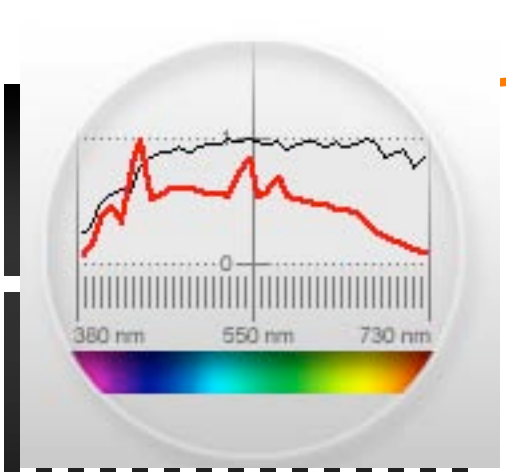
What is Color?

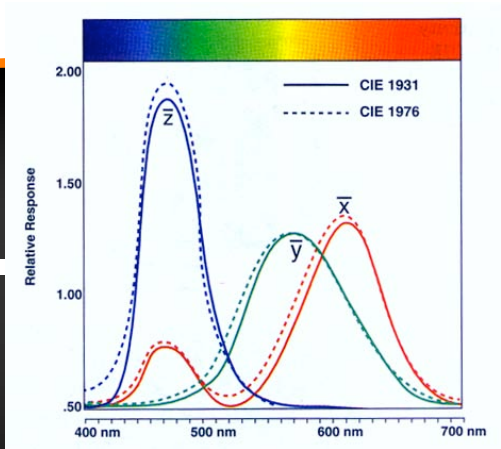
What is Color? 可見光範圍

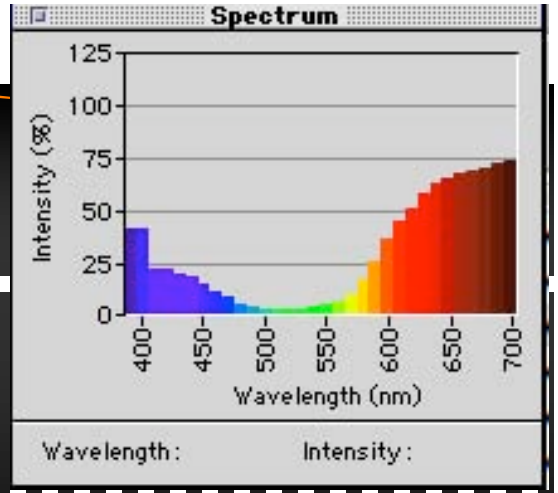
Isaac Newton examining light with a prism, while simultaneously striking a graceful pose

The breakthrough to the study color was this: Newton turned our attention to the light source . Color was, for the first time, an identifiable property of light. White light contains all colors. If a surface appears to be yellow this means that the light reaching our eyes has somehow been changed by reflecting off that surface. No light, no color. (For a description of Newton s experiment, see sidebar.)

