

2018-02-26 Color

PSY 525.001 • Vision Science • 2018 Spring

Rick Gilmore

2018-02-26 11:28:15

Today's topics

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Color



Reminder, project proposal due Wednesday, 2/28

A tale of two theories

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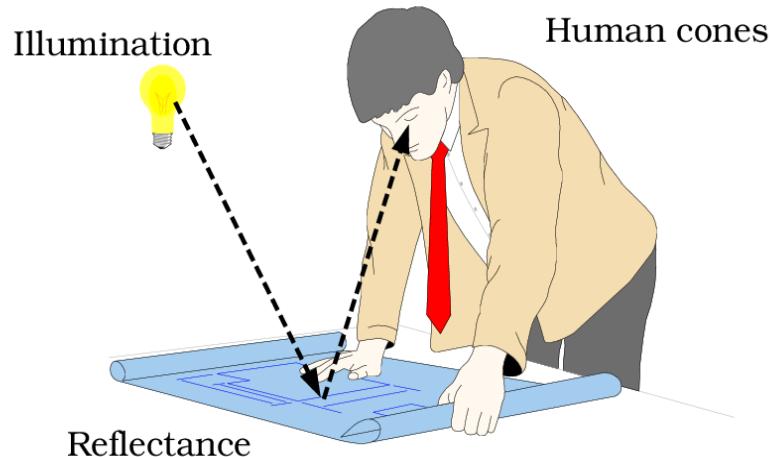
Or a theoretical **dialectic**

A tale of two theories

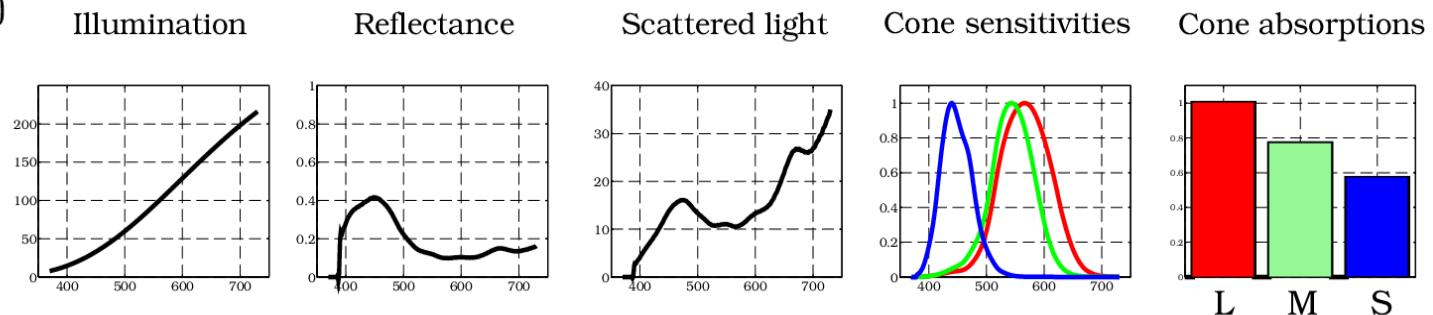
Or a theoretical **dialectic**

thesis, antithesis -> synthesis

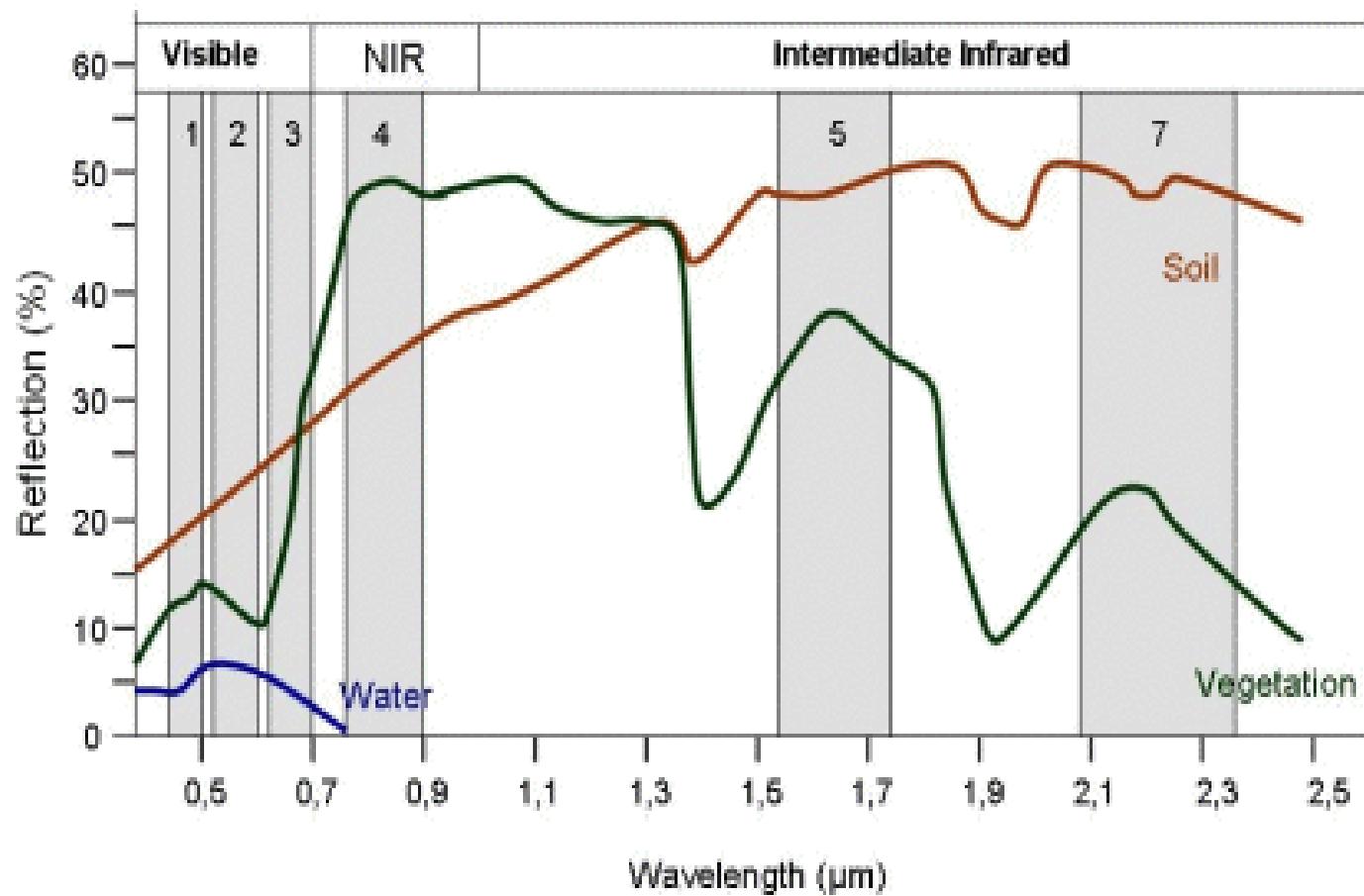
(a)



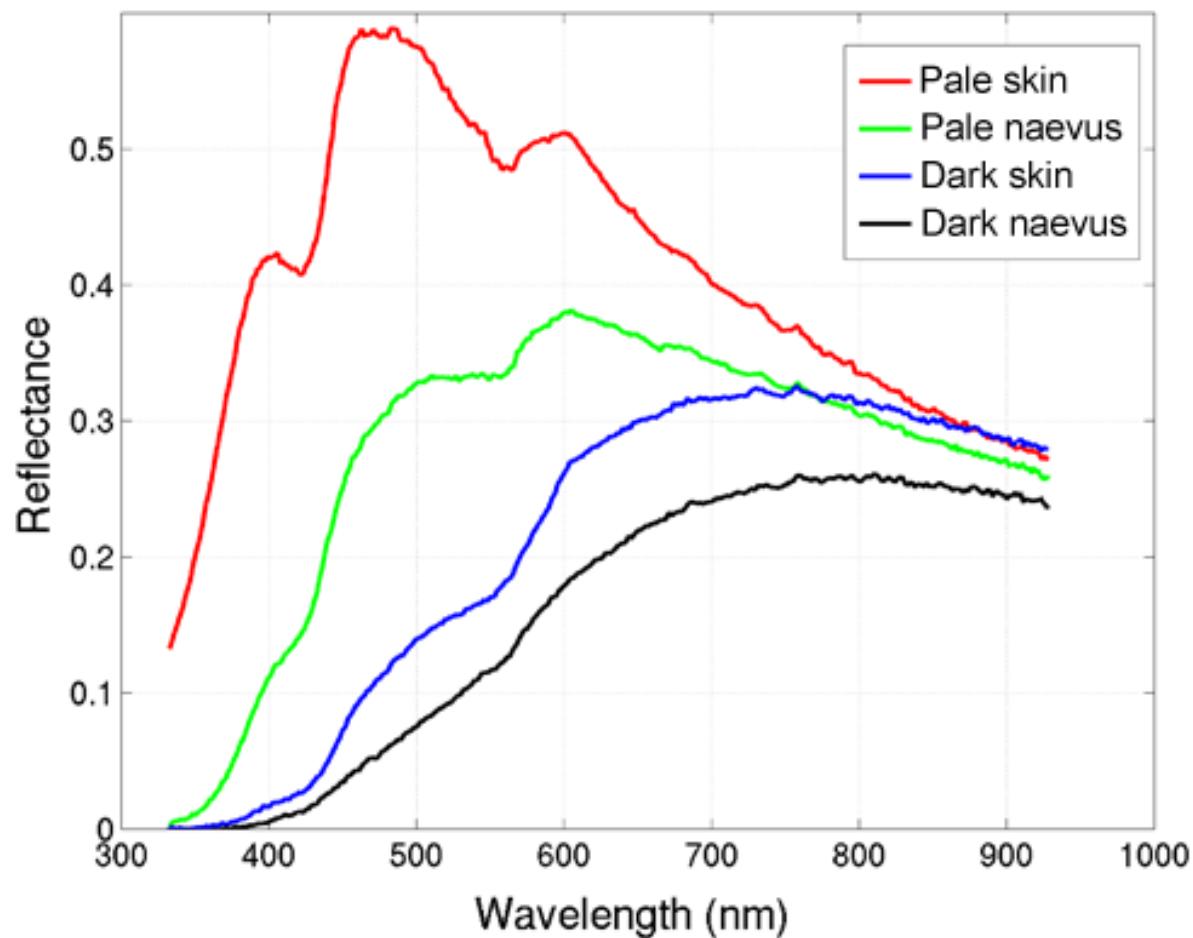
(b)

