

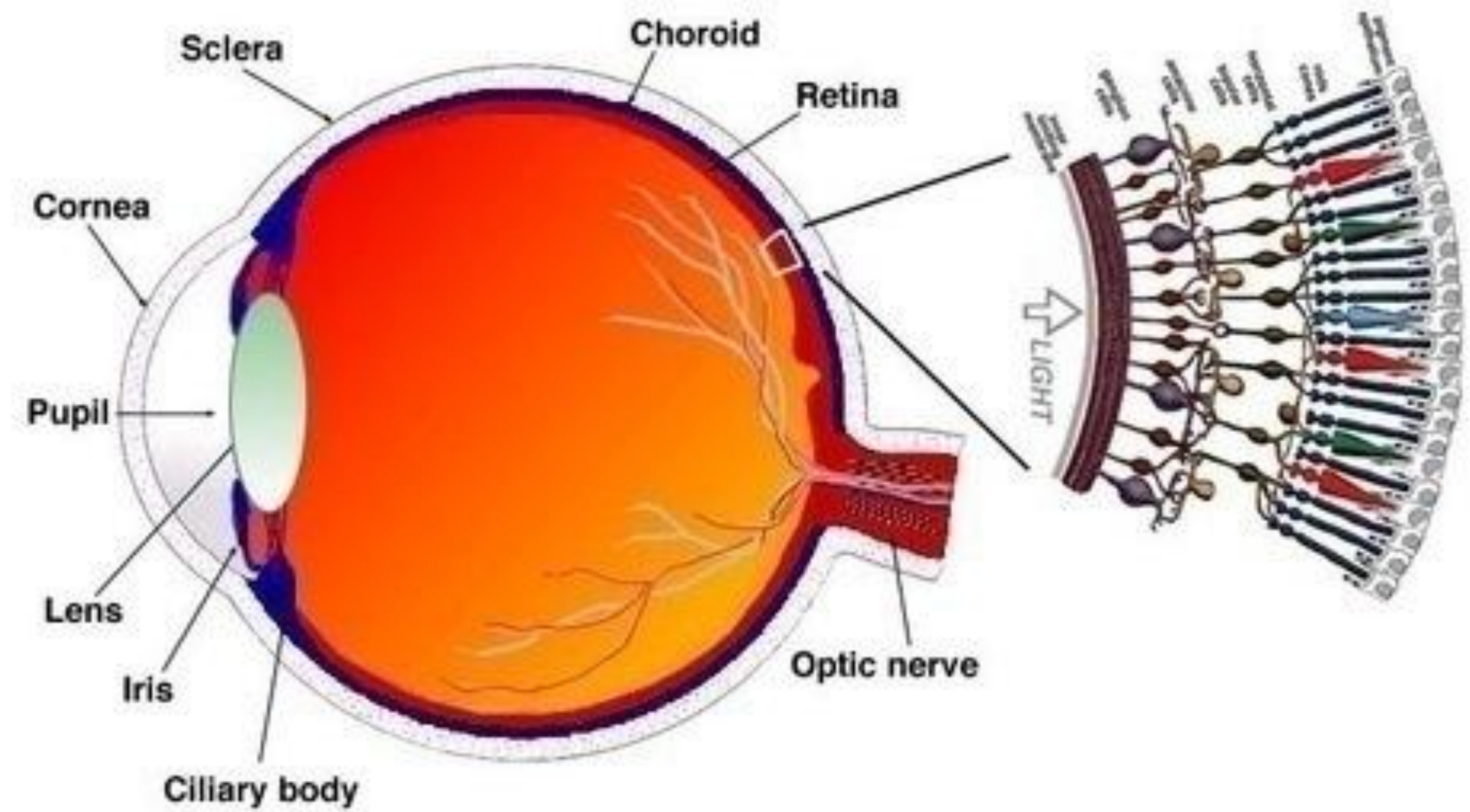
# Seeing Colours

**Image Processing & Analysis for Life Scientists**

Olivier Burri, Romain Guiet & Arne Seitz

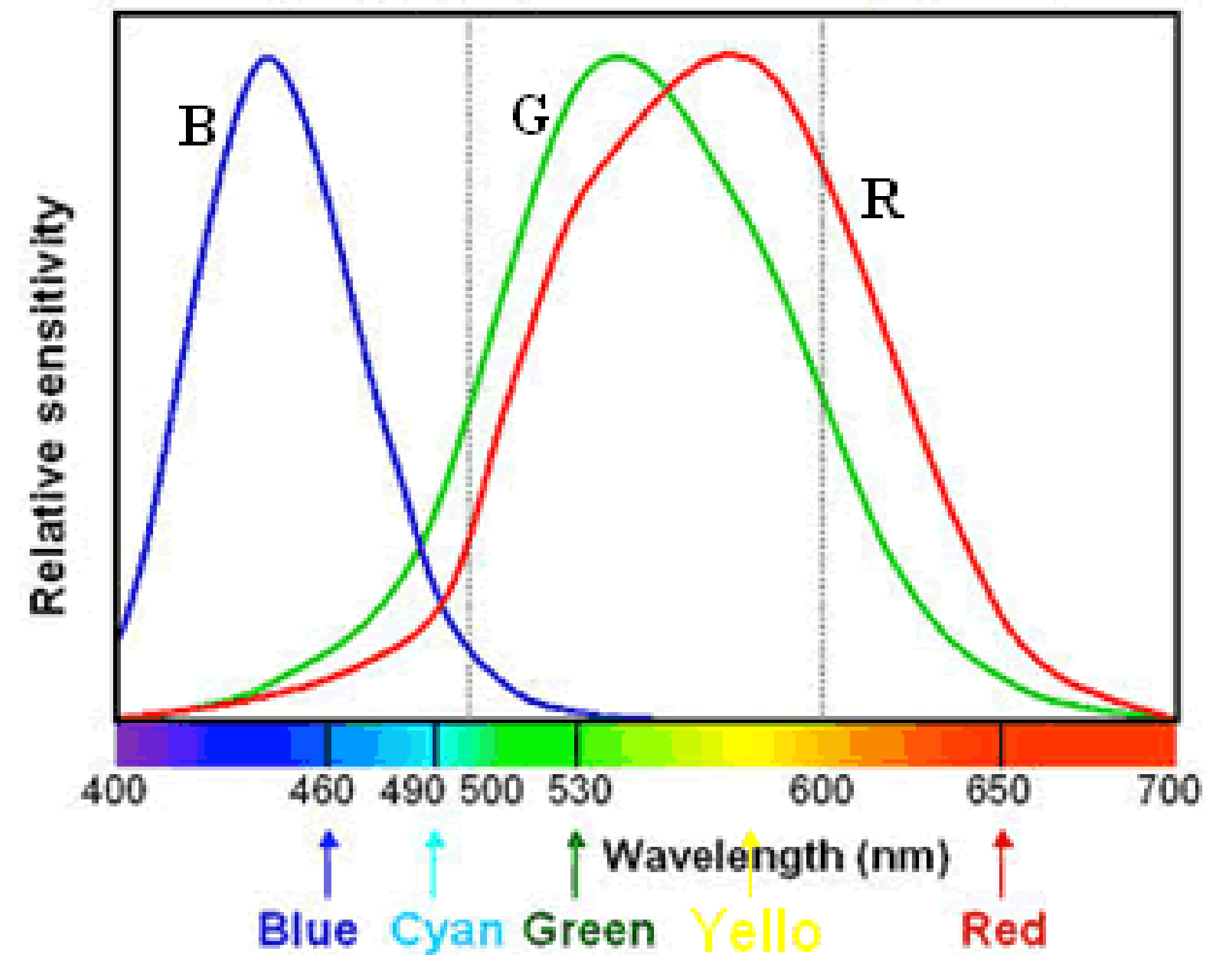
- Seeing Colours
- Colour Systems
- Look up Tables (LUT)
- LUTs in Fiji/ImageJ

