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Faculty of Philosophy
General Linguistics

Syntax & Semantics WiSe 2022/2023

Lecture 14: Lexical Functional Grammar II (LFG)

13/12/2022, Christian Bentz

Note:

Next week tuesday, 20th Dec, we will have an online session.

Section Q&As

Section 1: Recap of Lecture 13

Section 2: Basic Definitions in LFG

Section 3: Syntactic Structure in LFG

Section 4: Syntactic Phenomena

Section 4: Pros and Cons of LFG

Section 5: Basic Concepts in LFG

Section 6: References

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Overview

Section Q&As

Section 1: Recap of Lecture 13

Section 2: Basic Definitions in LFG
- Notational Conventions
- Glossary

Section 3: Syntactic Structure in LFG
- Argument Structure (A-Structure)
- Functional Structure (F-Structure)
- Constituent Structure (C-Structure)
- Mapping between C-Structure and F-Structure
- Summary: Structural Levels

Section 4: Syntactic Phenomena
- The Passive

Section 4: Pros and Cons of LFG
- Pros (Advantages)
- Cons (Disadvantages)

Section 5: Basic Concepts in LFG

Section 6: References

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Tutorial Week 6

> *Exercise 1: The trees in solutions for point 3. and 4. have different attachments for the PP (by the woman). Which one is correct?*

Actually, attaching the PP to the VP or the NP is both possible according to our rewrite rules. However, it is preferred to attach them to the VP in these case, as the PP arguably modifies the verb phrase (*is seen*), rather than the noun phrase (see next slide).

Section Q&As
Section 1: Recap of Lecture 13
Section 2: Basic Definitions in LFG
Section 3: Syntactic Structure in LFG
Section 4: Syntactic Phenomena
Section 4: Pros and Cons of LFG
Section 5: Basic Concepts in LFG
Section 6: References

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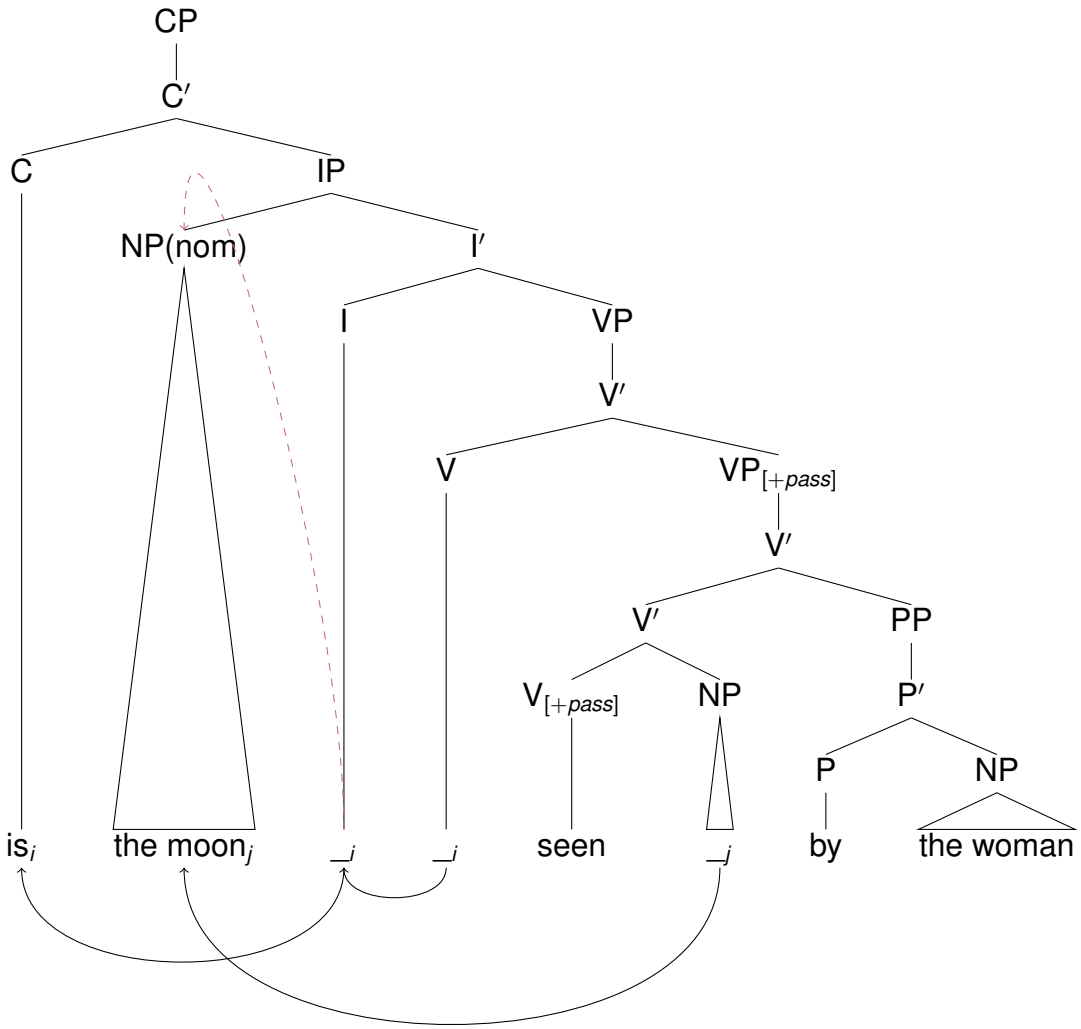

Section Q&As
Section 1: Recap of Lecture 13
Section 2: Basic Definitions in LFG
Section 3: Syntactic Structure in LFG
Section 4: Syntactic Phenomena
Section 4: Pros and Cons of LFG
Section 5: Basic Concepts in LFG
Section 6: References

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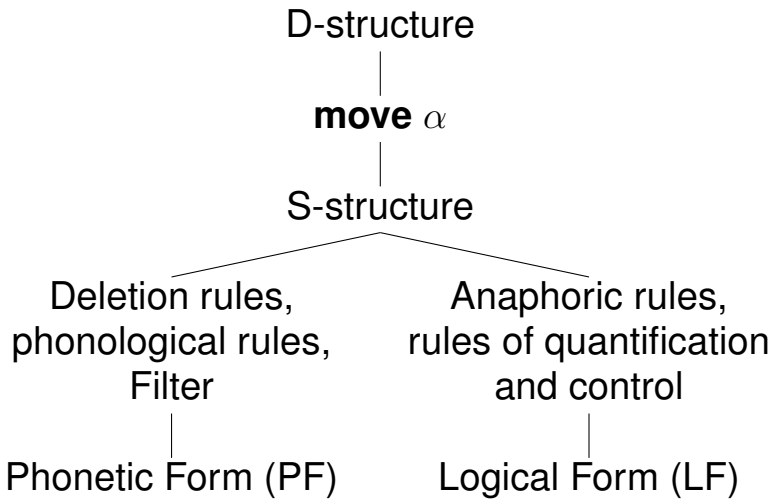
Tutorial 6

What exactly is the difference between D-Structure and S-Structure in Government and Binding?

