

Chapter 6: Vision

General Principles of Sensory Processing

The Visual Stimulus

The Anatomy of the Visual System

Coding of Light and Dark

Coding of Color

The Primary Visual Cortex

PSB3002

Physiological Psychology - chapter 6.5

1 / 14

Coding of Color

Cones and Color Vision.

- B/W vision adequate for most purposes
- color vision is important in identifying ripeness, counteracting camouflage
- humans, old world monkeys and apes have
3 types of cones (3 iodopsins) providing elaborate color vision





Coding of Color

Cones and Color Vision.

- B/W vision adequate for most purposes
- color vision is important in identifying ripeness, counteracting camouflage
- humans, old world monkeys and apes have
 - 3 types of cones (3 iodopsins) providing elaborate color vision





Coding of Color

Cones and Color Vision.

- B/W vision adequate for most purposes
- color vision is important in identifying ripeness, counteracting camouflage
- humans, old world monkeys and apes have
3 types of cones (3 iodopsins) providing elaborate color vision





Coding of Color

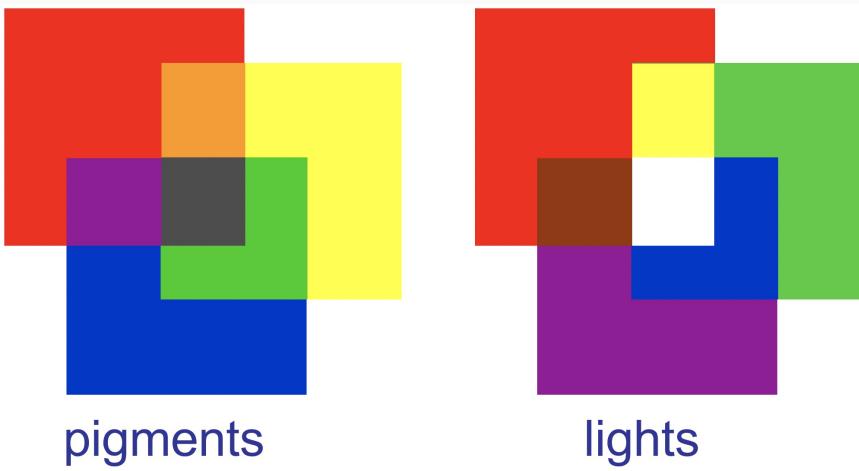
Cones and Color Vision.

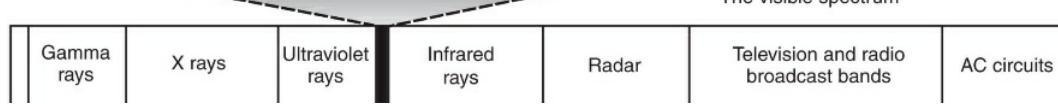
- mixing of colored light differs from pigment mixing



Trichromatic (Young-Helmholtz) Theory of Color Vision.

- based upon observation that any color of light





Coding of Color

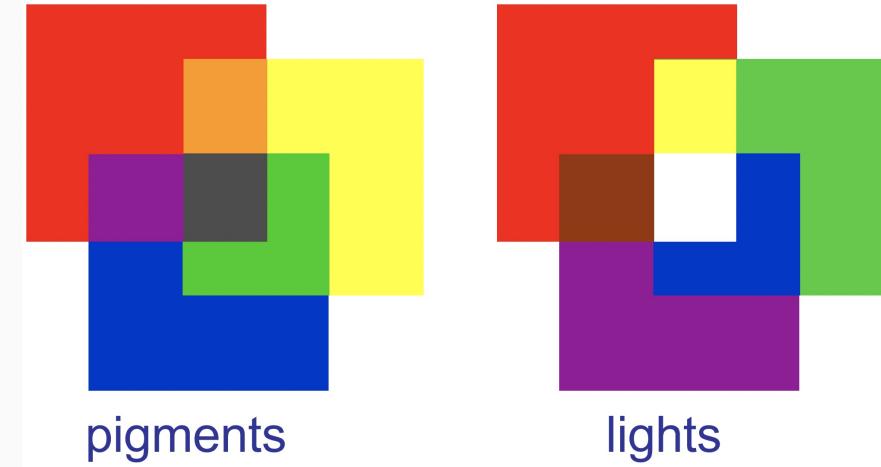
Cones and Color Vision.

