Language

• Language as a critical phenomenon for cognitive science
  – Language separates humans from other animals
  – Behaviorists: language learning by stimulus-response associations
  – Chomsky: An innate Language Acquisition Device is needed

• Innate constraints for language learning
  – Kids learn language in about 2.5 years, from positive evidence
  – Kids are not generally corrected for grammaticality
  – We can generate and understand novel sentences
  – Without any constraints, an infinite number of grammars is consistent with any finite amount of data (Gold’s Thesis)
  – $1, 2, 3, 4, \ldots = 5? \ 29? \ 53?$
  – $2(x-1)(x-2)(x-3)(x-4)+x=53$
"Matthews ... we're getting another one of those strange 'aw blah es span yol' sounds."
The Universal Language = what languages share

• Constraints on what we will consider as grammars
  – Constraints are good - they allow learning to take place

• Word order of subject and object
  – Subject-verb-object occurs
  – Subject-object-verb occurs
  – Object-subject-verb (almost) never occurs

• Word order of adjectives and nouns
  – An adjective comes close to the noun it modifies
  – La femme brave a frappe l’homme cruel
  – [The woman brave hit the man cruel]

• Constraints help us to learn grammar rules quickly
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Properties of Language

• Productivity/generativity
  – People can produce novel utterances by putting together pieces (words) in different arrangements

• Regularity
  – Language has a systematic structure
  – Only some structures are allowable
  – Grammar gives rules for determining what is allowable

• Arbitrariness of symbols
  – No inherent connection between symbol and meaning
  – Violations
    • Onomatopoiea - words that sound like what they mean: crack, buzz, bark
    • Sound/meaning clusters: slip, slither, slide, sled, slope, slalom, slack, slimy
Calvin and Hobbes

I like to verb words.

What?

I take nouns and adjectives and use them as verbs. Remember when "access" was a thing? Now it's something you do. It got verbed.

Verbing weird's language.

Maybe we can eventually make language a complete impediment to understanding.
Grammar

Sentence -> NP  VP

NP -> [article] [AP] noun

VP -> verb  NP

AP -> adj [AP] Recursion: AP defined in terms of itself

Obsequious sequins sequester sanguine sequences
Syntax and Semantics

- **Syntax**
  - The set of rules for putting together words and phrases to make sentences

- **Semantics**
  - The meaning of the sentence

- **Syntax without semantics**
  - Colorless green ideas sleep furiously
  - Williams’ syndrome. Very low IQ, preserved language
  - Wernicke’s aphasia: flowing, meaningless speech

- **Semantics without syntax**
  - If you wants now million dollars, “give it to me” say.
  - Broca’s aphasia: halted, contentful speech
Syntax and semantics each promote understanding

• Three kinds of sentences in experiment
  – Semantically meaningful and grammatical
  – Semantically meaningless but grammatical
  – Agrammatical

• Meaningful sentences are more likely to be comprehended than meaningless sentences
  – Contribution of semantics

• Meaningless but grammatical sentences are more likely to be comprehended than agrammatical sentences
  – Syntax provides its own constraints

• The more predictable and constrained a sentence is, the more comprehensible it is
  – Redundancy helps understanding
A) A witness signed the official legal document.
B) Sloppy poetry leaves nuclear minutes.
C) Attracted wrapper the reverence private odorless.
A) A jeweler appraised the glittering diamond earrings.
B) Romantic ink follows wasted games.
C) Became lecture the bar deep wealthy.
A) A storm prevented the annual company picnic.
B) Total coffee describes eternal spots.
C) Played the formula club old controversial the.
A) A magazine exposed the shocking political corruption.
B) Healthy angry packages bloomed dangerously.
C) The built a was tamer fortune blaze by lazy.
Syntax influences perception

- **Click migration**
  - Click travels to the boundary between phrases

(As a direct result of their new invention’s influence) (the company was given an award)

(The retiring chairman whose methods still greatly influence the company) (was given an award)

- Syntactic gaps seem larger than they really are
- Large gaps are more likely to be filled
Usually, syntax and semantics work together

- Finding meaning often requires finding syntactical parsing (interpretation)
  - Sentences are often ambiguous because parsing is ambiguous
- Often, once syntax is clear, semantics is clear

John, while Mary had had had had had “had had had had had” had had “had had had had” had had a better effect on the teacher.
They are flying planes

They are flying planes
Other examples of ambiguity

In the window of an Oregon store:

   Why go elsewhere and be cheated when you can come here?

In a New York restaurant:

   Customers who consider our waitresses uncivil ought to see the manager.

In a Los Angeles dance hall:

   Good clear dancing every night but Sunday.

In the offices of a loan company:

   Ask about our plans for owning your home.
Does Language influence thought?

- The Sapir-Whorf hypothesis
  - Linguistic relativism: people who speak different languages think about world differently
  - Eskimoes have 32 words for snow = NOT evidence for Sapir-Whorf
  - Hopi combine form and substance together in words and similarity judgments
  - Support from Brown and Lennenburg
    - Determine “highly codable colors” and less codable colors
    - Show 4 colors to subject
    - Have subjects find colors in a pile
    - Recognition for highly codable colors > recognition for less codable colors

- Rosch argues against Sapir-Whorf: universal color perception
  - Dani are better at recognizing highly codable colors (in English) even though they only have terms for “light” and “dark”
  - A universal progression of color terms

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Evidence in favor of linguistic relativism

- Berinmo and English differ in their ability to remember colors
  - English and Berinmo have different color categories
  - Task: Present a color, delay, show two possible colors, subjects’ task is to choose the previously presented color
  - English best at task when one color is “blue” and the other is “green”
  - Berinmo best at task when one color is “wor” and the other is “nol”
- Chinese children count earlier than American children
  - (In part) because Chinese numbers are more systematic
- Yucatac Mayan vs. English speakers (Lucy, 1992)
  - Count nouns are countable objects: chairs, bananas, pens, trees
  - Mass nouns are substances: jello, copper, mud, grease
  - Mayans do not need to use plurals for most objects, treating them as mass nouns
  - English:” two chairs”. Mayan:” two chair”
  - Mayans’ similarity judgments are more influenced by material (as appropriate for mass nouns), rather than shape (as appropriate for count nouns)
Davidoff, Davies, & Roberson (1999)

Blue/Green cross-category
Blue/Green within-category
Nol/Wor cross-category
Nol/Wor within-category

Stimulus pairs

mean correct/16

- Berinmo 30 seconds-Exp.6
- English 30 seconds-Exp.6
- Berinmo 5 seconds-Exp.6
The modularity of word activation

- The “speech is special” movement
- Word priming is modularized: fast, efficient, doesn’t take everything into account
- Disambiguation of word meaning
  - “Rumor had it that, for years, the government building had been plagued with problems. The man was not surprised when he found several spiders, roaches, and other bugs in the corner of the room.”
  - Are both “insect bugs” and “listening device bugs” activated when we read “bugs”?  
  - Lexical decision task: Is the following string a word?
    - Things: “No” - non word
    - Insect: “Yes” - word related to appropriate meaning
    - Spy: “Yes” - word related to inappropriate meaning
    - Book: “Yes” - word unrelated to either meaning
    - Both “Insect” and “Spy” are faster than “Book” immediately after we read “bugs”
  - After 750 msec, only “Insect” is primed.
  - First priming is based on pure association, not on context or knowledge
- Other examples of priming