SNS COLLEGE OF TECHNOLOGY
(AN AUTONOMOUS INSTITUTION)

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Department of Biomedical Engineering

Course Name: 19BMB304 & Biomedical Image Processing

III Year : VI Semester

Unit I –DIGITAL IMAGE FUNDAMENTALS

Topic : Color Models

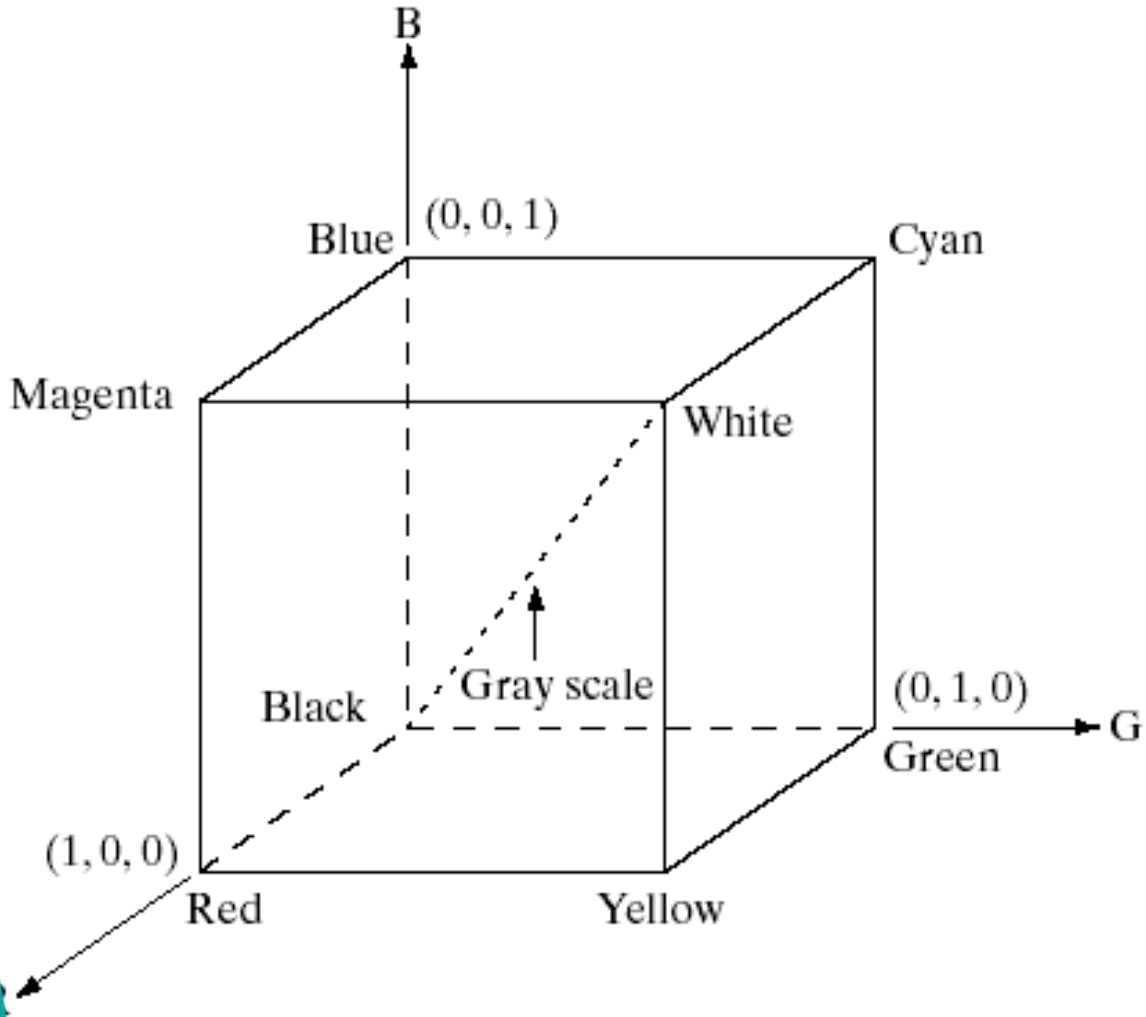
Color models

- Color model, color space, color system
  - Specify colors in a standard way
  - A coordinate system that each color is represented by a single point
- RGB model
- CYM model
- CYMK model
- HSI model

Suitable for hardware or applications

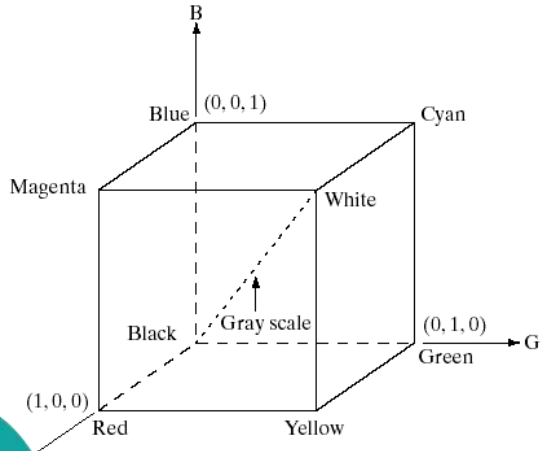
- match the human description

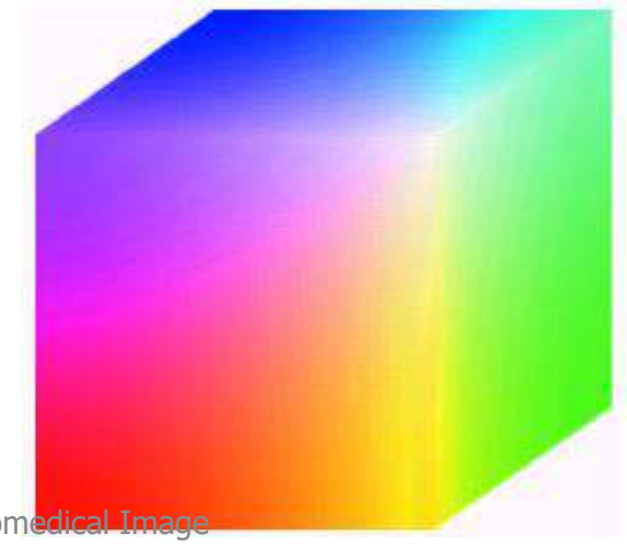
RGB color model



Pixel depth

- Pixel depth: the number of bits used to represent each pixel in RGB space
- Full-color image: 24-bit RGB color image
  - (R, G, B) = (8 bits, 8 bits, 8 bits)





