Synesthesia

What is Synesthesia?
• The stimulation of one sensory system that results in perceptual experiences in additional system(s)
• Not a disorder
• Occurs in about 1 in 25,000 people

What its Like to Have Synesthesia
• Synesthesia experiences are durable, consistent, generic, discrete, memorable, emotional
• Do NOT experience elaborate sensations – hallucinations and mental images

What makes Synesthesia Special?
• Violates conventional perception of the world
  - Not logically part of human brain function
  - Evolutionarily hard-wired for separation of function by anatomy
  - Vivid reality of synesthesia experience goes against this

Synesthesia
• Potential for 20 different pairings
• Can have multi-sensory pairing
• Most common is a link between colors and words
  - Called Color-Word Synesthesia
  - Associations between sound and color are systematic and constant
• Taste and touch less common, smell rarely
Synesthete

• Synesthete is a person who experiences ordinary senses in extraordinary ways

• Surprised others do not experience world in same way

• Each synesthete has unique pairing of letters and colors but are consistent across time

Color – Word Associations

• Strongest associations exist between vowels and colors

  A = reds and blues
  E = yellows and whites
  I = yellows and whites
  O = yellows, reds and blacks
  U = blues and blacks

• Words, Music, Voices, and Environmental sounds also trigger color vision

Why Do Such Associations Exist?

• Studies show interaction between auditory cortex and higher visual system
  ➢ Area V4 ➢ Have normal color vision

• People who don’t have synesthesia can make associations between different sensory systems
  ➢ Cross Modality Matching

Cross Modality Matching

• Subject presented with stimulus in one sensory system

• Asked to adjust a stimulus presented to a second sensory system to match the first stimulus
  ➢ Example: sound pitch and color matching ➢ Example: rate brightness and pitch of color words

Theories to Explain Synesthesia

• Many theories

• Neuronal Theory most commonly accepted
  ➢ Cross – Circuiting Theory

What is the Cross–Circuiting Theory?

• Neurons and synapses involved in processing sensory input usually confined to one sensory system

• Hard-wired function of brain

• Thought that everyone has at birth
  ➢ In most these connections are eliminated as brain goes through refinement
  ➢ Adult synesthetes have retained these connections
Where Does Synesthesia Take Place?

- Two competing ideas:
  - Limbic System – emotional responses
  - Cerebral Cortex – colored hearing
    - Synesthetes have activation in visual cortex during hearing tasks – normals don’t
  - Thought to be a left hemisphere function

Why is Synesthesia Important?

- Research potential great
- Shed light on many areas of brain function:
  - Consciousness
  - Nature of reality
  - Relation of reason and emotion

Acquired Synesthesia

- Synesthesia can be acquired
  - Temporal lobe epilepsy (seizures)
  - Head trauma
  - Mass lesions in middle temporal lobe
  - Drug induced hallucinations
  - Sensory deprivation
  - Electrical stimulation of limbic system

Our Perception

Perception of a Synesthete

- Much faster to pick out Ys and Vs from synesthete’s perspective
- Synesthesia allows grouping of letters by color – makes differences “pop” out
Letter Color Associations

- Synesthetic colors are vivid and saturated
- Does not interfere with experience of environmental stimulus
  - Ex: see word printed in green. A synesthete will see the word “green” in green, but will also associate a separate color with each letter green.

Potential websites
- [http://www.well.com/user/smalin/mam.html](http://www.well.com/user/smalin/mam.html)