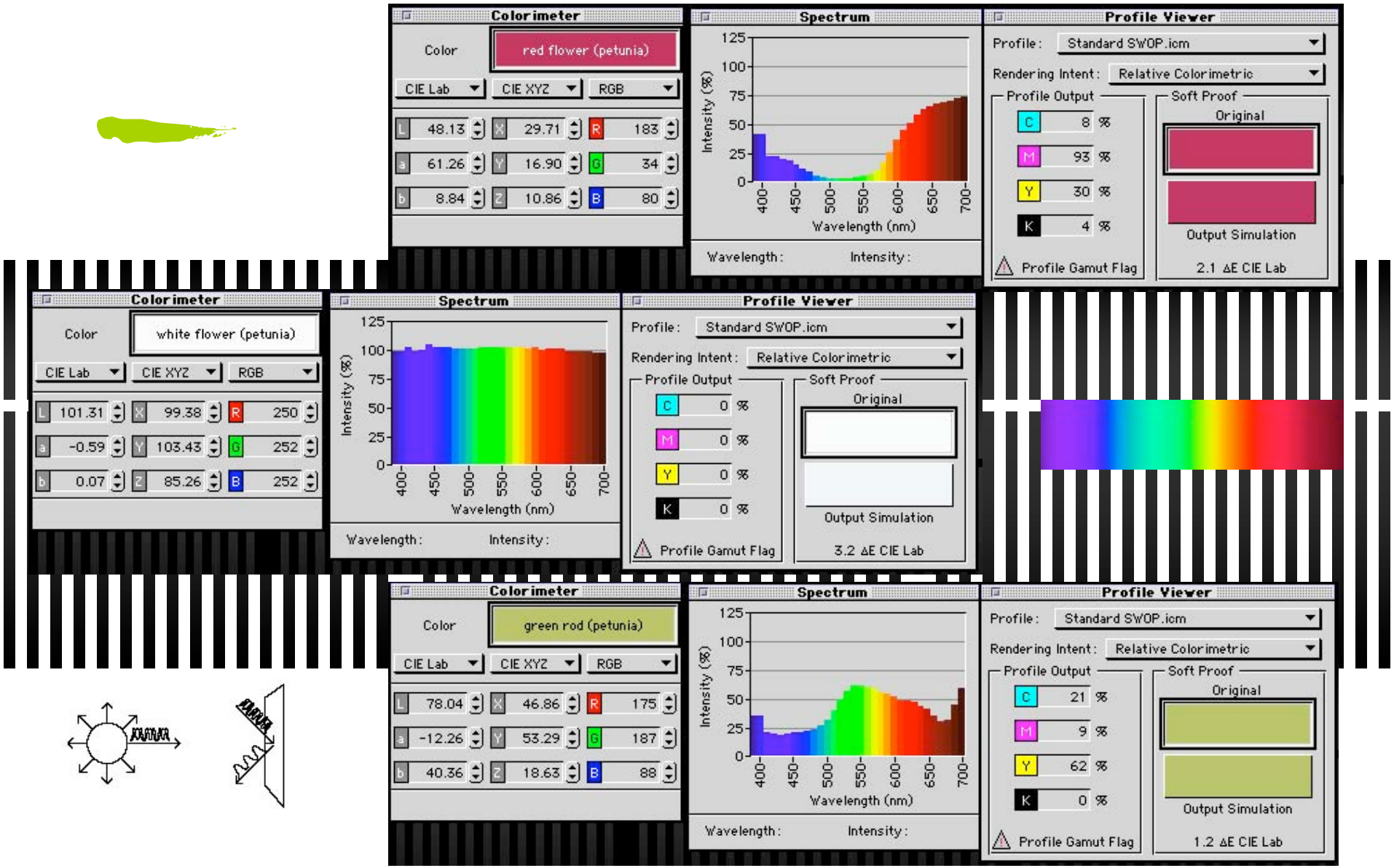
What is color? 光源,眼睛,物體



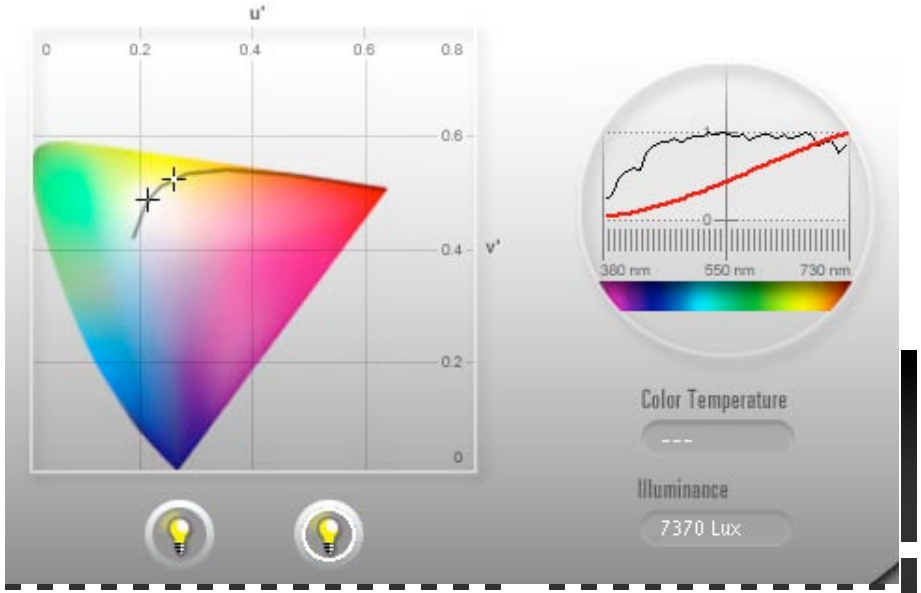


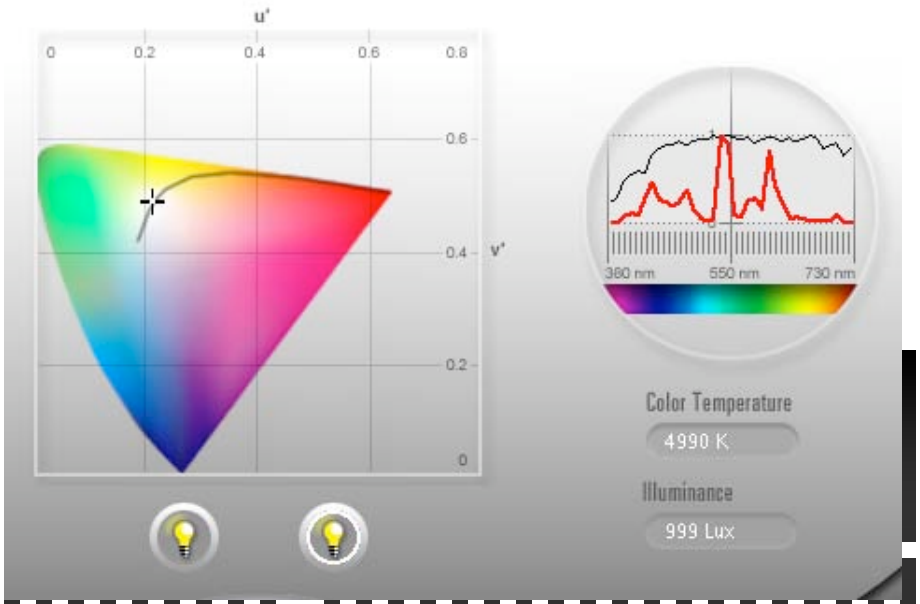


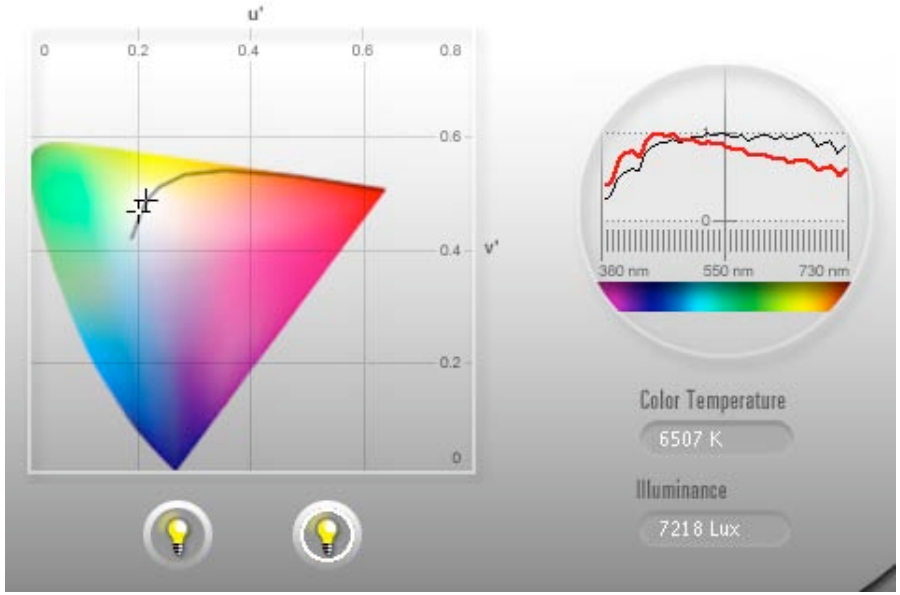
What is color? 光源,眼睛,物體



What is color? 光源,眼睛,物體

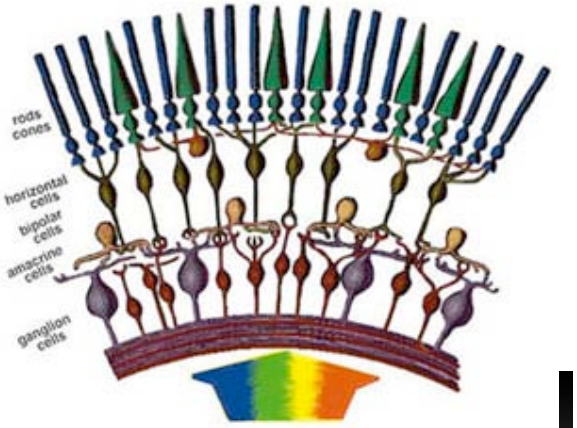


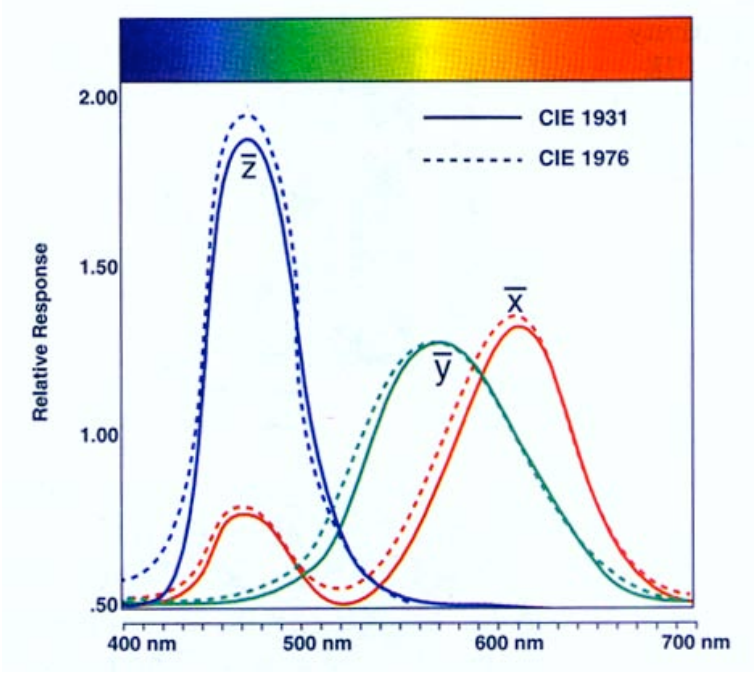


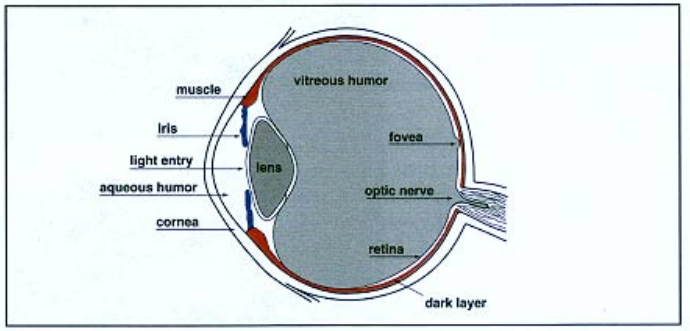


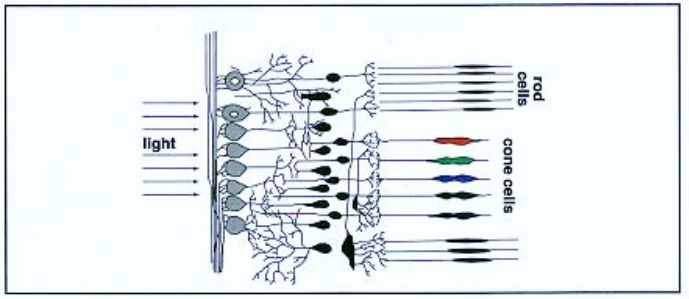
