

Digital Color

Lecture 1

Basics of spectral color

Stone, Maureen C.

A field guide to digital color

AK Peters, Natick, Mass. USA, 2003



Recognize edible fruits







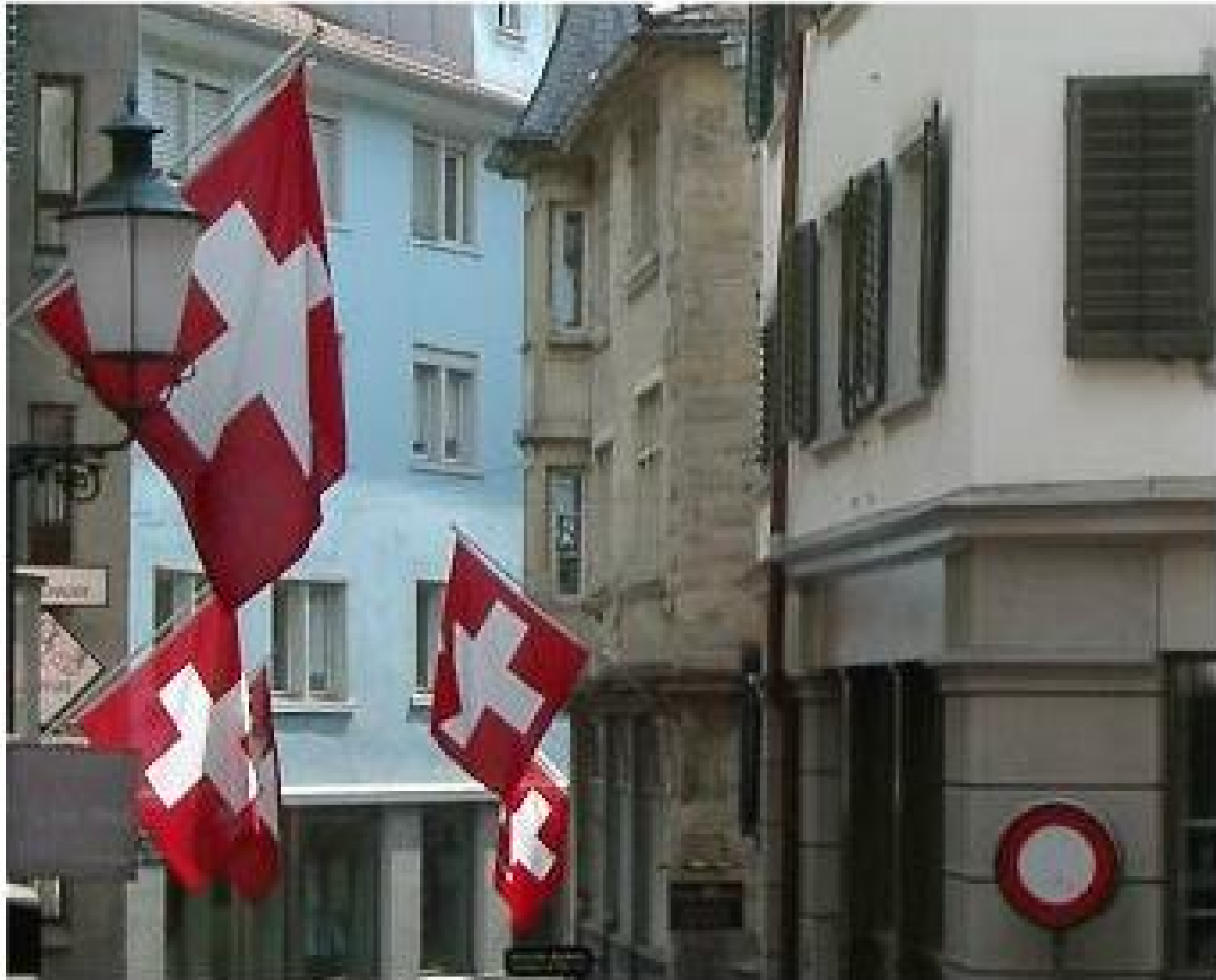


Also form is important in object recognition

How do you separate the peppers from each
other?



White structure on red background?

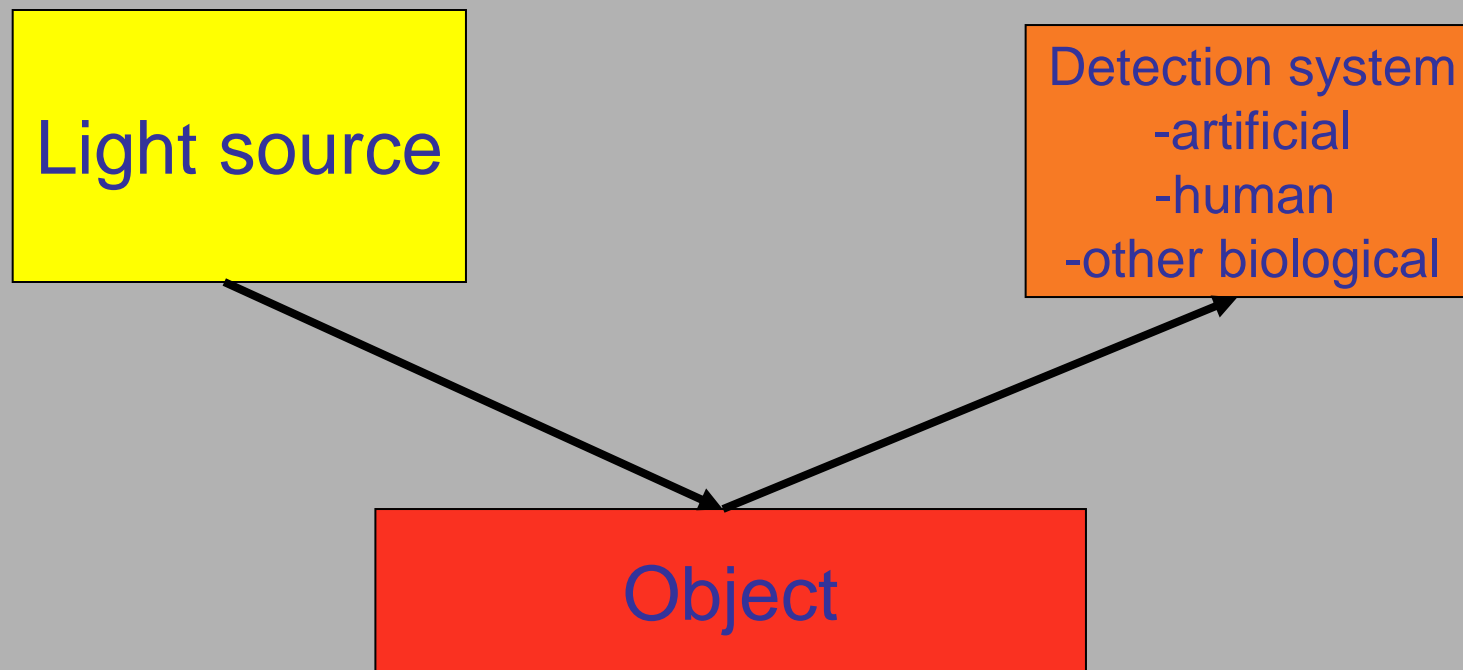


What is color?

- Human perception of light?
- Object property which we see?
- Electromagnetic radiation, which can be measured?
- Material waves, which reach the eye?
- In any case: Color exists only through human vision!

