

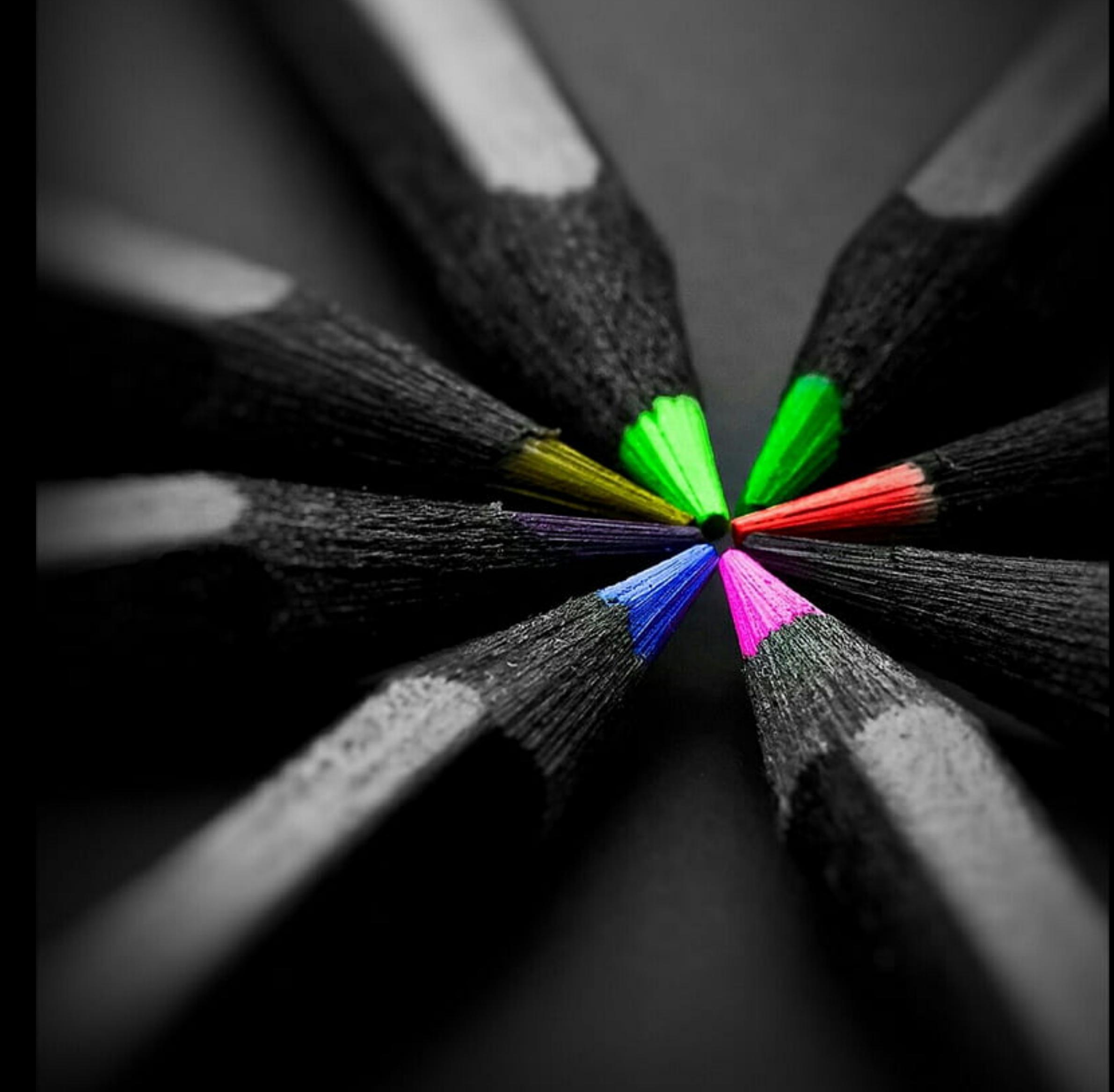
# All about colors in CSS

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*AVP, JP Morgan Chase & Co.*

Sat, Apr 15, 2023.

React Bangalore meetup #66



# color

*it is a definition (numeric or textual) of the human visual perception of a light or a physical object illuminated with light.*

*The color of a physical object depends on how much light it reflects at each visible wavelength, plus the actual color of the light illuminating it.*

# VS Code Extension: CSS Color Collector

The screenshot shows the Visual Studio Marketplace page for the "css color collector" extension. The page has a dark theme with a green header. At the top, there's a navigation bar with tabs for "Visual Studio" and "Marketplace". The user is signed in as "Keshav Mohta (xkeshav@gmail.com)". A search bar is located at the top right.

