9.85 Cognition in Infancy and Early Childhood

Lecture 5: “What’s it like to be a baby?”

“What’s it like to be a baby?”

- Babies as Martians
  - Big heads
  - Big eyes
  - Strange ways of seeing
  - Exercise mind control over us

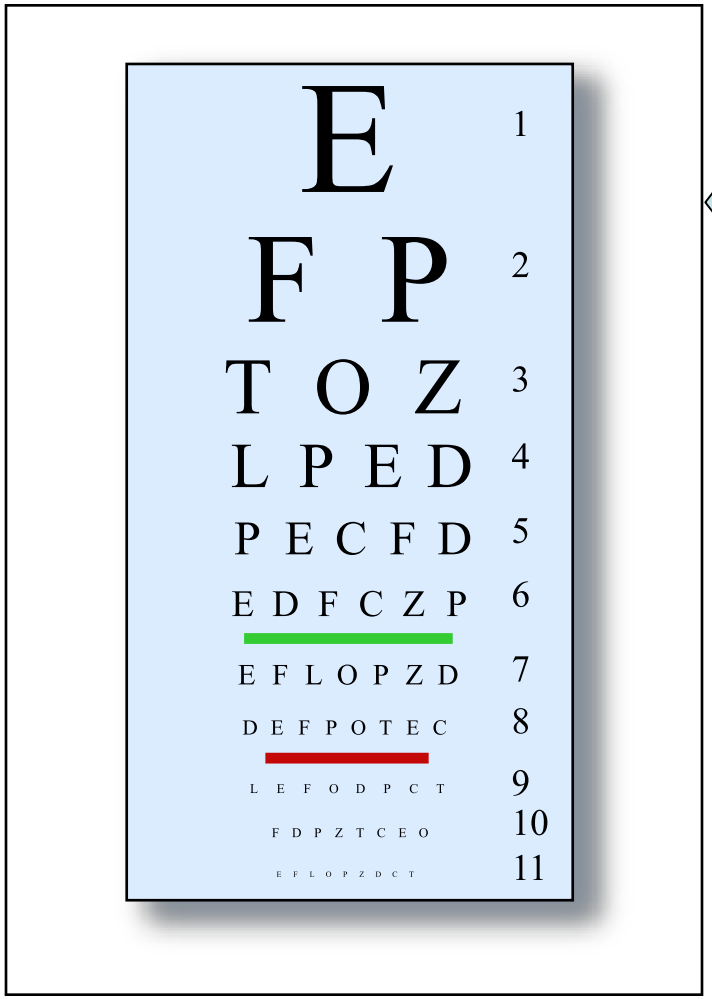
Perception

- Piaget -- constructivist approach
  - “Perception of light exists from birth and … the reflexes … All the rest (perception of forms, sizes, positions, distances, prominence, etc.) is acquired through the combination of reflex activity with higher activities.”
- Gibson -- perception is independent of experience.
  - “The structure of the environment is ‘out there’ to be picked up, and perception is a matter of picking up invariant properties of space and objects” (Bremner, 1994, p. 118).