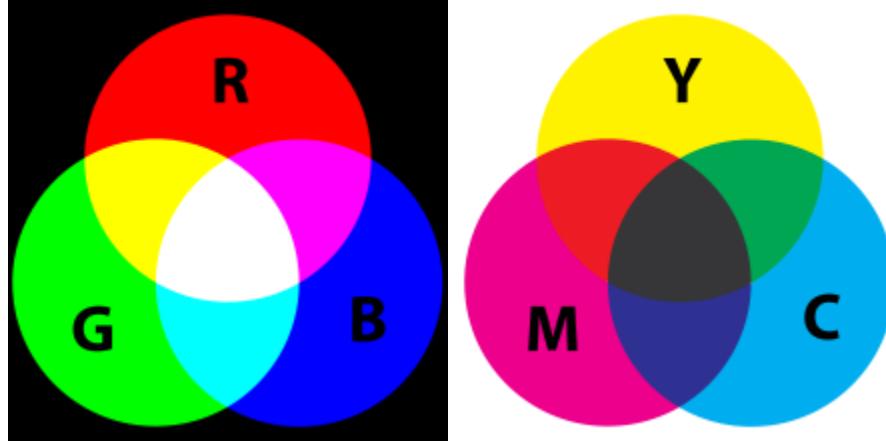


The problem of wavelength estimation

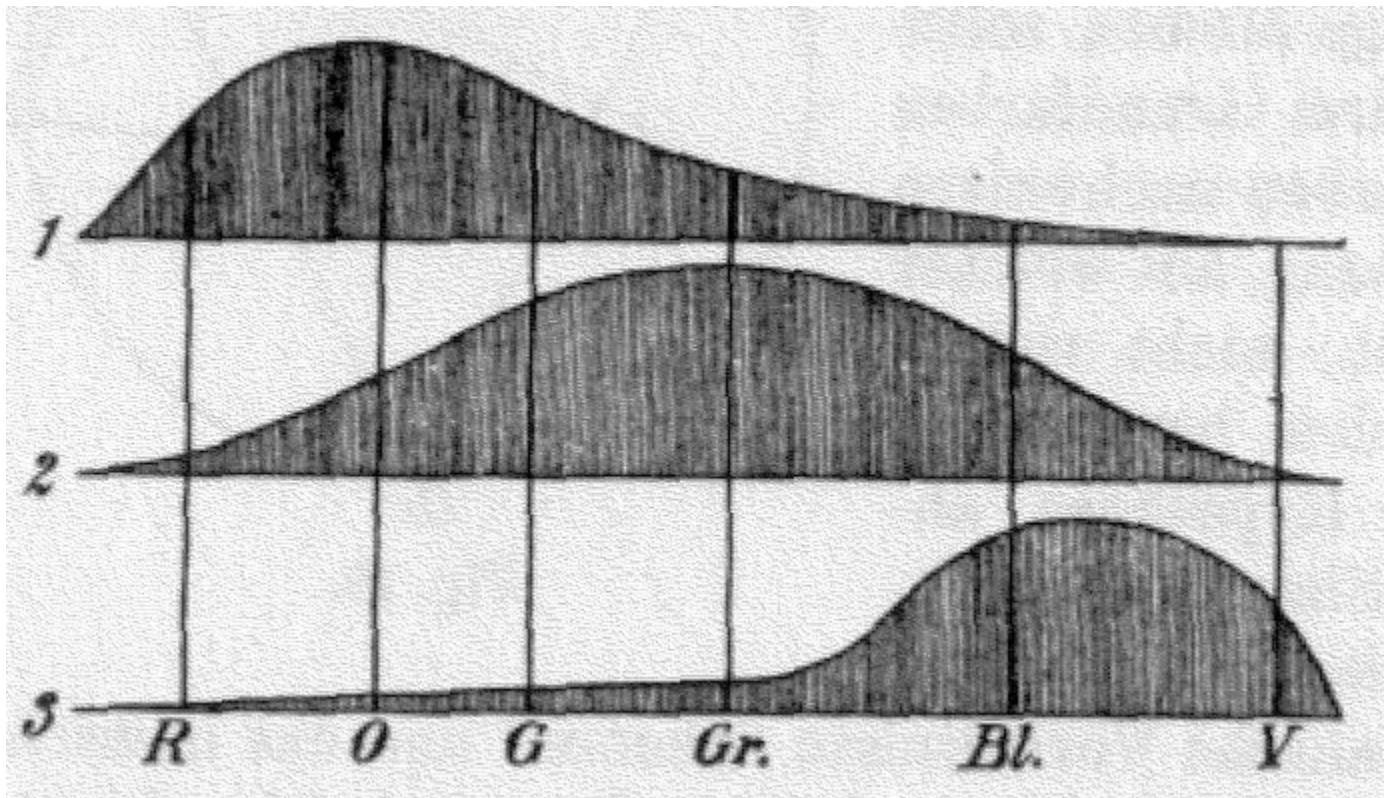


Reflectance spectra

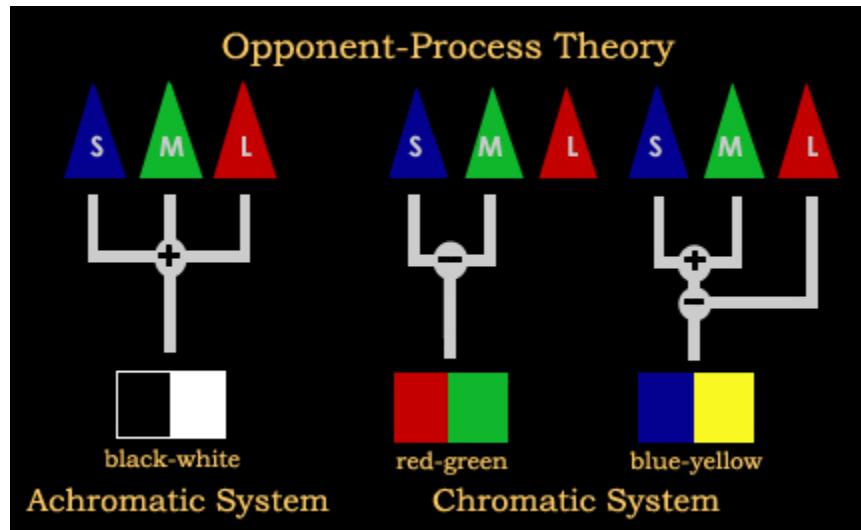




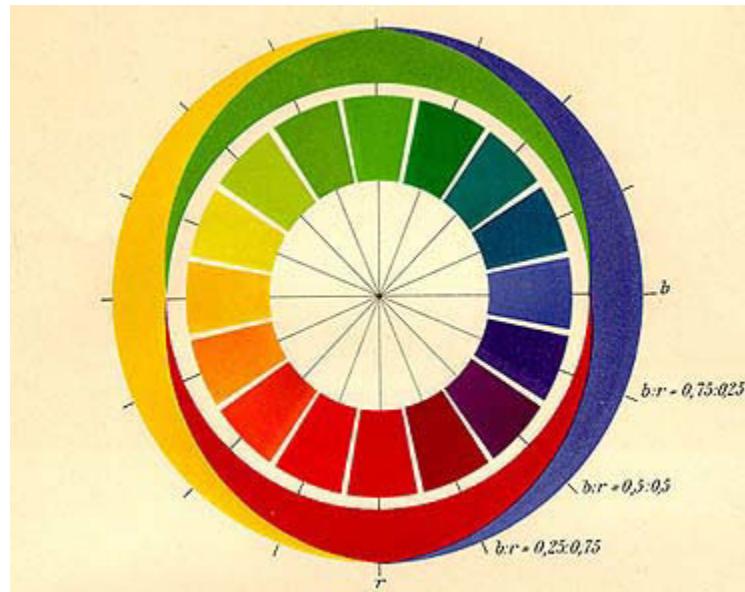
Trichromatic theory (Young/Helmholtz)



By Hermann von Helmholtz - [Hermann von Helmholtz](#): Gesammelte Schriften III.2, Olms-Weidmann, 2003, Fig. 21, Public Domain, [Link](#)

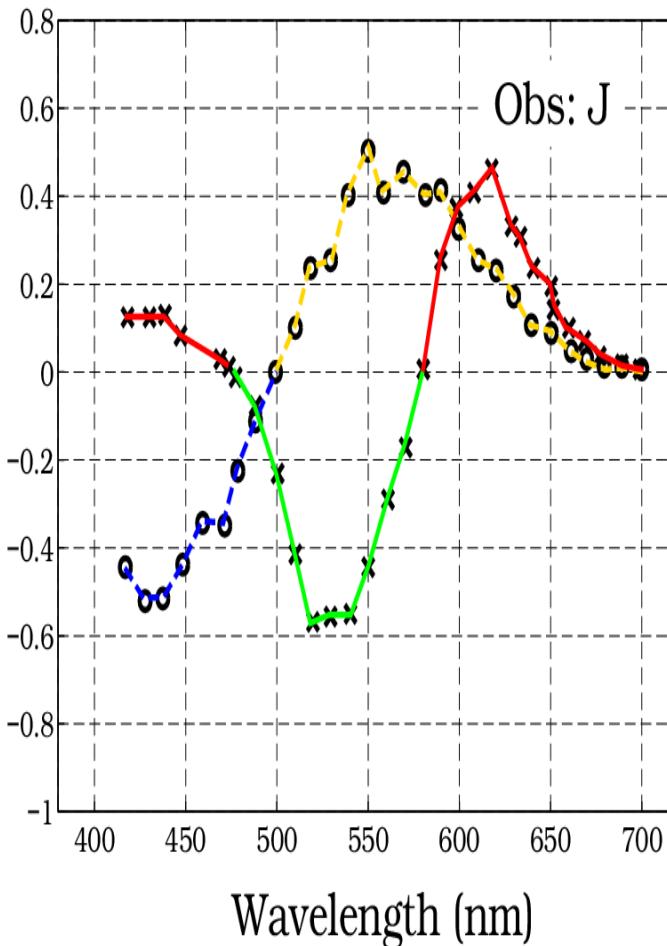
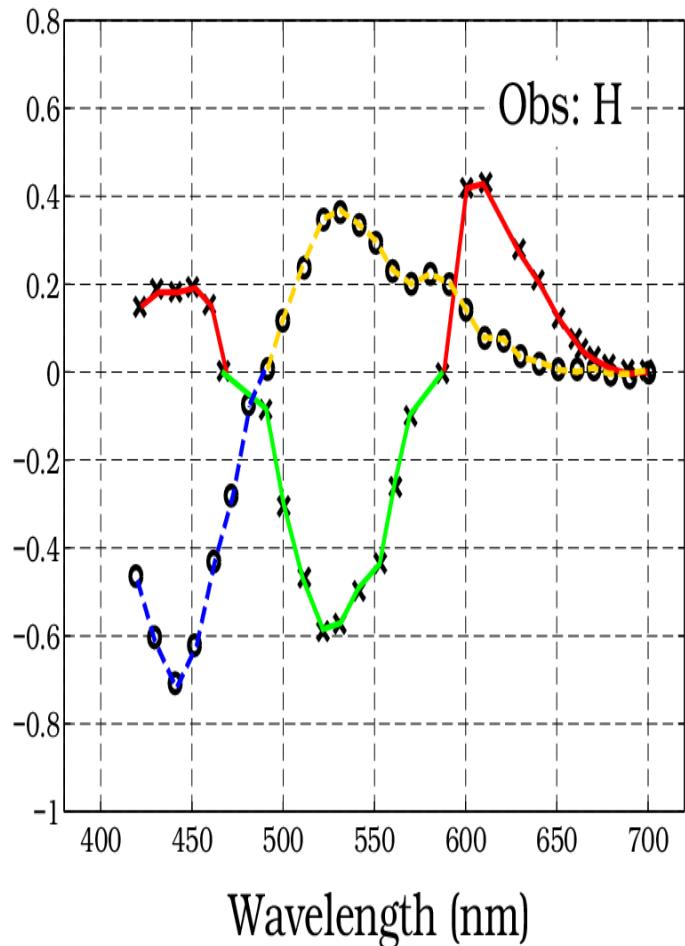


