Levels of Description in Linguistics 2

Ling499a, Spring 2009

Slide-copying acknowledgment:
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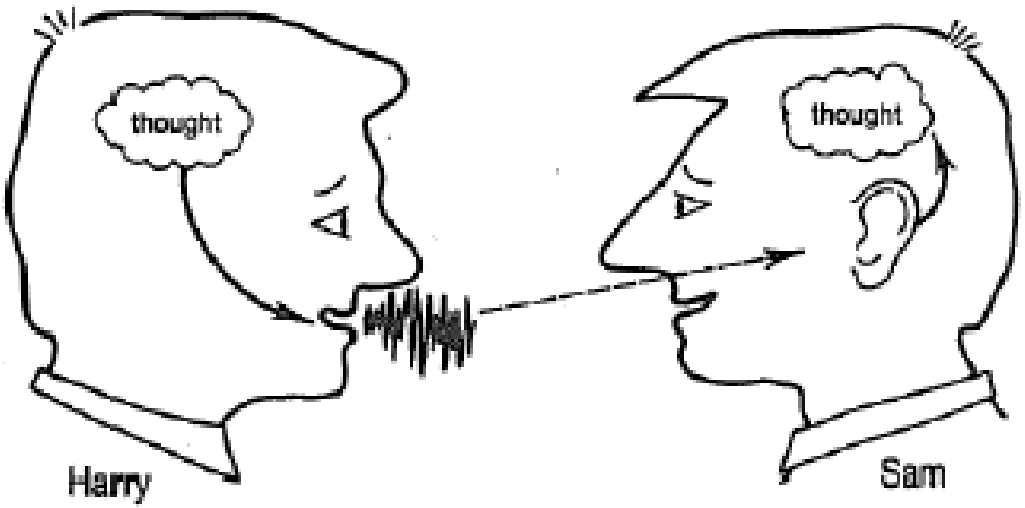
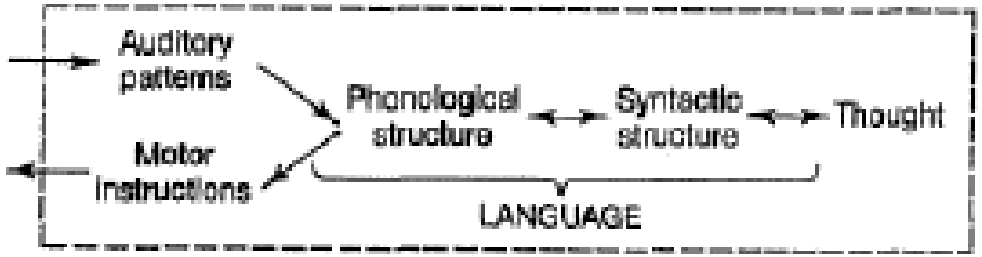
Language



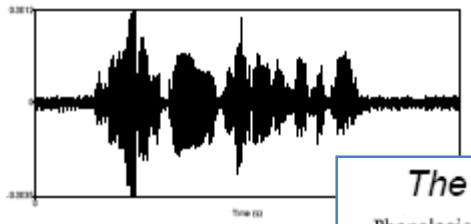


From Jackendoff (1994)

Linguistic representations

Thelittlestarisbesidethebigstar

The little star is beside the big star



The little star is beside the big star

Phonological structure

Prosodic structure

Syllabic structure

Segmental structure

Syntactic structure

Semantic/conceptual structure

Spatial structure

Using Marr's levels

Computational theory

What is the problem:

Mediation between "sound" and "meaning"

Different levels (phonology and syntax)

Theoretical Linguistics

Representation and Algorithm

How it is done:

Processes of online comprehension and production

Psycholinguistics

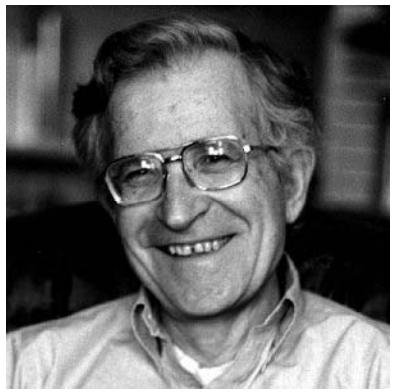
Implementation

What it is done *with*:

Brain

Neurolinguistics

“It has sometimes been argued that linguistic theory must meet the empirical condition that it account for the ease and rapidity of parsing. But parsing does not, in fact, have these properties. […] In general, it is not the case that language is readily usable or ‘designed for use.’” (Chomsky & Lasnik, 1993, p. 18)



One unified system

Computational theory

Representation and algorithm

???

What are the 'routines' for understanding/producing language?

How are they related to the well-formedness conditions/derivations specified by the computational theory?

Implementation

Or not ...

