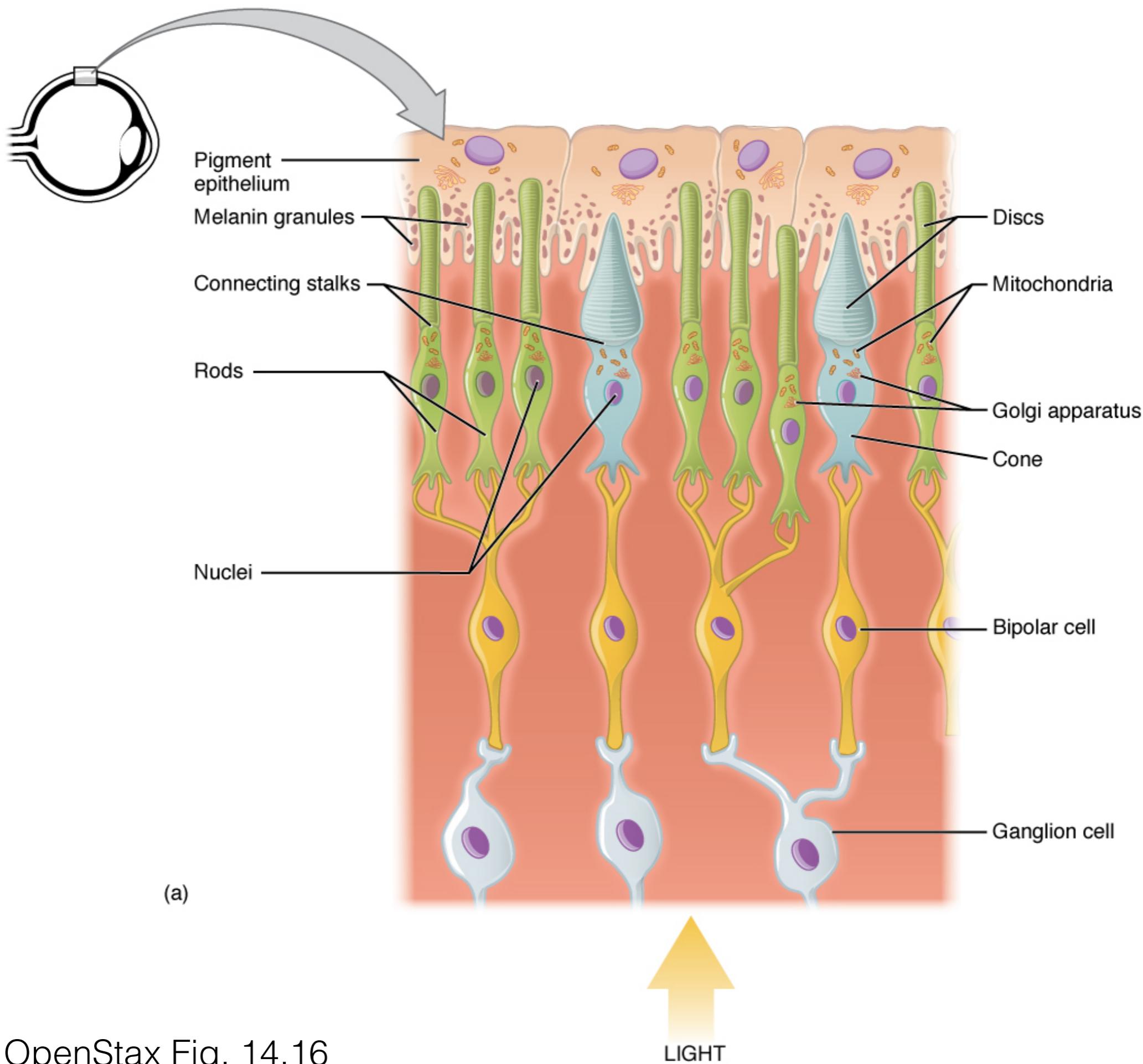


Lecture 06 – Color

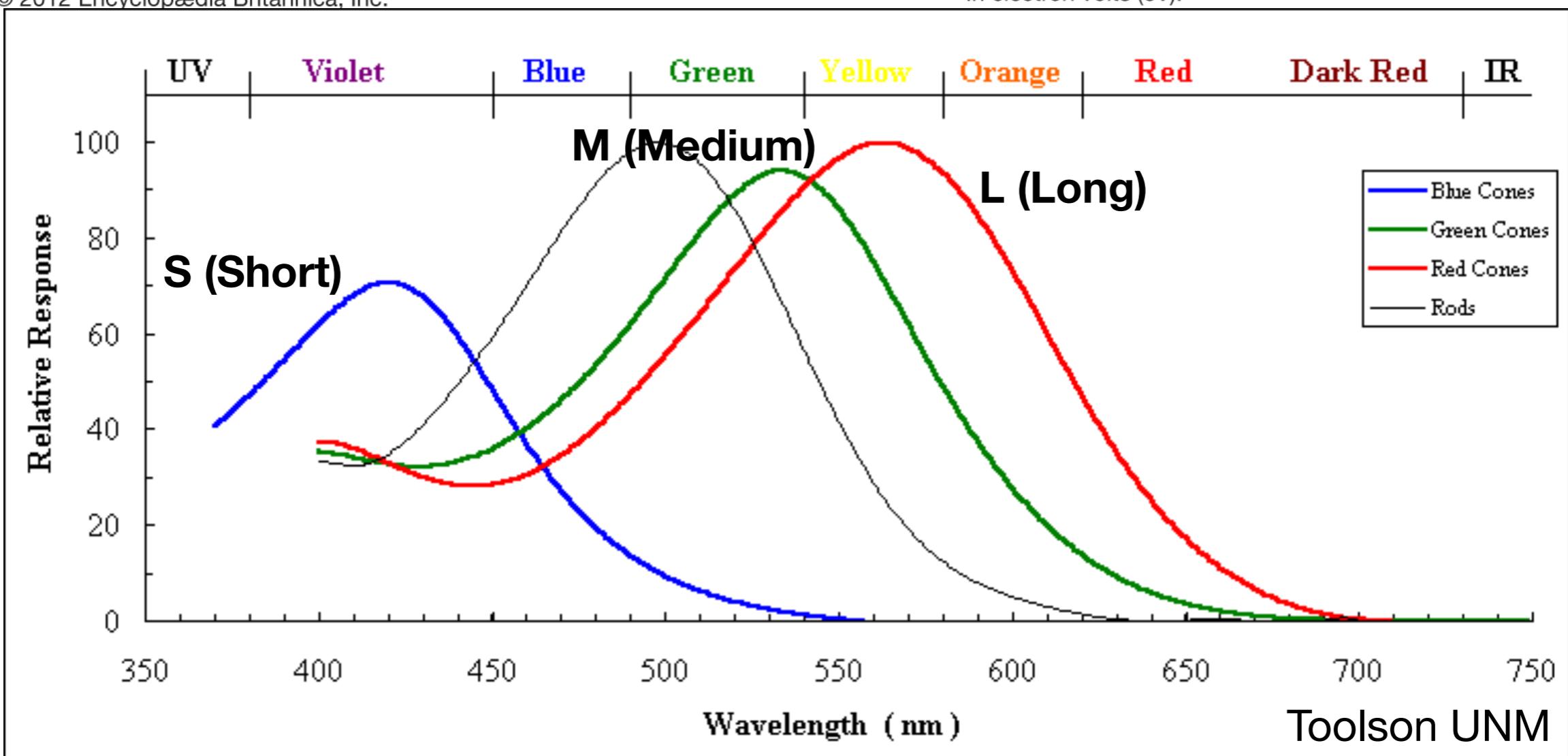
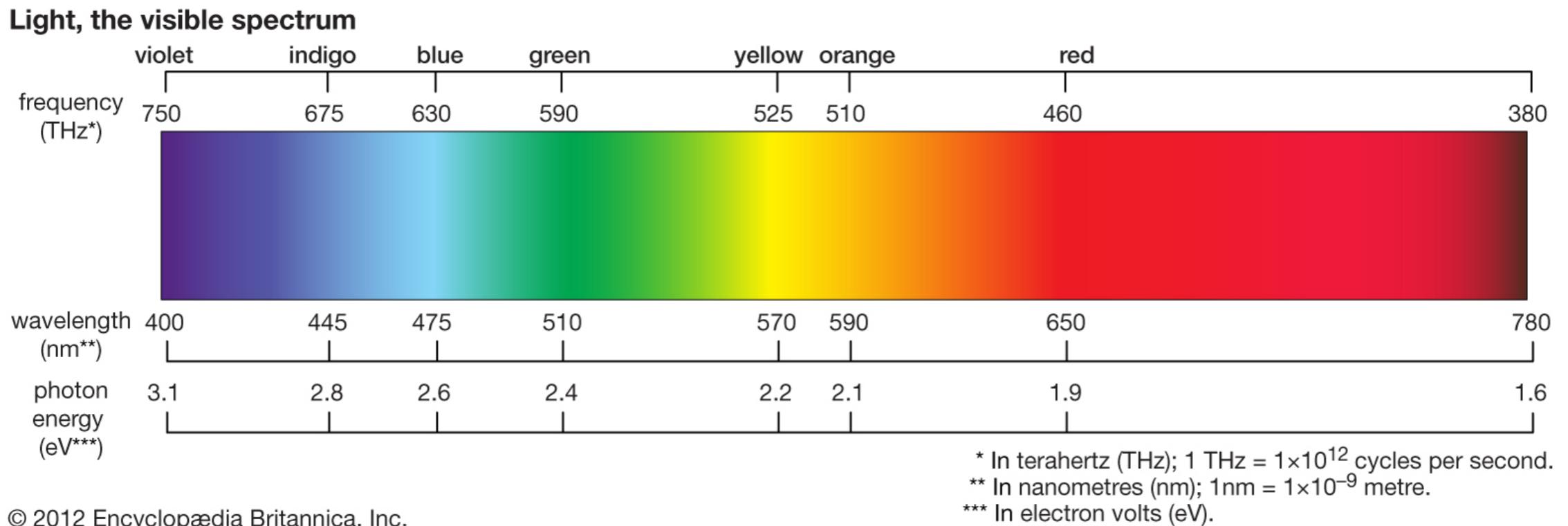
Today's Learning Objectives:

