



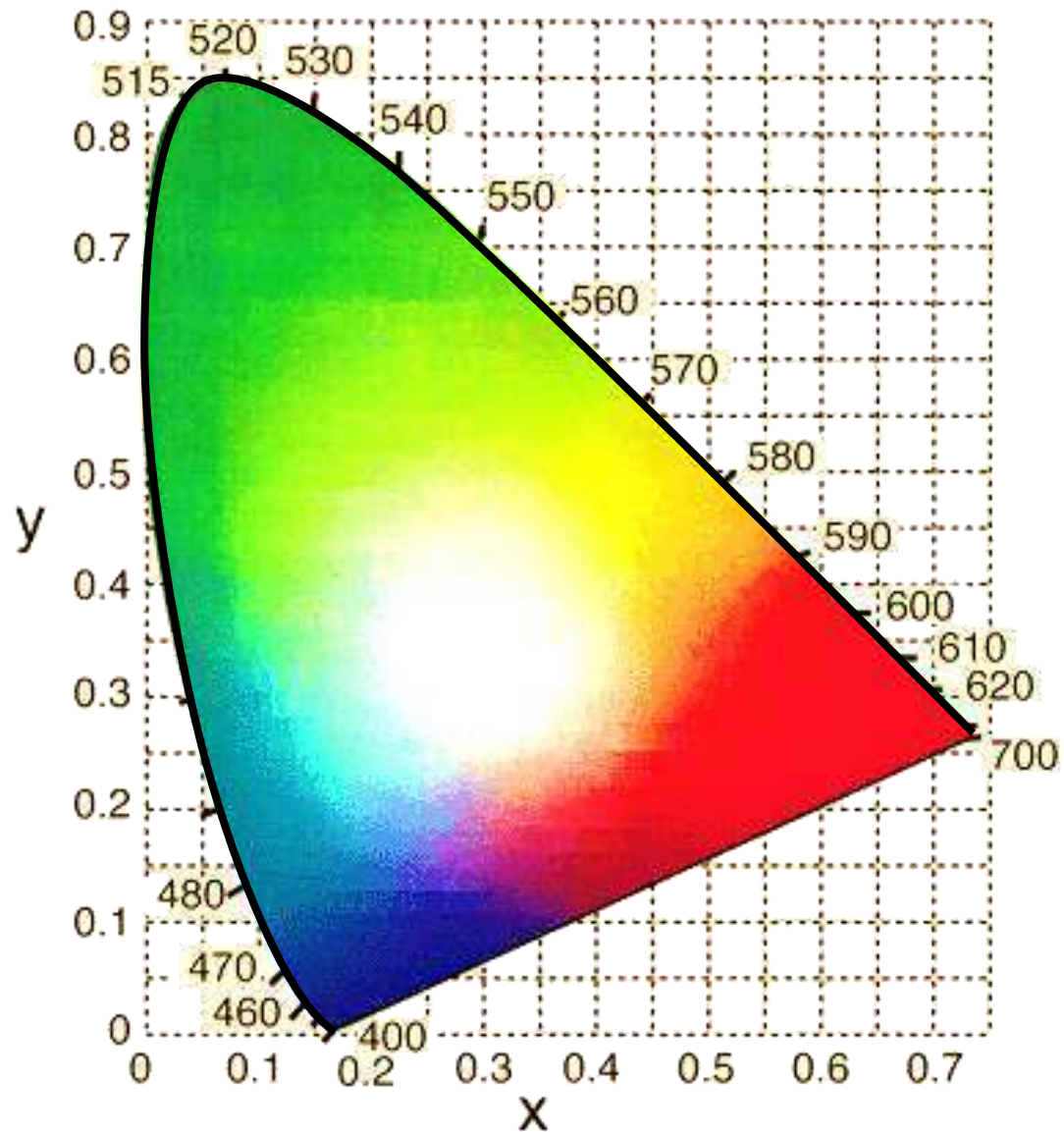
# THE 'HOWS' BEHIND COLOUR MANAGEMENT



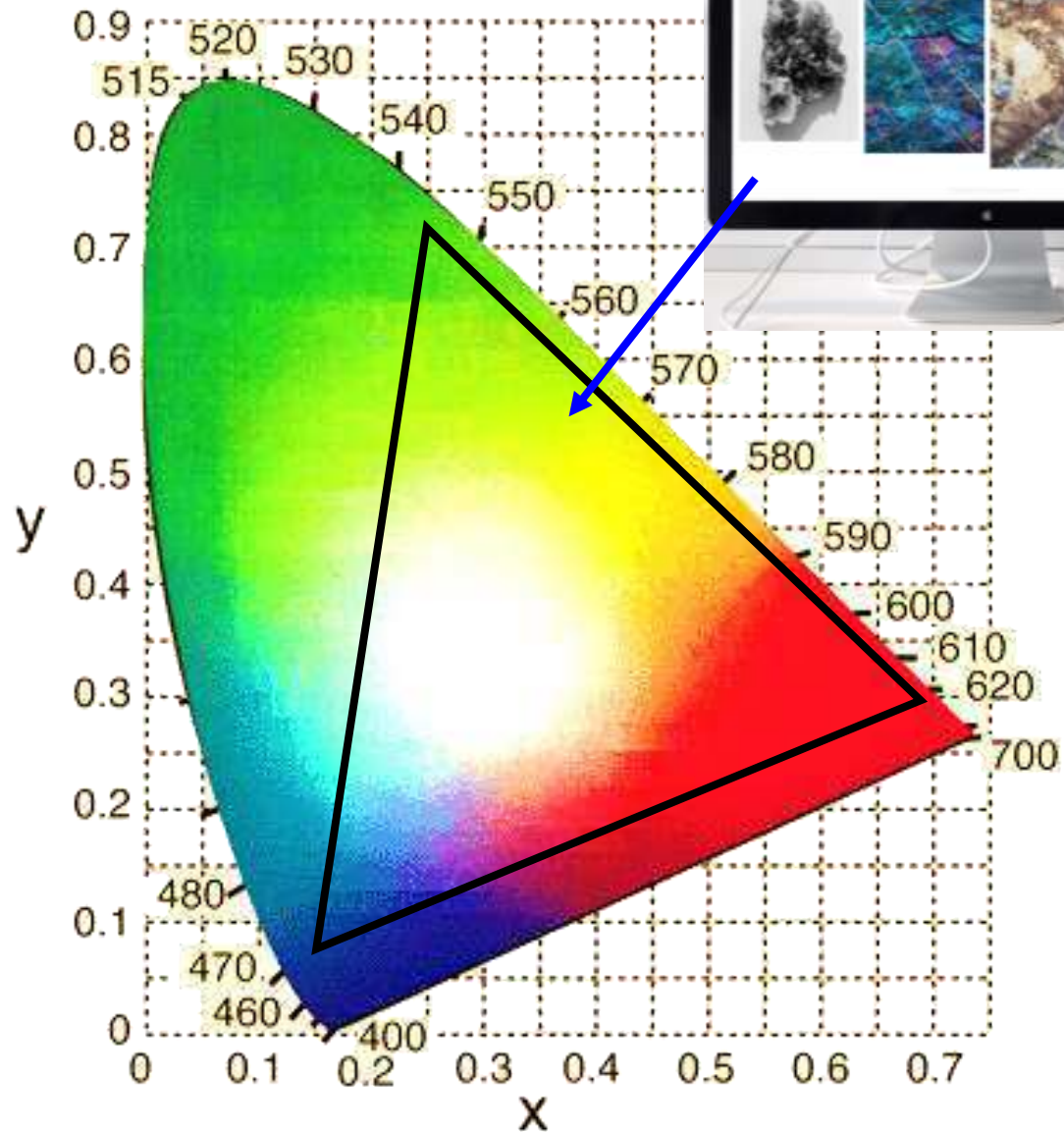
# HOW DO YOU PERCEIVE COLOUR?



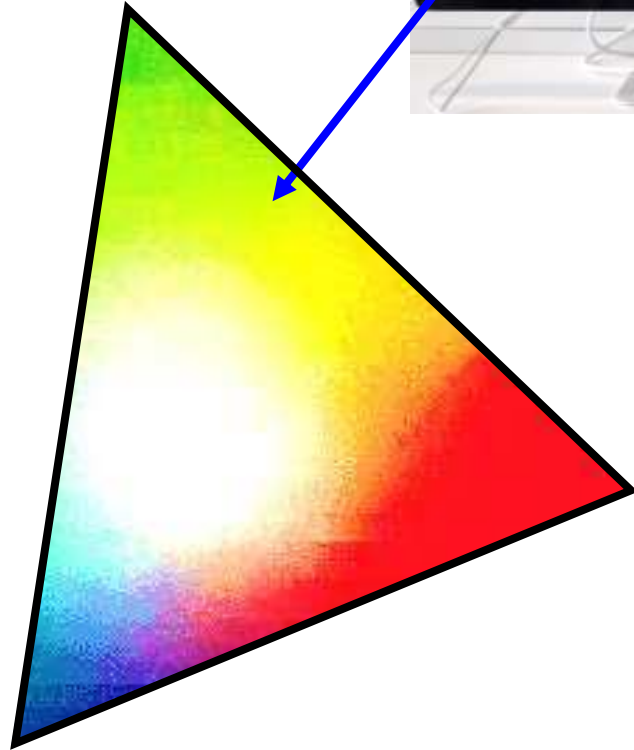
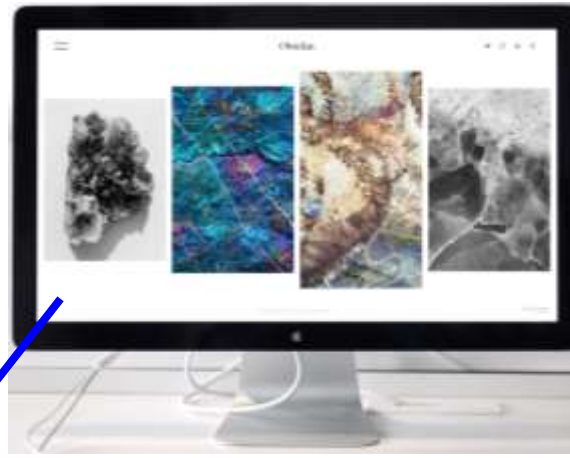
**DO YOU  
ENJOY  
SEEING  
COLOURS?**



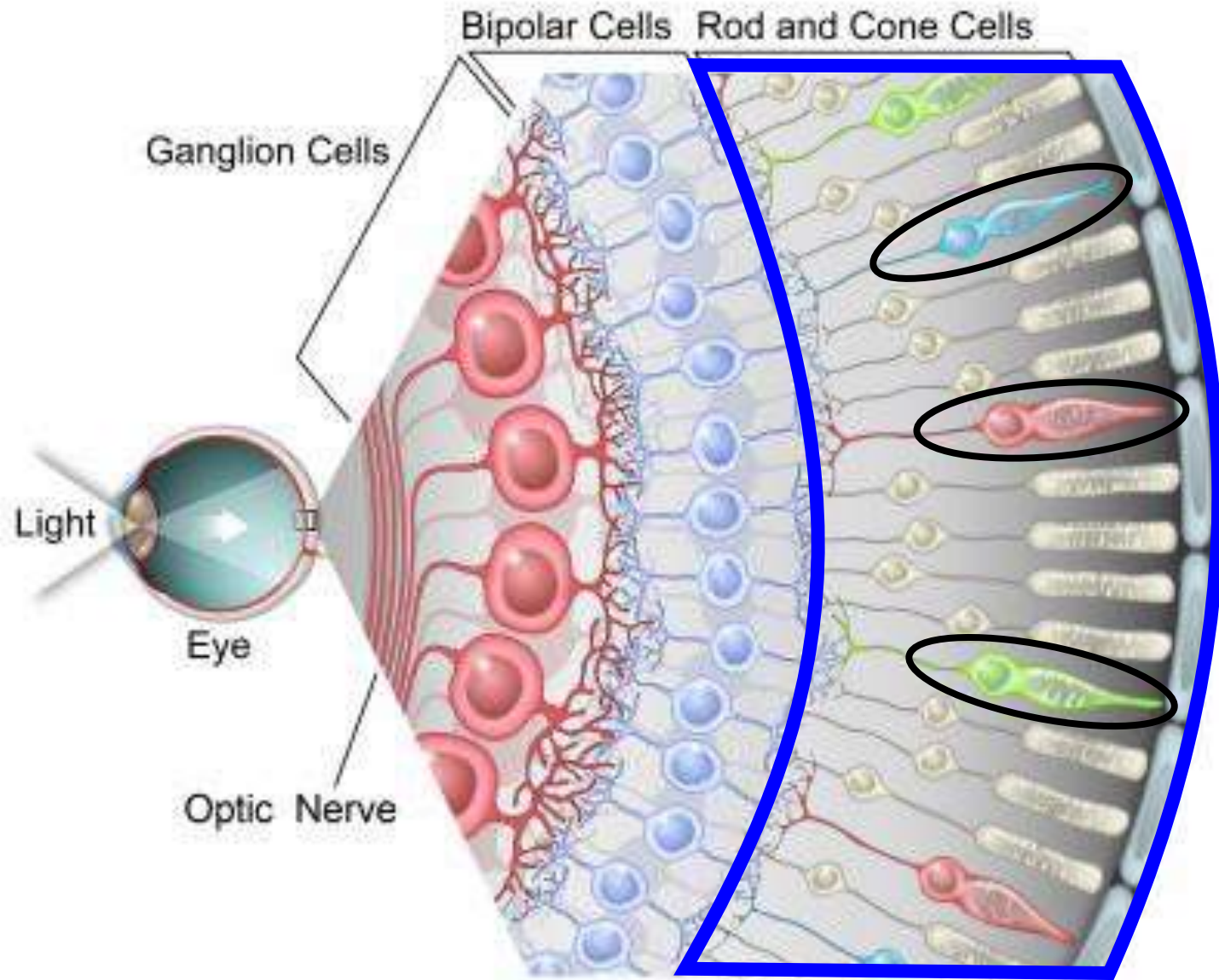
# PERCEIVABLE COLOUR RANGE BY HUMAN EYES