Performance (use)

Computational theory

Representation and algorithm

Implementation

Competence (grammaticality)

Computational theory

Representation and algorithm

Implementation

Origins of the Standard View

David J. Townsend and Thomas G. Bever

Sentence Comprehension

The Integration of Habits and Rules

Townsend & Bever (2001, ch. 2)

- "Linguists made a firm point of insisting that, at most, a grammar was a model of *competence* - that is, what the speaker knows. This was contrasted with effects of *performance*, actual systems of language behaviors such as speaking and understanding. Part of the motive for this distinction was the observation that sentences can be intuitively 'grammatical' while being difficult to understand, and conversely."

- Some examples:
  - The horse raced past the barn fell.
  - The mouse that the cat that the dog chased bit died.
  - *John kiss Mary

Townsend & Bever (2001, ch. 2)

- "…Despite this distinction the syntactic model had great appeal as a model of the processes we carry out when we talk and listen. *It was tempting to postulate that the theory of what we know is a theory of what we do*, thus answering two questions simultaneously.

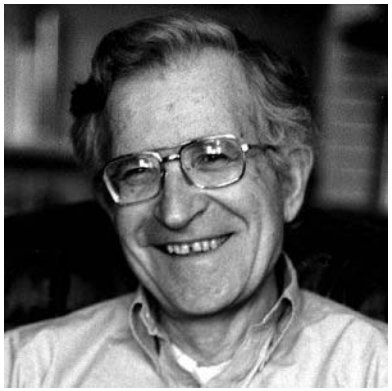
  1. What do we know when we know a language?
  2. What do we do when we use what we know?

Townsend & Bever (2001, ch. 2)

- "…It was assumed that this knowledge is linked to behavior in such a way that every syntactic operation corresponds to a psychological process. The hypothesis linking language behavior and knowledge was that they are identical.

Miller & Chomsky (1963)

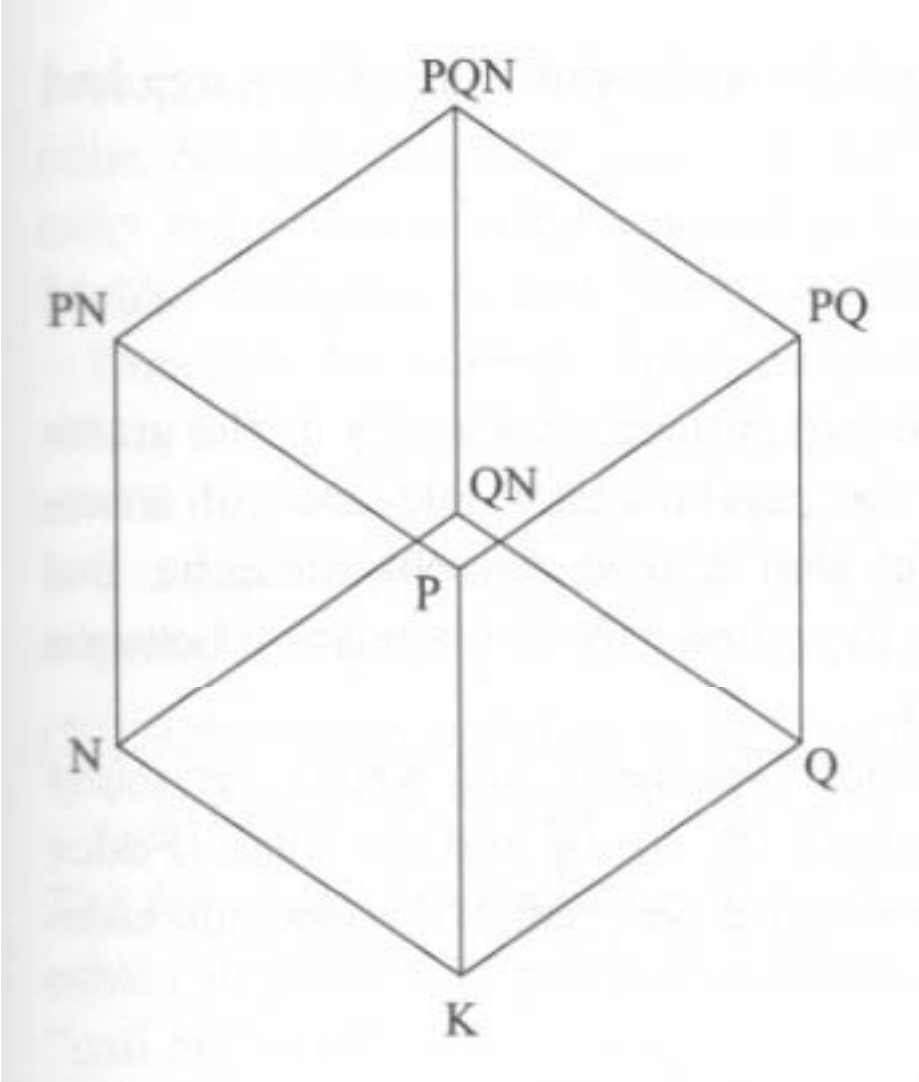
- ‘The psychological plausibility of a transformational model of the language user would be strengthened, of course, if it could be shown that our performance on tasks requiring an appreciation of the structure of transformed sentences is some function of the nature, number and complexity of the grammatical transformations involved.’ (Miller & Chomsky 1963: p. 481)



