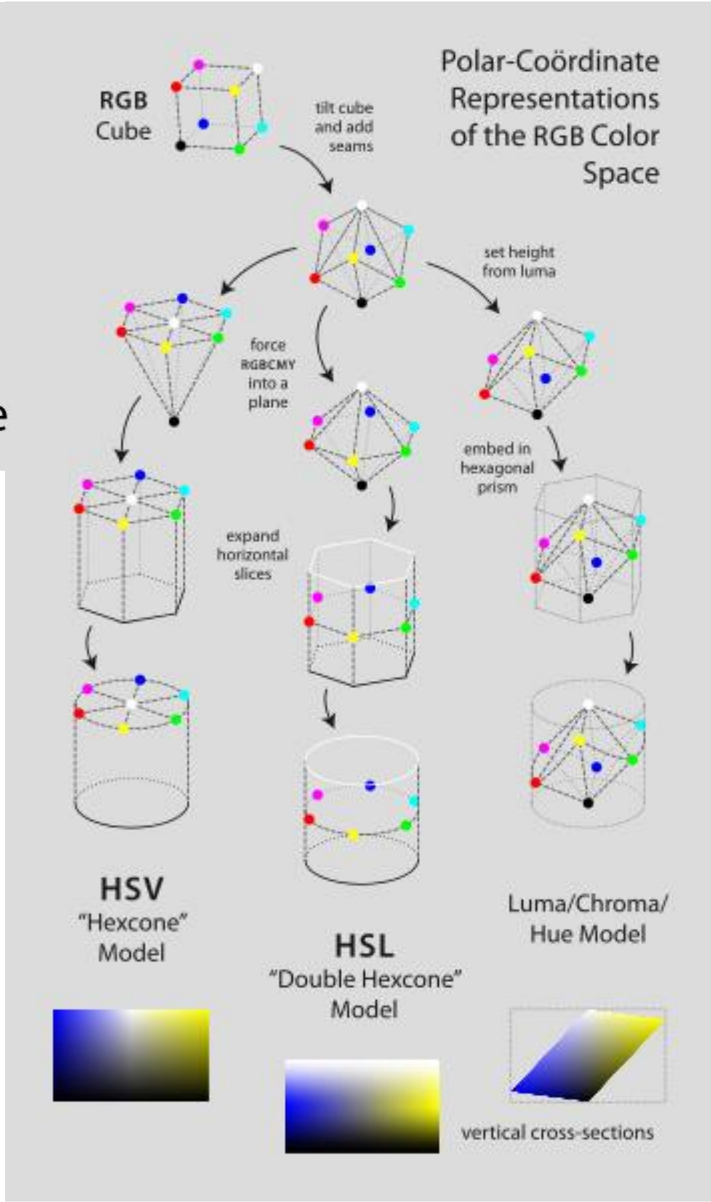

AFTER

Doostření pouze v kanálu L, chromatické složky ab to nezasáhne

brutální rozmazání ab (chromatických) složek

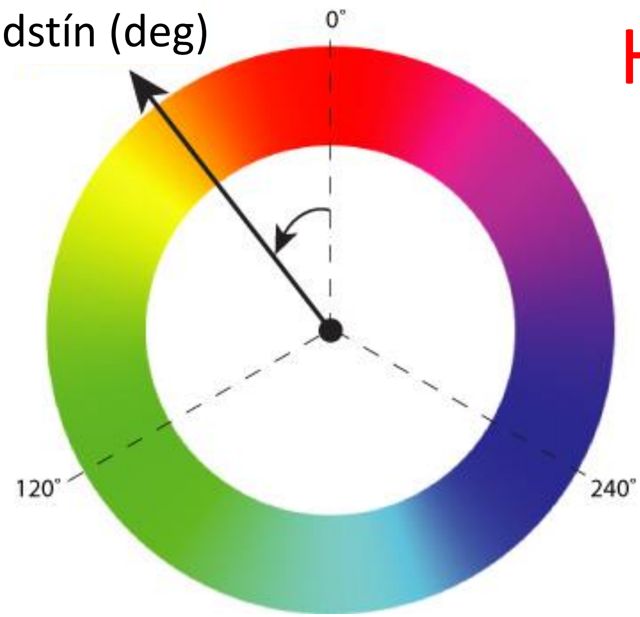
HSL/HSI HSB/HSV

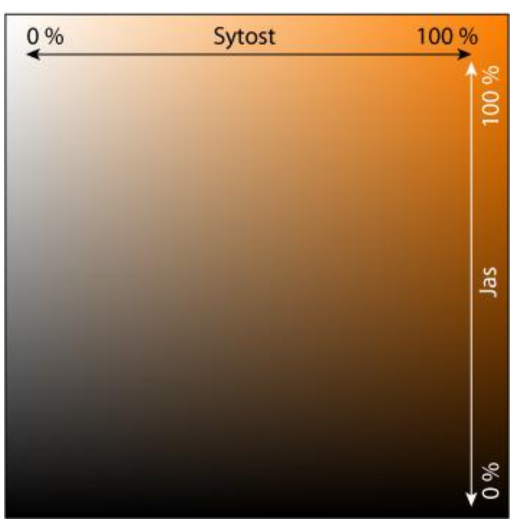


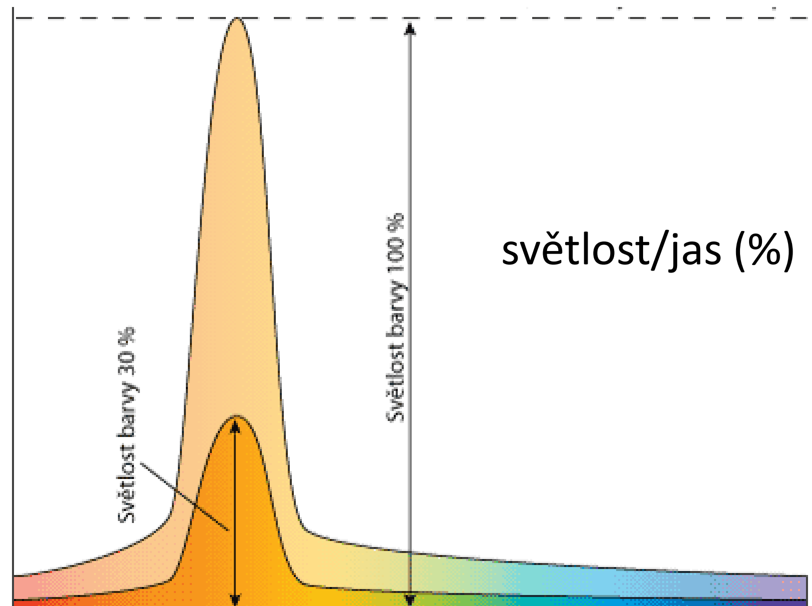


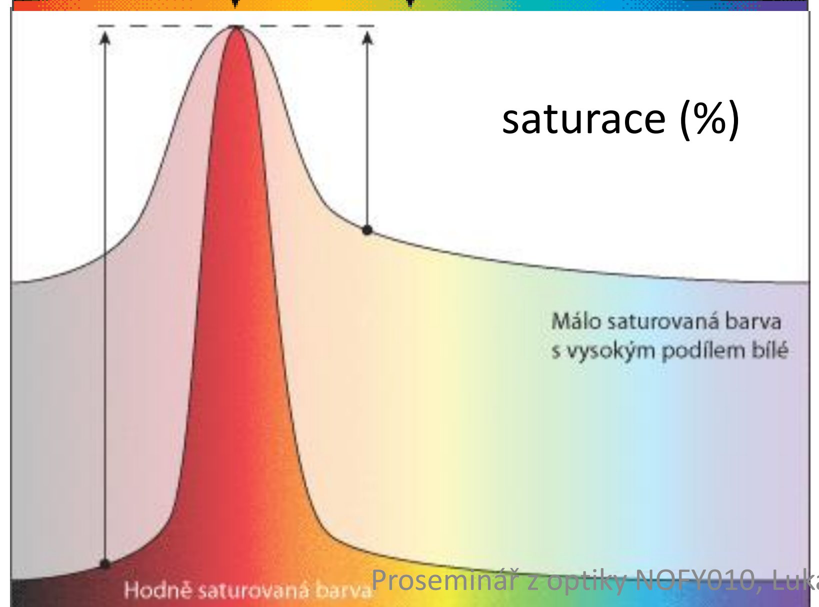
HSB

odstín (deg)