# COLOUR RANGE OF A TYPICAL DIGITAL DISPLAY



# COLOUR RANGE OF A TYPICAL DIGITAL DISPLAY



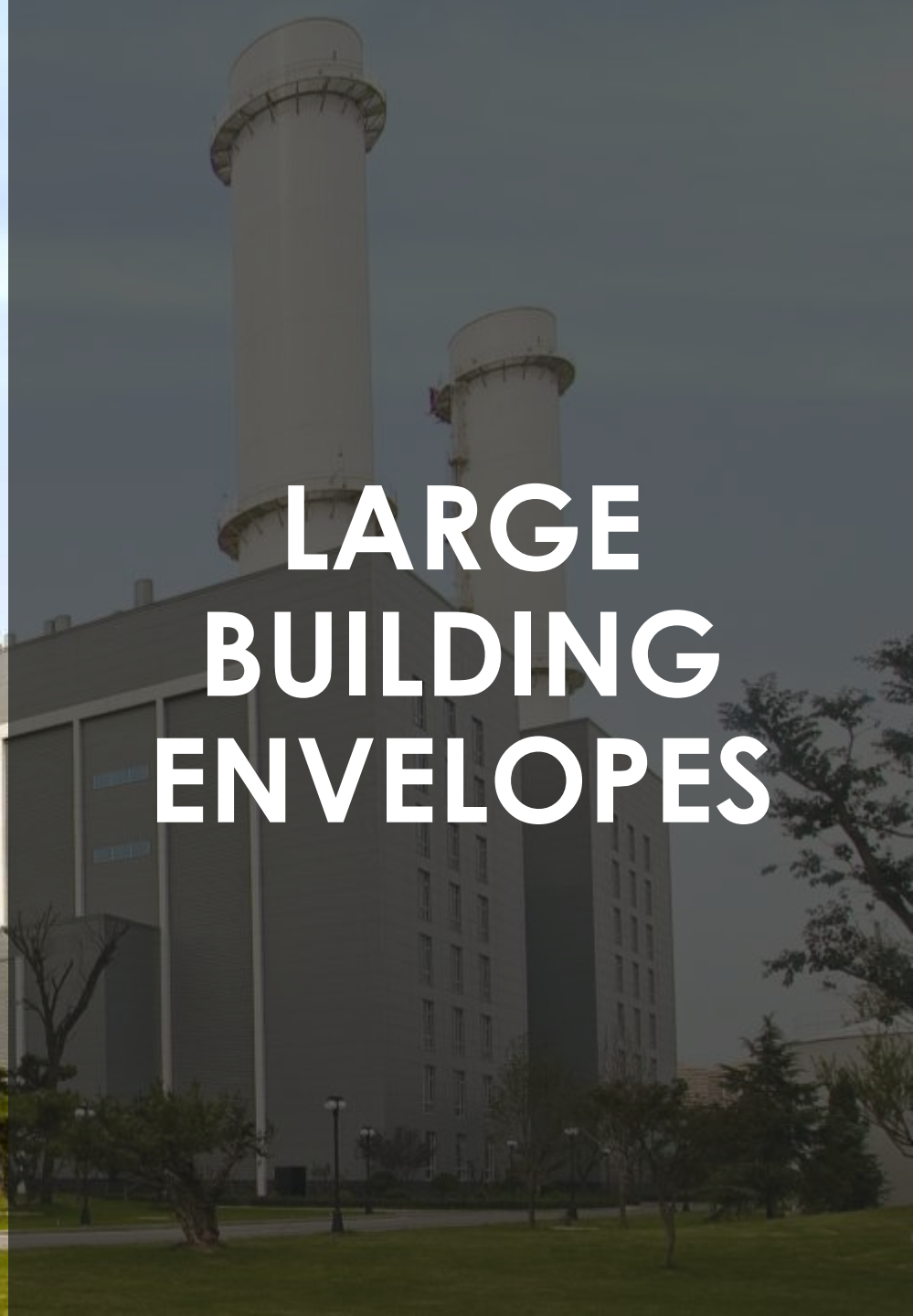
# PHOTO-RECEPTOR CELLS THAT PERCEIVE COLOURS

**CAN YOU  
SPOT A  
COLOUR  
DIFFERENCE?**





# WHY IS IT IMPORTANT TO BUILDINGS?





**PRODUCE A  
CONSISTENT  
COLOUR**



**MATCH TO A  
NEW COLOUR**

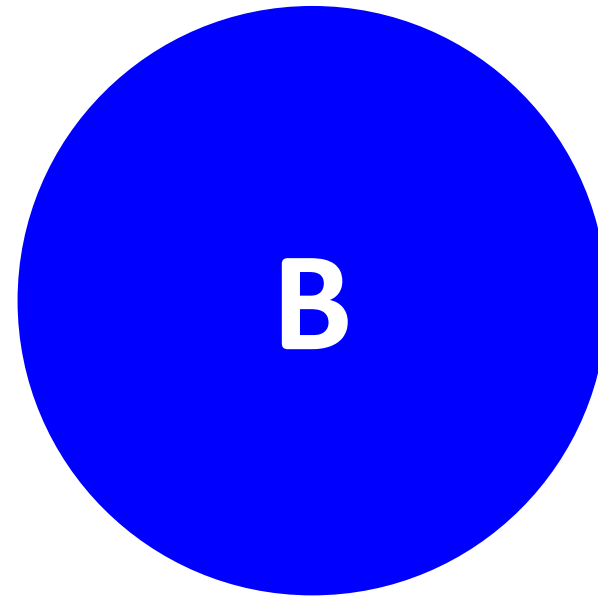
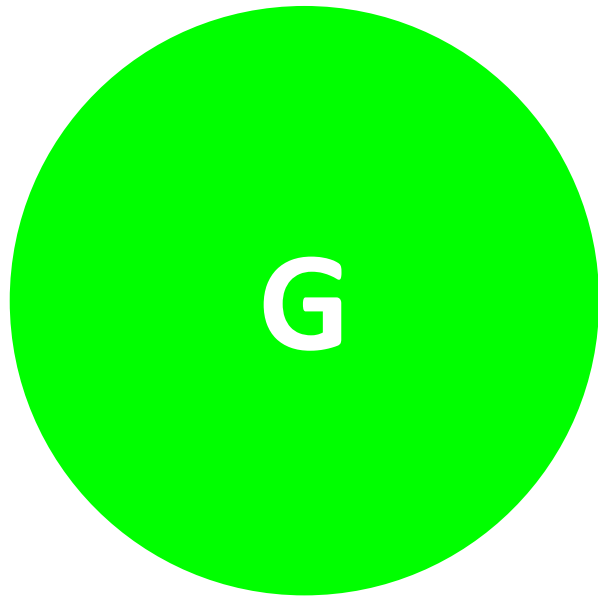
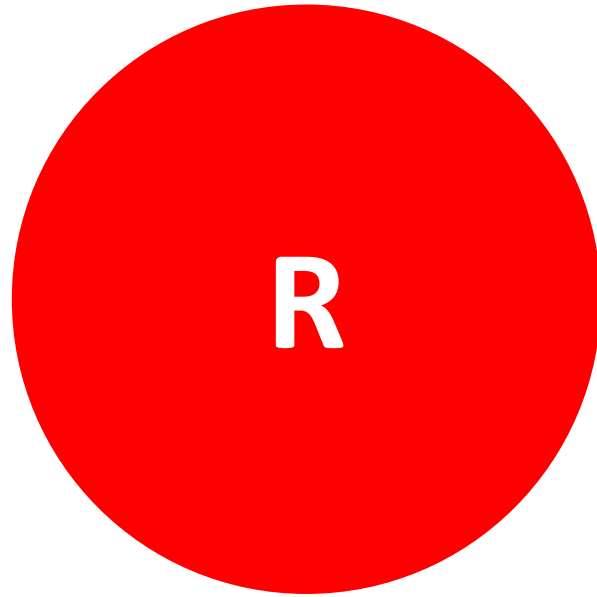