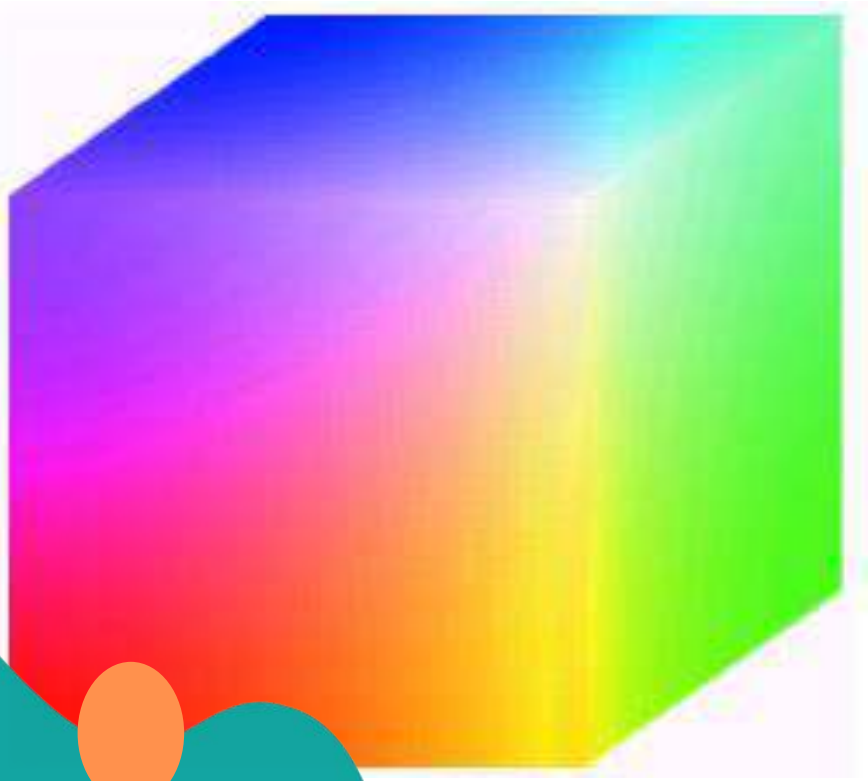
Safe RGB colors

- Subset of colors is enough for some application
- Safe RGB colors (safe Web colors, safe browser colors)

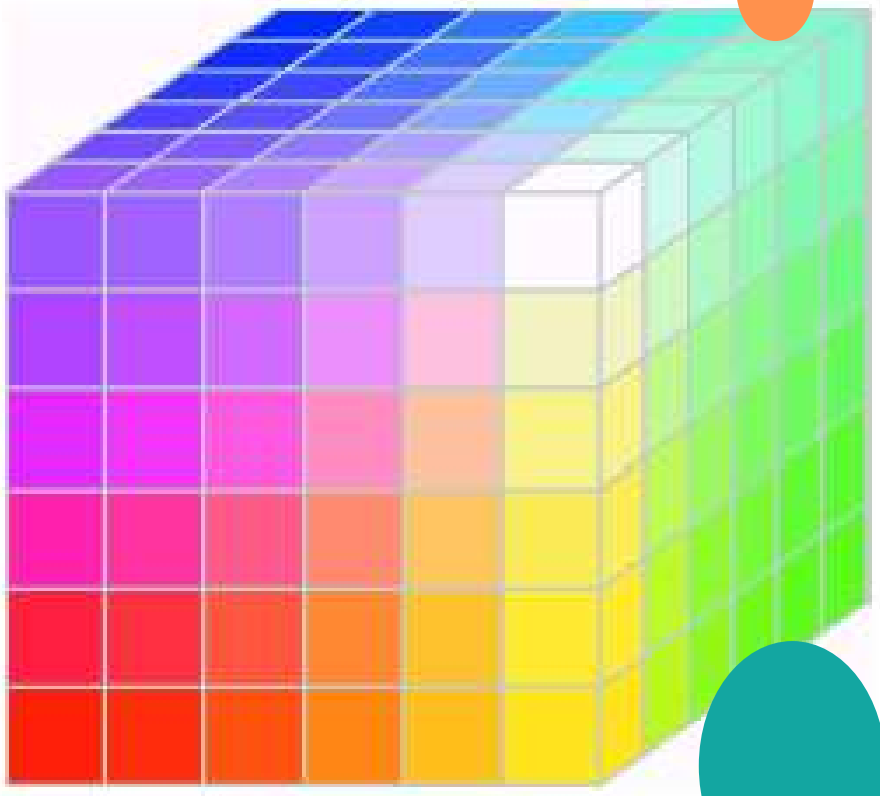
Number System	Color Equivalents					
Hex	00	33	66	99	CC	FF
Decimal	0	51	102	153	204	255

TABLE 6.1
Valid values of each RGB component in a safe color.

Safe RGB color (cont.)



