Naturally Acquired Literacy
Reading is a Visual Language

American Sign Language (ASL)
American Sign Language (ASL)

Days of the Week

- Monday
- Tuesday
- Wednesday
- Thursday
- Friday
- Saturday
- Sunday

card  pay  owe  late  library
understand  don’t understand  emergency  deaf  close
Communicate
Even Before Your Baby Can Talk!

- Bath
- Bed
- Cookie
- Daddy
- Eat
- Frog
- Gentle
- Hear
- Help
- Horse
- Hot
- I Love You
- Milk
- Mommy
- More
- No Touch
- Potty
- Shoes
- Telephone
- Thank You
- Where

www.signwithme.com
Cute Signing Baby
http://www.youtube.com/watch?v=7gSZfW4gVhI
Sign Language Videos

Sign Language Lessons
http://www.youtube.com/watch?v=7cayMkVidpc

Toddler Talk
http://www.youtube.com/watch?v=xF_Pvh7WNGI
Cued Speech

CUED SPEECH CONSONANT HANDSHAPES

1  2  3  4

p  k  s  n
D  z  h  b
zh  v  tH (the)  hw (why)

5  6  7  8
m  sh  j  y
f  l  g (go)  ng
T  w  th (thumb)  ch
Example of Cued Speech

- hand gesture
  - /d, p, zh/
- speechread
  - /b, p, m/
- denotes /p/

Orin Cornett
1913-2002
Cued Speech Videos

Overview of Cued Speech
http://www.youtube.com/watch?v=plPw4H-ZsMg

Learning Cued Speech
http://www.youtube.com/watch?v=6B18_G_8JHs
Puzzle of Language Acquisition

“No, Timmy, not ‘I sawed the chair’. It’s ‘I saw the chair’ or ‘I have seen the chair’.”
Language is Special

Innate

independent language organ

independent course of development

not traditional perception and learning theory

Noam Chomsky

Univ. of Maryland, Jan. 26, 2012
Language development alla Chomsky

- Chomsky's Language Organ
- not just abstraction, induction, generalization, and analogy
- languages have particular structures--because there are severe bounds on what can be learned
Reason Language is Special

• Poverty of the Stimulus
  
  – natural language grammar is un-learnable given the relatively limited data available to children learning a language, and therefore that this knowledge is supplemented with some sort of innate linguistic capacity
Critique: Language is Special

• Poverty of the Stimulus
  – positive evidence is actually enough to learn the various patterns that linguists claim are un-learnable by positive evidence alone.
  – brain's mechanisms of statistical pattern recognition could solve many of the imagined difficulties.
stochastic learning theory

• Also called Distributional Learning (DL)
• holds that language learning is based on complex, higher-order properties of stochastic patterns in sensory experience, not a mere tabulation of frequency of patterns.
Emergentist Coalition Model

• mapping of words onto referents
  – children rely on multiple cues

• weight given to these cues change across development.

• Example
  – Infants initially rely mostly on perceptual cues
  – Then rely more on speaker’s intent and linguistic cues
Figure 1. The Intermodal Preferential Looking Paradigm.
Habituation Videos

Infant Looking Time Habituation
http://www.youtube.com/watch?v=dliZh60qdA

Werker Sound Discrimination Research
http://www.youtube.com/watch?v=dAU5CAl1U6M

The Baby Human
http://www.youtube.com/watch?v=Ew5-xbc1HMk
Infants Have the Wetware for Spoken Language

http://www.youtube.com/watch?v=Ew5-xbc1HMk

Infants Perceive Subtle Distinctions in Speech

Infants Perceive Categories and When They Occur

http://www.youtube.com/watch?v=dAU5CAI1U6M
Infants Sensitivity to Speech

- Begin Life sensitive to all phonetic contrasts
- 10 months and sometimes earlier
  - Beginning to refine their categories
  - Still sensitive to differences
  - Can learn distributional information
  - Sensitive to contextual information
  - Acquired distinctiveness can occur
Babies

- Infant Learning and Intelligence
- http://www.youtube.com/watch?v=upMfun48euc
Babies

• Association Engines
• Learn Statistical Constraints
  – Speech
  – Music
  – Objects
Babies

• Association Engines
• Learn Statistical Constraints
  – Speech
  – Music
  – Objects
  – Letters?
Puzzle of Language Acquisition

• General Learning Principles
  – May be sufficient

• Generalization
  – Forms
    • Structure of the Expression
  – Functions
    • Meaning of the Expression
form and function

• Structure of the expression
• Meaning of the expression
Form And Function

• old forms express new functions
  – milk please ----> treat please

• new forms express old functions
  – milk please ----> please pass the milk
Infants understanding of words

• link object words to referents
  – 10 months of age

• understand verbs like dance and open
  – 15 months of age
Influences on Infants’ Word Learning

• Interest
  – 10-month-olds

• Action produces a result
  – At 21 months versus 33 months

• Names for their own actions
  – Versus others’ actions

• Agent performing the action
  – Familiar versus unfamiliar
Infants categorization

• across categories of containment
  – 6 months of age

• across categories of support
  – 14 months of age
Figure 1 is the standard trial (a). Children saw a video clip of a woman.
Path and manner

• Path
  – the movement of a figure with respect to a ground object.
  – 9 months

• Manner
  – how the figure moves within an event (e.g., climbing or walking)
  – 13 moths

• Path relations are easier to detect and categorize than manner relations.
Goal Paths Over Source Paths

- 12-month-olds attend preferentially to goal paths over source paths in dynamic, non-linguistic events
- 14 months of age children form categories of goals though not of sources
Why early experiences matter

**Newborn Brain**
Average weight 333 grams

**2 Year Old’s Brain**
Average weight 999 grams

Brain photo courtesy IsaacMao, Flickr
Childhood decides everything

John-Paul Sartre
Explosive Brain Development

(a) Neuron development over different ages:
- Neonate
- Six months
- Two years
Critical Periods

• Auditory System
• Visual System
• Language System(s)
  – Speech
  – Sign
  – Reading (Hypothesized)

Dr. Andrew Melthoff
http://www.youtube.com/watch?v=y4MCqFkbQXI
Still face experiment
http://www.youtube.com/watch?v=apzXGEbZht0
Matata and Kanzi

Kanzi, the Bonobo

http://www.youtube.com/watch?v=jKauXrp9dl4