# COLOUR CHART

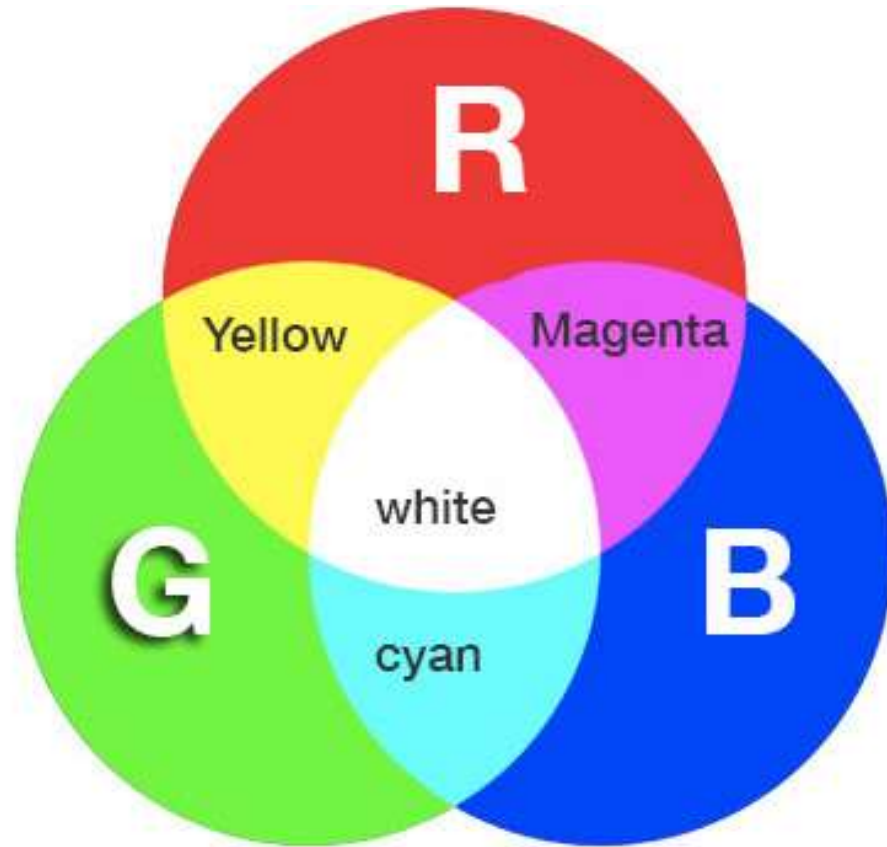


1

# COLOUR REFERENCE CODES

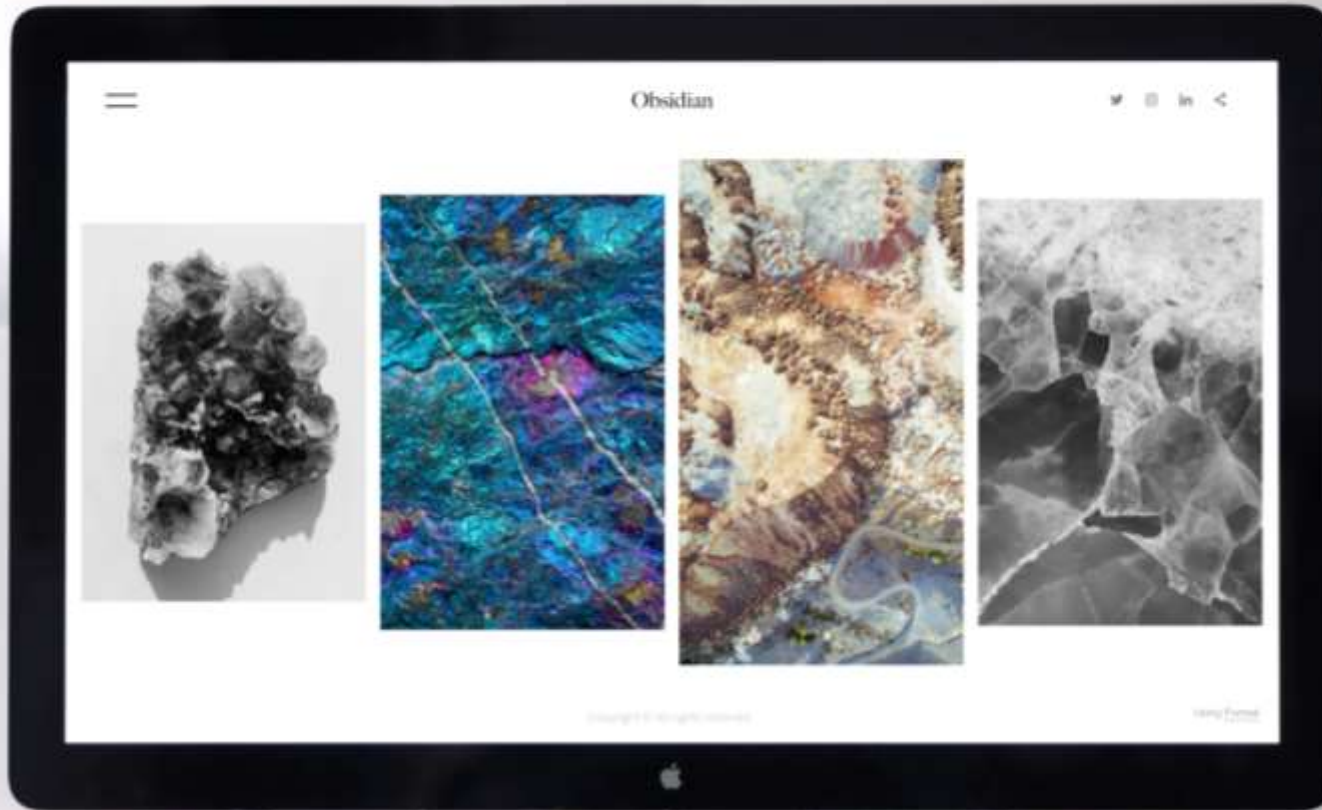


**RGB**



**RGB**

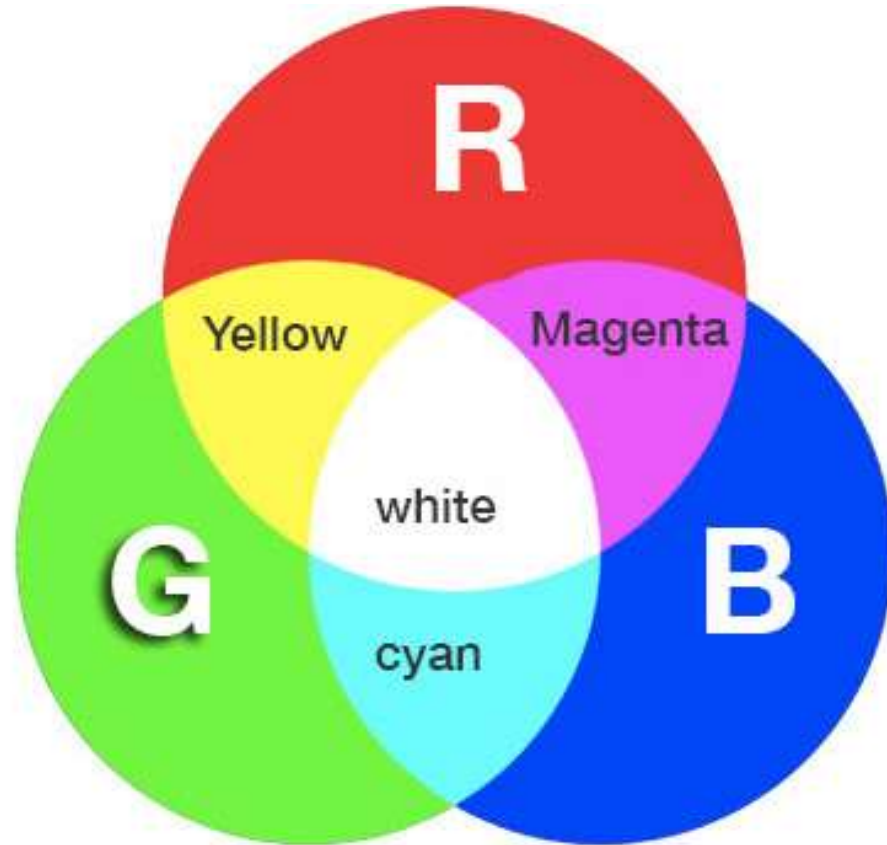




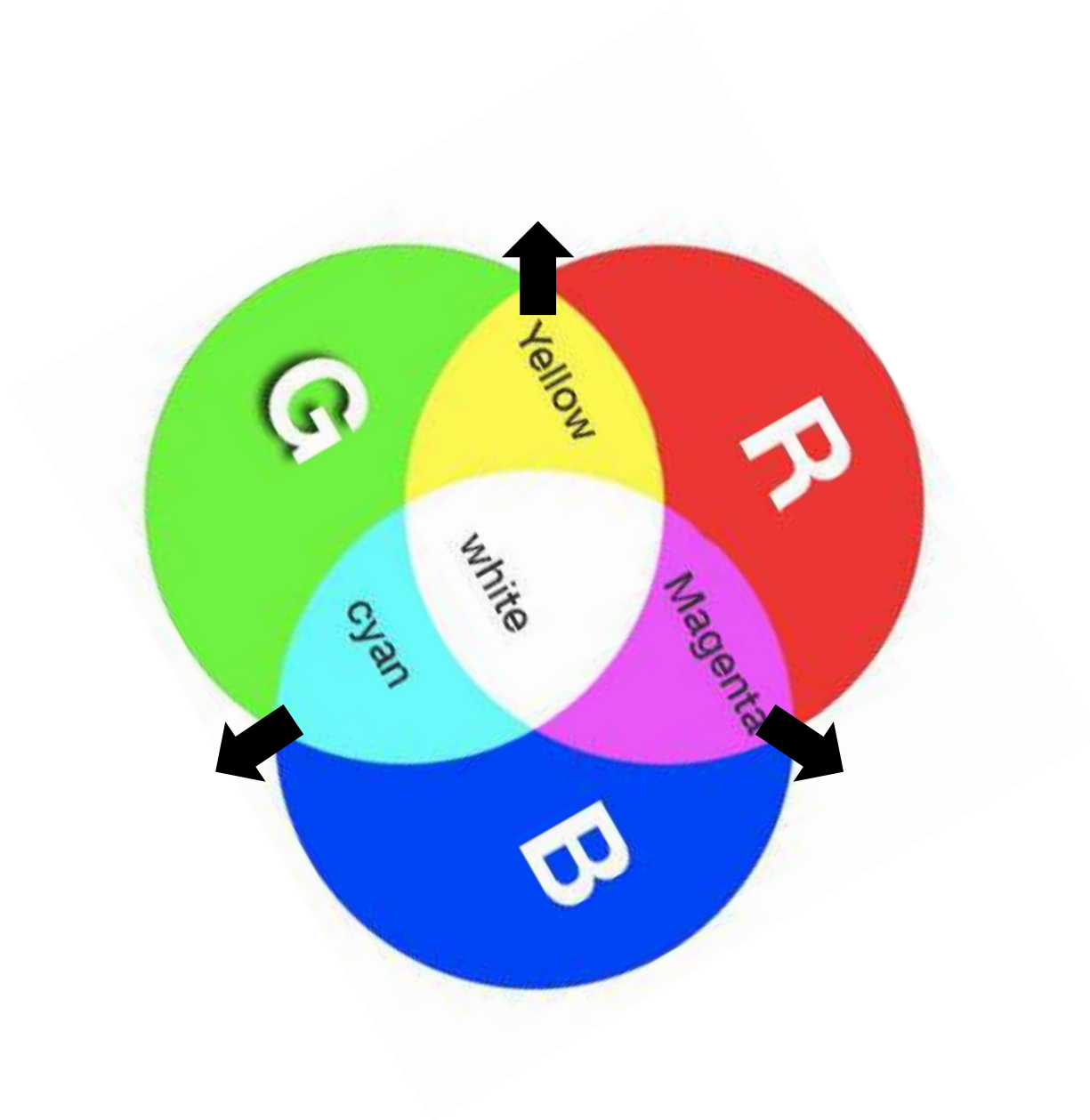
# LIGHTS EMITTED FROM DIODES

# 1 COLOUR REFERENCE CODES

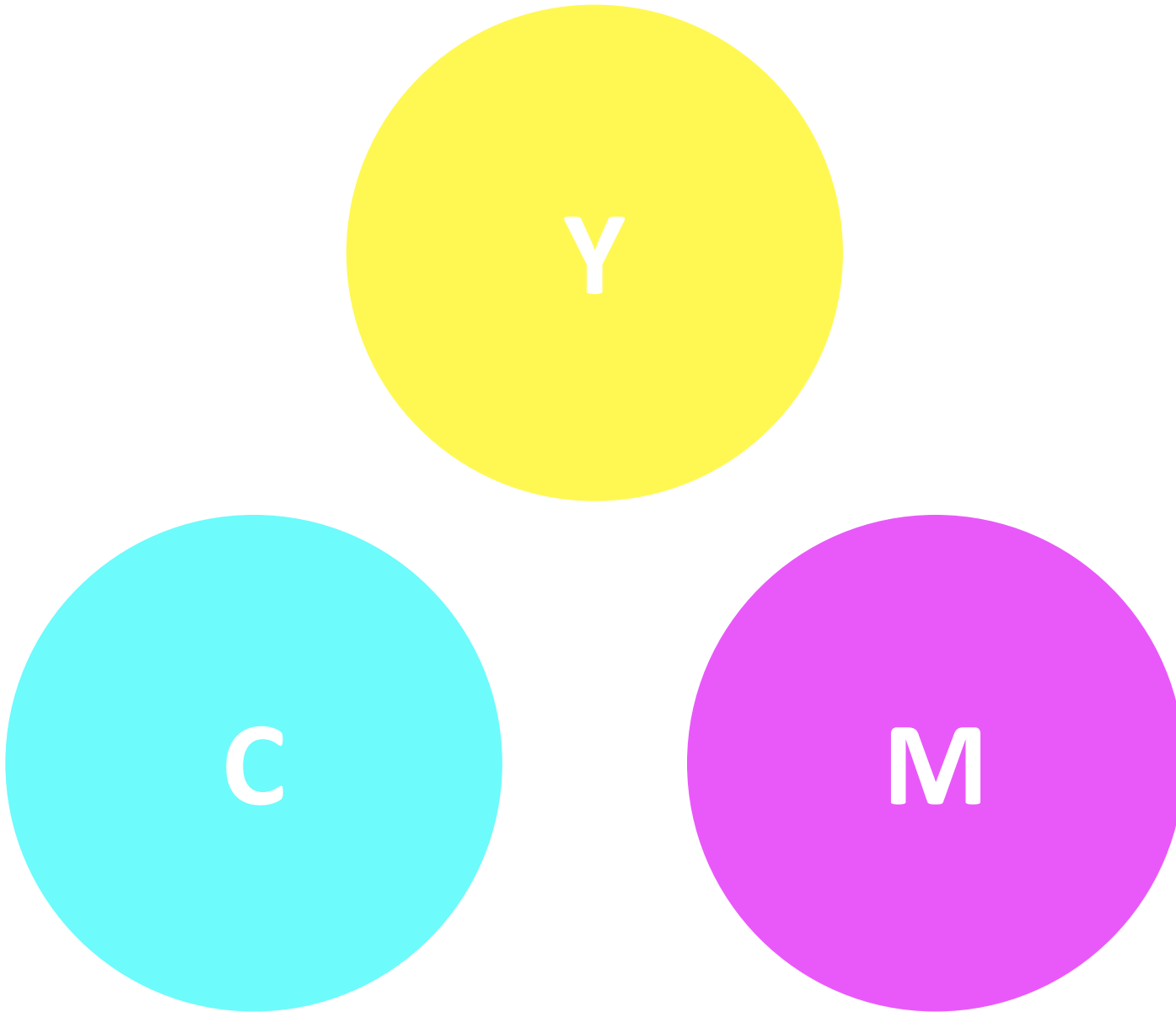
LED



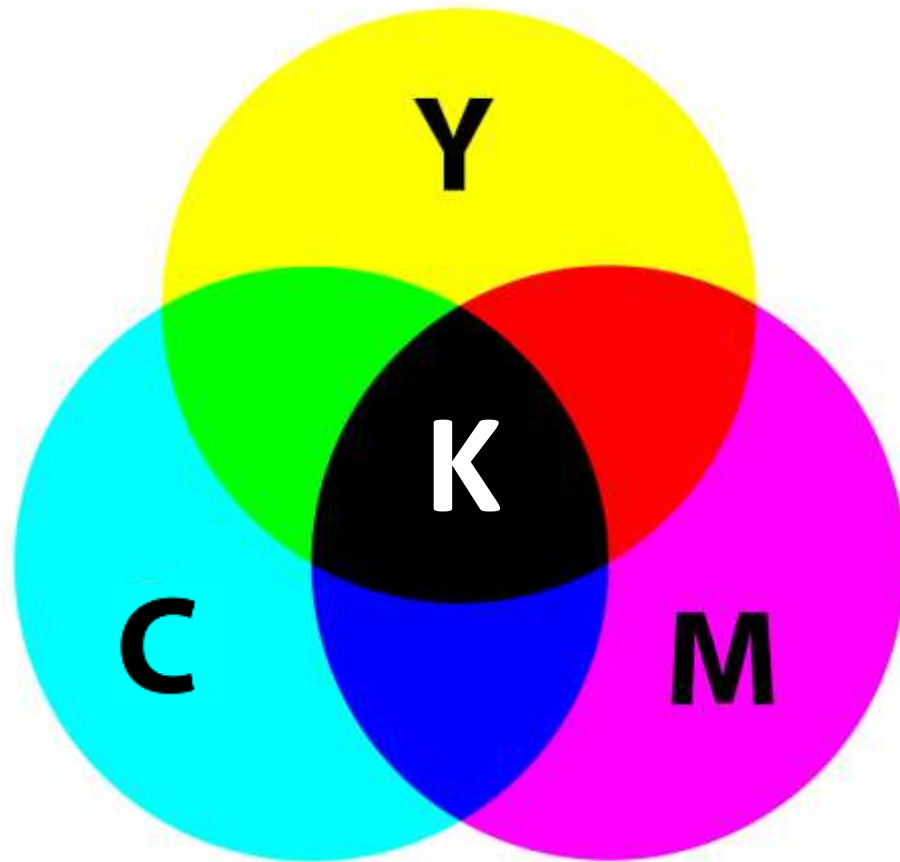
**COLOURS ARE  
CREATED VIA  
LIGHT EMITTING  
COMPONENTS**



**INTERSECTING  
RGB  
=  
CMYK**



