The Aims of Linguistic Theory

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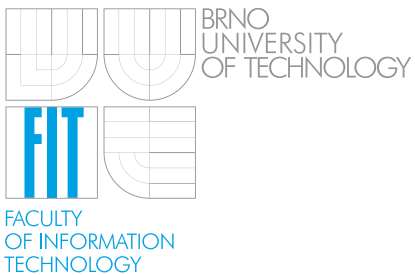

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Outline

- **Natural Language Processing**

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- **Structural Analysis**

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- Transformational Rules

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- Introducing of some basic linguistic terminology.
- We show diagnostics and techniques used by linguists for the examiniation of the structure of natural language utterances.
- Some general goals of a theory of language.

Major Linguistic Goals

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- Generalizations about the STRUCTURE and MEANING of sentence.

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- Others – structure of discourse, study of brain mechanisms

Patterns

Certain structural regularities.

Example

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2. *The man with the coat left the party earlier.*
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Highlighted words in each sentence appear in the same structural context and all perform the same *grammatical function* – **subject**.

- Each highlighted word can be replaced by any of the others and it is still grammatically correct.
- This part is called DISTRIBUTINAL ANALYSIS.
- Important unit – *noun phrase*.

Examples: Distributional Analysis

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Prepositional Phrase

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2. *The book on the shelf is mine.*
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Verb Phrase

1. *Bill ate the cake and Mary ate the pie.*
2. *Mary likes to go swimming and Bill does too.*
3. *John made Mary pack her bags.*

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- **Structural Analysis**
- Transformational Rules

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Considering two sentences above we know:

- There is a relation between *John* and *to leave*. (subject-predicate relation)
- *John* performs the role of the object in 2, but not in 1.
  - In 1, what is being expected is the entire proposition (John's leaving).

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- examining the meaning of sentences
- difference between object of the verb
  - *expect* – object is whole sentence
  - *persuade* – has two objects – noun phrase and embedded sentence

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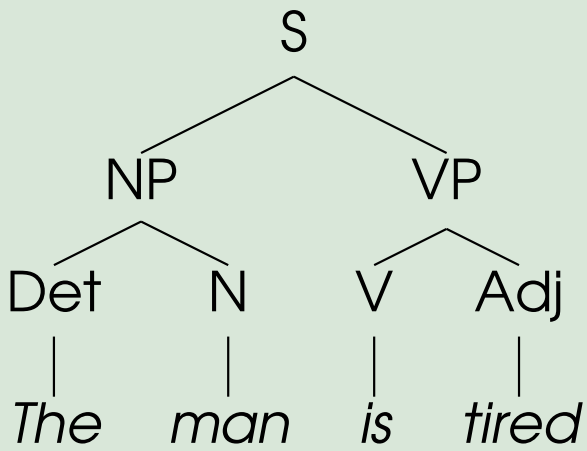

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- VP – verb phrase

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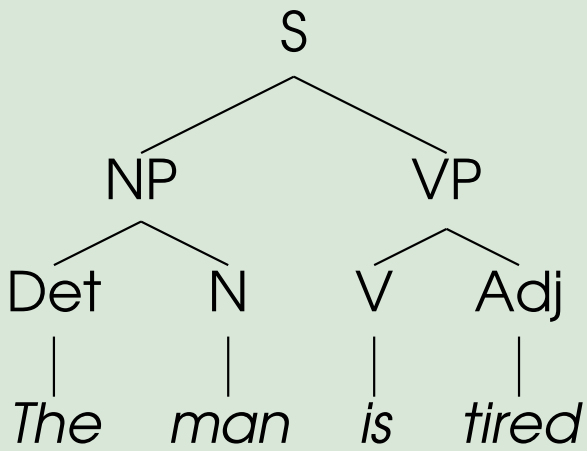

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- Linguistic notation (phrase marker):

$$[_S[_{NP}[_{Det}\textit{the}][_N\textit{man}]][_{VP}[_V\textit{is}][_{Adj}\textit{tired}]]]$$