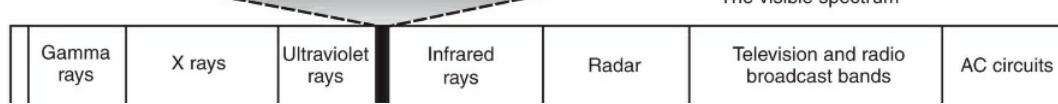
- mixing of colored light differs from pigment mixing



Trichromatic (Young-Helmholtz) Theory of Color Vision.

- based upon observation that any color of light

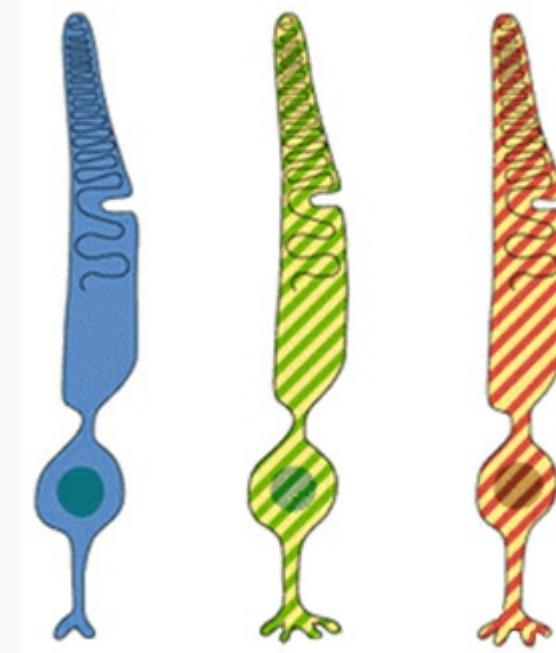




Coding of Color

Cones and Color Vision.

- cones exhibit maximal responses at 420 (short), 534 (medium), or 564 (long) nm
- determined by type of iodopsin in cone
- each cone responds over a range of wavelengths

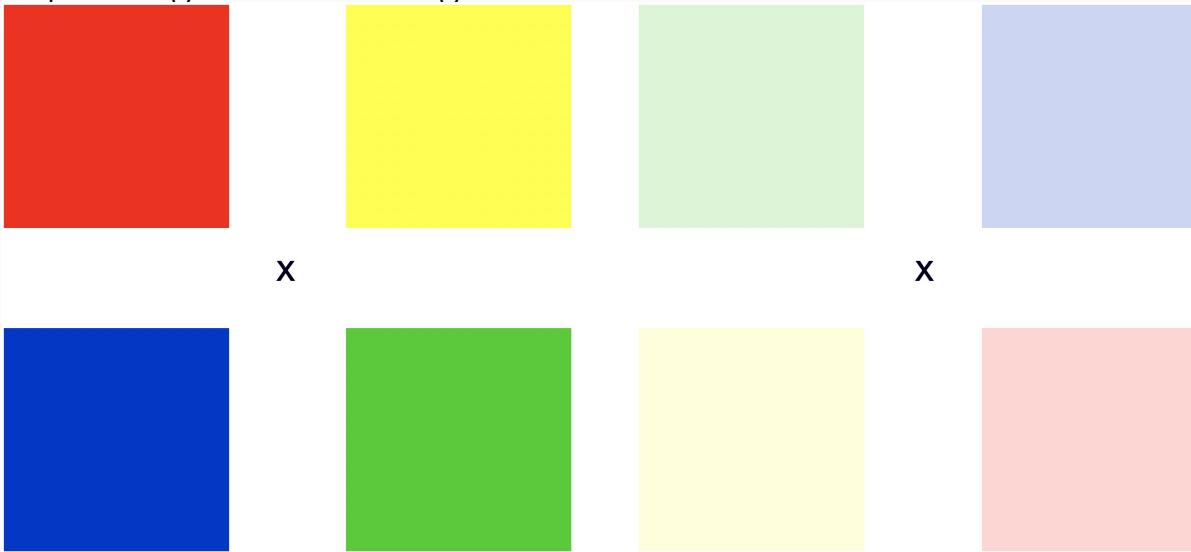




Coding of Color

Opponent Process Theory of Color Vision.