# The Human Eye



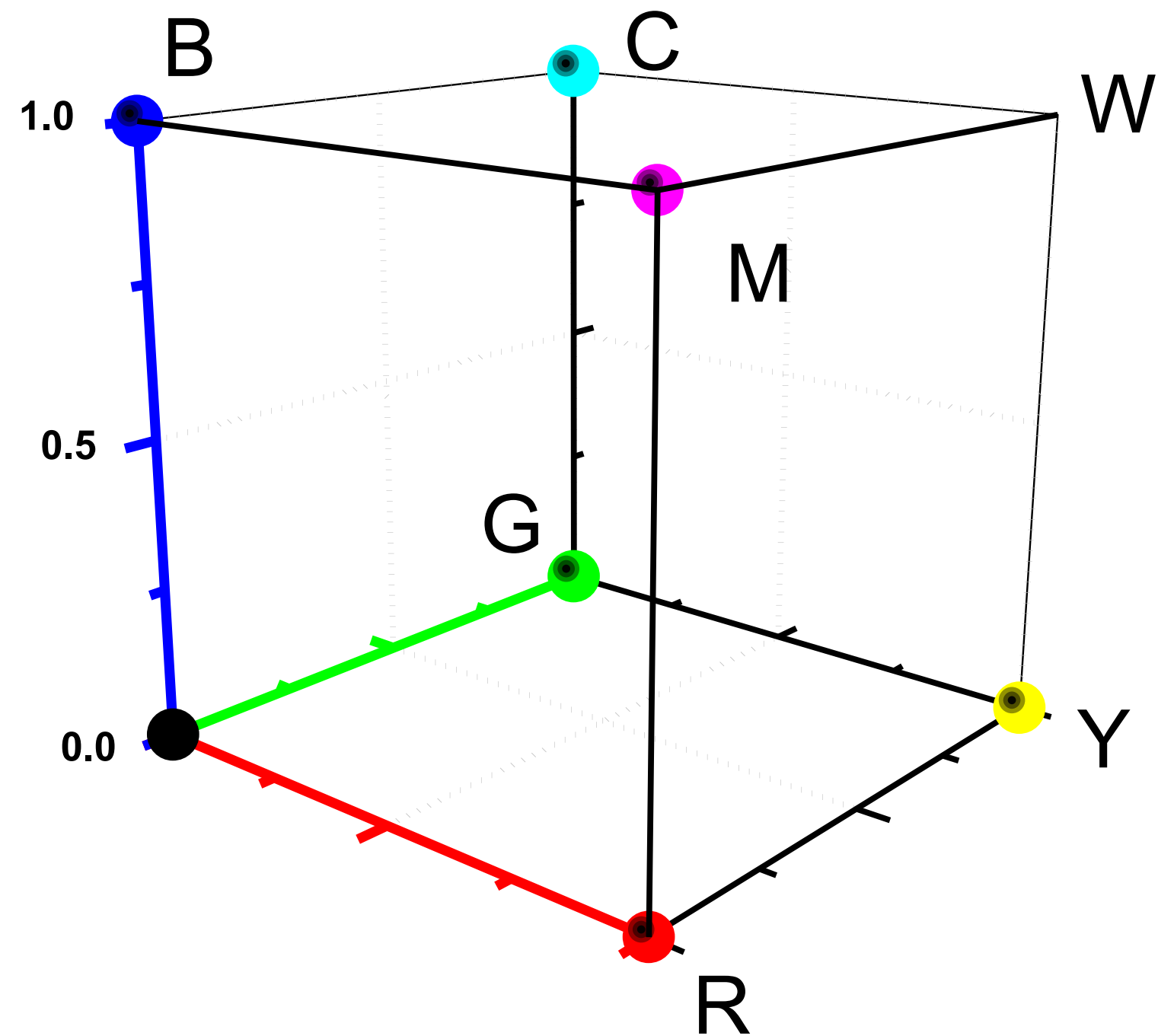
# Seeing Colors

Human spectral sensitivity to color

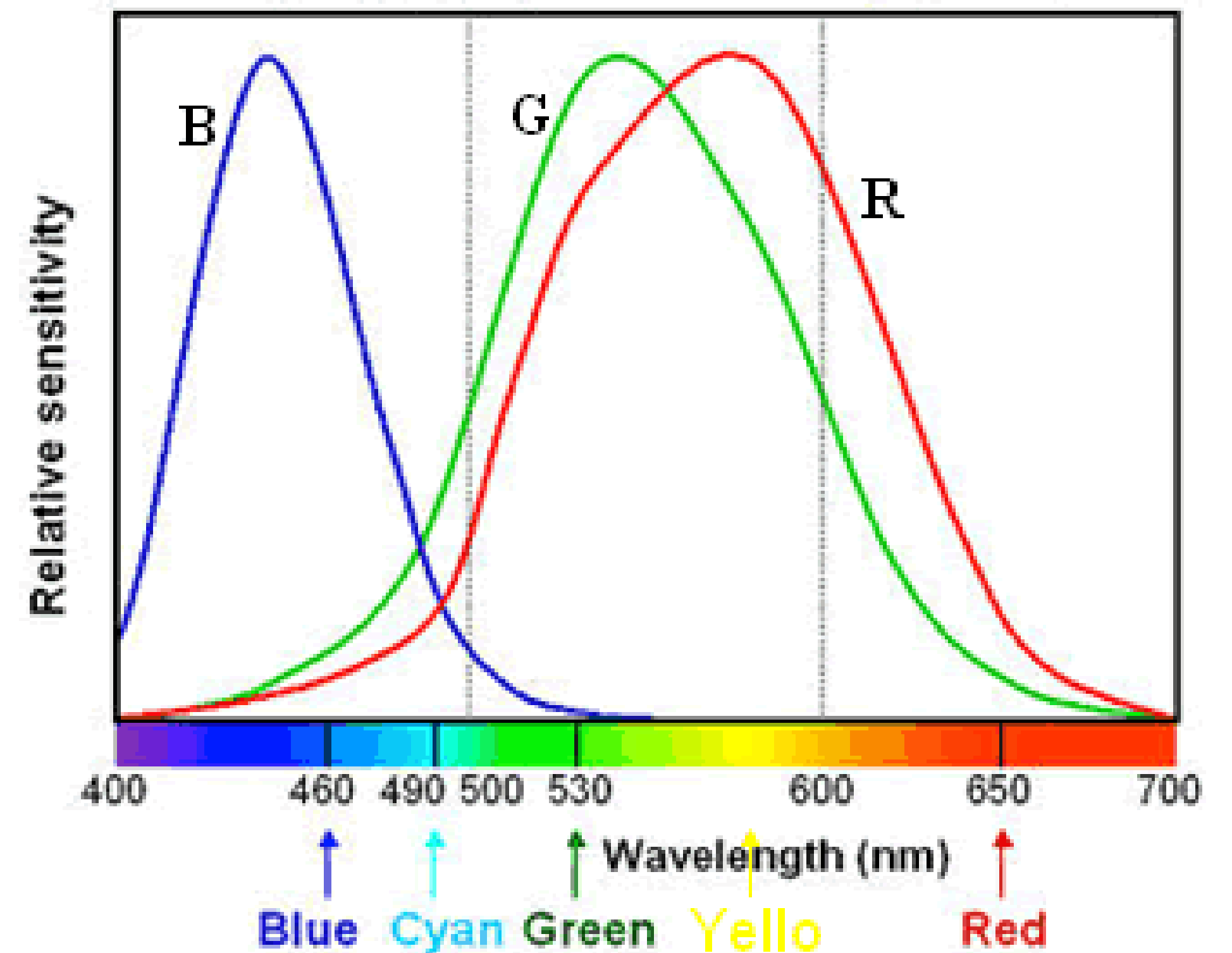


# Seeing Colors

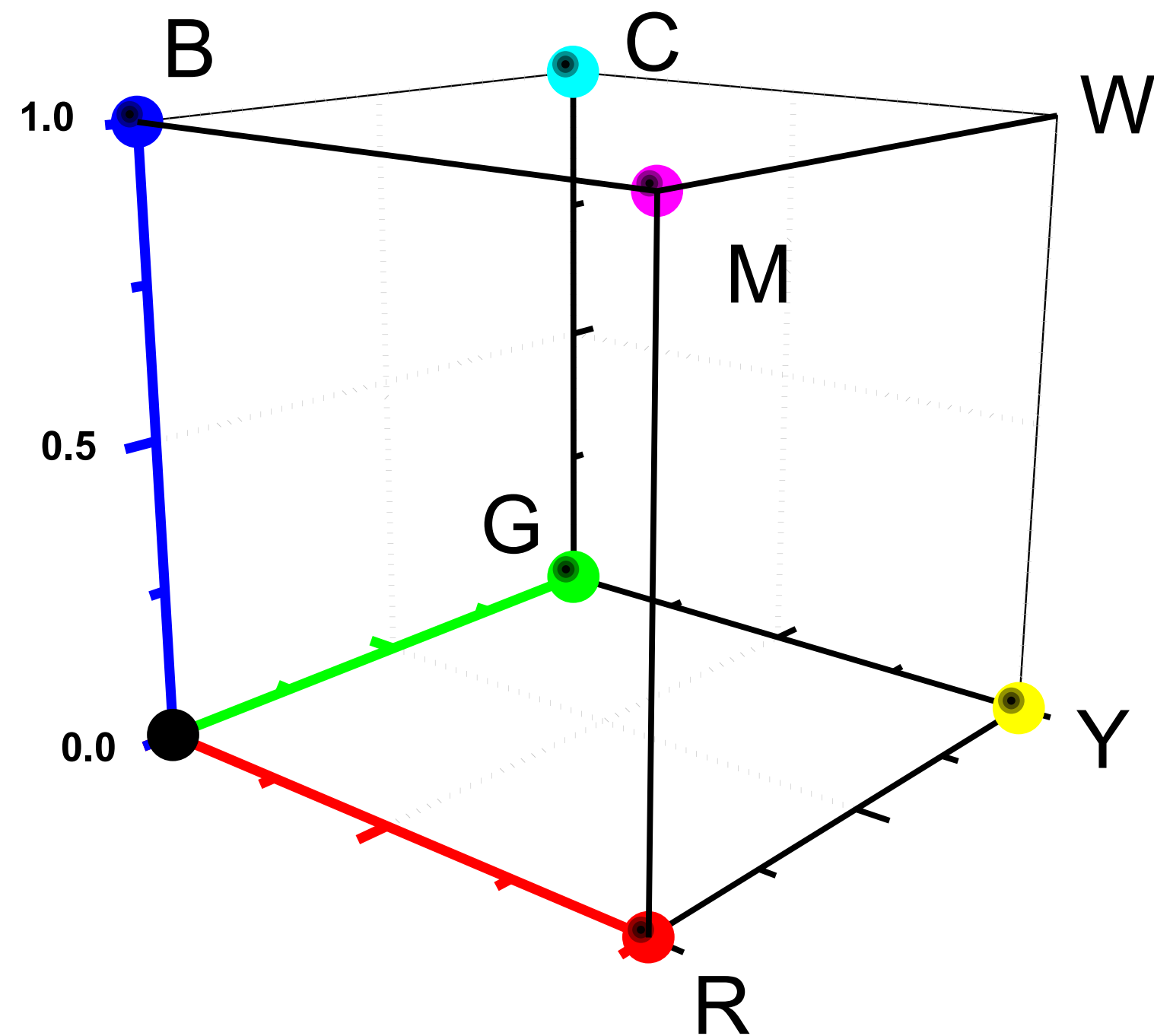
## RGB color space



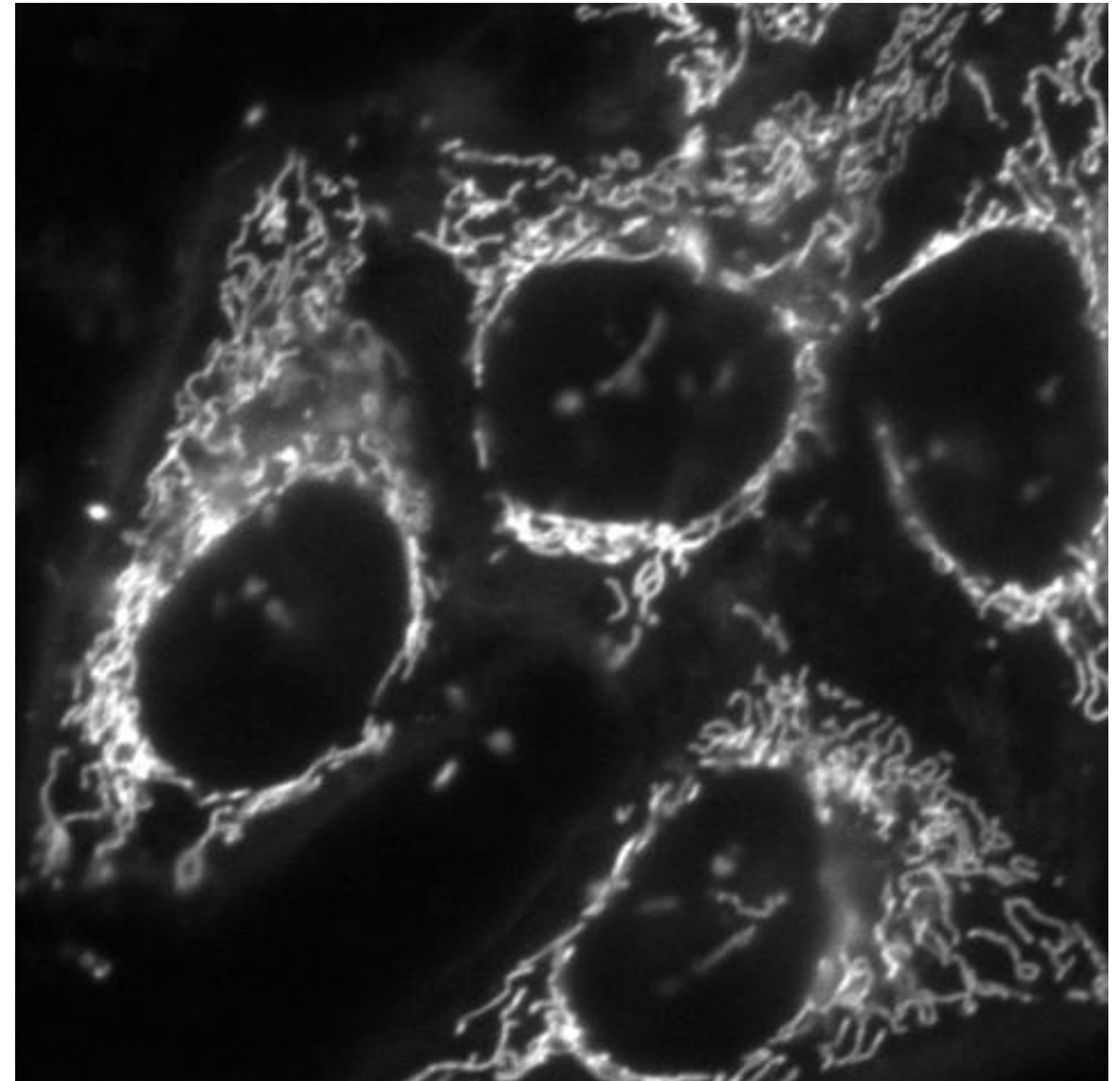
## Human spectral sensitivity to color



RGB color space

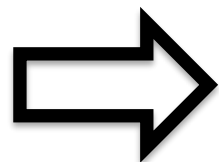
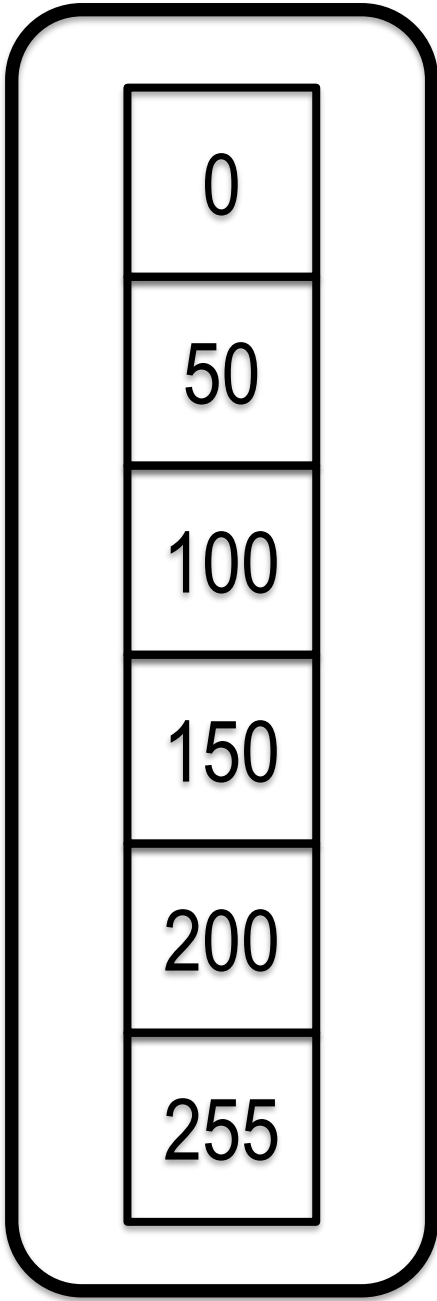