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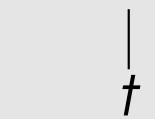
2. the phrase marker for 

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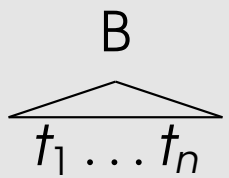
3. the phrase marker for 

is $[_B\{t_1\} \ldots \{t_n\}]$

- *persuade*

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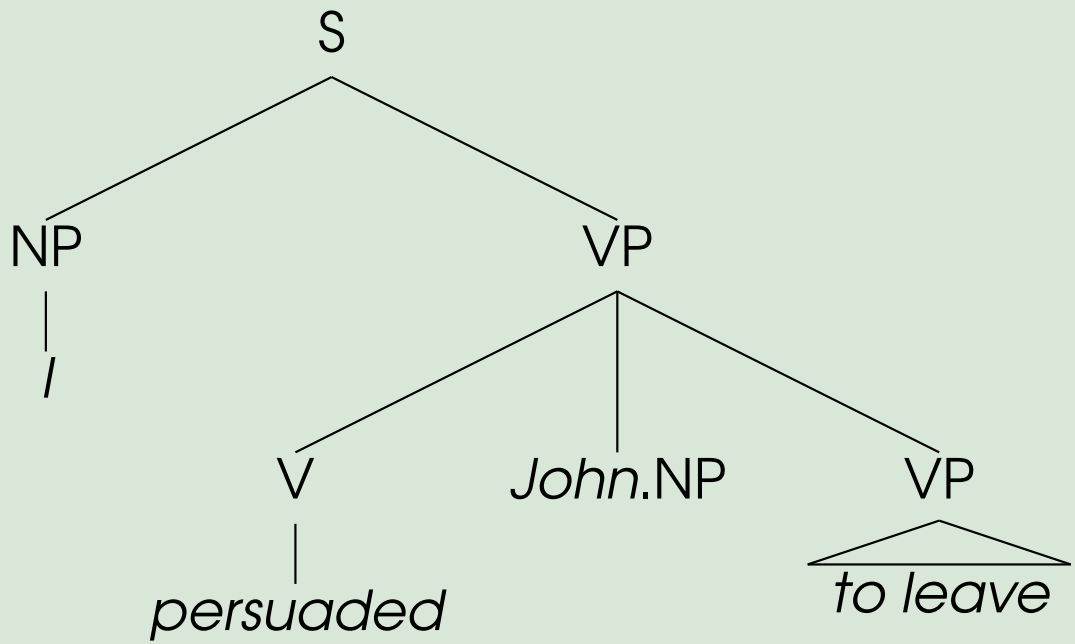

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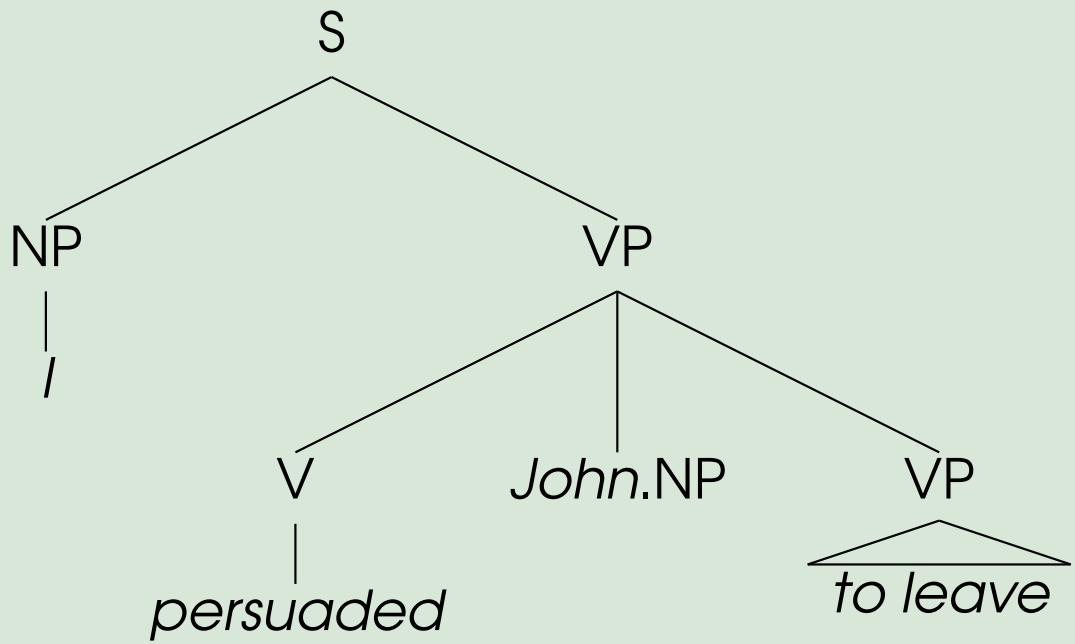