- based upon observation that some colors don't blend
- based upon negative afterimages
- trichromacy



Coding of Color

Opponent Process Theory of Color Vision.

- 2 kinds of colour sensitivity in ganglion cells
 - "medium opposes long"
 - "short opposes medium/long"



Coding of Color

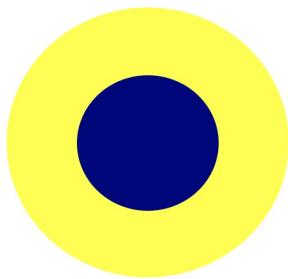
Opponent Process Theory of Color Vision.

- 2 kinds of colour sensitivity in ganglion cells
 - "medium opposes long"
 - "short opposes medium/long"

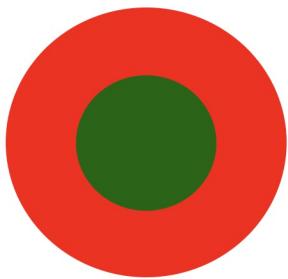
• ro



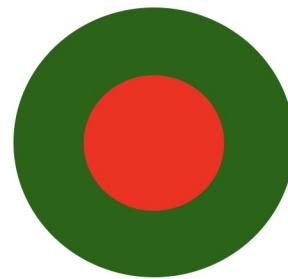
yellow on
blue off



blue on
yellow off



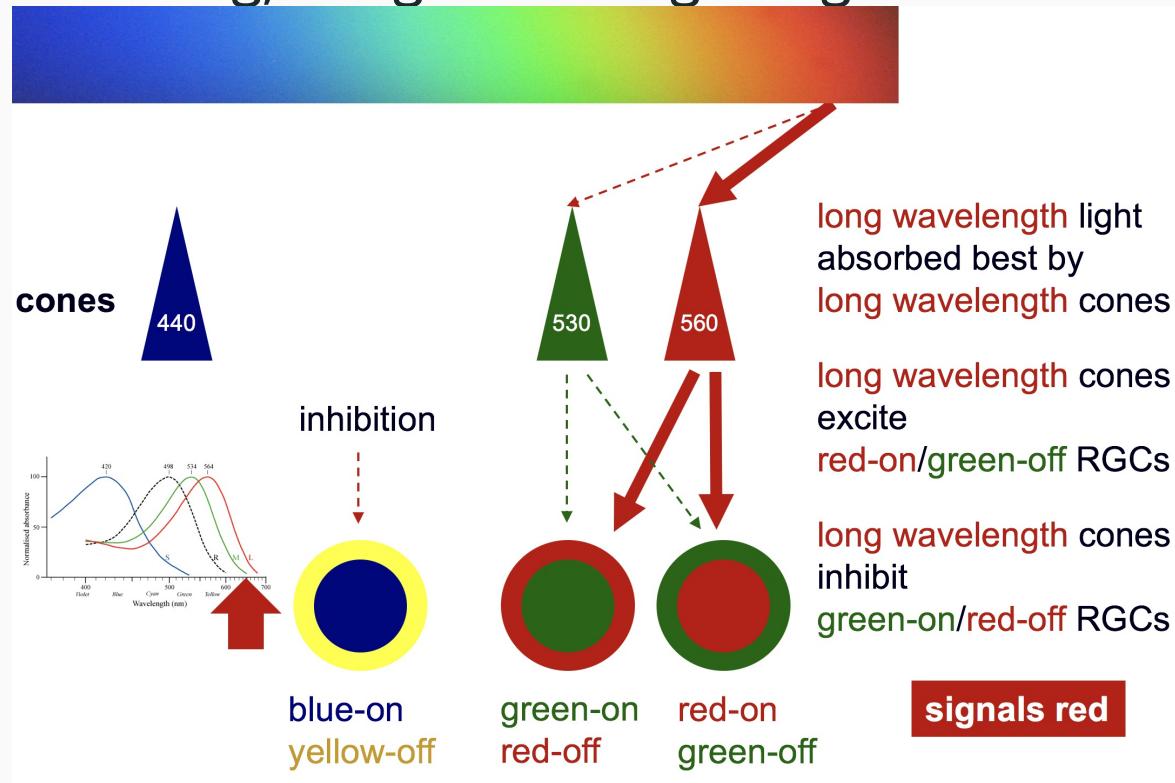
green on
red off



red on,
green off

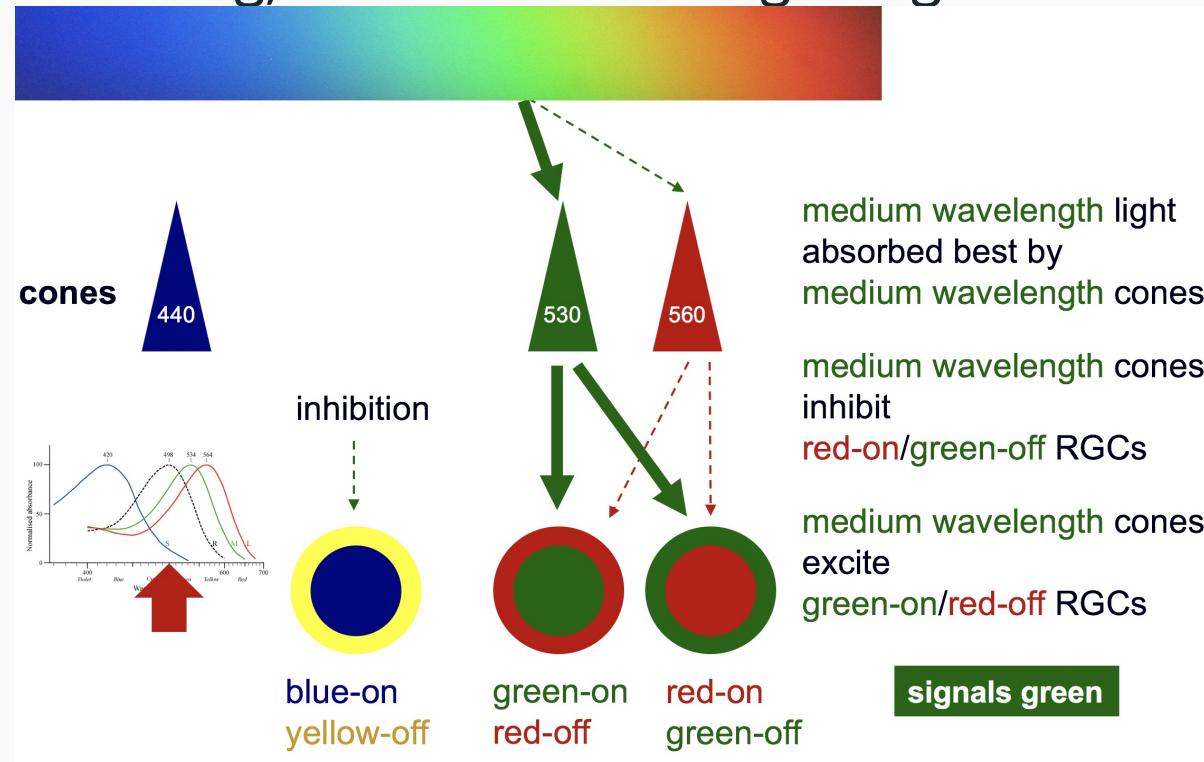
Coding of Color

Retinal Color-Coding, Long Wavelength Light.



