

Language and Cognitive Science

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[Slides based on Friedenberg and Silverman Ch. 9]

“How very commonly we hear it remarked that such and such thoughts are beyond the compass of words! I do not believe that any thought, properly so called, is out of the reach of language.”

—Edgar Allan Poe, 1846

Language

- Can be studied from all the approaches we've discussed: philosophical, psychological/cognitive, neuroscientific, computational/AI
- What is novel is not the tools but the subject matter itself
- For us: keep in mind the cognitive questions of **representation** and **processing**

The nature of language

- Many philosophical debates about definition
- Some characteristics
 - Communicative
 - Arbitrary (symbolic representation)
 - Structured (combining symbols)
 - Generative
 - Dynamic

Building blocks

- Spoken language: **phonemes** and **morphemes**
- Rules of language (grammar): **phonology**, **morphology**, **syntax**, **semantics**, **pragmatics**

Questions about language

- Language evolution
- Language acquisition
- Language production
- Language comprehension
- Language and thought

Linguistic relativity

The Sapir-Whorf Hypothesis

- Does the language we speak affect the way we think about the world around us?
- Strong version (Sapir-Whorf): Impossible to express thoughts generated in one language exactly in another
- Weak version: Translation may be possible, but language has some affect on thought

Whorf on Hopi

- Hopi language has a discrete conception of time; each unit of time considered unique
- They would say “*I left on the fifth day*” rather than “*I stayed five days*”
- Strong version of Sapir-Whorf: Hopi speakers are incapable of conceiving time as continuous, because their language has no words for it
- Weak version: Understanding time as continuous would require it to be expressed in a completely different set of Hopi words

Studies on Sapir-Whorf

- Colour perception: People tend to group colours in the same way, even if their vocabulary of colour words has differences
- Counterfactuals:
 - “*If you bought your ticket now, you would save money*” (subjunctive, imaginary scenario)
 - “*If it is hot today, then I will go swimming*” (simple if-then)
 - Chinese has only the second kind
 - Do Chinese speakers have more difficulty processing counterfactuals or hypothetical scenarios? Results unclear
- Generally, the strong version of Sapir-Whorf seems not to be supported by evidence, but some indications for weak version

Grammar

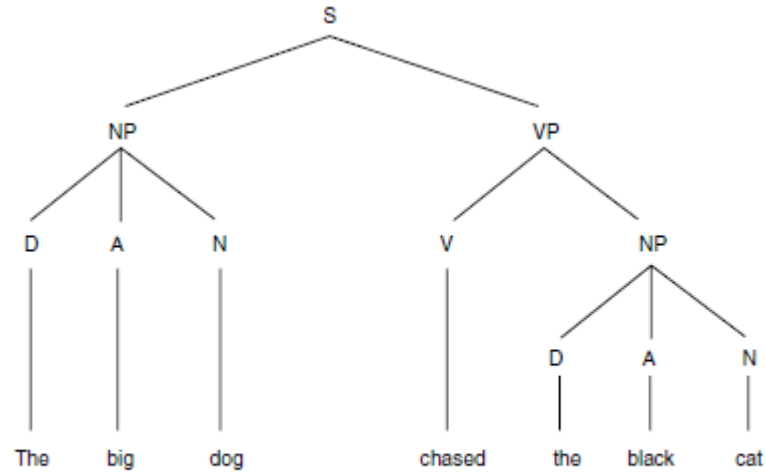


Figure 9.5 The phrase structure for a simple sentence

- Phrase structure
- Transformational and generative grammars
- Surface structure and deep structure
- Universal grammar (e.g., maximal onset principle, S-O order)
- Cognitive insights? We will look at sentence processing

