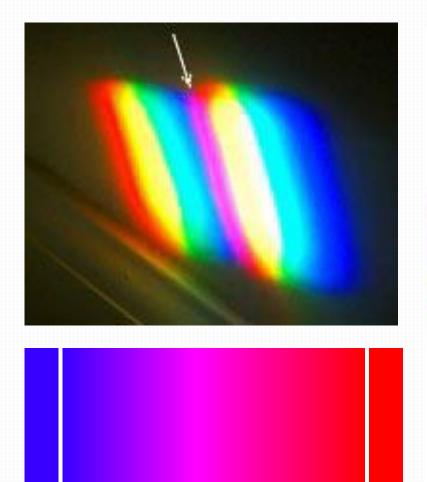
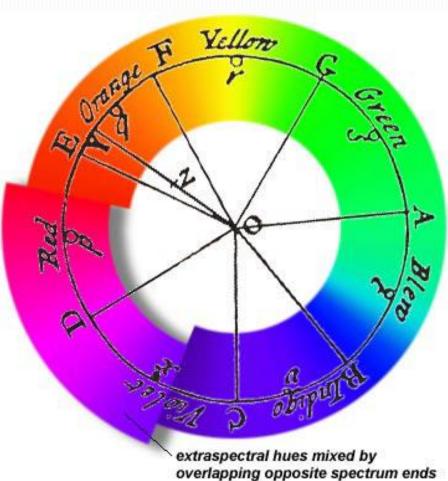
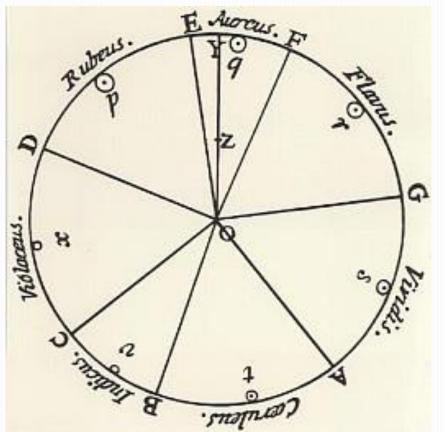
Computer Image Processing Lecture 5

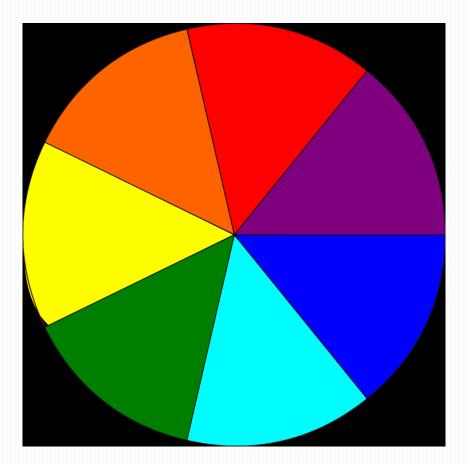
Colour measurement Colour models



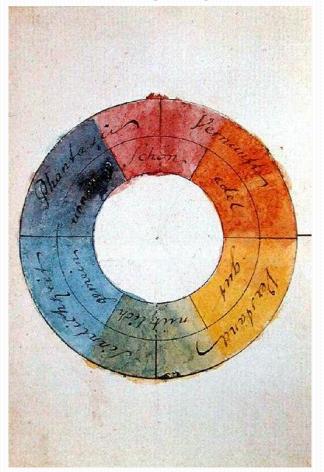


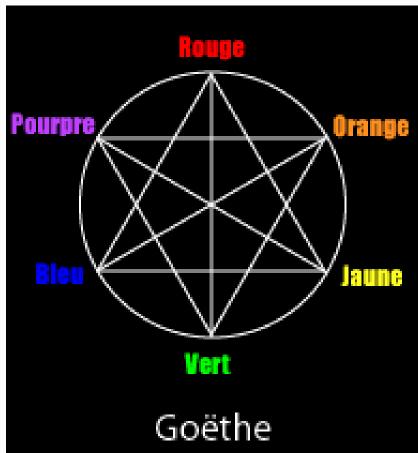
Issac Newton (1666 r.)