A	F10
D65	

What is color? 光源,眼睛,物體

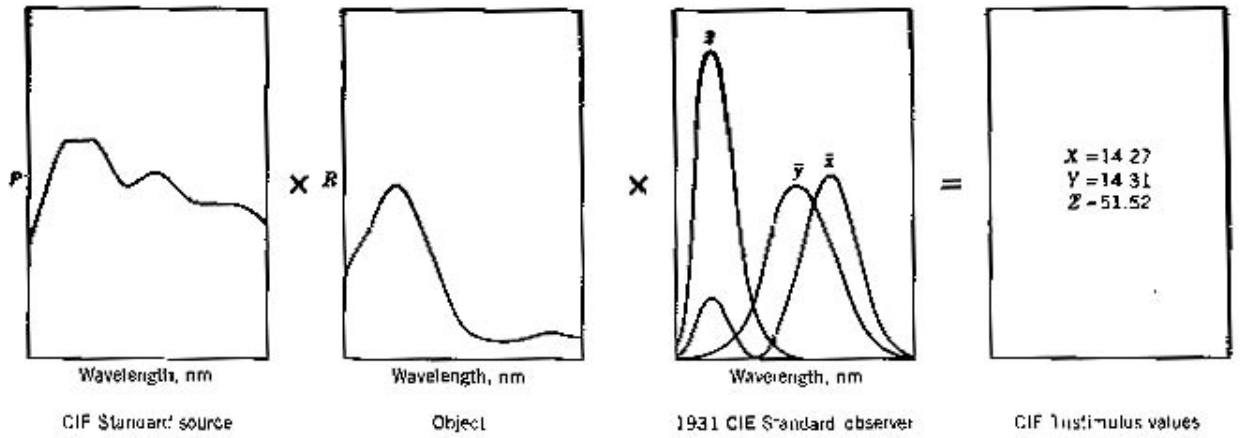


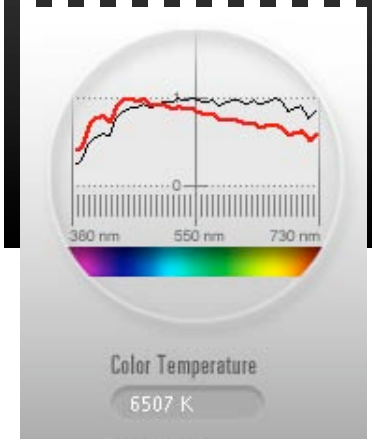


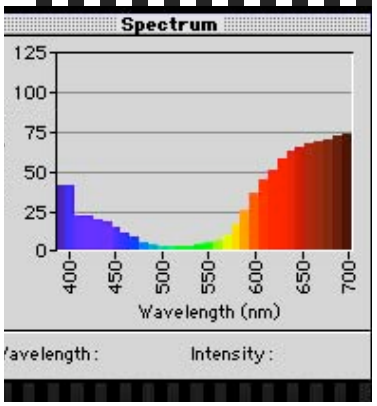


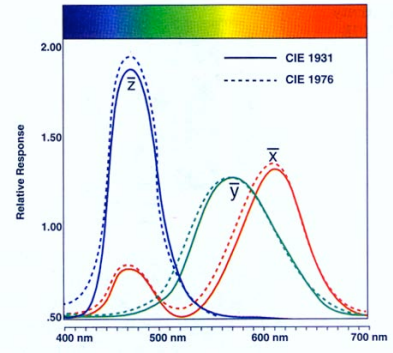


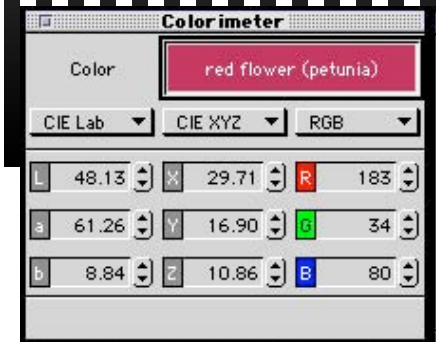
What is color? 光源,眼睛,物體





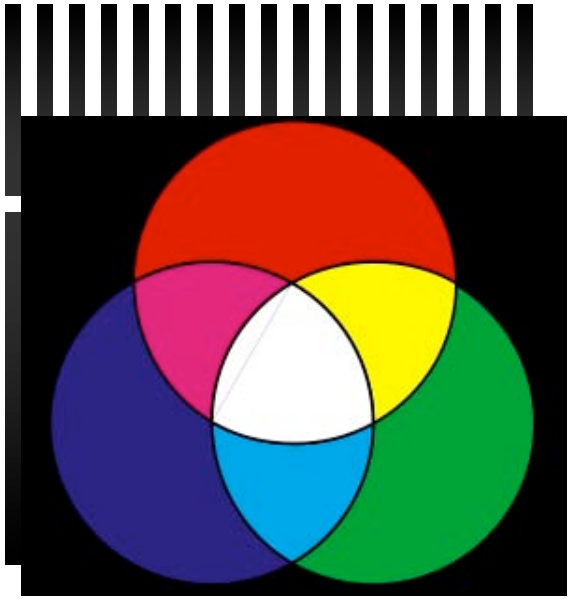


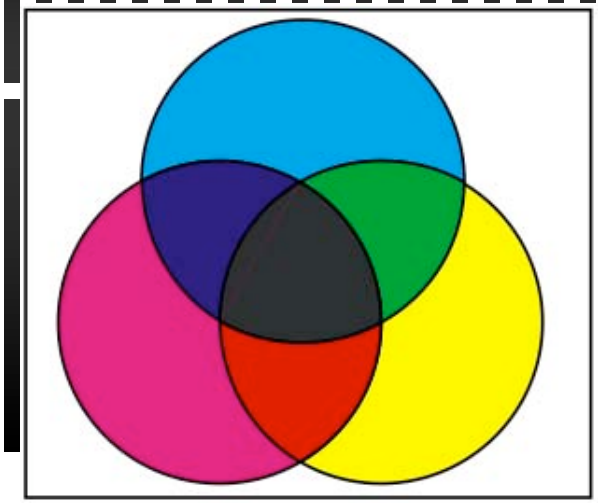


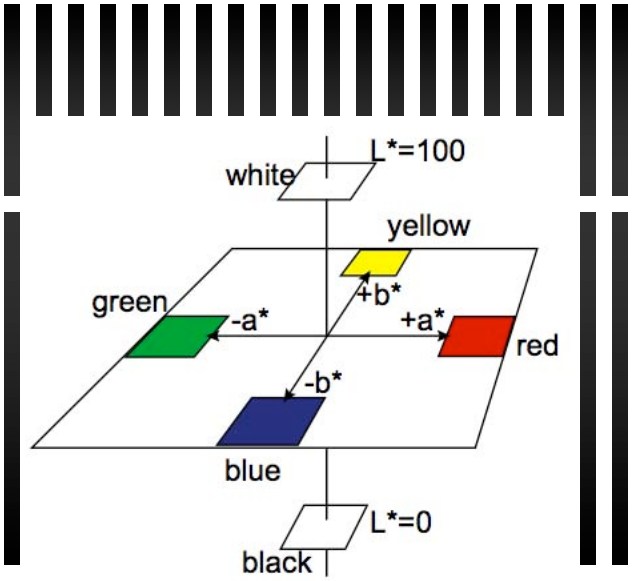