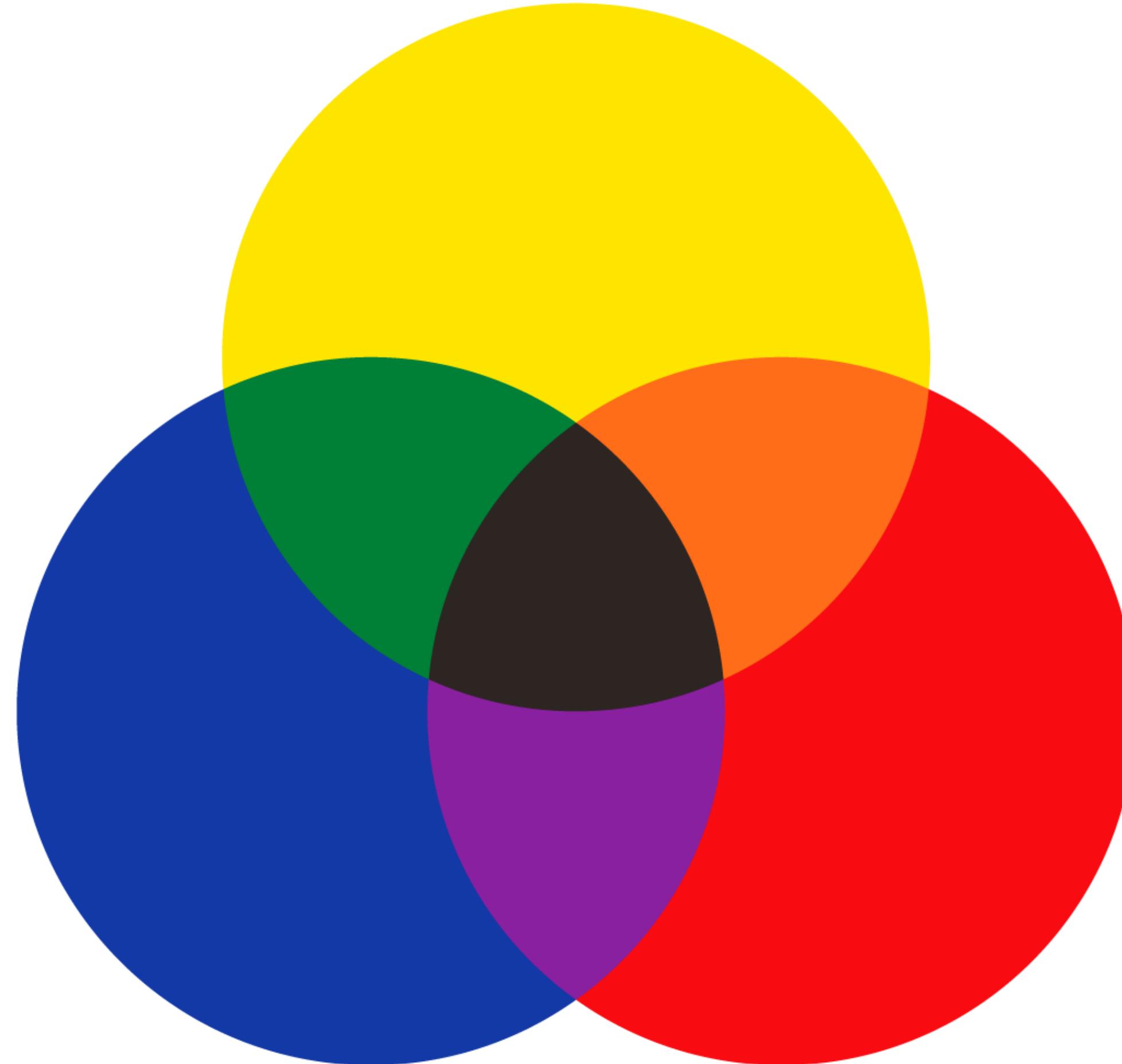
The main content area features the extension's icon (a red flower), its name "css color collector", the author "Keshav Mohta", the number of installs (101), its rating (5 stars from 2 reviews), and the word "Free". Below this, a description states: "collect each color values from a css file and replace it with an intuitive variable and add a new :root pseudo selector which contains these variables." There are "Install" and "Trouble Installing?" buttons.

Below the main card, there's a "Overview" tab followed by "Version History", "Q & A", and "Rating & Review". To the right, there are sections for "Categories" (listing "Programming Languages") and "Tags" (listing "ccc", "color collector", "color parser", and "css").

# History of colors

## Subtractive color model

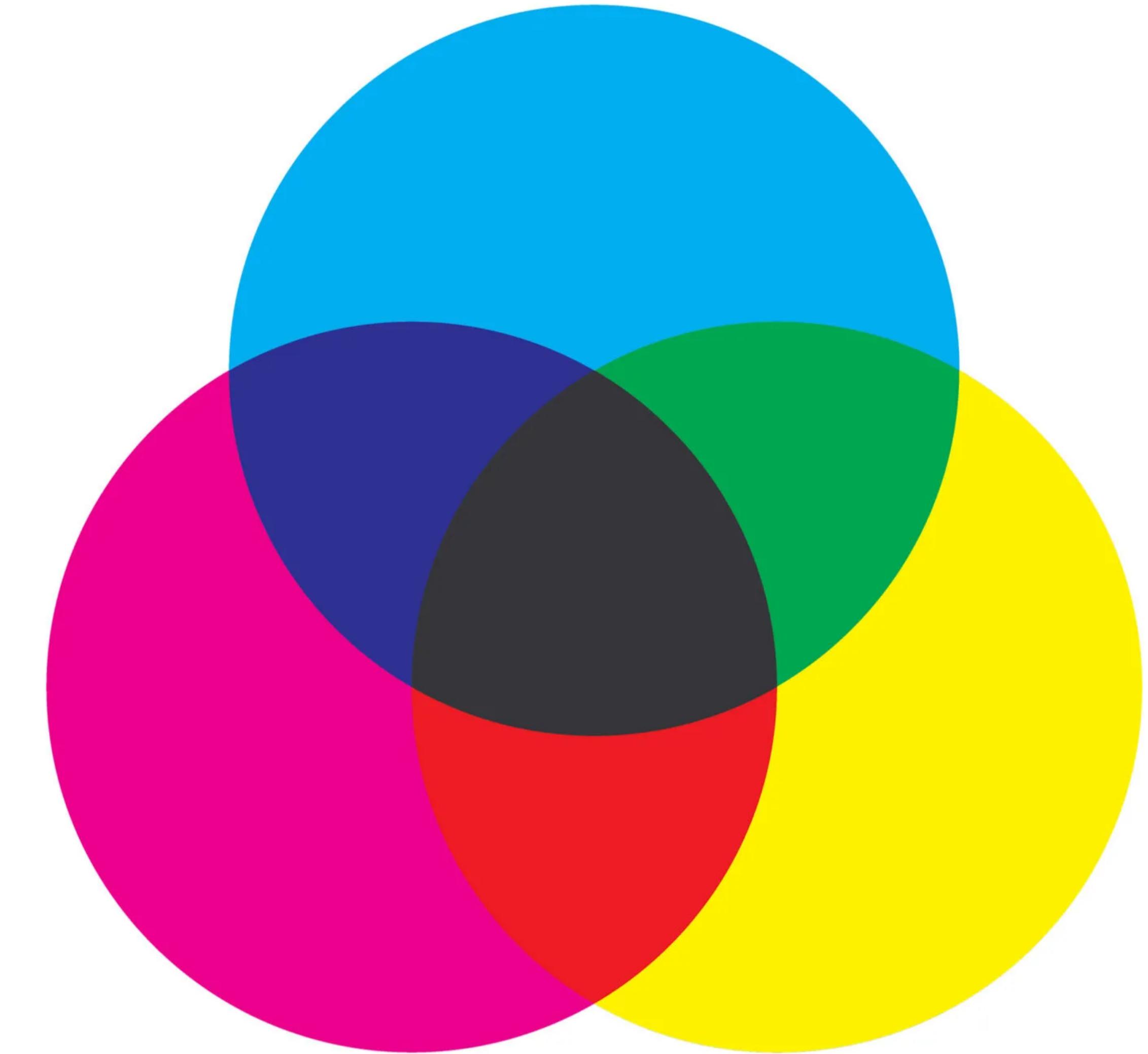
pigments



# History of colors

## Subtractive color model

CMYK



# History of colors

## Additive color model

optics



# CSS Module Journey so far

maintained by w3c (World Wide Web Consortium) community : <https://w3.org>

# CSS Module

## Module 1 - Dec 1996

- CSS1
- colors inherited from
  - ❖ x11 server; [rgb.txt](#) , Sinclair paint company.
  - ❖ color syntax are case insensitive. i.e. `#FFF`  $\equiv$  `#fff` and `BLack`  $\equiv$  `bLACK` but no white space
- 3 or 6 digit hex value, comma separated
  - ❖ `#abc`  $\equiv$  `#aabbcc`, `#abcdef`
  - ❖ `rgb(n, n, n)`
  - ❖ `rgb(p%, p%, p%)`
  - ❖ `rgb(255,255,255)` = `rgb(100%,100%,100%)` = `#FFF`