# Data and its Display

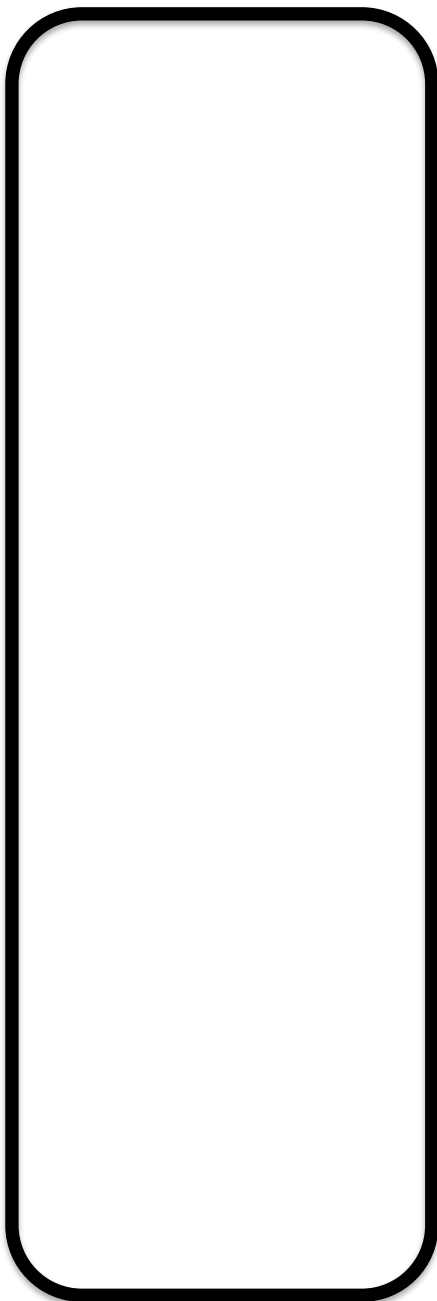


# Mapping Functions

Data



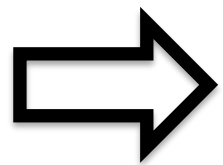
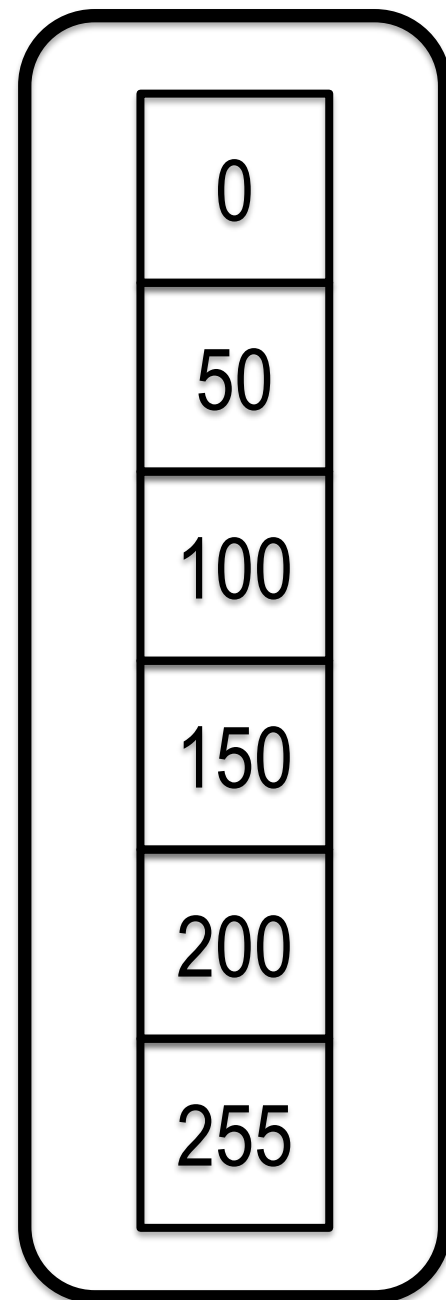
Display



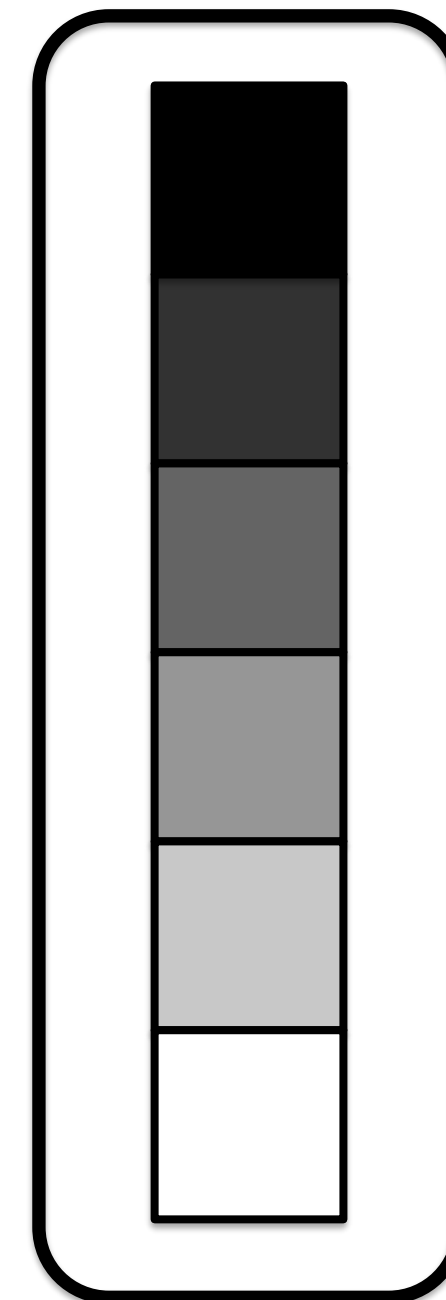


# Mapping Functions

Data



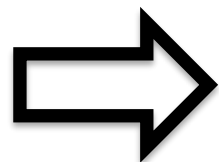
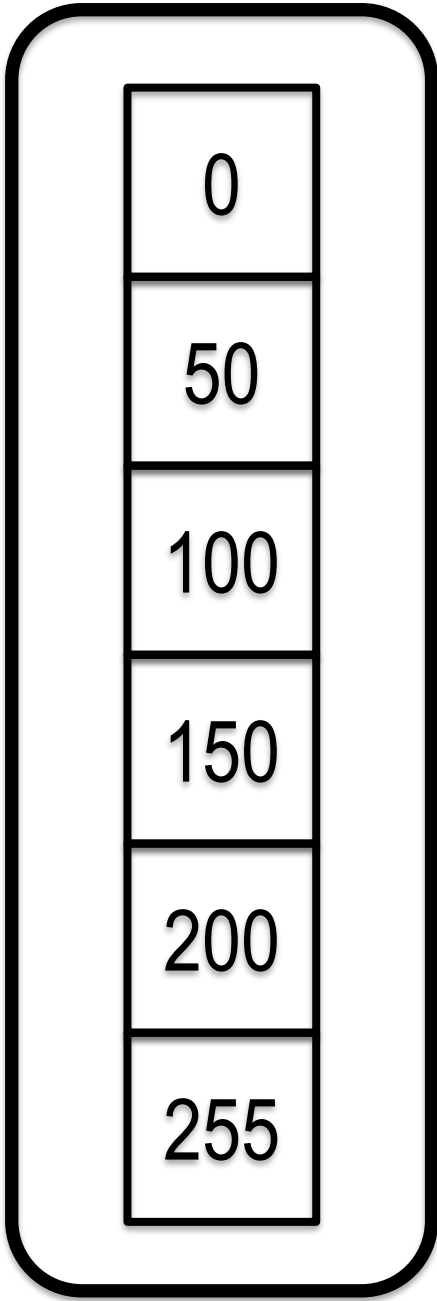
Display