- 1. List the three cone types and describe their wavelength sensitivities.**
- 2. Describe the opposition-process theory as it applies to chromatic and achromatic vision.**
- 3. Describe colorblindness and list the percentage of the population who are colorblind.**
- 4. Describe complementary color theory and how it interfaces with opposition-process theory.**
- 5. List the properties of hue, saturation, and value.**
- 6. Describe the problems using near-equal luminance colors in data visualizations.**

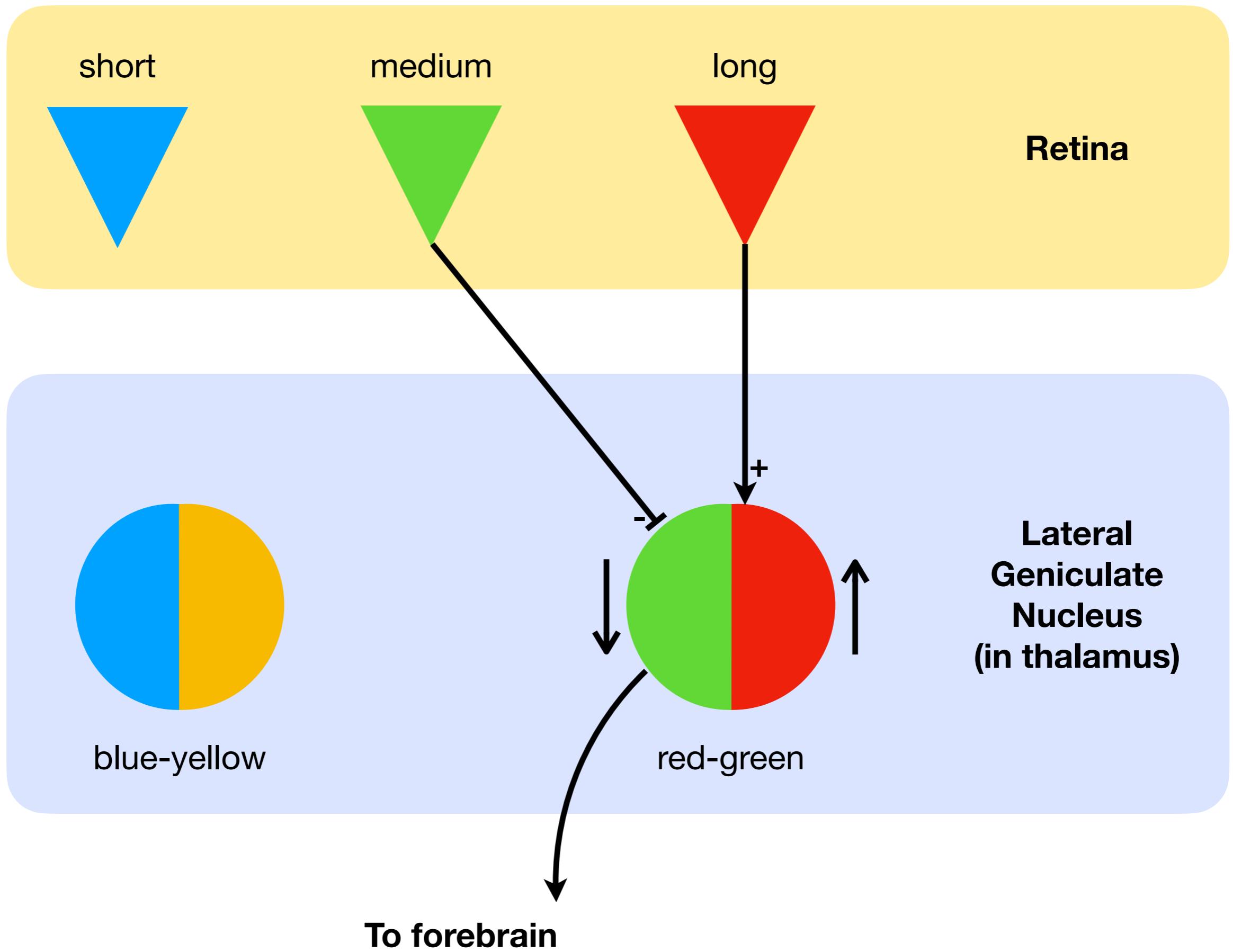


OpenStax Fig. 14.16

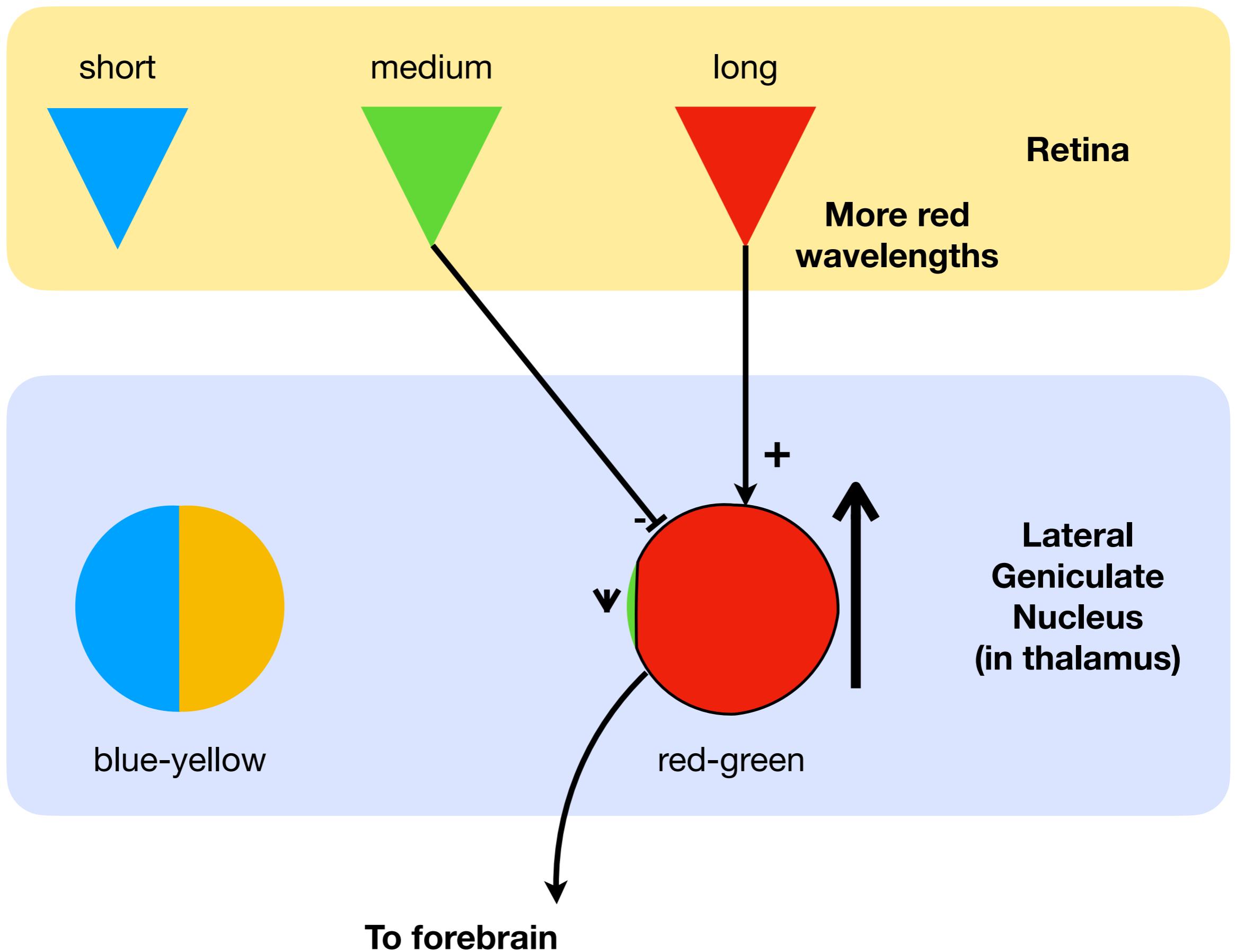
Cone types



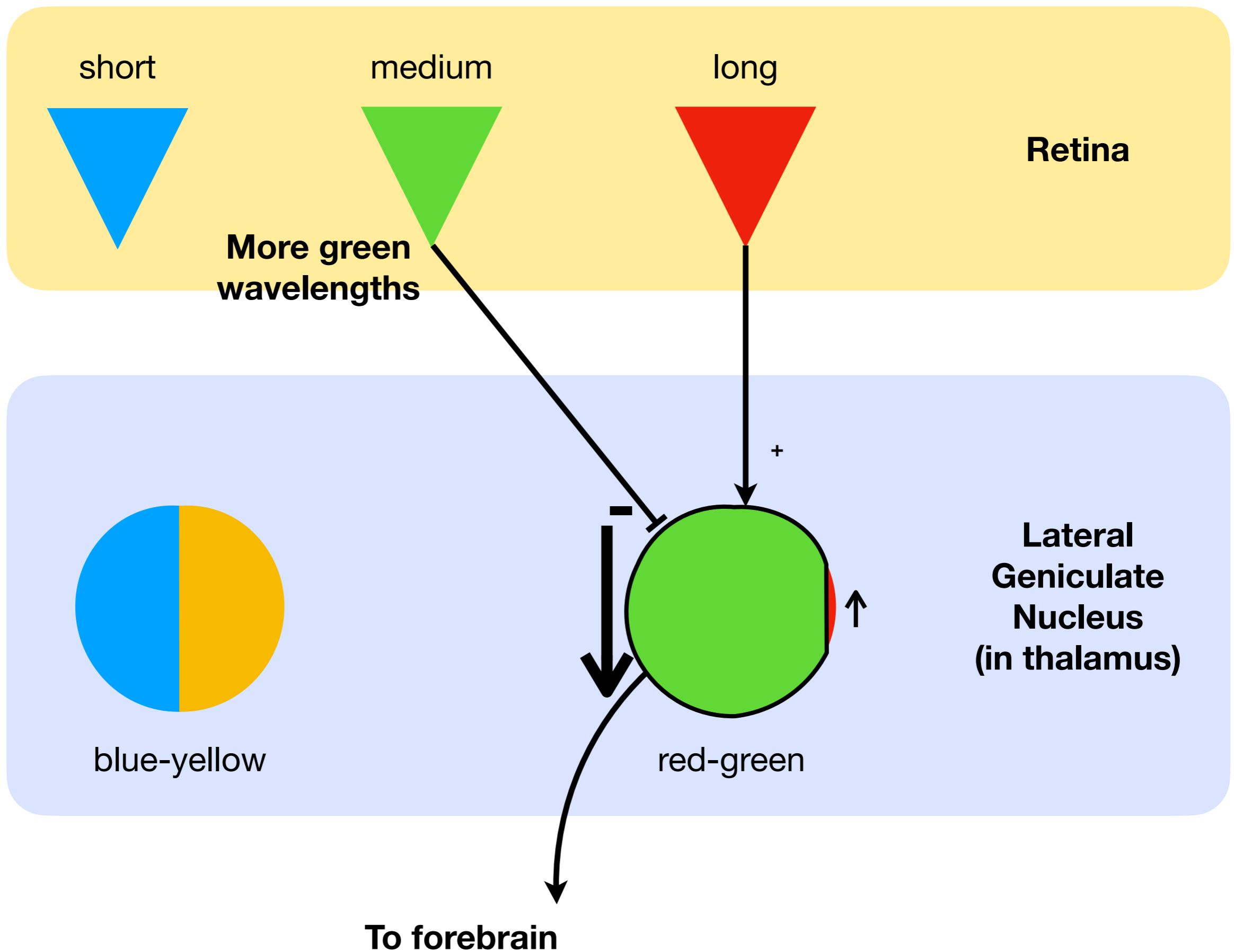
Opponent-Process Theory of Color (Chromatic)



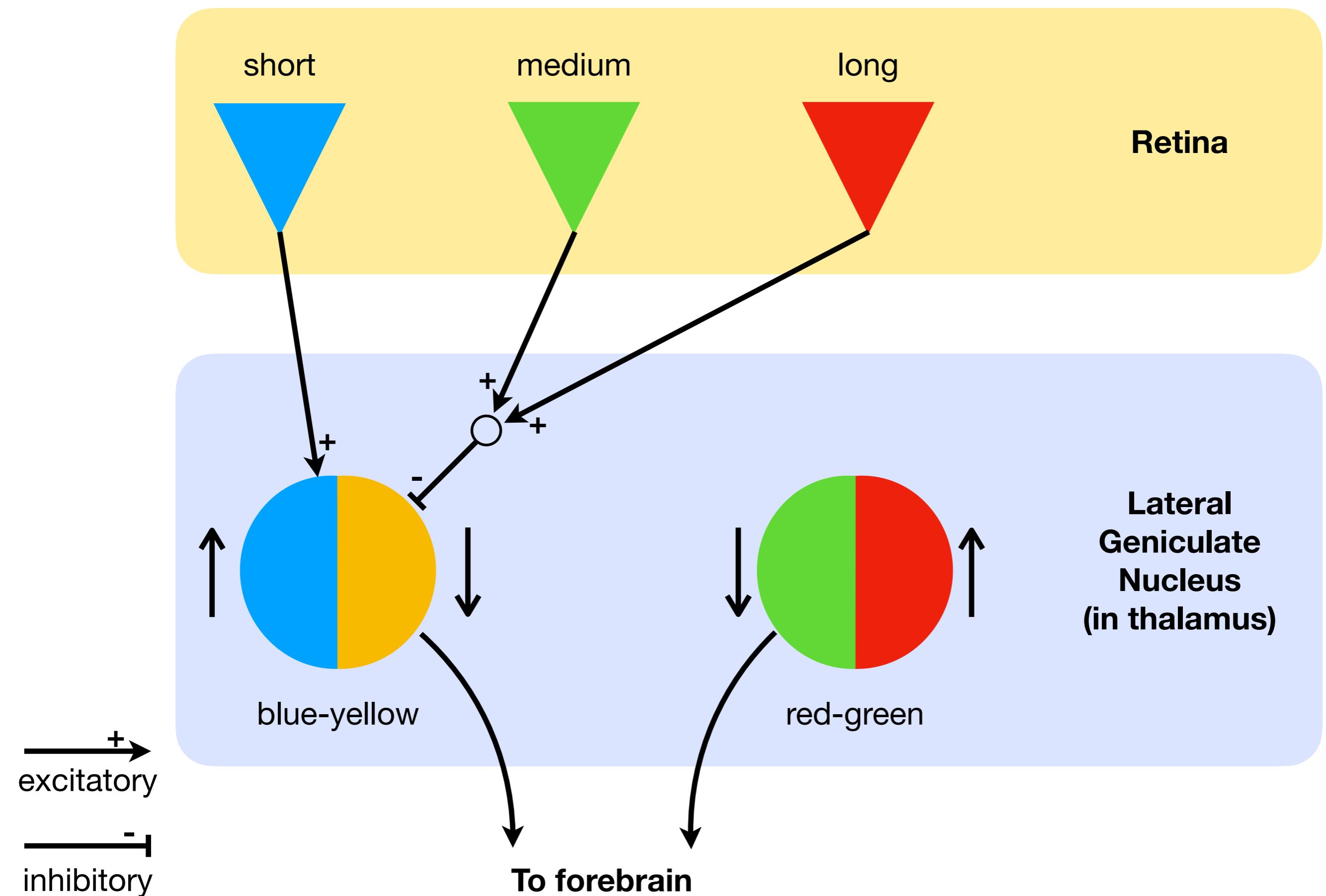
Opponent-Process Theory of Color (Chromatic)



Opponent-Process Theory of Color (Chromatic)