[w3c: css1 color specifications](#)

# HEX COLOR SYNTAX

- Hex Notation
- 0 - 9 a b c d e f
- F = 15; FF =  $15*16^1 + 15*16^0 = 240 + 15 = 255$
- #FFF and #000
- #abc === #aabbbcc === #abcf === #aabbccff

DECIMAL VALUES															
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
HEXADECIMAL DIGITS															

# CSS Module

## Module 2 - 1998

- CSS2.1
- added only single color - Orange
- Color outside of sRGB color space will be mapped
  - ❖ `rgb(300,0,0) /* clipped to rgb(255,0,0) */`
  - ❖ `rgb(255,-10,0) /* clipped to rgb(255,0,0) */`
- New <system-colors> added
  - ❖ `{ color: WindowText; background-color: InfoBackground }`

[w3c: css2.1 color specification](#)

# CSS Module

## Module 3 - 1999 till 2022

- CSS3 - divided into modules
- Added 231 named color - Total **248** colors
- New format included
  - ❖ `rgb()` with an alpha value of 1 - `rgb(a, b, c, 1)`
  - ❖ `rgba()` *format added* - `rgba(a, b, c, 0.1)`
  - ❖ `hsl(h, s%, l%)`  $\equiv$  `hsl(h, s%, l%, 1)`
  - ❖ `hsla(h, s%, l%, a)`
  - ❖ `systemColor` deprecated

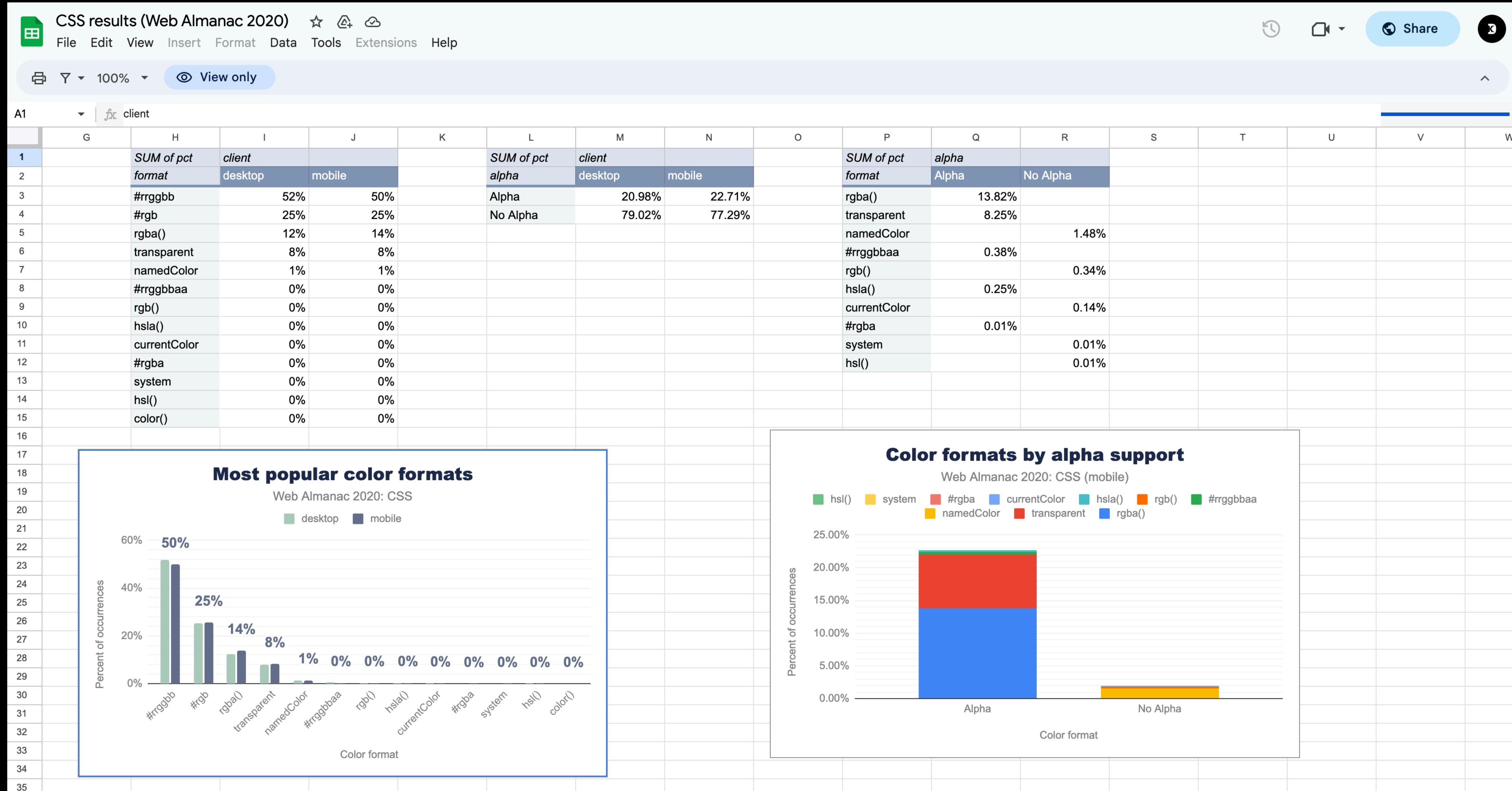
[w3c: css3 color specification](#)

# Named colors

- Where did CSS named colours originated from ?
- green is not #0f0 but *lime* is.
- pink and dark pink; grey and dark grey
- cyan === aqua | magenta === fuchsia
- *IndianRed*, *NavajoWhite*, *Moccasin* are not recommended.
- **RebeccaPurple** ; added in 2014 in honour of Rebecca Meyer

[w3c mail archive](#)