What is color? Color Space: RGB, CMYK. CIE

- Device dependent: RGB, CMYK
- Device independent: CIE





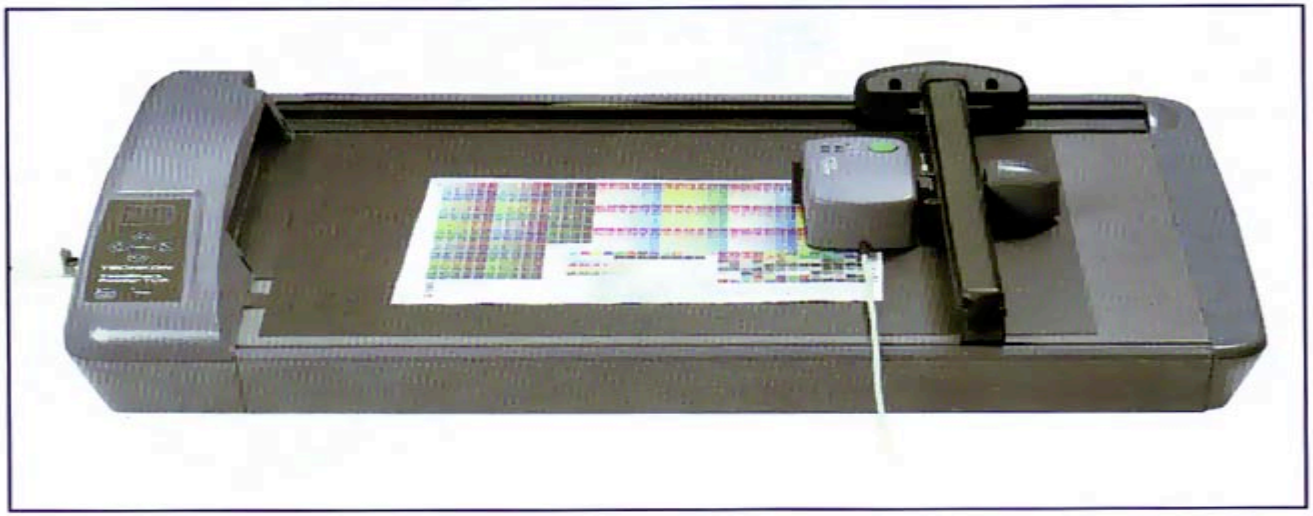


為什麼需要獨立的色彩空間?

- 設備空間(RGB,CMYK)溝通失敗
  - 同一組RGB資料在不同的螢幕顯示不相同
  - 同一張原稿在不同的掃描機得到不同的RGB資料
  - 同一組CMYK資料在不同的印表機得到不同的色彩
- 獨立色彩空間(CIE Space)的特性
  - 一種以人的眼睛與光源為基礎的色彩標示座標
  - 一種將人的眼睛與光源帶著跑的色彩座標

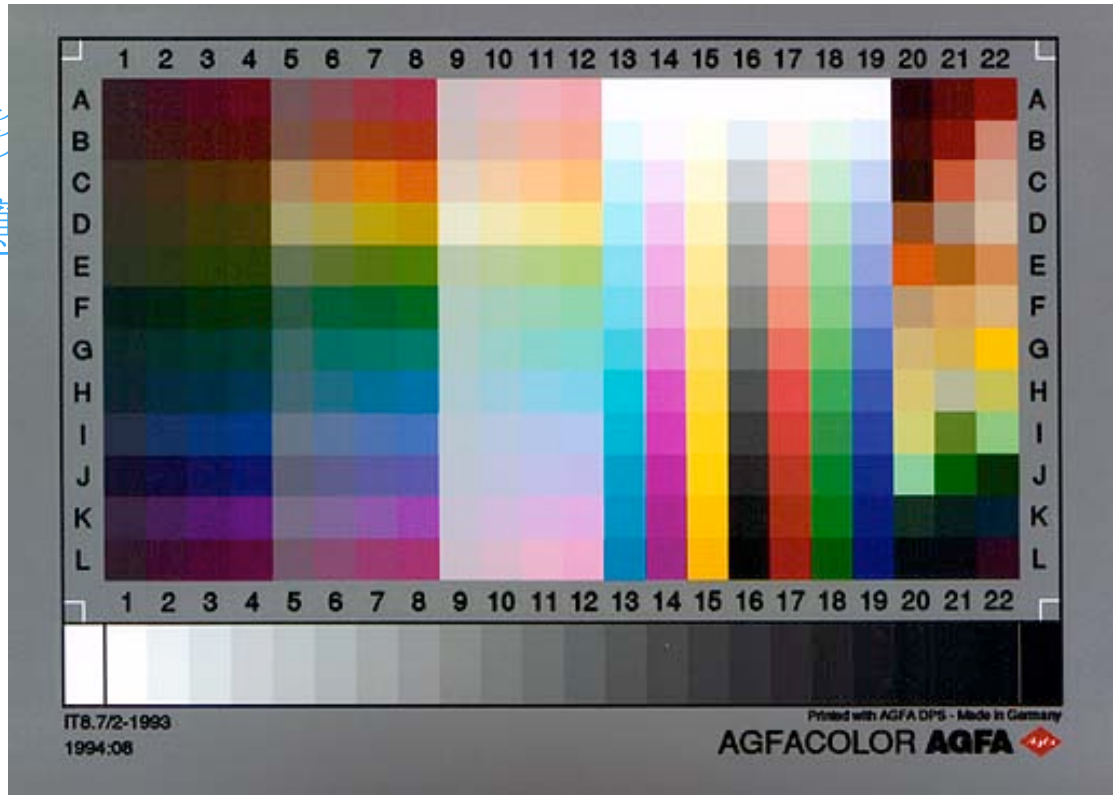
設備空間如何與獨立色彩空間溝通?