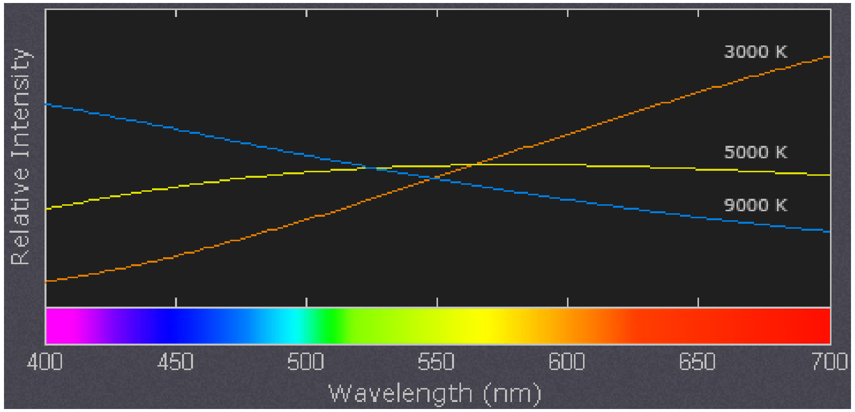


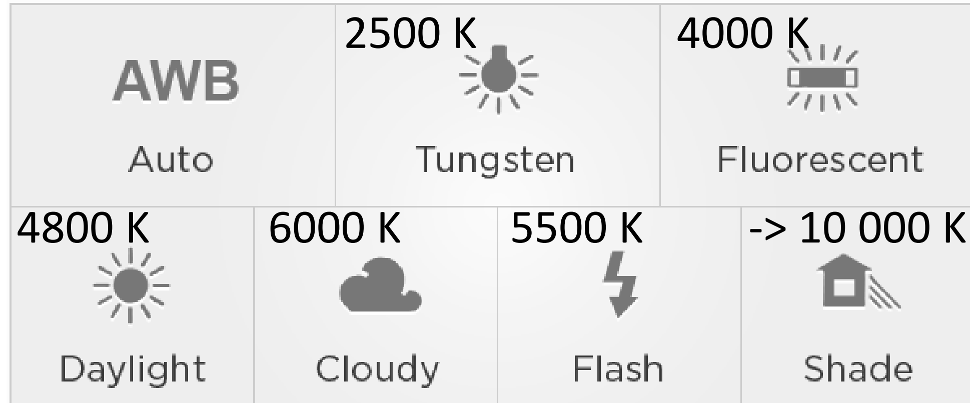


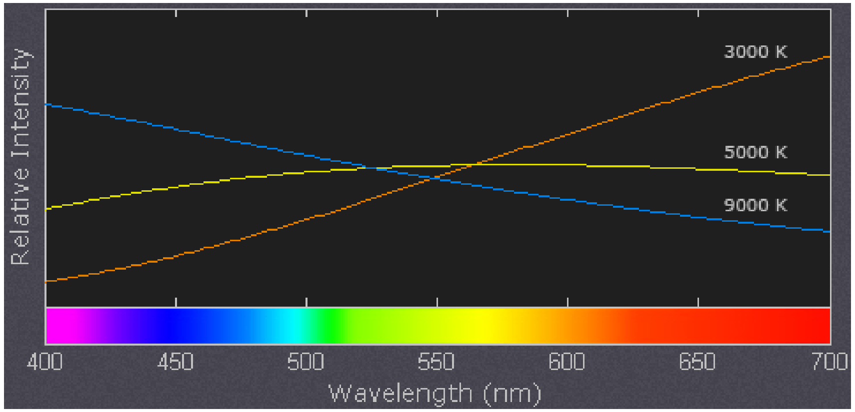


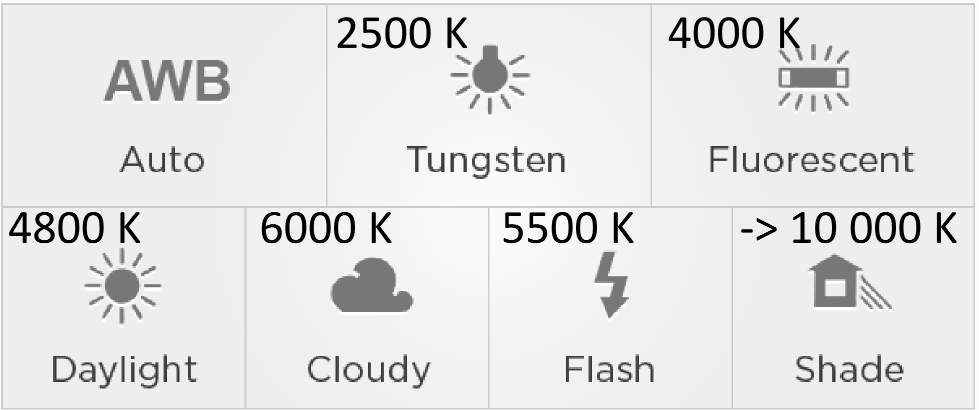


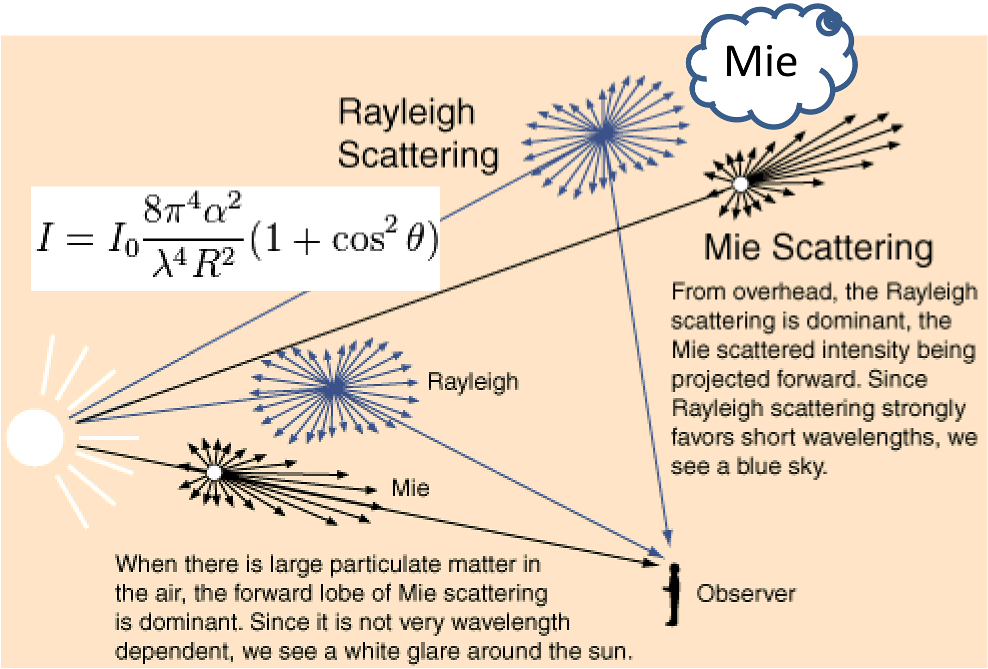

PAINT THE LIGHT

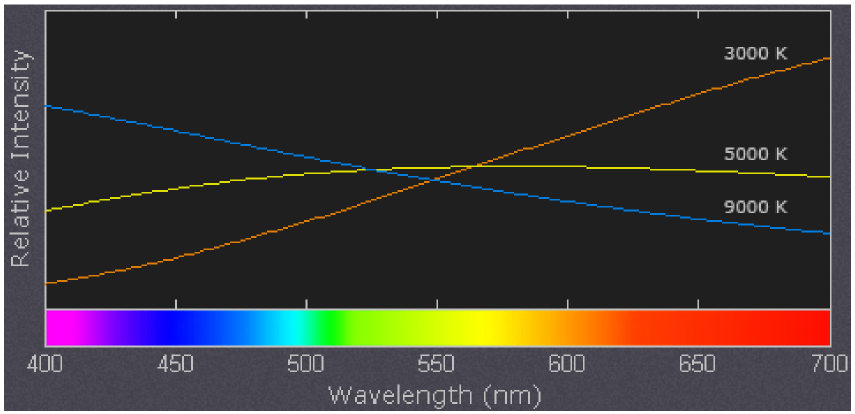

3000 K
5000 K
9000 K
Relative Intensity
400
450
500
550
600
650
700
Wavelength (nm)