**CMYK**



**CMYK**

# CYAN

① COLOUR REFERENCE CODES



# PRINTING INDUSTRY

# MAGENTA

① COLOUR REFERENCE CODES



## PRINTING INDUSTRY



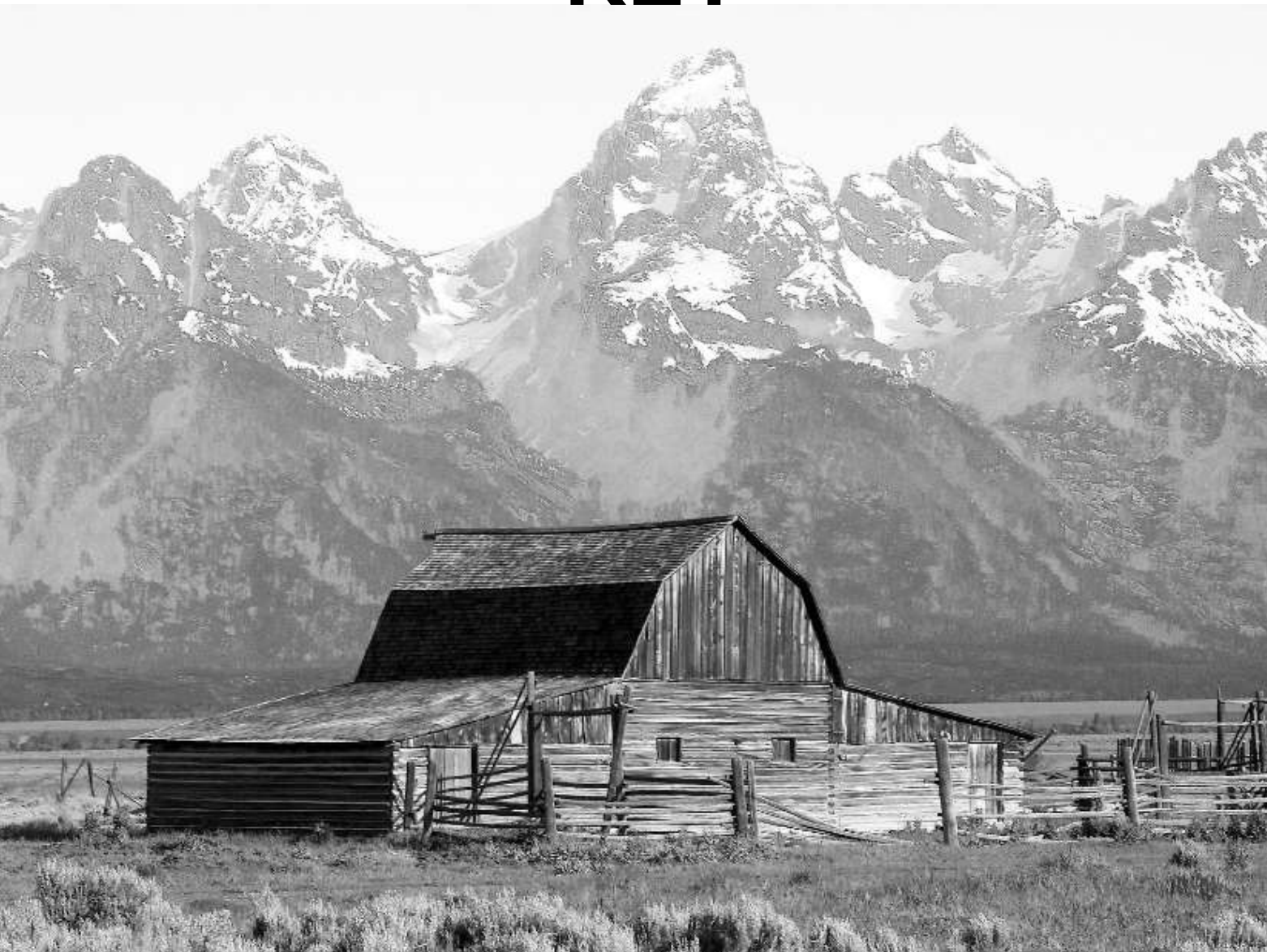
# YELLOW

① COLOUR REFERENCE CODES

# PRINTING INDUSTRY

# KEY

① COLOUR REFERENCE CODES



# PRINTING INDUSTRY



# COMPLETE CMYK PRINT

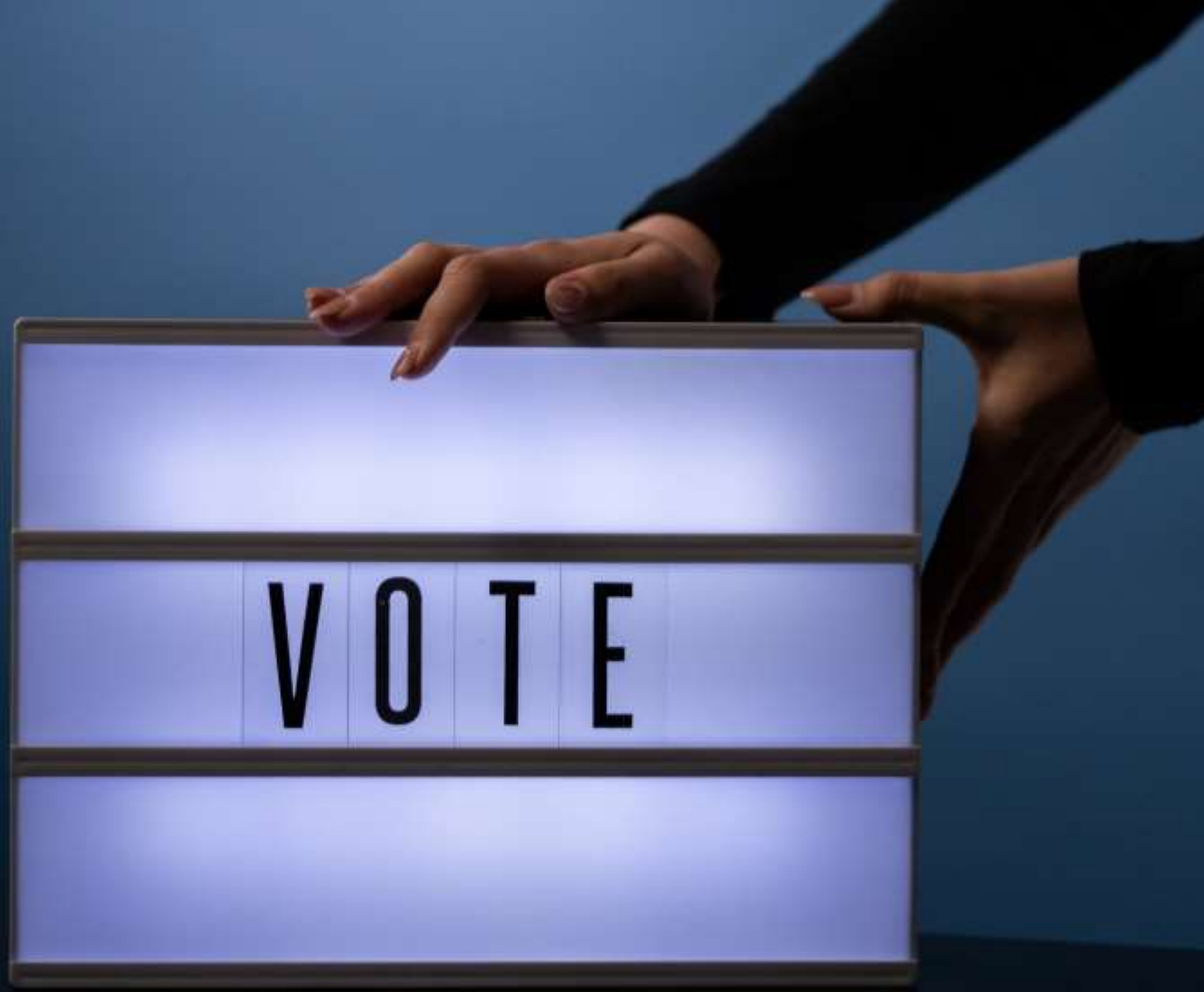
① COLOUR REFERENCE CODES

**RAL CODE**

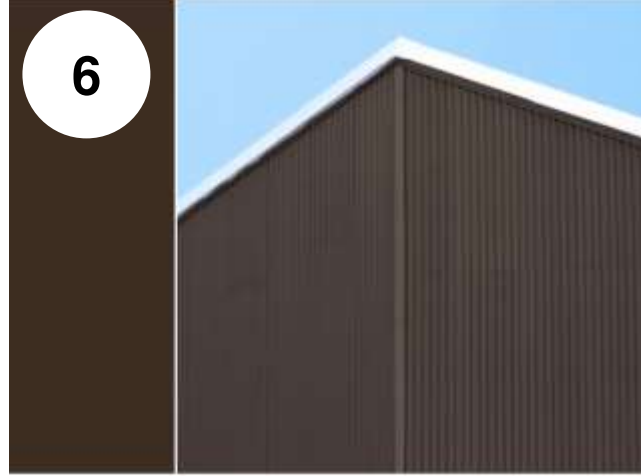
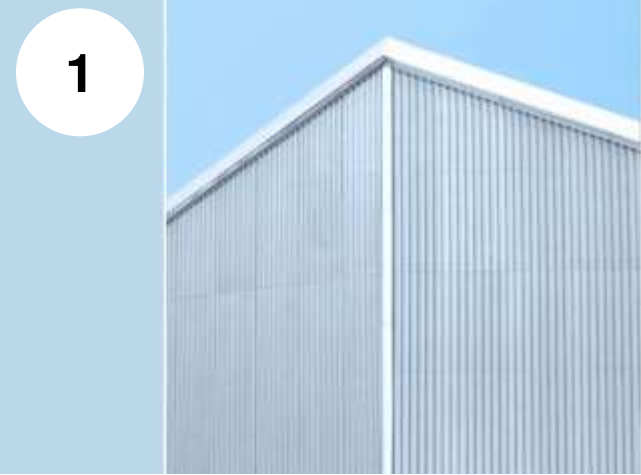
**RAL**  
**K5**  
CLASSIC