Our approach to color

- Color information is carried by the light signal originated from the colored object
- This signal is measurable and unique



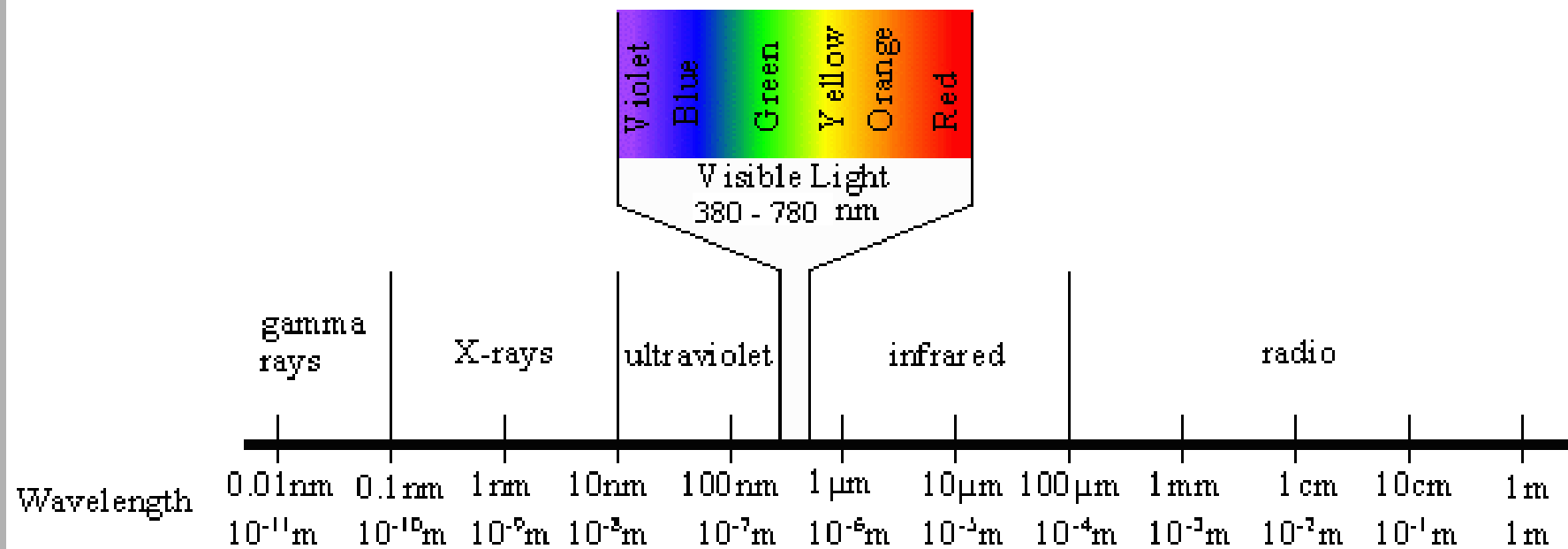
Our approach to color

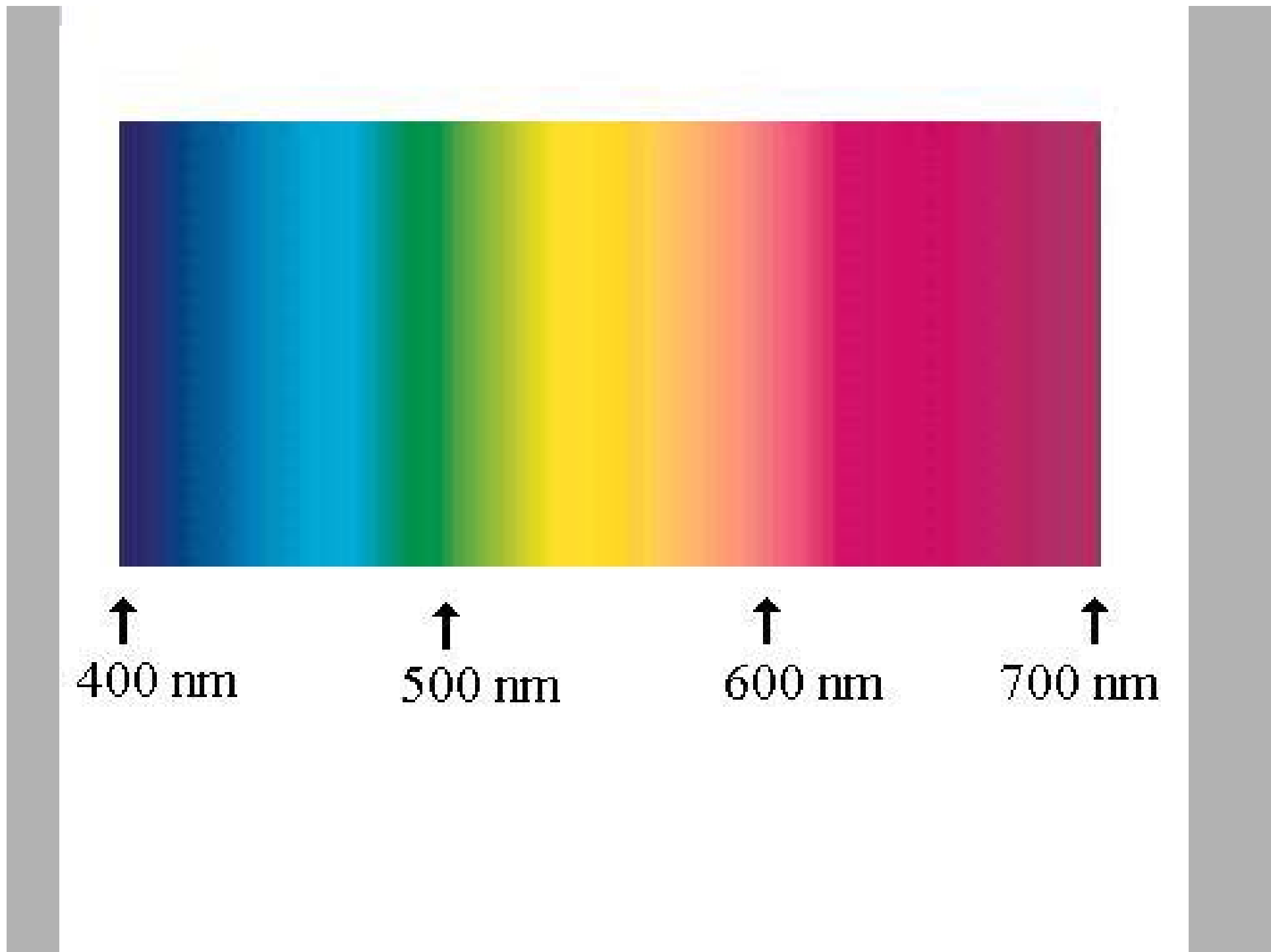
- Human vision is only a special case of light detection system
- What color is, is a philosophical question
- Essay topic:
Color, a philosophical approach