Full color cube

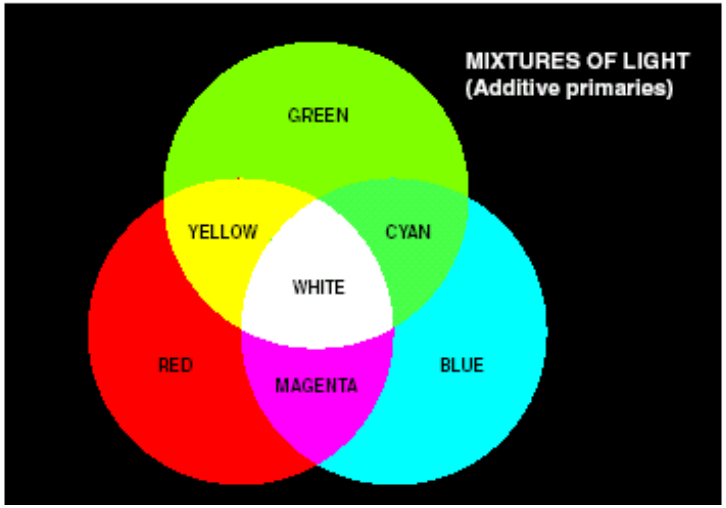


Safe color cube

CMY model (+Black = CMYK)

- CMY: secondary colors of light, or primary colors of pigments
- Used to generate hardcopy output

$$\begin{bmatrix} C \\ M \\ Y \end{bmatrix} = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix} - \begin{bmatrix} R \\ G \\ B \end{bmatrix}$$



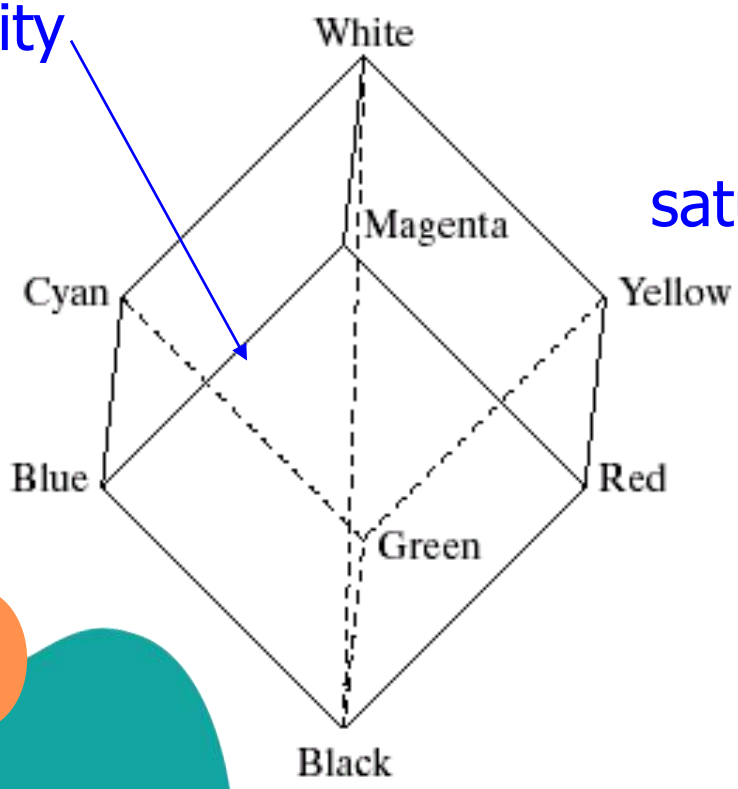
HSI color model

- Will you describe a color using its R, G, B components?
- Human describe a color by its hue, saturation, and brightness
  - Hue: color attribute
  - Saturation: purity of color (white->0, primary color->1)
  - Brightness: achromatic notion of intensity

HSI color model (cont.)

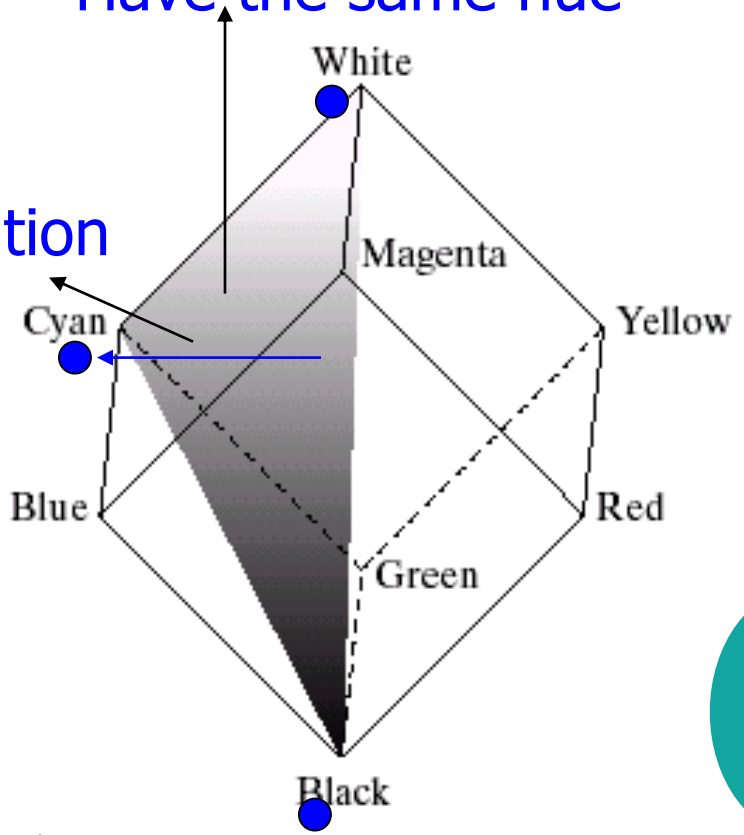
- RGB -> HSI model

Intensity line

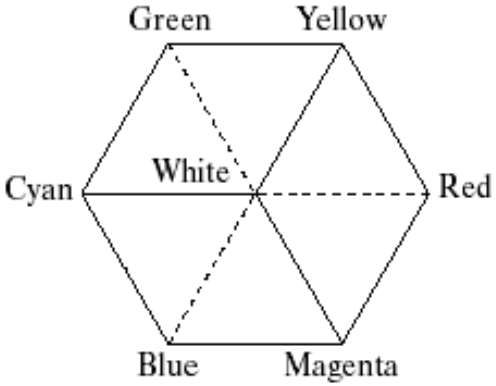


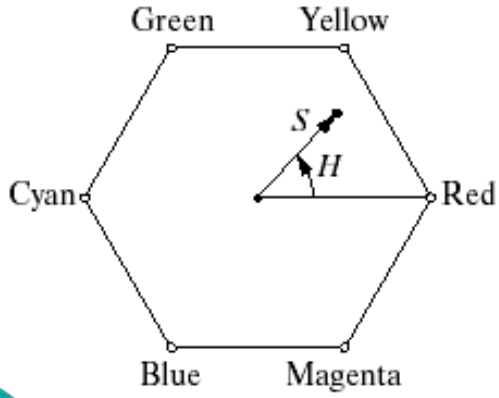
Colors on this triangle
Have the same hue