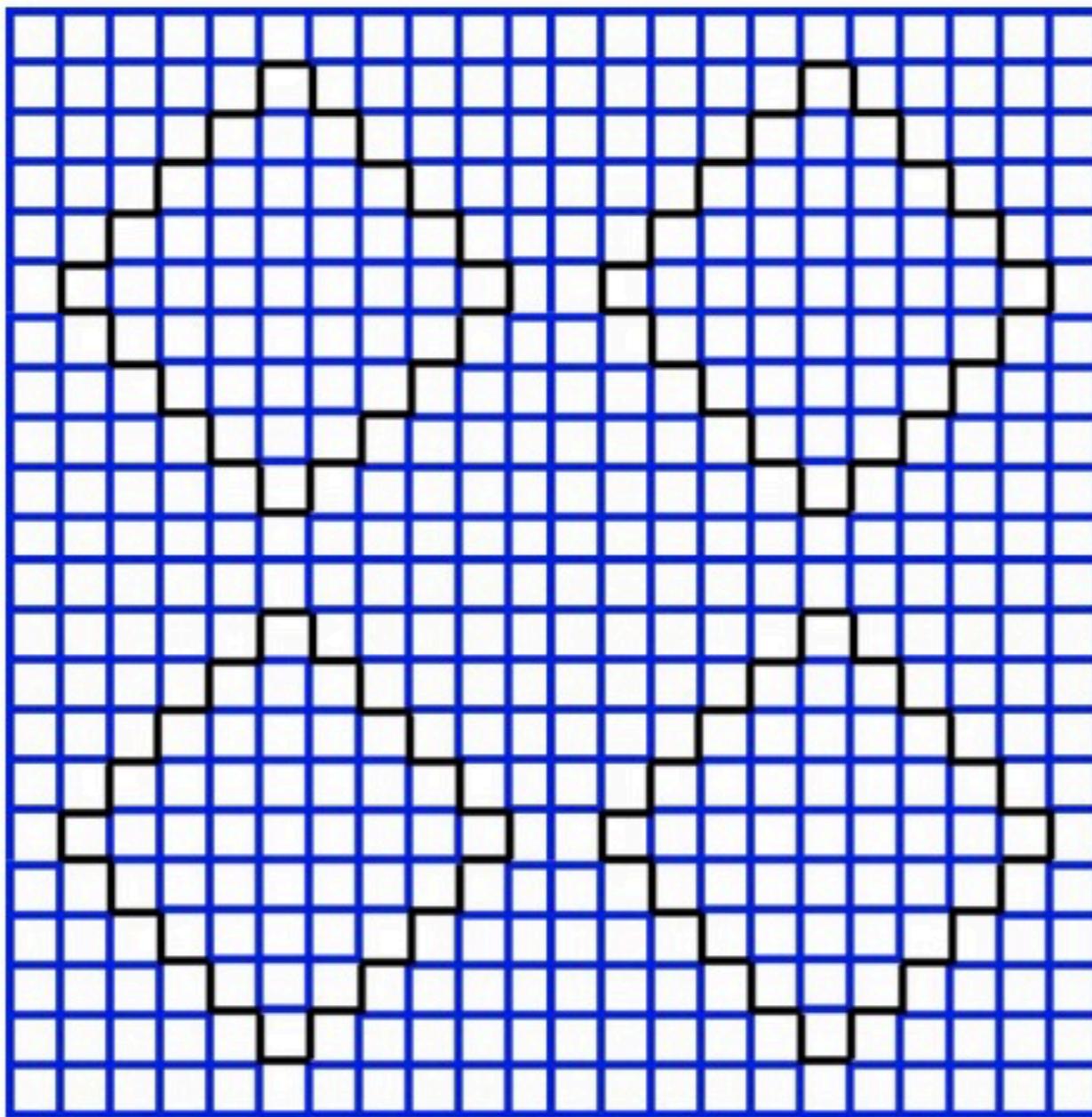


Opponent-Process Theory of Color (Chromatic)



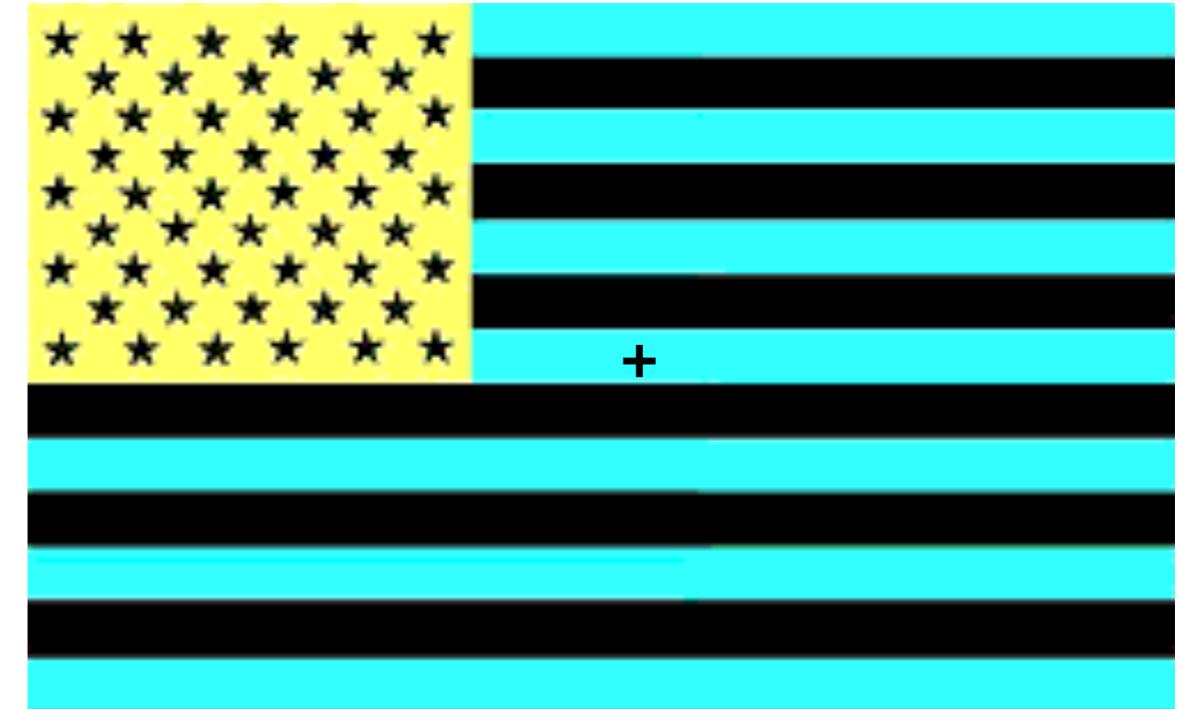
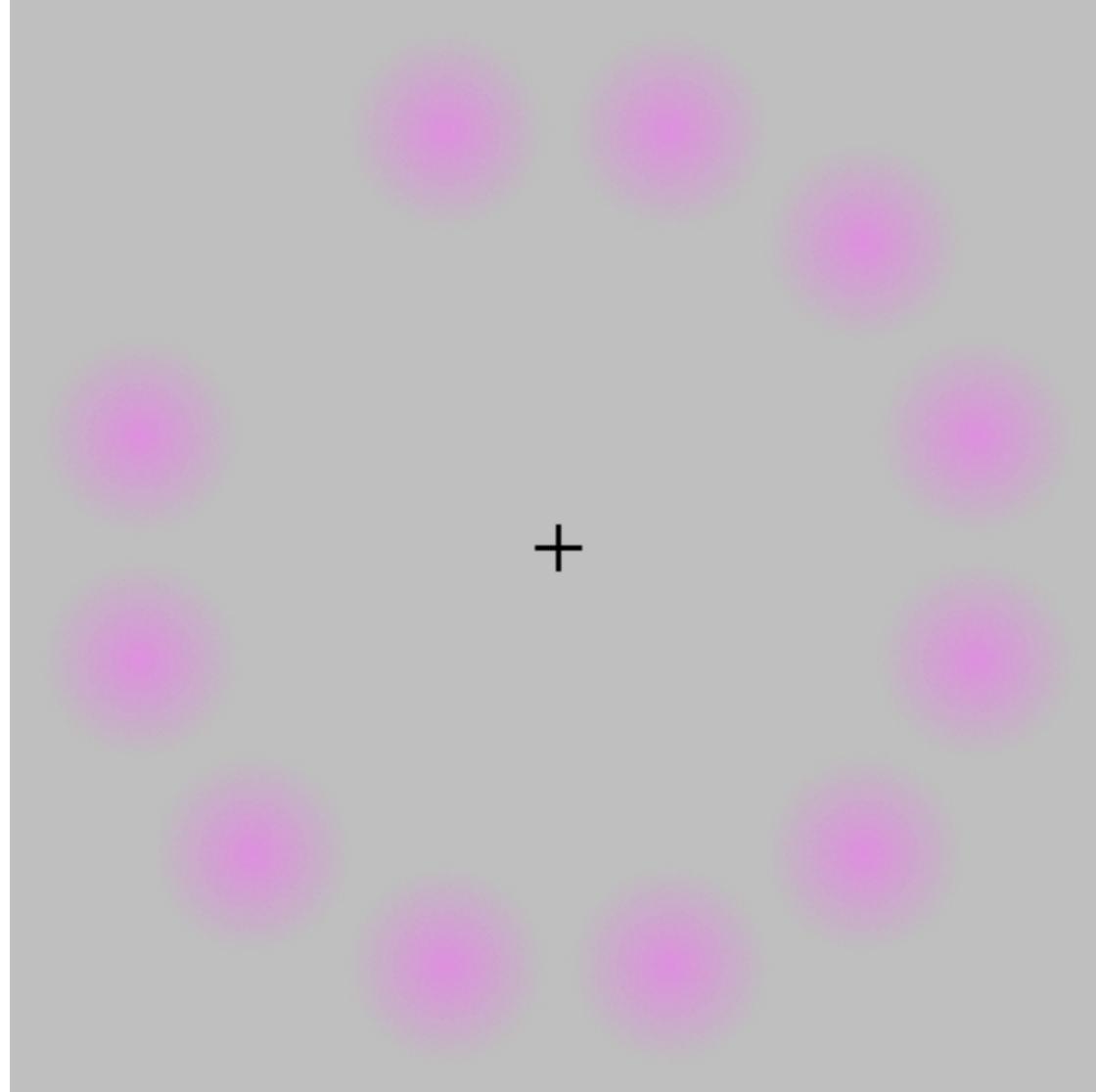
Opposition-process color illusions

