What are you learning when you’re learning a language?

DID YOU SEE THE CLEVERBOT-CLEVERBOT CHAT?

I AM NOT A ROBOT, I AM A UNICORN.

YEAH. IT’S HILARIOUS, BUT IT’S JUST CLUMSILY SAMPLING A HUGE DATABASE OF LINES PEOPLE HAVE TYPED. CHATTERBOTS STILL HAVE A LONG WAY TO GO.

SO... COMPUTERS HAVE MASTERED PLAYING CHESS AND DRIVING CARS ACROSS THE DESERT, BUT CAN’T HOLD FIVE MINUTES OF NORMAL CONVERSATION?

PRETTY MUCH.

IS IT JUST ME, OR HAVE WE CREATED A BURNING MAN ATTENDEE?
Language science: careers

• Speech-language pathology
  – More info: http://ling.ucsd.edu/docs/undergrad/ucsd_slp/

• Speech technology (Alexa, Siri, Google Voice)
  – Google, Microsoft Research, Nuance
  – Sometimes with a PhD, sometimes without

• Academic research
My classes

- COGS 156 Language Development
- COGS 157 Music and the Mind
- COGS14A Research Methods (sometimes)
Language at age 3

• Good narrative skills
• Gestures
• [Over]generalizes concepts
  – Obi-Wan is a teacher, garage sale for robots
• Phoneme errors
  – Erratic production of final L sound
    • “well” followed by “wew”
  – sh --> s (siny guy, spacesip)
  – th --> f (He tried to do it wifout seeing, Darf Vader)
• Verb forms overregularized (“blowed up”)
• Frozen phrases (Don’t talk back to Darf Vader, he’ll get ya!)
What are you learning?

- Speech sounds
- Finding word boundaries
- Mapping words to meanings
- Syntax (grammar)
- Language in social context

*How do these things go together?*
Possible patterns

• Sequential

Speech sounds  Words  Grammar  Social context

• Overlapping

Speech sounds  Words  Grammar  Social context
# Producing language

<table>
<thead>
<tr>
<th>Speech sounds</th>
<th>Words</th>
<th>Grammar</th>
<th>Social context</th>
</tr>
</thead>
<tbody>
<tr>
<td>~6-8 months: Babbling onset</td>
<td>10-12 months: say first words</td>
<td>18 months: “word spurt”</td>
<td>This takes quite a while…</td>
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<tr>
<td></td>
<td></td>
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<td>A caution: Perception precedes production.</td>
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</tbody>
</table>

“two-word speech”
Recognizing/comprehending language

By 10-12 months: Only sensitive to speech sound changes in your native language (mostly)

Older idea: you need to have a small set of sound “symbols”—phonemes—(kind of like mental letters) to be able to store words in the brain—otherwise, information overload

BUT...

Show some word recognition at 6-9 months (Bergelson & Swingley, 2012)
Respond to word order at 17 months, before 2-word stage (Hirsh-Pasek & Golinkoff, 1993)

Show some social (?) responsiveness to language in infancy (Kinzler et al., 2007)

MANY studies showing non-adultlike sensitivity to differences in speech sounds, voices, vocal emotion, word stress patterns in preschool years and beyond
Finding word boundaries
Cues to word boundaries

• Stress
  – English: most nouns are stress-initial
  – The|PREttyBAby|WANTSa|BOTtle
Cues to word boundaries

• Strong-initial vs. weak-initial words
  – Strong: BUTter, CANdle, PUPpy, SAUsage
  – Weak: baNAna, caBOOSE, reCLINE, aGREE

• Cutler and colleagues: “metrical segmentation strategy” (MSS)
  – Strong syllable is the start of a word
Cues to word boundaries

- Jusczyk, Houston & Newsome
  - Infants’ recognition of word forms
  - 7.5 months:
    - Stress-initial *(king)dom)* ✓
    - Stress not initial *(guitar)* ❌
  - 10.5 months:
    - Stress not initial *(guitar)* ✓
But...

• Not all languages have this kind of stress pattern.

• How do you know what the properties of words are if you don’t know what the words are?
• Look at the pretty baby
• Where is the baby now pretty girl
• This baby is pretty silly
Look at the pretty baby
Where is the baby now pretty girl
This baby is prettysilly

Given “ty”, what’s likely to come next?
What about given “ba”?
StaKsKcal learning

- Saffran, Aslin & Newport (1996)
  - 8-month-old infants

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Statistical learning

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Statistical learning

• Play for 2 minutes
• Present kids with bidaku or piro.bi type words
• What do they listen to longer?
  bidaku < piro.bi
  – (novelty preference)
• At 8 months infants can segment words based on statistical cues
But what about stress?

• Johnson & Jusczyk (2001)
  – 8-month-olds
  – Stress vs. statistics: Stress wins
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  - Statistics wins @ 7 mos
  - Stress wins @ 9 mos
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- *Segmentation precedes stress.*