[S[NP *I*][VP[V *persuaded*]][NP *John*[VP *to leave*]]

Structural Distinction – *expect* and *persuade*

- *expect*

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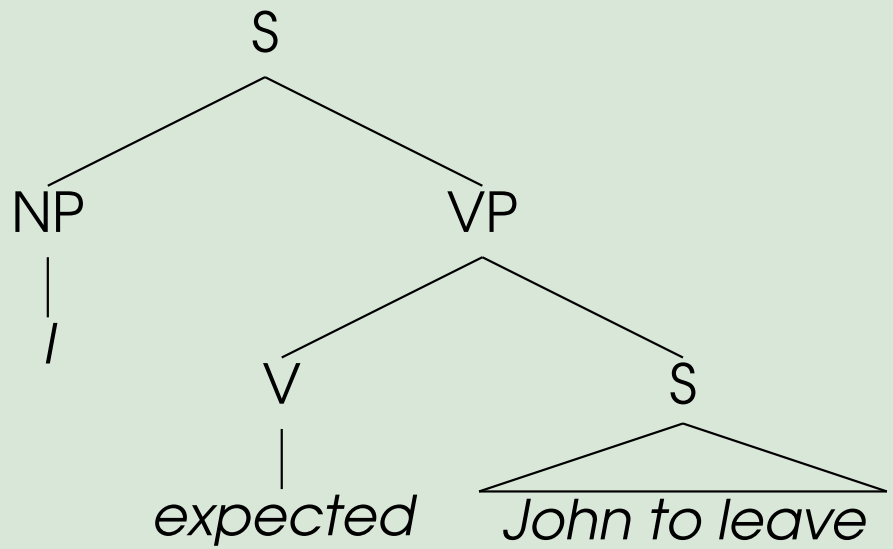

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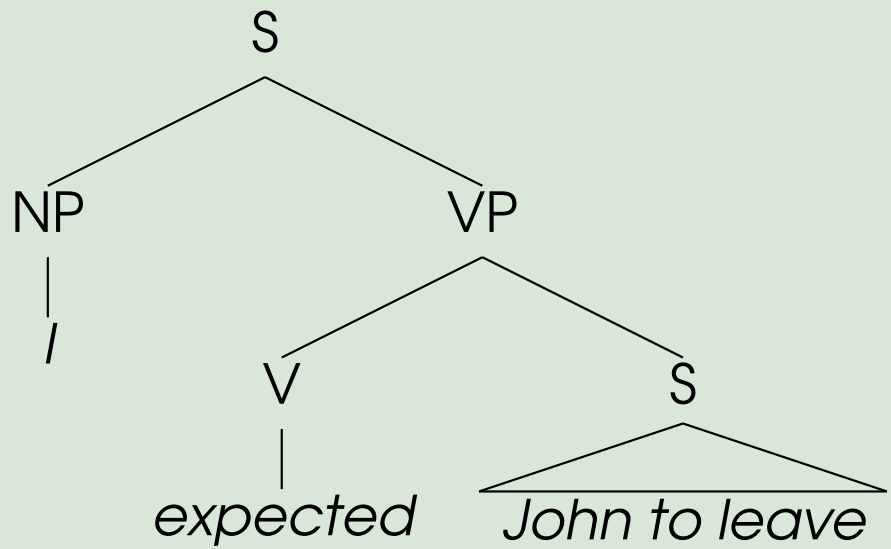

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- Note: As you can notice *John to leave* is marked as sentence S. (Further information can be found in literature.)