Opponent-process theory (Ewald Hering)



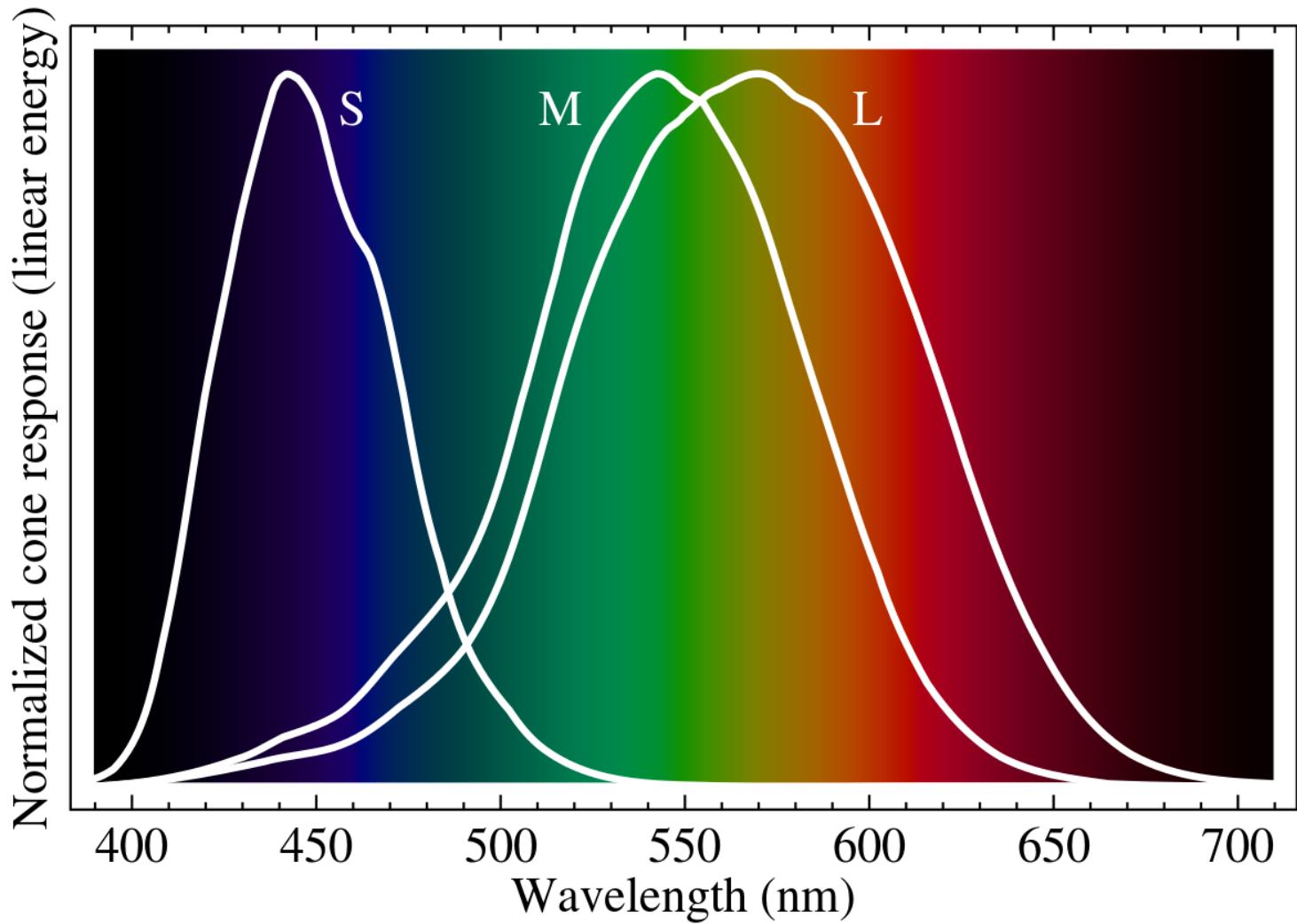
Opponent-process theory (Ewald Hering)

How to reconcile?

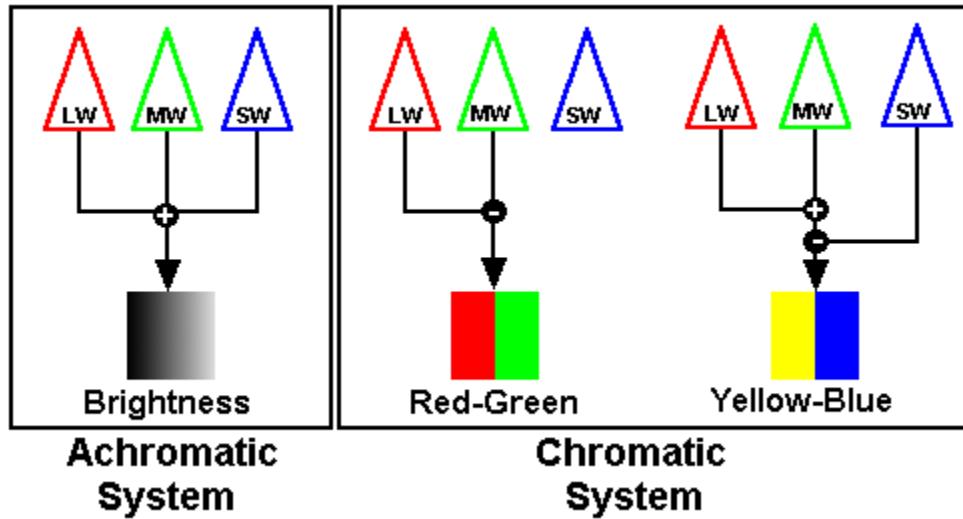


Hurvich & Jameson (1957) hue cancelling

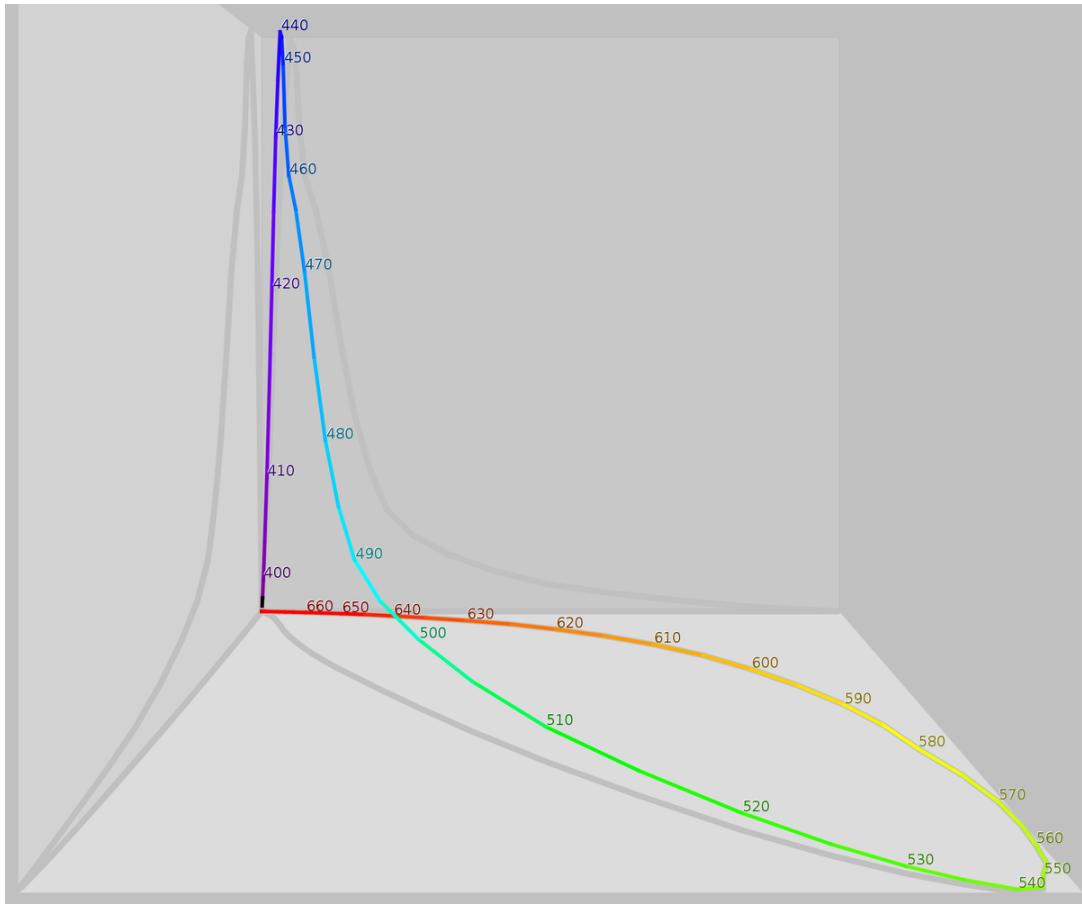
A physiological reconciliation



By BenRG - Own work, Public Domain, [Link](#)



Synthesis



By KoenB - self-made Java program displaying an interpretation of public domain figures, Public Domain, [Link](#)