# Syntax and Format Result



# CSS Module

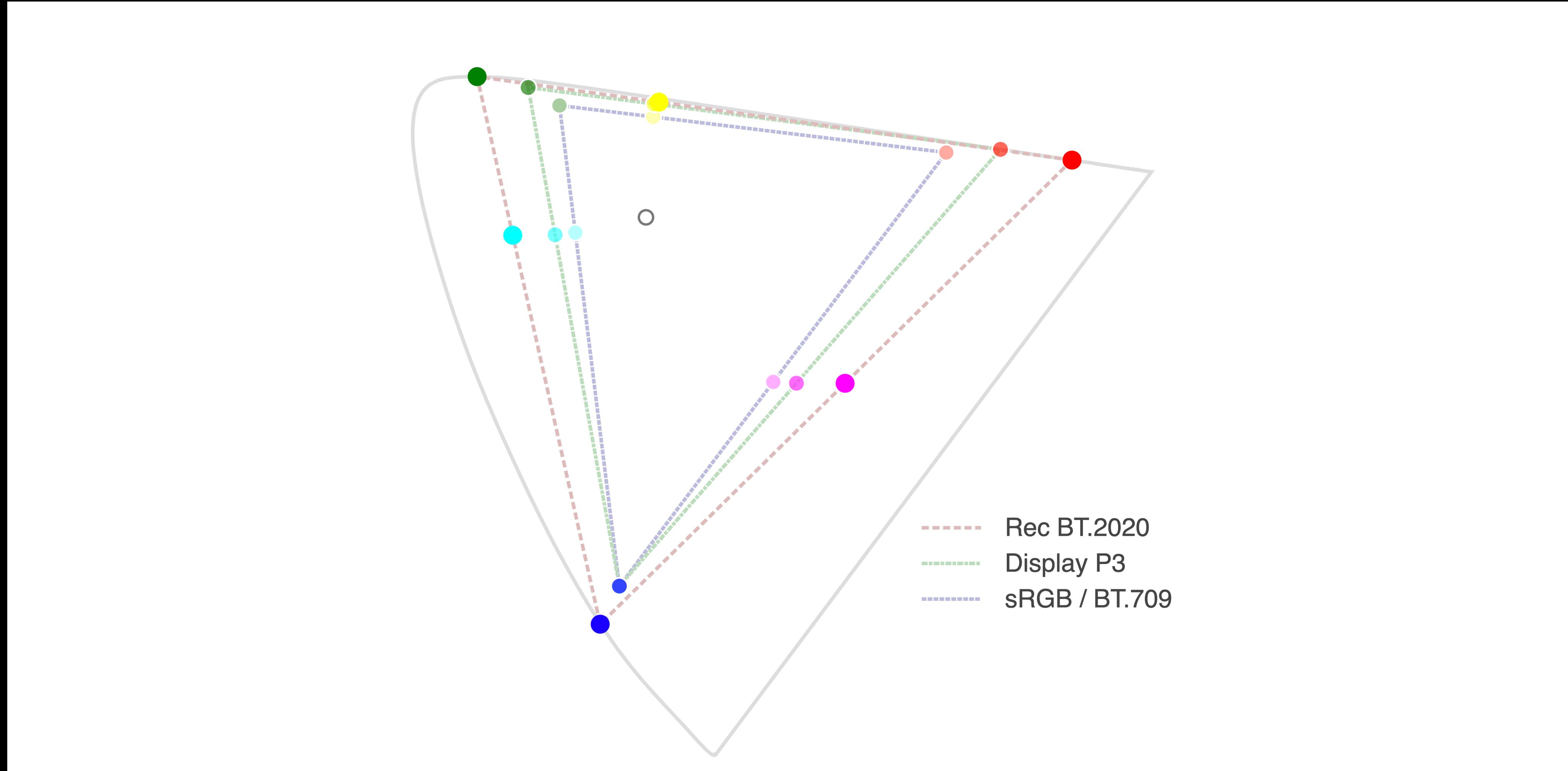
## Module 4 - Nov 2022

- CSS4 - added wide color gamut
- The range of colors that a given device can produce is termed the *gamut*.

for eg. `rgb(300, -10, 0)` , clipped to  $rgb(255,0,0)$  due to *out of gamut of rgb*

[w3c: css4 color specification](#)

# Color Gamut



# CSS Module

## Module 4 - syntax and format

- 4 and 8 digit hex value introduced - `#abcd` or `#123456ab`
- values *without comma are preferred*
- use of `none` keyword allowed - `rgb(n n n)` or `rgb(p% none p% / n%)` or `hsl(h s% l% / none)`
- new format added
  - ❖ `hwb(n p% p%)`
  - ❖ `lab()`, `lch()`, `oklab()`, `oklch()`
- color function syntax added - `color(<color-space> n/p n n)`
- Legacy comma-separated syntax also supported for `rgb[a]/hsl[a]` but can not use word `none` here
  - ❖ `rgb(None 1 1)` is valid but `rgb (None, 1, 1)` is invalid
- cylindrical polar color model ==> `hsl()` / `hsla()` / `lch()` / `oklch()`
- rectangular orthogonal color model ==> `lab()` / `oklab()`

# color syntax

```
<color> = <absolute-color-base> | currentcolor  
<absolute-color-base> = <absolute-color-function> | <named-  
color> | <hex-color> | transparent  
  
<absolute-color-function> = <rgb(>) | <rgba(>) |  
    <hsl(>) | <hsla(>) | <hwb(>) | <color(>)>  
    <lab(>) | <lch(>) | <oklab(>) | <oklch(>) // #  
  
#: device independent color spaces
```

# color() syntax in CSS4

```
color() = color(<colorspace-params> [ / [ <alpha-value> | none ] ]? )  
<colorspace-params> = [ <predefined-rgb-params> | <xyz-params>]  
<predefined-rgb-params> = <predefined-rgb> [ <number> | <percentage> |  
none ]{3}  
<predefined-rgb> = srgb | srgb-linear | display-p3 | a98-rgb | prophoto-  
rgb | rec2020  
<xyz-params> = <xyz-space> [ <number> | <percentage> | none ]{3}  
<xyz-space> = xyz | xyz-d50 | xyz-d65
```

[w3c refrence](#)

# color() syntax

`color(<color-space> [0-1] [0-1])`

pre defined color-space

- srgb
- srgb-linear
- display-p3
- a98-rgb
- prophoto-rgb
- rec-2020
- xyz
- xyz-d50
- xyz-d65