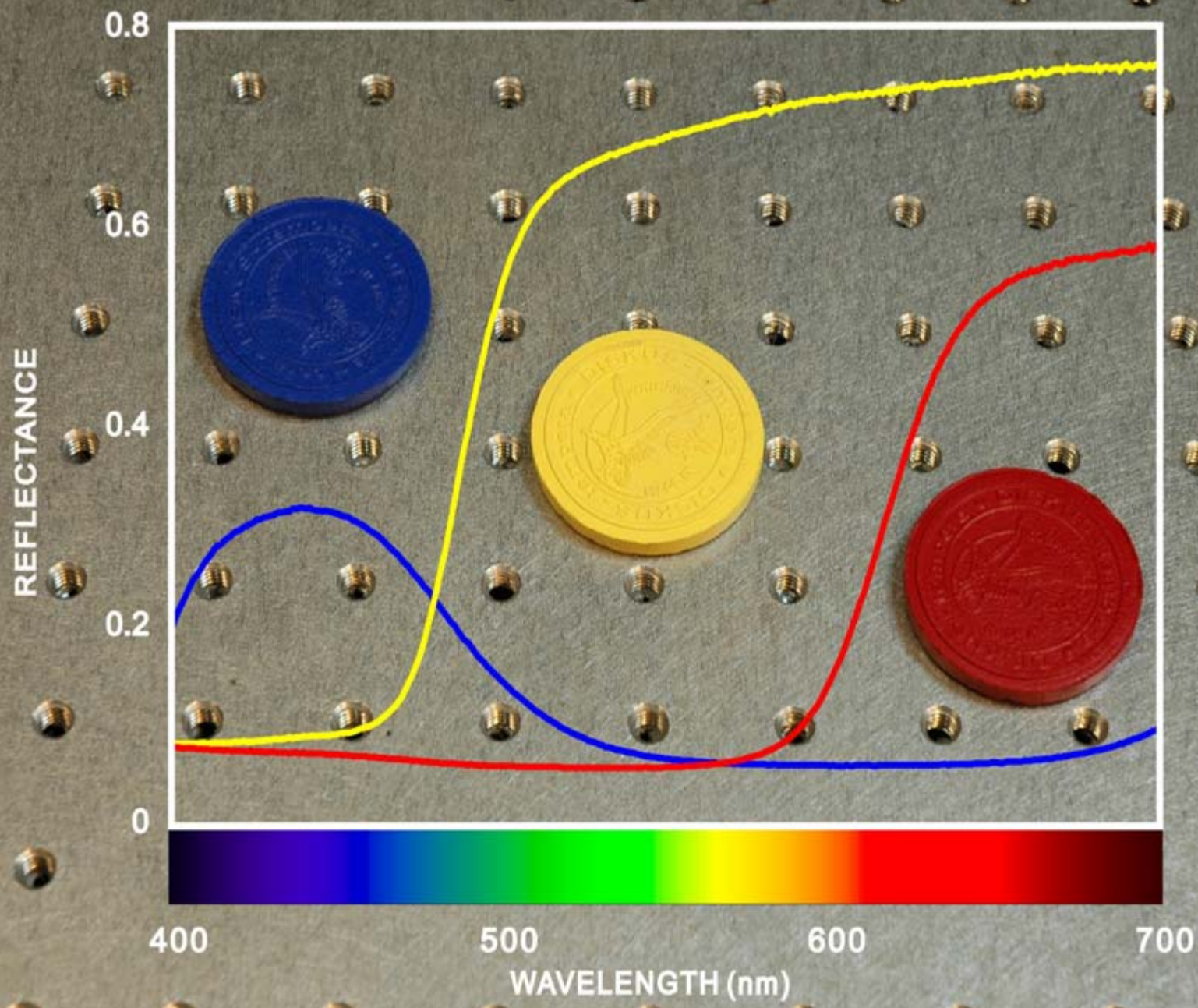
Our approach to digital color

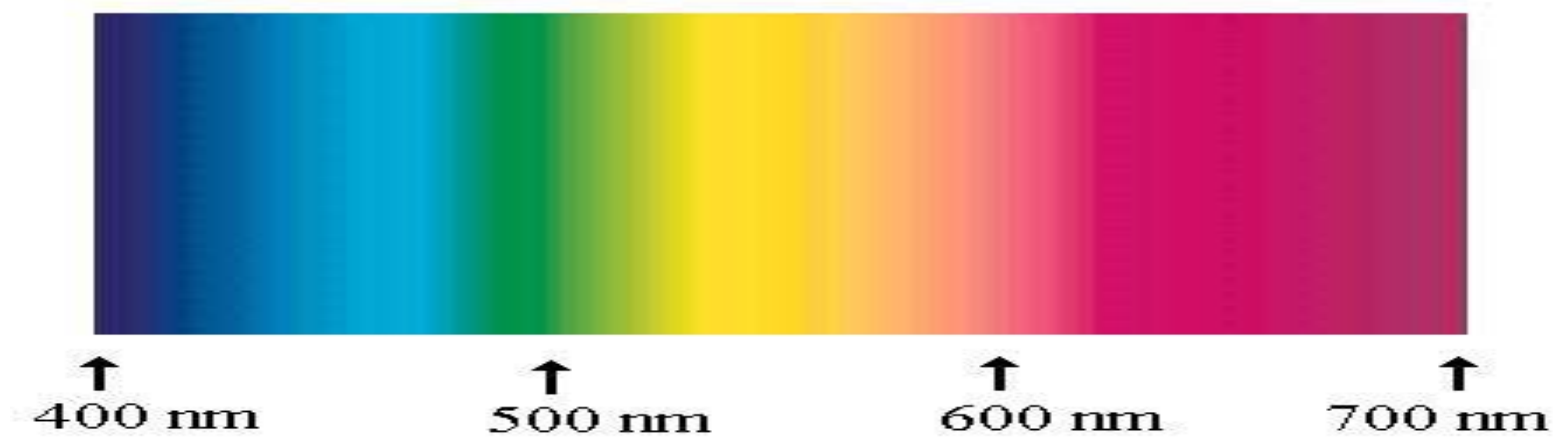
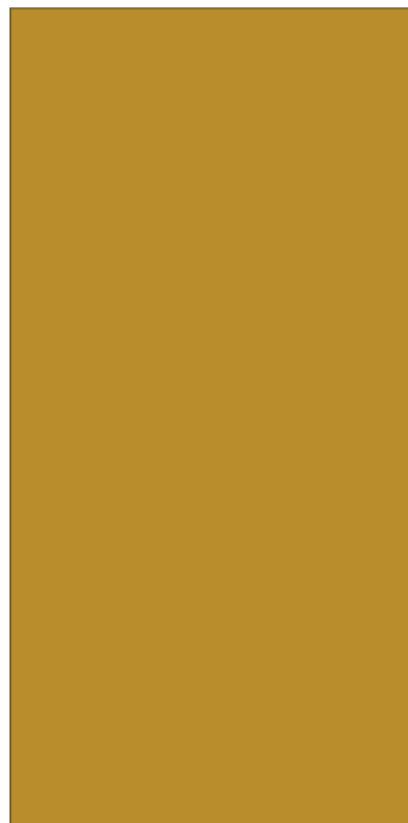
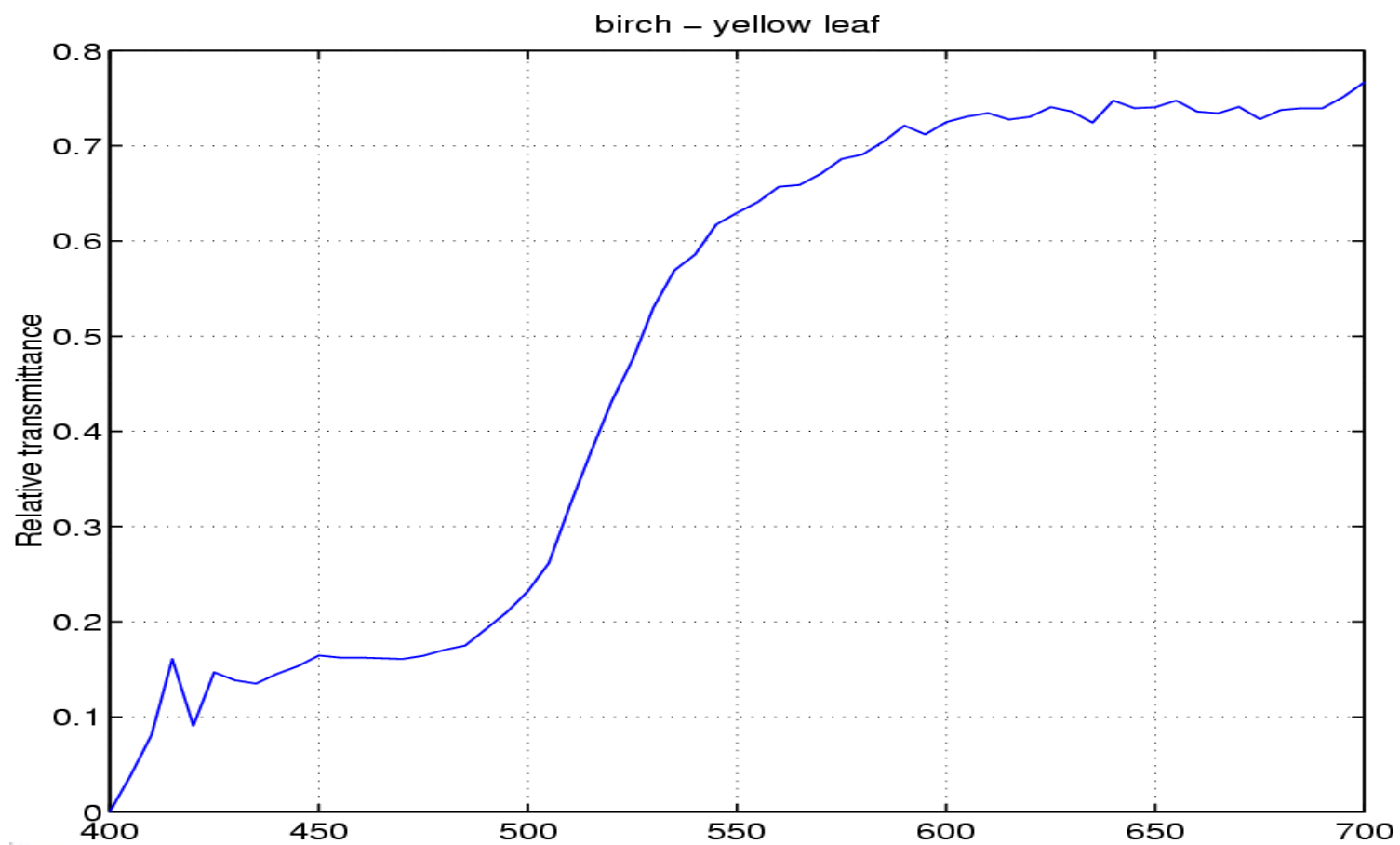
- Digital color is representation of color in digital form
- We consider topics like
 - color coordinates
 - color reproduction
 - device dependency
 - color processing
- Often we think colors in images