D-Structure is the template before movement has taken place, whereas S-structure is what we have after movement. Remember the T model (I have added move here).



Section Q&As
Section 1: Recap of Lecture 13
Section 2: Basic Definitions in LFG
Section 3: Syntactic Structure in LFG
Section 4: Syntactic Phenomena
Section 4: Pros and Cons of LFG
Section 5: Basic Concepts in LFG
Section 6: References

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Tutorial 6

> *In the Exericise on binding (Exercise) three, there are indices without movement. How are the indices in binding theory derived, and does this relate to movement?*

The indices relevant for binding are different from the indices of movement. The binding indices are about co-reference (logical form), while the movement indices are about the difference between D-structure and S-structure. Note that there are no strict rules of how to put the indices which indicate co-reference. This is done intuitively like grammaticality judgements.

Section Q&As
Section 1: Recap of Lecture 13
Section 2: Basic Definitions in LFG
Section 3: Syntactic Structure in LFG
Section 4: Syntactic Phenomena
Section 4: Pros and Cons of LFG
Section 5: Basic Concepts in LFG
Section 6: References

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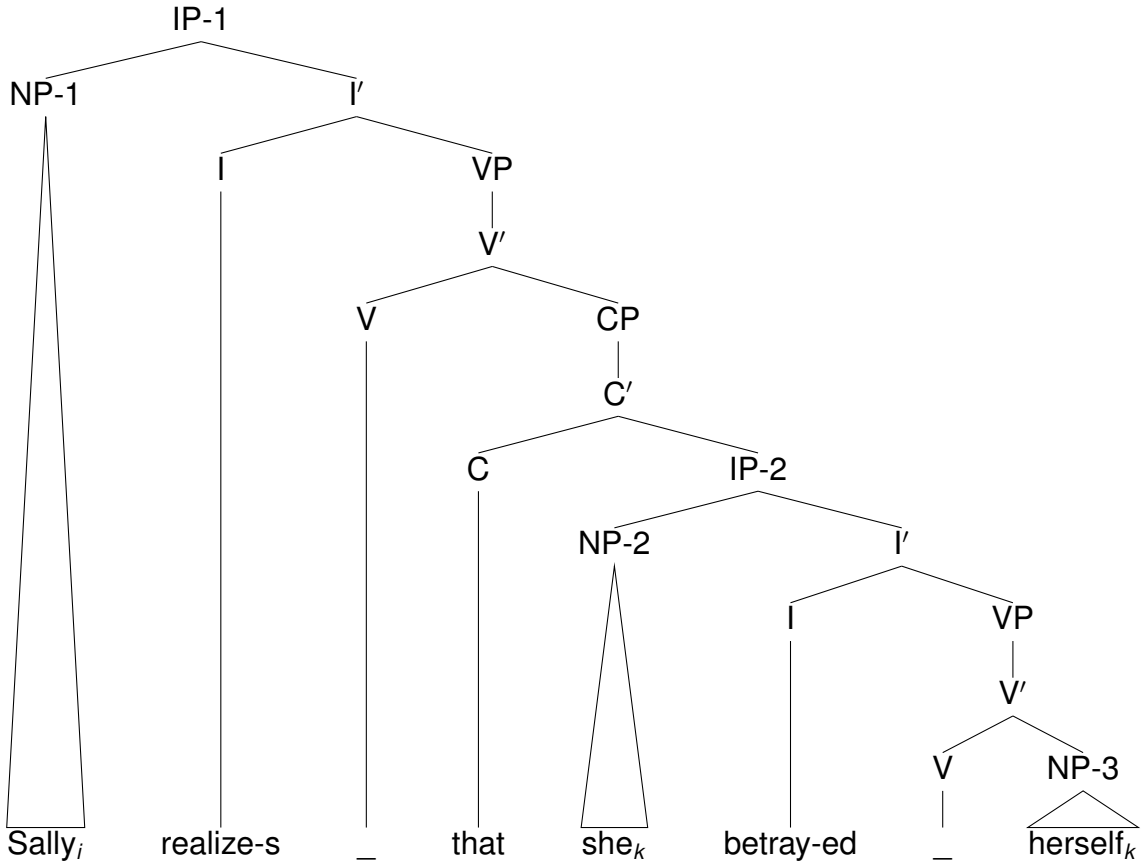

Section Q&As
Section 1: Recap of Lecture 13
Section 2: Basic Definitions in LFG
Section 3: Syntactic Structure in LFG
Section 4: Syntactic Phenomena
Section 4: Pros and Cons of LFG
Section 5: Basic Concepts in LFG
Section 6: References