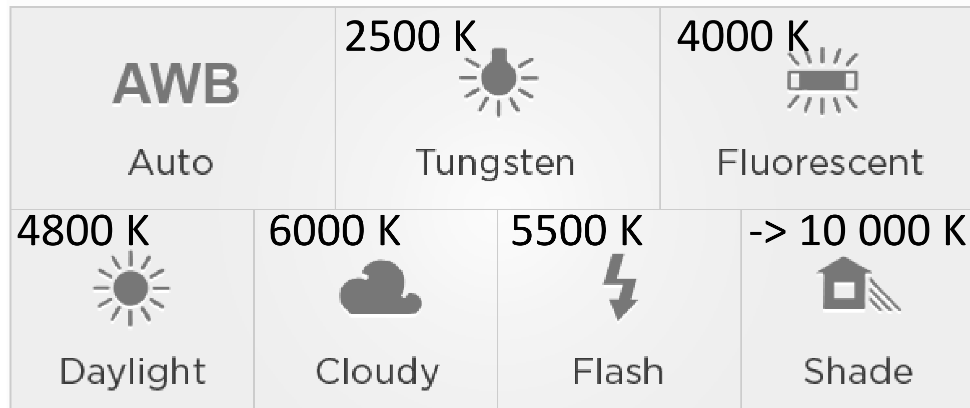

AWB
Auto
2500 K
Tungsten
4000 K
Fluorescent
4800 K
Daylight
6000 K
Cloudy
5500 K
Flash
-> 10 000 K
Shade

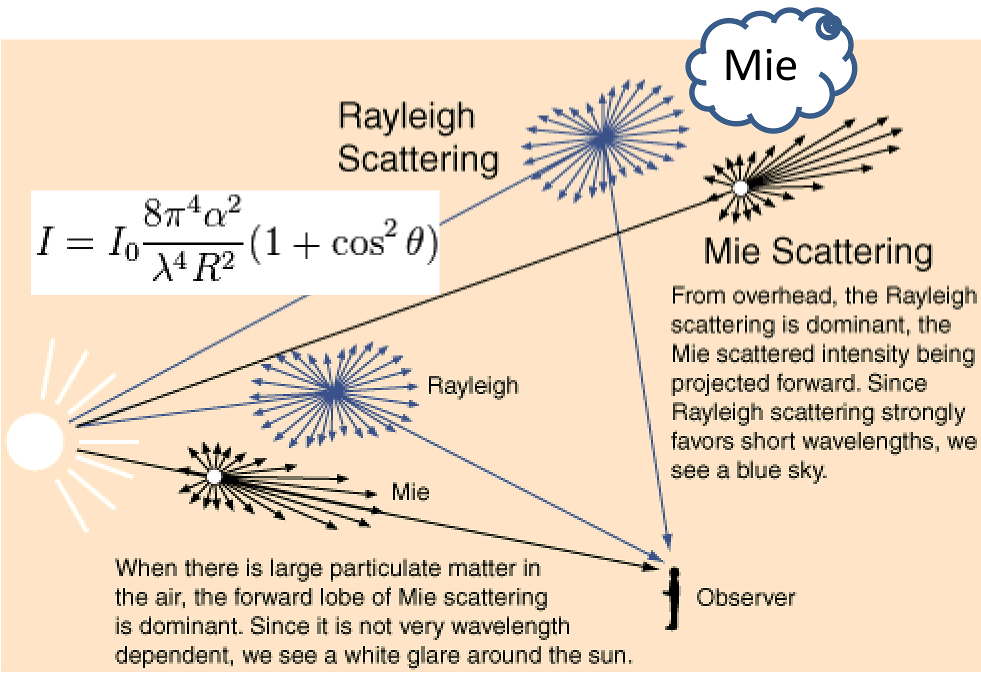

3000 K
5000 K
9000 K
Relative Intensity
400
450
500
550
600
650
700
Wavelength (nm)


AWB
Auto
2500 K
Tungsten
4000 K
Fluorescent
4800 K
Daylight
6000 K
Cloudy
5500 K
Flash
-> 10 000 K
Shade