Visible spectrum

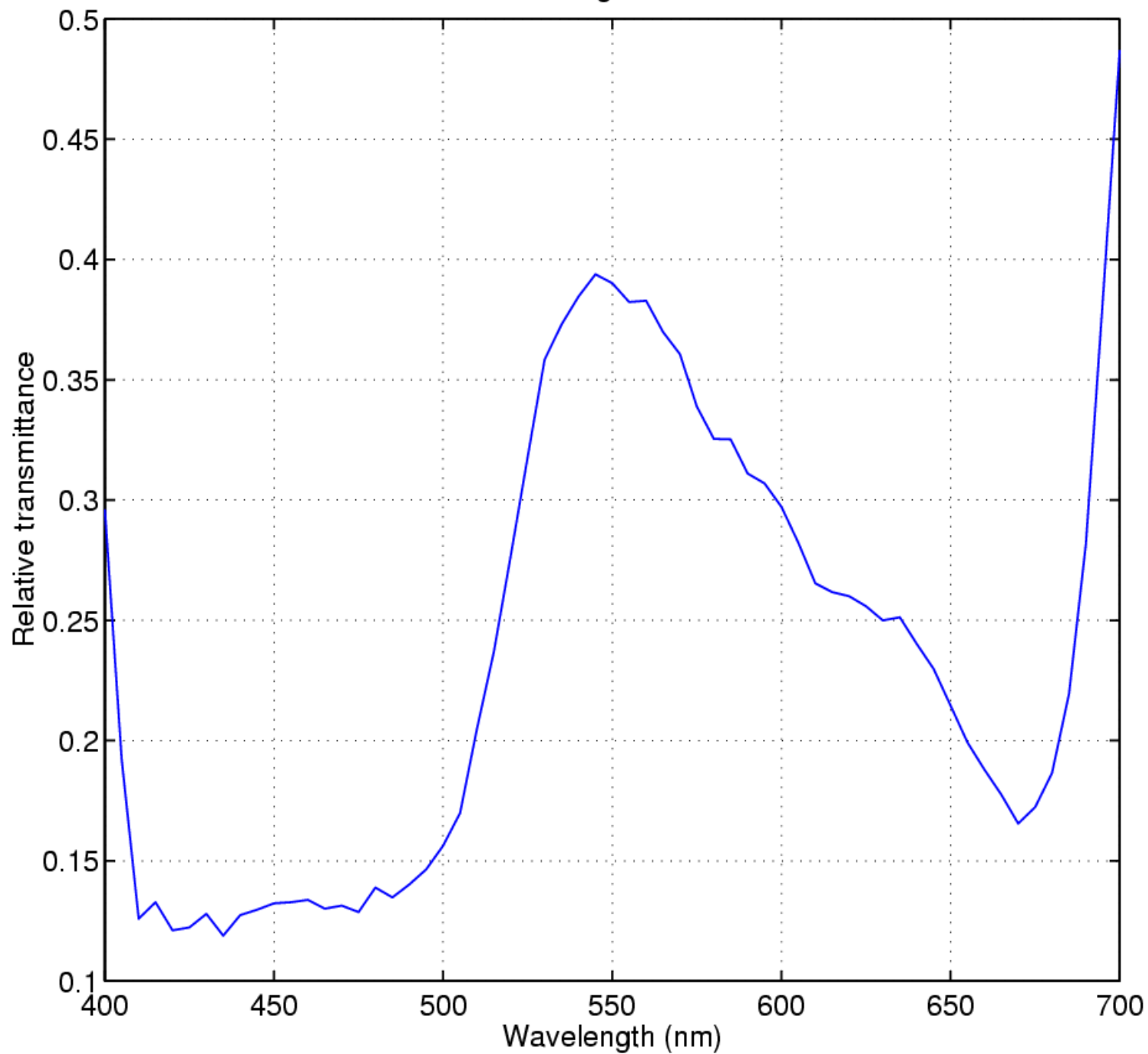


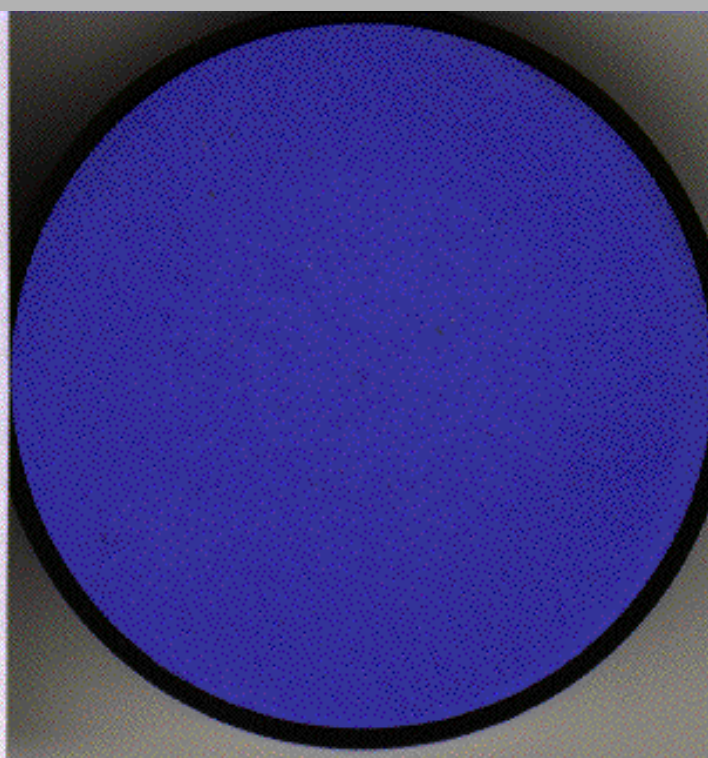
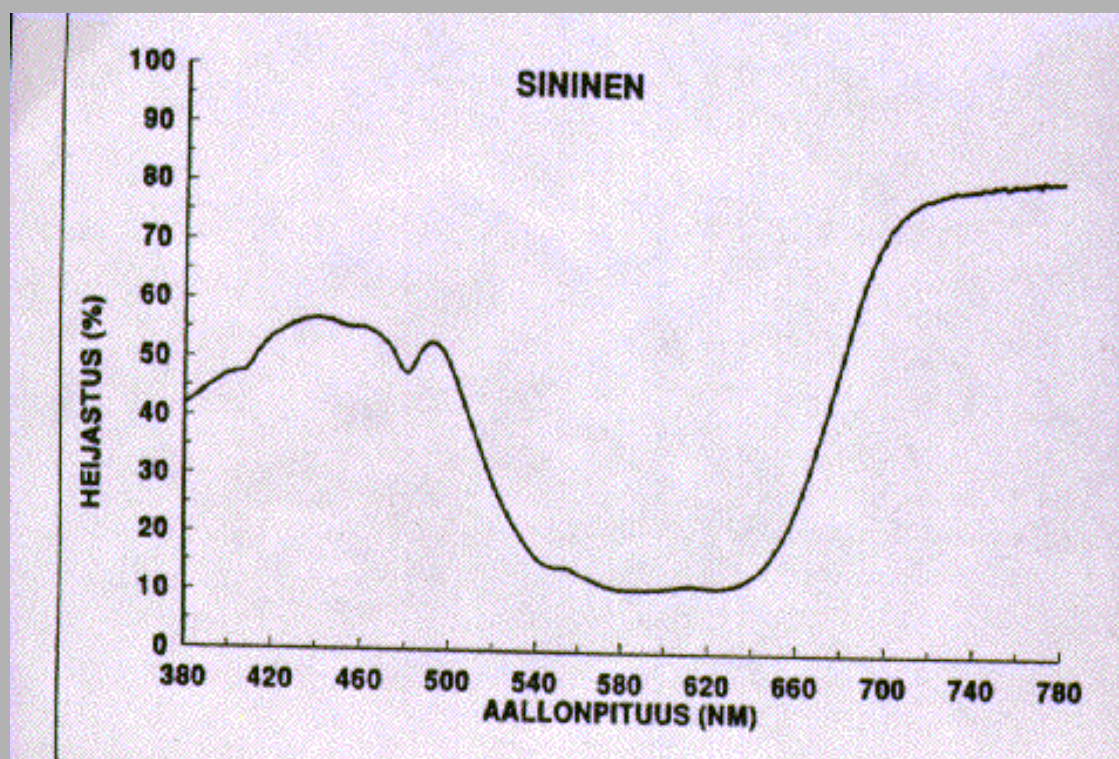