Yellow-blue illusion



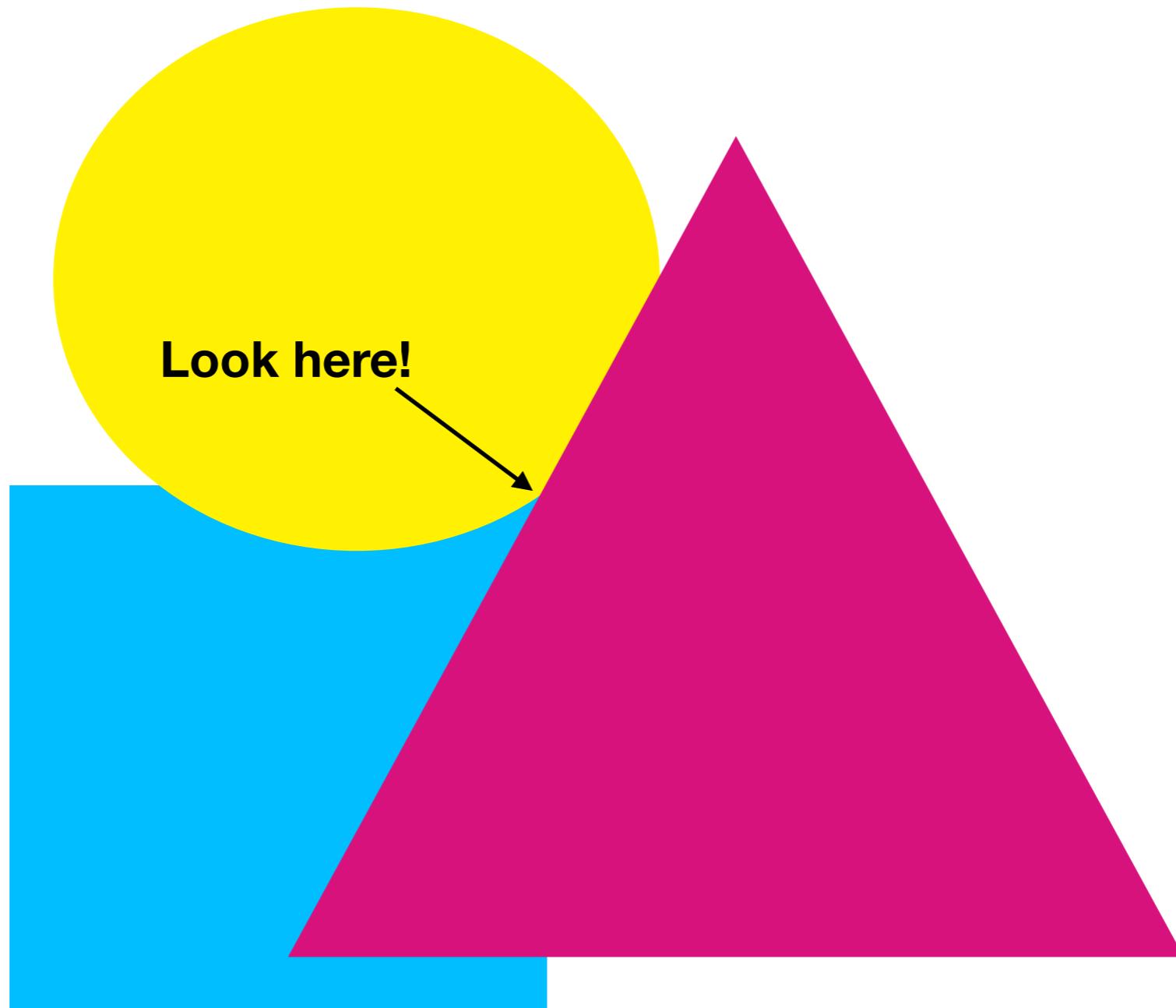
Complementary Color illusions

“Lilac Chaser”

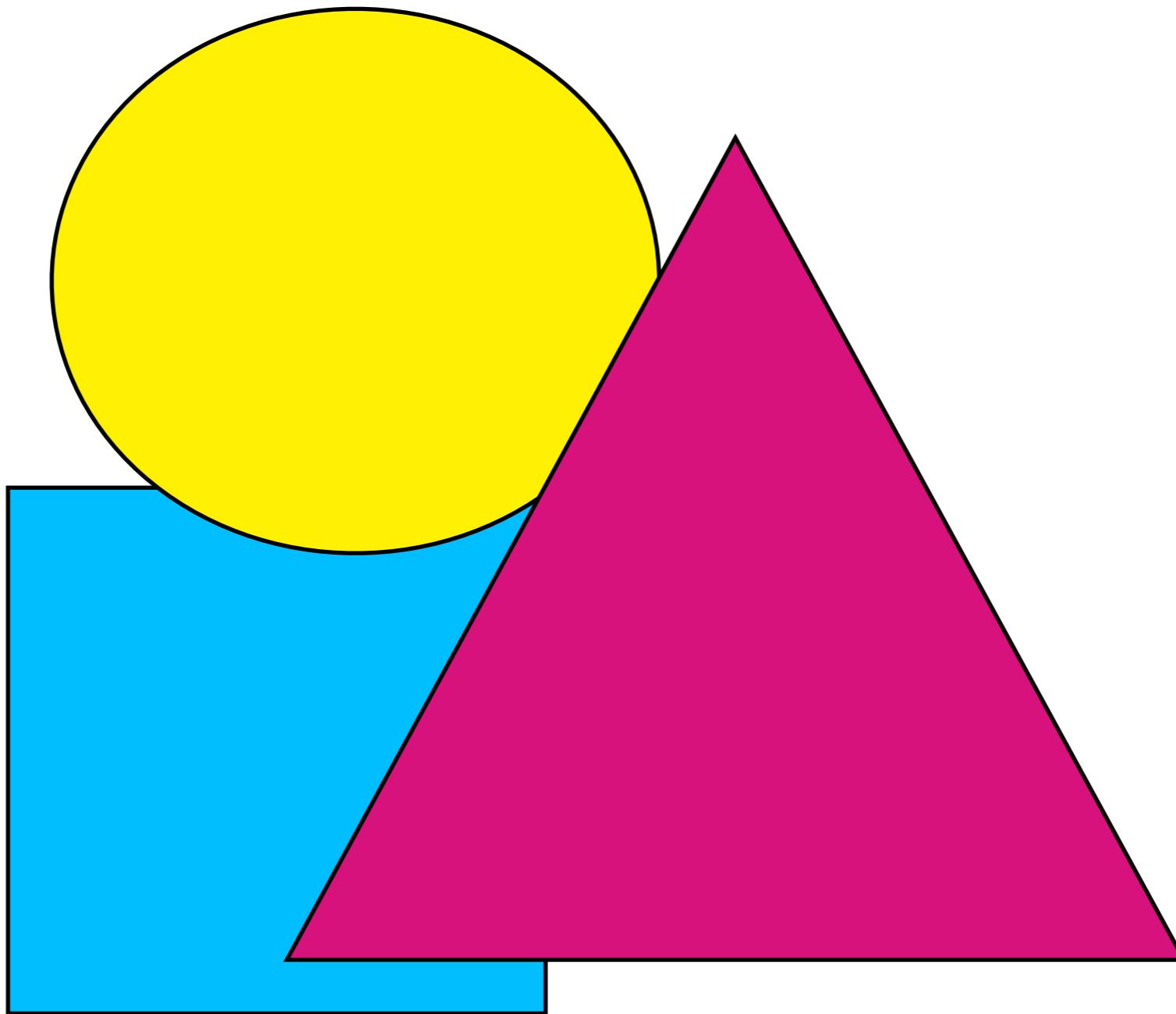


[https://en.wikipedia.org/wiki/
Visual adaptation](https://en.wikipedia.org/wiki/Visual_adaptation)