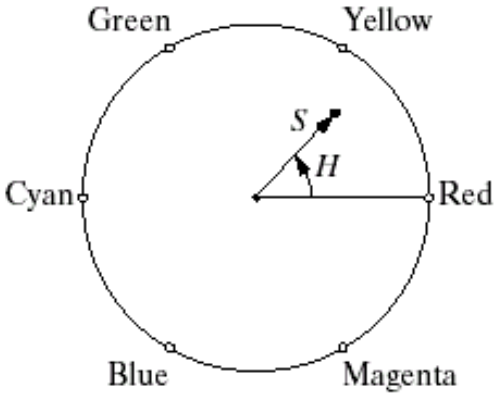
saturation

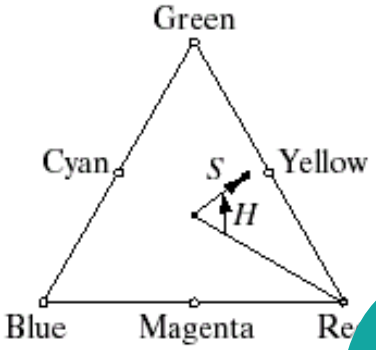


HSI model: hue and saturation

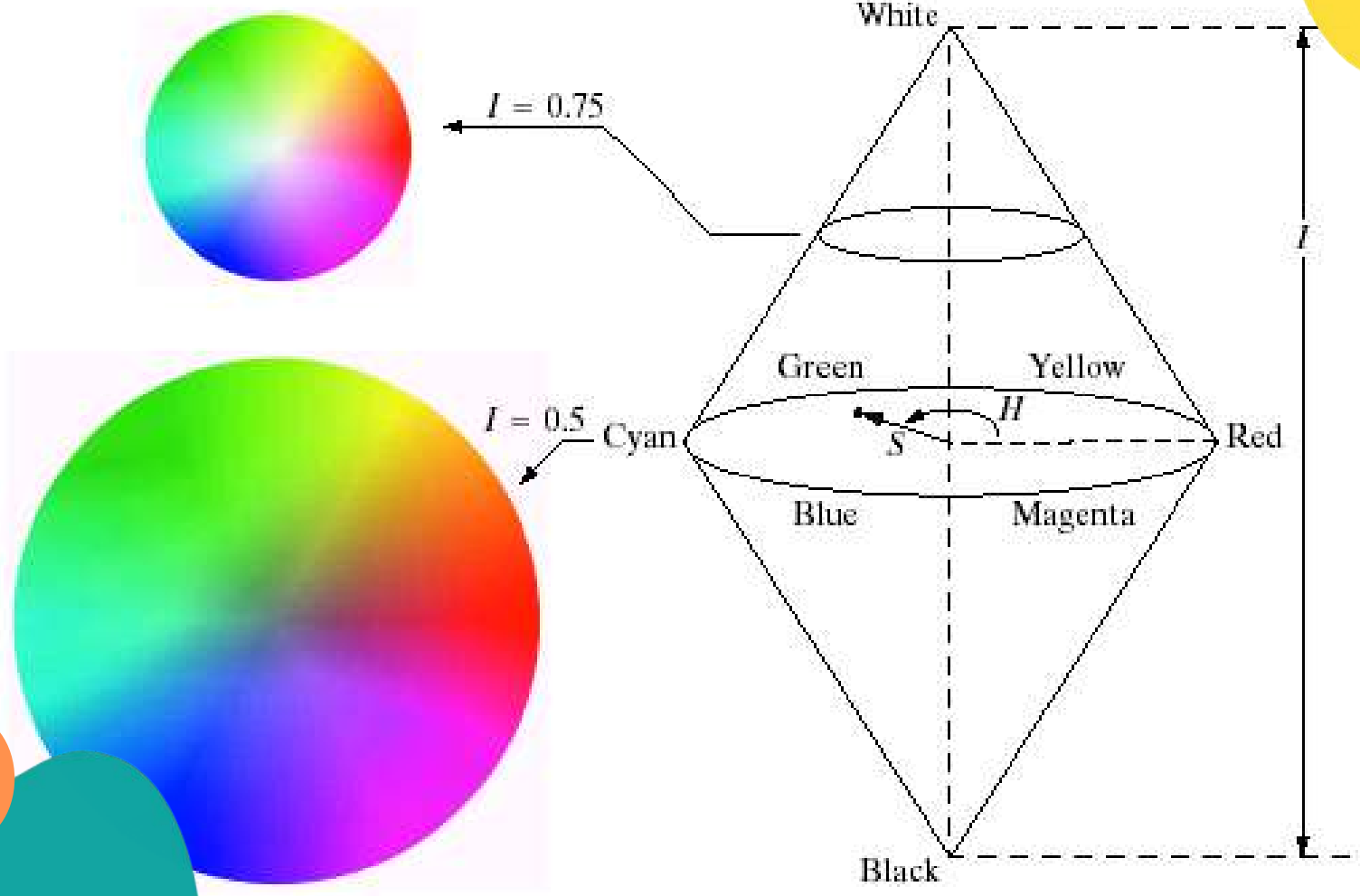






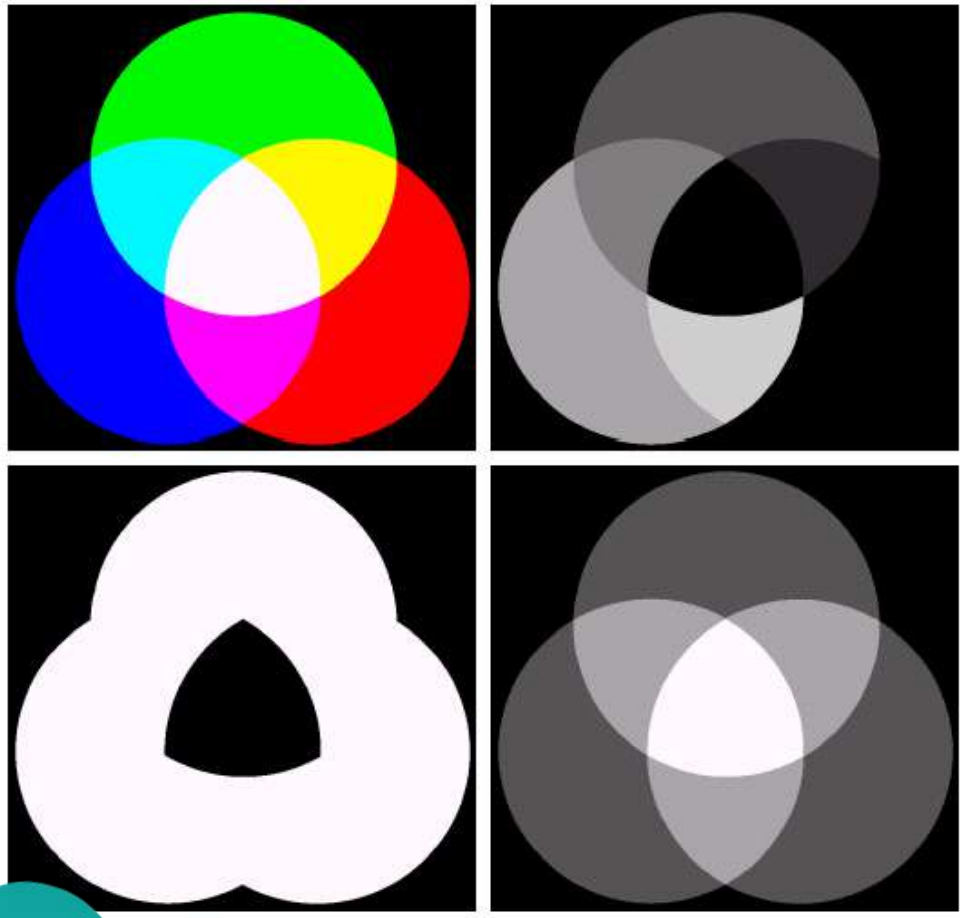


HSI model



HSI component images

R,G,B



Hue

saturation