Ganglion and bipolar cells of trivariant color vision

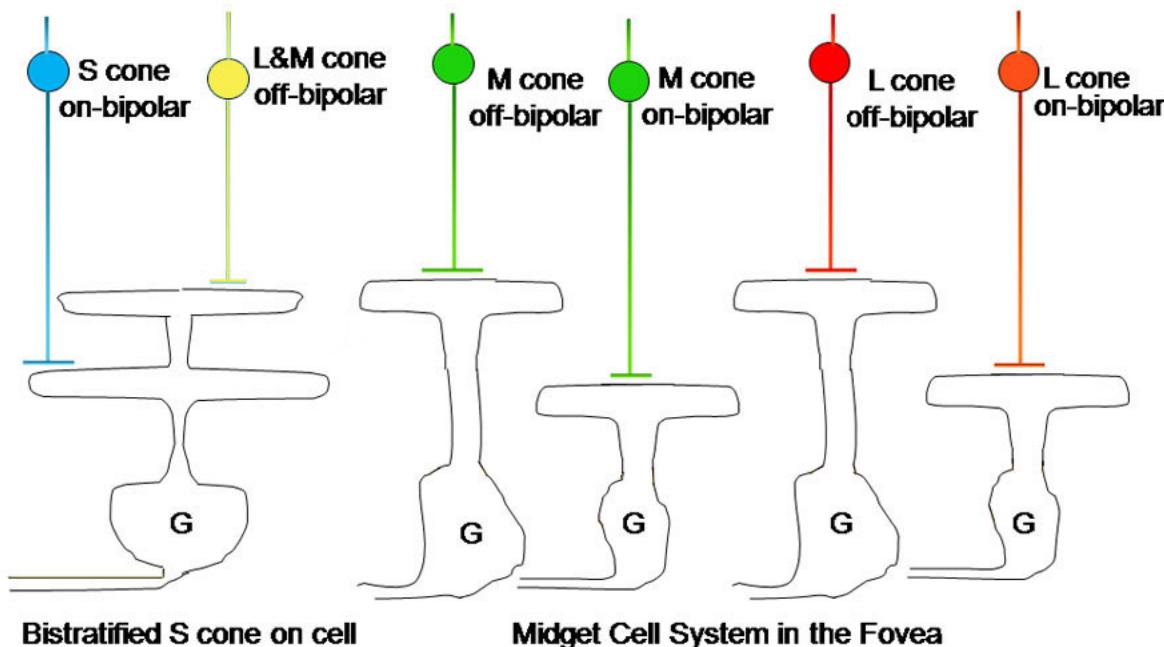
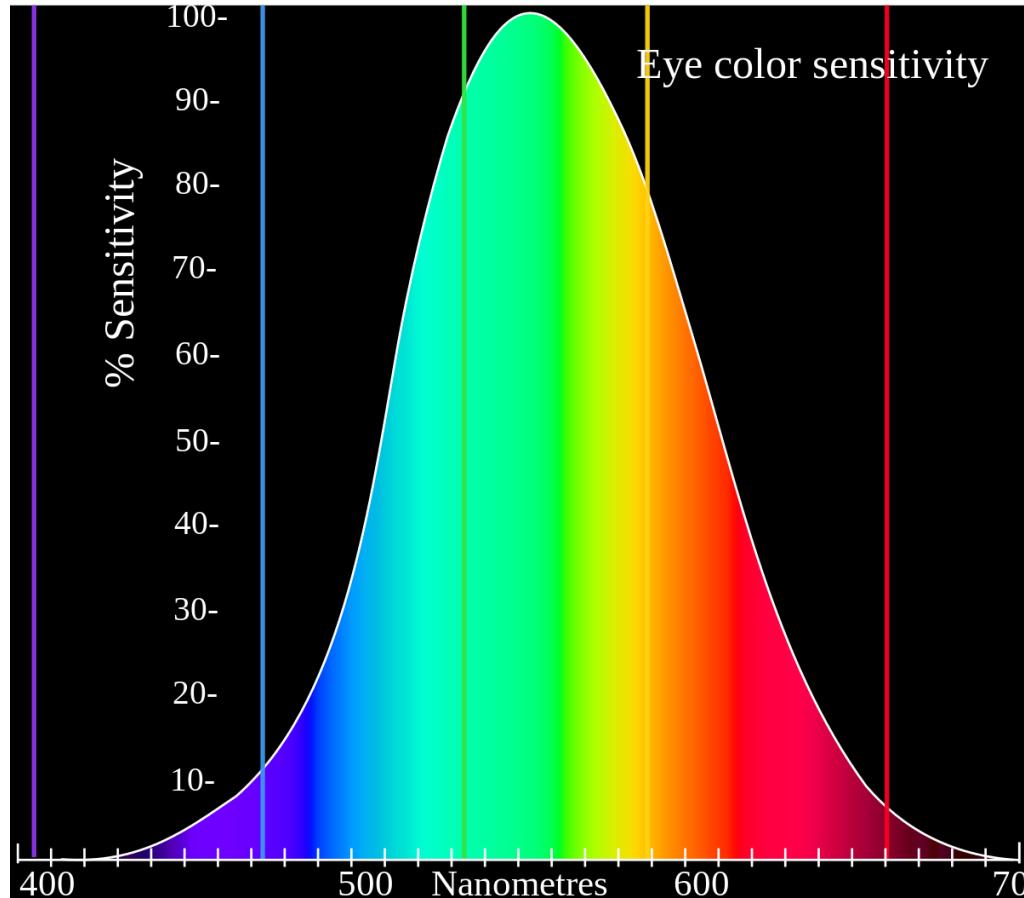


Fig. 16 shows four varieties of ganglion cells considered to mediate trivariant color vision in primates. The L cone on/ S cone off cells reported to be in the koniocellular layers of the lateral geniculate nucleus are not included here.

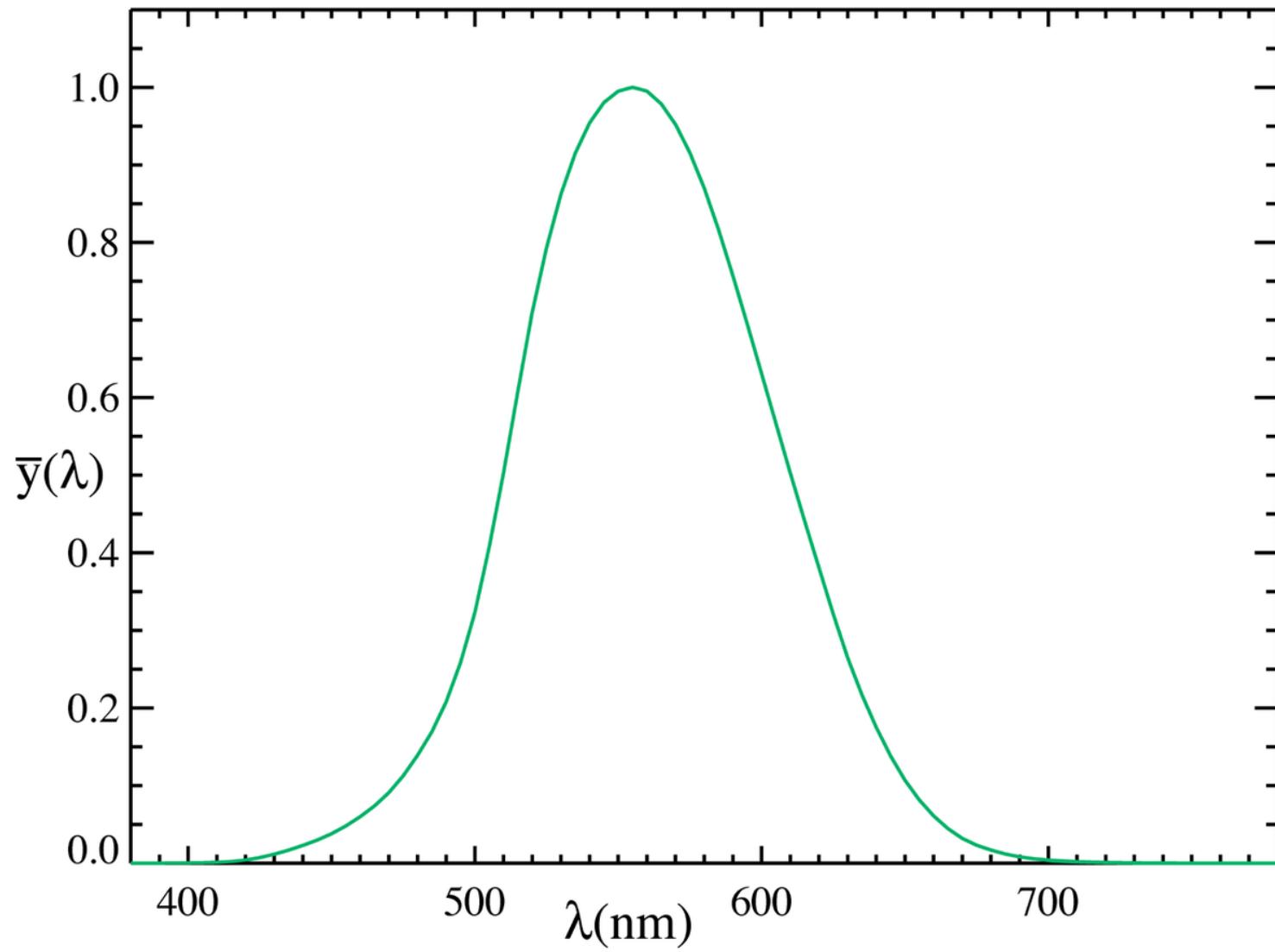
Retinal circuitry for color opponency

Consequences...