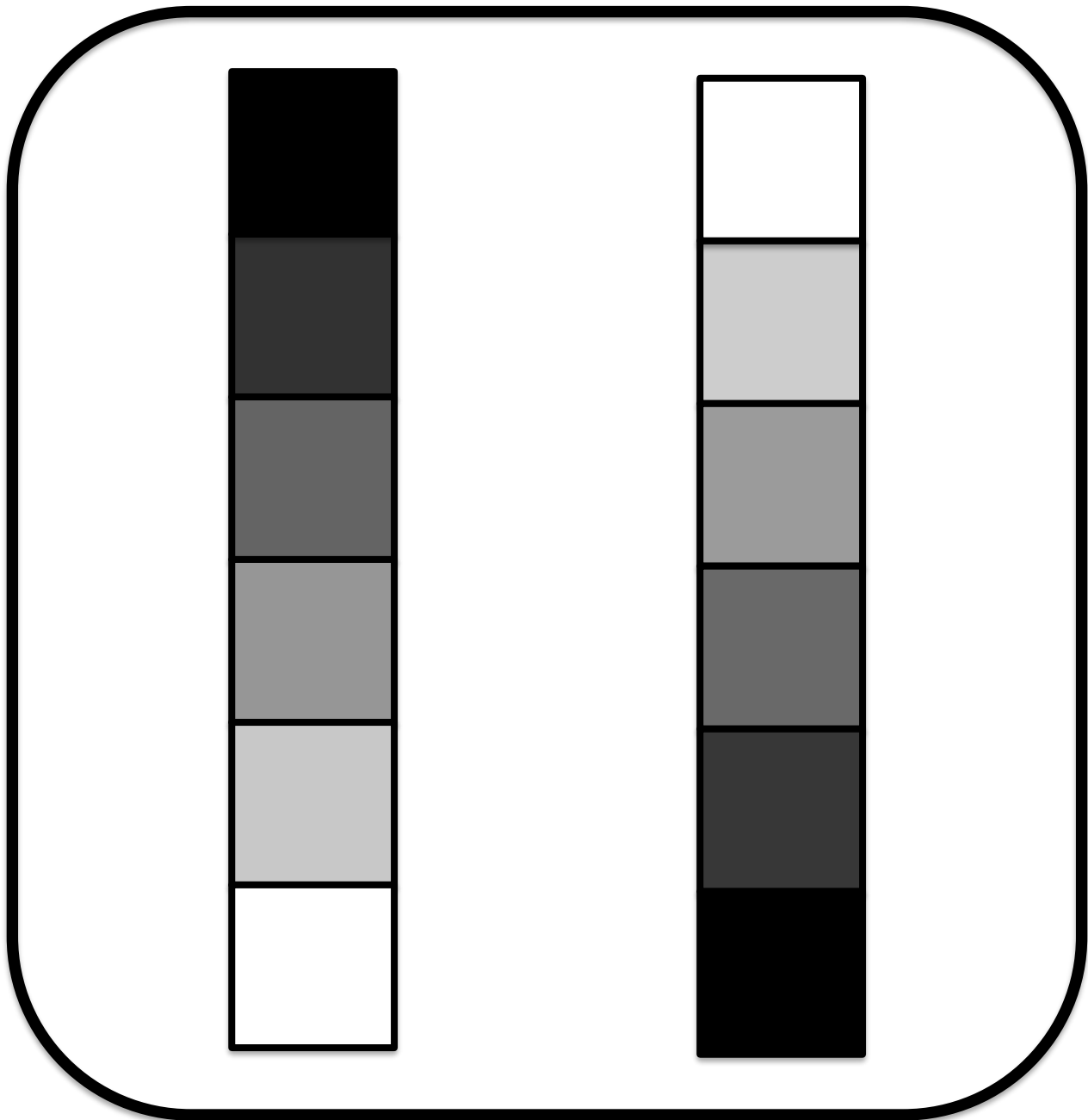
Grey scale

# Mapping Functions

Data



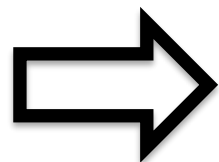
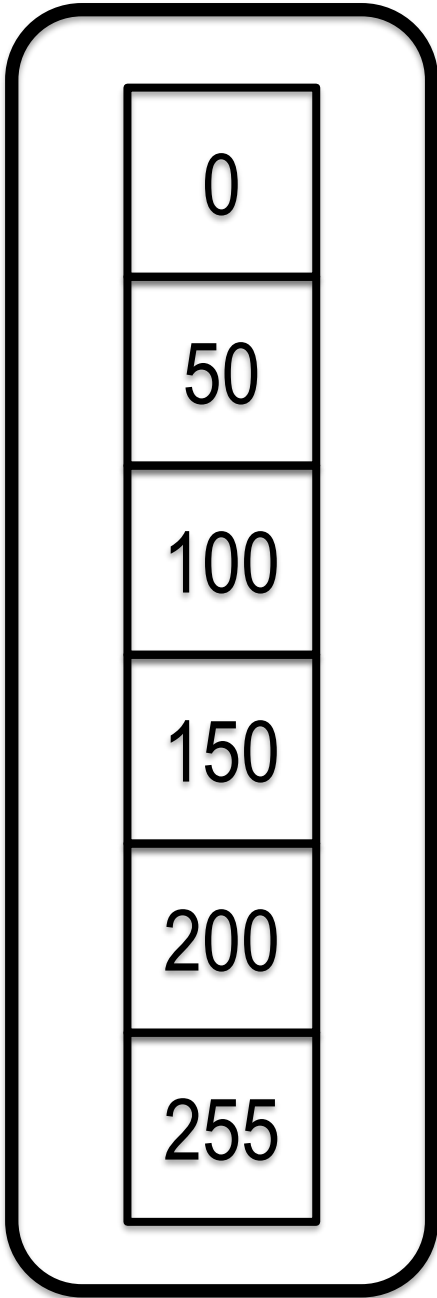
Display



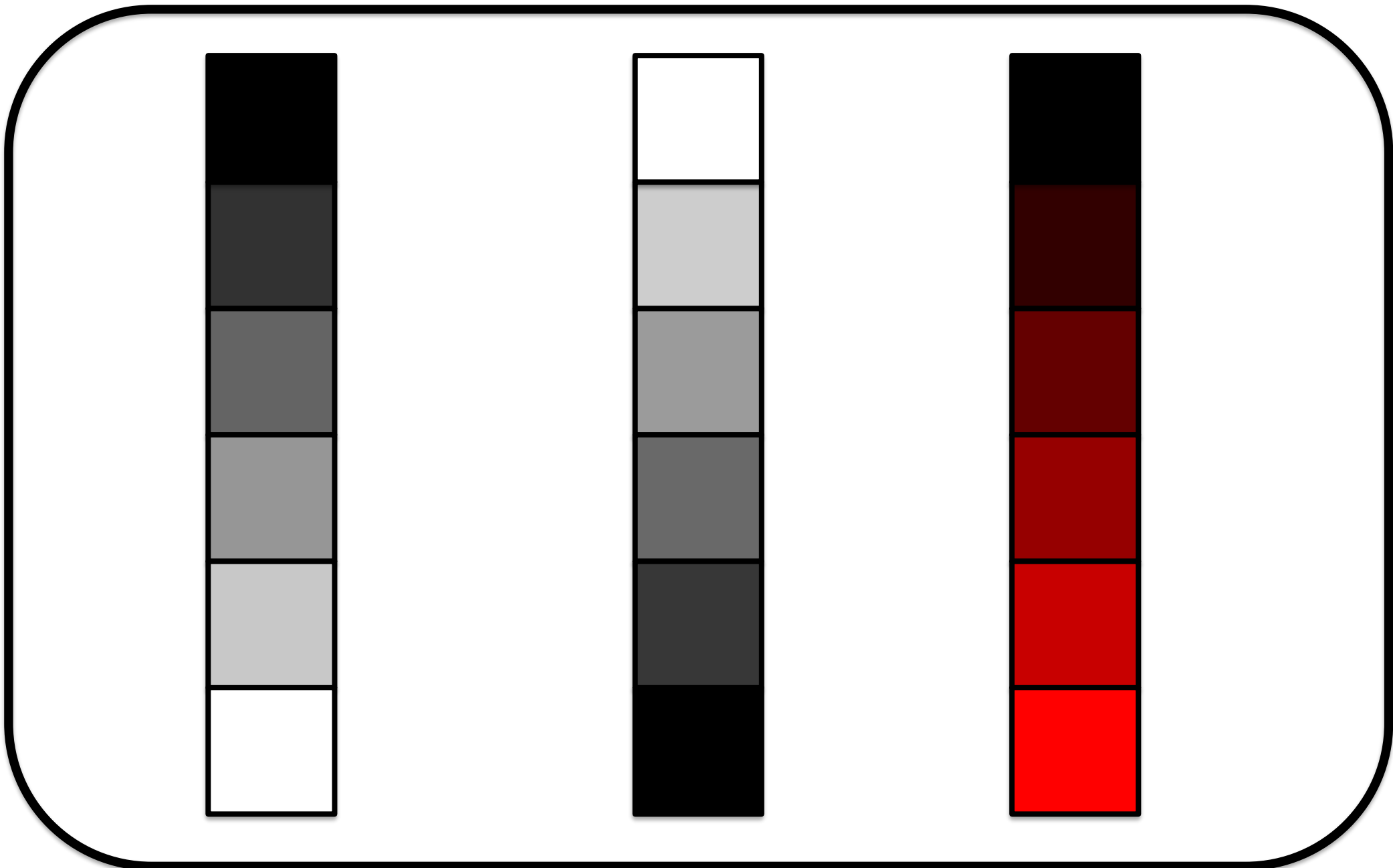
Grey scale      Grey scale  
inverted

# Mapping Functions

Data



Display



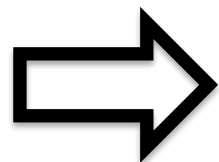
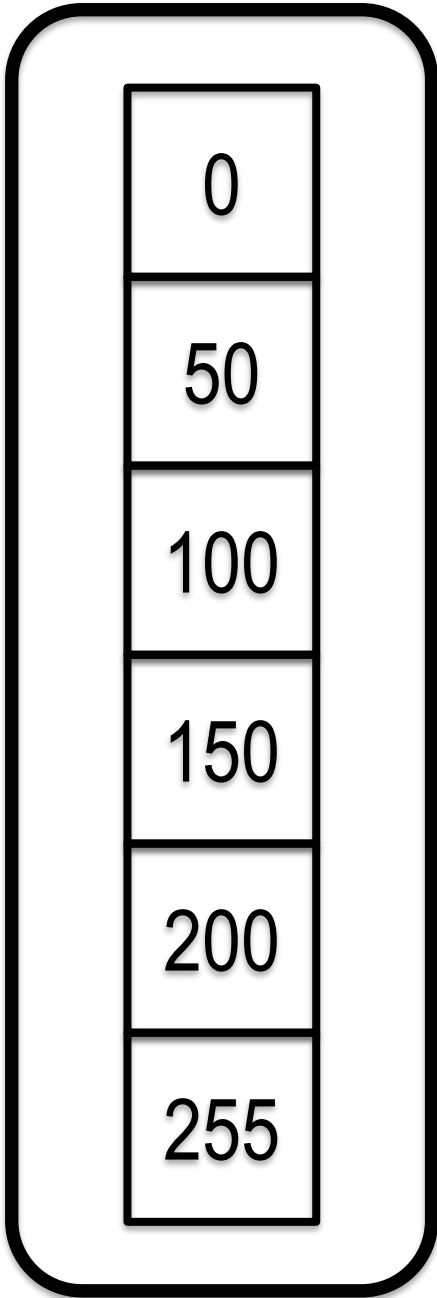
Grey scale