Vision

- Focus and acuity
- Color and contrast
- Depth
- Orientation and form
- Faces

Vision -- focus and acuity



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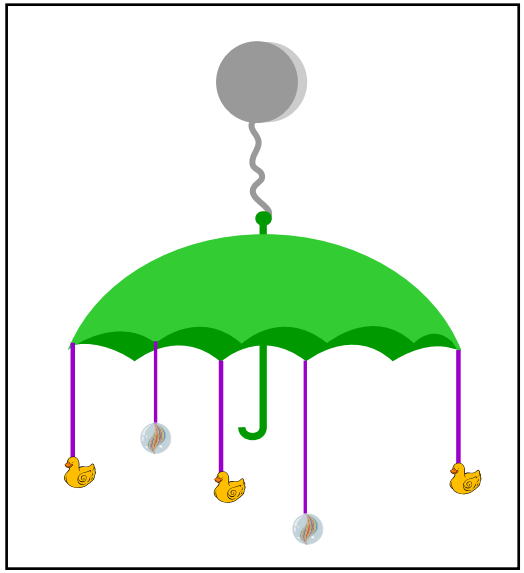
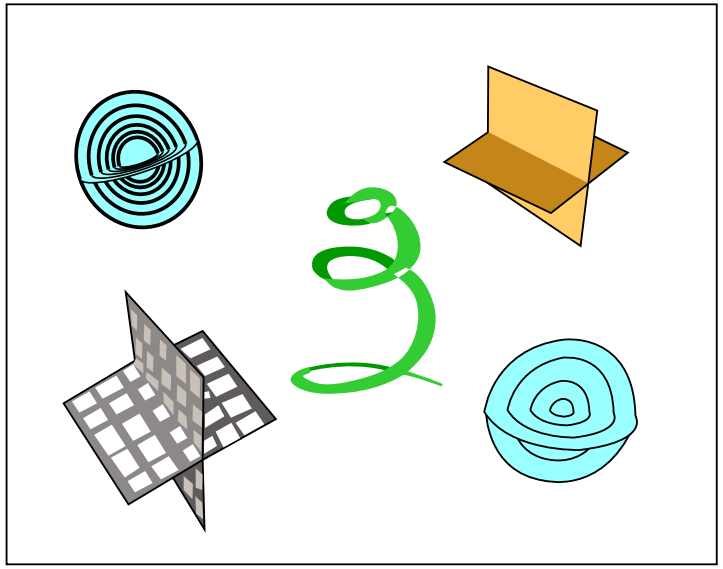
Acuity at birth is 6 times worse than normal adults -- but good enough to see faces, hands, eyes, etc.

Vision -- focus and acuity

- Not that newborns can’t focus -- lens is fully developed
- But that they don’t do it well -- poor control of cilliary muscles.
- And even when they do focus correctly, vision may be blurry because the fovea is immature.

Vision -- contrast and color





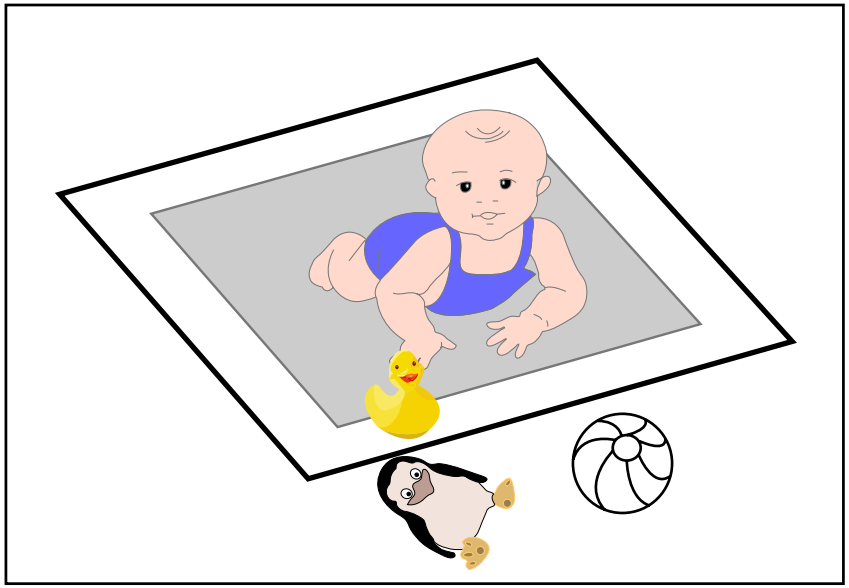
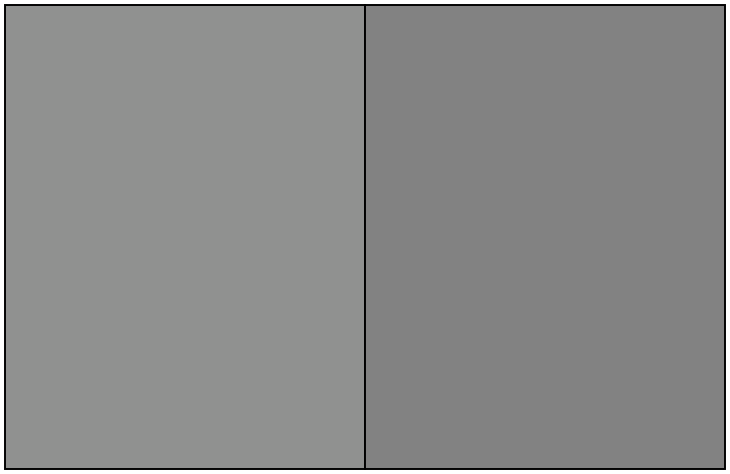


Illustration courtesy of MIT OCW.