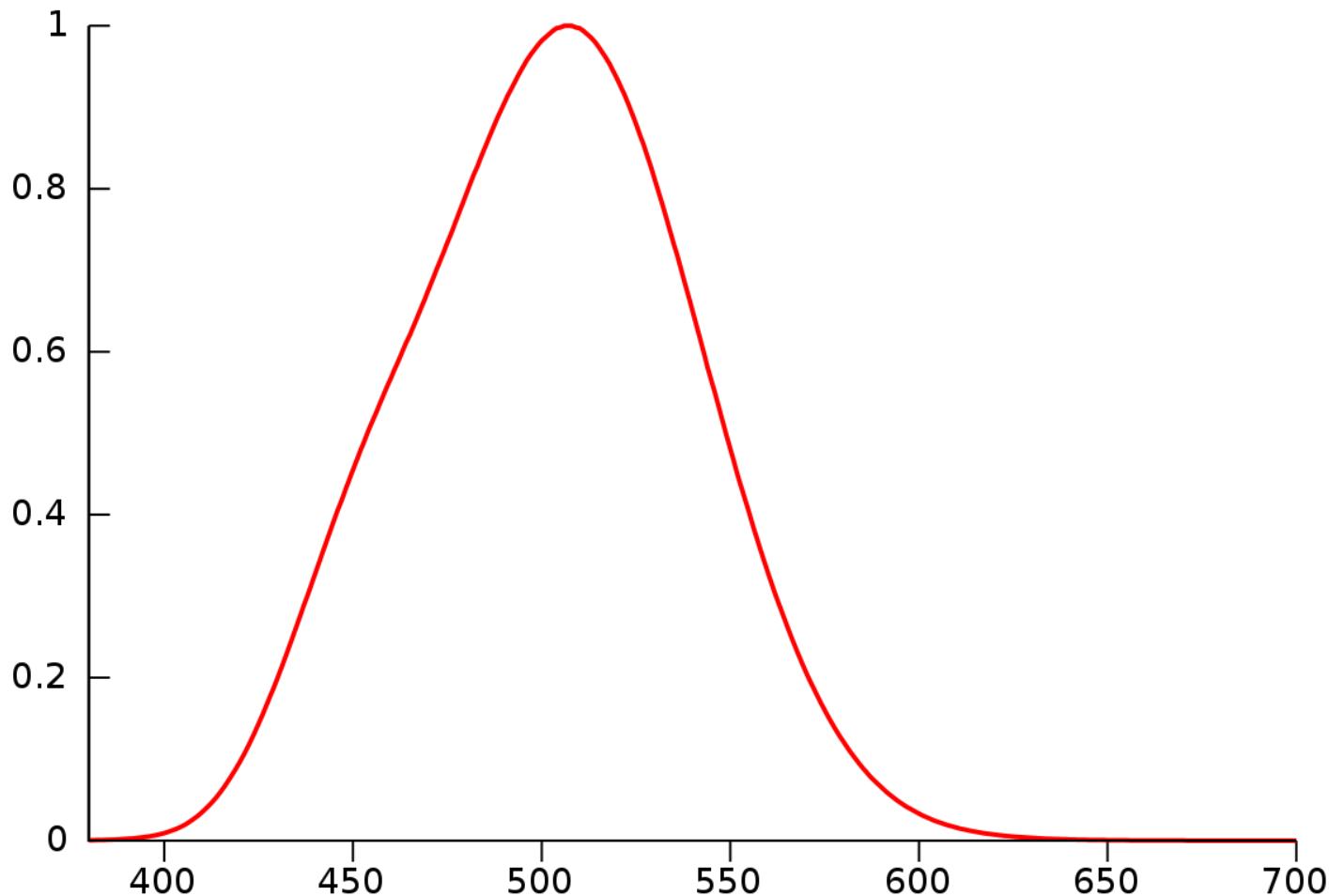


By [Skatebiker](#), vector by [Adam Rędzikowski](#) - File:Evesensitivity.svg,
vectorised, CC BY-SA 3.0, [Link](#)

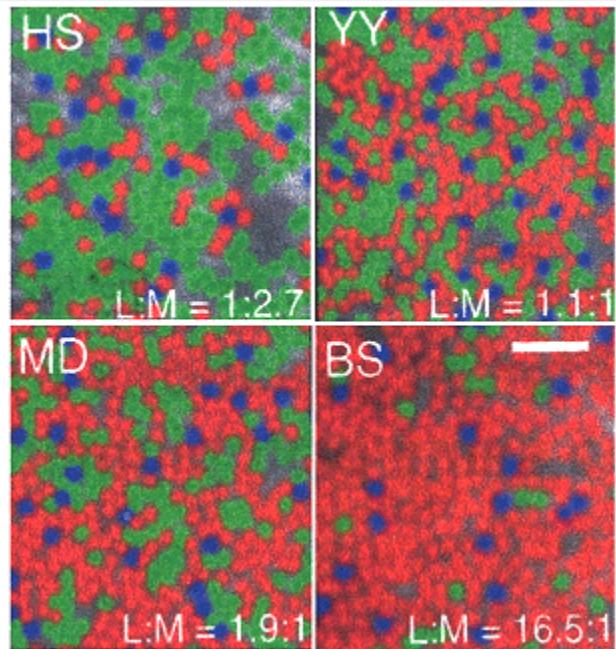
Photopic (day/bright light) sensitivity



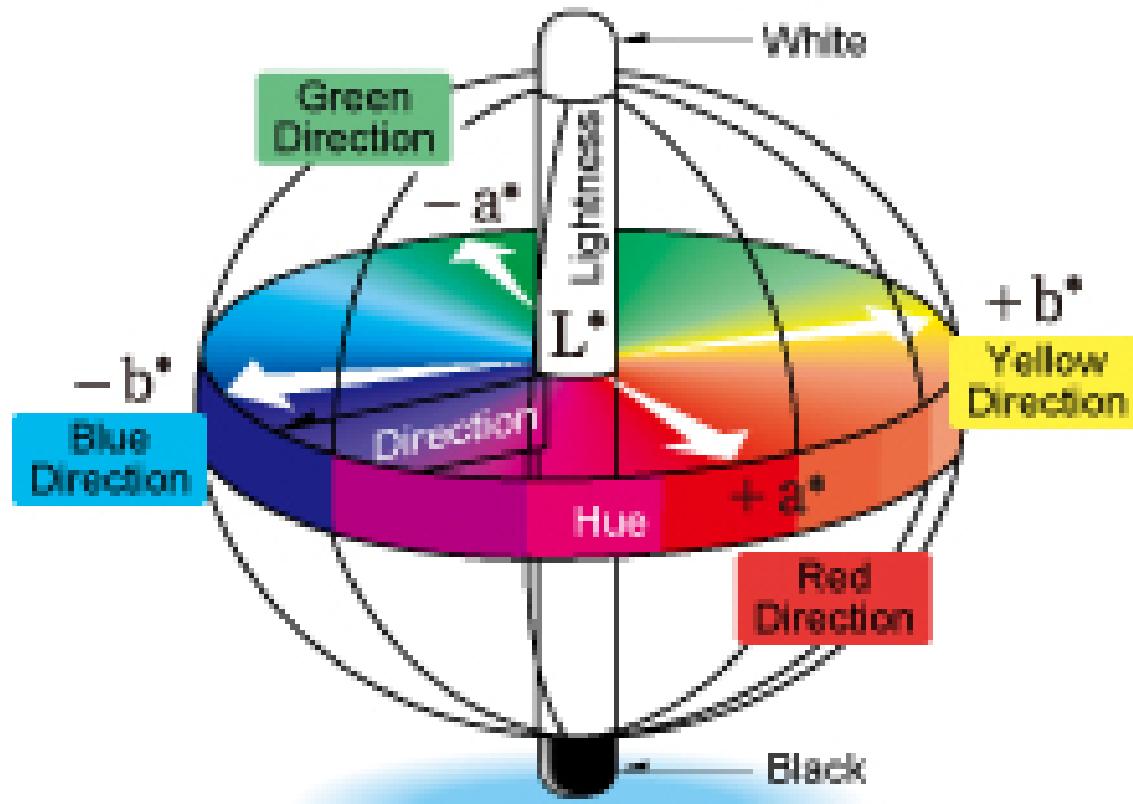
Public Domain, [Link](#)



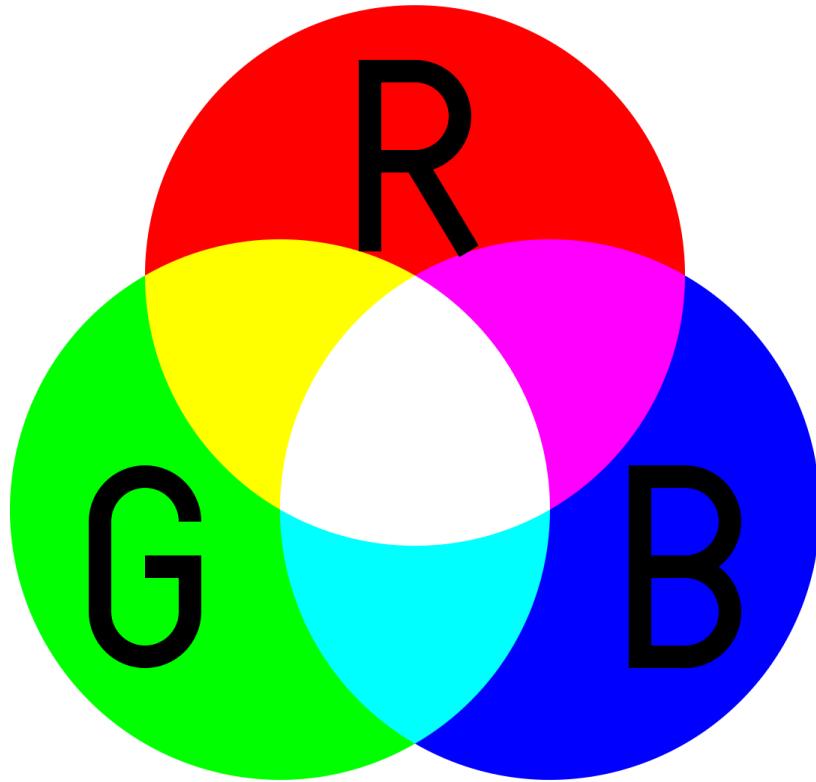
By [Designed to match original bitmap version Image:Scotopic1.png](#) by
[User:en:Dicklyon](#) Gnuplot vector version by [User:Qef](#) - Data from
<http://www.cvrl.org/database/text/lum/scvl.htm>, Public Domain, [Link](#)