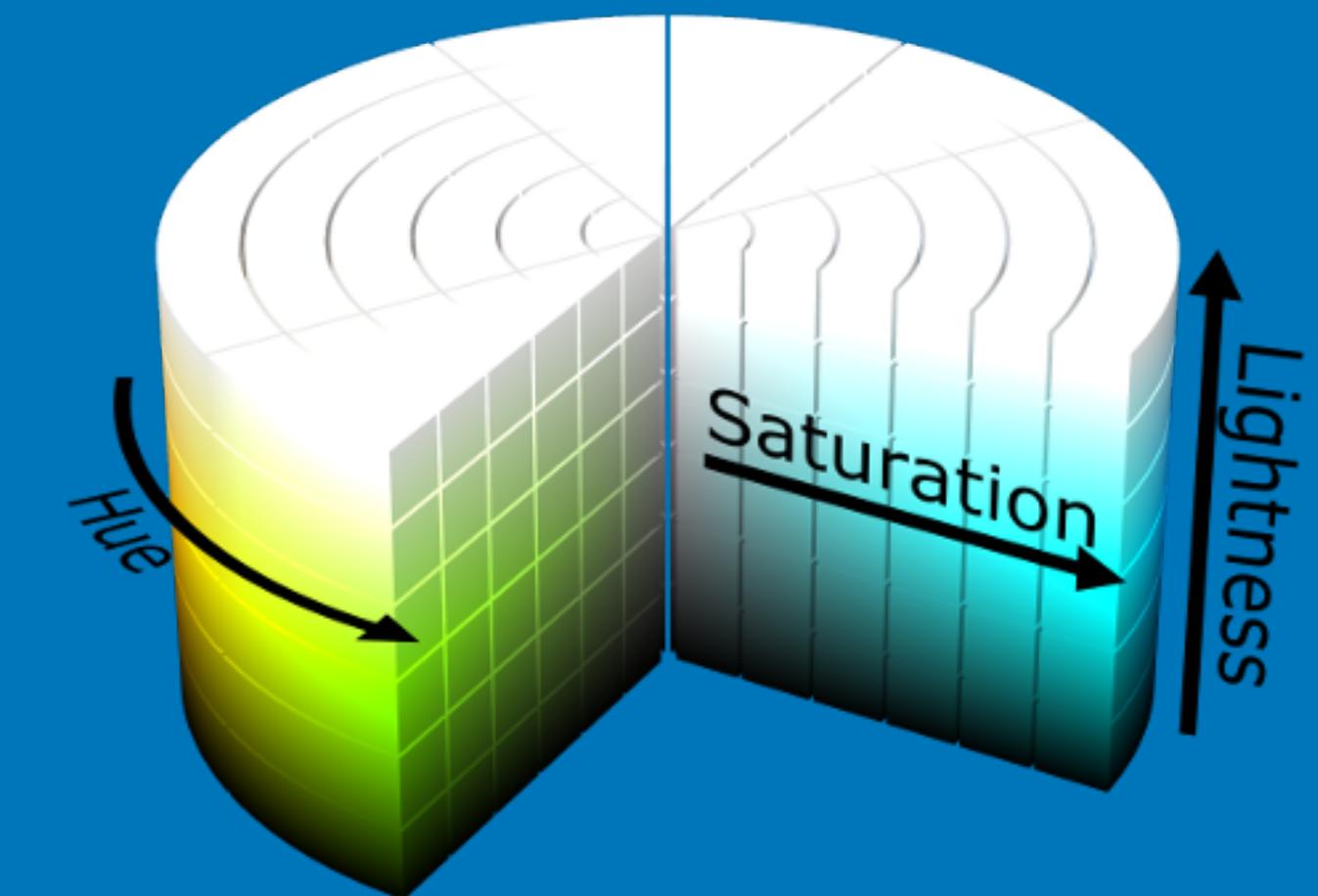
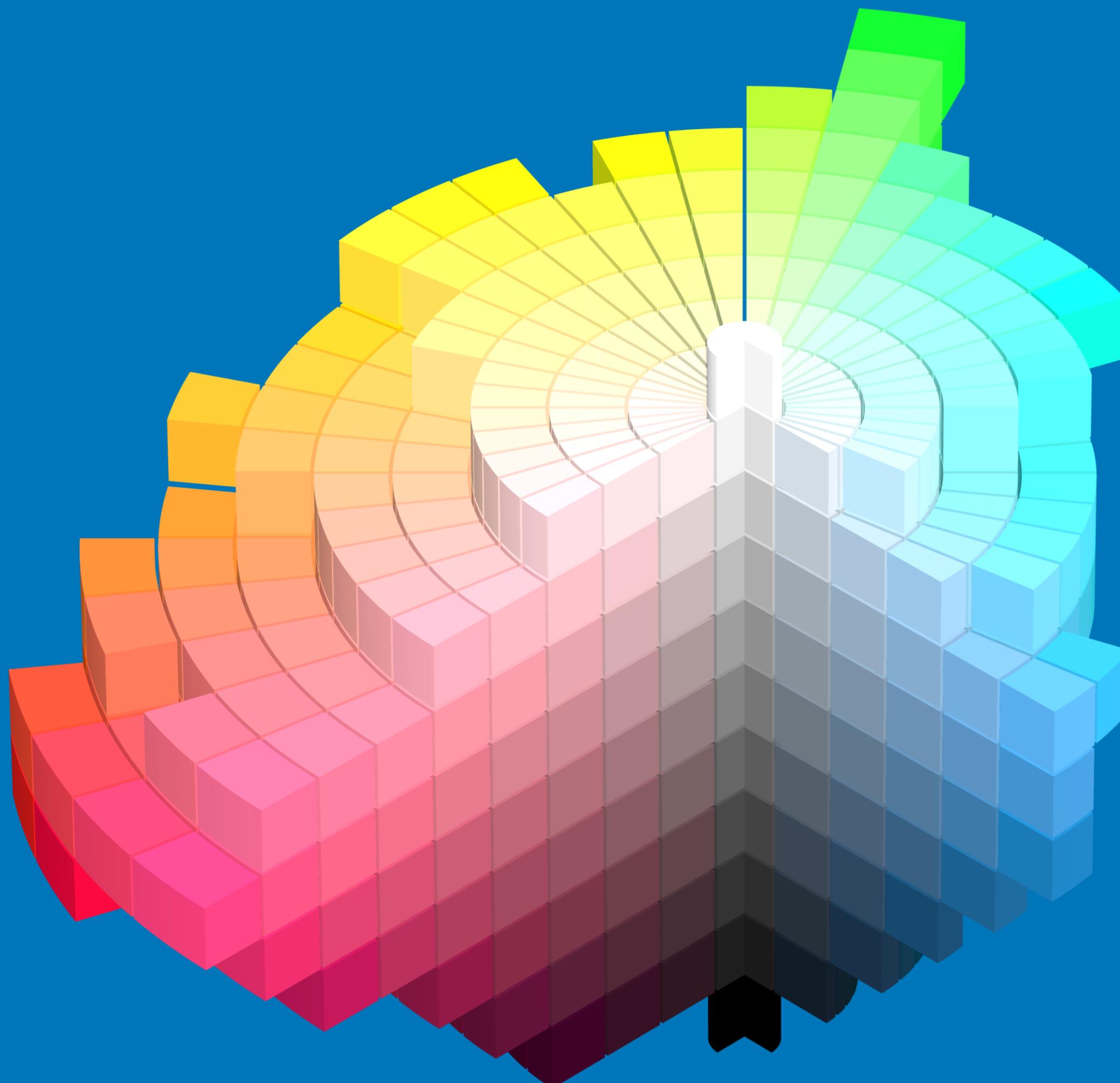
`background-color: color(display-p3 1 0.08 0); /* super red! */`