Mie
Rayleigh Scattering
$I = I_0 \frac{8\pi^4\alpha^2}{\lambda^4 R^2}(1+\cos^2\theta)$
Mie Scattering
From overhead, the Rayleigh scattering is dominant, the Mie scattered intensity being projected forward. Since Rayleigh scattering strongly favors short wavelengths, we see a blue sky.
Rayleigh
Mie
Observer
When there is large particulate matter in the air, the forward lobe of Mie scattering is dominant. Since it is not very wavelength dependent, we see a white glare around the sun.


3000 K
5000 K
9000 K
Relative Intensity
400
450
500
550
600
650
700
Wavelength (nm)


AWB
Auto
2500 K
Tungsten
4000 K
Fluorescent
4800 K
Daylight
6000 K
Cloudy
5500 K
Flash
-> 10 000 K
Shade


Mie
Rayleigh Scattering
$I = I_0 \frac{8\pi^4\alpha^2}{\lambda^4 R^2}(1+\cos^2\theta)$
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Rayleigh
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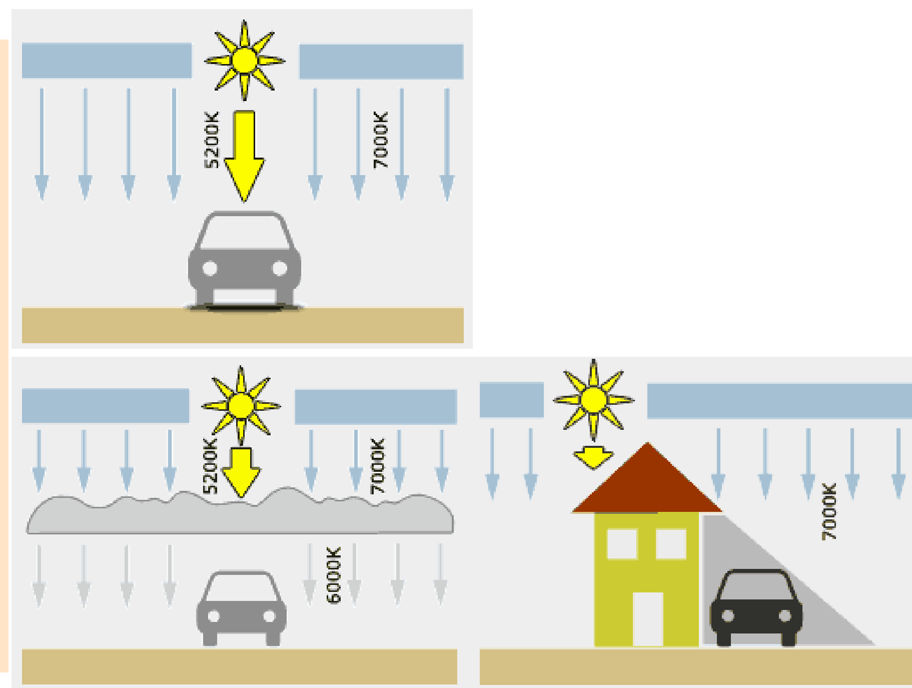
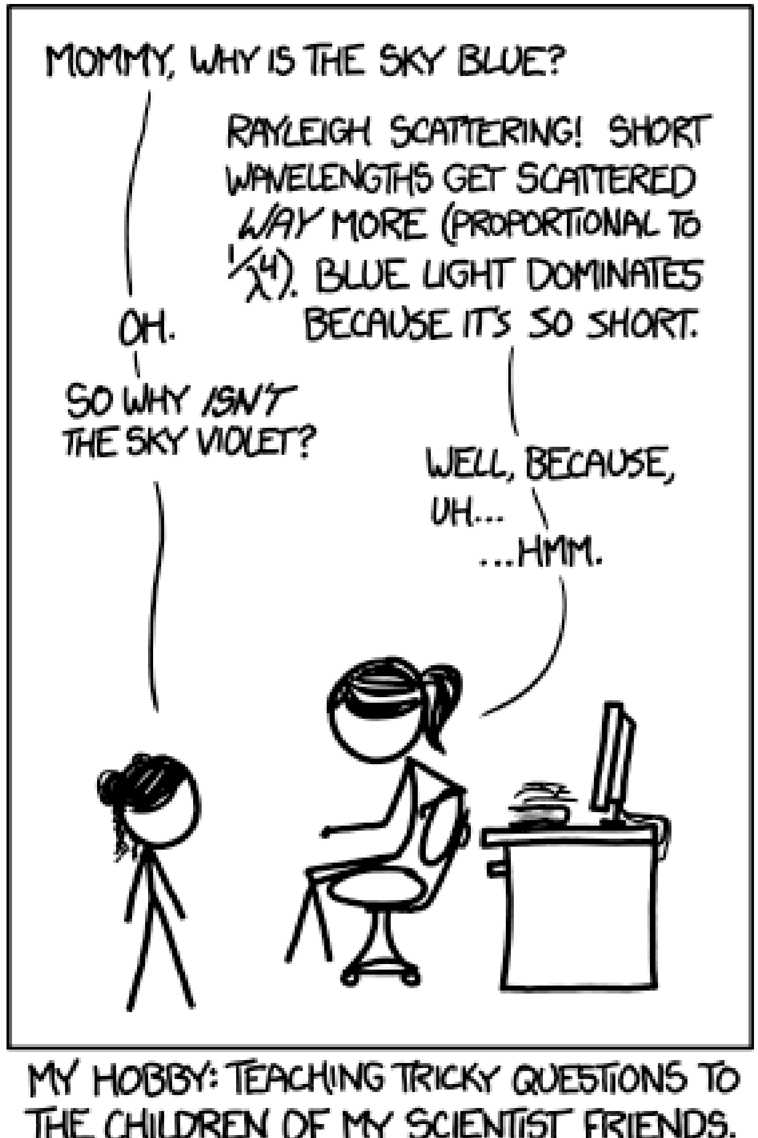
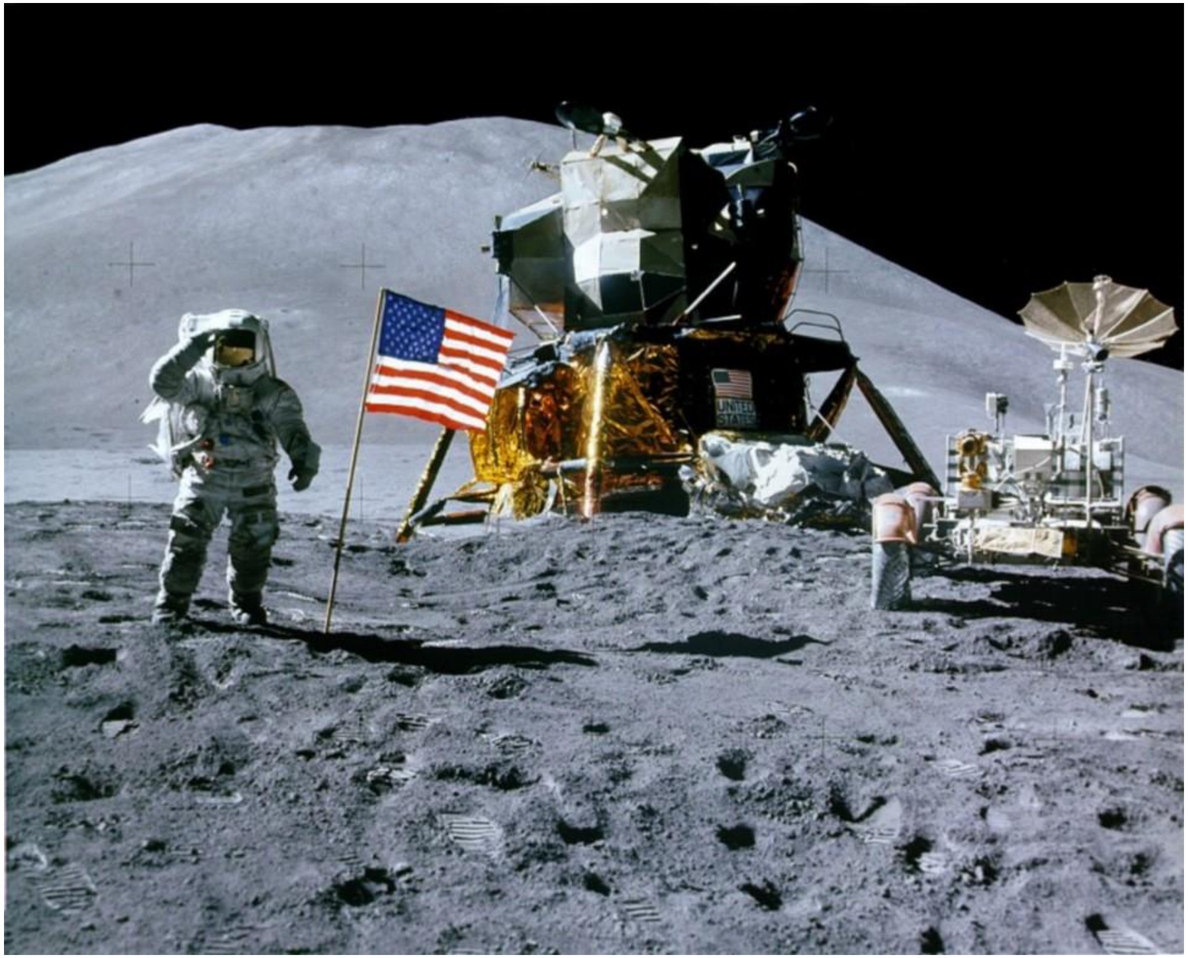
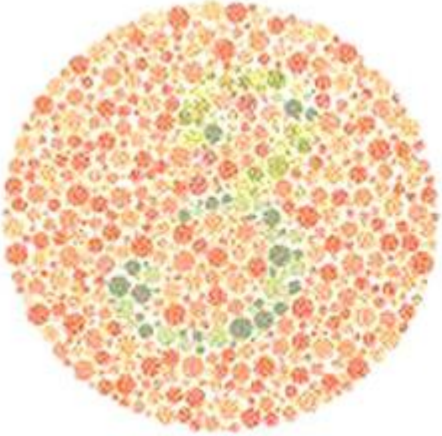
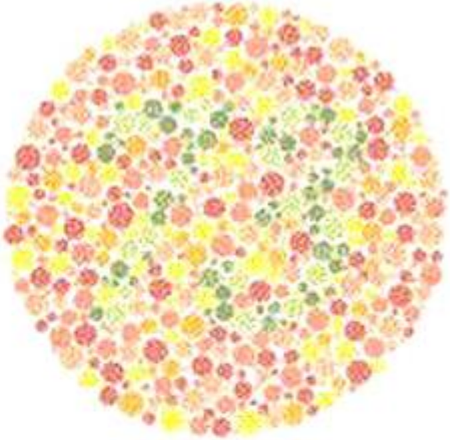
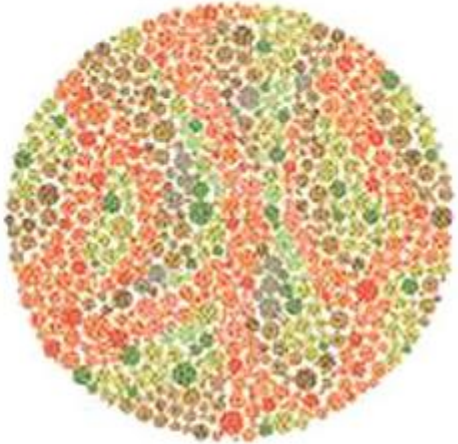
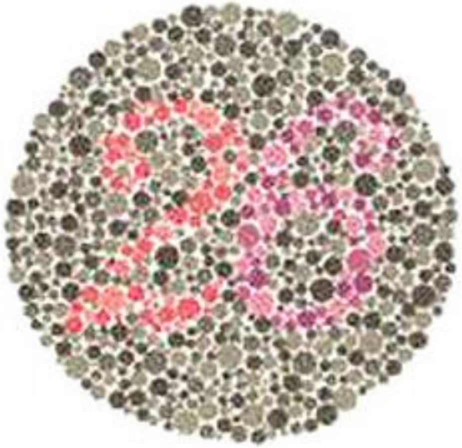
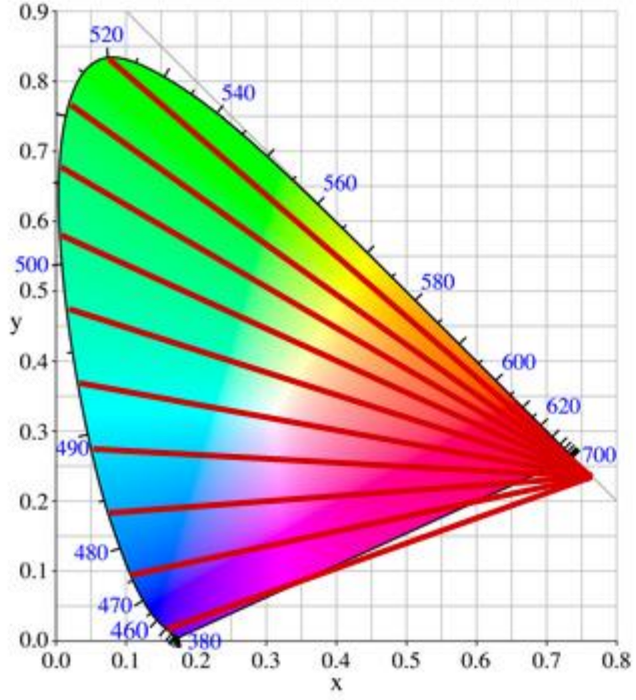