Individual differences in L vs. M cone distribution

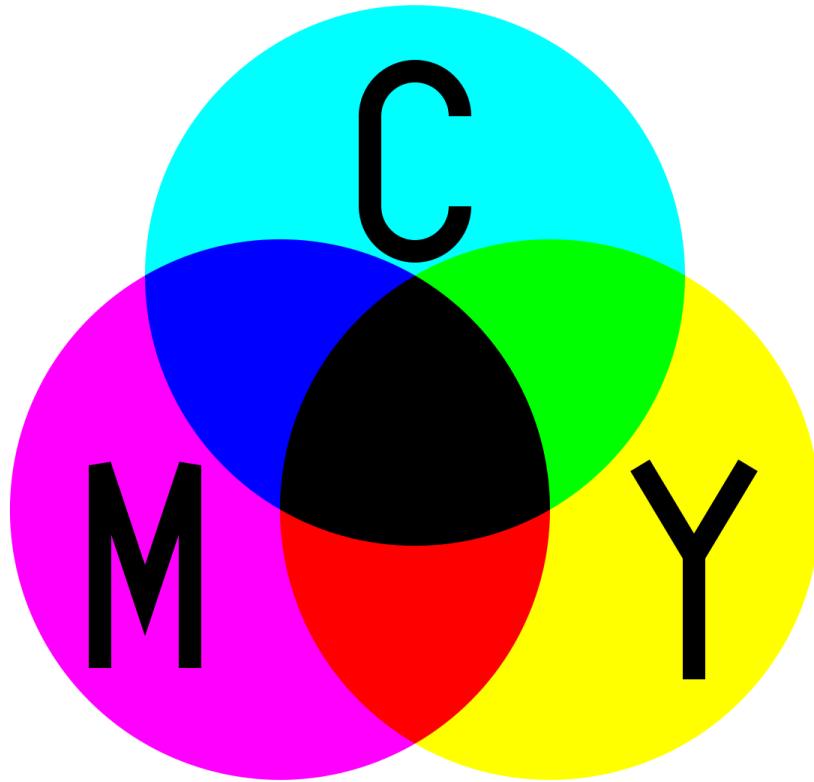


3 parameter color space



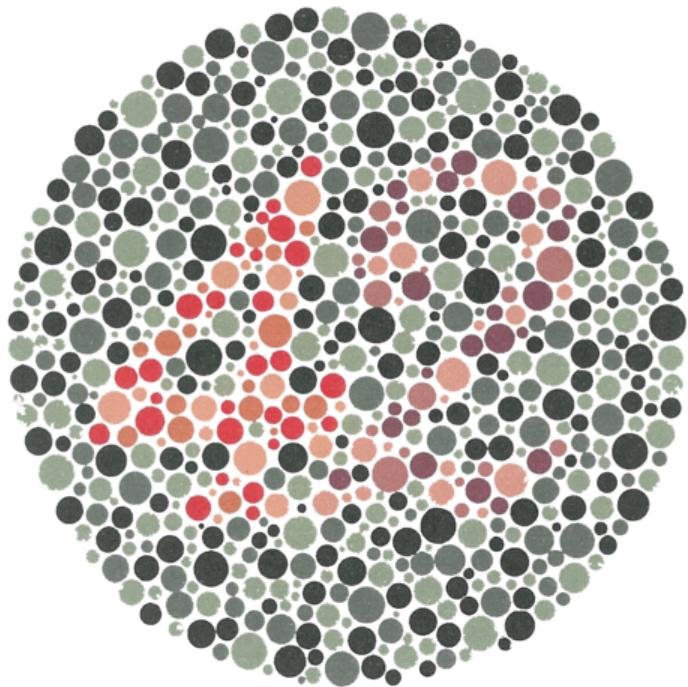
By [SharkD](#) at [English Wikipedia](#) Later versions were uploaded by [Jacobolus](#) at [en.wikipedia](#). - Transferred from [en.wikipedia](#) to Commons., Public Domain, [Link](#)

RGB space (for computer monitors)

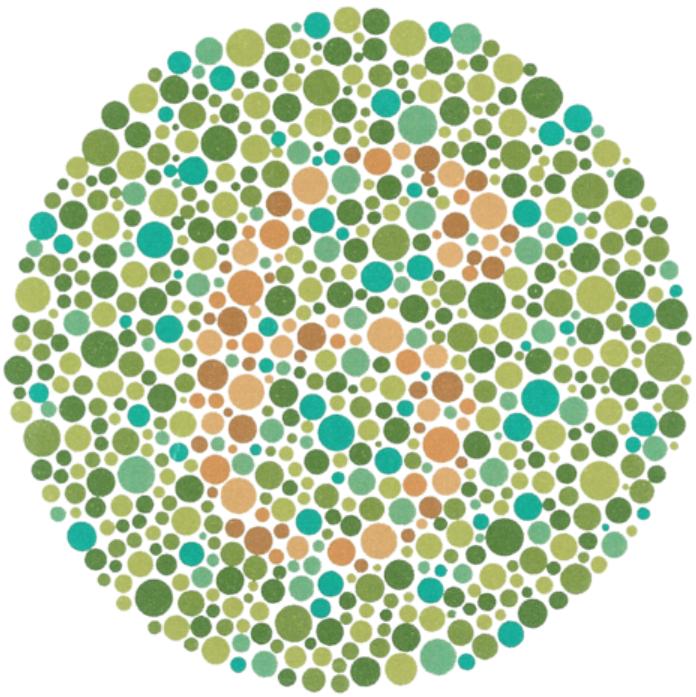


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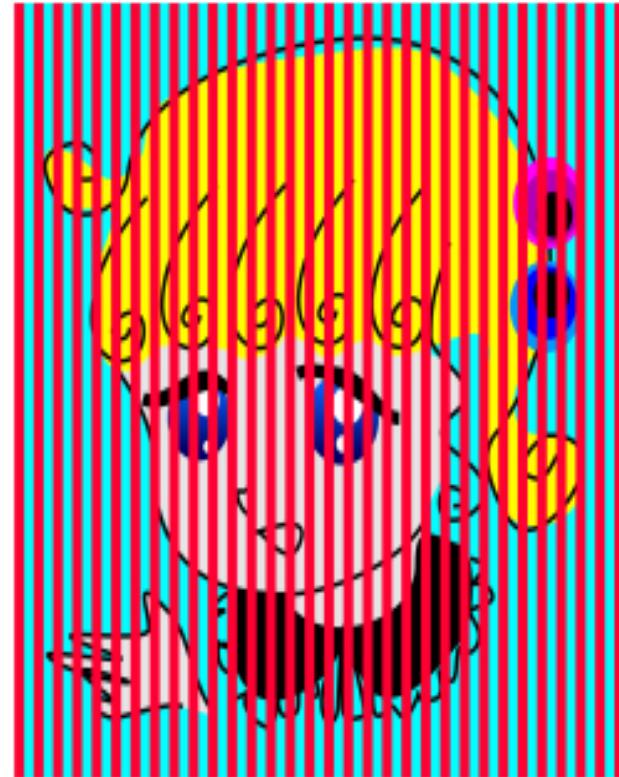
CMYK (cyan, magenta, yellow, black) space for printing