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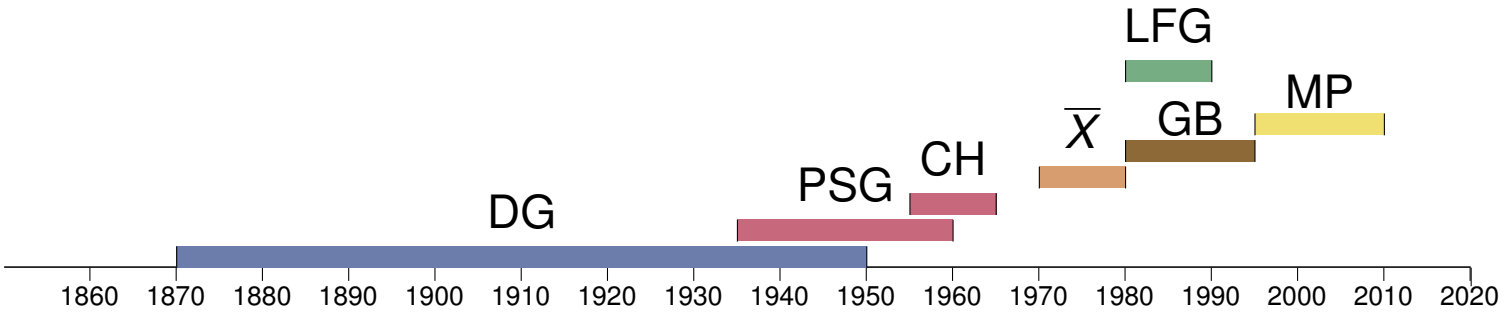
Section 1: Recap of Lecture 13

Historical Perspective

"Lexical Functional Grammar (LFG) was developed in the 80s by Joan Bresnan and Ron Kaplan (Bresnan & Kaplan 1982). LFG forms part of so-called West-Coast linguistics: unlike MIT, where Chomsky works and teaches, the institutes of researchers such as Joan Bresnan and Ron Kaplan are on the west coast of the USA [...]. Bresnan & Kaplan (1982) view LFG explicitly as a psycholinguistically plausible alternative to transformation-based approaches."

Müller (2019). Grammatical theory, p. 222.



Section Q&As
Section 1: Recap of Lecture 13
Section 2: Basic Definitions in LFG
Section 3: Syntactic Structure in LFG
Section 4: Syntactic Phenomena
Section 4: Pros and Cons of LFG
Section 5: Basic Concepts in LFG
Section 6: References

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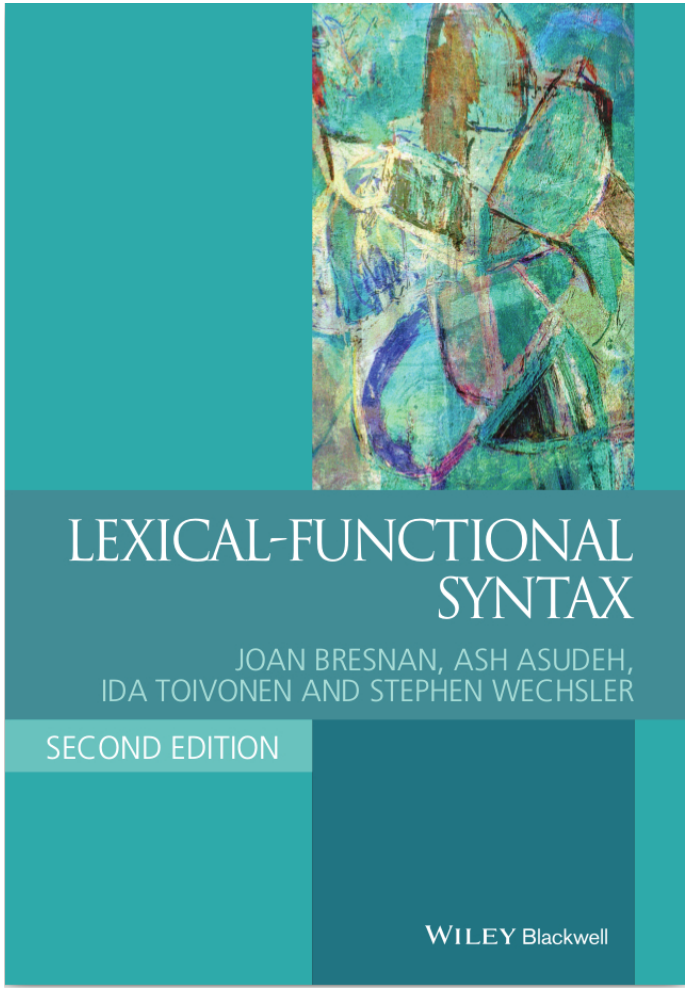
How is it different?

- "LFG is closely attuned to the **overt perceptible expressions** of language [...]"
- "[...] there are **no 'deep structures'** or 'initial structures.' "
- "Being designed for a wide range of **nonconfigurational** and **configurational** language types, LFG departs radically from most other grammar formalisms in one striking way: it is **noncompositional**, allowing the 'content' of a constituent to vary depending on its context."

Bresnan et al. (2016).
Lexical-Functional Syntax, p. xi.



Section Q&As
Section 1: Recap of Lecture 13
Section 2: Basic Definitions in LFG
Section 3: Syntactic Structure in LFG
Section 4: Syntactic Phenomena
Section 4: Pros and Cons of LFG
Section 5: Basic Concepts in LFG
Section 6: References

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Untyped Feature Descriptions

A typical example of **untyped feature descriptions** are matrices that contain inflectional information of a given word form. In this particular context, the *feature values* are often given without the *feature labels*, since there is little syncretism between feature values which could make them ambiguous.

Example from GB theory (Lecture 10):

$$\textit{drank}: \begin{bmatrix} +\textit{past} \\ 3\textit{pers} \\ +\textit{sg} \end{bmatrix}.$$

Section Q&As
Section 1: Recap of Lecture 13
Section 2: Basic Definitions in LFG
Section 3: Syntactic Structure in LFG
Section 4: Syntactic Phenomena
Section 4: Pros and Cons of LFG
Section 5: Basic Concepts in LFG
Section 6: References

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Notational Conventions

However, to be maximally specific we will here use *upper case letters* for **feature labels**, and *lower case italics* for **feature values**, and always give both in the feature descriptions.

Example from Müller describing a person:

$$\begin{bmatrix} \text{FIRSTNAME} & \textit{max} \\ \text{LASTNAME} & \textit{meier} \\ \text{DATE-OF-BIRTH} & \textit{10.10.1985} \end{bmatrix}$$

Example from above for *drank*:

$$\begin{bmatrix} \text{TENSE} & \textit{past} \\ \text{PERSON} & \textit{3} \\ \text{NUMBER} & \textit{sg} \end{bmatrix}$$

Section Q&As
Section 1: Recap of Lecture 13
Section 2: Basic Definitions in LFG
Section 3: Syntactic Structure in LFG
Section 4: Syntactic Phenomena
Section 4: Pros and Cons of LFG
Section 5: Basic Concepts in LFG
Section 6: References

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Embedding: Linguistic Example

A linguistic example of embeddings of feature descriptions is *derivational morphology*, which can create a new word form out of a word form that functions as a stem for derivational affixes.