# HSL - Hue Saturation Lightness

# HSL = Hue Saturation Lightness



# HSL = Hue Saturation Lightness



# HSL => Hue Saturation Lightness

**hsl( h s l ) | hsla( h s l a)**

- h => [0-360]deg | [0-1]turn
- s and l => [0-100]%
- a => [0.0-1.0]
- eg: *hsl(150 50% 50% / 0.5); // no comma*

[hsl demo](#)

# **HWB- Hue Whiteness Brightness**

# HWB => Hue Whiteness Brightness

**hwb( h w b [/ a] )**

- h => angle [0-360]
- w and b => [0-100]%
- eg.

(I) *hwb(0 0% 0%) --> red*

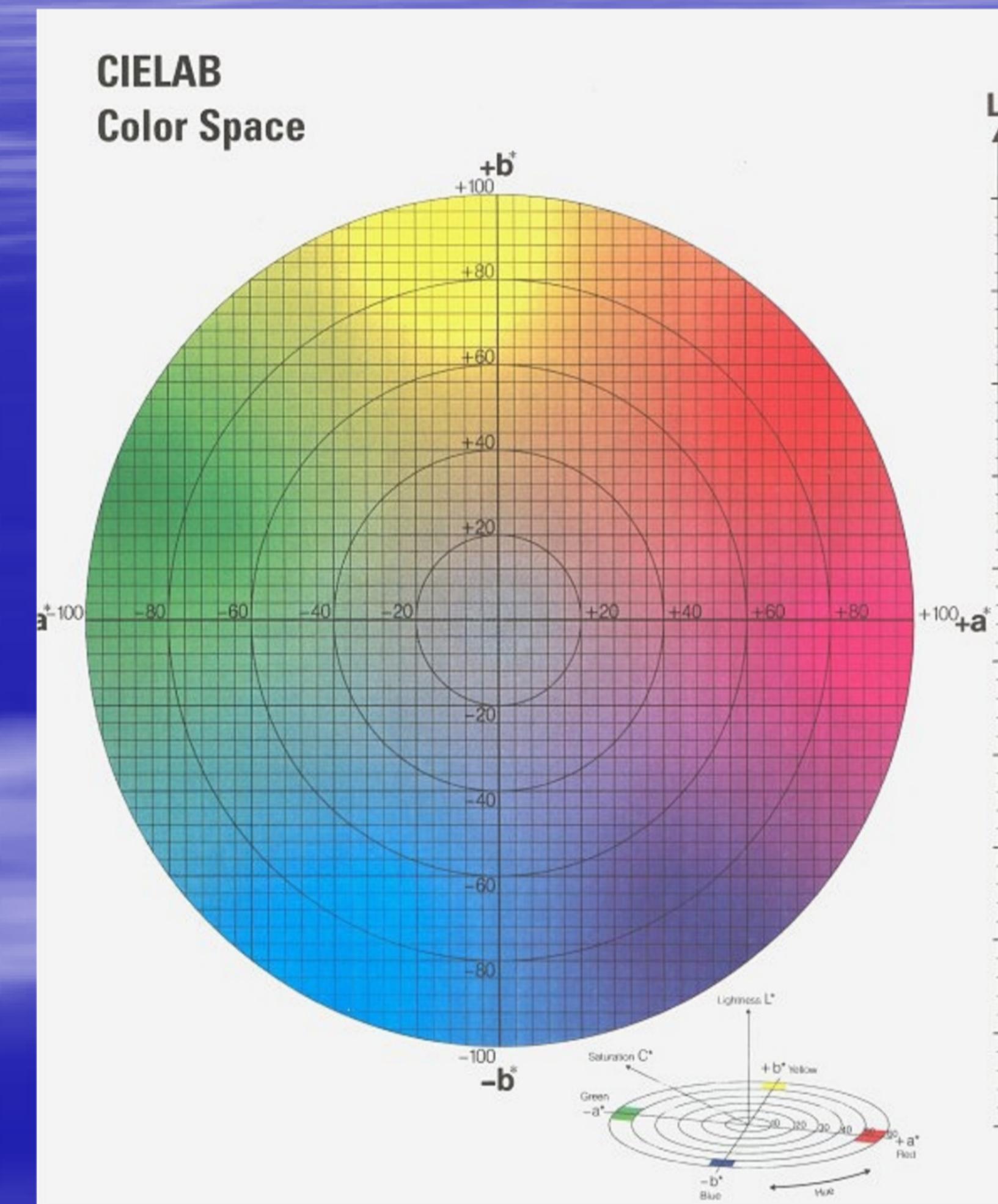
(II) *hwb(0 100% 0%) --> white*

(III) *hwb(0 0% 100%) --> black*

# LAB - Lightness A and B Axis

# LAB

## CIELab Color space



- Colour space  $L^*$ ,  $a^*$ ,  $b^*$ .  
CIELab (CIE 1976) – Commission International de l'Eclairage

$L^*$  whiteness/blackness (100 – white, 0 – black)

$a^*$  red (+100), green (-100)

$b^*$  yellow (+100), blue (-100)

# LAB => Lightness A and B Axis

lab( l a b )