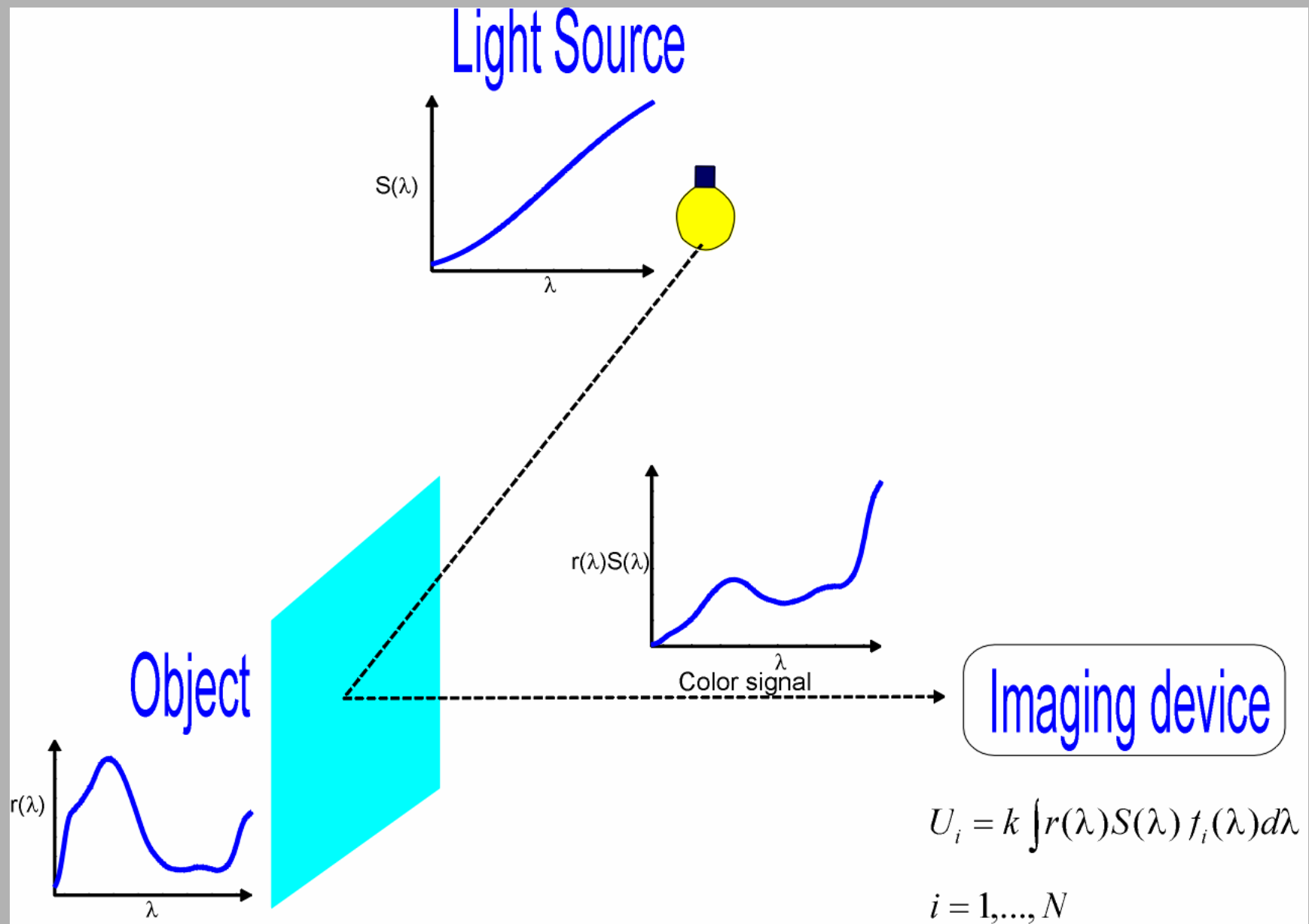


birch – green leaf





Formation of the Color Signal



gti gti graphic technology, inc.

