

Ling 488

Exploring Natural Languages
by modeling

Em Bozsahin

Department of Linguistics
Boğaziçi University

Kinds of models

- 1 Scientific models (eg. DNA, atom)
- 2 Engineering models (eg. of dams, bridges)
houses
- 3 Business models (eg. LLMs)
- 4 Logic models (eg. truth conditions)

1 Scientific models

- Preparing an idea or theory for experiments
 - Real experiments or thought experiments
- Simplified representation of reality
 - The theory or the idea must be explicit and formulable enough to be able to do that
- Needs more than notational precision

- One important question: Are linguistic theories modelable in this sense?

- The points of scientific modeling:

- Make the idea independently testable

- gain a new understanding from the test

2 Engineering models

- Preparing a system for deployment
- Basic concerns in developing an eng. model:
 - . Reliability
 - . Efficiency
 - . Robustness
 - . Effects on the environment
 - . feasibility (cost, realizability)
- There has to be a design and a system in the first place.

3 Business models

- A system + financial concerns
+ legal concerns

(cost, revenue, profit, competition, liability)

- In terms of parameters, a business model does NOT have to be transparent. They may have hidden parameters.
- Other kinds of models WANT to be transparent.

4 Models in logic

- To connect symbols and formulae to truth values
- In general, connecting FORMS to VALUES
(true, false, degree of belief, probability etc.)
- Ex: Proof theory and model theory in logic

- We study scientific models
in this course

- That doesn't mean they have no
engineering or logical aspects

- Let us assume that we have a linguistic theory which is modelable in sense 1 (ie., scientifically modelable)
- what would we expect it to model?

- Morphology
- Phonology
- Syntax
- Semantics
- Information structure
- Discourse
- Variation (intra- and cross-linguistic)

- Language acquisition
- Interaction $\begin{pmatrix} \text{self} \\ 1-n \\ n-m \end{pmatrix}$
- One mind does it all

- Why do we study language at these levels?

- One cognitive scientist, Herbert Simon, said that we study NATURE at levels becomes IT COMES TO US AT LEVELS.

AGREE?

Morphology vs. phonology

ev-ler-e

Turkish

house-PLU-DAT

'to the houses'

ev.le.re

(syllables)

(morphemes and syllables)
are distinct

Morphology vs. vocabulary (lexicon?)

ev-ler

house-PLU

'houses'

Turkish

kiler

cellar

(ki-ler ??)

- Compare **kilerler**

(how do we know
kiler is not plural?)

Morphology vs. syntax

- Portmanteau phenomenon: ONE form serving TWO distinct semantic functions to the extent of being not separately identifiable.
- why do we see that in morphology but not in syntax?

I/she was working.
tense
person

cf. I {wouldn't} work.
I {wanna} work.
separately identifiable

Phonology vs. Syntax vs. Morphology

The boys like the video. English

She toys with the idea.

- Same phonological shape (/z/), different syntax and morphology

Syntax vs. semantics

John promised / persuaded / expected
Mary to study.

English

- Almost identical syntactic behaviour; altogether different semantics depending on the verb.

Semantics vs. Information Structure

I like this book.

English

This book I like.

- Same truth conditions; same referents;
different packaging.

Morphology

Phonology

Syntax

Semantics

Information Structure

Discourse



grammar

- Therefore, a grammar is by its very nature multi-dimensional.

- But these are empirical dimensions.

- Therefore, we need **ABSTRACTION** to put them together.

⇒ REPRESENTATION

Put them together to do what?

to study:

- language acquisition
- language variation
 - within a language
 - across languages
- Integration and interaction
(recall: one mind does it all.)
- Emergence of grammatical systems and constructions.

- Linguistic dimensions can be interpreted very differently depending on one's views and biases.