# WHAT COLOUR CHARTS DO YOU USE?

# WHICH COLOUR DO YOU PREFER?



**WHICH  
COLOUR  
WOULD YOU  
TRY FOR YOUR  
NEXT ICONIC  
BUILDING?**



# POLLING 1





# POLLING 2



# POLLING 3

1



2



3



4



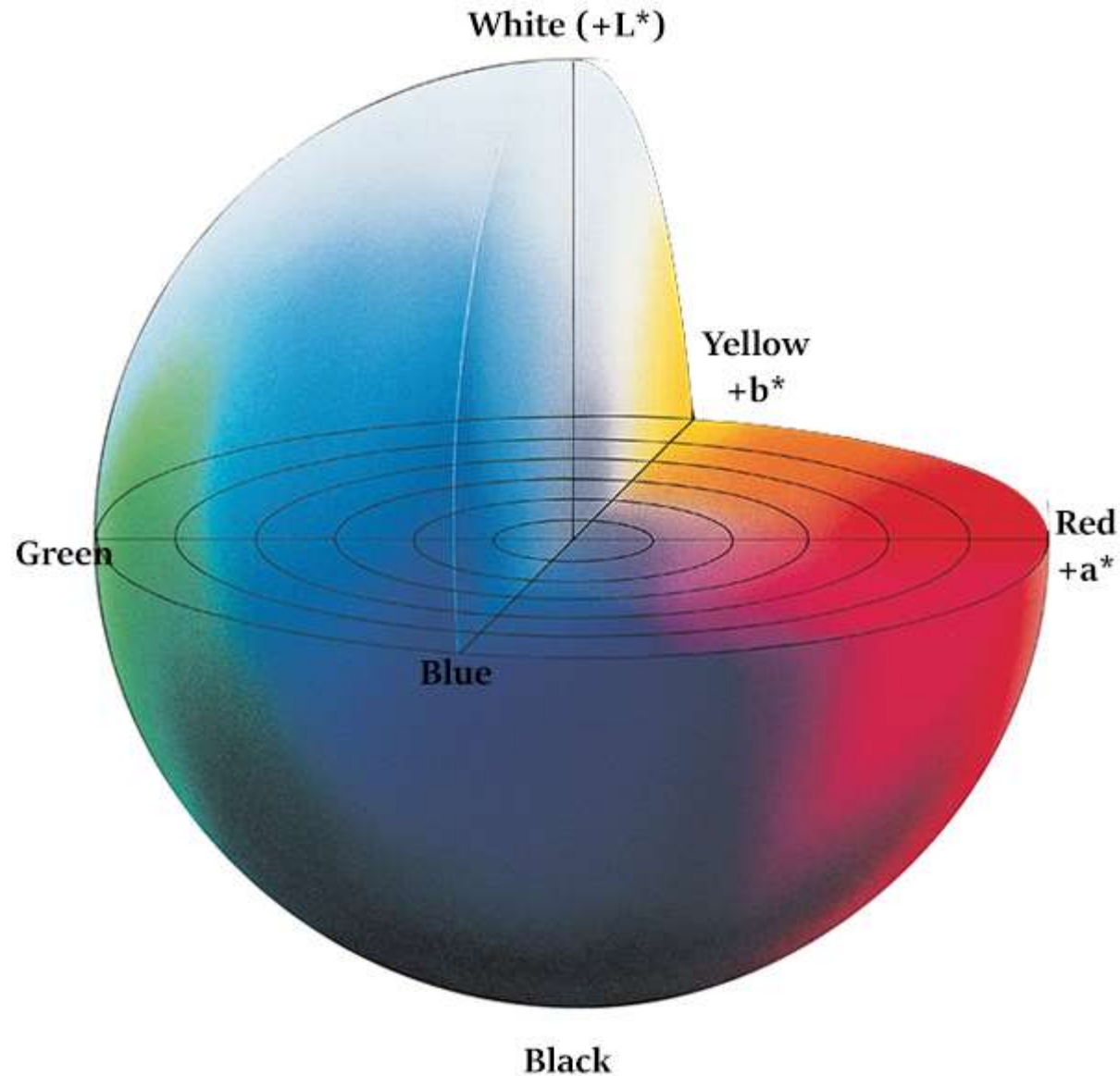
5



6

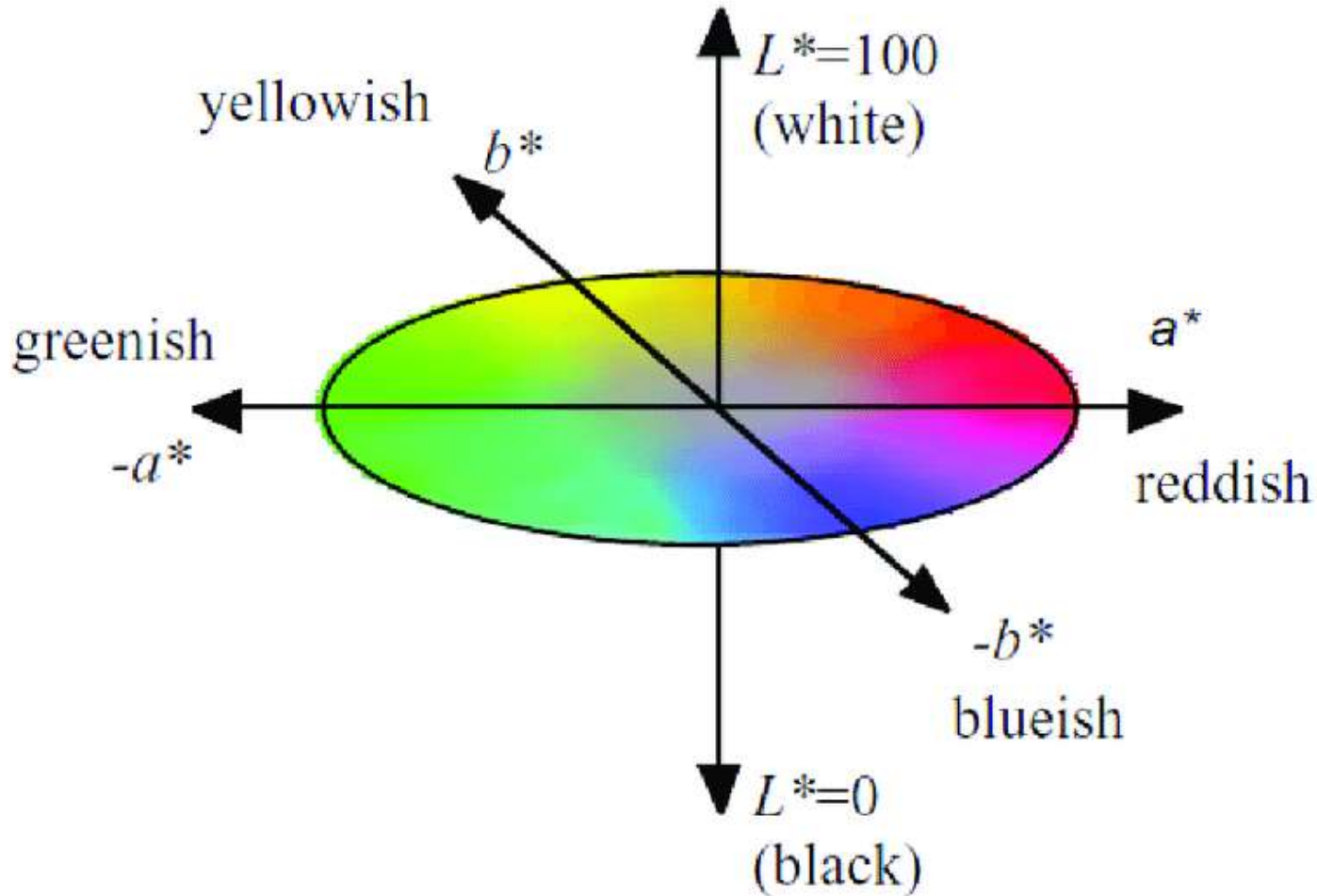


# POLLING 4



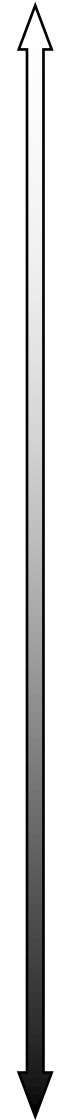
②

CIELAB  
COLOUR  
SPACE



**CIELAB  
IS THE  
INTERMEDIARY  
BETWEEN  
DIFFERENT  
COLOUR  
CODES**

$L^* = 100$

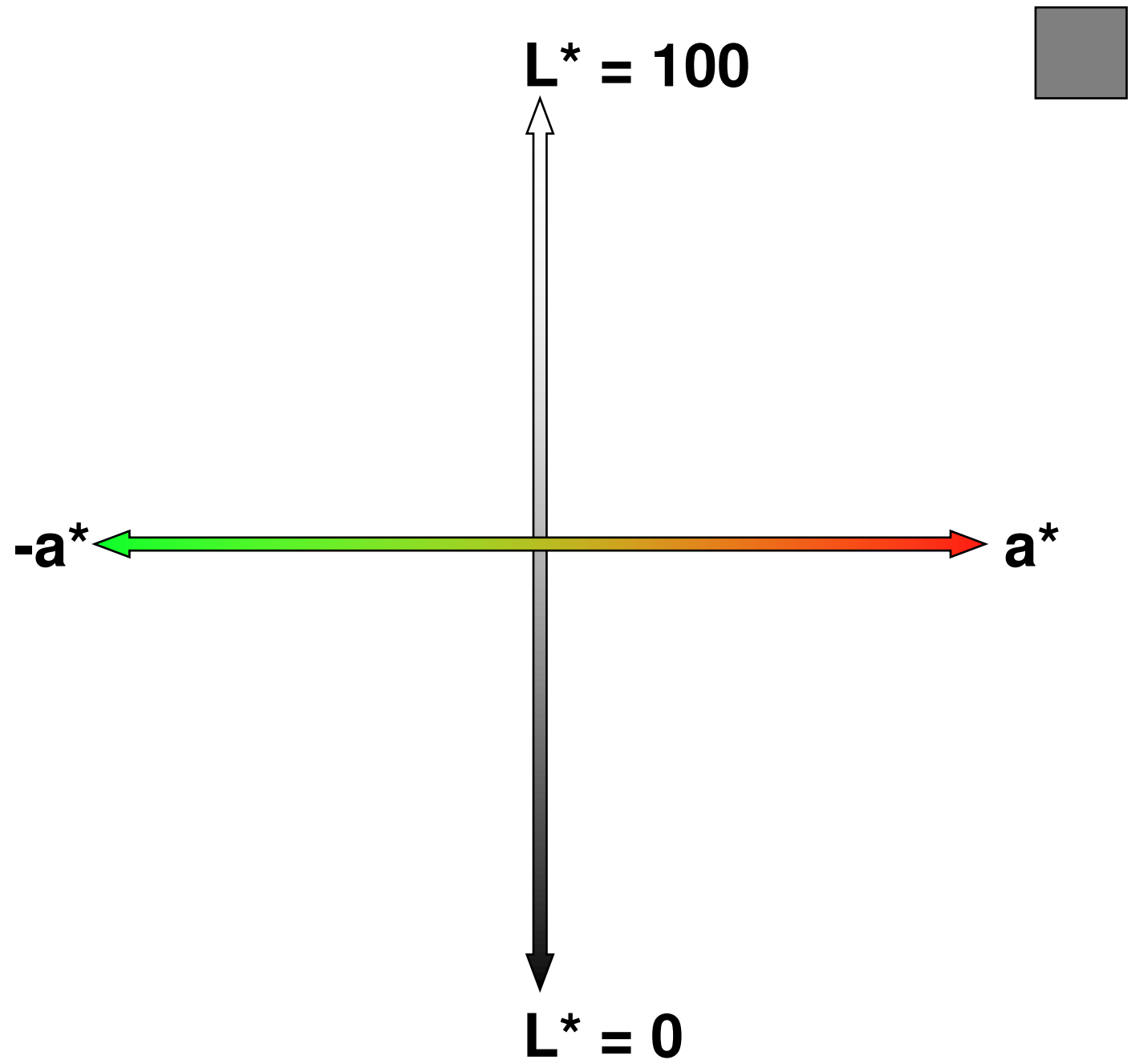


$L^* = 0$

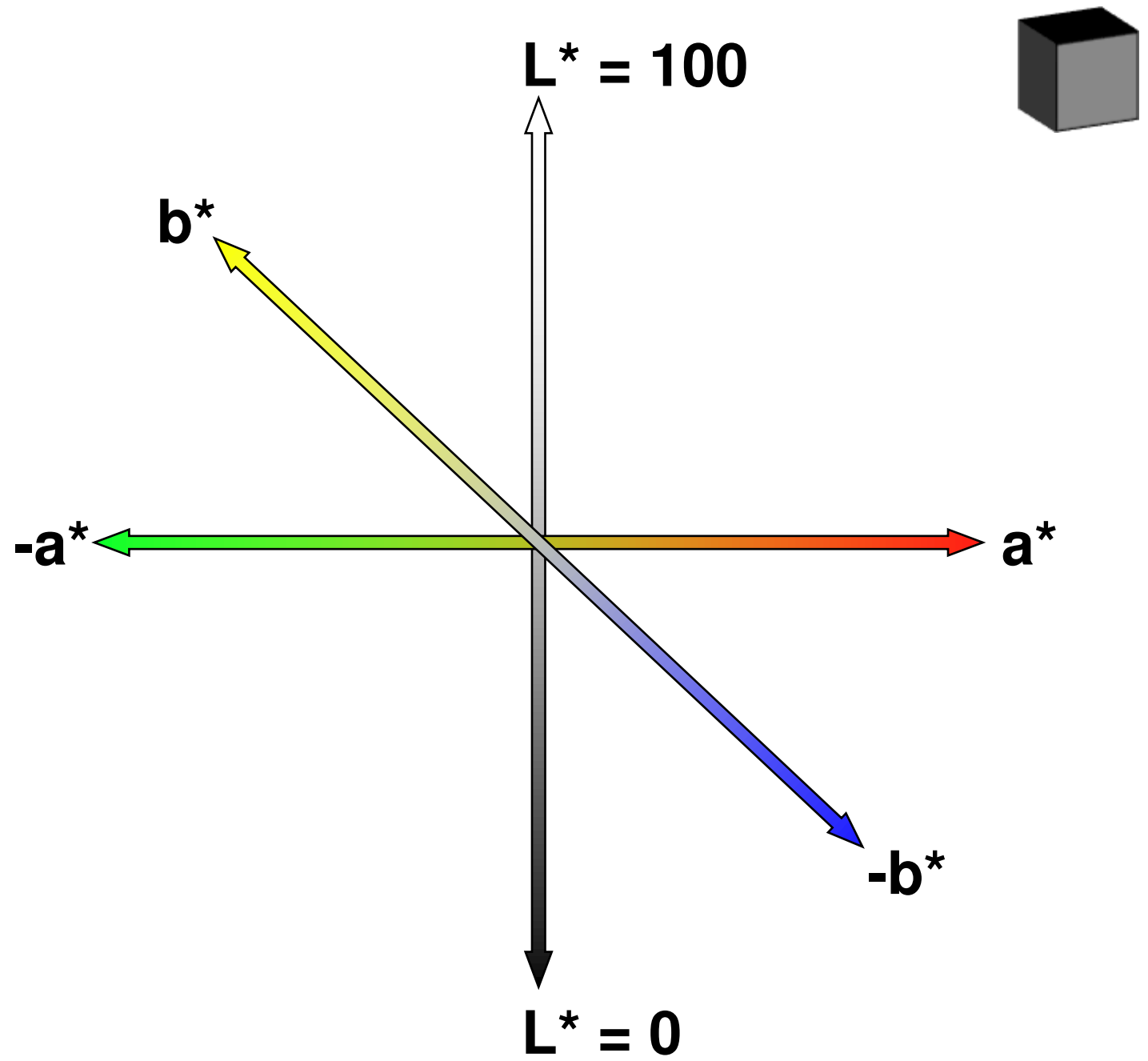