CRD
COLOR REPRODUCTION DEMONSTRATOR

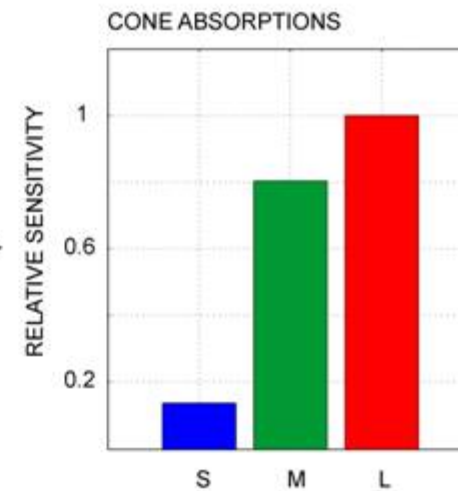
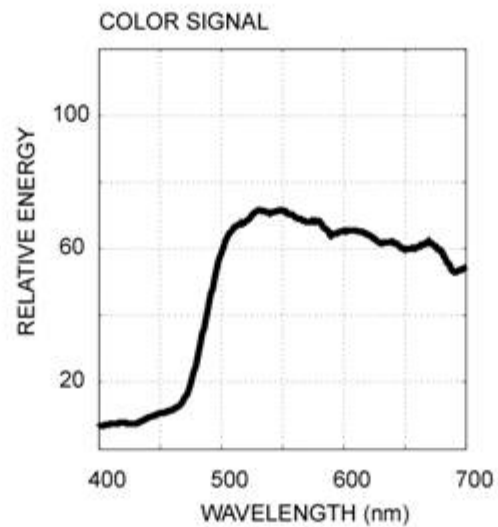
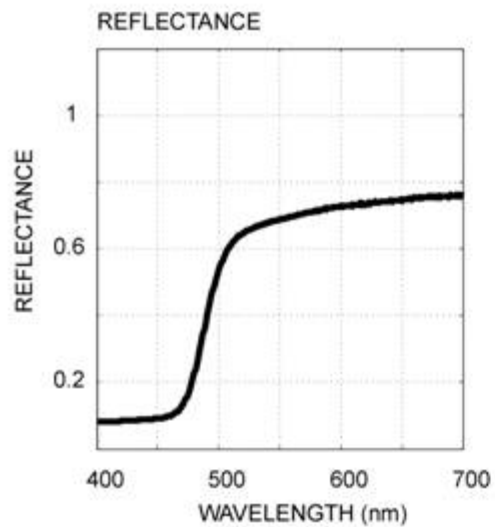
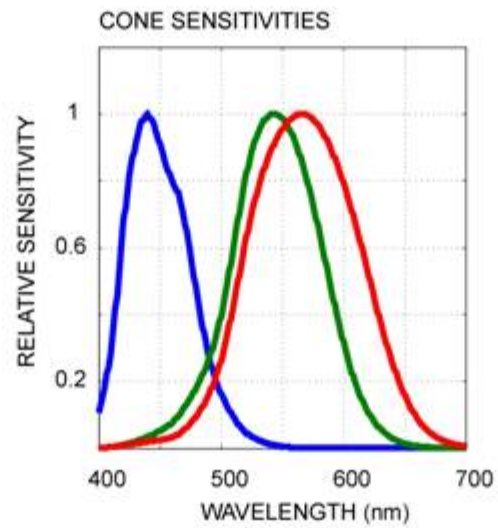
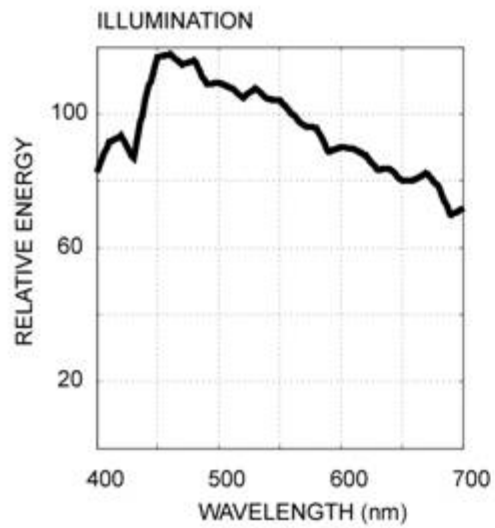
STORE LIGHT