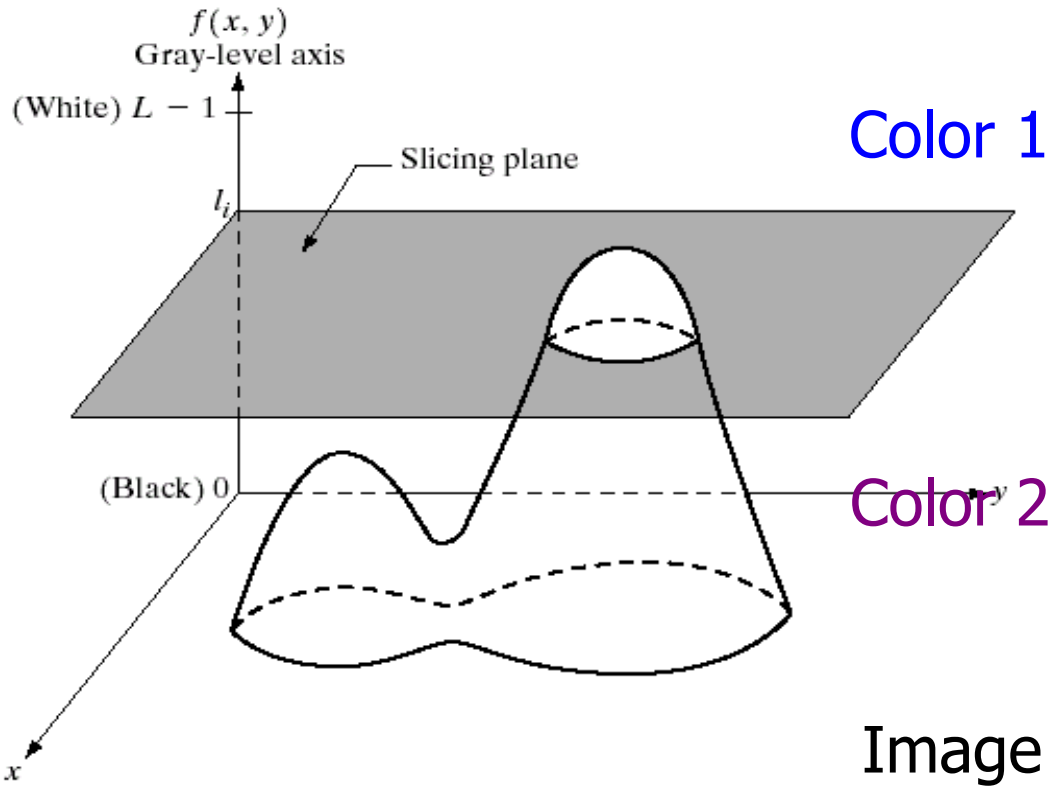
intensity

Pseudo-color image processing

- Assign colors to gray values based on a specified criterion
- For human visualization and interpretation of gray-scale events
- Intensity slicing
- Gray level to color transformations