Word form: *unhelpfully*

$$\begin{bmatrix} \text{POS} & \textit{adv} \\ \text{STEM} & \begin{bmatrix} \text{POS} & \textit{adj} \\ \text{STEM} & \begin{bmatrix} \text{POS} & \textit{adj} \\ \text{STEM} & \begin{bmatrix} \text{POS} & \textit{noun} \vee \textit{verb} \end{bmatrix} \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

Section Q&As
Section 1: Recap of Lecture 13
Section 2: Basic Definitions in LFG
Section 3: Syntactic Structure in LFG
Section 4: Syntactic Phenomena
Section 4: Pros and Cons of LFG
Section 5: Basic Concepts in LFG
Section 6: References

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Lists: Linguistic Examples

Going beyond the word level, we might want to capture the feature description, for example, of whole phrases such as *the green house*. In this particular example, we assume a HEAD feature for *house*, and a list of feature descriptions for the *complements* (COMP).[1]

phrase: *the green house*

$$\begin{bmatrix} \text{HEAD} & \begin{bmatrix} \text{POS} & \textit{noun} \\ \text{CASE} & \textit{nom} \vee \textit{acc} \vee \textit{dat} \\ \text{NUMBER} & \textit{sg} \end{bmatrix} \\ \text{COMP} & \left\langle \begin{bmatrix} \text{POS} & \textit{det} \end{bmatrix}, \begin{bmatrix} \text{POS} & \textit{adj} \end{bmatrix} \right\rangle \end{bmatrix}$$

[1] Note that these matrices look different from genuine LFG matrices. We use *complement* here in a general sense, i.e. everything which is not the head of the phrase. This is similar to Head-Driven Phrase Structure Grammar, though in HPSG the article would be called a *specifier*.

Section Q&As
Section 1: Recap of Lecture 13
Section 2: Basic Definitions in LFG
Section 3: Syntactic Structure in LFG
Section 4: Syntactic Phenomena
Section 4: Pros and Cons of LFG
Section 5: Basic Concepts in LFG
Section 6: References

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Typed Feature Descriptions: Linguistic Example

When we deal, for instance, with *word forms* in our linguistic analyses, we might define a feature structure for the type *word*. Note, however, that the content of this structure is dependent on the theory we adopt, and the particular language we analyze.

Section Q&As
Section 1: Recap of Lecture 13
Section 2: Basic Definitions in LFG
Section 3: Syntactic Structure in LFG
Section 4: Syntactic Phenomena
Section 4: Pros and Cons of LFG
Section 5: Basic Concepts in LFG
Section 6: References

Possible feature structure of the type *word*:

word	
ASPECT	*aspect*
BOUNDEDNESS	*boundedness*
CASE	*case*
GENDER	*gender*
MOOD	*mood*
NUMBER	*number*
PERSON	*person*
POS	*pos*
TENSE	*tense*
etc.	

Note: BOUNDEDNESS is here introduced to distinguish between *morphemes* and *words*, morphemes are *bound*, words are *unbounded* (according to the traditional definition.)

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Structure Sharing: Lingustic Example

A linguistic example of structure sharing is **agreement**. In the example below, between determiner, adjective and noun in German.

Section Q&As
Section 1: Recap of Lecture 13
Section 2: Basic Definitions in LFG
Section 3: Syntactic Structure in LFG
Section 4: Syntactic Phenomena
Section 4: Pros and Cons of LFG
Section 5: Basic Concepts in LFG
Section 6: References

phrase: *das grüne Haus*

$$\begin{bmatrix} \textit{phrase} & & \\ \text{HEAD} & \begin{bmatrix} \textit{noun} & \\ \text{CASE} & \boxed{1}\ \textit{nom} \vee \textit{acc} \\ \text{GENDER} & \boxed{2}\ \textit{neut} \\ \text{NUMBER} & \boxed{3}\ \textit{sg} \end{bmatrix} \\ \text{COMPS} & \left\langle \begin{bmatrix} \textit{determiner} & \\ \text{CASE} & \boxed{1} \\ \text{GENDER} & \boxed{2} \\ \text{NUMBER} & \boxed{3} \end{bmatrix}, \begin{bmatrix} \textit{adjective} & \\ \text{CASE} & \boxed{1} \\ \text{GENDER} & \boxed{2} \\ \text{NUMBER} & \boxed{3} \end{bmatrix} \right\rangle \end{bmatrix}$$

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Section 2: Basic Definitions in LFG

Grammatical Functions

"In LFG, grammatical functions such as **subject** and **object** play a very important role. Unlike in most other theories discussed in this book, they are primitives of the theory."

Müller (2019). Grammatical theory, p. 223.

Section Q&As
Section 1: Recap of Lecture 13
Section 2: Basic Definitions in LFG
Section 3: Syntactic Structure in LFG
Section 4: Syntactic Phenomena
Section 4: Pros and Cons of LFG
Section 5: Basic Concepts in LFG
Section 6: References

David devoured a sandwich.

$$\begin{bmatrix} \text{PRED} & \text{'DEVOUR}\langle \textbf{SUBJ}, \textbf{OBJ} \rangle\text{'} \\ \textbf{SUBJ} & \begin{bmatrix} \text{PRED} & \text{'DAVID'} \end{bmatrix} \\ \textbf{OBJ} & \begin{bmatrix} \text{SPEC} & \text{A} \\ \text{PRED} & \text{'SANDWICH'} \end{bmatrix} \end{bmatrix}$$

Note: Example with the notation given in Müller (2019).

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Interlude: Notational Conventions

We will change the notation – compared to Müller (2019) – slightly. This is in order to a) stay closer to the reference introduction by Bresnan et al. (2016), and b) to keep it as close as possible to the notation used in the lecture on *Feature Descriptions*.

Müller (2019). Grammatical theory, p. 223.