Complementary Color illusions

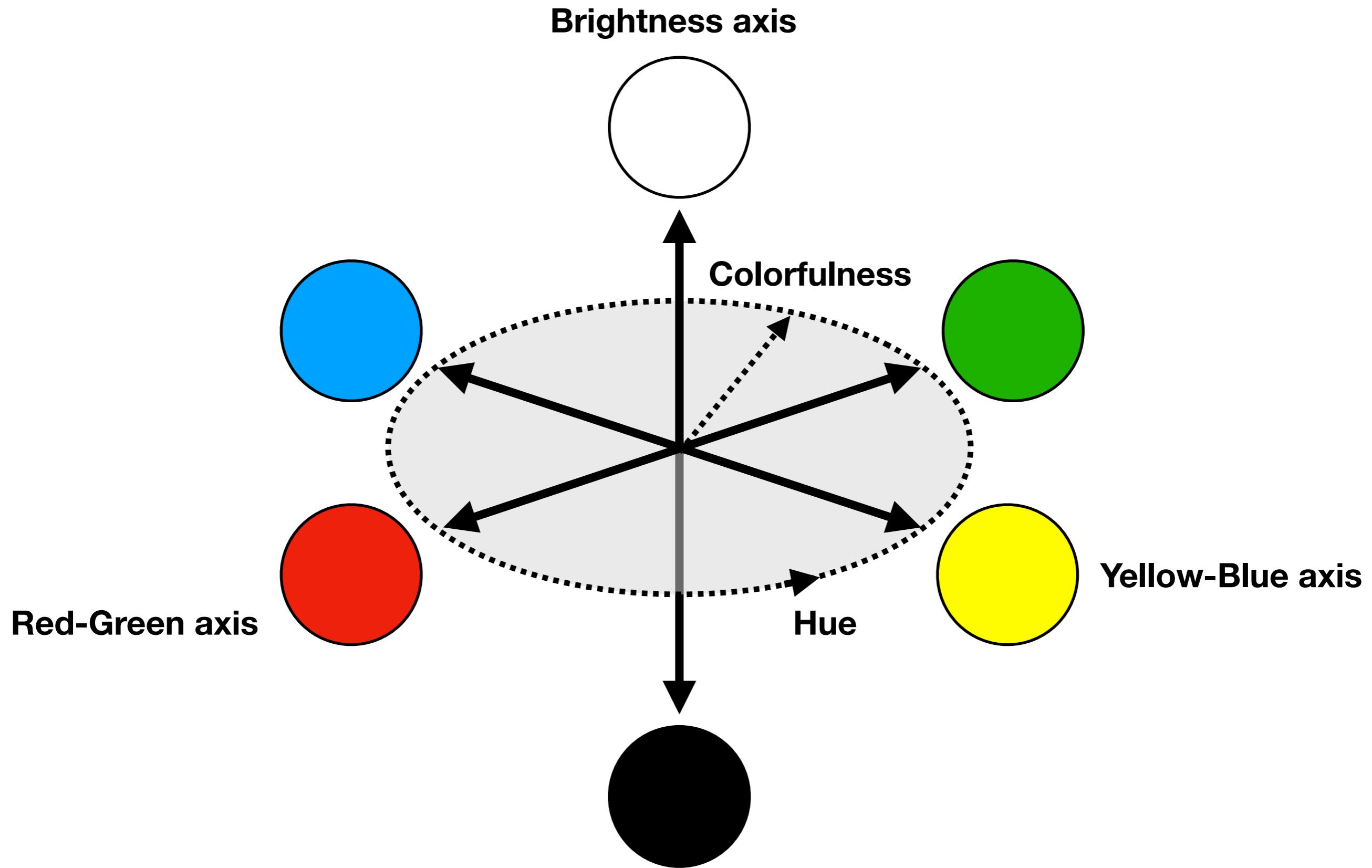


Complementary Color illusions



Livingstone 2014 reproduction

Opponent-Process Theory of Sight

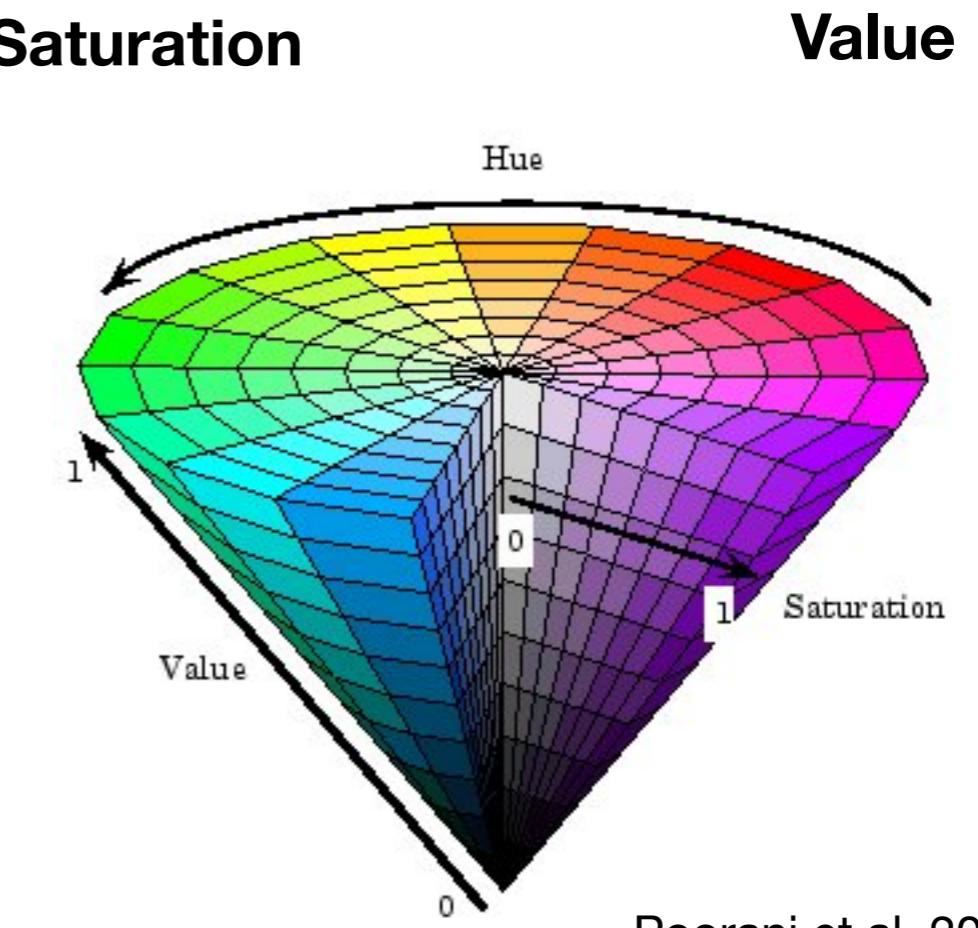
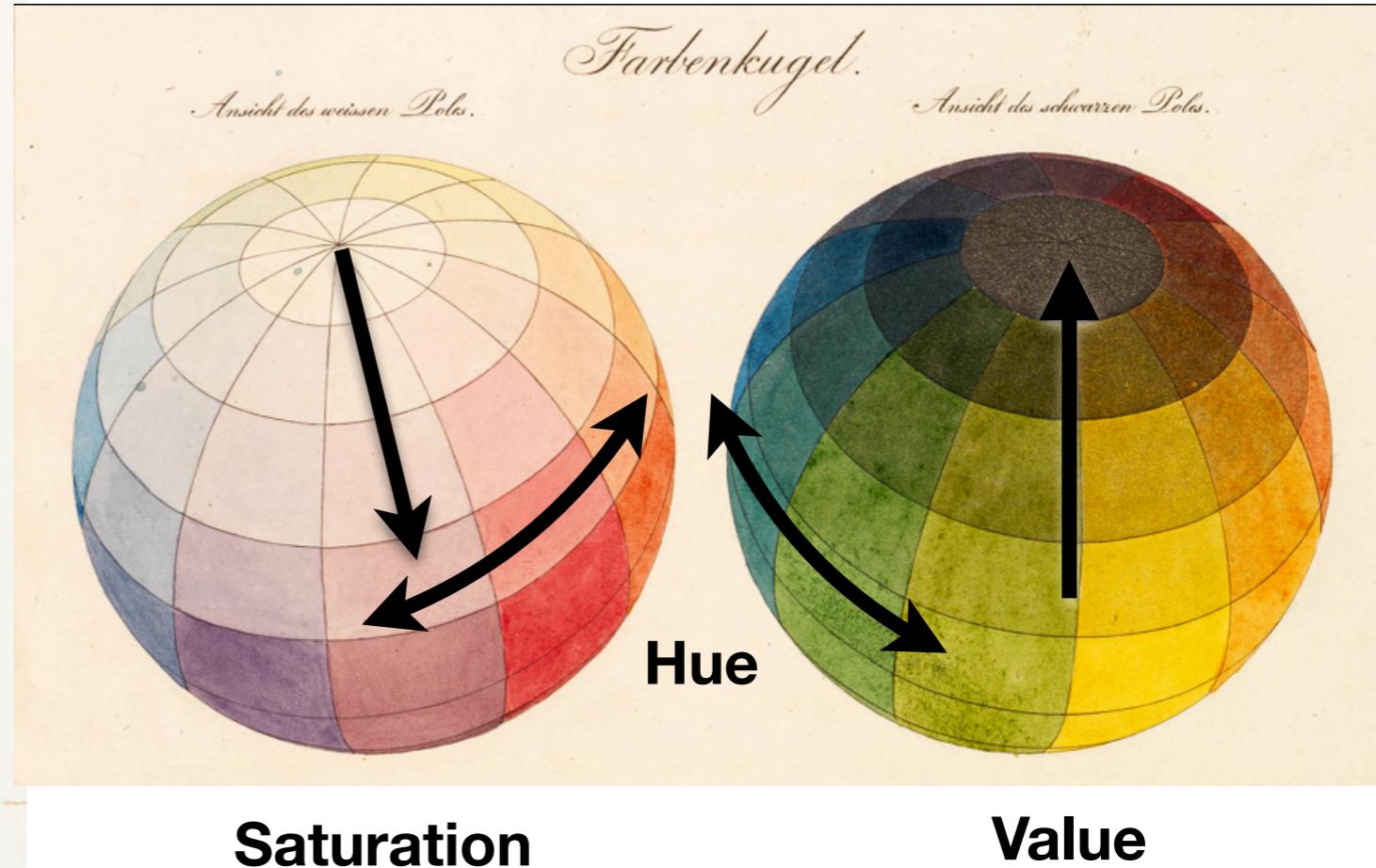
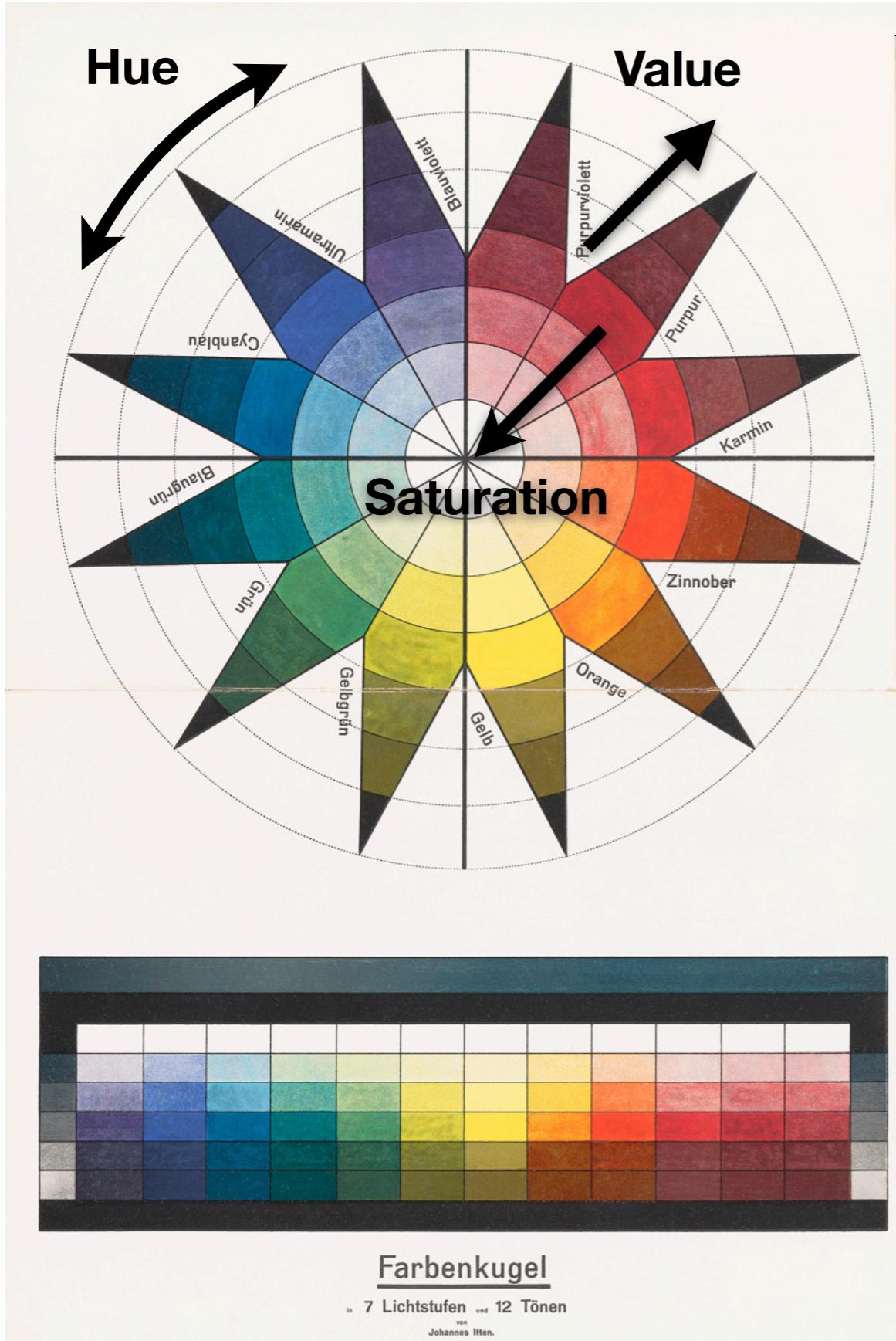