Vision -- contrast and color

- By first month -- 5% contrast
- By two months -- .5% (adult is .2%)



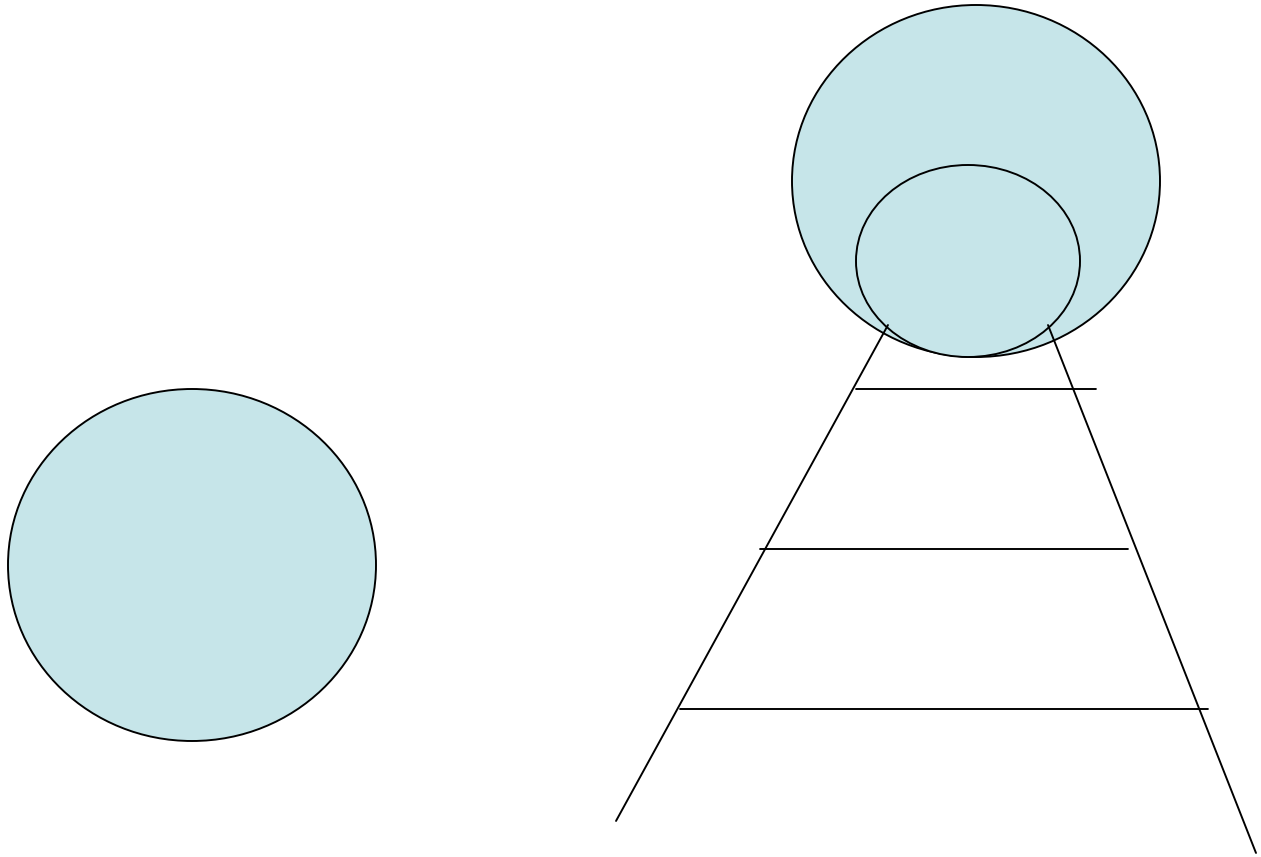
Vision -- contrast and color

- Contrast sensitivity improves faster than visual acuity.
- Close to adult levels by 8-9 weeks rather than 8-9 months.
- Can distinguish reds and greens of the same brightness by 2 weeks.
- Immature fovea means they might not make subtle distinctions (orangish red from reddish orange).