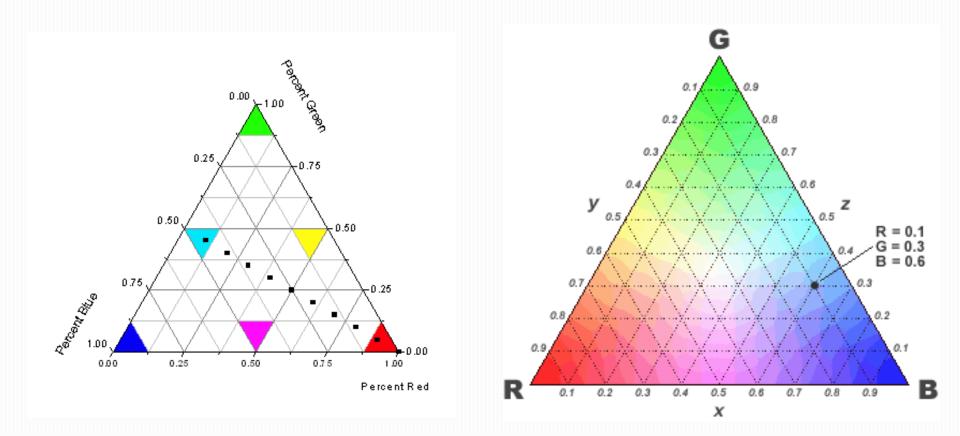


Johann Wolfgang Goethe (1810 r.)





James Clerck Maxwell (1859 r.)



Subjective methods

PANTONE

Samples that are part of the PMS (Pantone Matching System).

The basic scale describes 1761 colors marked with numbers with additional descriptions such as metallicity.



Subjective methods

PANTONE

dyes are applied.

Each of the shades corresponds with ready paint or recipe to mixing paints. They are formed by mixing 18 pigments. The samples include type of substrate for which

574 PC	575 PC	576 PC	577 PC	578 PC	579 PC	580 PC
5743 PC	5753 PC	5763 PC	5773 PC	5783 PC	5793 PC	5803 PC
5747 PC	5757 PC	5767 PC	5777 PC	5787 PC	5797 PC	5807 PC
581 PC	582 PC	583 PC	584 PC	585 PC	586 PC	587 PC
5815 PC	5825 PC	5835 PC	5845 PC	5855 PC	5865 PC	5875 PC
600 PC	601 PC	602 PC	603 PC	604 PC	605 PC	606 PC
607 PC	608 PC	609 PC	610 PC	611 PC	612 PC	613 PC
614 PC	615 PC	616 PC	617 PC	618 PC	619 PC	620 PC
621 PC	622 PC	623 PC	624 PC	625 PC	626 PC	627 PC
628 PC	629 PC	630 PC	631 PC	632 PC	633 PC	634 PC
635 PC	636 PC	637 PC	638 PC	639 PC	640 PC	641 PC
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656 PC	657 PC	658 PC	659 PC	660 PC	661 PC	662 PC
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670 PC	671 PC	672 PC	673 PC	674 PC	675 PC	676 PC

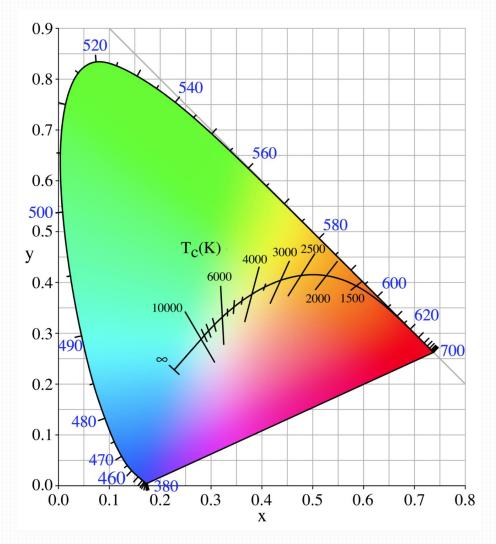
PANTONE" Color Simulations using the PANTONE MATCHING SYSTEM-Coated Simulation

mark for color reproduction and color reprod

er over a reason, as a cardeonaria cardinaria control reproduction are over reproduction mathematical solid color standards. PANTONE Color Reference Manuals for accurate color. PANTONE Color Lookup Table @ Pantone, Inc., 1994