Complementary Color Theory

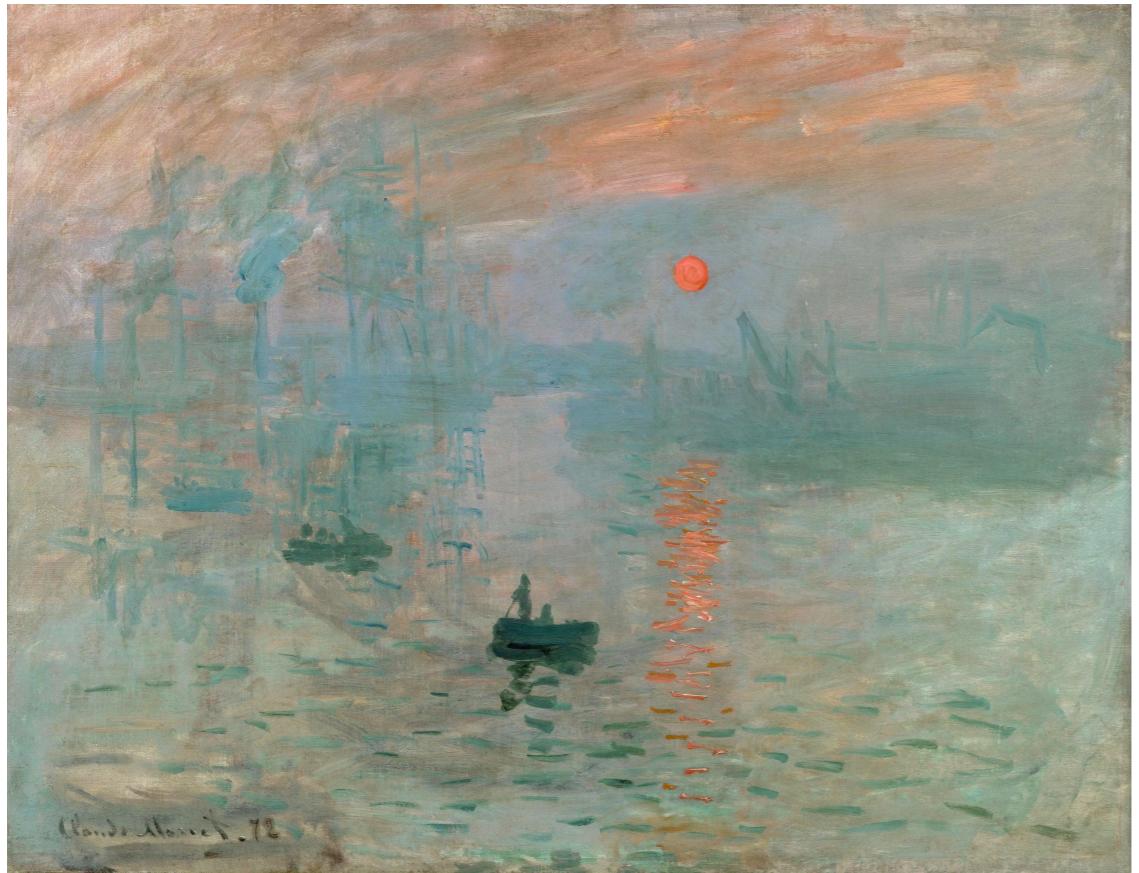


Johannes Itten, *Utopia*, The Getty Research Institute

Hue, Saturation, and Value



Be careful of equal luminance in hues!



