

9.65 March 31, 2004: Language: Psycholinguistics HANDOUT

1. Introduction
2. What a theory of language needs to explain
3. Theories of grammar:
 - a. phrase structure grammar
 - b. transformational grammar
 - c. others
4. Psycholinguistics: How we parse a sentence

1. Introduction

Our knowledge of language can be divided into several semi-independent topics, the chief of which are PHONOLOGY (roughly, the study of the rules governing the sounds and sound-sequences of the language); MORPHOLOGY--rules governing the formation of words and affixes to words; SYNTAX--the structural arrangements of words in sentences; and SEMANTICS--the meanings conveyed by sentences.

SYNTAX today.

CLASSIC EXAMPLES--CHOMSKY

Colorless green ideas sleep furiously

Large fierce dog sleep lightly.

Universal Grammar or UG

2. What does a theory of language need to explain?

(1) What makes a string of words GRAMMATICAL

(2) How can the set of rules represent relations among the words WITHIN A SENTENCE?

John is eager to please

John is easy to please

(3) How can the set of rules represent relations between sentences:

John kissed Mary

Mary was kissed by John

Did John kiss Mary?

Who did John kiss?

etc.

(4) What makes some sentences AMBIGUOUS?

They are flying planes

Visiting relatives can be boring

(5) How can language be infinitely productive, yet follow rules?

(6) How can language be learned?

3. Theories of grammar: A brief evolutionary history

(a) PHRASE STRUCTURE GRAMMAR

Not left-to-right, but hierarchical, with a constituent analysis:

[the (dog)] [will] [chase (that gray {cat})]

Three components of a PS grammar:

1. Constituent symbols:

S sentence

det determiner (article) the, a, ...

A adjective gray, small...

N noun dog, cat...

AUX auxiliary verb: will, do....

V verb chase, bite....

NP noun phrase e.g., det + N, det + A + N

VP verb phrase e.g., V + NP, V + S

PP prepositional phrase e.g., P + NP

adverbs, etc.

2. Phrase structure rules:

"Rewrite" rules such as $S \rightarrow NP + AUX + VP$

$NP \rightarrow (Det) + N$

$NP \rightarrow NP + PP$

$VP \rightarrow V + S$

3. Set of terminal elements:

Usually words--terminal in that they can't be rewritten further.

This constitutes a "generative" grammar because the rules must be able to generate any and all valid (grammatical) sentences in the language, and no invalid sentences.

Explains:

-What makes a sentence grammatical

-relations among words in a sentence: who did what to whom

-accounts for SOME ambiguity:

[(they) (are eating {apples})]

[(they) (are {eating apples})]

-explains productivity (recursive)

-explains discontinuous speech errors

-MAY help explain how language can be acquired

DOES NOT explain:

-some ambiguities

[(visiting relatives) {(can be) boring}]

-relations between sentences: declarative, question, negation, passive...

-difference between sentences like "John is easy to please" and "John is eager to please".

(b) TRANSFORMATIONAL GRAMMAR (Transformations are now called "movement rules")

Distinction between Deep Structure (d-structure) and Surface Structure (s-structure)

The dog chased the cat

Deep: [(Art1 + N1) + (V + {Art2 + N2})]

Who chased the cat?

Rule: change above to [(Who) + (V + {Art2 + N2})]

Did the dog chase the cat?

Rule: Move AUX to front

Transformations can rearrange (move) constituents: by substitution, by displacement, by permutation.

Can explain the ambiguity of the visiting-relatives example:

Also: difference between:

John is eager to please

John is easy to please

Traces:

In transformational grammar, when parts of a sentence are moved around, as when forming a question, an inaudible, invisible "trace" may be left behind in the original position of the moved constituent. But what's the evidence for this "trace"?

I wanna go home!

But:

*The student you wanna solve the problem just came in.

(The asterisk, *, is a conventional symbol for Not Grammatical.)

Another pair of sentences: Only one permits "wanna."

Who do you want to go instead of you?

Who do you want to go with to the party?

Constraints on transformations

E.g., topicalization. "The brain, I'm fascinated by."

Constraint: can't topicalize only part of a coordinate structure:

Mary, Joe went out with.

Mary and Sue, Joe went out with.

*Sue, Joe went out with Mary and.

In general, coordinate structures have to stick together and be made up of the same category:

John wrote a letter and a postcard

John wrote to Mary and to Fred

*John wrote a letter and to Fred

Another example:

John walked and Mary ran up the hill

*John rang and Harry picked up Mary's sister.

(c) OTHER DEVELOPMENTS in linguistic theory:

Thematic (theta) roles: semantic roles that NP subjects and (direct) objects have to fulfill, for a given verb. E.g., agent, object [or "patient" and "theme"], location, temporal info, instrument.

4. Psycholinguistics: How we parse a sentence

Parsing strategies:

Do we actually recover the structure of a sentence in order to understand it?

The man bit the dog

The scouts the Indians saw killed a buffalo.

Decide: Were both these words in the sentence?

Indians, killed

Or:

scouts, killed

Possible parsing strategies:

I scream/ice cream

HEURISTICS or STRATEGIES

1. Word or constituent order strategies:

- a. In a N V N sentence, assume the first N is the agent of the V and the second N is the object.
- b. Clause order: Assume first of two clauses is the main clause.
- c. If you have a function word, begin a constituent (the, a: begin NP);(preposition, begin PP)
- d. When you find a relative pronoun (that, which, who...) begin a new clause. (If the relative pronoun is omitted, which it often can be, then processing does tend to be harder.)

2. Semantic strategies:

- a. After you have the verb, look for the number and kind of "arguments" or theta roles the verb takes:

3. Interpretive strategies:

e.g., When you get a definite noun phrase ("the book," rather than "a book"), search memory for the referent and replace with that entity.

4. Frazier and Fodor's hypothesis that listeners use the MINIMUM ATTACHMENT STRATEGY (see text):

a. The spy (watched {the cop} {with the binoculars})

b. The spy (watched [{the cop} {with the binoculars}])

a. is preferred because the with.. phrase is attached to an existing node for the whole VP.
But, try this version of the sentence:

The spy saw the cop with the revolver.

Pragmatically, the more complicated "b" is required--but in fact readers momentarily hesitate when they arrive at "revolver," suggesting a minimal attachment strategy.
(Rayner, Carlson, & Frazier, 1983)