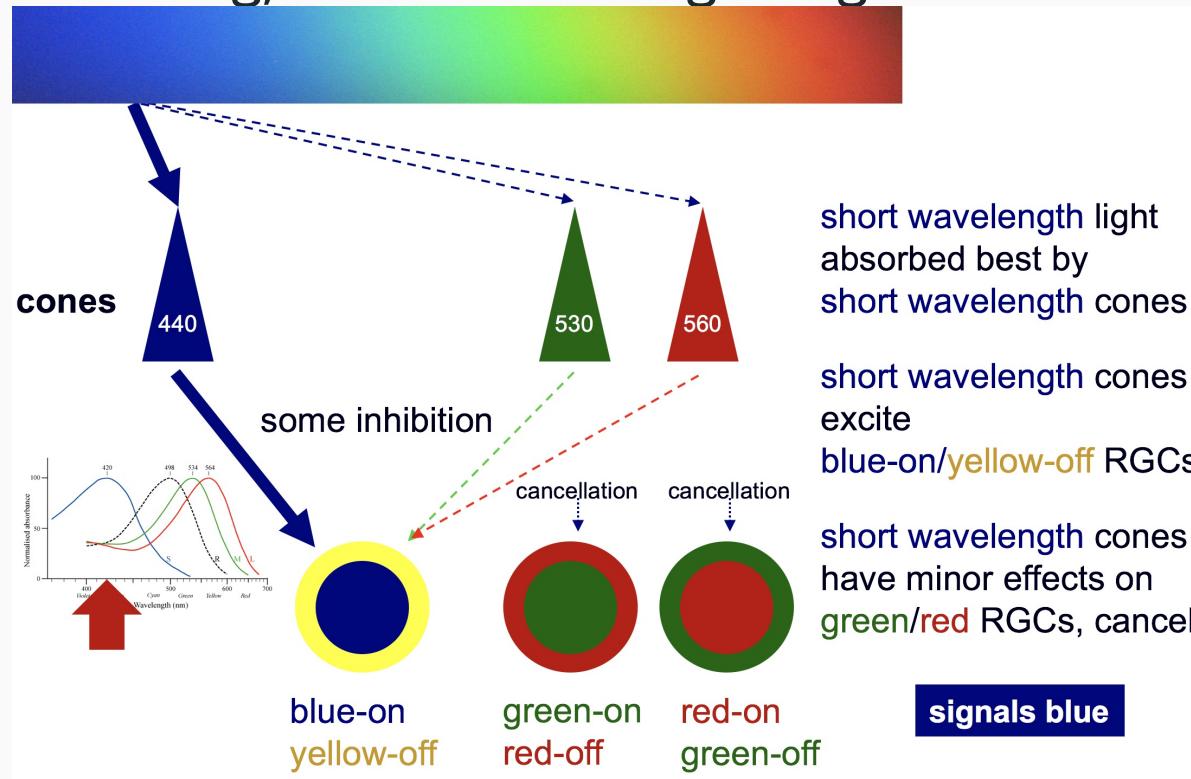
Coding of Color

Retinal Color-Coding, Medium Wavelength Light.