5200K
7000K
5200K
7000K
6000K
7000K


MOMMY, WHY IS THE SKY BLUE?
RAYLEIGH SCATTERING! SHORT WAVELENGTHS GET SCATTERED WAY MORE (PROPORTIONAL TO 1/λ4). BLUE LIGHT DOMINATES BECAUSE IT'S SO SHORT.
OH.
SO WHY ISN'T THE SKY VIOLET?
WELL, BECAUSE, UH...
...HMM.
MY HOBBY: TEACHING TRICKY QUESTIONS TO THE CHILDREN OF MY SCIENTIST FRIENDS.

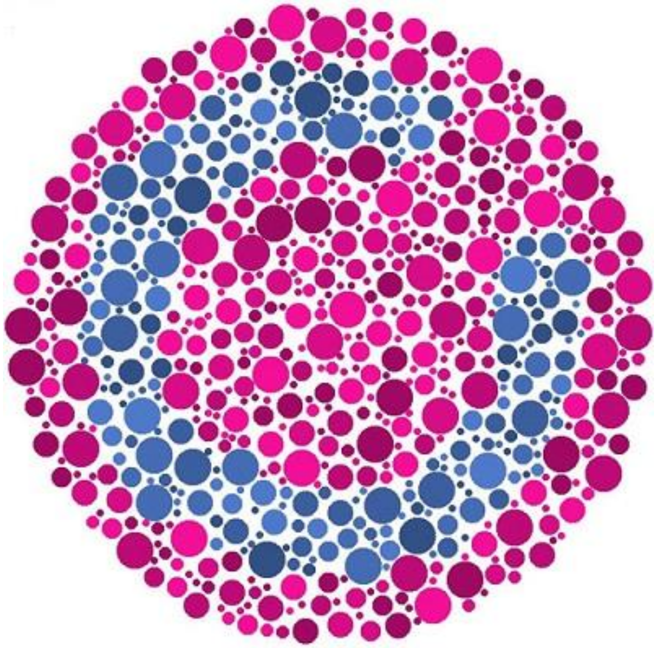


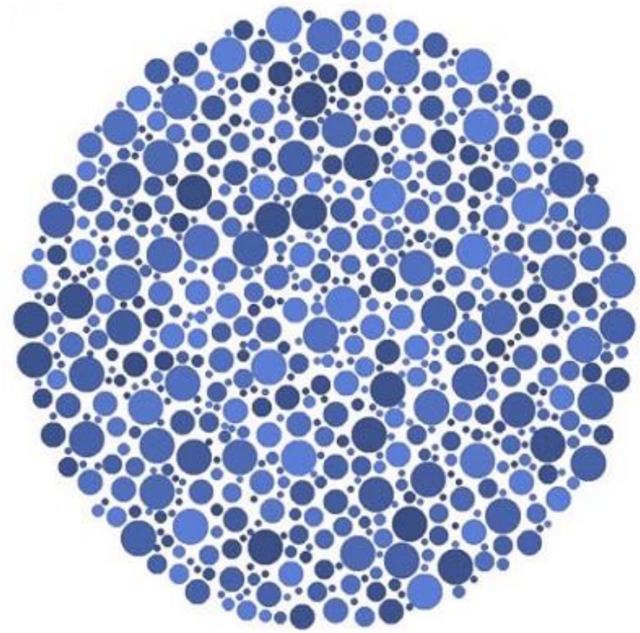





protan



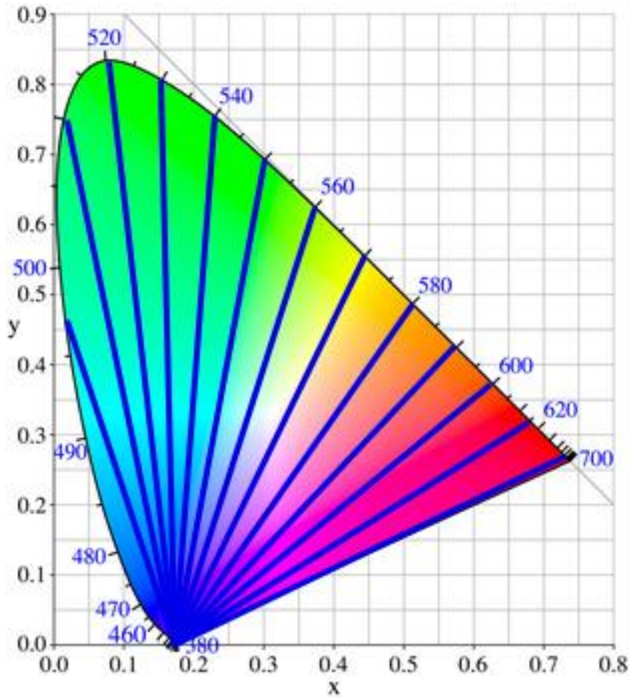
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
y
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
x
520
540
560
580
600
620
700
500
490
480
470
460
380





