

NEURAL MECHANISMS OF COLOR VISION Fall 2018, Mondays 2-3:50 PM

Instructor: Robert Shapley

Syllabus

Readings posted in NYU Classes (Resources)

No Class September 10 because of Rosh Hashanah

1. Perception of color and brightness: Phenomenology --September 17

Parks (1995) Chapter 6 "Color in nature"

in *Colour, Art and Science*, ed. Lamb and Bourriau, Cambridge UP

<https://www.colour-blindness.com/> take Ishihara and Color Arrangement tests

2. Measuring brightness and color --September 24

Brainard, Stockman (2010) "Colorimetry" Handbook of Optics 3rd edition volume 3 Chapter 10

Ohno (2010) "Radiometry and photometry for vision optics" Handbook of Optics 3rd edition volume 3 Chapter 37

<http://www.michaelbach.de/ot/col-flicker/index.html>

<http://www.michaelbach.de/ot/col-mix/index.html>

https://en.wikipedia.org/wiki/CIE_1931_color_space/

3. Cone Photoreceptors--Oct 1

Baylor, Nunn, Schnapf (1987) Spectral sensitivity of cones of the monkey *Macaca fascicularis* *J Physiol* 390:145-160

Hofer et al (2005) Organization of the Human Trichromatic Cone Mosaic
J Neurosci 25: 9669-79

No class Oct 8--class meets Tuesday this week

4. Evolution of color vision in primates—Oct 9

Imamoto, Shichida (2014) Cone visual pigments *Biochim Biophys Acta* 1837:664-673

Jacobs (2008) Primate color vision: A comparative perspective *Vis Neurosci* 25: 619-633

5. Color opponent neurons: LGN I--October 15

DeValois (1960) Color vision mechanisms in the monkey *J Gen Physiol* 43 Supp. 115-128

Derrington, Krauskopf, Lennie (1984) Chromatic mechanisms in lateral geniculate nucleus of macaque *J Physiol* 357:241-265

QUIZ 1

6. Color opponent neurons: LGN II--October 22

Reid, Shapley (1992) Spatial structure of cone inputs to receptive fields in primate

lateral geniculate nucleus *Nature* 356:716-718

Reid, Shapley (2002) Space and time maps of cone photoreceptor signals in macaque lateral geniculate nucleus *J Neurosci* 22:6158-6175

7. Color-opponent neurons: Retina—Oct 29

Lee, Martin, Grünert (2010) Retinal connectivity and primate vision *Prog Retinal Eye Res* 29:622-639

Solomon et al. (2005) Chromatic organization of ganglion cell receptive fields in the peripheral retina *J Neurosci* 25:4527-39

No Class Nov. 5--Society for Neuroscience meeting

8. Color coding in primary visual cortex I – makeup (to be arranged)

Livingstone, Hubel (1984) Anatomy and physiology of a color system in the primate visual cortex *J Neurosci* 4:309-356

Conway, Livingstone (2006) Spatial and temporal properties of cone signals in alert macaque primary visual cortex *J Neurosci* 26:10826-46

9. Color coding in primary visual cortex II—Nov 12

Lennie, Krauskopf, Sclar (1990) Chromatic mechanisms in striate cortex of macaque *J Neurosci* 10:649-66

Friedman, Zhou, von der Heydt (2003) The coding of uniform colour figures in monkey visual cortex. *J Physiol* 548:593– 613

QUIZ 2

10. Color coding in primary visual cortex III --Nov 19

Johnson, Hawken, Shapley (2008) The orientation selectivity of color-responsive neurons in macaque V1 *J Neurosci* 28:8096-8106

Zweig et al (2015) Representation of Color Surfaces in V1: Edge Enhancement and Unfilled Holes *J Neurosci.* 35: 12103-15

11. Color coding in extra-striate cortex I – Nov 26

Zeki (1983) Colour coding in the cerebral cortex: the reaction of cells in monkey visual cortex to wavelengths and colours *Neuroscience* 9:741-765

Kiper, Levitt, Gegenfurtner (2001) Extrastriate visual areas, in *Color Vision, from genes to perception* ed. Gegenfurtner and Sharpe, Chapter 13

12. Color coding in extra-striate cortex II --Dec 3

Conway, Moeller, Tsao (2007) Specialized color modules in macaque extrastriate cortex *Neuron*, 56: 560–573

Yasuda, Banno, Komatsu (2010) Color selectivity of neurons in the posterior inferior temporal cortex of the macaque monkey *Cerebral Cortex* 20:1630–1646.

13. Color in human visual cortex--Dec 10

Mullen et al (2007) Selectivity of human retinotopic visual cortex to S-cone-opponent, L/M-cone-opponent and achromatic stimulation *Eur J Neurosci* 25:491-502

Xing et al (2015) Brightness-color interactions in human early visual cortex *J Neurosci* 35:2226-32

FINAL EXAM --- DECEMBER 17 2PM