

# Week 1 Lecture Material

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## Welcome to Sensation & Perception!



- My background and interests
  - Perceiving and LOVING IT!
    - Sound, multimodal, motion, speech, aging, and more!
- Why is perception important?
  - Every interaction with the world
  - Information in the world



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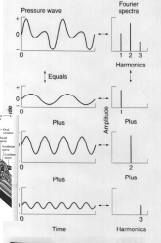

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## What is the study of perception?

Physics:  
sound, light

Physiology:  
Human & animal

Philosophy



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### Basic Questions of Perception

- Why do we perceive?
  - To see rainbows
  - To hear music
  - To eat food
- Successful behaviors




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### Basic Questions of Perception

- What do we perceive?
  - Sensations?
    - Light/sound/scent/etc.
    - How many sensory modalities are there?
  - Forms?
    - Shape, size
  - Meaningful objects
    - Phenomenology

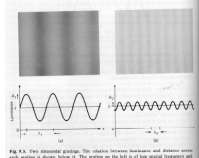


Fig. 4.5. Two identical gratings. The relation between luminance and distance varies with spatial frequency. The grating on the left is of the spatial frequency 10 cycles per degree.

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### Pragmatic Perception

- Who cares how we perceive?
  - Perceptual assistance designers
    - Hearing aids
- Virtual reality
  - Remote systems
- Efficient public systems
  - Dollar bills
- Speech analysts
  - Perceptual trainers (blind, deaf)
- Commercial producers
  - Wine and beer
- Human Factors
  - Military and more!




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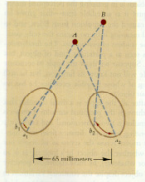
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### Where did it all begin?

- Ancient thought on Perception
- (2500 years ago)
  - Pythagoras - Emanation hypothesis
    - Eye --> Object --> Eye
- Democritus - Eidola hypothesis
  - Object → Eye



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### Where did it all begin?

- Ancient thought on Perception
  - Plato - Theory of Eidos/Forms
    - Cosmic link to ideal
    - Form of form of form
- The Humunculus Problem
  - Representations
- **Simulative assumption - representation**



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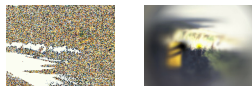
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### All new (non)ancient thought

- Alkindi - Physics of light
  - Rays of light
  - Pointilistic image on eye
  - (~830 ACE)
- Alhazen - Physics of eye
  - Distorted image
    - Upside down
    - Flat
    - Mis-oriented
  - (~1000 ACE)



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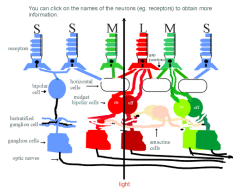
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### More Perception, More Problems

- Image appears complete on eye
  - Part of retina has no receptors
  - Lots of space between receptors
  - Lots of junk in between the world and the receptors




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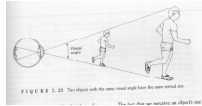
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### Perceptual History con't

- Molyneux's Problem
  - What would a blind person see if suddenly he had sight?
  - Depth and size ambiguity
    - Distorted → depth
- Measuring Molyneux
  - Hallway science?
  - Partner: Artist & Artist




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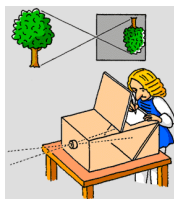
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### Why do we need a pupil?

- Looking through the eye
  - Why aren't images distorted?
  - Sensory mechanisms
    - Staring at eyes
  - Pin-hole reading demonstration
- Perceptual problems
  - Solve with
    - Simple design elements
    - Complicated processing algorithms




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### Renaissance thought

- Descartes - Mind/Body problem
  - Body in world - relates info to mind
- Doctrine of Corporeal Ideas
  - Minimal awareness
    - Are you a dualist?
- Mueller - Biological inspiration
  - Nerves are binary (on/off)
  - Energy transducer = sensation
- Doctrine of Specific nerve energies
  - Does perception require sensation?




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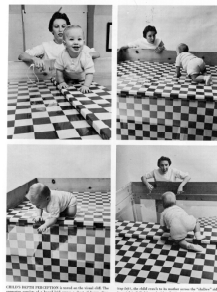
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### Almost to modern times

- Empiricism (Locke)
  - Tabula Rasa (blank slate)
  - Education via touch
    - I believe it when I *feel* it
- Where is the homunculus?




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### Theories: Psychology Begins

- Who is the father of Psychology?
- Why is he the father of Psychology?
  - Psychology as a science
    - Physics, Chemistry inspiration
- Steps to perceive
  - Alkindi, Alhazen
    - Distorted media, distorted sensory experience
  - Stimulate receptors
    - Automatic passive process
- Structuralism (est. 1870-ish)
  - Associate sensations into perceptions
    - Sum of perceptions = phenomenology
- Method of Structuralism
  - Introspection on perceptions
    - Apperception of object
      - Focus to consciousness
    - Separation into components




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### Structuralism

- Primary and Secondary Qualities
  - Primary - physical dimensions
    - Size, shape, color, intensity, physiological reactions? (Tichener)
      - Empirically verifiable qualities
        - » 2-D availability, confirmed by multiple observers
    - 40K elements
  - Secondary –psychophysical
    - Physical vs. psychophysical
      - Perceived qualities



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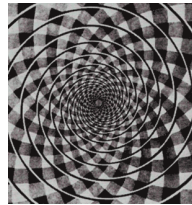
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### Associating Sensations in Structuralism

- Fusion
  - Elements can not be separated
    - Examples?
      - Auditory, olfactory???
- Assimilation
  - Combination of elements at a conscious and unconscious level
    - Examples?
      - Words, visual groups???
- Complication
  - Multimodal combinations of elements
    - Examples?
      - Foods???



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