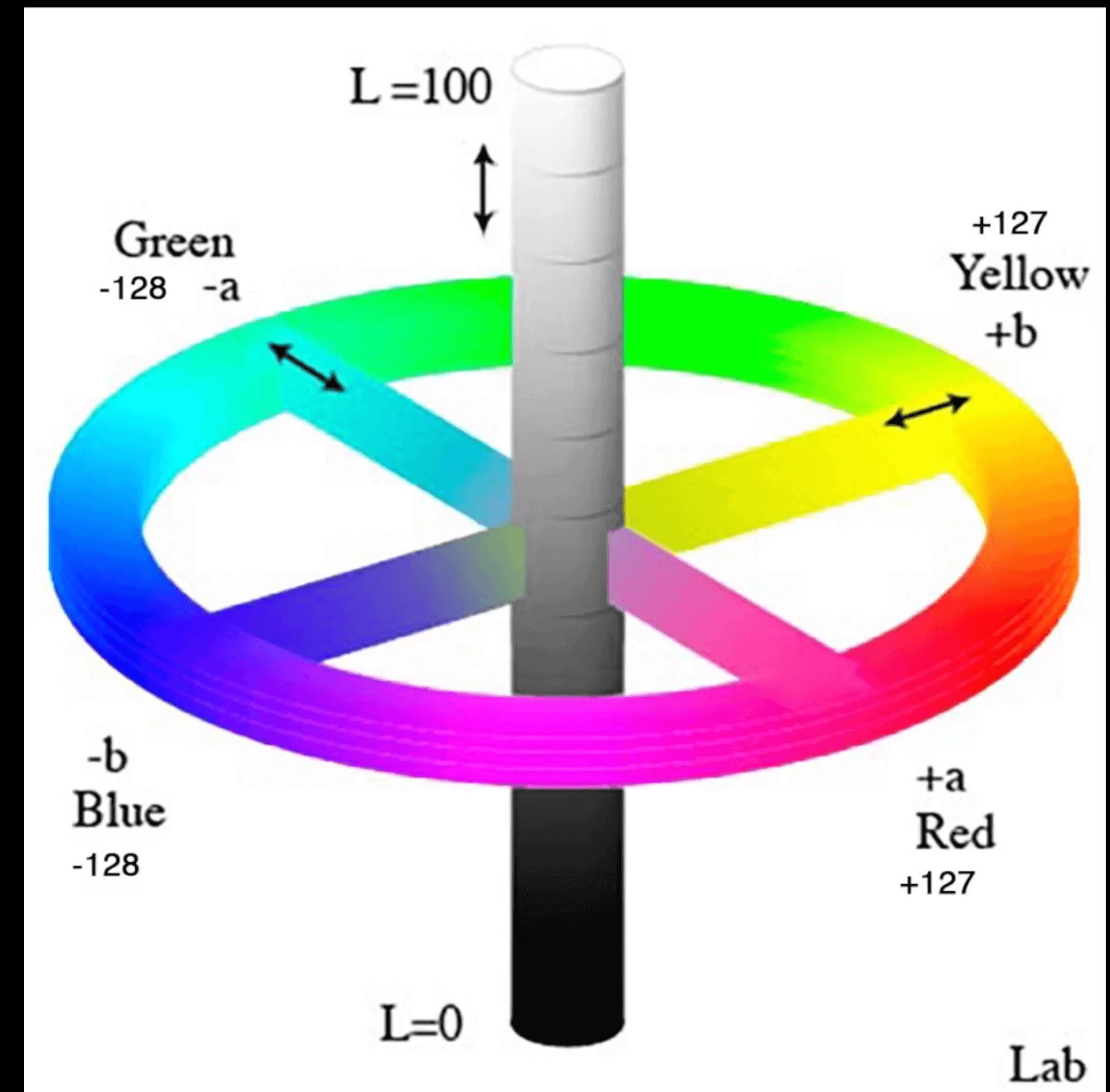
- l => [0-100]%
- a axis => green to red ( -127 to +128 )
- b axis => blue to yellow ( -127 to +128 )
- optional alpha channel parameter separated by /

• eg.

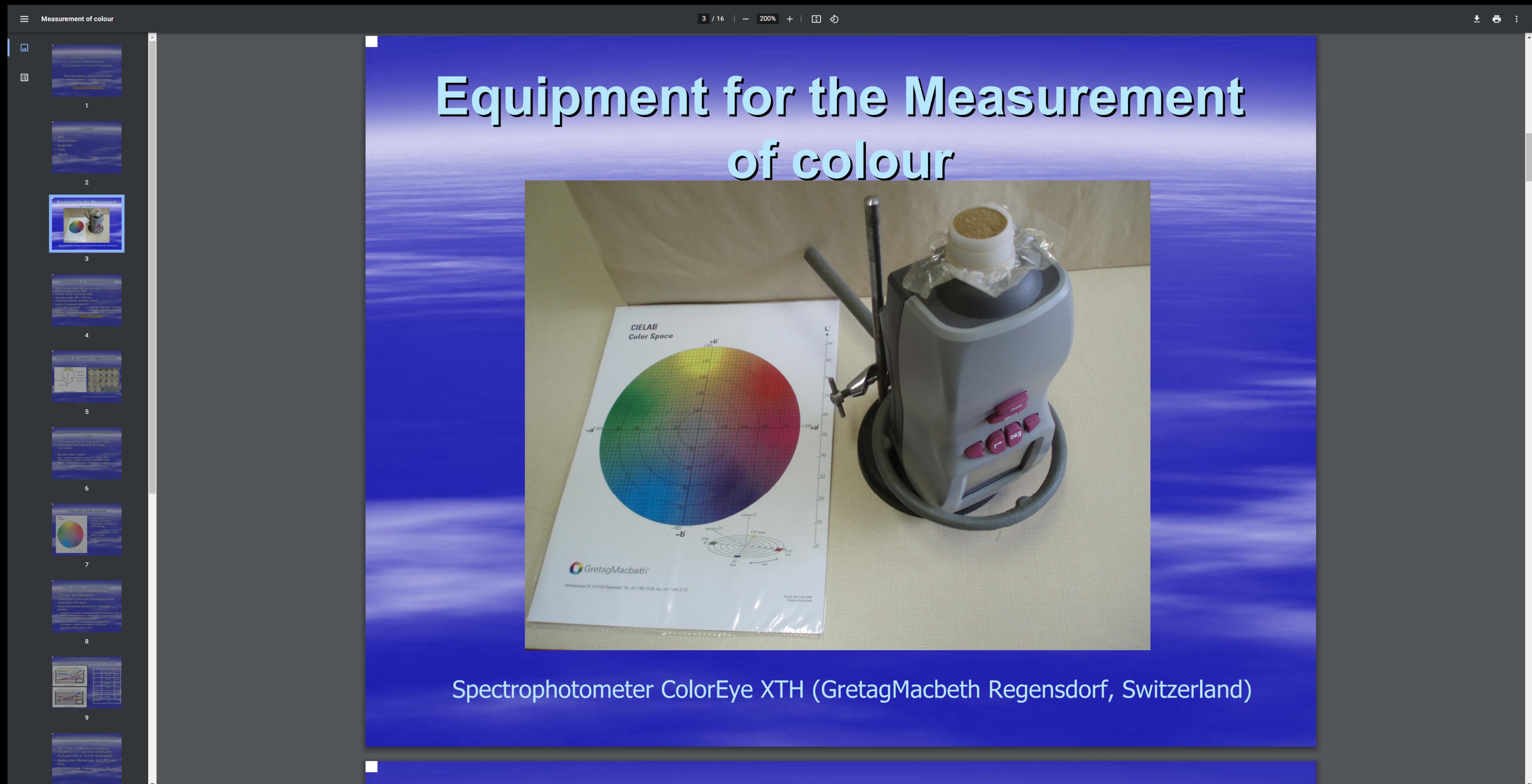
(I) lab(100 125 125);