Grey scale  
inverted

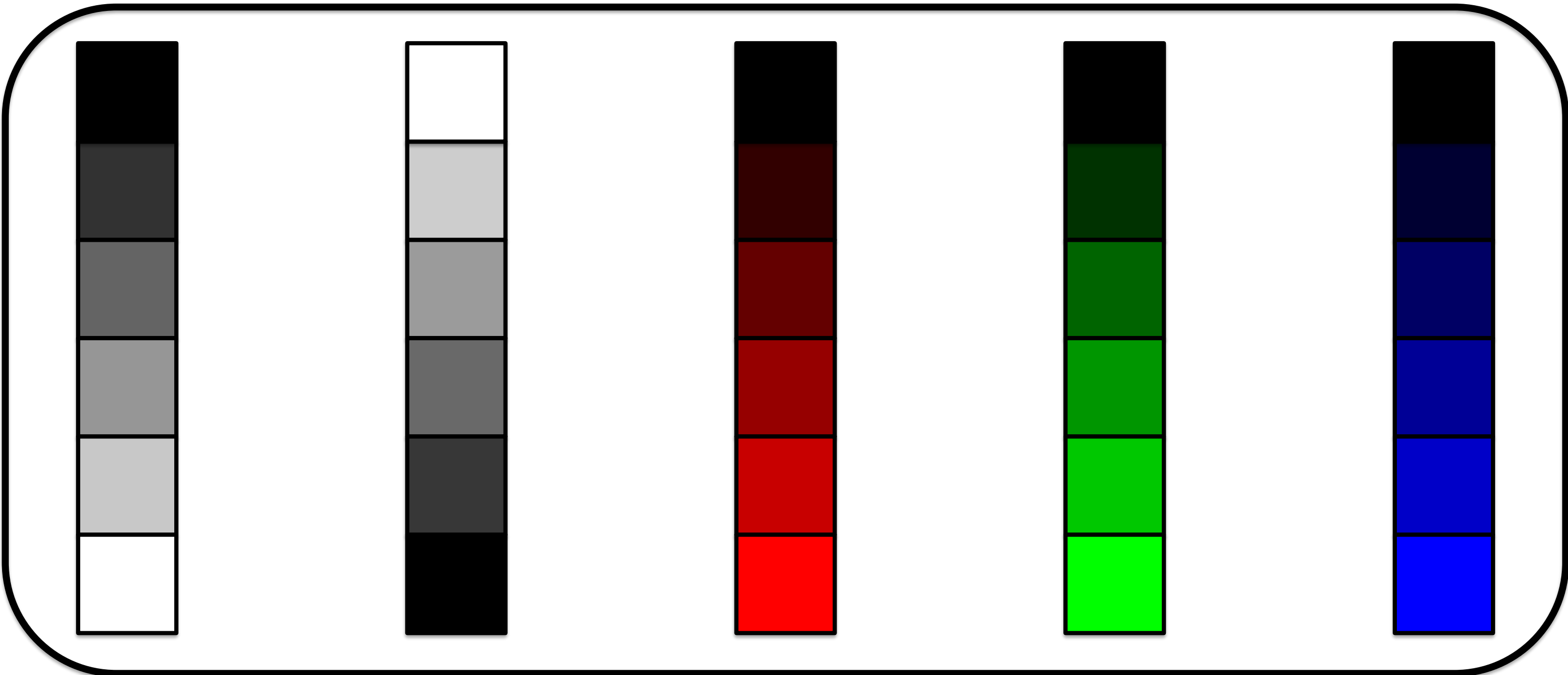
Red

# Mapping Functions

Data



Display



Grey scale

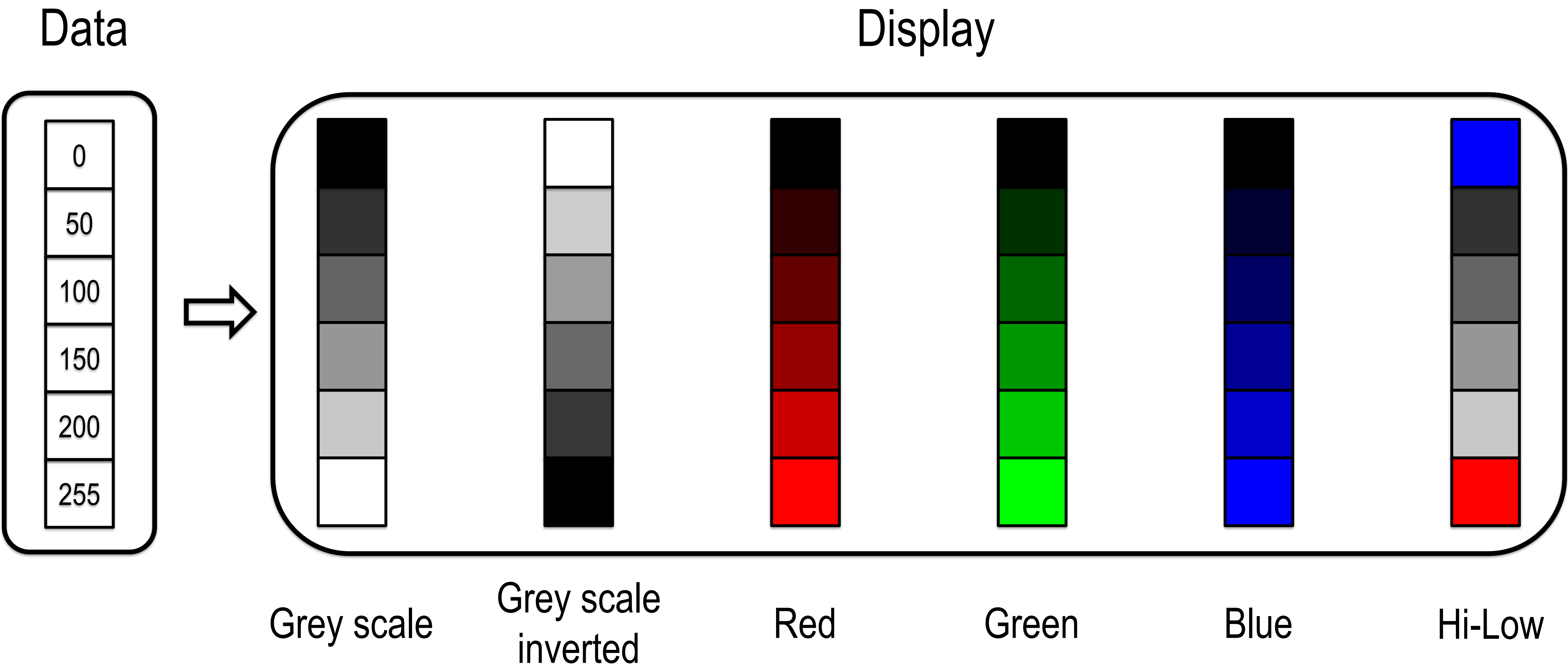
Grey scale  
inverted

Red

Green

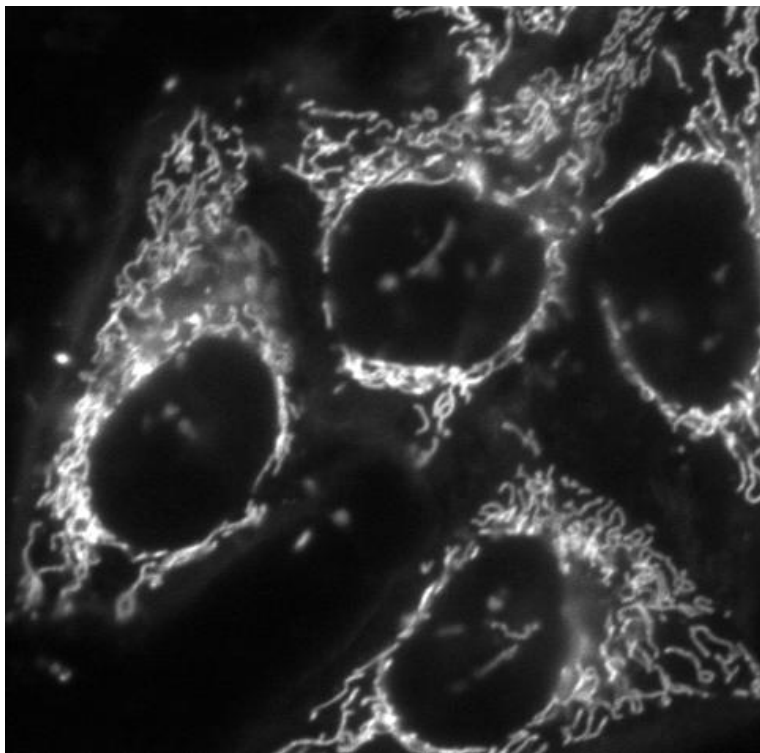
Blue

# Mapping Functions

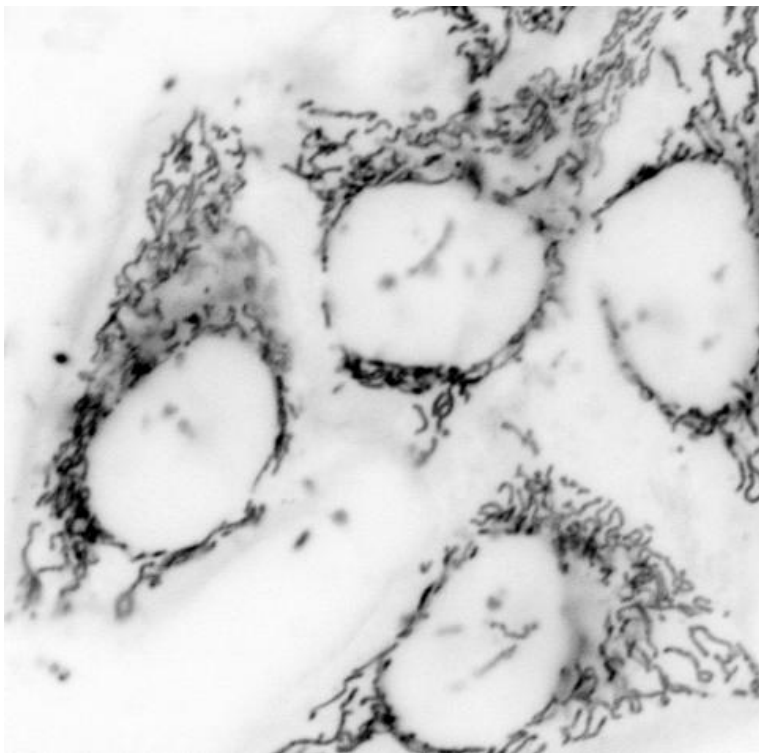




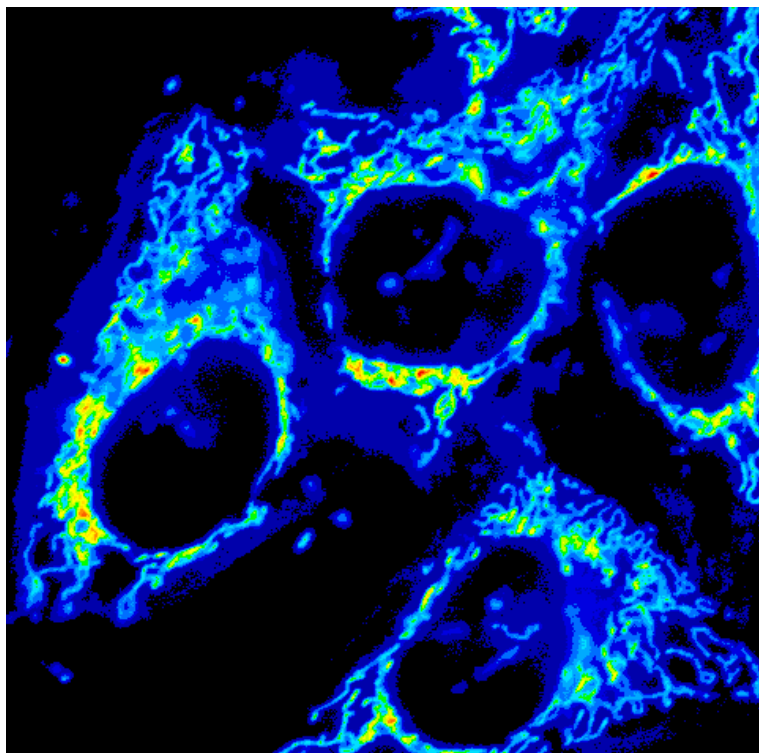
# Look up Table (LUT)



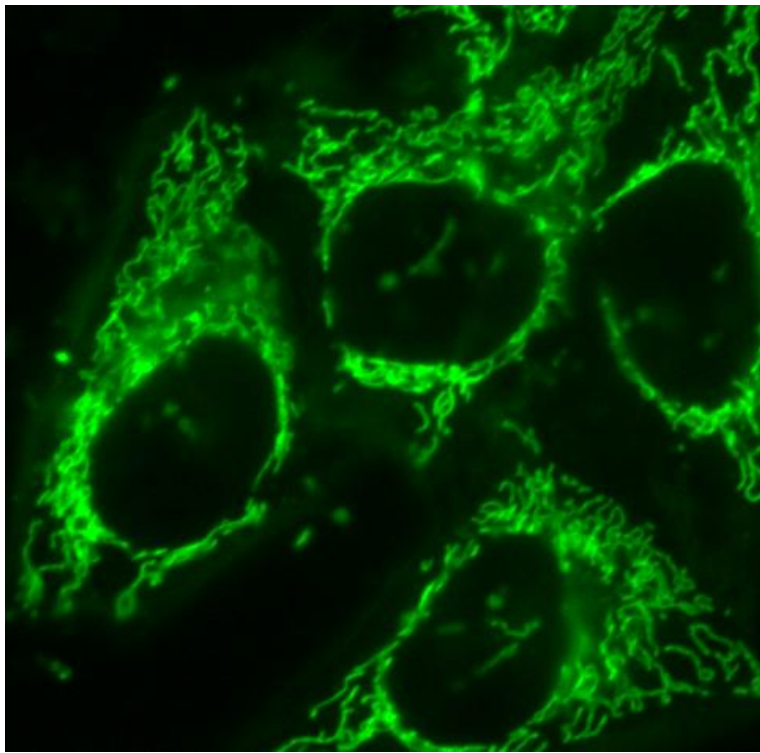
Grey scale



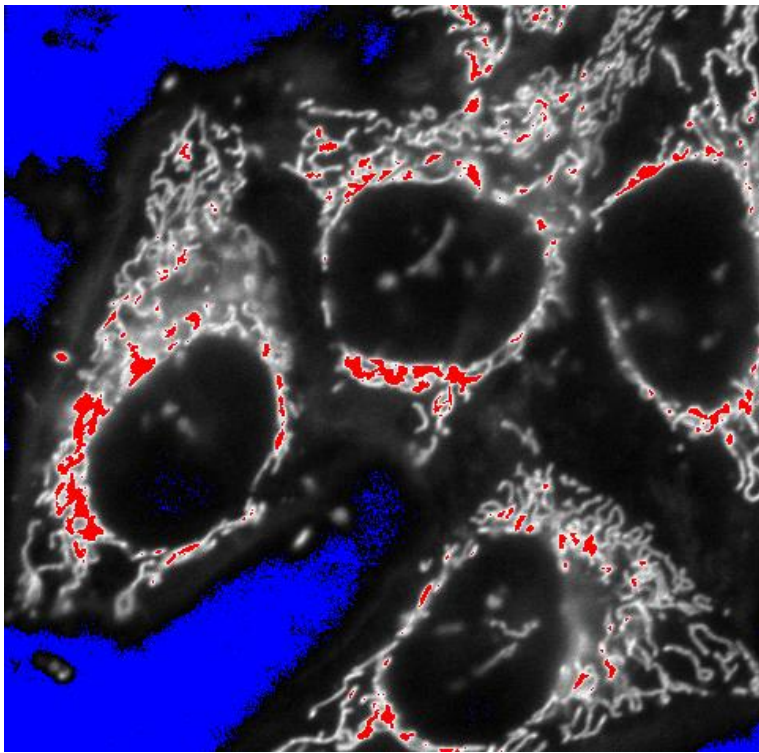
Grey scale (inverted)