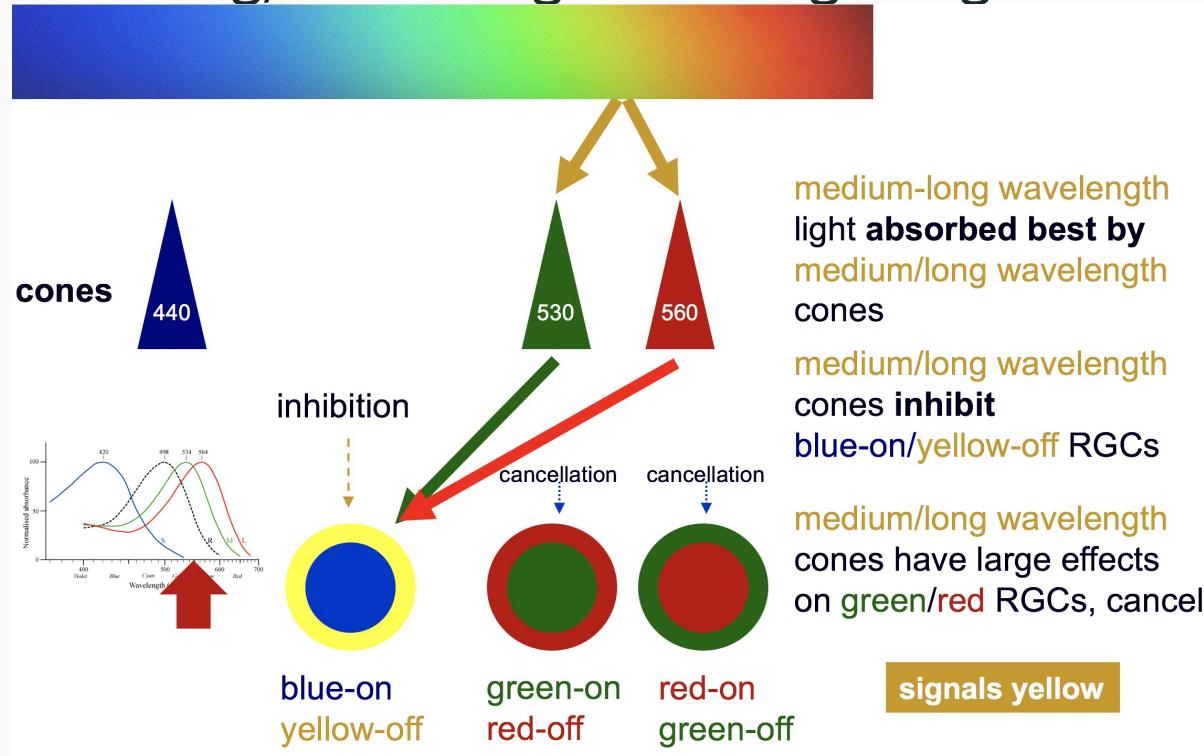
Coding of Color

Retinal Color-Coding, Short Wavelength Light.



Coding of Color

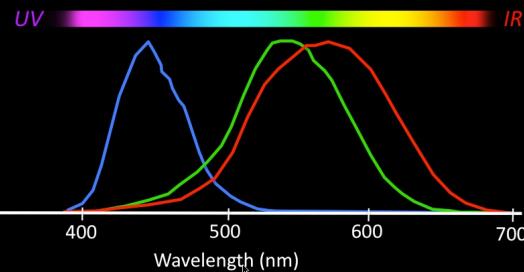
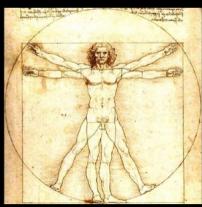
Retinal Color-Coding, Med-Long Wavelength Light.