Section Q&As
Section 1: Recap of Lecture 13
Section 2: Basic Definitions in LFG
Section 3: Syntactic Structure in LFG
Section 4: Syntactic Phenomena
Section 4: Pros and Cons of LFG
Section 5: Basic Concepts in LFG
Section 6: References

David devoured a sandwich.

$$\begin{bmatrix} \text{PRED} & \text{`devour}\left\langle \text{SUBJ,OBJ} \right\rangle\text{'} \\ \text{TENSE} & \textit{past} \\ \text{SUBJ} & \begin{bmatrix} \text{PRED} & \text{`david'} \end{bmatrix} \\ \text{OBJ} & \begin{bmatrix} \text{SPEC} & \text{a} \\ \text{PRED} & \text{`sandwich'} \end{bmatrix} \end{bmatrix}$$

Note: I added a TENSE feature here for illustration puproses, but also since it is relevant here for inflection (i.e. devour-ed).

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Interlude: Notational Conventions

The symbols in **upper case letters** are **feature labels** in accordance with the lecture on *Feature Descriptions* (though called *attributes* by Bresnan et al., 2016).

Section Q&As
Section 1: Recap of Lecture 13
Section 2: Basic Definitions in LFG
Section 3: Syntactic Structure in LFG
Section 4: Syntactic Phenomena
Section 4: Pros and Cons of LFG
Section 5: Basic Concepts in LFG
Section 6: References

David devoured a sandwich.

$$\begin{bmatrix} \textbf{PRED} & \text{`devour}\left\langle \text{SUBJ,OBJ} \right\rangle\text{'} \\ \textbf{TENSE} & \textit{past} \\ \textbf{SUBJ} & \begin{bmatrix} \textbf{PRED} & \text{`david'} \end{bmatrix} \\ \textbf{OBJ} & \begin{bmatrix} \textbf{SPEC} & \text{a} \\ \textbf{PRED} & \text{`sandwich'} \end{bmatrix} \end{bmatrix}$$

Note: We could here also specify further features of the predicate (*devour*) and the subject and object, for example, NUMBER and PERSON. However, note that these features are here not relevant in terms of agreement since *devoured* could occur with any person and number.

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Interlude: Notational Conventions

The symbols in **lower case italics** are **feature values** in accordance with the lecture on *Feature Descriptions*.

David devoured a sandwich.

$$\begin{bmatrix} \text{PRED} & \text{'devour}\left\langle \text{SUBJ,OBJ} \right\rangle\text{'} \\ \text{TENSE} & \textit{past} \\ \text{SUBJ} & \begin{bmatrix} \text{PRED} & \text{'david'} \end{bmatrix} \\ \text{OBJ} & \begin{bmatrix} \text{SPEC} & \text{a} \\ \text{PRED} & \text{'sandwich'} \end{bmatrix} \end{bmatrix}$$

Section Q&As
Section 1: Recap of Lecture 13
Section 2: Basic Definitions in LFG
Section 3: Syntactic Structure in LFG
Section 4: Syntactic Phenomena
Section 4: Pros and Cons of LFG
Section 5: Basic Concepts in LFG
Section 6: References

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Interlude: Notational Conventions

The strings in **single quotation marks** and **normal script** (not italics or upper case) are also **feature values**. However, they constitute a particular type of feature value that is called a **semantic form** by Bresnan et al. (2016), p. 44.

Section Q&As
Section 1: Recap of Lecture 13
Section 2: Basic Definitions in LFG
Section 3: Syntactic Structure in LFG
Section 4: Syntactic Phenomena
Section 4: Pros and Cons of LFG
Section 5: Basic Concepts in LFG
Section 6: References

David devoured a sandwich.

$$\begin{bmatrix} \text{PRED} & \text{`}\textbf{devour}\left\langle \textbf{SUBJ,OBJ} \right\rangle\text{'} \\ \text{TENSE} & \textit{past} \\ \text{SUBJ} & \begin{bmatrix} \text{PRED} & \text{`}\textbf{david}\text{'} \end{bmatrix} \\ \text{OBJ} & \begin{bmatrix} \text{SPEC} & \textbf{a} \\ \text{PRED} & \text{`}\textbf{sandwich}\text{'} \end{bmatrix} \end{bmatrix}$$

Note: The specifier *a* is written without quotation marks in Müller (2019). This indicates that determiners – in contrast to other lexical items written inside quotation marks – are not considered to contribute meaning to the sentence.

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Predicates (PRED)

The **PRED feature** is used for all lexical items that **contribute meaning to the sentence** (remember the remarks on *predicate logic* in earlier lectures). The value of a PRED feature is either just a lexical item (e.g. 'david'), or – if the lexical item is a *head* (e.g. devour) which *governs grammatical functions* (e.g. SUBJ, OBJ) – then the lexical item is followed by a list specifying the grammatical functions.

$$\begin{bmatrix} \textbf{PRED} & \text{'devour}\left\langle \text{SUBJ,OBJ} \right\rangle\text{'} \\ \text{TENSE} & \textit{past} \\ \text{SUBJ} & \begin{bmatrix} \textbf{PRED} & \text{'david'} \end{bmatrix} \\ \text{OBJ} & \begin{bmatrix} \text{SPEC} & \text{a} \\ \textbf{PRED} & \text{'sandwich'} \end{bmatrix} \end{bmatrix}$$

Section Q&As
Section 1: Recap of Lecture 13
Section 2: Basic Definitions in LFG
Section 3: Syntactic Structure in LFG
Section 4: Syntactic Phenomena
Section 4: Pros and Cons of LFG
Section 5: Basic Concepts in LFG
Section 6: References

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Notation Glossary

ADJ: adjunct

BEN: benefactive

COMP: complement feature (typically representing a *that*-clause)

OBJ: object feature

OBL: oblique feature (typically prepositional phrases required as arguments of the head-verb)

PRED: predicate feature

SPEC: specifier (here typically used for determiners)

SUBJ: subject feature

Section Q&As
Section 1: Recap of Lecture 13
Section 2: Basic Definitions in LFG
Section 3: Syntactic Structure in LFG
Section 4: Syntactic Phenomena
Section 4: Pros and Cons of LFG
Section 5: Basic Concepts in LFG
Section 6: References

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Section 3: Syntactic Structure in LFG

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Argument Structure (A-Structure)

Argument Structure (A-Structure)

The **argument structure (a-structure)** is a standardized representation of the valency of the main verb of a sentence. The general representational format is:

$$verb\langle x, y, z, \text{etc.} \rangle,$$

where x, y, z correspond to symbols which represent the participant roles of arguments and adjuncts of the verb.