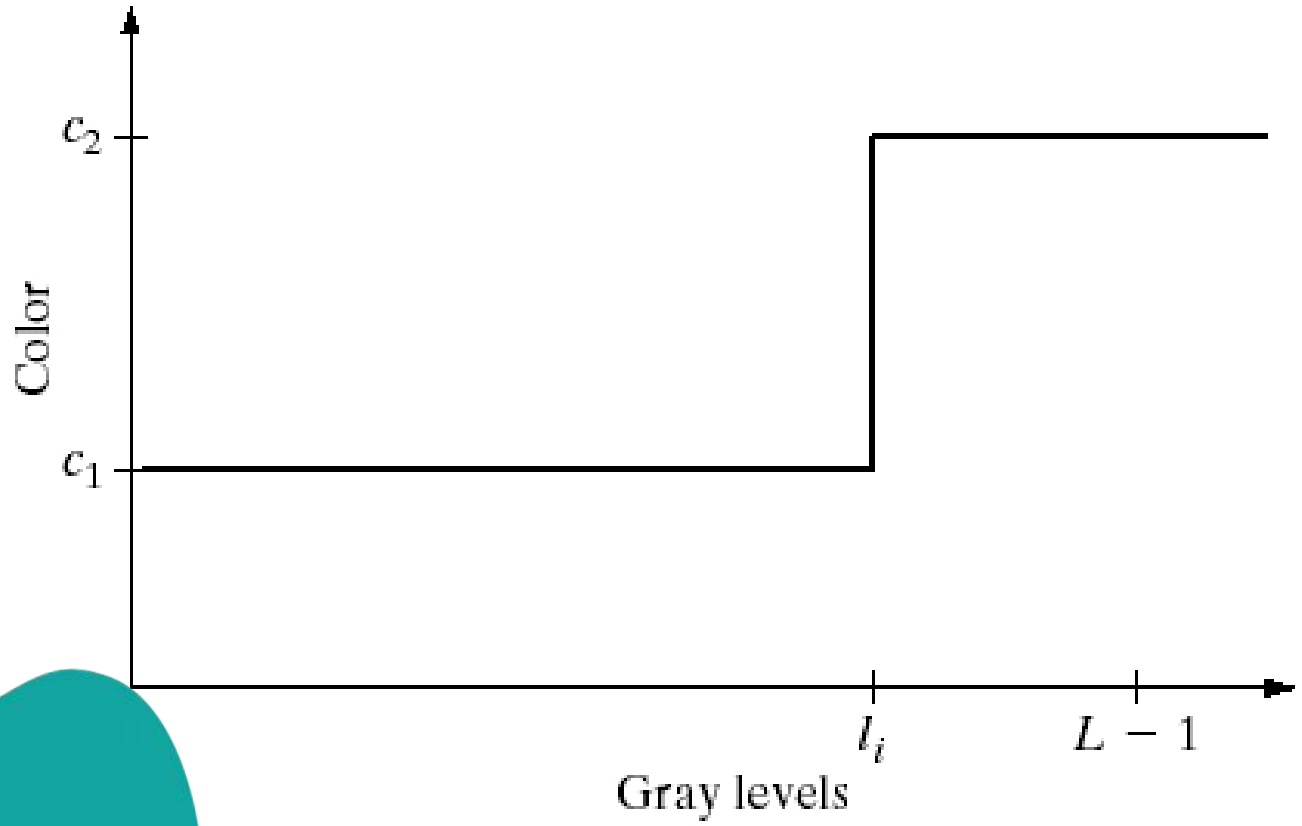
Intensity slicing

- 3-D view of intensity image



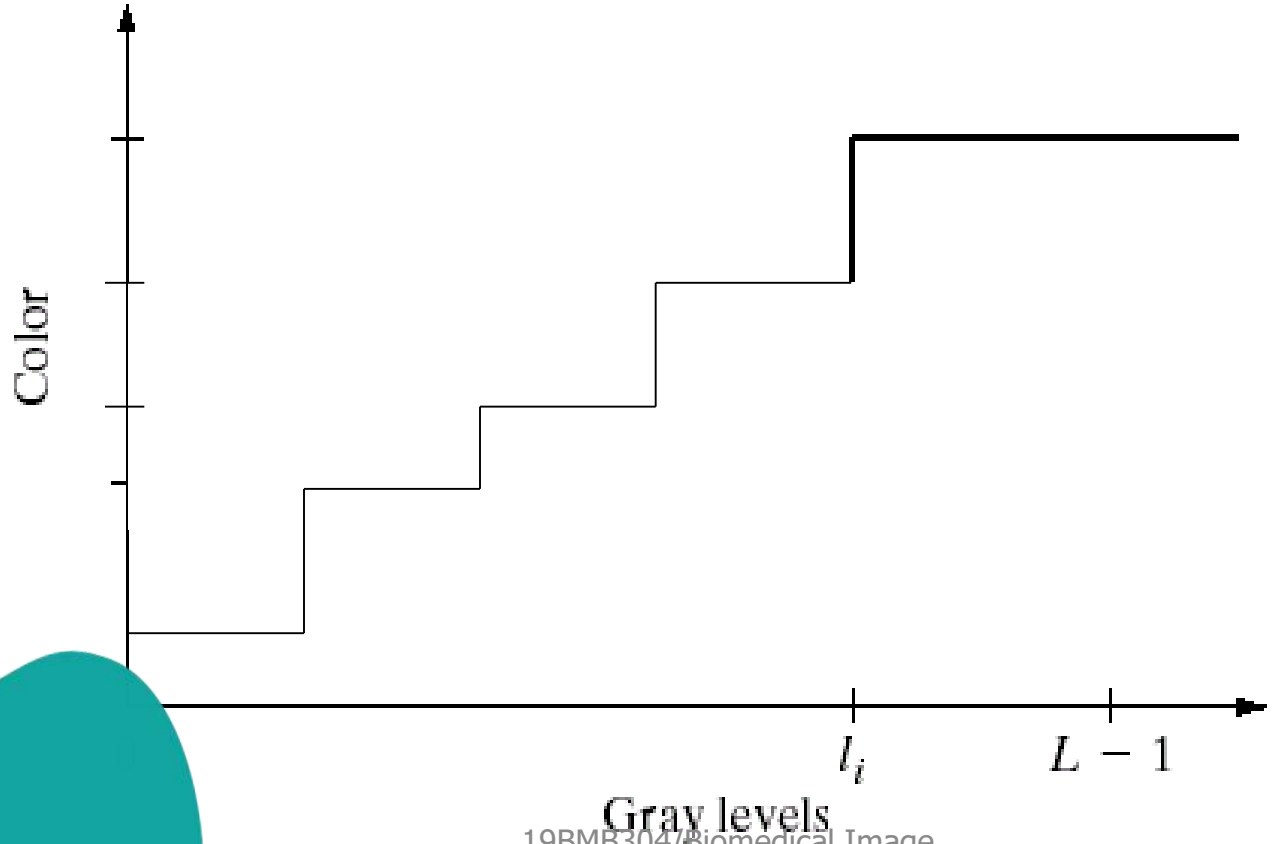
Intensity slicing (cont.)