② CIELAB COLOUR SPACE

$L^*$

REPRESENTS  
PERCEPTUAL  
LIGHTNESS

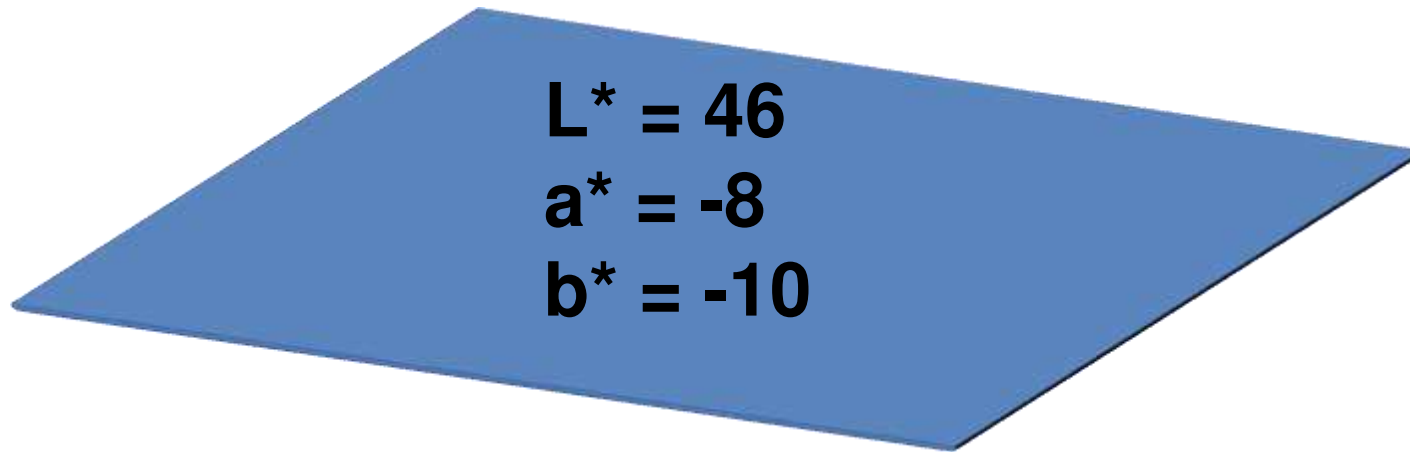


$a^*$   
REPRESENTS  
DEGREE OF  
RED / GREEN



$b^*$   
REPRESENTS  
DEGREE OF  
YELLOW / BLUE

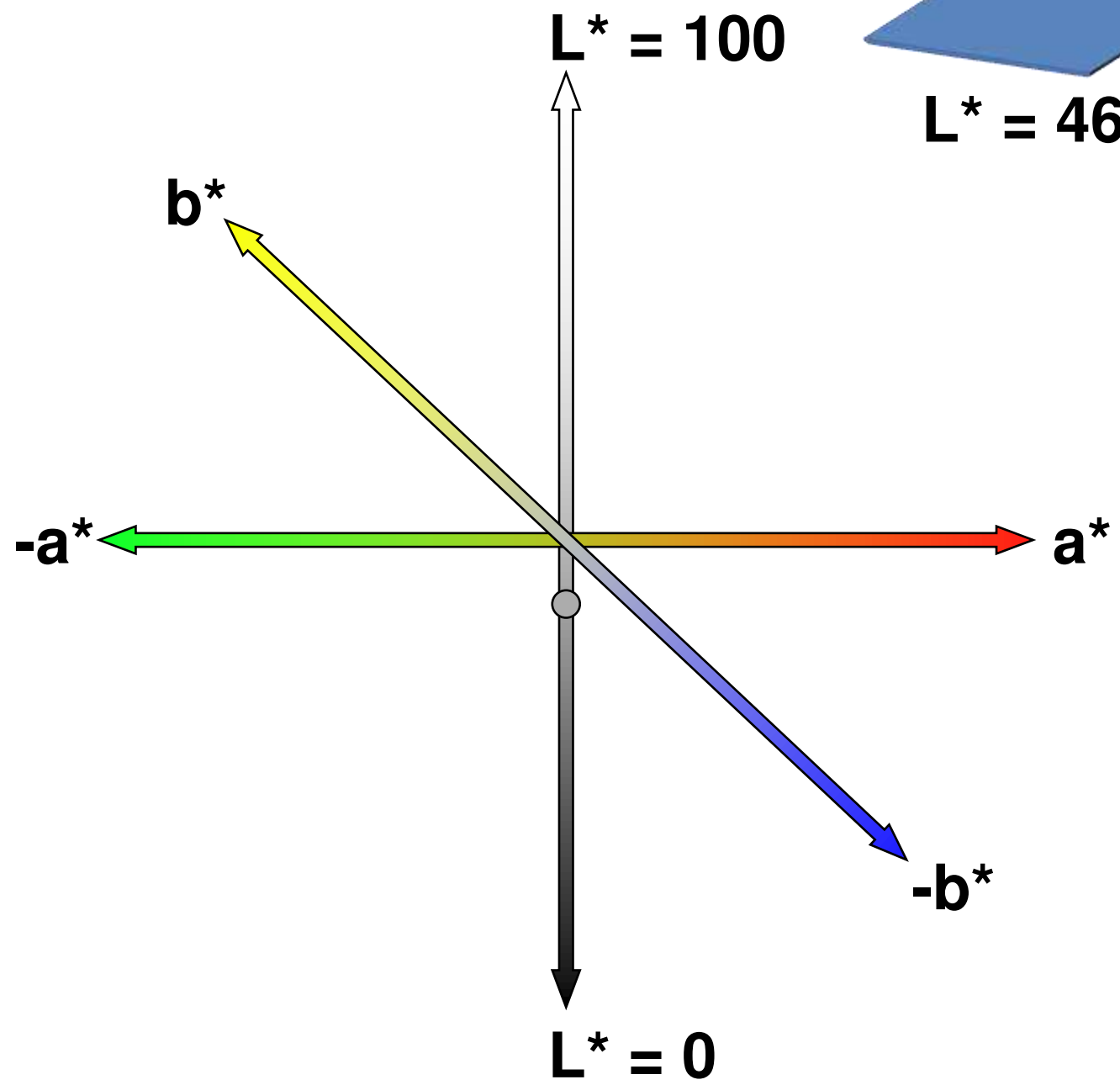




# A BLUE COLOUR SAMPLE



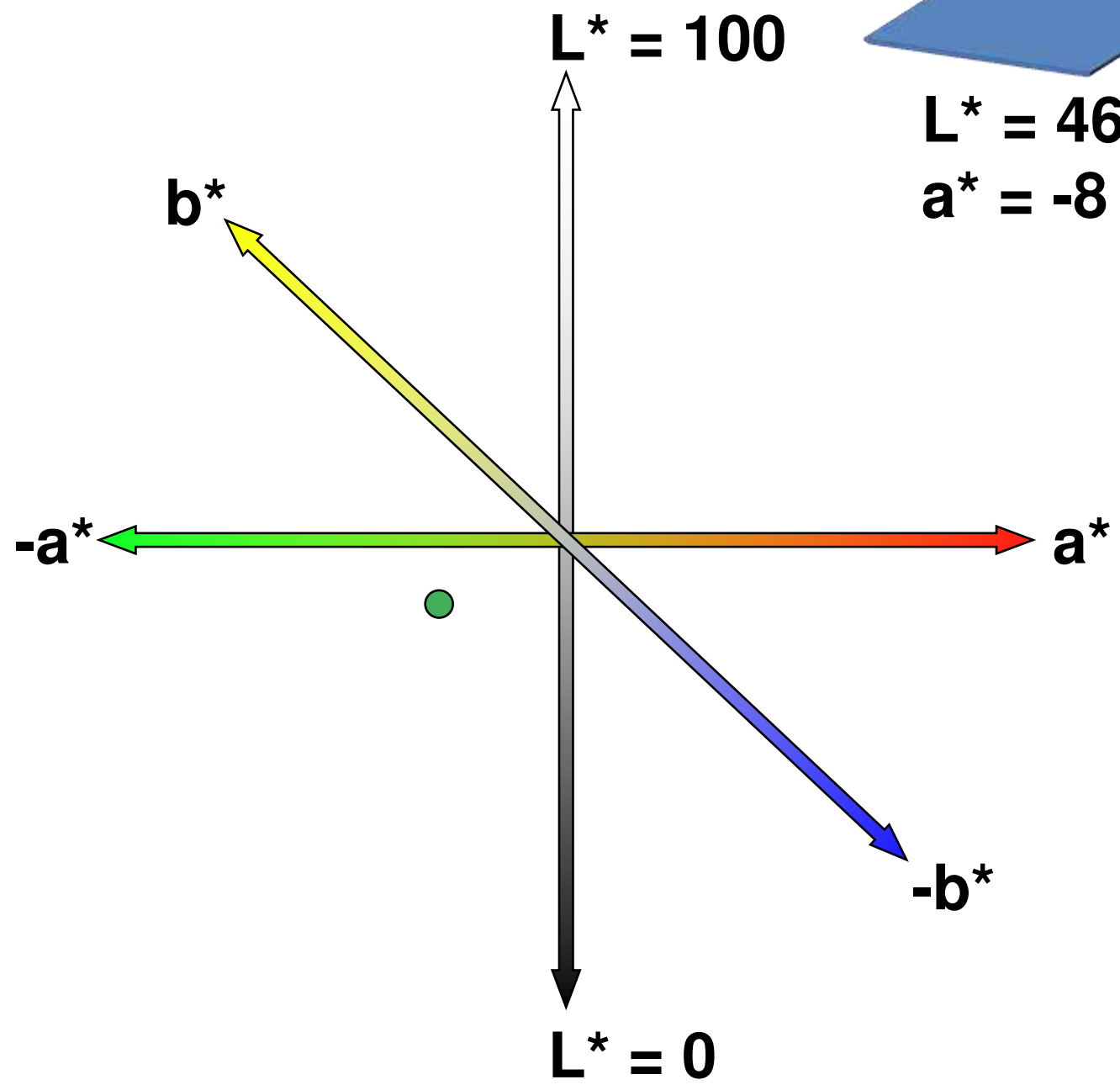
$L^* = 46$



FIND  
 $L^*$   
VALUE



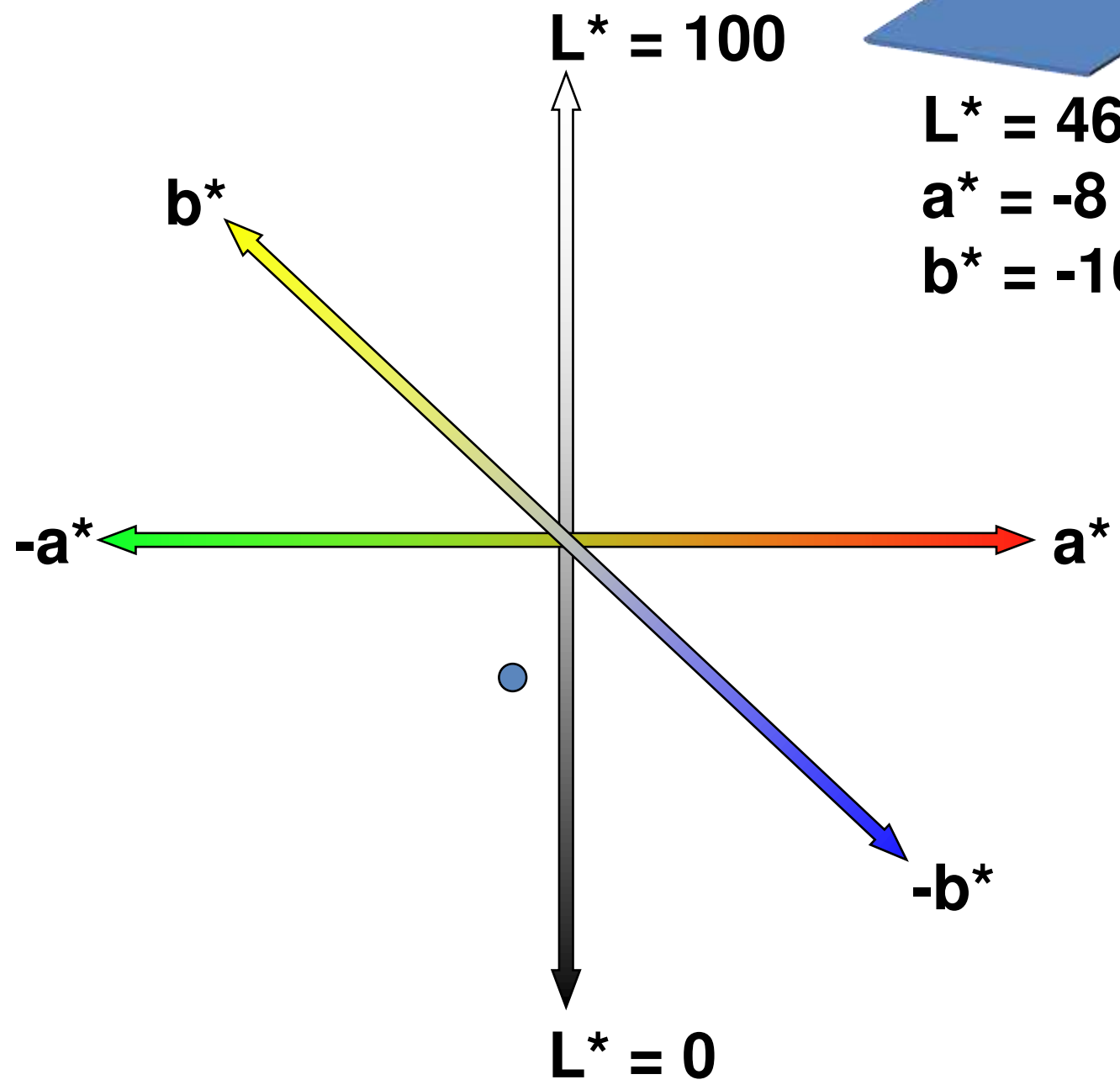
$L^* = 46$   
 $a^* = -8$



FIND  
 $a^*$   
VALUE



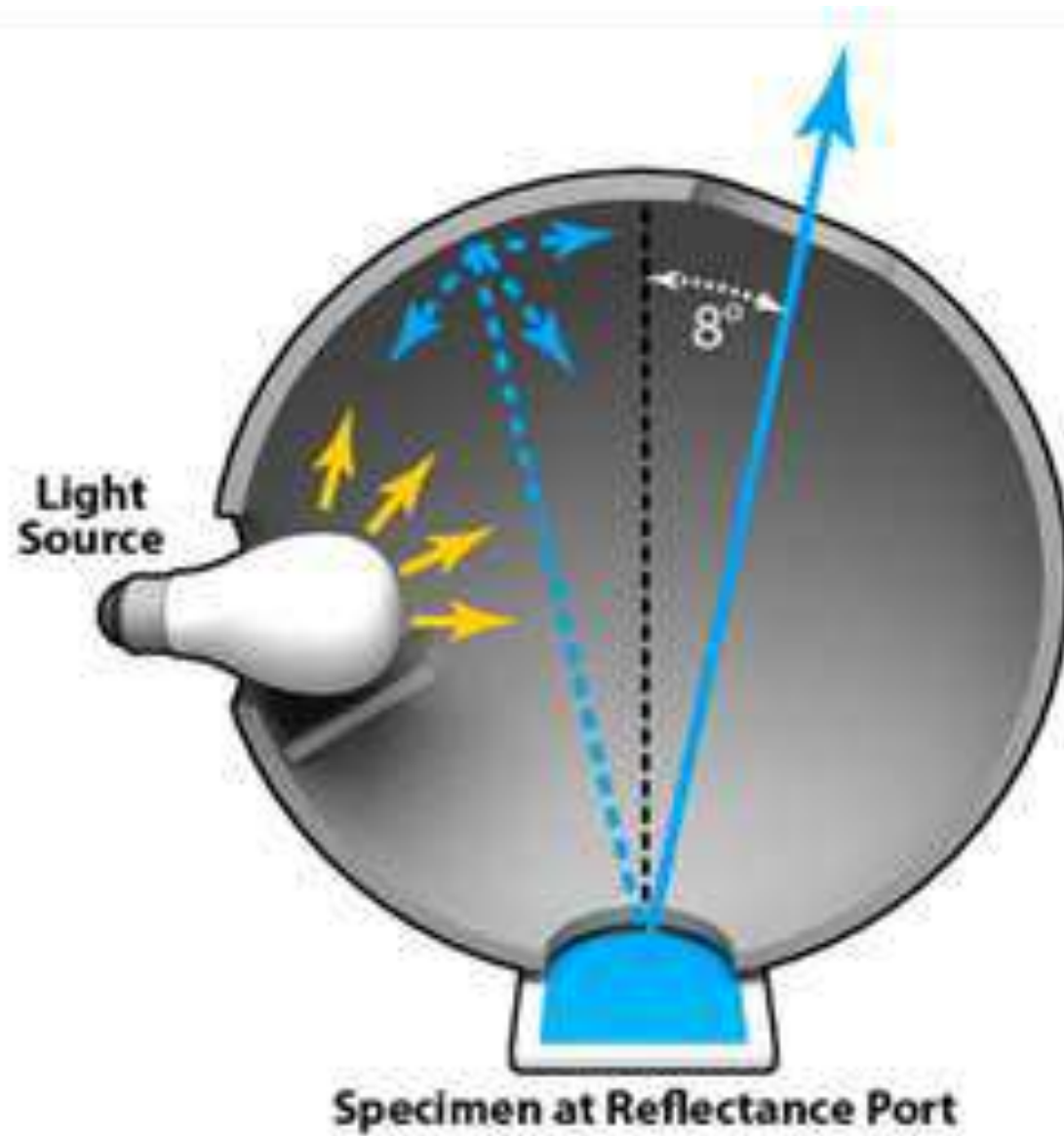
$L^* = 46$   
 $a^* = -8$   
 $b^* = -10$