Bresnan (2016), p. 15.

Section Q&As
Section 1: Recap of Lecture 13
Section 2: Basic Definitions in LFG
Section 3: Syntactic Structure in LFG
Section 4: Syntactic Phenomena
Section 4: Pros and Cons of LFG
Section 5: Basic Concepts in LFG
Section 6: References

Sentence	**a-structure**
Peter sleeps.	sleep $\langle$ SUBJ $\rangle$
Mary sees him.	see $\langle$ SUBJ,OBJ $\rangle$
She gives the child a book.	give $\langle$ SUBJ,OBJ,OBJ$_{THEME}$ $\rangle$

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A-Structure: Ordering of Arguments

"An a-structure consists of a predicator with its argument roles, an ordering that represents the relative prominence of the roles [...] The relative prominence of the roles is indicated by their **left to right order and reflects a thematic hierarchy**."

Thematic hierarchy:
agent > beneficiary > experiencer/goal > instrument > patient/theme > locative

Bresnan et al. (2016), p. 329.

Note: This means that the ordering of arguments in a-structure is **not relevant to the ordering of actual words** in the respective sentence represented by it. Thematic hierarchies are fairly common in different grammatical frameworks, see Bresnan et al. 2016, p. 329 for some references. The general idea is that across different languages the same hierarchy of "prominence" for thematic roles can be established.

Section Q&As
Section 1: Recap of Lecture 13
Section 2: Basic Definitions in LFG
Section 3: Syntactic Structure in LFG
Section 4: Syntactic Phenomena
Section 4: Pros and Cons of LFG
Section 5: Basic Concepts in LFG
Section 6: References

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Governable Grammatical Functions

Against the backdrop of the definitions above **governable grammatical functions** are functions which have to be specified by the *head* of the overall phrase/sentence.

- SUBJ: subject
- OBJ: object
- OBJ_θ: so-called *secondary* object(s). In English, there is only OBJ_{THEME}, where the *theme* typically corresponds to the direct object of a ditransitive sentence (e.g. *gave the book* ...)
- COMP: *sentential* complement (*that*-clause). Beware that this definition is different from our earlier usage of the term *complement*, where we referred to direct and indirect objects as complements (according to the valency of the verb).
- OBL: so-called *oblique grammatical functions*, e.g. OBL_{LOC}. Often correspond to adpositional phrases which are *necessary* to build a grammatical sentence. For example, when the phrase *to be located* is used (e.g. *The cinema is located* ...) then it takes an *obligatory* argument, namely, a prepostional phrase starting with *in...* or *at...*, which we typically wouldn't call an object.

Adopted from Müller (2019). Grammatical theory, p. 224.

Section Q&As
Section 1: Recap of Lecture 13
Section 2: Basic Definitions in LFG
Section 3: Syntactic Structure in LFG
Section 4: Syntactic Phenomena
Section 4: Pros and Cons of LFG
Section 5: Basic Concepts in LFG
Section 6: References

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Non-Governable Grammatical Functions

Non-governable grammatical functions are then the ones which are not specified by the head (i.e. not being arguments of the head).

- ADJ: adjuncts (typically adpositional phrases)
- TOPIC: the topic of an utterance
- FOCUS: the focus of an utterance

Note: TOPIC and FOCUS are grammatical functions which can be used to model, for instance, word order variation when particular NPs are topicalized.

Section Q&As
Section 1: Recap of Lecture 13
Section 2: Basic Definitions in LFG
Section 3: Syntactic Structure in LFG
Section 4: Syntactic Phenomena
Section 4: Pros and Cons of LFG
Section 5: Basic Concepts in LFG
Section 6: References

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Functional Structure (F-Structure)

Functional Structure (F-Structure)

The **functional structure (f-structure)** is essentially a *feature description for a whole phrase*. The a-structure of a head is given under PRED, the grammatical functions which it *governs* (e.g. SUBJ and OBJ) receive separate features with their embedded feature descriptions.

Müller (2019). Grammatical theory, p. 223.

Section Q&As
Section 1: Recap of Lecture 13
Section 2: Basic Definitions in LFG
Section 3: Syntactic Structure in LFG
Section 4: Syntactic Phenomena
Section 4: Pros and Cons of LFG
Section 5: Basic Concepts in LFG
Section 6: References

f-structure for *David devoured a sandwich*:

$$\begin{bmatrix} \text{PRED} & \text{`devour}\left\langle \text{SUBJ,OBJ} \right\rangle\text{'} \\ \text{TENSE} & \textit{past} \\ \text{SUBJ} & \begin{bmatrix} \text{PRED} & \text{`david'} \end{bmatrix} \\ \text{OBJ} & \begin{bmatrix} \text{SPEC} & \text{a} \\ \text{PRED} & \text{`sandwich'} \end{bmatrix} \end{bmatrix}$$

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F-Structure Examples: Intransitive Sentence

f-structure for *David sneezed*:

$$\begin{bmatrix} \text{PRED} & \text{‘sneeze}\left\langle \text{SUBJ} \right\rangle\text{’} \\ \text{TENSE} & \textit{past} \\ \text{SUBJ} & \left[\text{PRED} \quad \text{‘david’} \right] \end{bmatrix}$$

Governable functions (arguments): SUBJ
Non-Governable functions (adjuncts): –

Section Q&As
Section 1: Recap of Lecture 13
Section 2: Basic Definitions in LFG
Section 3: Syntactic Structure in LFG
Section 4: Syntactic Phenomena
Section 4: Pros and Cons of LFG
Section 5: Basic Concepts in LFG
Section 6: References