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- Structural Analysis
- **Transformational Rules**

Transformational Rules

Q: How to relate two sentences with the same meaning but different structure?

- active and passive forms in English

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A: Relatedness between sentences can be captured by deriving the two phrase markers (Chomsky):

- S-structures (surface structure)
- D-structures (deep structure)

Transformational Rules

According the Chomsky transformational theory, grammar for natural language has the following components:

1. Set of phrase structure rules (all of them in form of context-free rules)
2. A lexicon (dictionary for the language)
3. The transformational rules
4. Rules of phonology

Transformational Rules – Lexicon

Lexicon contains this type of information:

1. Categorization
2. Subcategorization
3. Selectional Restriction
4. Argument structure
5. Lexical semantics
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- (4) argument structure is a list of thematic roles

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Passive Transformation					
SD:	NP	V	NP	X	
	1	2	3	4	$\Rightarrow$
SC:	3	*be*+2(pp)	4	*by* + 1	

- SD - structural description
- SC - structural change

Passive Transformation

Example

$$[_S[_{NP}\textit{this man}[_{AUX}][_{VP}[_V\textit{love}][_{NP}\textit{Mary}]]]$$

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The **result** of the passive transformation is **the sentence in passive form with the same meaning as the sentence in active form**.

Example

Some problems could be in sentences containing idioms. For example:

1. *John took advantage of the situation.*
2. *Advantage was taken of the situation by John.*
3. *The situation was taken advantage of by John.*

Contraction in English

Eg. using verb *want* in everyday speech:

- *I wanna buy the beer for the party.*
- ***want*** and ***to*** become one word phonetically
- (also others – *going to* $\rightarrow$ *gonna*, *used to* $\rightarrow$ *useta*)

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Answer: **No.**

Example

- *Who do you **want to** buy the beer for the party?*
  we can not contract to
- ☹*Who do you **wanna** buy the beer for the party?*

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$\rightarrow$ Why we can not do this? It is explained by deep study of the sentence structure.

wh-questions

- One type of generalization that can be captured by transformations involves questions.
- Questions involving who and what are called wh-questions.

Example

TYPE I

1a *John drove his car.*

2a *John thinks Mary drove his car.*

3a *John thinks Mary wants Bill to drive his car.*

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TYPE II

1b *What did John drive?*

1c *Who drove his car?*

2b *Who does John think drove his car?*

2c *What does John think Mary drove?*

3b *Who does John think Mary wants to drive his car?*

3c *What does John think Mary wants Bill to drive?*

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SD:	X	wh	Y		
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- e - empty category (trace) marking an interesting concept

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Applying this rule to sentence 1b:

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By comparing two sentences 1a and 1b we get following semantic representation:

1. DRIVE(John, John's car)
2. ?(For which x) DRIVE (John, x)

Example

- wh-questions explain previous example with contraction of *want* and *to*.
- In fact, *want* and *to* are not contiguous, because there is a **NP-trace** between them.
  - *You want who to buy the beer for the party?*

    and after applying the wh-movement we get:

  - *Who$_i$ do you want e_i to buy the beer for the party?*

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In the original sentence were two passives. How do we know where to apply the rule first?

Cycling Nature of Transformational Rules

How do we know where to apply the rule first?

1. Apply the rule to the lowest (most deeply embedded) sentence.
2. Work our way up to the top cycle.

- wh-movement also applies cyclically.

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Thank you for your attention!

End