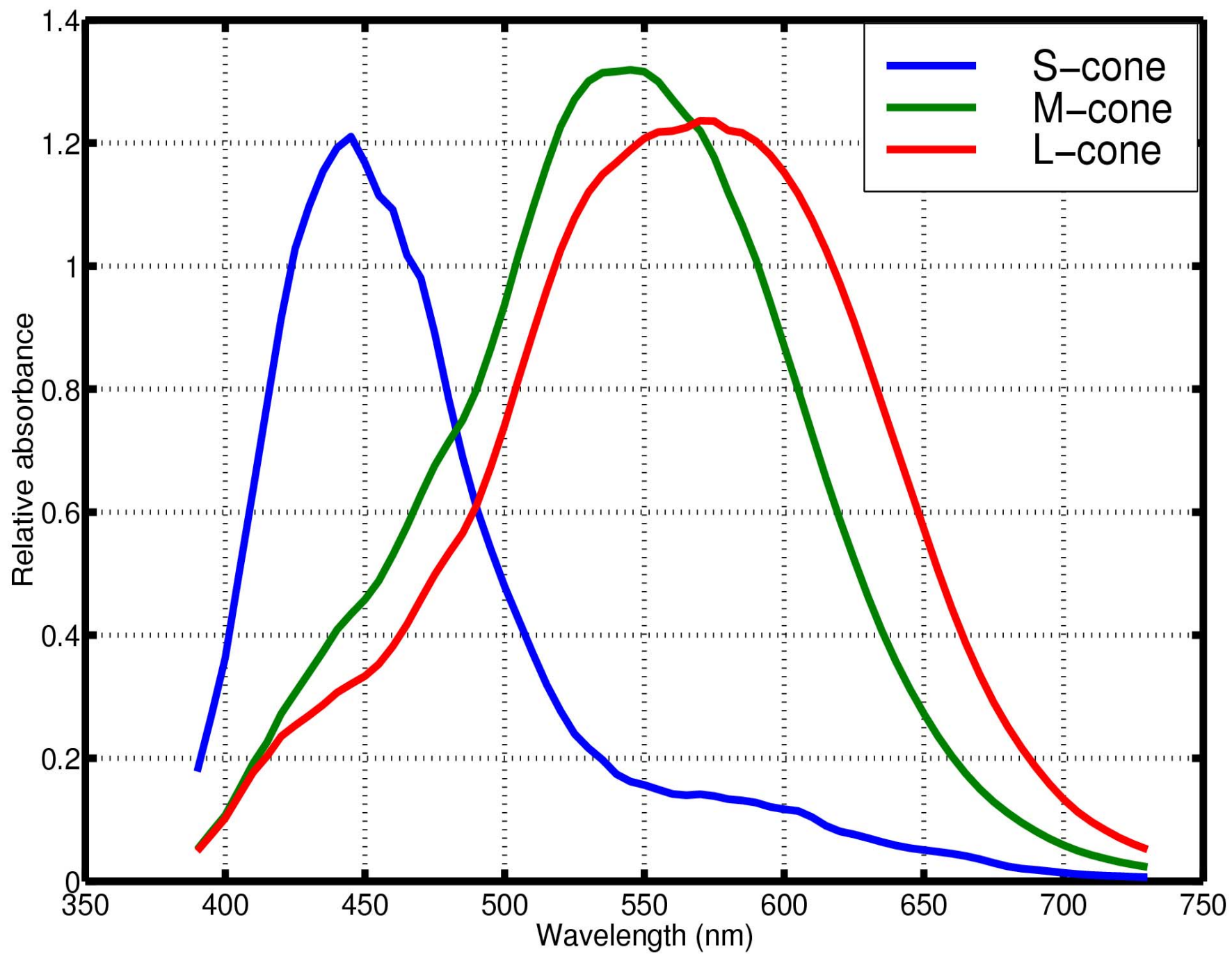
DAYLIGHT

HOME LIGHT

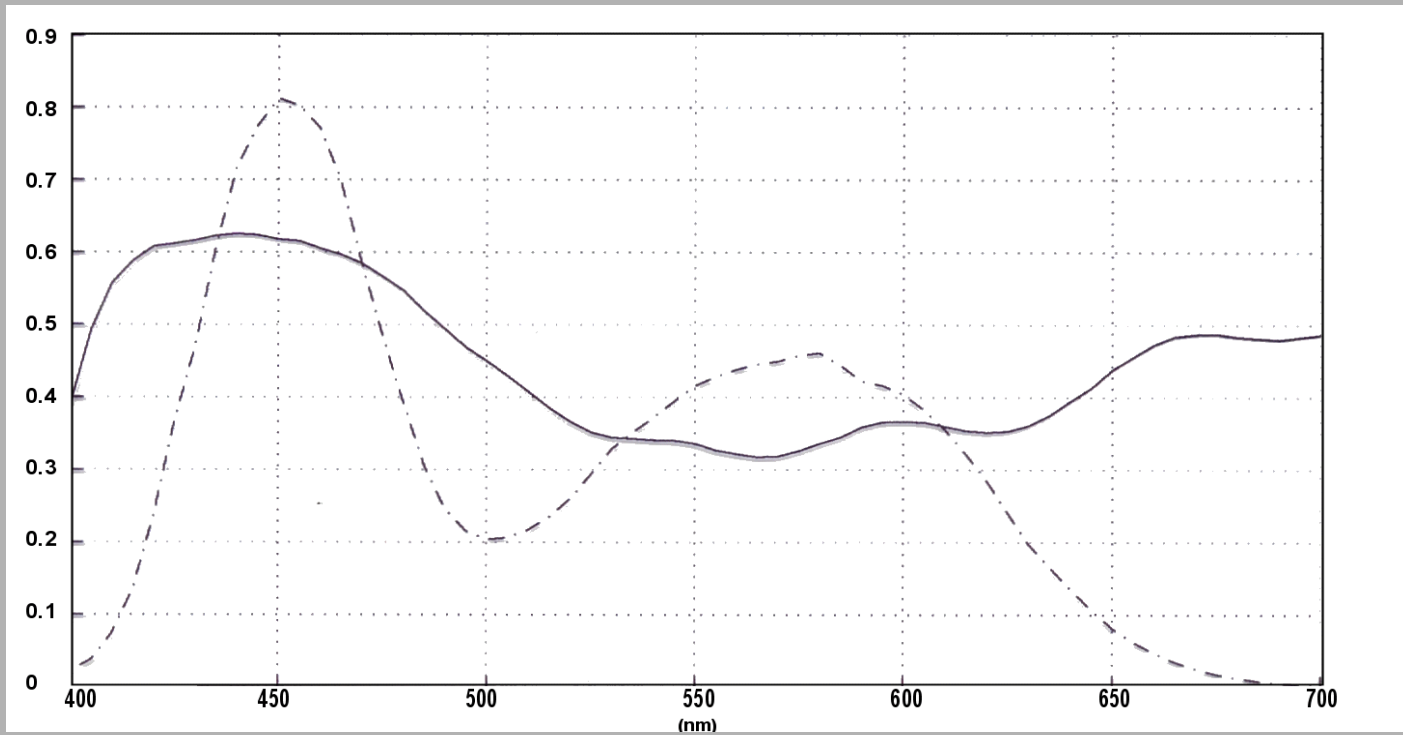








Metamerism



L* 66.90
a* 11.94
b* -24.60



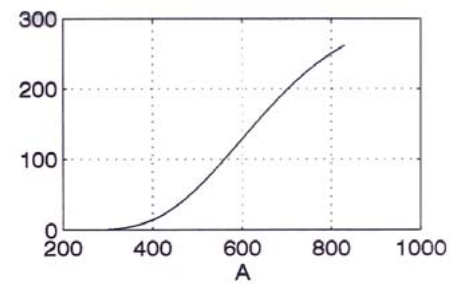
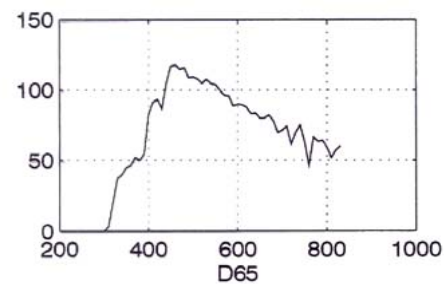
L* 66.90
a* 11.94
b* -24.60



L* 66.37
a* 5.27
b* -24.16



L* 66.51
a* -5.80
b* -22.84



Examination of metameric ink

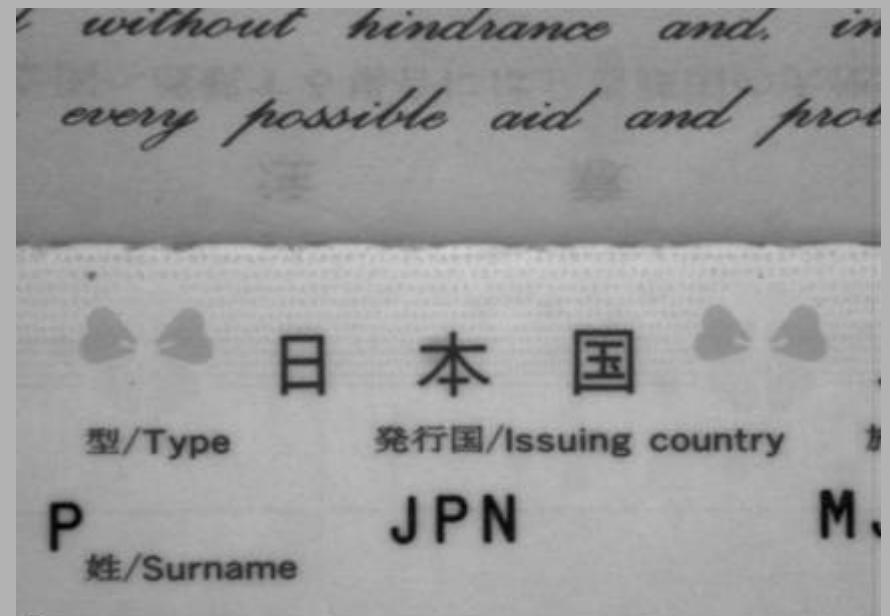
Courtesy by Yoichi Miyake

Passport of Japan (Personal page)