purpurovo-modrý test

tritan



0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
y
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
x
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560
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620
700
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490
480
470
460
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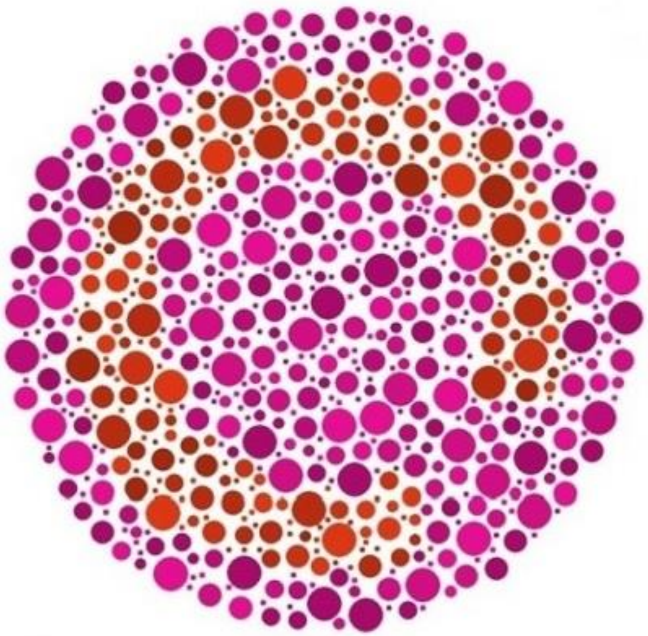
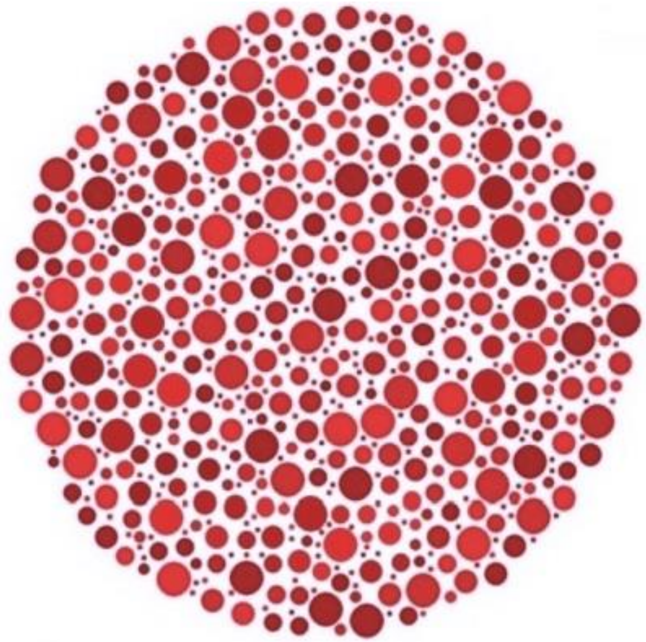
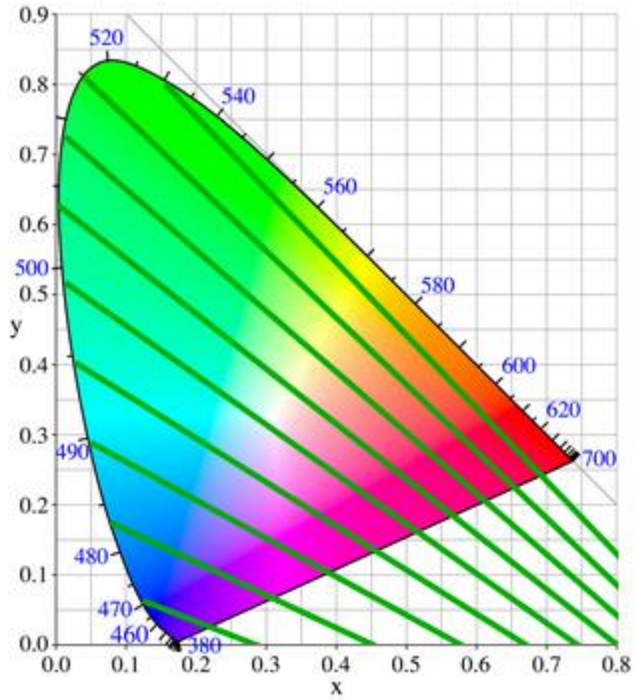




červeno-purpurový test

deutan



0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
y
x
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
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540
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580
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500
490
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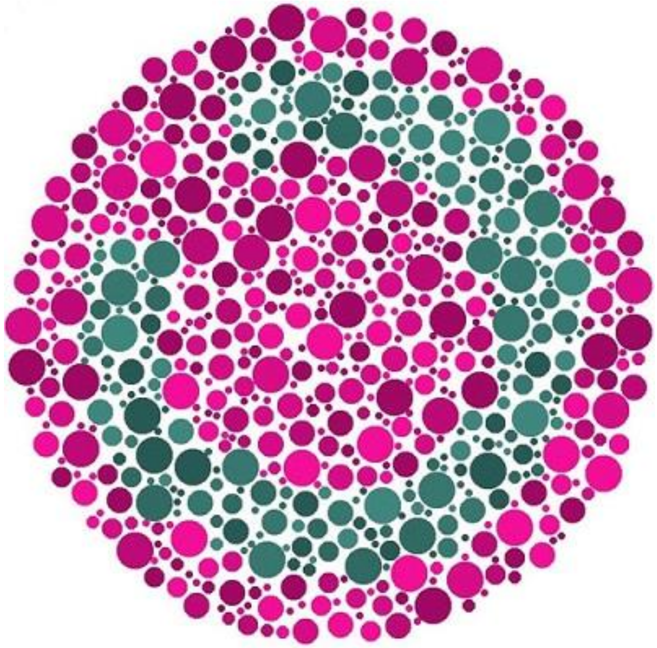
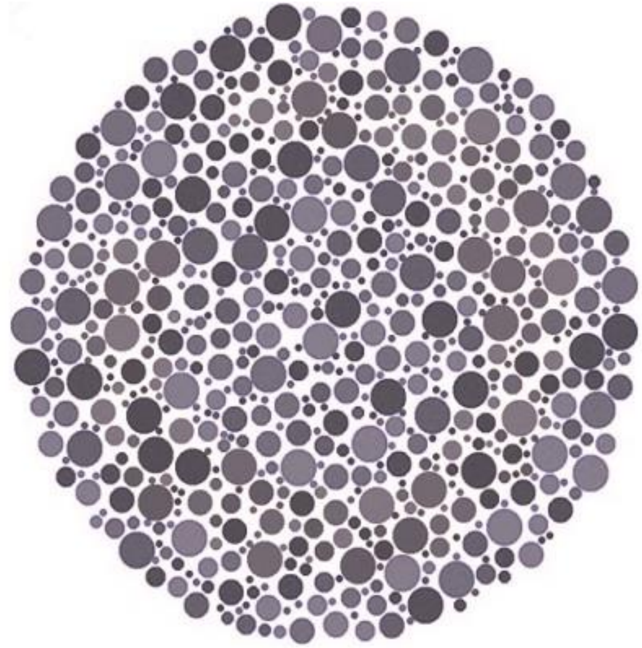
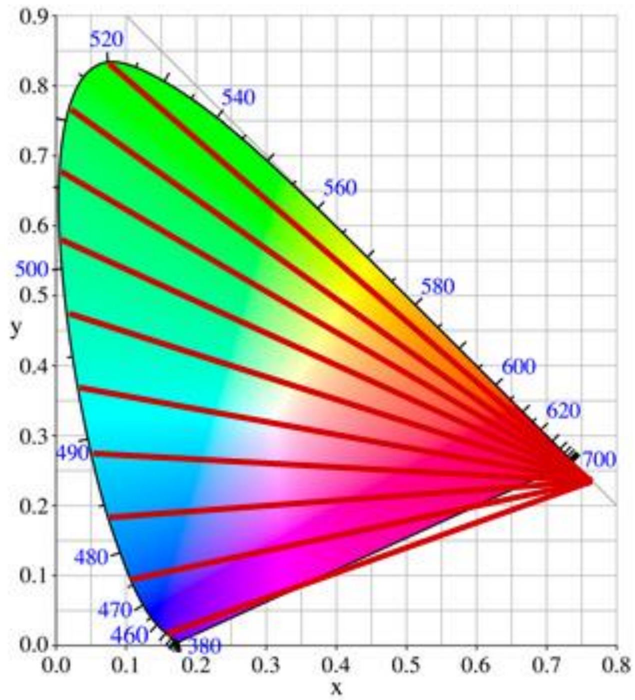
460
380