- ✓ 對設備空間取樣,經由色度計或光譜儀量取設備樣本的獨立空間色彩值,由樣本與色彩值之間的關係可推算出設備空間與獨立色彩空間的對應關係。



輸入設備如何與獨立色彩空間溝通?

- ✓ IT8.7/1掃描機特性導表
  - ✓取樣
  - ✓量取色彩
  - ✓建立對應

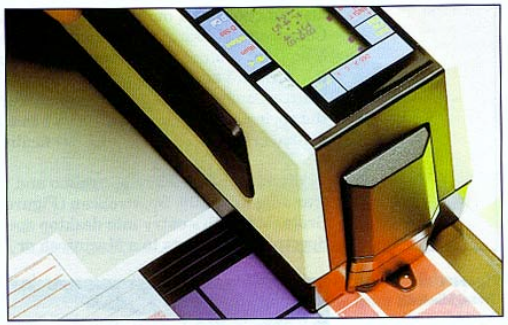


繼續

輸入設備如何與獨立色彩空間溝通?

續

- ✓ IT8.7/1掃描機特性導表
  - ✓取樣
  - ✓量取色彩值
  - ✓建立對應關係



C20919XX

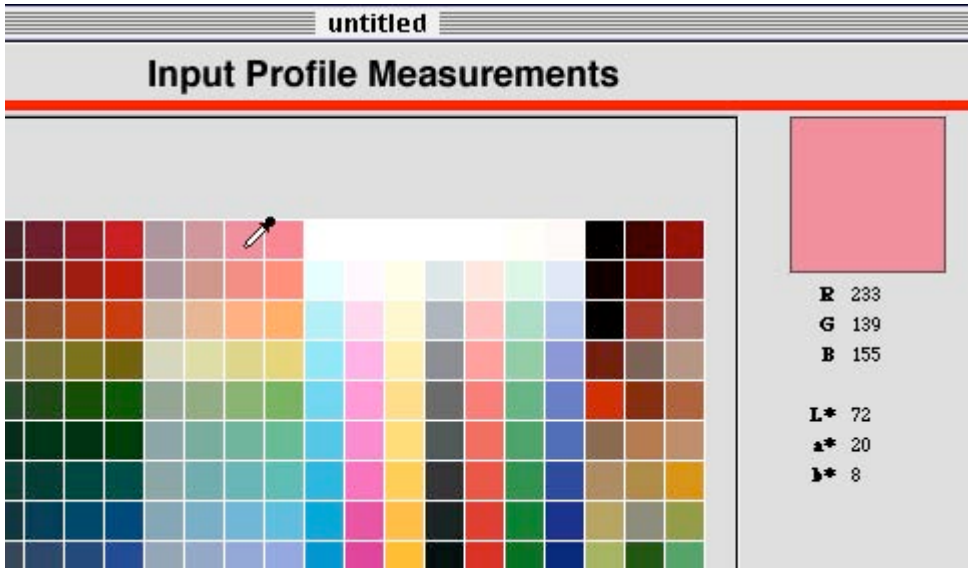
```
IT8.7/2
ORIGINATOR "FotoTune"
MATERIAL Agfacolor
MANUFACTURER Agfa
PROD_DATE 1992:09
SERIAL "5x7  C20919xx"
BEGIN_DATA_FORMAT
SAMPLE_ID XYZ_X XYZ_Y XYZ_Z LAB_L LAB_A LAB_B LAB_C LAB_H
END_DATA_FORMAT
BEGIN_DATA
A1    3.17   2.51   1.78  17.95  13.75   2.84 126.39   1.30
A2    4.08   2.61   1.47  18.41  25.91   7.13 241.82   1.71
A3    5.62   3.16   1.52  20.67  35.85  10.36 335.87   1.79
A4    6.16   3.42   1.61  21.64  37.65  11.06 353.13   1.82
A5   13.36  11.42   7.59  40.27  16.18   6.73 157.73   2.51
A6   15.14  10.76   6.21  39.16  31.96  10.67 303.26   2.05
A7   17.55  10.82   5.60  39.28  45.13  13.73 424.56   1.88
A8   19.66  10.96   5.11  39.52  55.01  16.62 517.17   1.87
A9   45.94  45.77  35.68  73.39   5.23   2.90  53.89   3.22
A10  47.23  44.61  33.46  72.63  12.13   4.79 117.40   2.39
A11  50.18  44.46  31.15  72.54  20.60   8.12 199.25   2.39
A12  49.49  42.05  28.82  70.90  25.78   9.00 245.77   2.14
A13  74.78  76.92  63.59  90.28   1.29  -0.10  11.63  39.50
A14  75.09  77.12  63.59  90.38   1.54   0.05  13.85  13.53
A15  75.10  77.12  63.62  90.38   1.55   0.03  13.97  17.89
```

繼續

輸入設備如何與獨立色彩空間溝通?

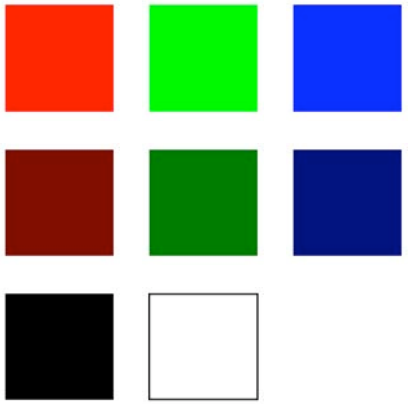
續

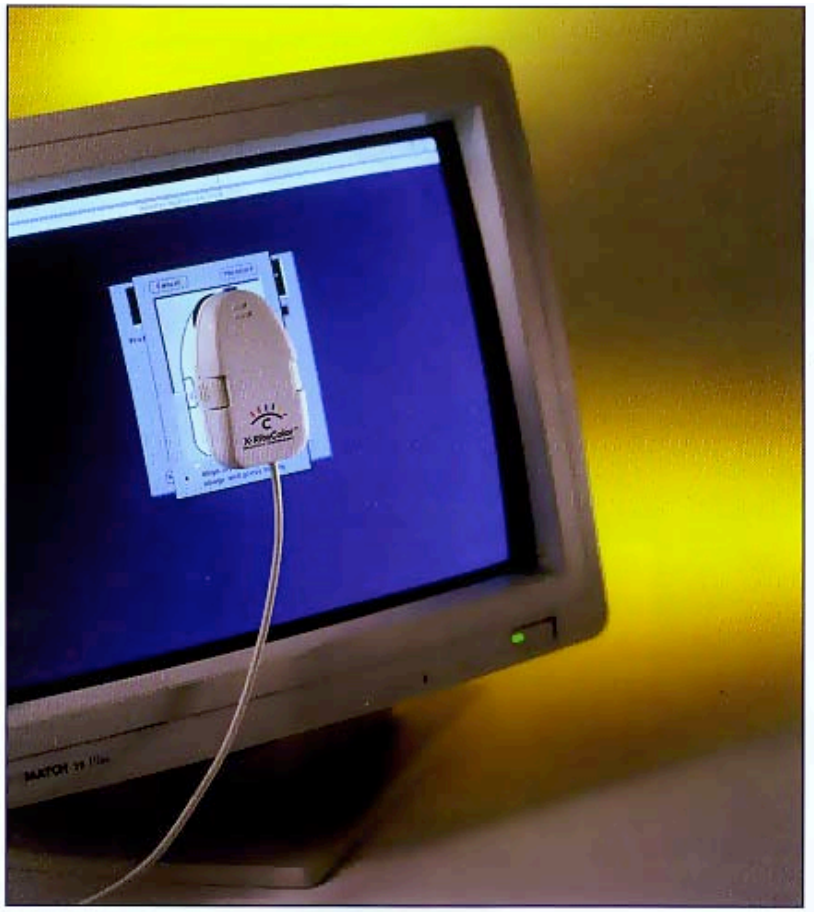
- ✓ IT8.7/1 掃描機特性導表
  - ✓取樣
  - ✓量取色彩值
  - ✓建立對應關係



顯像設備如何與獨立色彩空間溝通?