Neurolinguistics

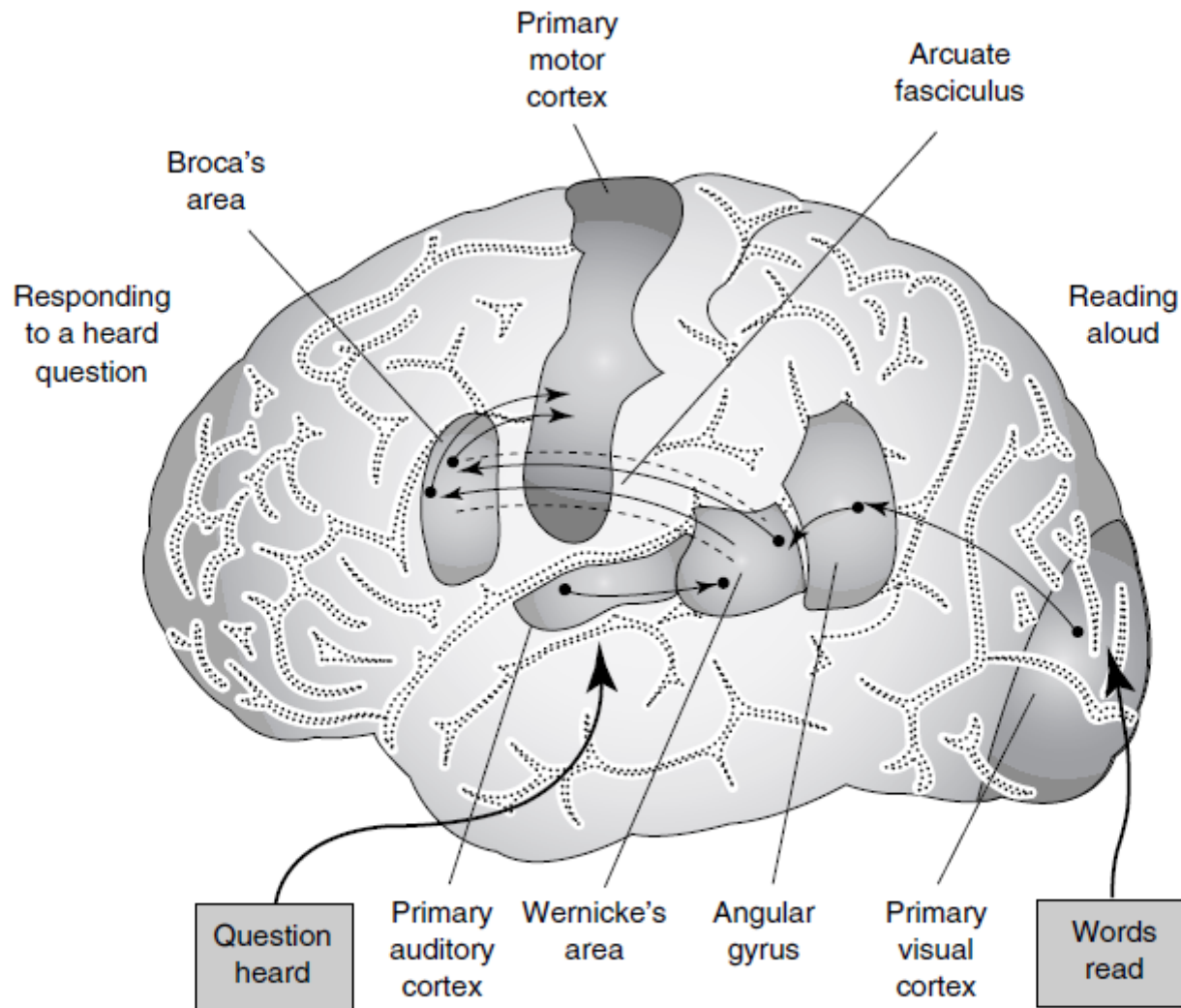


Figure 9.6 Brain areas of the left hemisphere that are part of the Wernicke-Geschwind model of language comprehension and production

Broca's Aphasia

*Yes . . . ah . . . Monday er . . . Dad and Peter
H . . . , and Dad . . . er . . . hospital . . . and ah . . .
. Wednesday . . . Wednesday, nine o'clock . . .
and oh . . . Thursday . . . ten o'clock, ah doctors
. . . two . . . an' doctors . . . and er . . . teeth . . .
yah*

(Goodglass & Geschwind, 1976, p. 408)

Wernicke's Aphasia

Oh sure, go ahead, any old think you want. If I could I would. Oh I'm taking the word the wrong way to say, all of the barbers here whenever they stop you it's going around and around, if you know what I mean, that is tying and tying for repucer, repuceration, well, we were trying the best that we could while another time it was with the beds over there the same thing.

(Gardner, 1974)

Issues with Wernicke-Geschwind

- Oversimplification; brain areas have multiple and plastic functions
- Areas like Broca's and Wernicke's implicated in other cognitive processes
- Modern brain imaging shows a more complex picture of areas involved

NLP/AI

- Major stages:
 - Speech recognition
 - Syntactic analysis (parsing)
 - Semantic analysis
 - Pragmatic analysis (context, discourse)
- From our perspective: what can computational NLP techniques tell us about cognitive language processing?