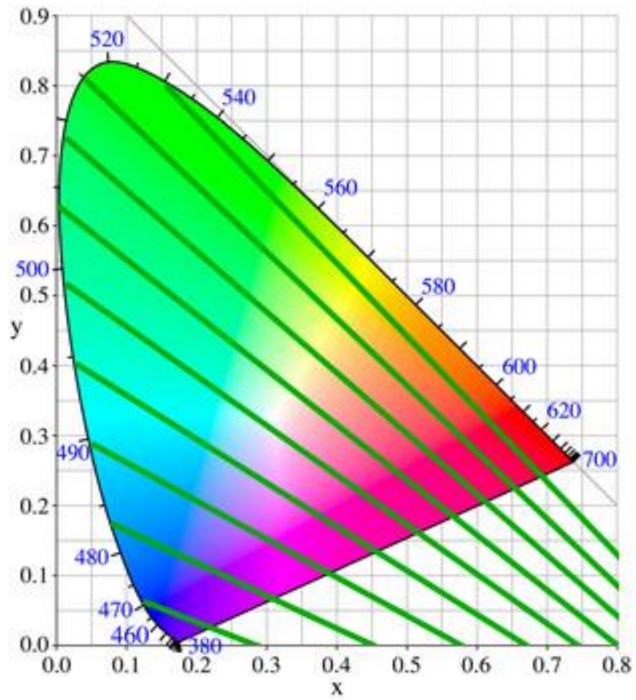


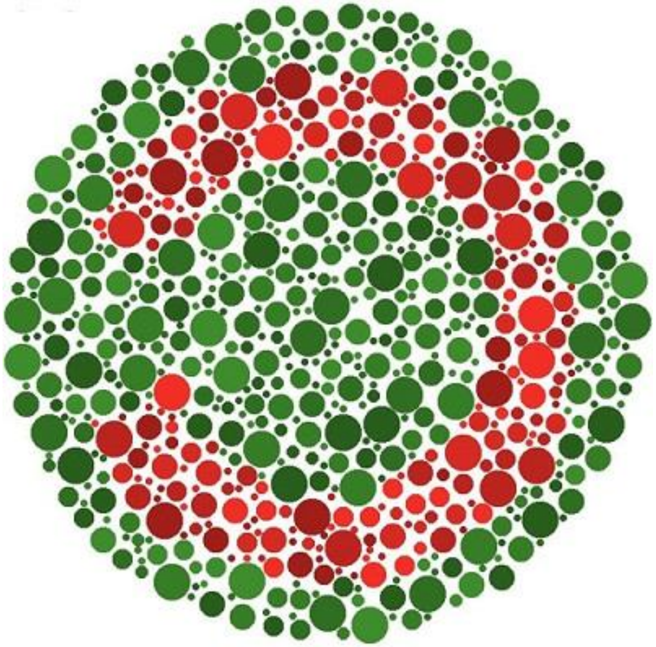
purpurovo-zelený test

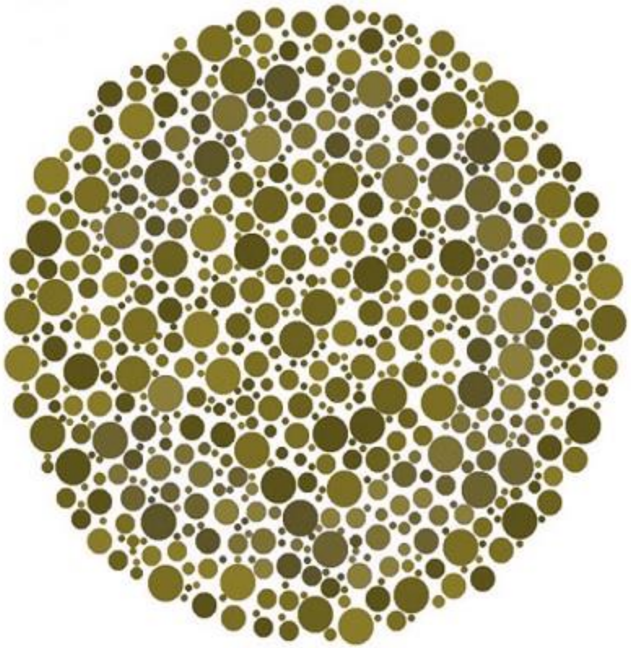
protan



deutan







červeno-zelený test

Normal Color Vision

Deuteranopia Vision

Protanopia Vision

Tritanopia Vision


TEN PES SEM NEMŮŽE.
ALE TO JE ASISTENČNÍ PES!
VÁŽNĚ? JSTE SLEPÝ?
JSEM BARVOSLEPÝ.
ALE TO JSOU PSI TAKÉ.
JE TU, ABY SE MNOU SOUCÍTIL.
Cyanide and Happiness © Explosm.net


BOBE, MÁME JEN 3 VTEŘINY, NEŽ BOMBA VYBUCHNE!
PŘESTŘIHNI ČERVENÝ DRÁT, NE!!! ZELENÝ!
BERNICE, JE TU NĚCO, CO TI CHCI UŽ DLOUHO ŘÍCT...
ANO?
...JSEM BARVO-SLEPÝ
PÁ-PÁ, BOBE A BERNICE