Miller (1962)

1. Mary hit Mark.	K(ernel)
2. Mary did not hit Mark.	N
3. Mark was hit by Mary.	P
4. Did Mary hit Mark?	Q
5. Mark was not hit by Mary.	NP
6. Didn’t Mary hit Mark?	NQ
7. Was Mark hit by Mary?	PQ
8. Wasn’t Mark hit by Mary?	PNQ

Miller (1962)



Transformational Cube

Townsend & Bever (2001, ch. 2)

- "The initial results were breathtaking. The amount of time it takes to produce a sentence, given another variant of it, is a function of the distance between them on the sentence cube. (Miller & McKean 1964)."

  "…It is hard to convey how exciting these developments were. It appeared that there was to be a continuing direct connection between linguistic and psychological research. […] The golden age had arrived."

Derivational Theory of Complexity

- Miller & McKean (1964): Matching sentences with the same meaning or 'kernel'

• Joe warned the old woman.	K	
The old woman was warned by Joe.	P	1.65s
• Joe warned the old woman.	K	
Joe didn't warn the old woman.	N	1.40s
• Joe warned the old woman.	K	
The old woman wasn't warned by Joe.	PN	3.12s

But…

McMahon (1963)

a.	i. seven precedes thirteen	K (true)
	ii. thirteen precedes seven	K (false)
b.	i. thirteen is preceded by seven	P (true)
	ii. seven is preceded by thirteen	P (false)
c.	i. thirteen does not precede seven	N (true)
	ii. seven does not precede thirteen	N (false)
d.	i. seven is not preceded by thirteen	PN (true)
	ii. thirteen is not preceded by seven	PN (false)

Easy Transformations

- Passive
  - The first shot the tired soldier the mosquito bit fired missed.
  - The first shot fired by the tired soldier bitten by the mosquito missed.
- Heavy NP Shift
  - I gave a complete set of the annotated works of H.H. Munro to Felix.
  - I gave to Felix a complete set of the annotated works of H.H. Munro.

Townsend & Bever (2001, ch. 2)

- “Alas, it soon became clear that either the linking hypothesis was wrong, or the grammar was wrong, or both.”

Townsend & Bever (2001, ch. 2)

- “The moral of this experience is clear. Cognitive science made progress by separating the question of what people understand and say from how they understand and say it. The straightforward attempt to use the grammatical model directly as a processing model failed. The question of what humans know about language is not only distinct from how children learn it, it is distinct from how adults use it.”

Summarizing so far

- Theory of competence and theory of performance – completely separate information processing systems?
- DTC experiments didn’t always succeed, and many took this as a support for the great divide…

Failure of DTC?

- Any DTC-like prediction is contingent on a particular theory of grammar, which may be wrong
- It's not surprising that transformations are not the *only* contributor to perceptual complexity
  - *memory demands*, may increase or decrease
  - *ambiguity*, where grammar does not help
  - difficulty of *access*
    e.g., *John donated the dog the mouse chased to the school.*
- We first need a) a much more **articulate model** of how the psychological processes of language comprehension are actually realized, and b) the appropriate **measures** of the psychological processes
- We need **good linking hypotheses btw. measures and models**

How about child data?

- For some reason, people are willing to take child data to inform syntactic theories
  - E.g., Testing Principles & Parameters

- …but these data are **performance data** from experiments or corpus, in which children have to parse/produce sentences

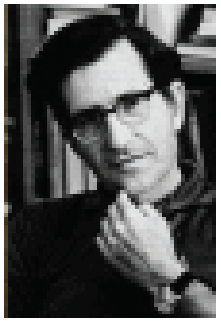
Data for syntacticians?

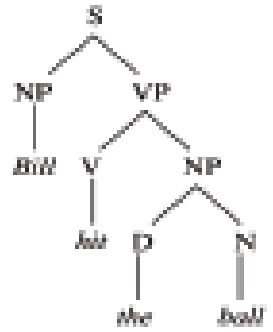
- What kind of data do syntacticians use?
- Data for syntacticians also come from ‘performance’ (though perhaps subject to relatively few resource limitations?)

Using Marr's levels

Linguistic cognition

Computational theory





Representation and algorithm

Implementation

Syntax time!

- Specifying “What is computed and why” for wh-constructions