(II) lab(75% -120 125);

(III) lab(67.5345 -8.6911 -41.6019);



# Spectrophotometer



# LCH - Lightness Chroma Hue

# LCH => Lightness Chroma Hue

**lch(l ch) | oklch (l ch /a)**

- l => [0-100]%
- c => [0-132]
- h => [0-360] units deg, grad, rad, or turn
- a => [0-1] or [0-100]%
- Eg.

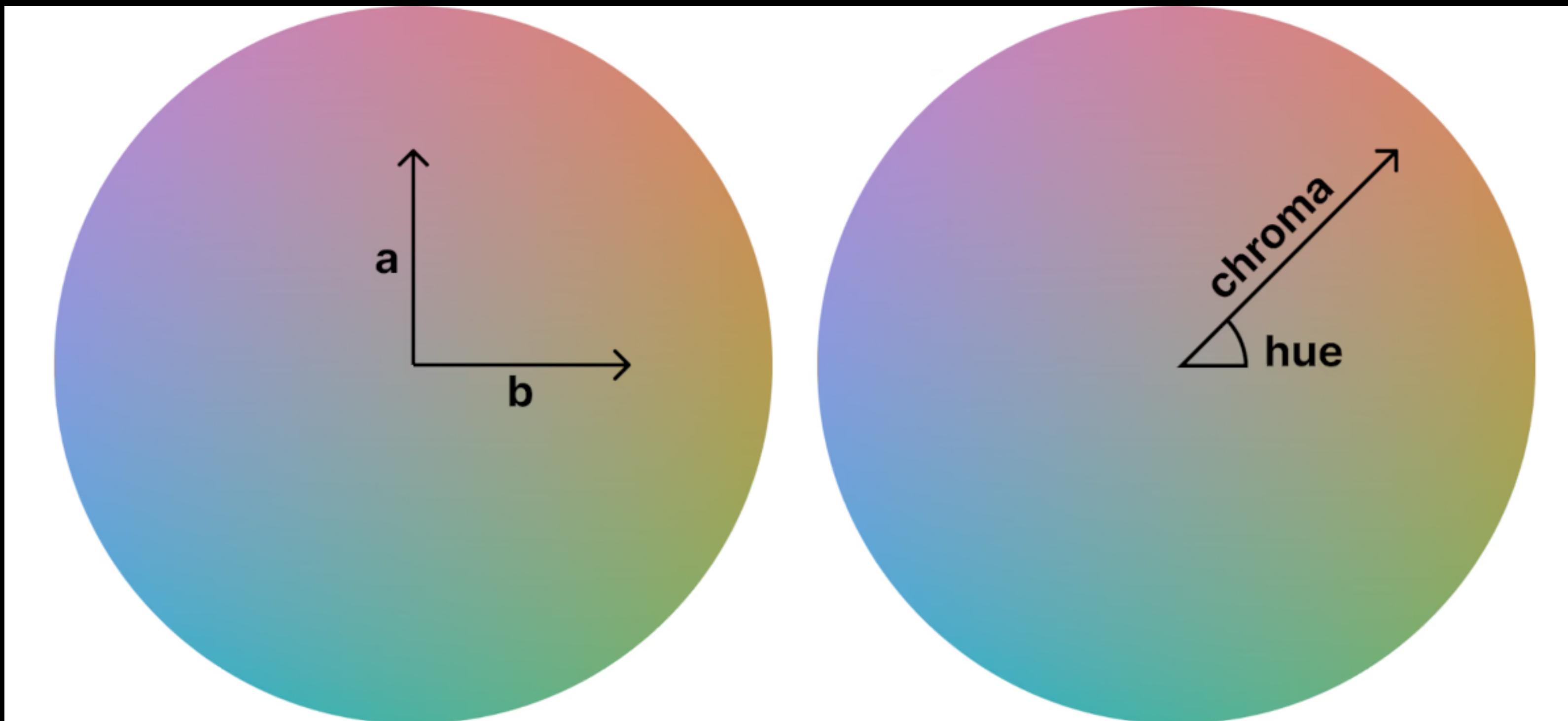
(I) oklch(100% 0 0deg) /\* white \*/

(II) oklch(0% 0 0 / 50%) /\* black with 50% opacity \*/

(III) lch(50% 130 20rad)

# Difference between *lab* and *lch* format

oklab and Lab cartesian coordinates (a: the green/red value of a color, b: blue/yellow value), and OKLCH and LCH use polar coordinates (angle for hue and distance for chroma).



# Demo

color syntax variation demo

1 color 34 syntax

# CSS Module

## Module 5 - 29 March 2023

- CSS5
- *specifying custom color space in color()*
- *New syntax added*
  - `color-mix()` `color-mix(in lch, red, blue)`
  - *relative color syntax (using from keyword)* `rgb(from tomato r g b / 50%)`
  - `color-contrast()`
    - `color-contrast(currentColor vs rgb(10 75 107), rgb(128 0 128) to 4.5);` *now moved to CSS6*

[w3c: css5 color specifications](#)

# color() syntax in CSS5

```
color() = color( [from <color>]? <colorspace-params> [ / [ <alpha-value> |  
none ] ]? )  
<colorspace-params> = [<custom-params> | <predefined-rgb-params> | <xyz-  
params>]  
<custom-params> = <dashed-ident> [ <number> | <percentage> | none ]#  
<predefined-rgb-params> = <predefined-rgb> [ <number> | <percentage> | none  
]{3}  
<predefined-rgb> = srgb | srgb-linear | display-p3 | a98-rgb | prophoto-rgb  
| rec2020  
<xyz-params> = <xyz> [ <number> | <percentage> | none ]{3}  
<xyz> = xyz | xyz-d50 | xyz-d65
```

# Thank you. :)



xkeshav