rarks are the primerties of their respective com-

Chromaticity diagram

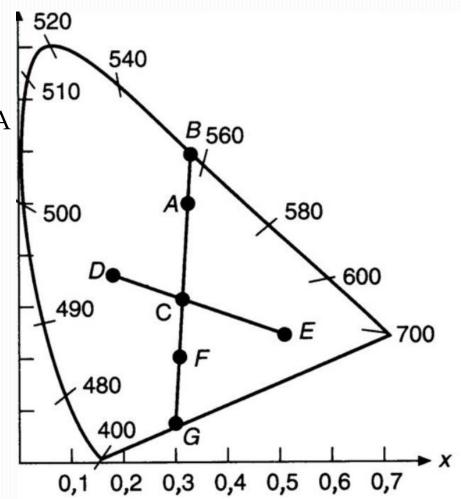


Computer Image Processing – Lecture 5

Chromaticity diagram

Colour dependencies in chromaticity diagram:

- C "standard" white
- the dominant wavelength for color A is pure light with a spectral color at point B
- AC to BC ratio (in percent) is the purity of the color A
- colours D and E are complementary
- F unspectral color
- purple and magenta are determined by the complementary wavelength

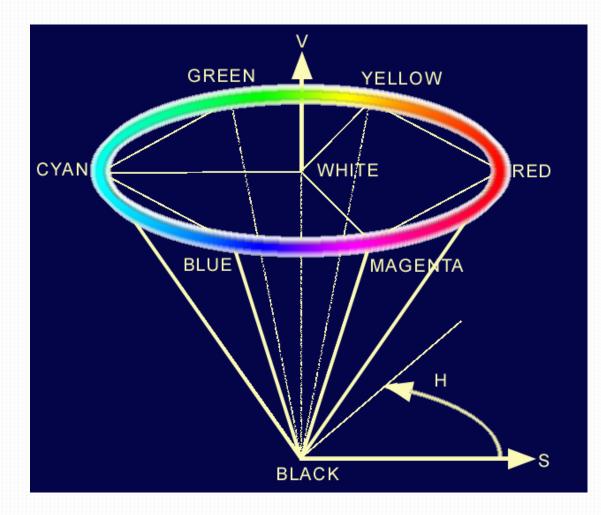


Colour models used in computer graphics:

- User-oriented HSV
- Device-oriented RGB, CMY
- Independent CIE La*b*

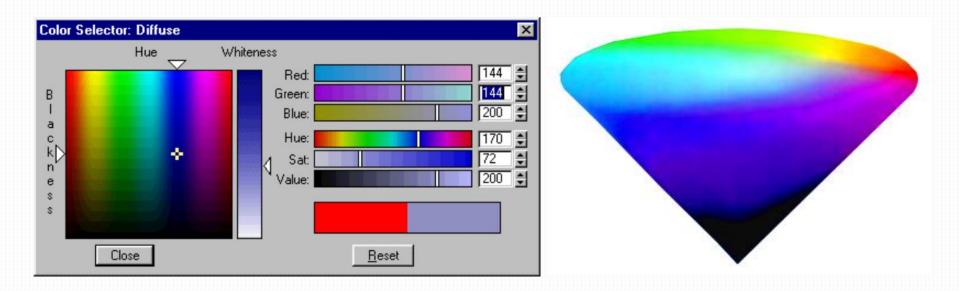
Colour models - HSV

H – Hue S – Saturation V - Value

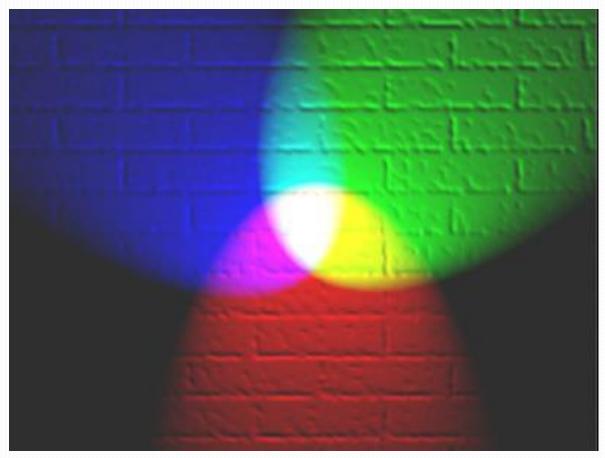


Colour models - HSV

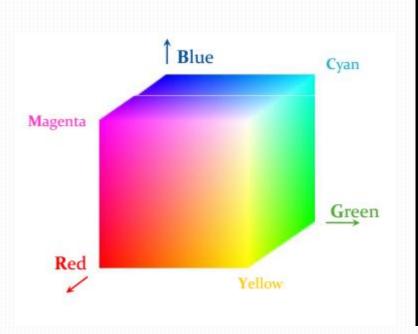
HSV model

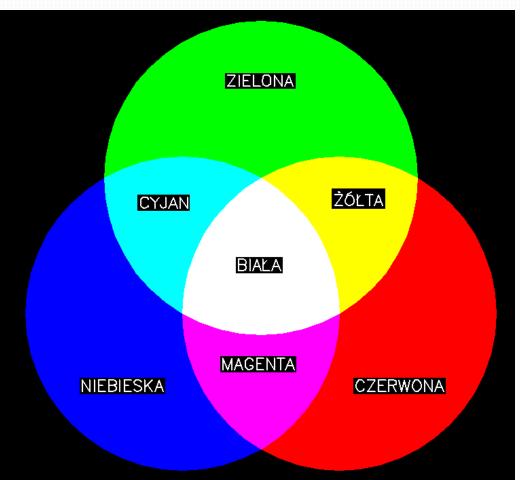


Additive model (oriented on display equipment)



Additive model





Additive model (RGB)

R = 1,0,0

$$G = 0, 1, 0$$

$$B = 0, 0, 1$$

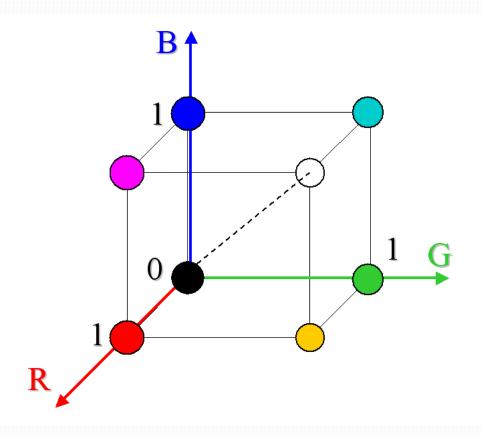
$$C = 0, 1, 1$$

$$M = 1,0,1$$

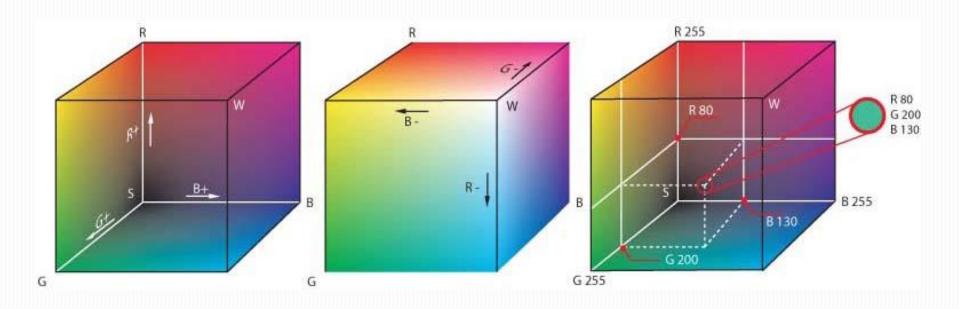
$$Y = 1, 1, 0$$

$$black = 0, 0, 0$$

gray = 0.5,0.5,0.5



Additive model (RGB)