- Alternative representation of intensity slicing

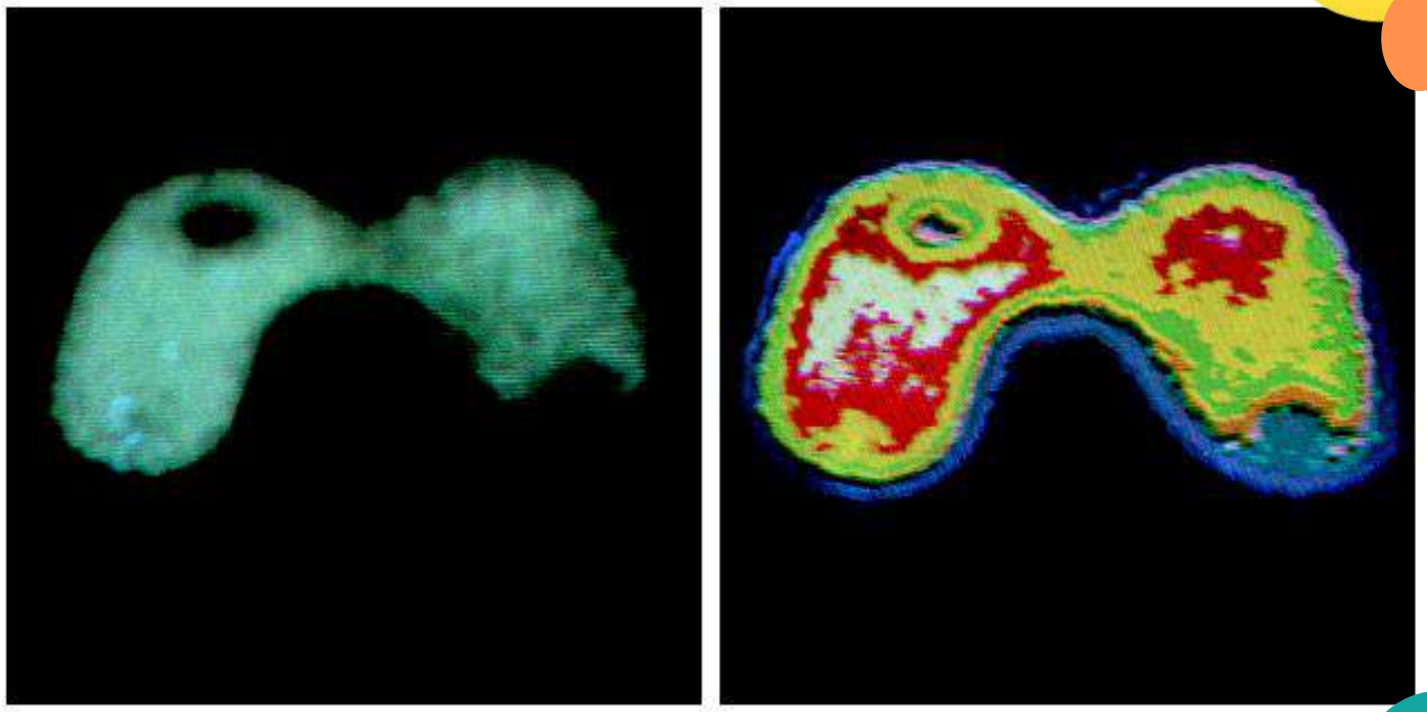


Intensity slicing (cont.)