FIND  
 $b^*$   
VALUE



# WHAT IS THE EQUIPMENT USED TO MEASURE COLOUR?



# SPECTRO- PHOTOMETER

# HOW DO WE MAKE USE OF CIELAB VALUE?

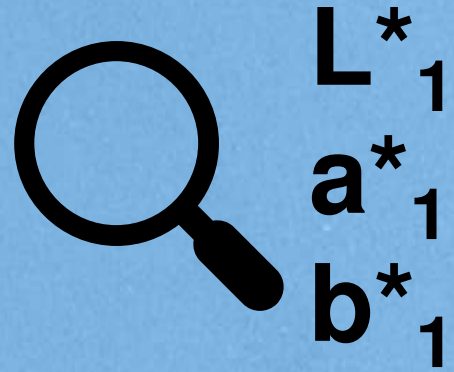
3

# COLOUR DIFFERENCE

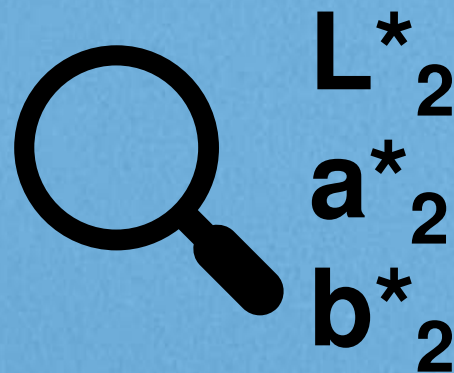


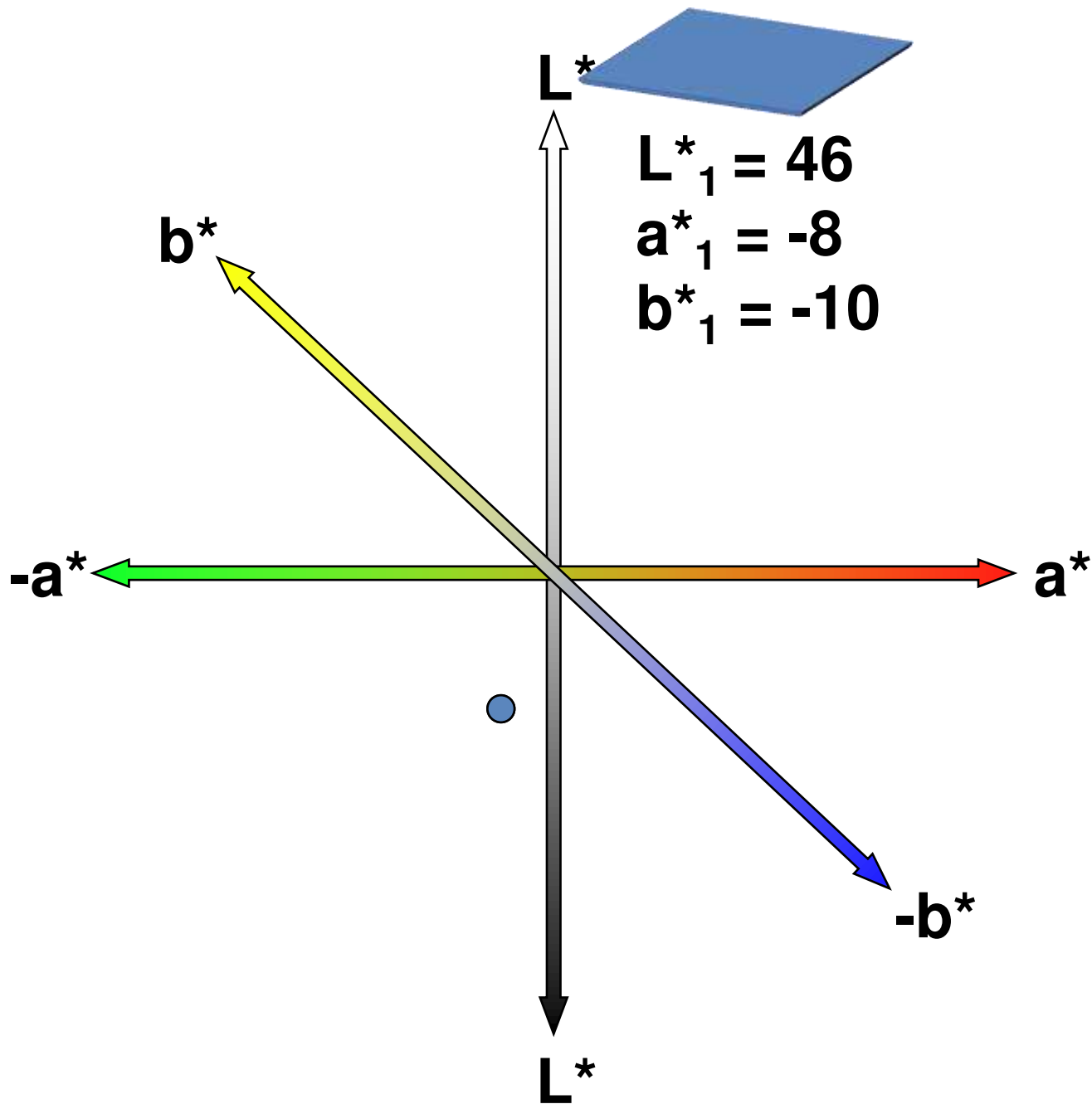
# QUANTIFYING THE COLOUR DIFFERENCE



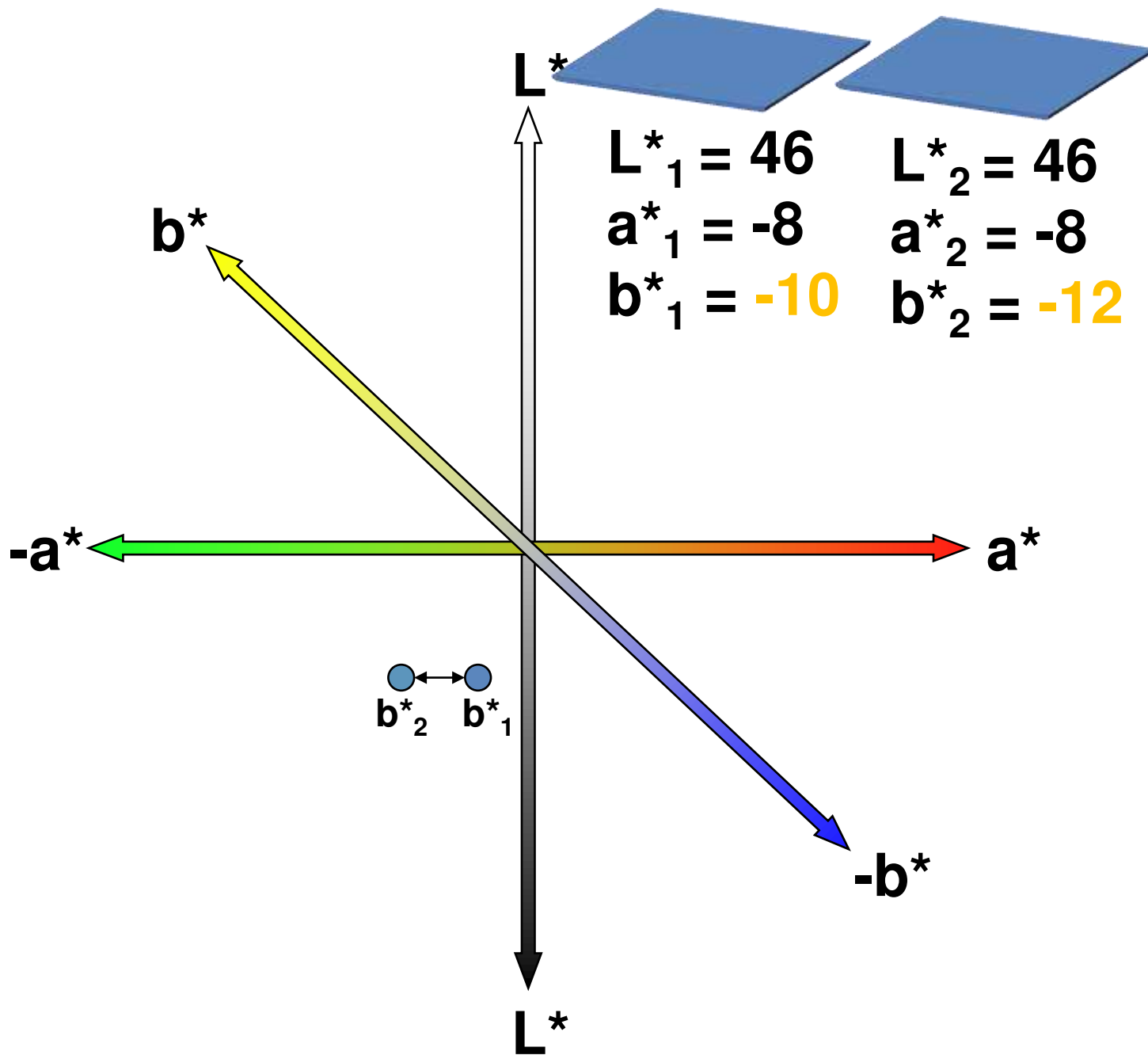


# DIFFERENT CIELAB VALUES

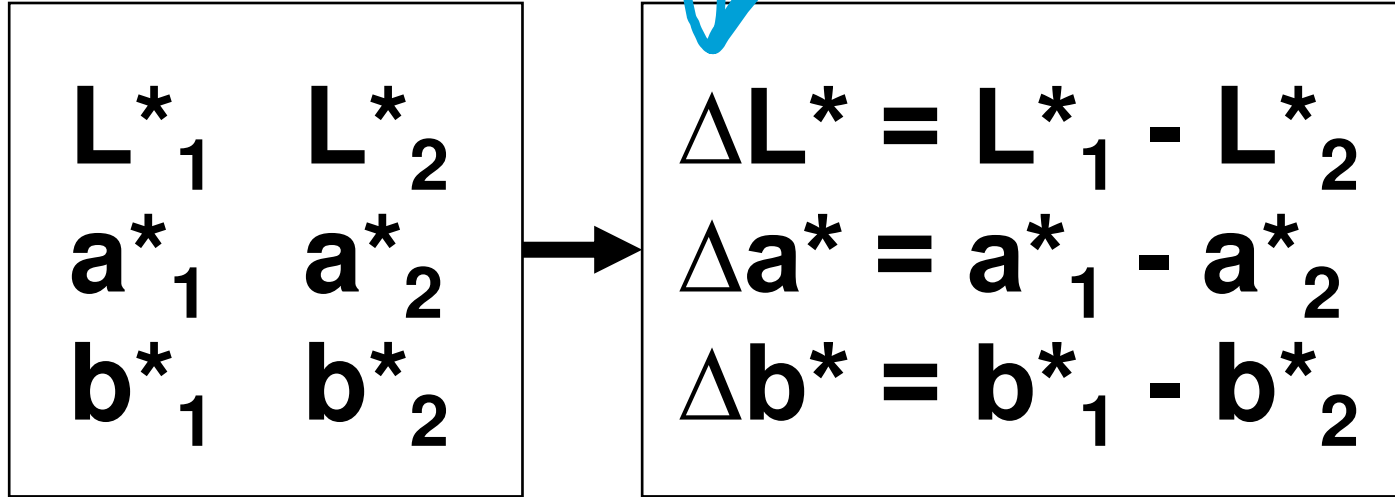




# POSITION OF $L^*_1 a^*_1 b^*_1$



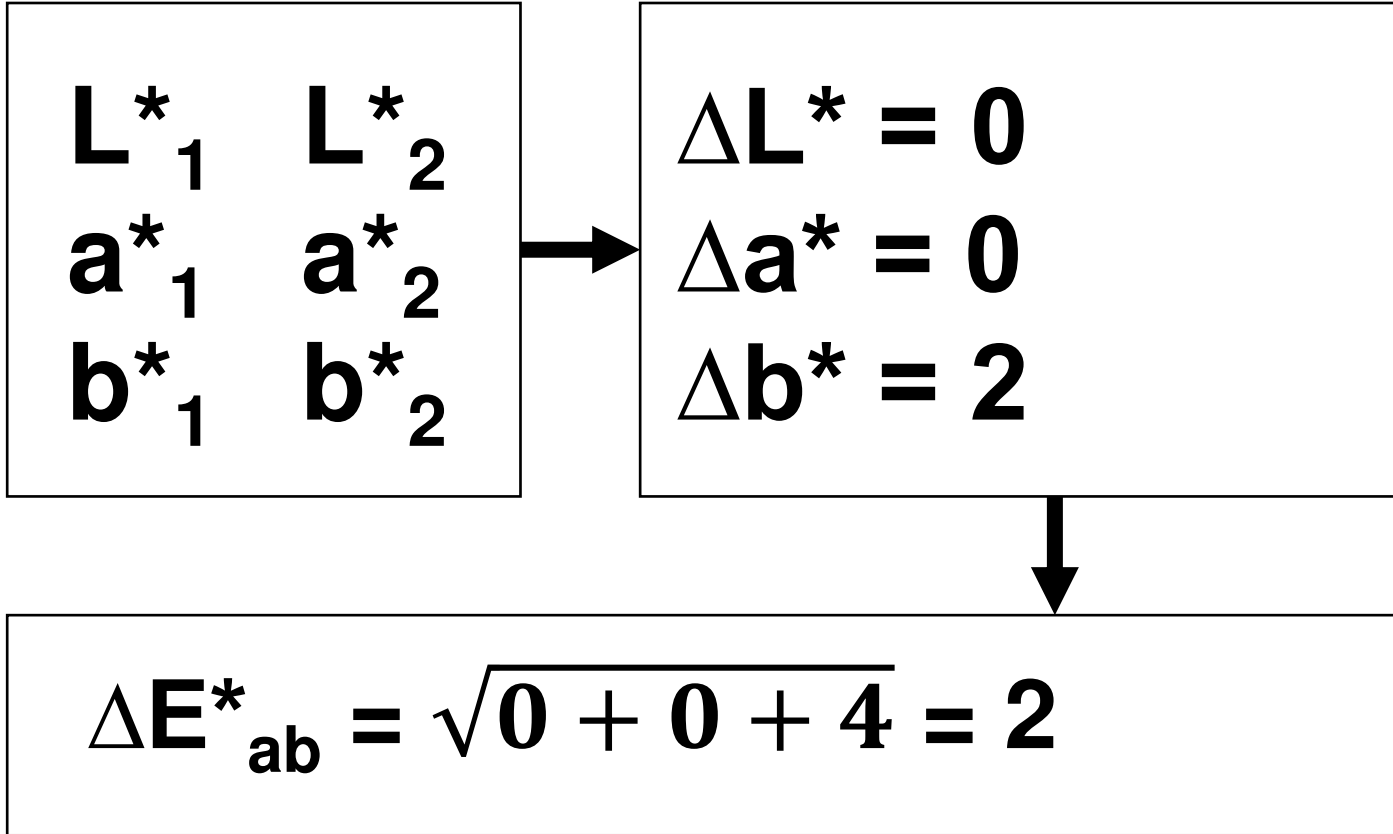
SMALL  
DIFFERENCE  
BETWEEN  
 $b^*_1$  &  $b^*_2$



$$\Delta E^*_{ab} = \sqrt{\Delta L^{*2} + \Delta a^{*2} + \Delta b^{*2}}$$

DELTA E

WE CAN  
CALCULATE  
THE COLOUR  
DIFFERENCE!



**WE CAN  
MEASURE THE  
COLOUR  
DIFFERENCE!**

## CIE76

$$\Delta E_{ab}^* = \sqrt{(L_2^* - L_1^*)^2 + (a_2^* - a_1^*)^2 + (b_2^* - b_1^*)^2}.$$

## CIE94

$$\Delta E_{94}^* = \sqrt{\left(\frac{\Delta L^*}{k_L S_L}\right)^2 + \left(\frac{\Delta C_{ab}^*}{k_C S_C}\right)^2 + \left(\frac{\Delta H_{ab}^*}{k_H S_H}\right)^2}$$

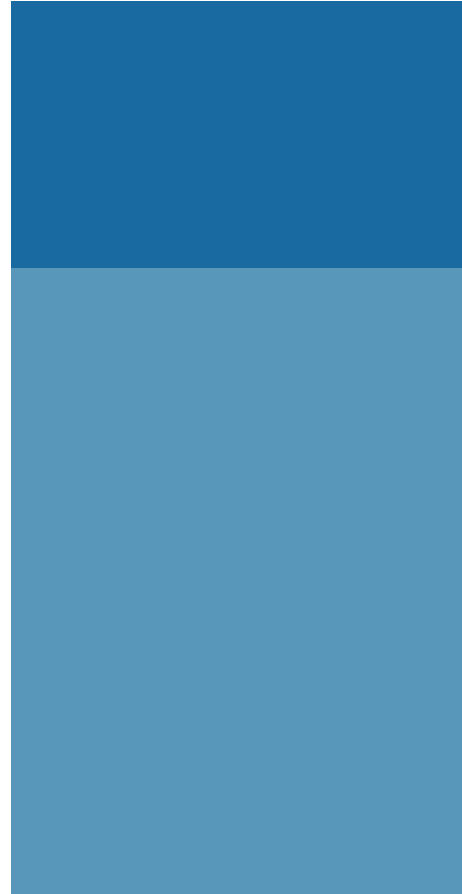
## CIE2000

$$\Delta E_{00}^* = \sqrt{\left(\frac{\Delta L'}{k_L S_L}\right)^2 + \left(\frac{\Delta C'}{k_C S_C}\right)^2 + \left(\frac{\Delta H'}{k_H S_H}\right)^2 + R_T \frac{\Delta C'}{k_C S_C} \frac{\Delta H'}{k_H S_H}}$$

# CALCULATION FORMULA



$\Delta E \sim 7$



$\Delta E \sim 16$



$\Delta E \sim 20$

**HIGHER  $\Delta E$   
MEANS  
BIGGER  
COLOUR  
DIFFERENCE**