Vision -- depth perception

- Size constancy
- Steroposis
- Relative size
- Object interposition
- Shading
- Texture gradients
- *"For those of a creationist bent, one could note that God must have loved depth cues, for He made so many of them"* (Yonas & Granrud, 1985, p. 45).

Vision -- size constancy



Size constancy

But if familiarized to a small object preferred large(and vice-versa) even when retinal sizes were identical.

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Please see:
Fig 1.4, 1.5 in Bremner, Gavin, and Alan Fogel, eds. *Handbook of Infant Development*.
Malden, MA : Blackwell Publication, 2001. ISBN: 0631212345.

Preferential looking: Preferred largest retinal size regardless of real size or distance

Vision -- depth perception

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Please see:
Witherington, David C., Joseph J. Campos, David I. Anderson, Laure Lejeune, and Eileen Seah. "Avoidance of Heights on the Visual Cliff in Newly Walking Infants." *Infancy* 7, no. 3 (2005): 285-298.

Also looming effect in 2-week olds

Vision -- depth perception

- Steroposis
  - Ability to coordinate the vision from each retina into a single 3-d image.
  - Develops between 3-5 months and once it starts develops to adult levels quite rapidly (in a matter of weeks).
  - Develops about

  a month earlier

  in girls than boys.

Vision -- depth perception

Steropsis is experience dependent -- Critical period beginning several months after birth.

- Eye movements have to be coordinated and get clear input around 3-4 months for normal binocular vision.
- But the poor oculomotor control and acuity of the young infant does not cause a problem.

Vision -- depth perception

- Sensitivity to monocular cues like shadows and perspective develops later.
- 7 but not 5-month-olds reached for “nearer” object (with extended shadow) when viewed monocularly.
- 7 but not 5-month old

  reached for “nearer” cylinder.

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Please see:
Fig 1.3 in Bremner, Gavin, and Alan Fogel, eds. *Handbook of Infant Development*. Malden, MA : Blackwell Publication, 2001. ISBN: 0631212345.

Vision -- form and orientation

- Some researchers had proposed that there was a shift from subcortical to cortical visual processing around 2 months.
- In primates, orientation discrimination only found in cortical neurons.

Vision -- form and orientation

- Newborns

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Please see:
Fig 1.6 in Bremner, Gavin, and Alan Fogel, eds. *Handbook of Infant Development*. Malden, MA : Blackwell Publication, 2001. ISBN: 0631212345.

Vision -- orientation and form

- 3 -month-olds habituated to L preferred novel vertical lines; to R preferred novel horizontal lines.

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Please see:
Fig 1.8 in Bremner, Gavin, and Alan Fogel, eds. *Handbook of Infant Development*. Malden, MA : Blackwell Publication, 2001. ISBN: 0631212345.

Vision -- form and orientation

- Gestalt grouping -- good continuation and closure (3-month-olds)

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Please see:
Fig 1.9 in Bremner, Gavin, and Alan Fogel, eds. *Handbook of Infant Development*. Malden, MA : Blackwell Publication, 2001. ISBN: 0631212345.

Object tracking and scanning

- Newborns will track a moving object if it’s large enough and moves slowly.

- Newborns begin by scanning the edges of things -- older older infants will track details.

Figure removed due to copyright restrictions.
Please see:
Fogel, Alan, and Gail Melson. *Child Development: Individual, Family, and Society*. St. Paul, MN: West Publishing Company, 1988, p. 158. ISBN: 0314258698.

Vision -- faces

- Neonates look longer at faces than non-faces or scrambled faces.
- Also look longer at “face-like” configurations. Right-side up than upside down T’s.
- Continued controversy over the degree to which face recognition is “face-specific”.

Vision -- faces

Adults and 9-month olds distinguished only individual human faces

Six-month-olds distinguished individual primate faces.