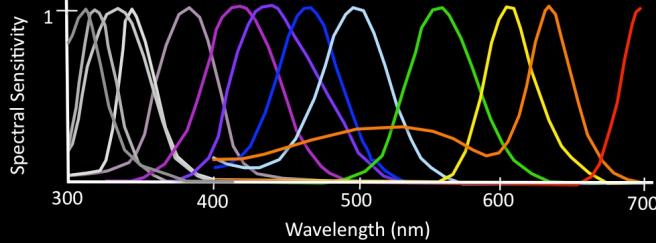
Coding of Color

That Mantis Shrimp Again Mantis Shrimp: Extraordinary Eyes

Homo sapiens



Neogonodactylus oestedii



Marshall et al., 2007; Marshall and Oberwinkler, 1999



Coding of Color

Higher-Level Processing

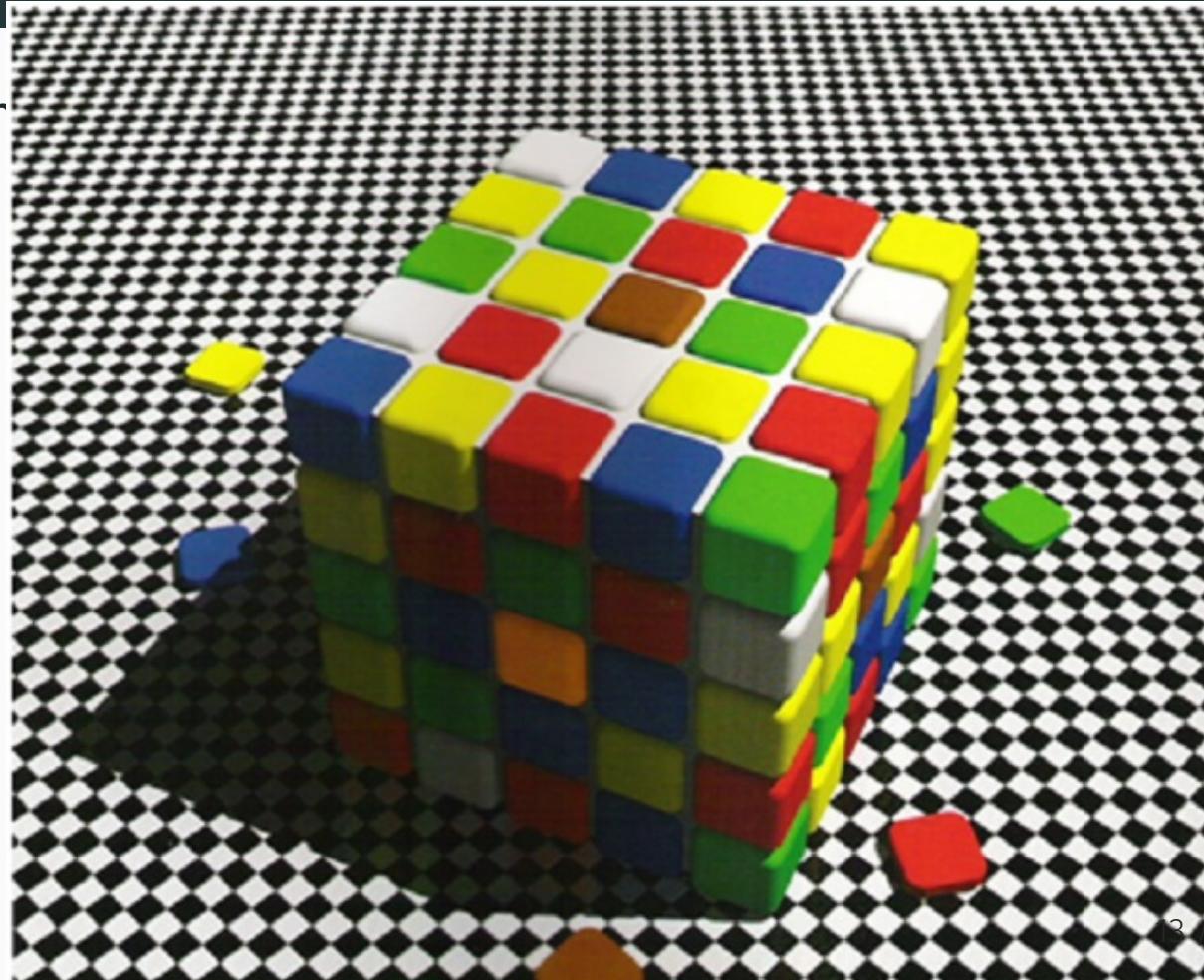


Image Credits

- slide 2: <http://m.rgbimg.com/cache1qybvK/users/t/ta/tacluda/600/n2fnFiE.jpg>
<http://awakeningtoanimals.com/wp-content/uploads/2013/05/zebra-camouflage.jpg>
[http://upload.wikimedia.org/wikipedia/commons/3/3f/Mantis_shrimp_\(Odontodactylus_scyllarus\).jpg](http://upload.wikimedia.org/wikipedia/commons/3/3f/Mantis_shrimp_(Odontodactylus_scyllarus).jpg)
- slide 3: http://nunojpereira.com/portfolio/wp-content/uploads/940_2013quarellatray01.jpg
<http://thumbs.dreamstime.com/t/watercolor-tray-22470358.jpg> Carlson, N.R. (2012). Physiology of Behavior, 11th ed. Pearson Publishing drawn by D.P. Devine
- slide 4: <http://upload.wikimedia.org/wikipedia/commons/c/c2/Cone-response.png>
<https://letubeu.files.wordpress.com/2012/03/visible-spectrum-st-patricks-day1.jpg> Pinel, J.P.J. (1997). Biopsychology, 4th ed. Allyn and Bacon
- slide 5: drawn by D.P. Devine
- slide 6: Pinel, J.P.J. (1997). Biopsychology, 4th ed. Allyn and Bacon
- slide 7: drawn by D.P. Devine
- slide 8-11: Carlson, N.R. (2012). Physiology of Behavior, 11th ed. Pearson Publishing drawn by D.P.