**TYPICALLY**  
 **$\Delta E \leq 1.0$**   
**IS NOT**  
**PERCEPTIBLE BY**  
**HUMAN EYE**



**$\Delta E$  BETWEEN  
1.0 – 2.0  
IS PERCEPTIBLE  
BY CLOSE  
OBSERVATION**



**MANUFACTURING  
TOLERANCE**

$\Delta E$

**IS USED AS  
A QUALITY  
CONTROL  
METRIC**

**RECOMMEND  
TO USE ONE  
BATCH OF  
PRODUCT FOR  
ONE SURFACE**

**GLOSS LEVEL  
WILL AFFECT  
COLOUR  
APPEARANCE**

**LOW  
GLOSS**

**HIGH  
GLOSS**

**3** COLOUR DIFFERENCE

**GLOSS LEVEL  
WILL AFFECT  
COLOUR  
APPEARANCE**

**MAY NOT BE  
INDICATED IN  
COLOUR  
REFERENCE  
CODES**

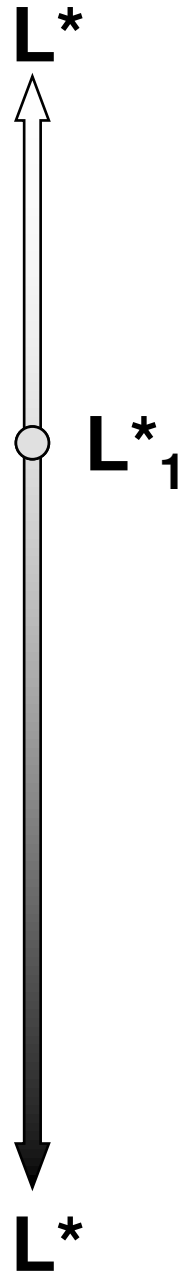
3 COLOUR DIFFERENCE

**CIELAB CAN  
INDICATE  
CLEANLINESS  
OF A COLOUR**





$L^*_1$



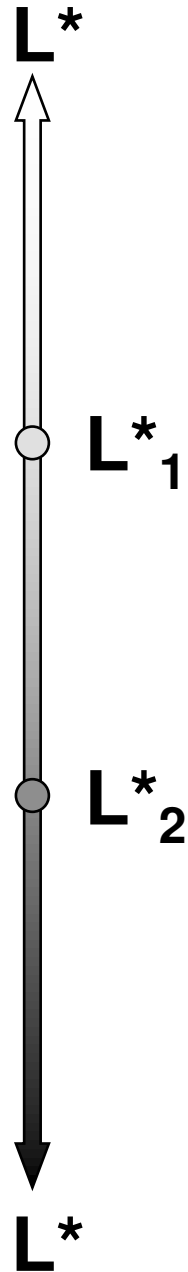
3 COLOUR DIFFERENCE

$\Delta L^*$

INDICATES  
LIGHTNESS OF  
A COLOUR

$L^*_1$

$L^*_2$



3 COLOUR DIFFERENCE

**HIGHER  $\Delta L^*$   
MEANS  
MORE  
STAINED**



# SUMMARY

---

1. KNOW YOUR COLOUR REFERENCE CODES
2. CIELAB AS INTERMEDIARY
3. HOW TO CALCULATE COLOUR DIFFERENCE

A nighttime photograph of the Central Festival Eastville building. The building features a curved facade with large red panels and blue accent lighting. The text "central festival EASTVILLE" is visible on the lower part of the building. In the foreground, there are trees, a parking lot with cars, and a large yellow sculpture. The sky is dark blue.

# QUESTION & ANSWER SESSION

**IDEAS TO  
SHARE?**

**EMAIL TO  
events@bluescope.com**