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F-Structure Examples: Intransitive Sentence with Agreement

f-structure for *David sneezes*:

$$\begin{bmatrix} \text{PRED} & \text{‘sneeze}\langle \text{SUBJ} \rangle\text{’} \\ \text{NUMBER} & \boxed{1}\ sg \\ \text{PERSON} & \boxed{2}\ 3 \\ \text{TENSE} & pres \\ \text{SUBJ} & \begin{bmatrix} \text{PRED} & \text{‘david’} \\ \text{NUMBER} & \boxed{1} \\ \text{PERSON} & \boxed{2} \end{bmatrix} \end{bmatrix}$$

Governable functions (arguments): SUBJ
Non-Governable functions (adjuncts): –

Section Q&As
Section 1: Recap of Lecture 13
Section 2: Basic Definitions in LFG
Section 3: Syntactic Structure in LFG
Section 4: Syntactic Phenomena
Section 4: Pros and Cons of LFG
Section 5: Basic Concepts in LFG
Section 6: References

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F-Structure Examples: Intransitive Sentence + Oblique

f-structure for *Lions lived in the savannah*:

$$\begin{bmatrix} \text{PRED} & \text{'live}\left\langle \text{SUBJ, } \textbf{OBL}_{LOC} \right\rangle\text{'} \\ \text{TENSE} & \textit{past} \\ \text{SUBJ} & \begin{bmatrix} \text{PRED} & \text{'lion'} \\ \text{NUMBER} & \textit{pl} \end{bmatrix} \\ \textbf{OBL}_{LOC} & \begin{bmatrix} \text{PRED} & \text{'in}\left\langle \textbf{OBJ} \right\rangle\text{'} \\ \textbf{OBJ} & \begin{bmatrix} \text{PRED} & \text{'savannah'} \\ \text{SPEC} & \text{the} \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

Governable functions: SUBJ, OBL_{LOC}
Non-Governable functions: –

- The prepositional phrase *in the savannah* is here interpreted as a **OBL**, i.e. it is obligatory to build a grammatical sentence with *lived ...* (in parallel to our example with **to be located at**). This follows Bresnan et al. (2016), p. 44.
- Note that the NP (the savannah) headed by the preposition (in) is considered an **OBJ** of the preposition. This is highly unusual notation, but it follows both Müller (2019), p. 228 and Bresnan et al. (2016), p. 44.

Section Q&As
Section 1: Recap of Lecture 13
Section 2: Basic Definitions in LFG
Section 3: Syntactic Structure in LFG
Section 4: Syntactic Phenomena
Section 4: Pros and Cons of LFG
Section 5: Basic Concepts in LFG
Section 6: References

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F-Structure Examples: Intransitive Sentence + Complement

f-structure for *David knows **that** he snores*:

$$\begin{bmatrix}
\text{PRED} & \text{'know}\left\langle \text{SUBJ, } \textbf{COMP} \right\rangle\text{'} \\
\text{NUMBER} & \boxed{1}\ sg \\
\text{PERSON} & \boxed{2}\ 3 \\
\text{TENSE} & pres \\
\text{SUBJ} & \begin{bmatrix} \text{PRED} & \text{'david'} \\ \text{NUMBER} & \boxed{1} \\ \text{PERSON} & \boxed{2} \end{bmatrix} \\
\textbf{COMP} & \begin{bmatrix} \text{PRED} & \text{'snore}\left\langle \text{SUBJ} \right\rangle\text{'} \\ \text{NUMBER} & \boxed{3}\ sg \\ \text{PERSON} & \boxed{4}\ 3 \\ \text{SUBJ} & \begin{bmatrix} \text{PRED} & \text{'he'} \\ \text{NUMBER} & \boxed{3} \\ \text{PERSON} & \boxed{4} \end{bmatrix} \end{bmatrix}
\end{bmatrix}$$

Governable functions (arguments): SUBJ, COMP

Non-Governable functions (adjuncts): –

Note: The structure shared features of the subject in the main clause have to get different indices to the structure shared features of the complement clause (i.e. 1 and 2 versus 3 and 4). While in this particular example, the feature values are the same (i.e. *sg* and *3*), this does not have to be the case. For example, for the sentence *David knows that we snore* the feature values would be *3* and *sg* for the main clause, but *2* and *pl* for the complement clause.

Section Q&As
Section 1: Recap of Lecture 13
Section 2: Basic Definitions in LFG
Section 3: Syntactic Structure in LFG
Section 4: Syntactic Phenomena
Section 4: Pros and Cons of LFG
Section 5: Basic Concepts in LFG
Section 6: References

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F-Structure Examples: Transitive Sentence

f-structure for *David devoured a sandwich*:

$$\begin{bmatrix} \text{PRED} & \text{‘devour}\left\langle \text{SUBJ,OBJ} \right\rangle\text{’} \\ \text{TENSE} & \textit{past} \\ \text{SUBJ} & \begin{bmatrix} \text{PRED} & \text{‘david’} \end{bmatrix} \\ \text{OBJ} & \begin{bmatrix} \text{SPEC} & \text{a} \\ \text{PRED} & \text{‘sandwich’} \end{bmatrix} \end{bmatrix}$$

Governable functions (arguments): SUBJ, OBJ
Non-Governable functions (adjuncts): –

Section Q&As
Section 1: Recap of Lecture 13
Section 2: Basic Definitions in LFG
Section 3: Syntactic Structure in LFG
Section 4: Syntactic Phenomena
Section 4: Pros and Cons of LFG
Section 5: Basic Concepts in LFG
Section 6: References

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F-Structure Examples: Transitive Sentence + Adjunct

f-structure for *David devoured a sandwich **in the library***:

$$\begin{bmatrix} \text{PRED} & \text{‘devour}\langle \text{SUBJ,OBJ} \rangle\text{’} \\ \text{TENSE} & \textit{past} \\ \text{SUBJ} & \begin{bmatrix} \text{PRED} & \text{‘david’} \end{bmatrix} \\ \text{OBJ} & \begin{bmatrix} \text{SPEC} & \text{a} \\ \text{PRED} & \text{‘sandwich’} \end{bmatrix} \\ \textbf{ADJ} & \left\{ \begin{bmatrix} \text{PRED} & \text{‘in}\langle \text{OBJ} \rangle\text{’} \\ \text{OBJ} & \begin{bmatrix} \text{SPEC} & \text{the} \\ \text{PRED} & \text{‘library’} \end{bmatrix} \end{bmatrix} \right\} \end{bmatrix}$$