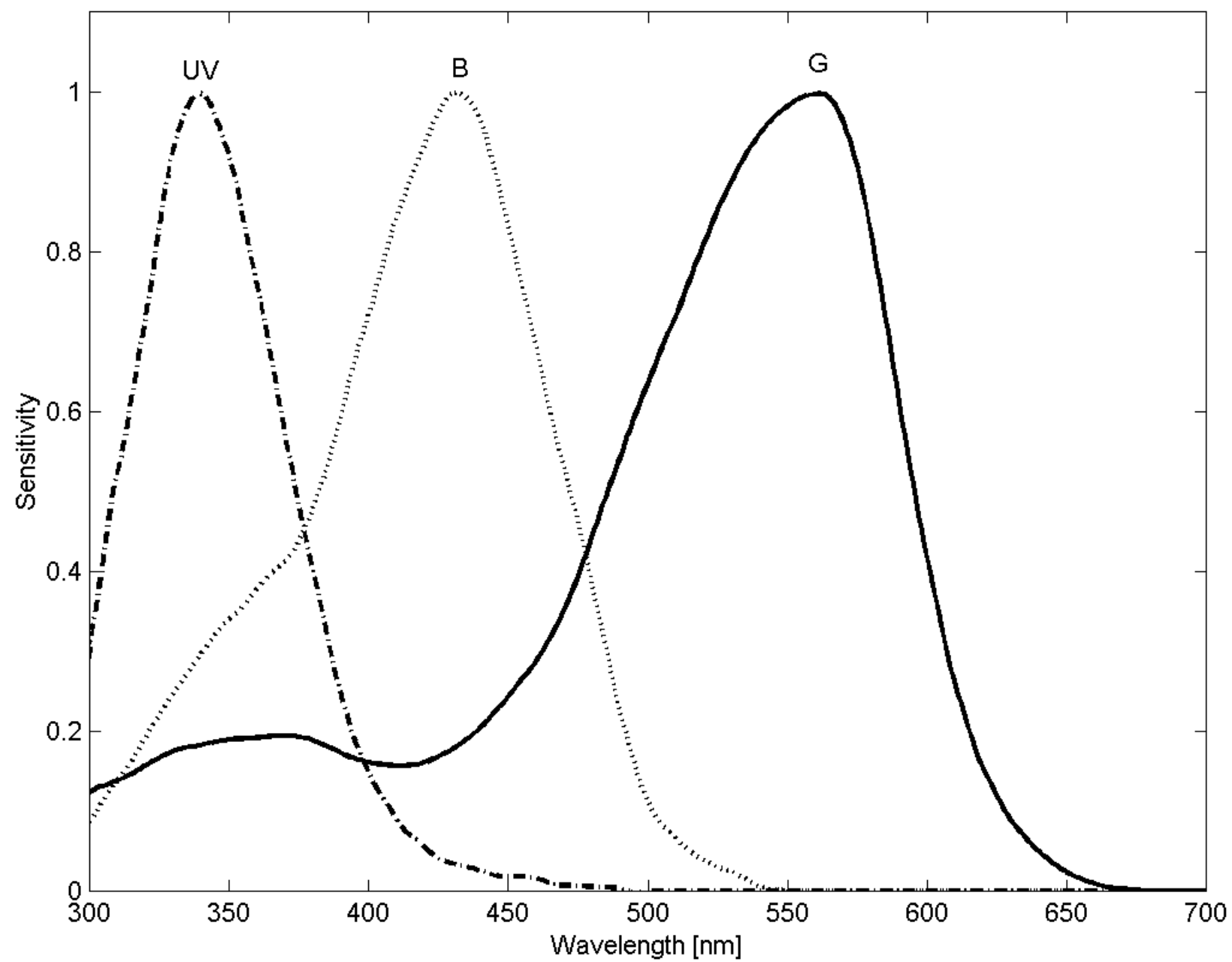
Color image



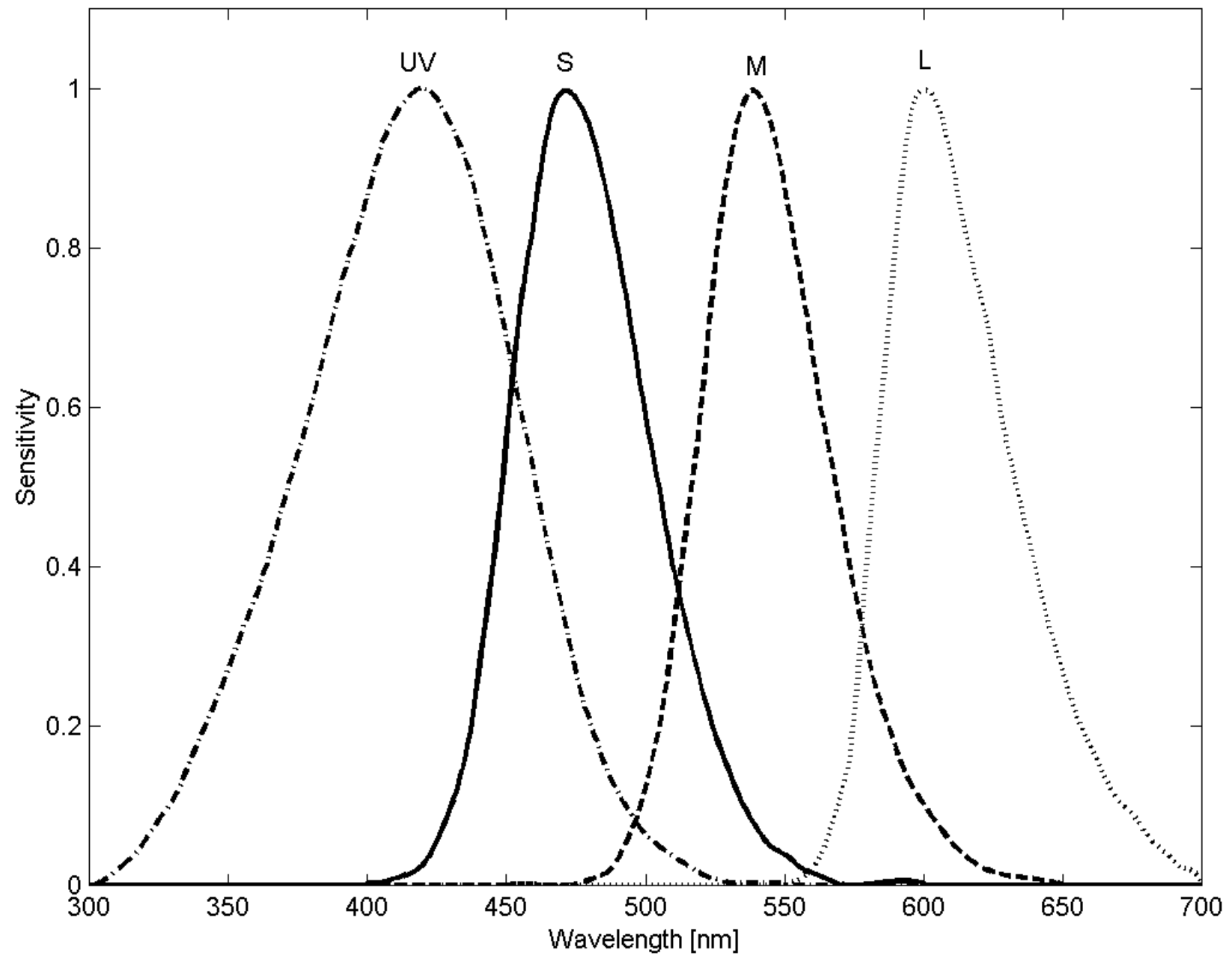
With long pass filter
>645nm



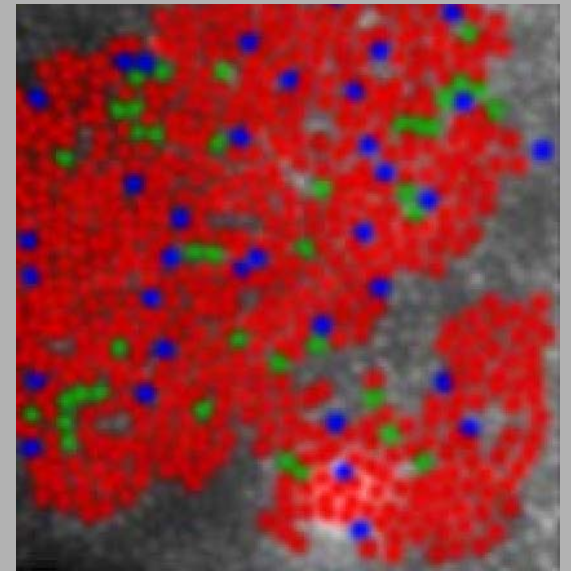
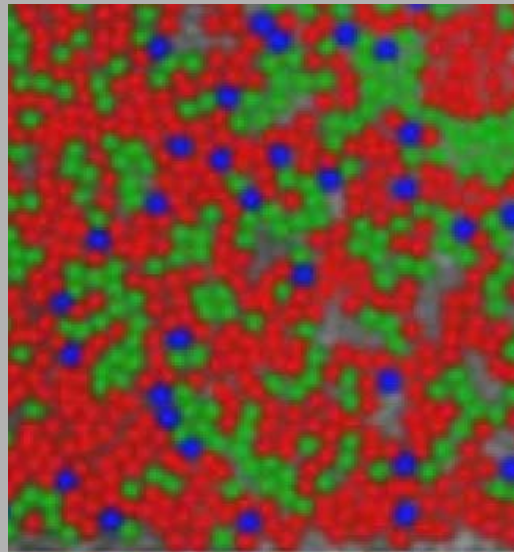
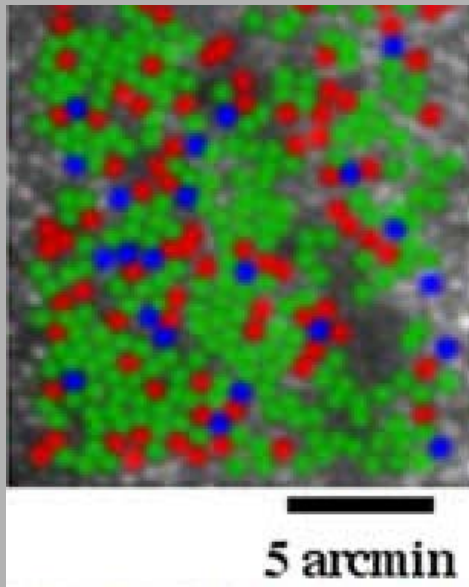
Spectral sensitivities of honeybee



Spectral sensitivities of chicken



Distribution of Cone Cells in Human Eye



Reference: Hofer *et al.*, Organization of the Human Trichromatic Cone Mosaic. J. Neurosci. (2005)