- ✓ 顯像設備
  - ✓取樣
  - ✓量取色彩值
  - ✓建立對應關係

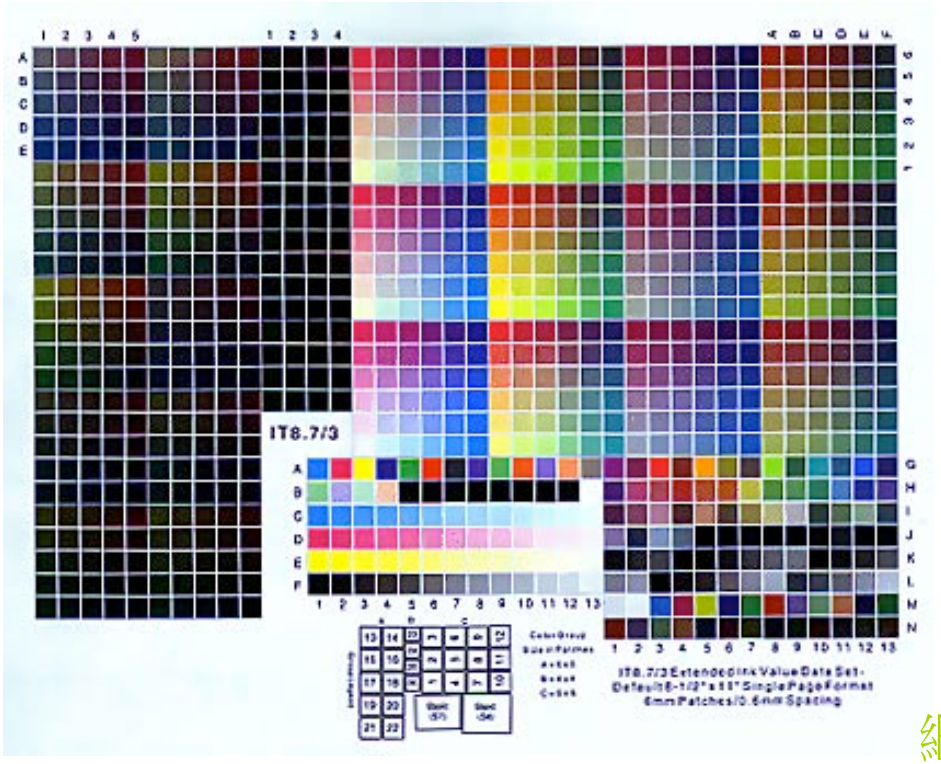




繼續

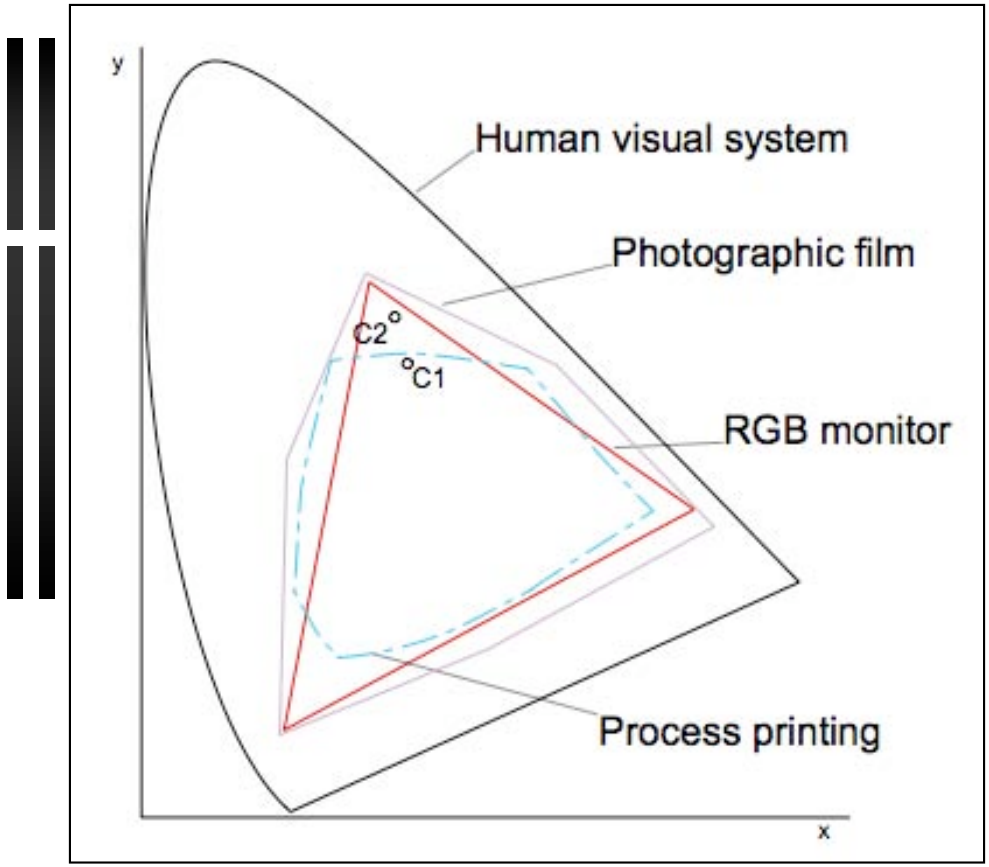
輸出設備如何與獨立色彩空間溝通?