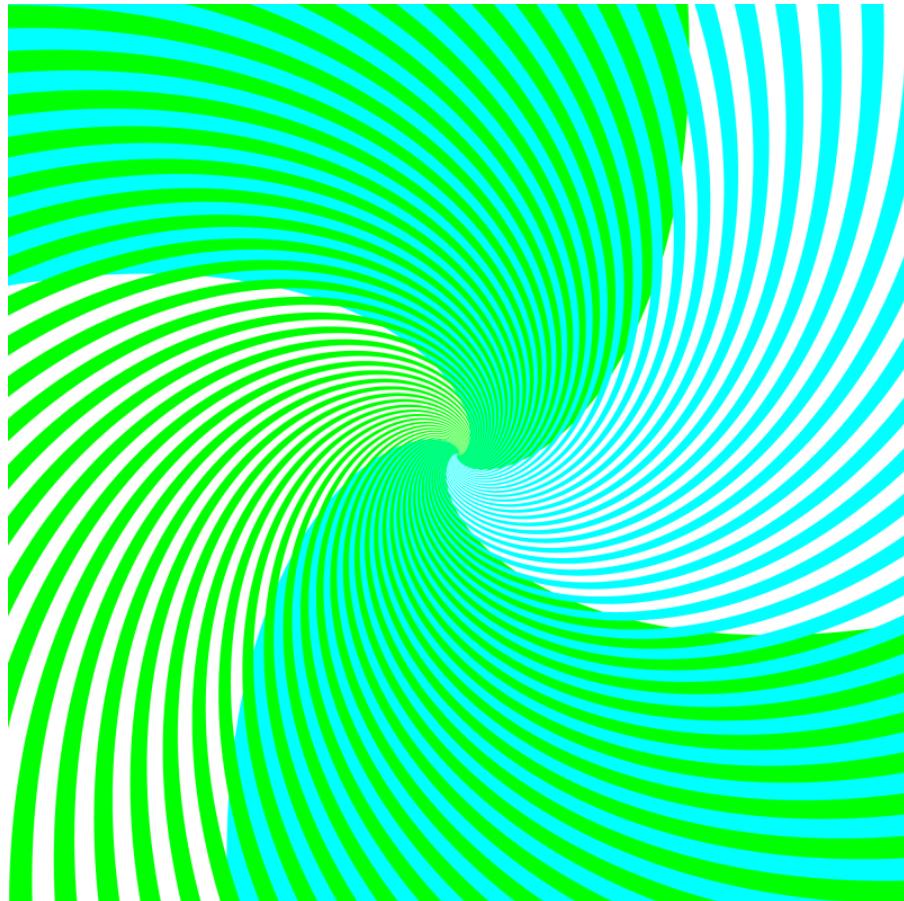
Tests for color-blindness



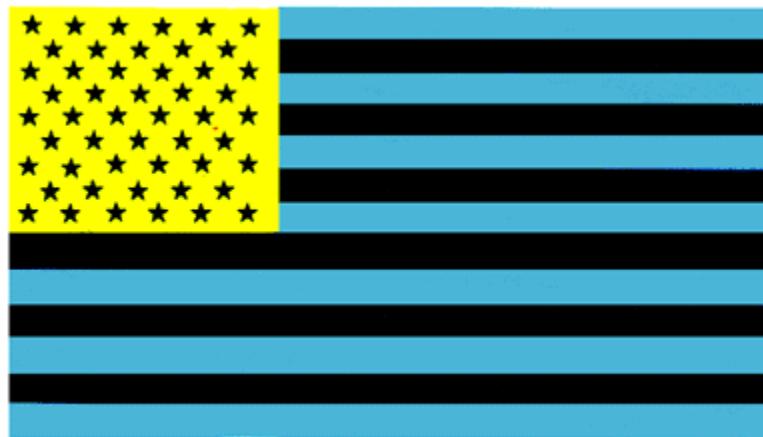
Tests for color-blindness

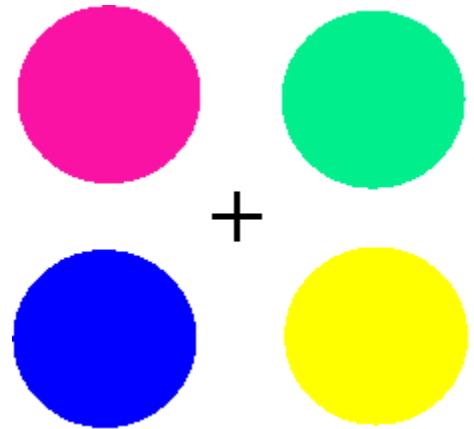


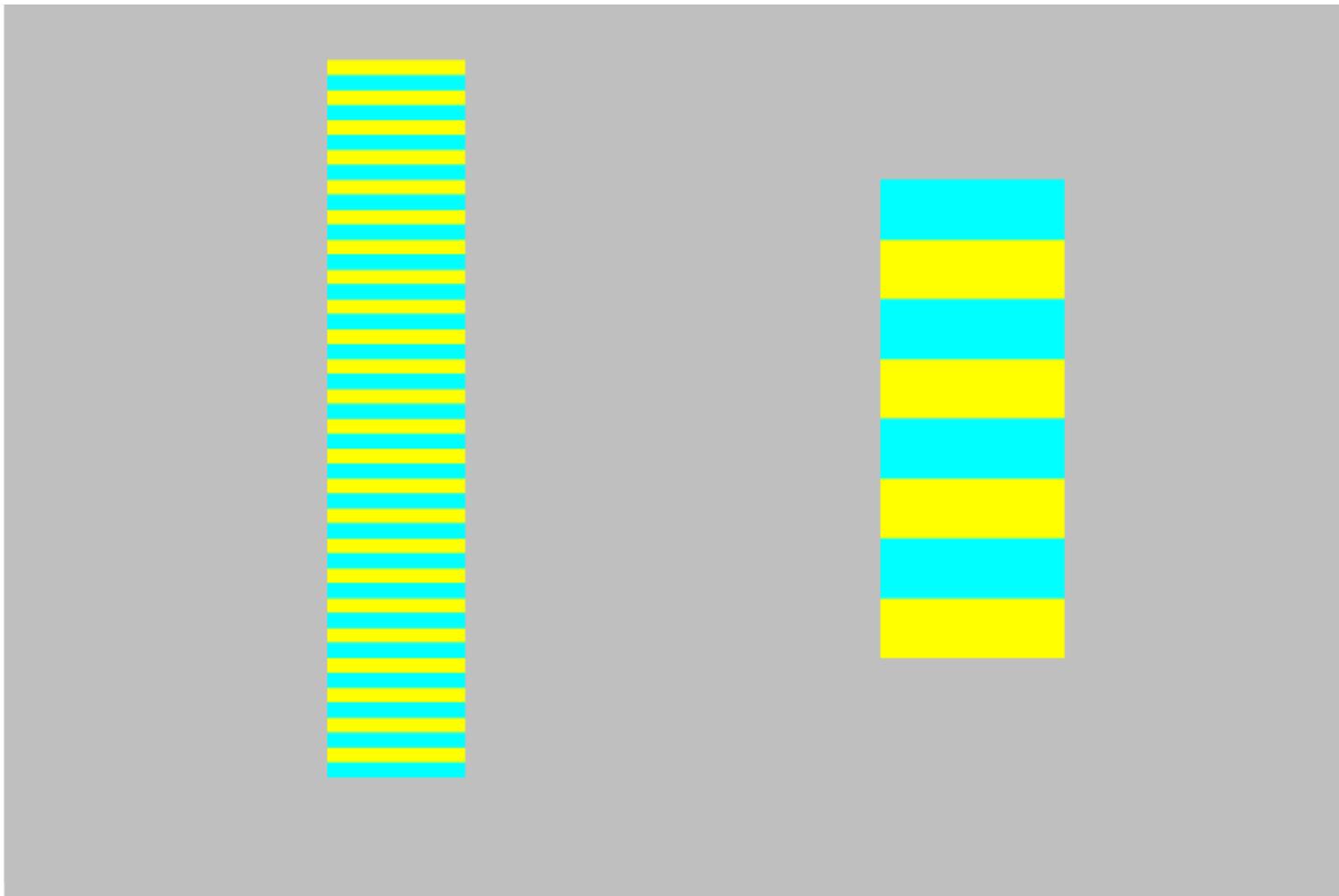
Good complexion illusion



<http://www.psy.ritsumei.ac.jp/~akitaoka/AIC2009.html>







Wavelength is continuous
Color perception is categorical, cyclical, psychological

Don't Believe Your Lying Eyes! (1/2)

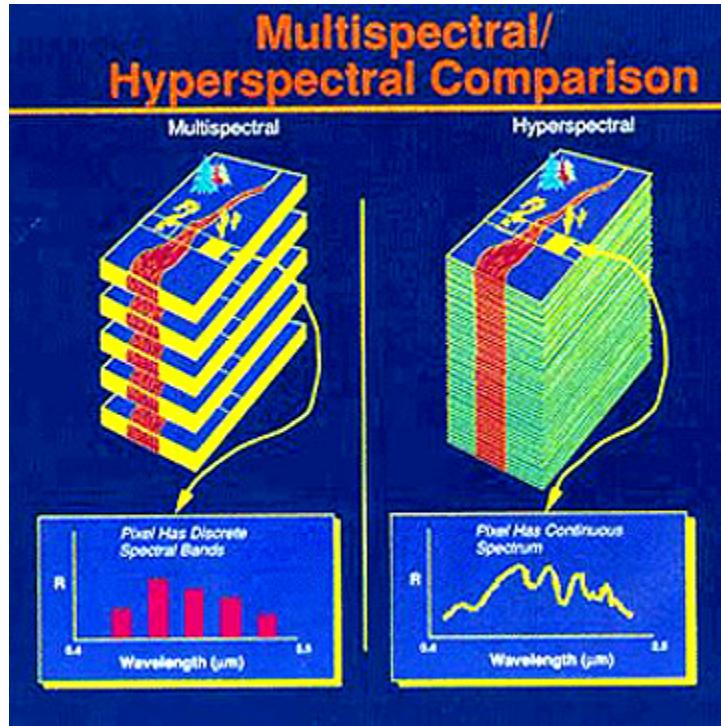


Don't believe your lying eyes

Break

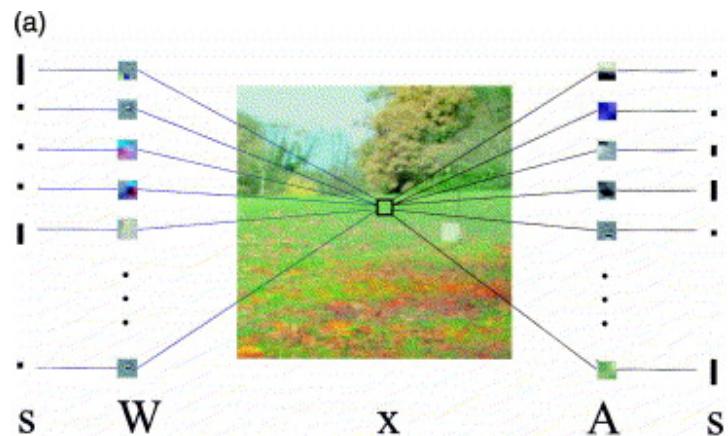
Lee, T.-W., Wachtler, T., & Sejnowski, T. J. (2002). Color opponency is an efficient representation of spectral properties in natural scenes. *Vision Research*, 42(17), 2095–2103. Elsevier. Retrieved from
<https://www.ncbi.nlm.nih.gov/pubmed/12169429>

http://www.cvc.uab.es/color_calibration/Bristol_Hyper/



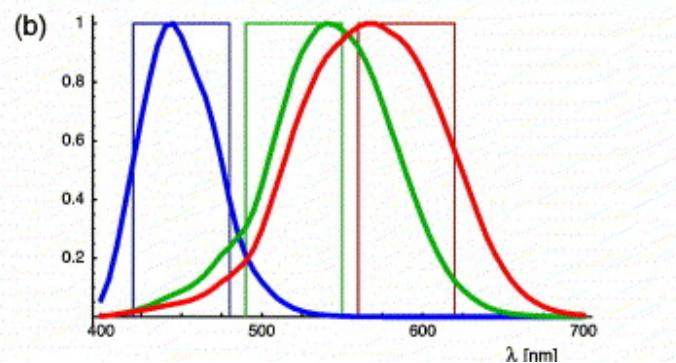
By Dr. Nicholas M. Short, Sr. - NASA <http://rst.gsfc.nasa.gov/> This file has source information, but it either links directly to the file or is a generic base URL, or is not an Internet source for a file that was likely found on the Internet. Source information should be provided so that the copyright status can be verified by others. It is requested that a better source be provided to make determination of the copyright information easier. Please provide a URL to an HTML page that contains this file. See

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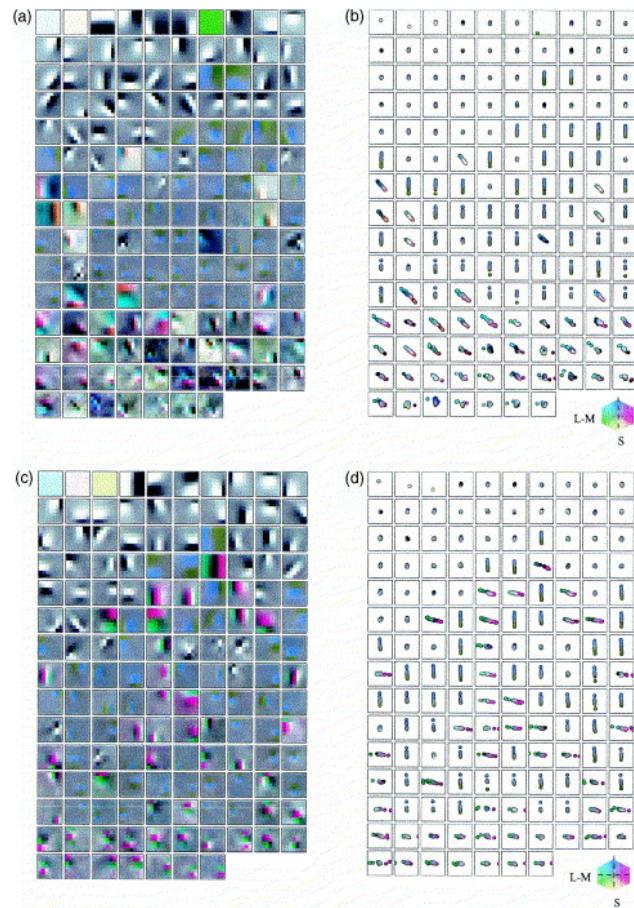