"Perceptual tuning"

Pascalis, et al., 2002 Science

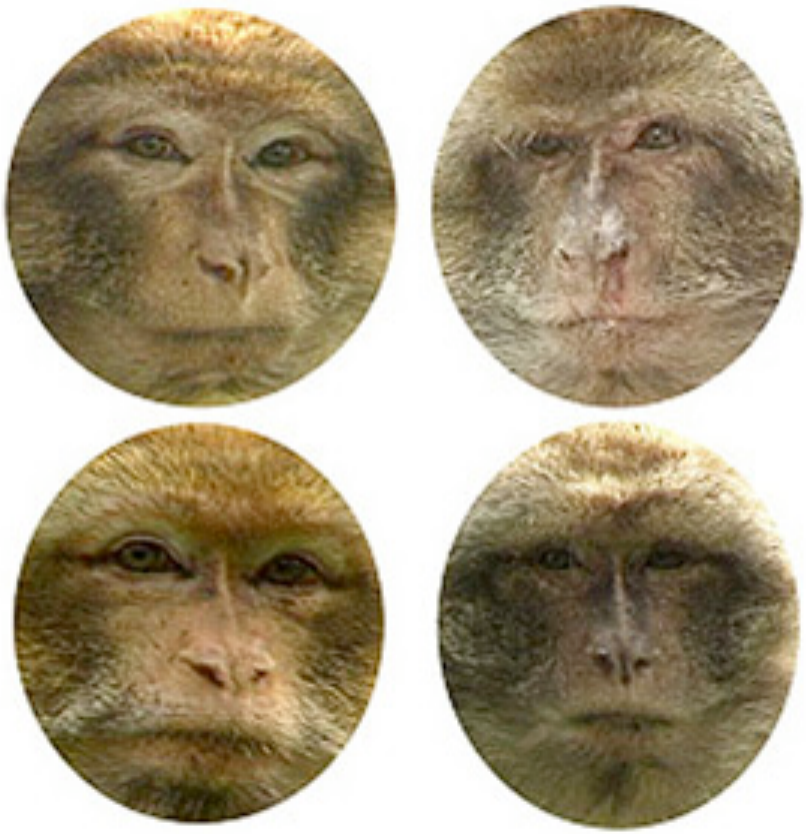

Fig 1 in Pascalis, O., L. S. Scott, D. J. Kelly, R. W. Shannon, E. Nicholson, M. Coleman, and C. A. Nelson. "Plasticity of face processing in infancy." *Proc Natl Acad Sci U.S.A.* 102, no. 14 (Apr 5, 2005): 5297-300. Epub 2005 Mar 24. Copyright 2005 National Academy of Sciences, U.S.A. Used with permission.

Hearing

- Newborns recognize their mother's voice -- suck at rate that will permit hearing mother's voice over alternative.
- Neonatal audition -- Cat in the Hat study (Casper and DeSpence, 1986).
- Recognition even when story read by a stranger.

Hearing

- Preference for
  - the human voice over other sounds of similar pitch and intensity
  - for sounds within the human voice range to sounds outside the human voice range
  - for female voices over male voices
  - their own language from other languages
  - infant-directed over adult-directed speech

Hearing

- Until approximately 8-months of age, infants can hear phonemic distinctions in other languages not present in their own.
- Phonemic distinctions are categorical.
- Not species specific -- other animals can hear them too.
- Not domain specific -- non-linguistic acoustic stimuli are also heard categorically.

- Brief exposure “keeps the window open” for babies (but only if it’s interactive).

Hearing

- Infants also develop a sensitivity to prosody -- English-speaking 9-month-olds (but not 6-month-olds) have a preference for **strong**/weak accents (**ba**by, **mom**my) over weak/**strong** on novel words.
- Also by 9-months prefer “possible” words in their own language (zw and vl are legal in Dutch not English; English-speaking babies prefer English words).

Hearing

- Categorical speech perception
- Changes between da and ba are continuous -- but we hear them as discrete categories.

Touch/Smell/Taste

- Tactile stimuli
  - Neonates and pain?
  - Anesthesia in infancy (Anand & Hickey, 1992)
  - Air puffs (more sensitive than adult)