- ✓ 輸出設備
  - ✓取樣(IT8.7/3)
  - ✓量取色彩值
  - ✓建立對應關係

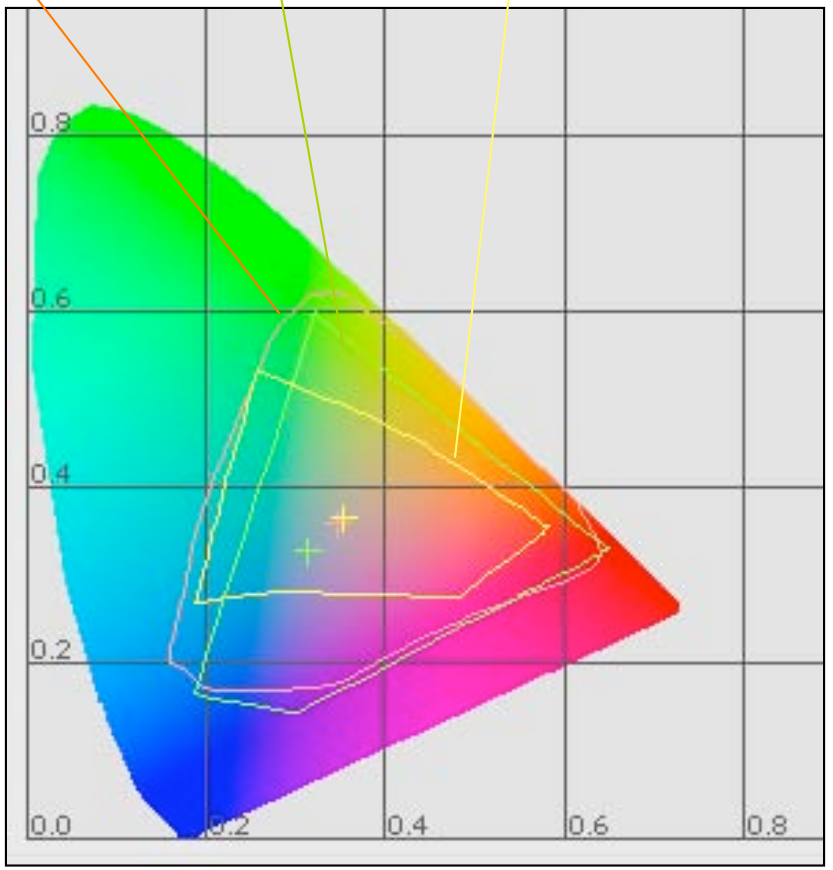


繼續

What is color?　Color Gamut 色域



Kigamo　sRGB　SWOP *L=50



What is color? Attributes of Color: Hue, Chroma, Lightness

色彩標示特性: 色角度, 飽和度, 明度

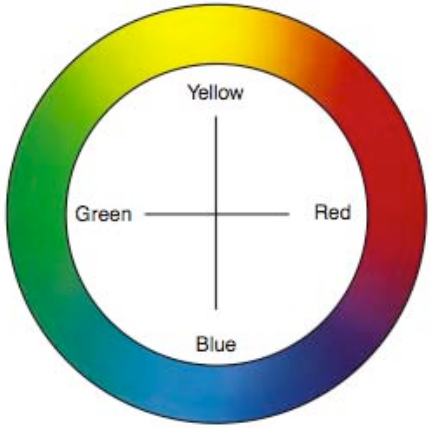


Figure 1: Hue

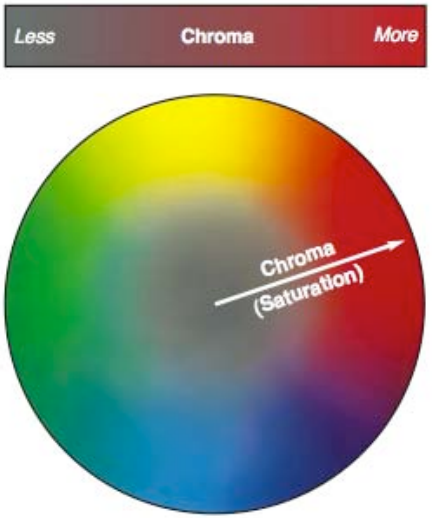


Figure 2: Chromaticity

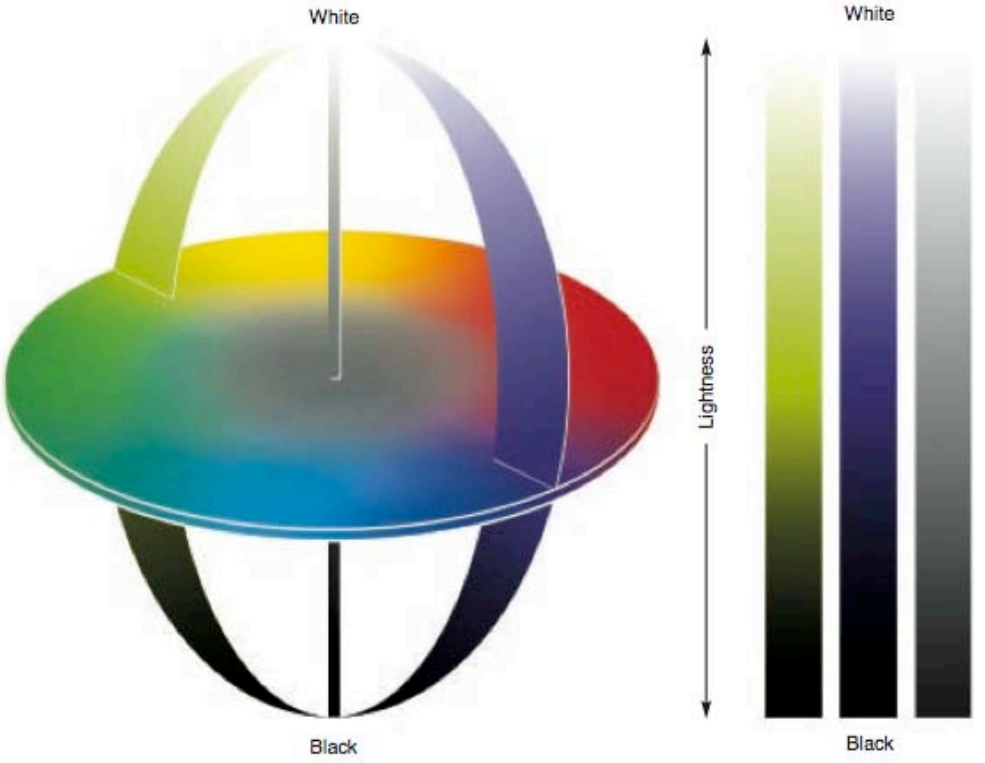
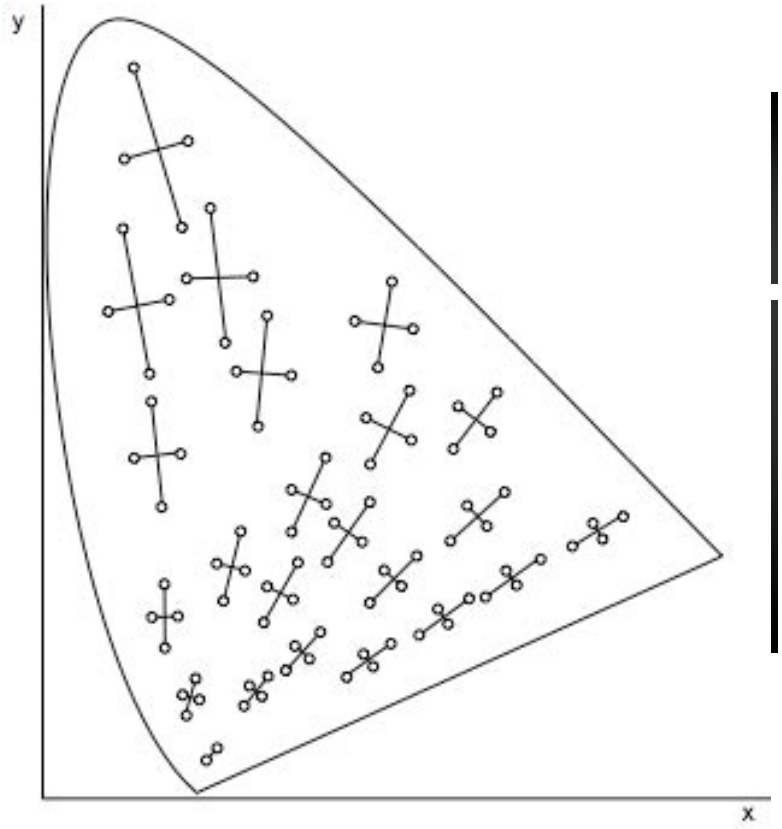