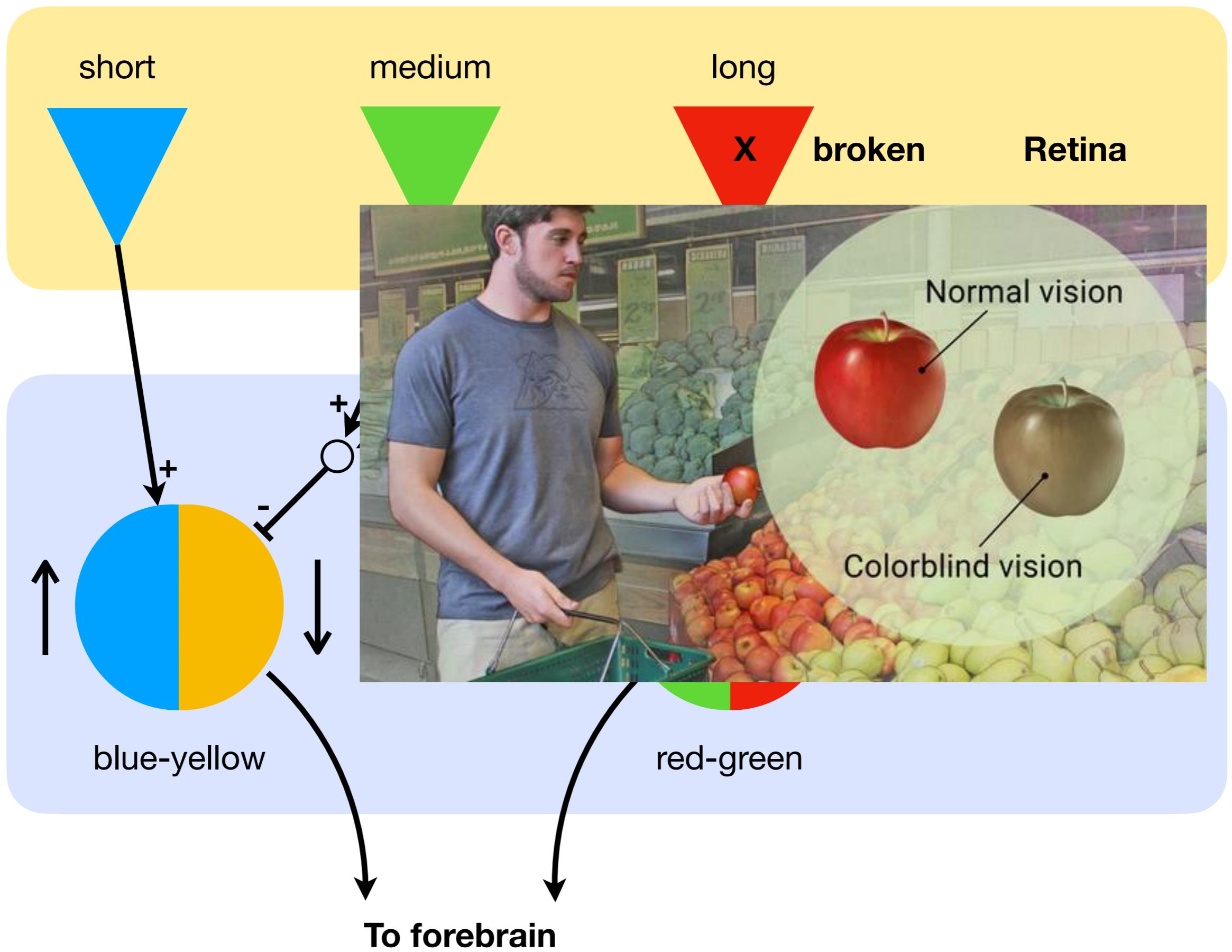
Text, lines, and other design elements should not be of equal or close luminance to the background. Near-equal luminance objects are very hard to pick out, and near-equal luminance text is very difficult to read. Use luminance contrast that is sufficiently different to avoid problems.

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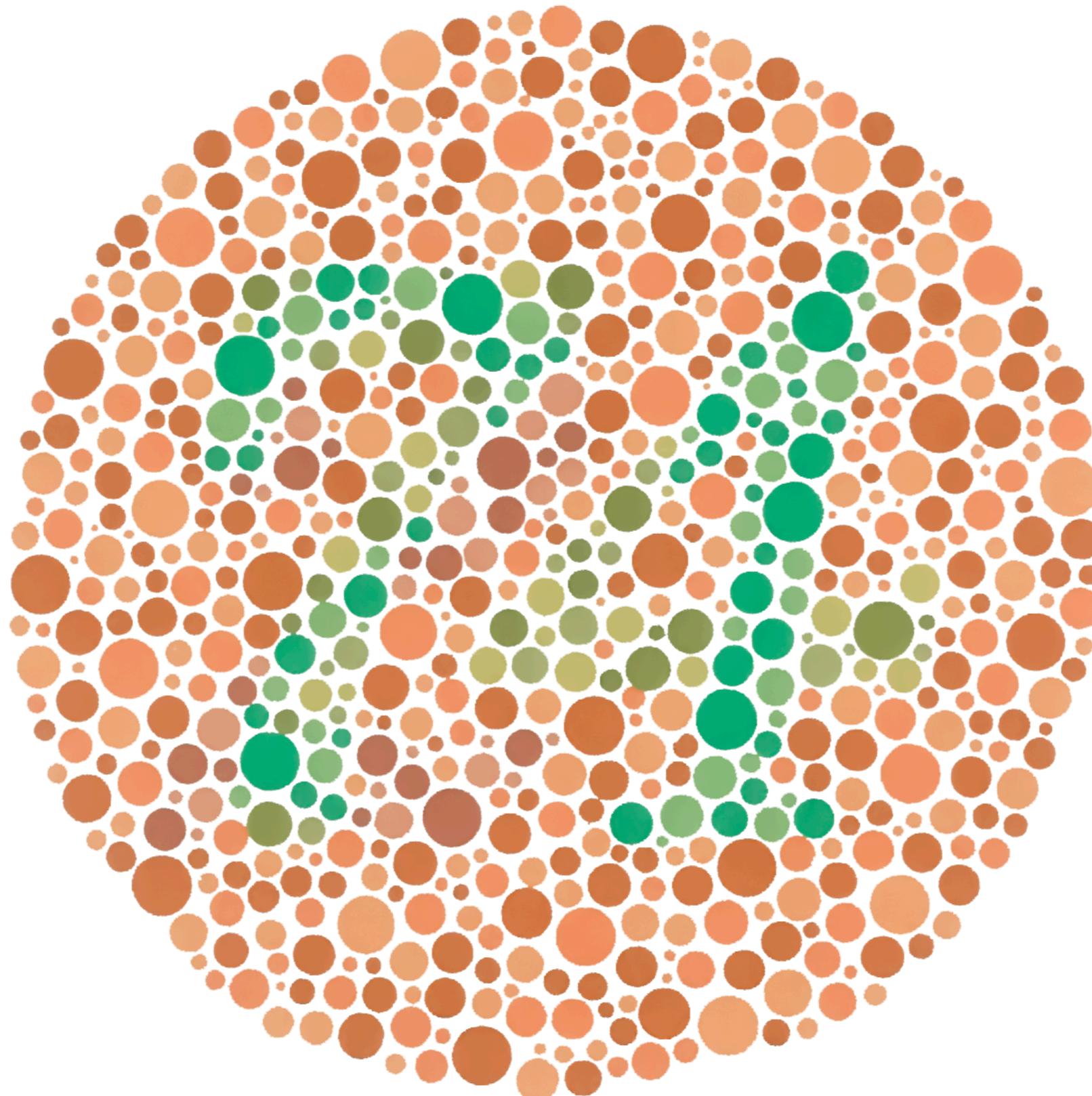
Be careful of equal luminance in hues!



What happens in color blindness?



Ishihara Plate 9 (Color blindness Test)



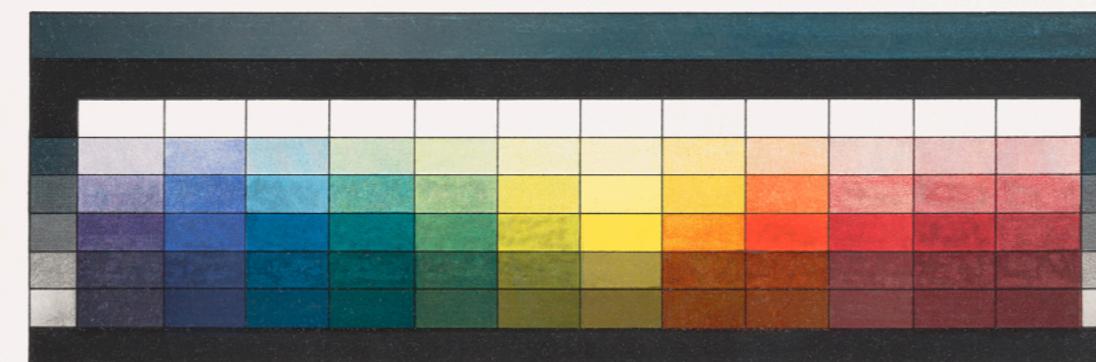
74 or 21

Colorblindness simulator: <https://www.color-blindness.com/coblis-color-blindness-simulator/>

The Dress



Group work: Reproduce the Bauhaus Color Wheel in R.



Farbenkugel

in 7 Lichtstufen und 12 Tönen
von
Johannes Itten.

Johannes Itten, *Utopia*, The Getty Research Institute

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