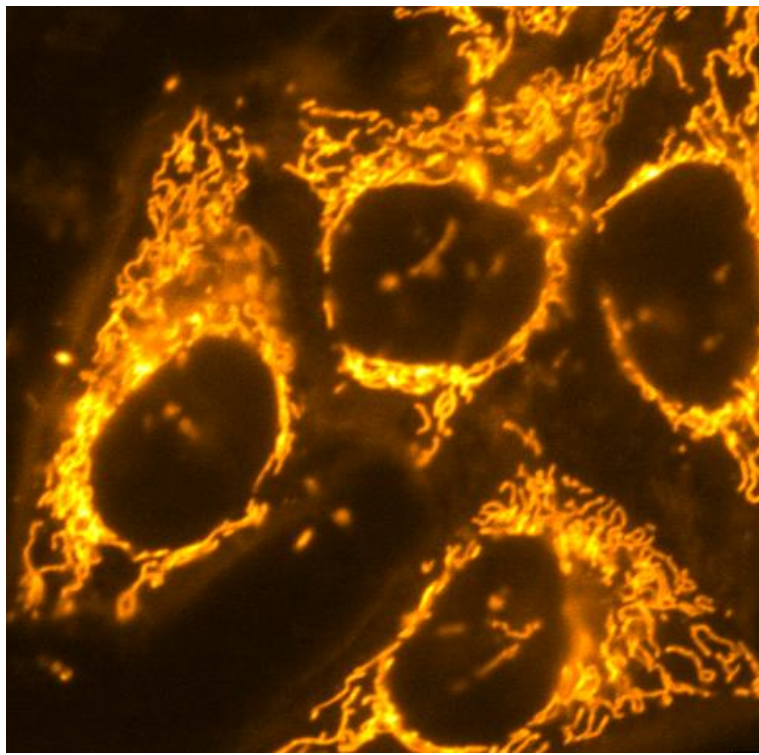
16 colours



Green

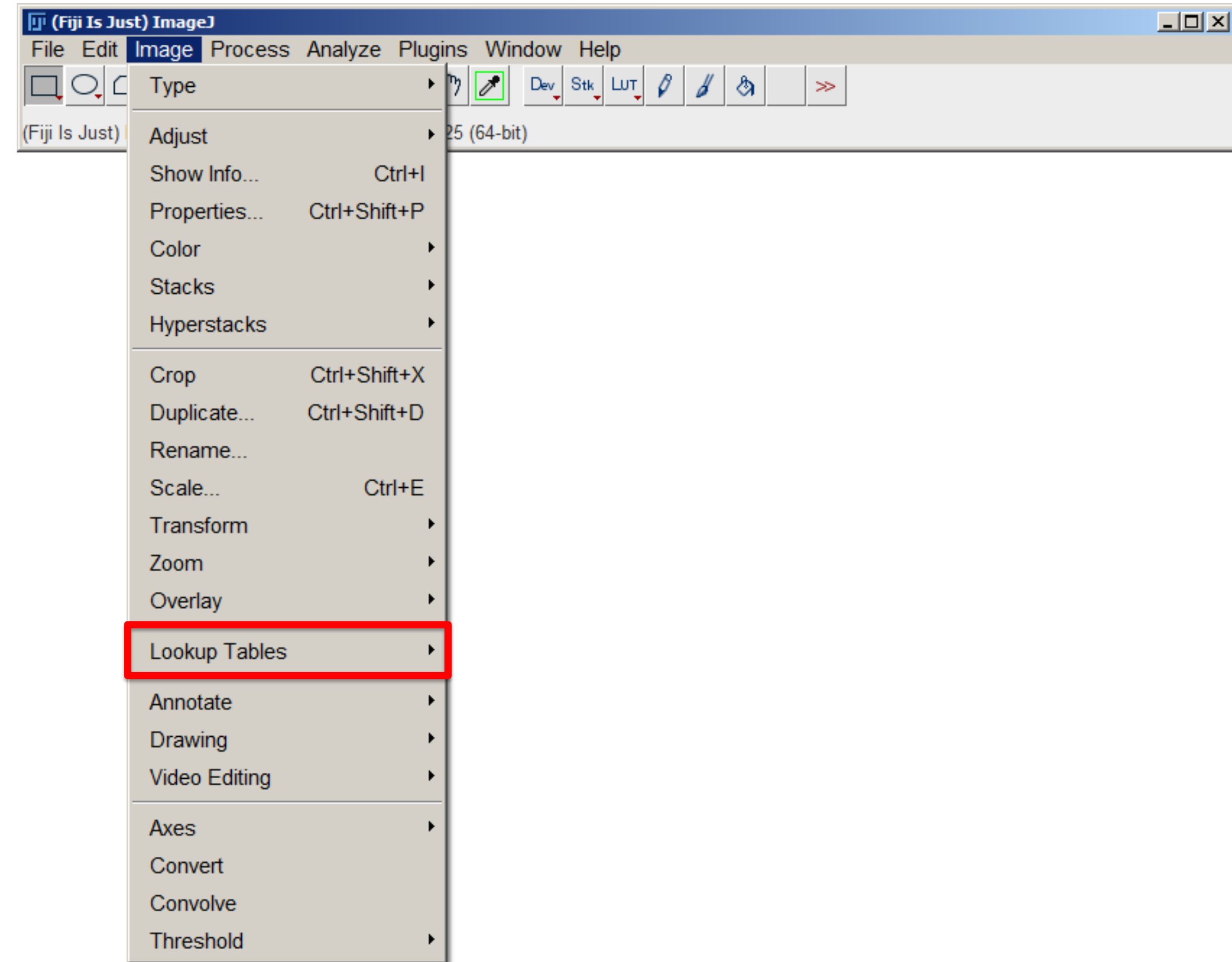


Hi-Lo

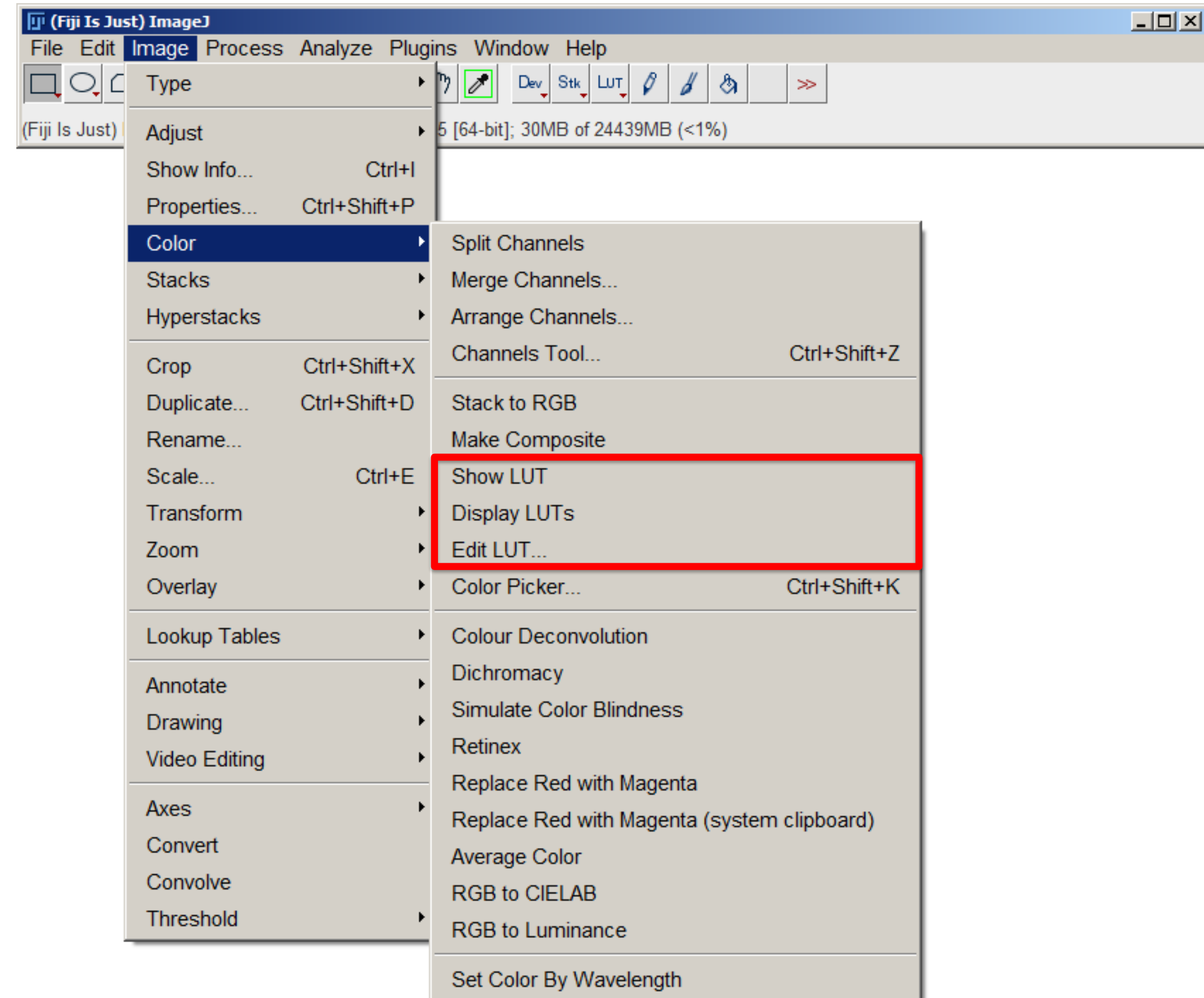


Orange-Hot

# LUT in Fiji/ImageJ



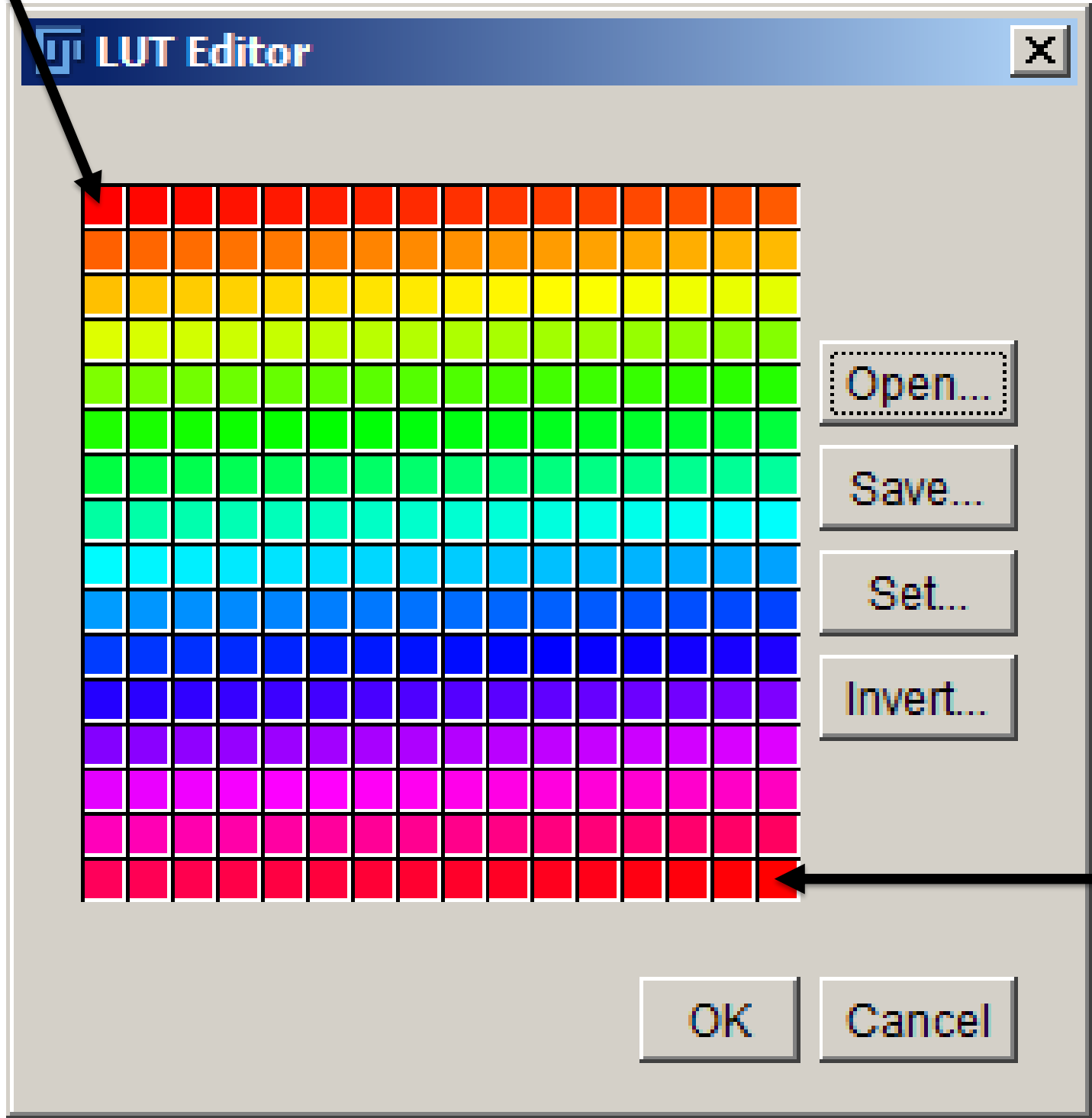
# LUT in Fiji/ImageJ



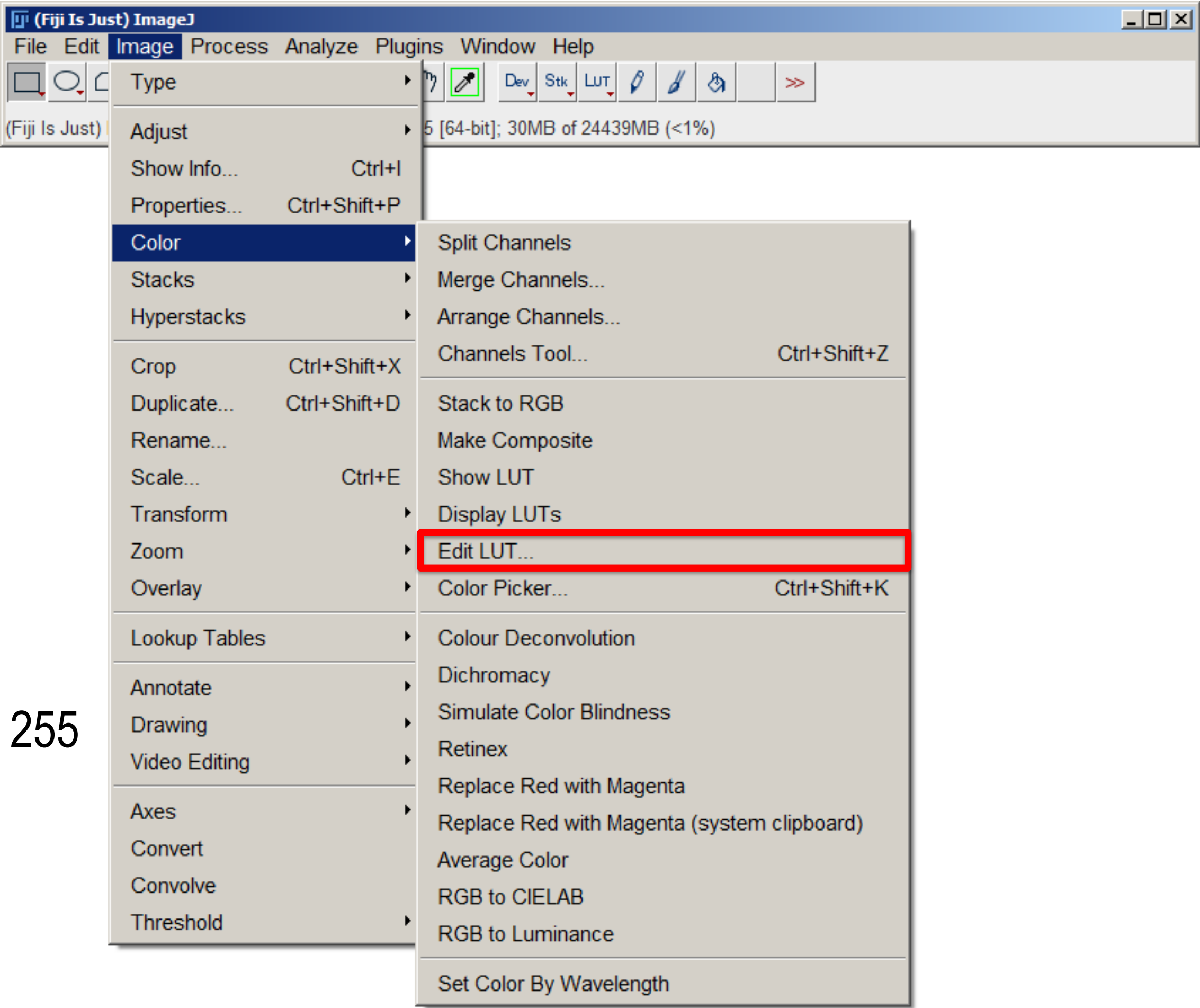


# LUT in Fiji/ImageJ

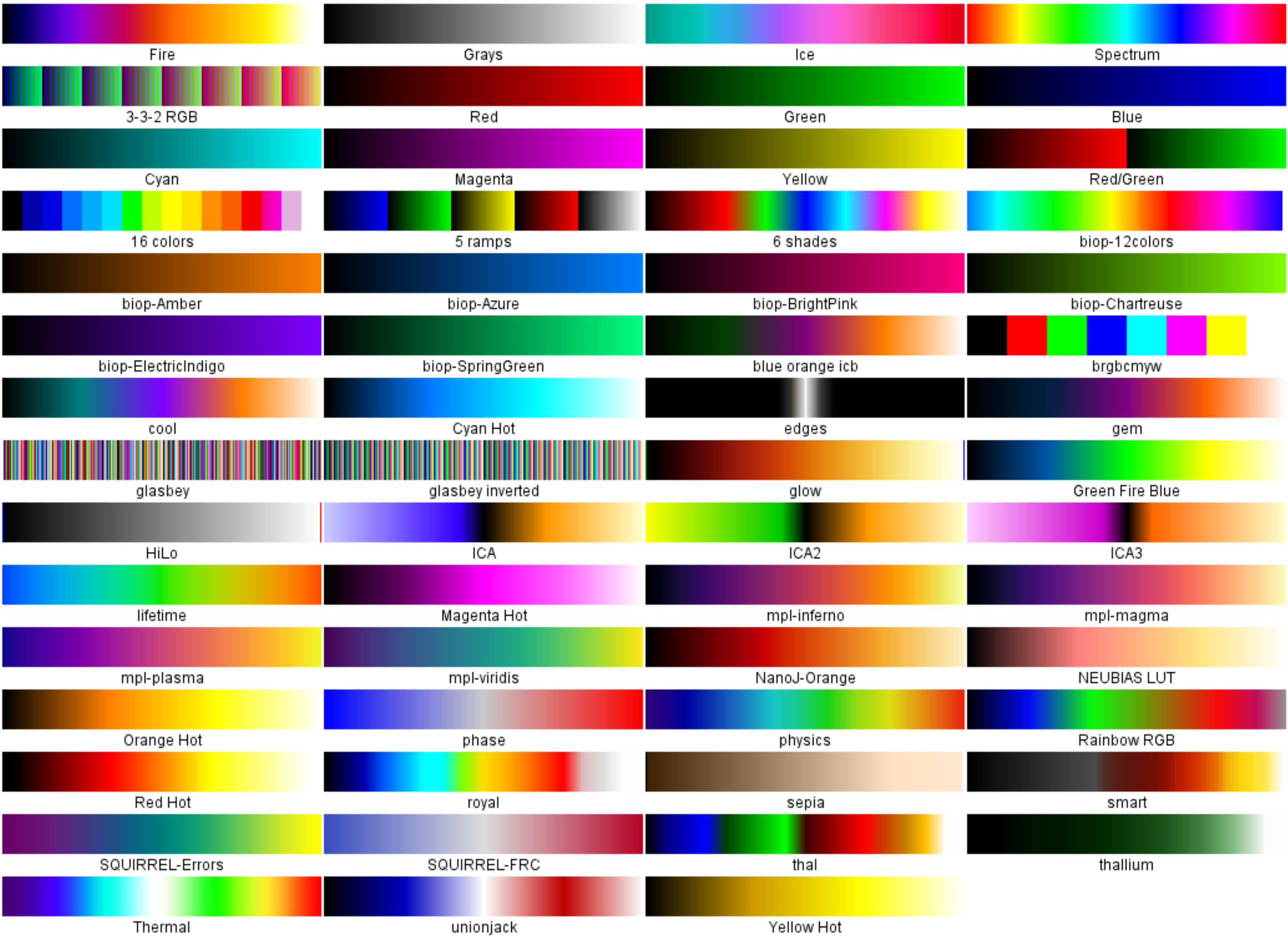
