Language

Outline
• Syntax and semantics
  – Aphasia that affect one or the other
  – How semantics can depend on syntax
• Ambiguity
  – Effects on comprehension
  – Types of ambiguity
• What makes human language special

Syntax and semantics
• Syntax: Rules that govern how words are assembled into sentences
• Semantics: The meaning of words and sentences
• Separate, but also related
  – Semantics can depend on syntactic information

Syntax
• Consider:
  1 Colorless green ideas sleep furiously
  2 Sleep green furiously ideas colorless
• 1 is syntactically well-formed
  – Words are organized correctly, by category
  – Even if it doesn’t make much sense
• 2 is not syntactically well-formed
  – And everyone agrees
  – Even if they haven’t seen it before

Semantics
• Meaning comes from words, but also comes from syntax
  1 The leopard killed the lion
  2 The lion killed the leopard
  3 The leopard was killed by the lion
  – was and by cue the object-verb-subject rule
Broca’s area is involved in:
- Representing syntax
- Language production (near motor cortex)

Wernicke’s area is involved in:
- Representing meaning (near the "what" system)
- Language comprehension (near auditory cortex)

Projections link the two

Aphasia

“Yes.. ah.. Monday er.. Dad and Peter H., and Dad.. er.. hospital.. and ah.. Wednesday.. Wednesday, nine o’clock.. and ah Thursday.. ten o’clock, ah doctors.. two.. an’ doctors.. and er teeth” [Broca’s aphasia]

“Boy, I’m sweating, I’m awful nervous, you know, once in a while I get caught up. I can’t mention the tarripoi, a month ago, quite a little, I’ve done a lot well, I impose a lot, while on the other hand, you know what I mean, I have to run around, look it over, trebin and all that sort of stuff.” [Wernicke’s aphasia]

Tan’s brain

Semantics

- Meaning comes from words, but also comes from syntax
  1. The leopard killed the lion
  2. The lion killed the leopard
  3. The leopard was killed by the lion
     - was and by cue the object-verb-subject rule

More evidence for rules

- Rules applied to made-up words
  - Rules for plurals and past tense
- Rules applied incorrectly to real words
  - Over-regularization errors
  - Erin, from Born to Talk:
    - So he drewed a picture of a car
    - Elmo walked over and sticked it Alan’s head

While the man hunted the deer ran through the woods.

- Did the man hunt the deer?
- Did the deer run through the woods?
**While Anna bathed the baby spit up on the bed.**

- Did Anna bathe the baby?
- Did the baby spit up on the bed?

**Example of a garden path sentence**

- The parser runs into a dead end at *spit*
  - So the eyes pause on *spit*
- The parser has to backtrack
  - Detach the baby from *While Anna bathed*, start a new clause with it, attach *spit*
- What happens to the initial, incorrect meaning?

**Lingering misinterpretations**

- Participants read sentences 1 at a time
  - Garden-path (*While Anna bathed the baby*)
  - Controls (*While Anna bathed, the baby*)
- After each, pressed space bar
  - The sentence disappeared
  - ½-sec later, a question appeared
  - Did Anna bathe the baby?
  - Participant answered yes or no
  - Then next sentence appeared

**Lingering misinterpretations**

- Yes (incorrect) answers:
  - Garden path: 57%
  - Control: 12%
- What happens to the initial, incorrect meaning?
  - It can stick around in working memory

**Other types of ambiguity**

- *He was bothered by the cold*
  - Lexical ambiguity: Meaning of cold
- *Hannibal sent troops over a week ago*
  - Surface ambiguity: Syntactic role of *over*
- *Visiting relatives can be a nuisance*
  - Underlying ambiguity: Who’s doing what to whom

**Two conjectures**

1. Writing contains many more ambiguities than the writer suspects
   - You know what meaning you intended
   - Your reader doesn’t have that context
2. Lingering misinterpretations confuse the message