Analysis

Synthesis



Lee et al. 2002(00122-0), Fig 1



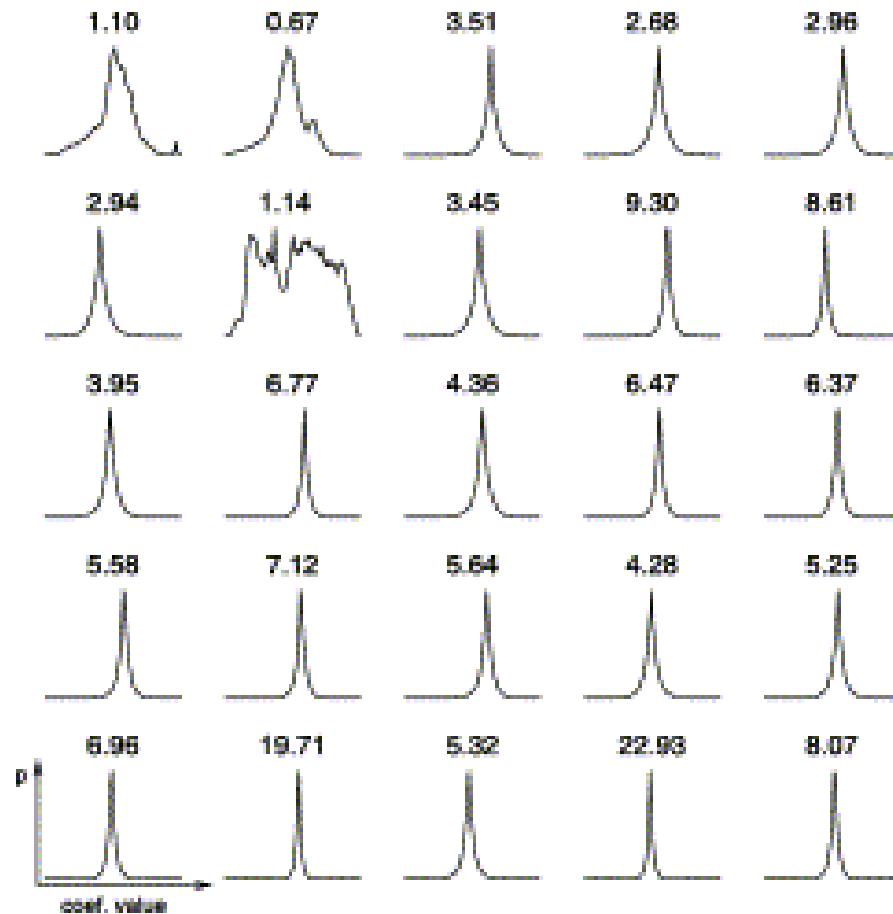
Lee et al. 2002 00122-0), Fig 2

Types of observed basis functions

Homogenous chromatic

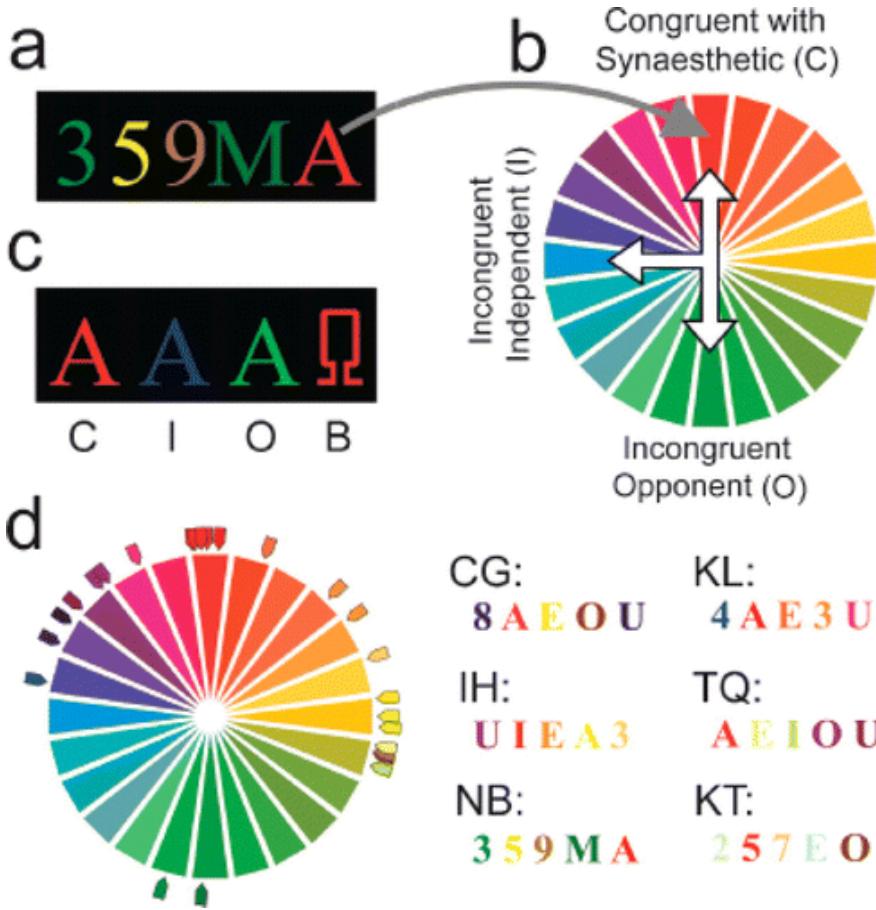
Oriented achromatic

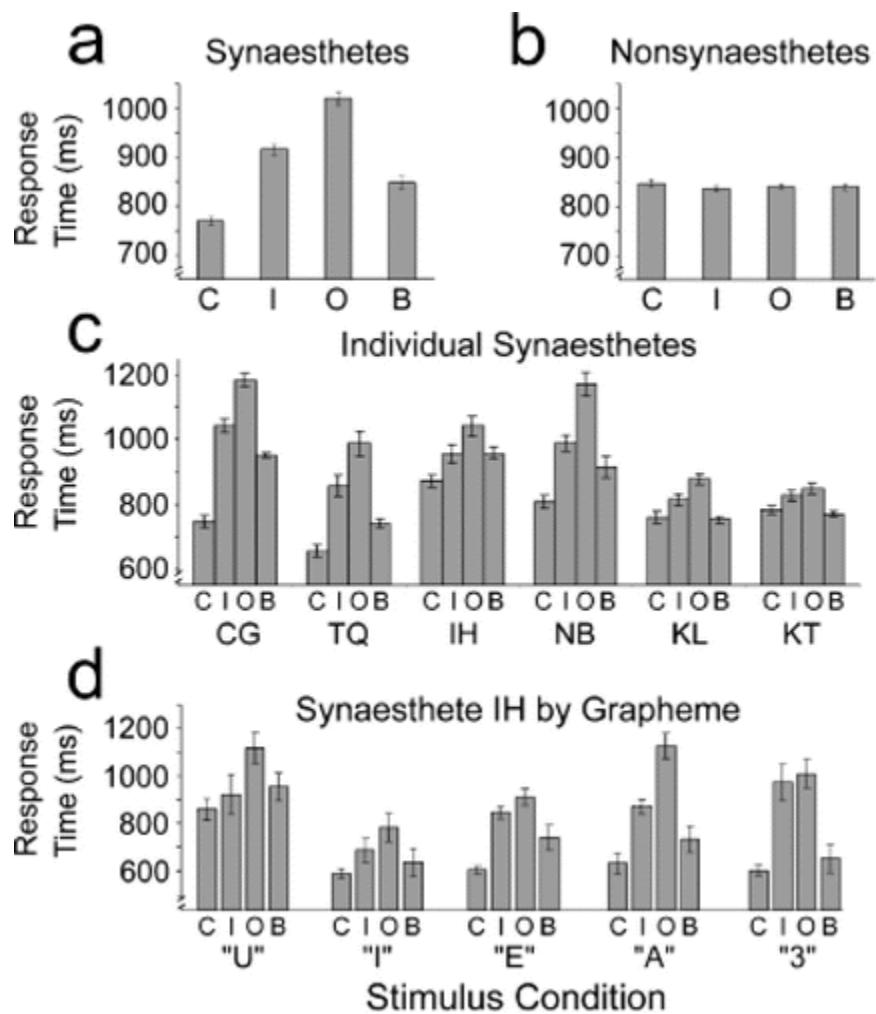
Color opponent basis



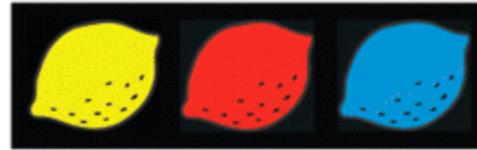
Lee et al. 2002(00122-0), Fig 2

Nikolić, D., Lichten, P., & Singer, W. (2007). Color opponency in synaesthetic experiences. *Psychological Science*, 18(6), 481–486. Retrieved from
<http://dx.doi.org/10.1111/j.1467-9280.2007.01925.x>

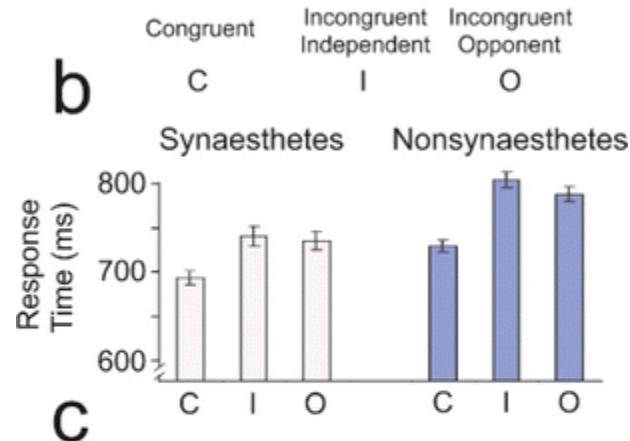




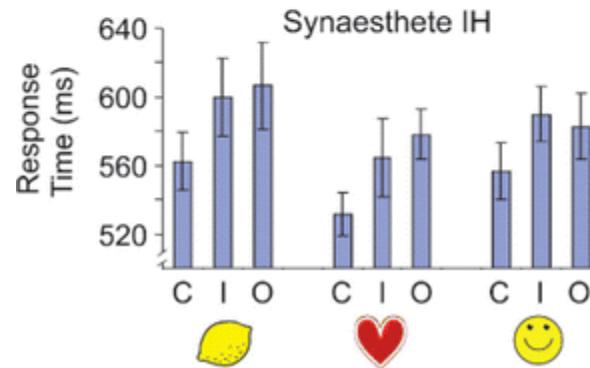
a



b



c



"Thus, the results of our study provide strong psychophysical evidence for involvement of color-opponent channels and, hence, early visual areas in the generation of synaesthetic color experiences."

"Therefore, our results indicate that the color interactions in the present Stroop task have two components: The stronger component reflects synesthesia proper and depends on color opponency, and the weaker component reflects knowledge about the synaesthetic associations and is independent of color opponency."

Nikolić, Lichti, & Singer, 2007

Slides created via the R package **xaringan**. Rendered HTML and supporting files are pushed to GitHub where GitHub's 'pages' feature is used to host and serve the course website.