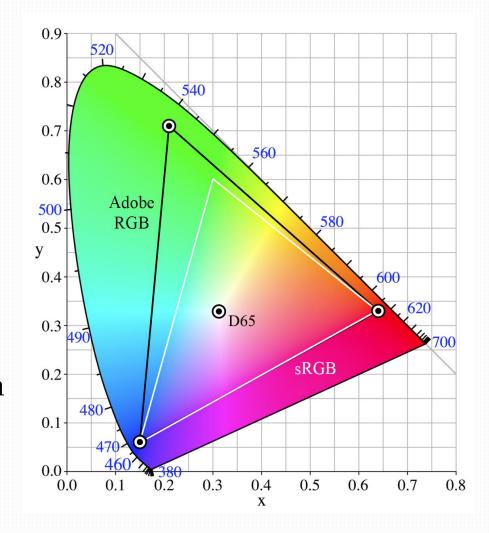




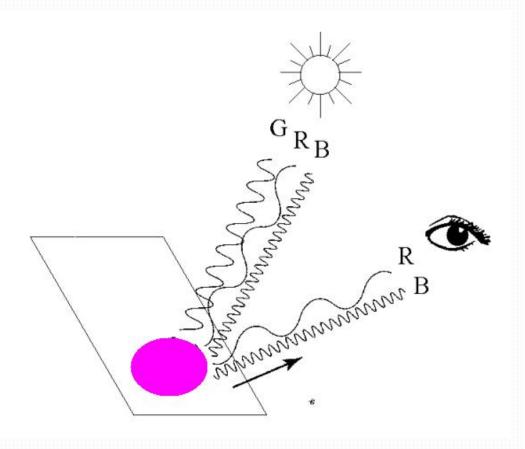
1911 - photography made with the use of colour filters and three exposures

Gamut

In color reproduction, including computer graphics and photography, the gamut is a certain complete subset of colors. The most common usage refers to the subset of colors which can be accurately represented in a given circumstance, such as within a given color space or by a certain output device.



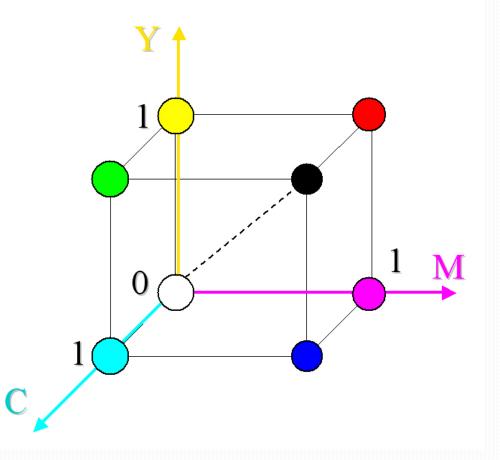
Subtractive model (oriented on printing equipment)



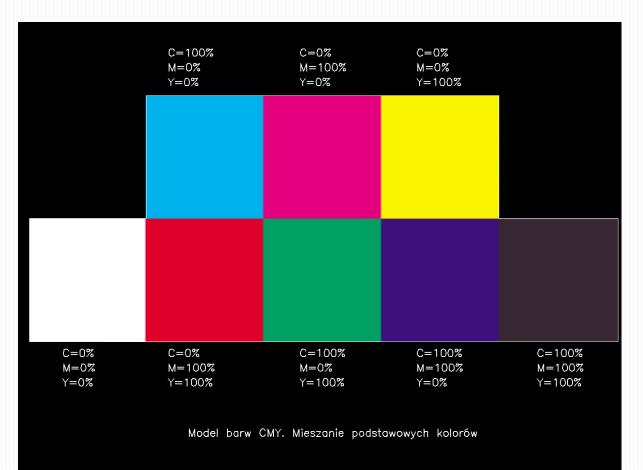
Subtractive model (CMY)

C = 1,0,0M = 0,1,0 Y = 0,0,1 R = 0,1,1 G = 1,0,1 B = 1,1,0 black = 1,1,1 white = 0,0,0

gray = 0.5,0.5,0.5

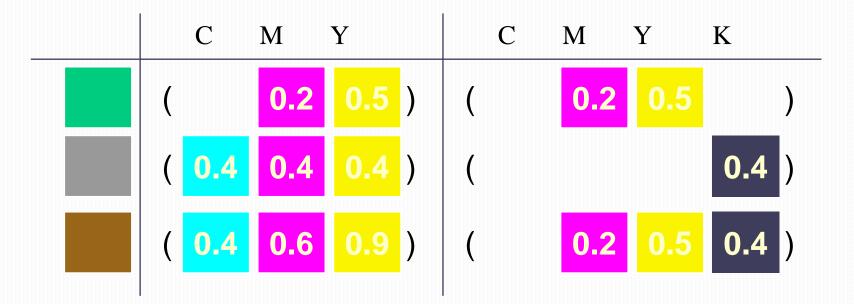


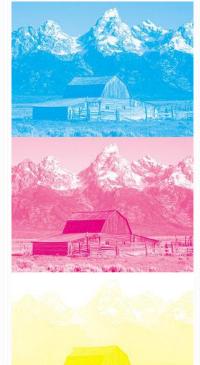
CMY colour space



CMYK model

In the CMY model, gray is obtained by mixing equal amounts of three basic colors (C=M=Y). In the CMYK model it is generated by the fourth primary color - blacK