- More slicing plane, more colors



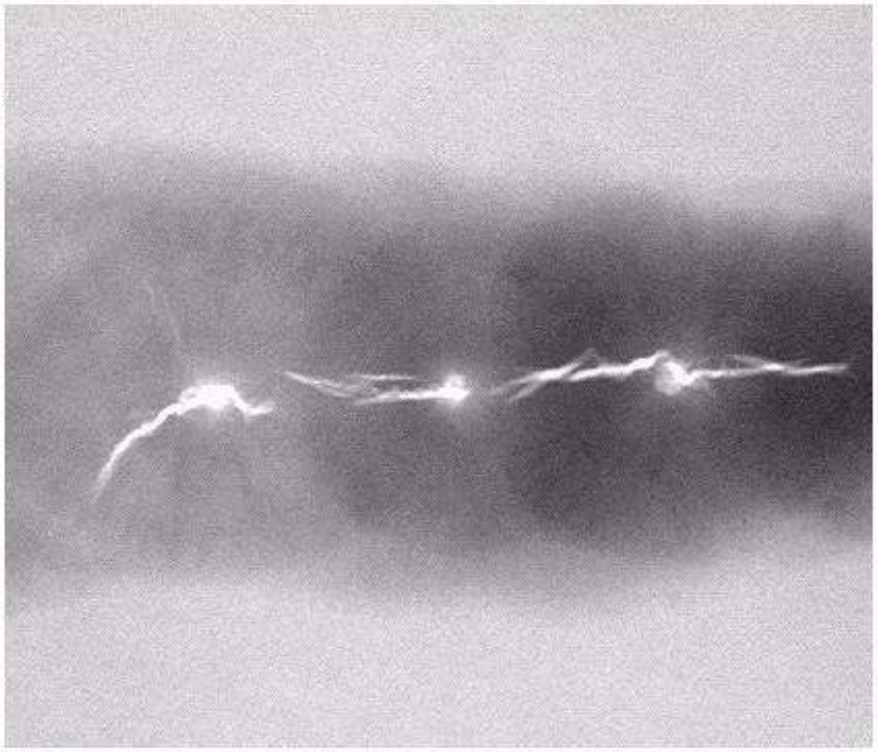
Application 1

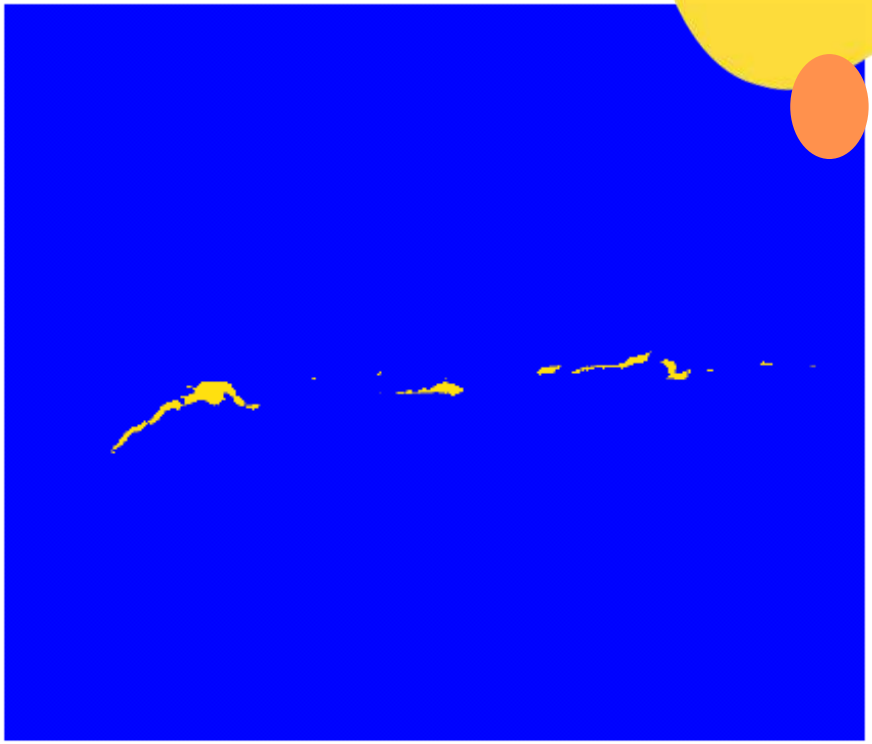


Radiation test pattern ⟶ 8 color regions

* See the gradual gray-level changes

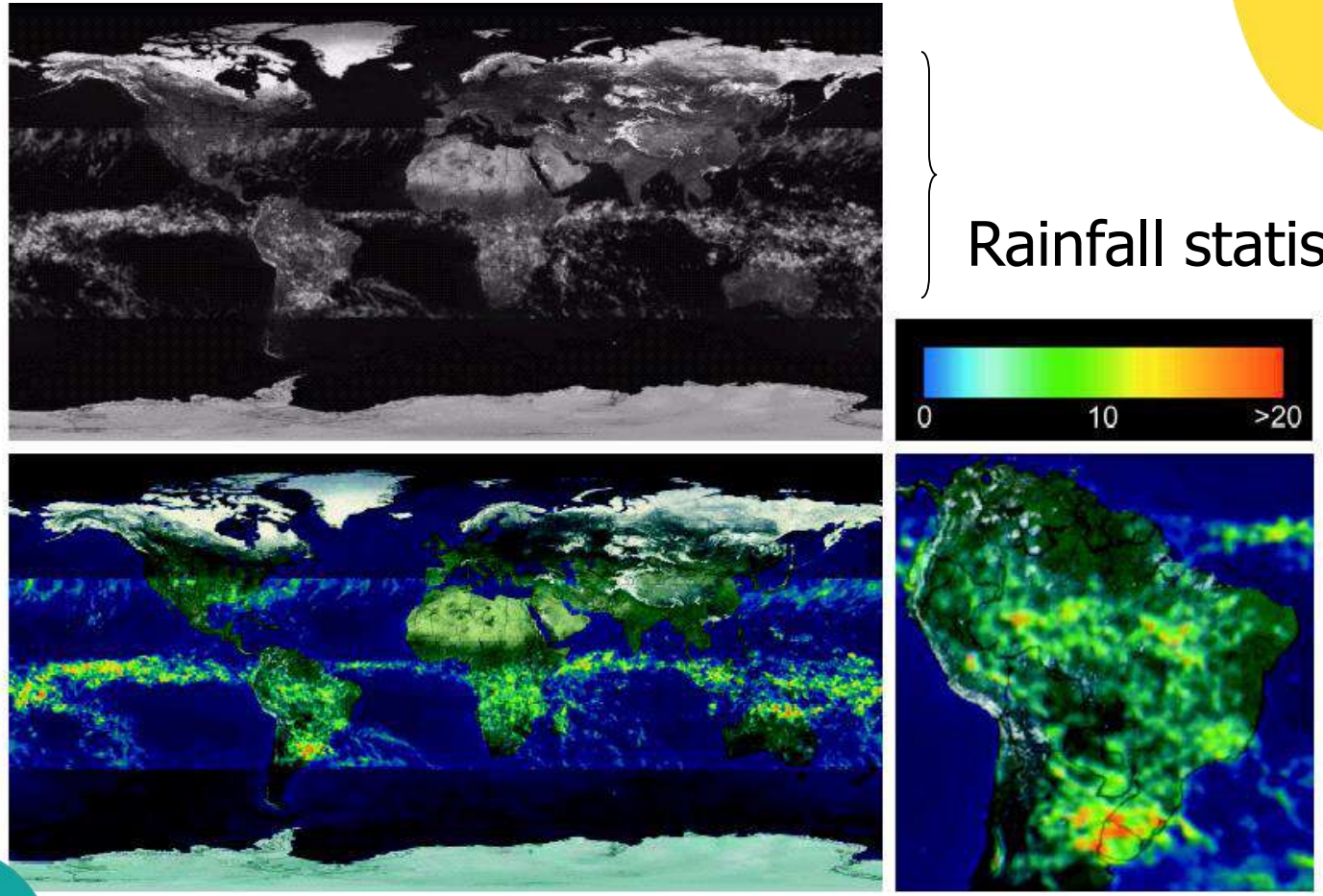
Application 2





X-ray image of a weld

Application 3



Rainfall statistics

Thank You