Pixel value: 0

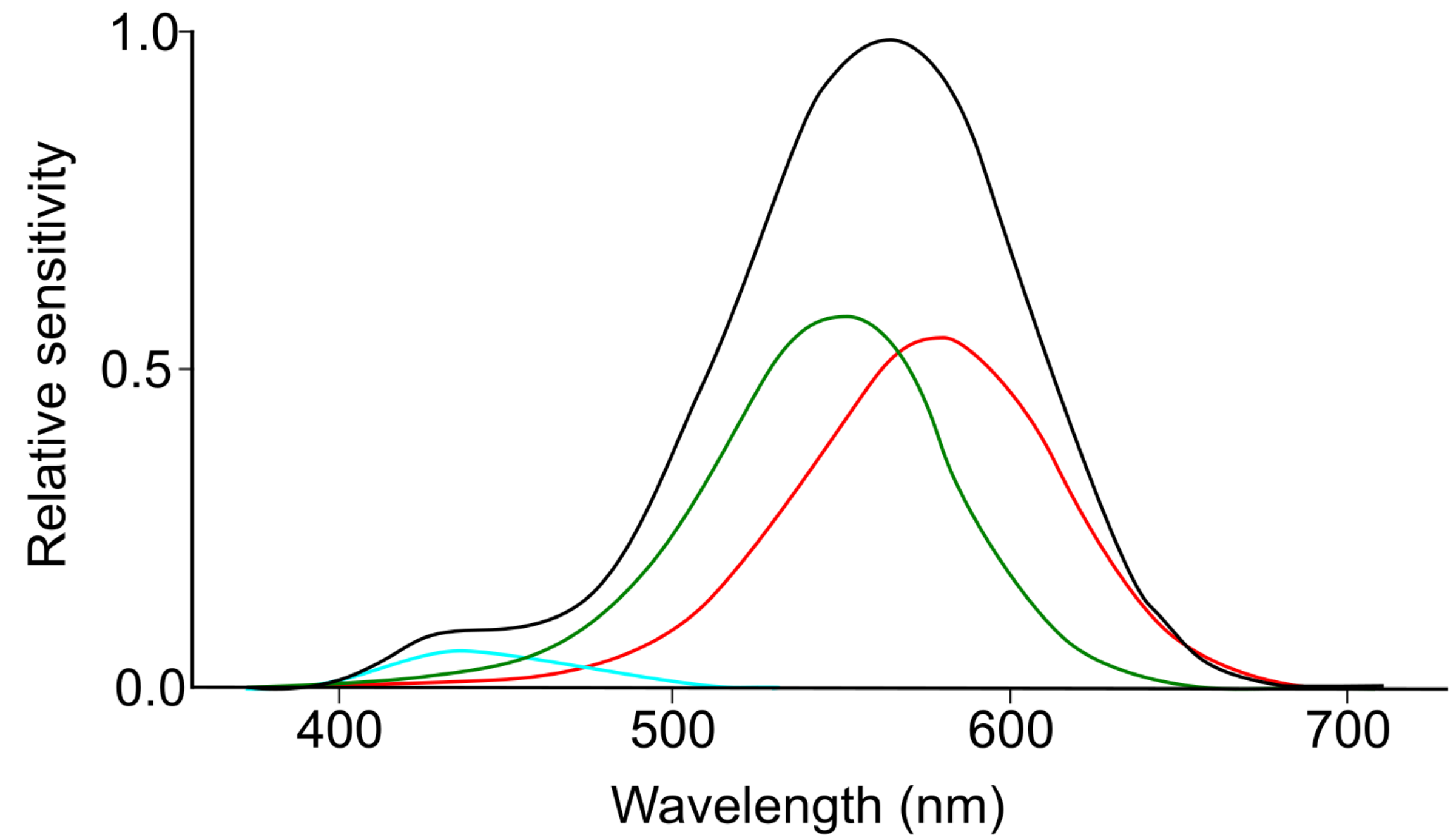


Pixel value: 255



# Display LUTs



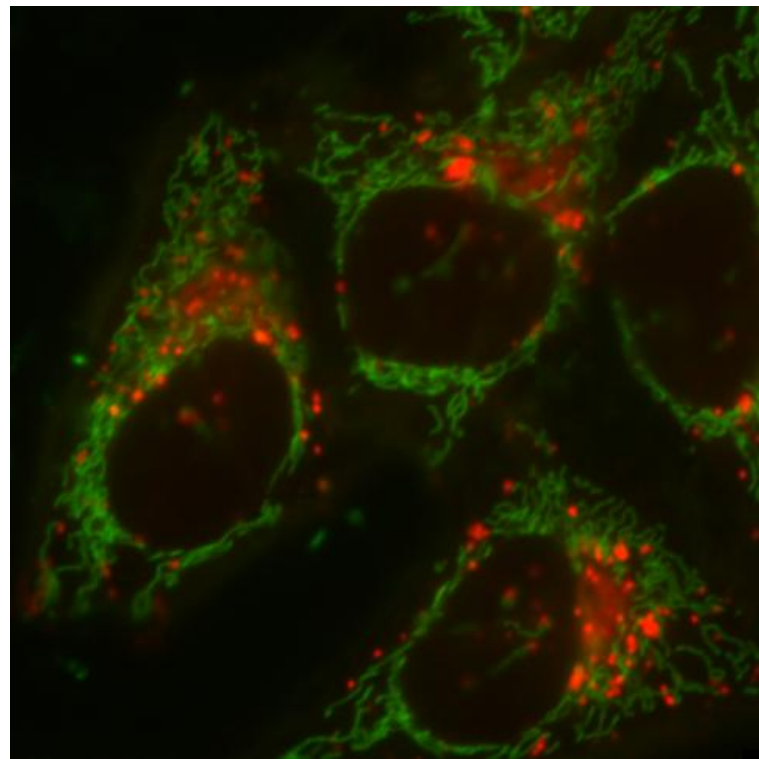


Modified from:

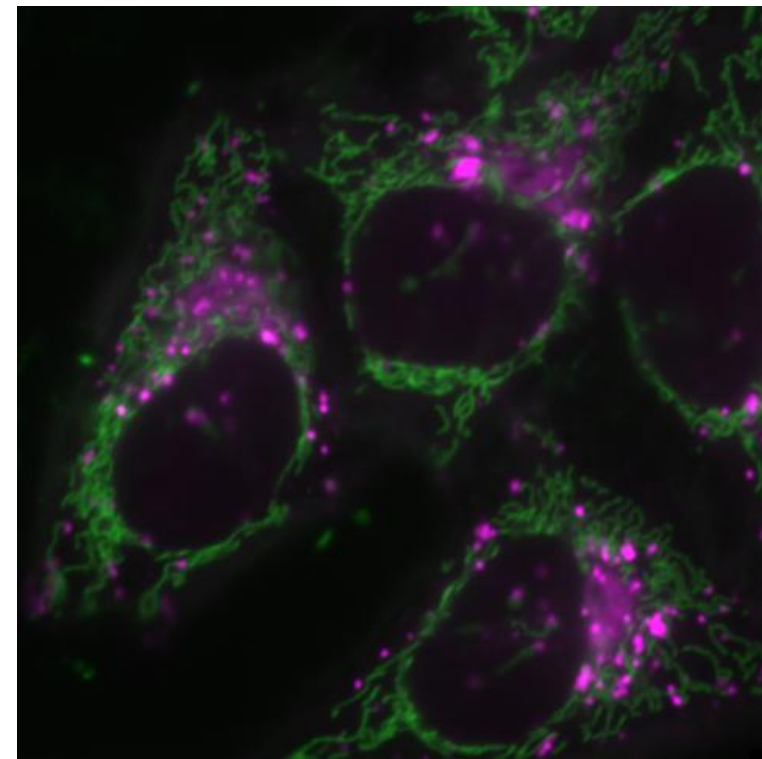
Wald, G. The Receptors of Human Color Vision. *Science* **145**, 1007-1016 (1964).

# Pitfalls

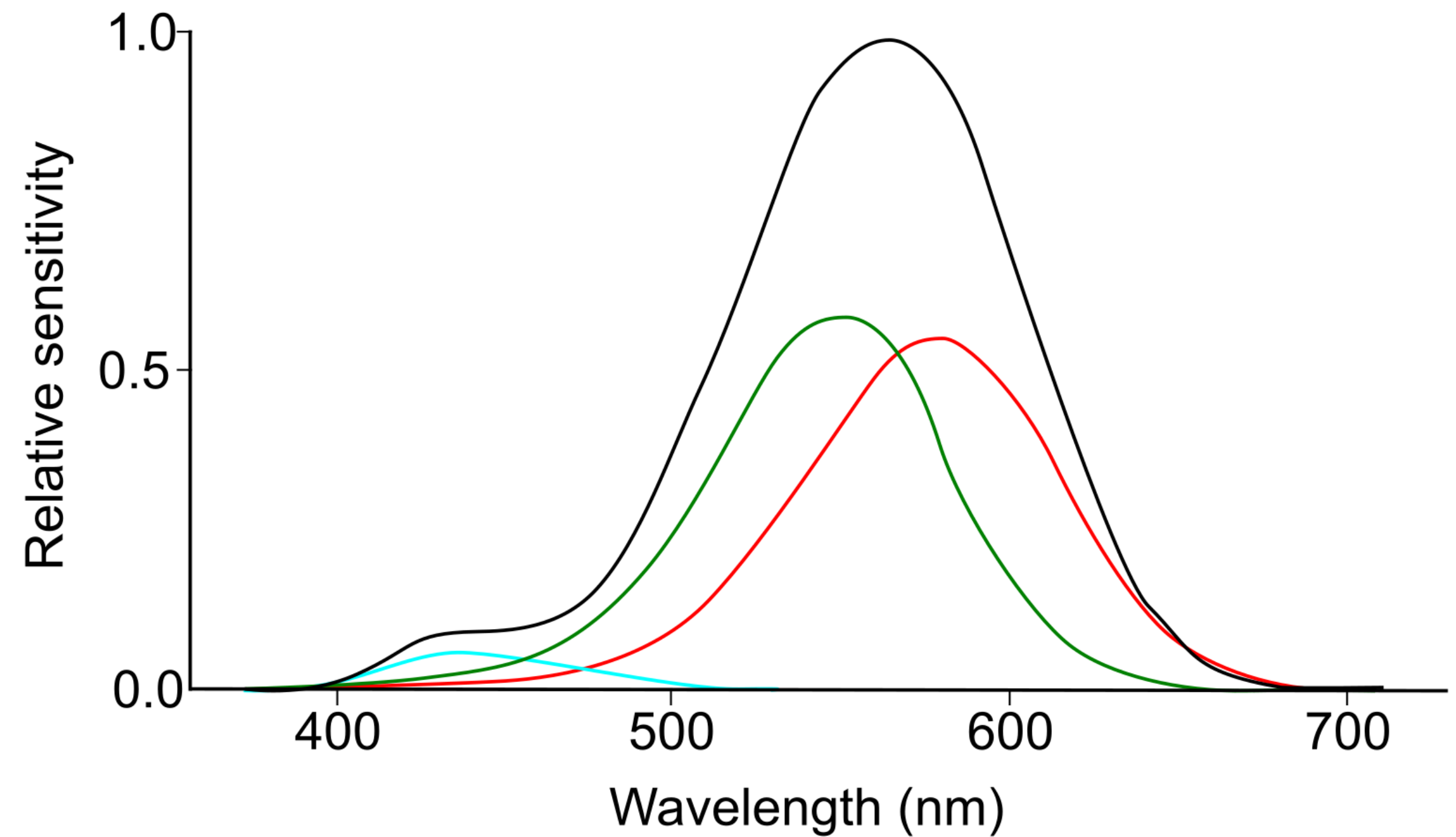