Figure 3: Three-dimensional color system depicting lightness

What is color?　Delta-E 色差

CIE xyY



CIE Lab

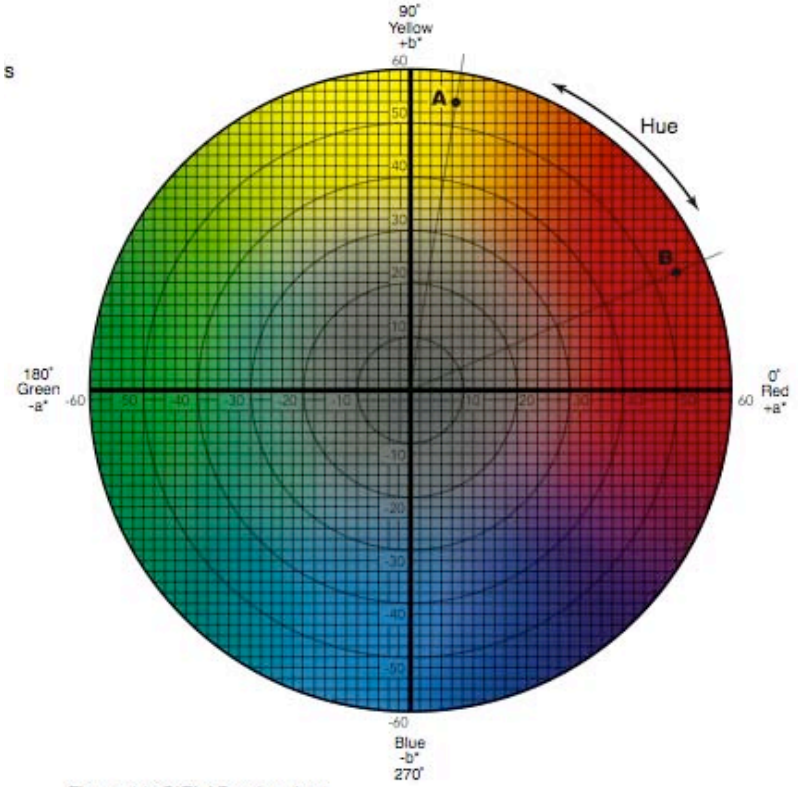


Figure 11: CIELAB color chart

What is color?　Color CIELAB Tolerancing　色差容許

CIE Lab

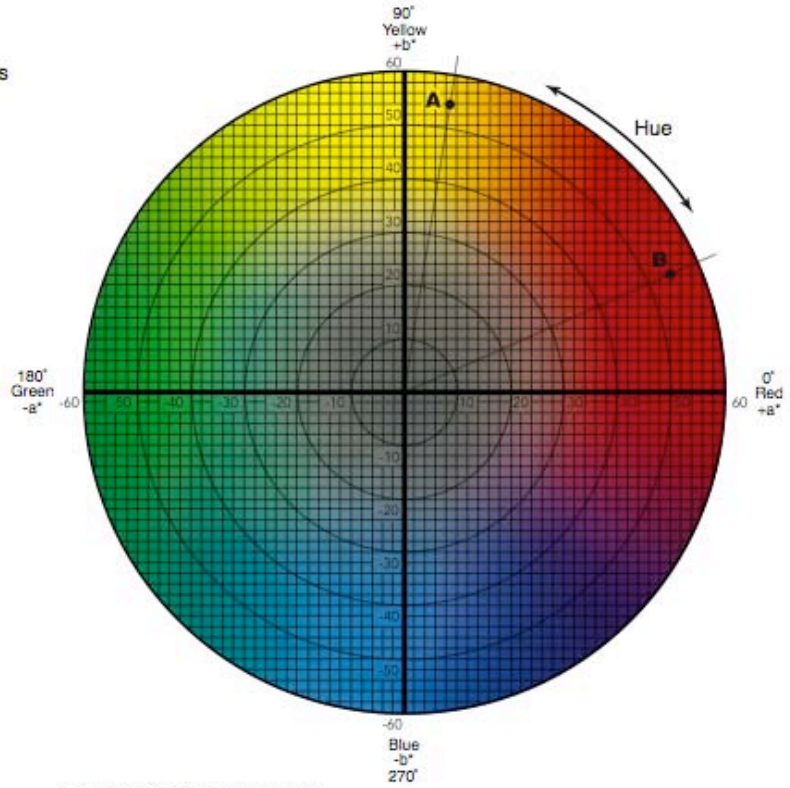


Figure 11: CIELAB color chart

CIE CMC

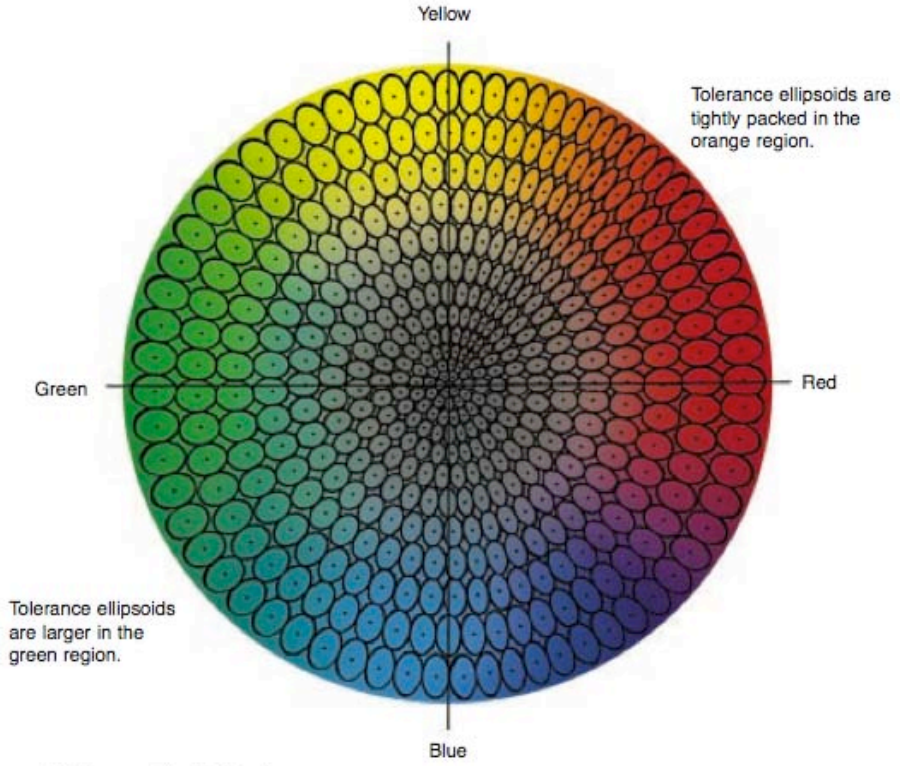


Figure 18: Tolerance ellipsoids in color space