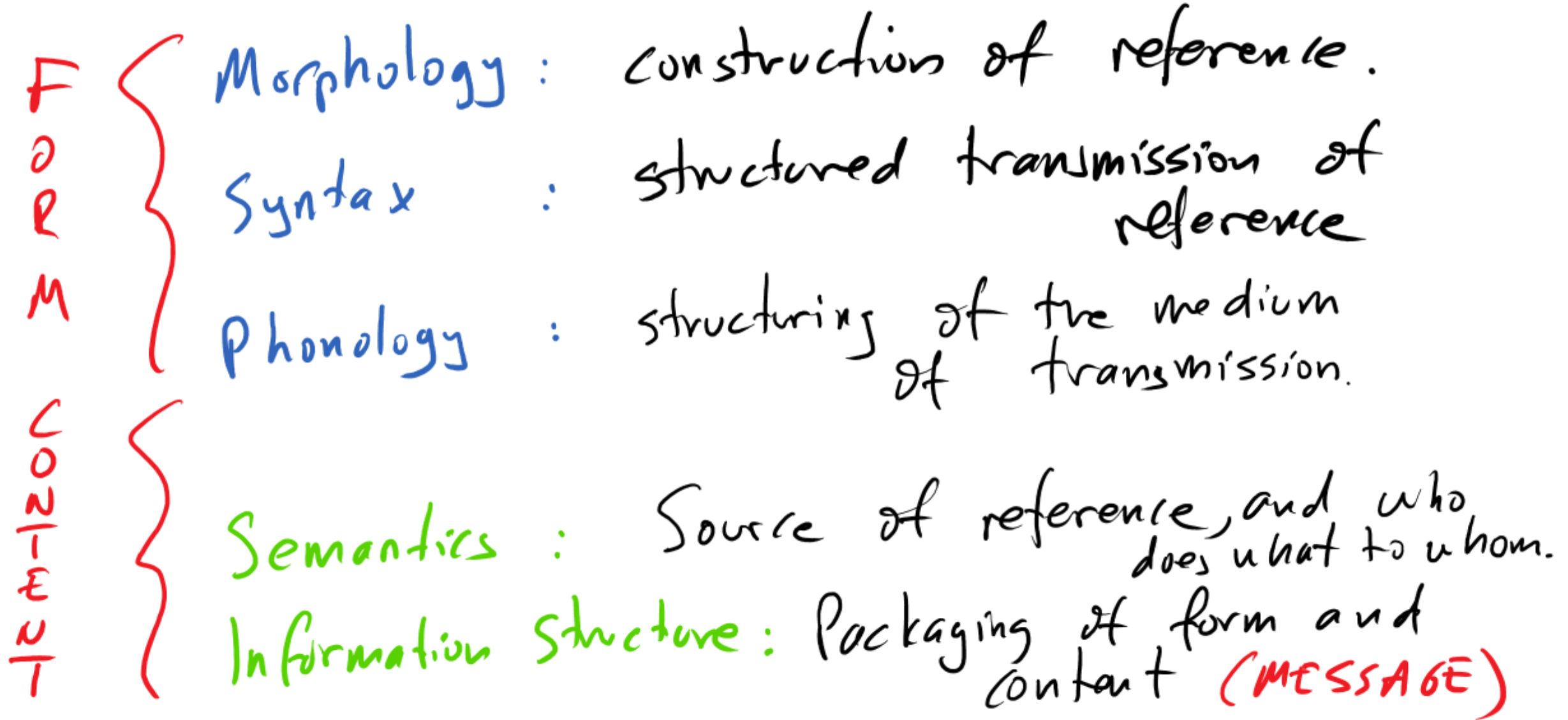
- This is a big challenge for modeling.

- Because we have to develop a modeling language to facilitate modeling.

- A grammar model must be unambiguously interpretable by the modelers.

one conception of dimensions

(Bozsahin
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Reference can be

- participant reference
- event reference (Vendler)
 - activities
 - states
 - human conceptions of activities and states
(accomplishments, achievements)
- location, time, figure, ground reference
- view reference (e.g. aspect)

MODELING PROCESS