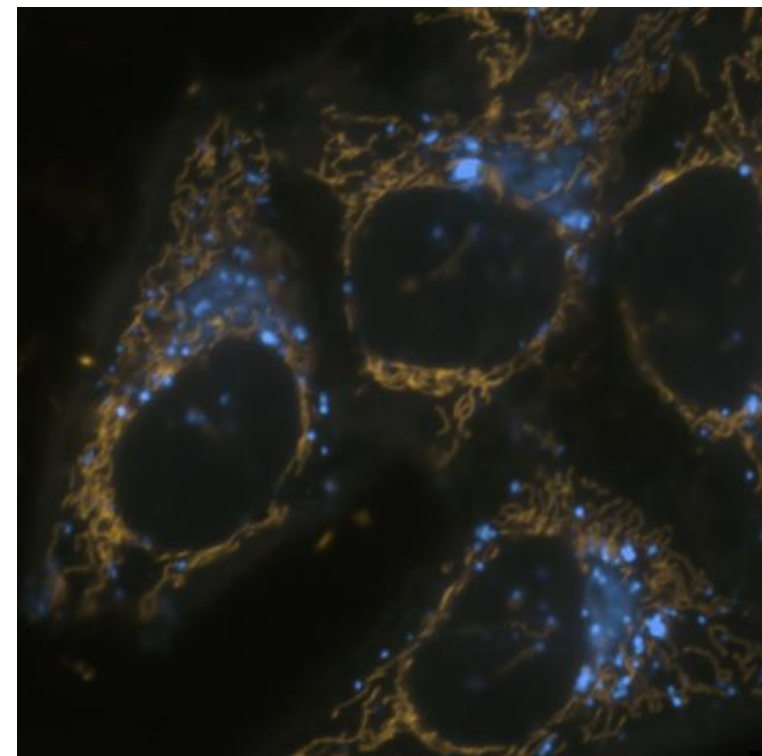
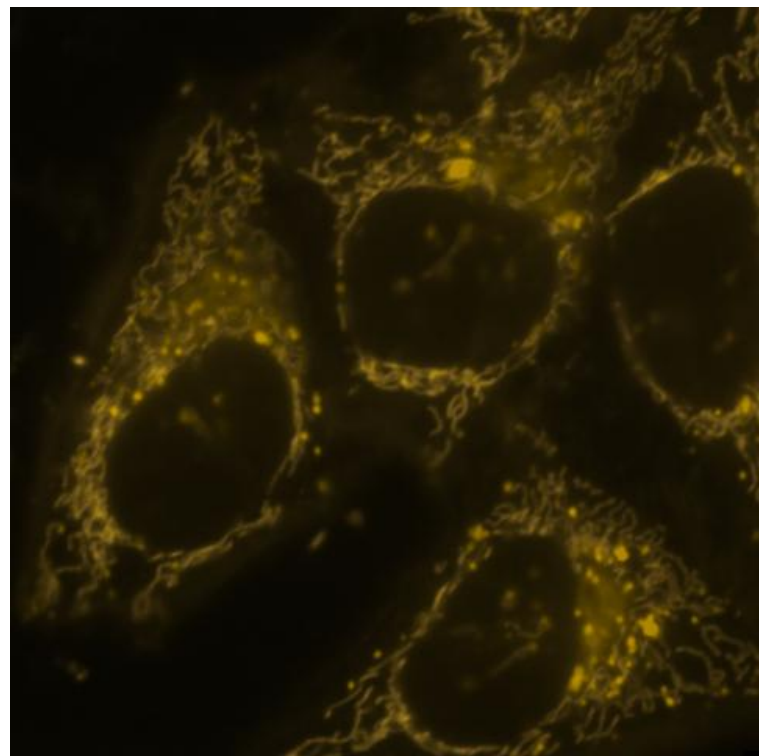
Red on Green



Magenta on Green



Seen by Deutanopes



Modified from:  
Wald, G. The Receptors of Human Color Vision. *Science* **145**, 1007-1016 (1964).

- Look up tables (LUT)
  - Mapping function
  - Only affects the display of the image.
  - Preserves the original data.
  - Portable