is Mills Land



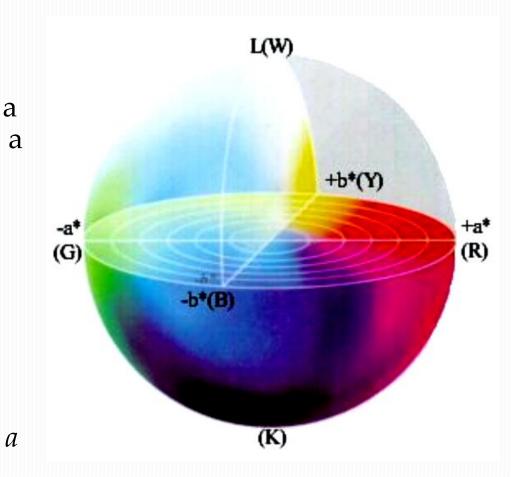




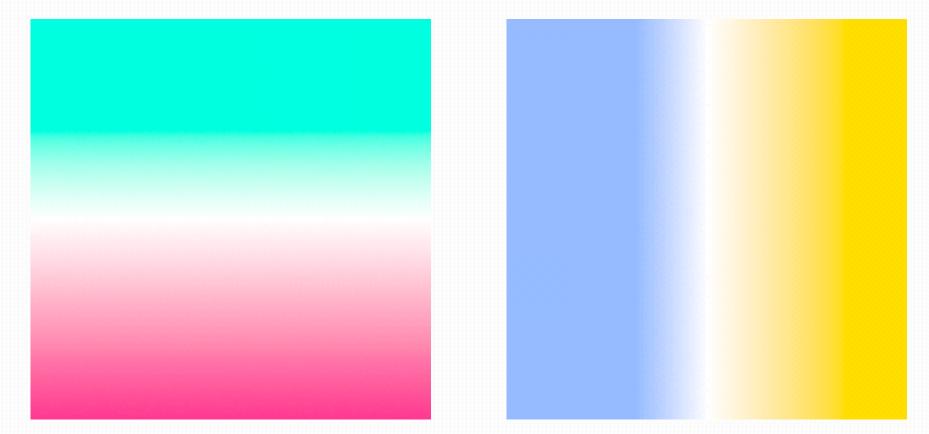
CIE La*b*

It contains the widest mathematically defined colour space, which was created as result of the transformation of CIE cone.

The most important computer graphics model, used for calculations on colours by CMS (Color Management Systems). The colours are described mathematically by three components : L - brightness (luminance) and two channels - aand b.



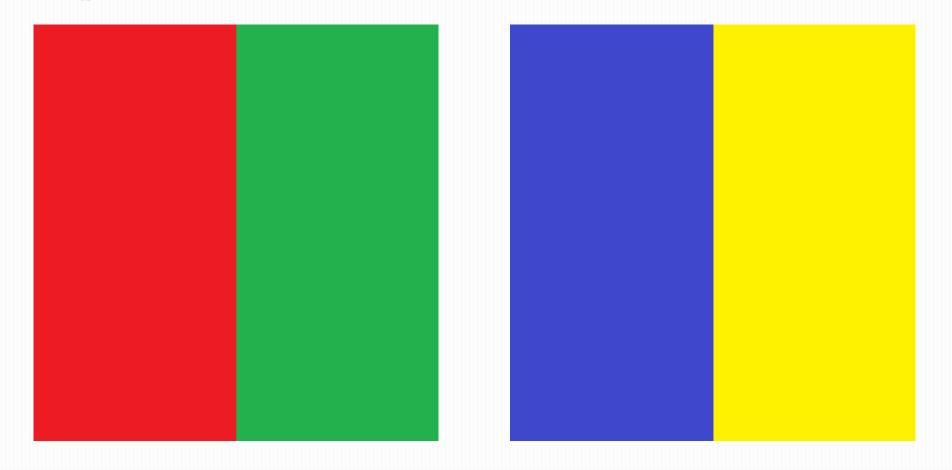
CIE La*b*



channel a

channel b

"Impossible" colours





Computer Image Processing – Lecture 5