Governable functions (arguments): SUBJ, OBJ
Non-Governable functions (adjuncts): **ADJ**

Section Q&As
Section 1: Recap of Lecture 13
Section 2: Basic Definitions in LFG
Section 3: Syntactic Structure in LFG
Section 4: Syntactic Phenomena
Section 4: Pros and Cons of LFG
Section 5: Basic Concepts in LFG
Section 6: References

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F-Structure Examples: Transitive Sentence + Adjuncts

f-structure for *David devoured a sandwich* ***in the library yesterday***:

$$\begin{bmatrix} \text{PRED} & \text{‘devour}\left\langle \text{SUBJ,OBJ} \right\rangle\text{’} \\ \text{TENSE} & \textit{past} \\ \text{SUBJ} & \begin{bmatrix} \text{PRED} & \text{‘david’} \end{bmatrix} \\ \text{OBJ} & \begin{bmatrix} \text{SPEC} & \text{a} \\ \text{PRED} & \text{‘sandwich’} \end{bmatrix} \\ \text{ADJ} & \left\{ \begin{bmatrix} \text{PRED} & \text{‘in}\left\langle \text{OBJ} \right\rangle\text{’} \\ \text{OBJ} & \begin{bmatrix} \text{SPEC} & \text{the} \\ \text{PRED} & \text{‘library’} \end{bmatrix} \end{bmatrix}, \begin{bmatrix} \text{PRED} & \text{‘yesterday’} \end{bmatrix} \right\} \end{bmatrix}$$

Note: For adjuncts, **curly brackets** (indicating a set) are used instead of the list brackets, since the order of adjuncts is irrelevant.

Section Q&As
Section 1: Recap of Lecture 13
Section 2: Basic Definitions in LFG
Section 3: Syntactic Structure in LFG
Section 4: Syntactic Phenomena
Section 4: Pros and Cons of LFG
Section 5: Basic Concepts in LFG
Section 6: References

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F-Structure Examples: Ditransitive Sentence

f-structure for *David gave her a book*:

$$\begin{bmatrix} \text{PRED} & \text{‘give}\left\langle \text{SUBJ, OBJ, } \mathbf{OBJ}_{THEME} \right\rangle\text{’} \\ \text{TENSE} & \textit{past} \\ \text{SUBJ} & \begin{bmatrix} \text{PRED} & \text{‘david’} \end{bmatrix} \\ \text{OBJ} & \begin{bmatrix} \text{PRED} & \text{‘she’} \\ \text{CASE} & \textit{dat} \end{bmatrix} \\ \mathbf{OBJ}_{THEME} & \begin{bmatrix} \text{SPEC} & \text{a} \\ \text{PRED} & \text{‘book’} \end{bmatrix} \end{bmatrix}$$

Note: The direct object is here a theme object (OBJ_{THEME}). We here also have a CASE feature which is relevant since the object has to be in dative case, and this changes *she* to *her*. If this was a noun (as in the case of *a book*) or name (e.g. Susan) we wouldn’t necessarily need the CASE feature, since these do not inflect for accusative/dative case in English.

Section Q&As
Section 1: Recap of Lecture 13
Section 2: Basic Definitions in LFG
Section 3: Syntactic Structure in LFG
Section 4: Syntactic Phenomena
Section 4: Pros and Cons of LFG
Section 5: Basic Concepts in LFG
Section 6: References

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F-Structure Examples: Ditransitive Sentence with Prepositional Phrase as Indirect Object (Dative Alternation)

f-structure for *David gave a book* ***to her***:

$$\begin{bmatrix} \text{PRED} & \text{`give}\left\langle \text{SUBJ}, \textbf{OBL}_{BEN}, \text{OBJ}_{THEME} \right\rangle\text{'} \\ \text{TENSE} & \textit{past} \\ \text{SUBJ} & \begin{bmatrix} \text{PRED} & \text{`david'} \end{bmatrix} \\ \textbf{OBL}_{BEN} & \begin{bmatrix} \text{PRED} & \text{`she'} \\ \text{CASE} & \textit{dat} \end{bmatrix} \\ \text{OBJ}_{THEME} & \begin{bmatrix} \text{SPEC} & \text{a} \\ \text{PRED} & \text{`book'} \end{bmatrix} \end{bmatrix}$$

Note: If the *indirect object* (here coded as the benefactive BEN of the giving) is realized by a prepositional phrase (e.g. *to*-phrase), then it is considered an **oblique phrase** (OBL_{BEN}) rather than an object. See also the discussion of different grammatical functions in Bresnan et al. (2016), p. 99. Also, the 'to' here is actually seen rather as a case marker, and not a preposition, so it is not modelled like a PP (see also Bresnan et al. 2016, p. 300).

Section Q&As
Section 1: Recap of Lecture 13
Section 2: Basic Definitions in LFG
Section 3: Syntactic Structure in LFG
Section 4: Syntactic Phenomena
Section 4: Pros and Cons of LFG
Section 5: Basic Concepts in LFG
Section 6: References

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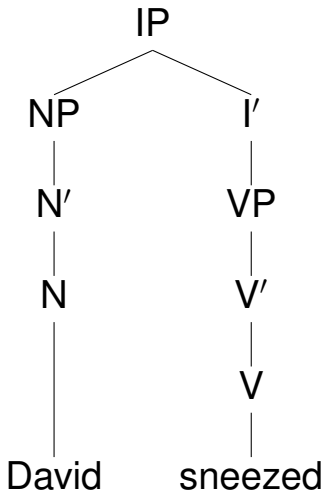
Constituent Structure (C-Structure)

Constituent Structure (C-Structure)

"**c-structure** is the **constituent structure** and it is licensed by a phrase structure grammar. This phrase structure grammar uses $\overline{X}$ structures for languages for which this is appropriate."

Müller (2019). Grammatical theory, p. 223.

$\overline{X}$-theoretic **c-structure** for *David sneezed*:



Section Q&As
Section 1: Recap of Lecture 13
Section 2: Basic Definitions in LFG
Section 3: Syntactic Structure in LFG
Section 4: Syntactic Phenomena
Section 4: Pros and Cons of LFG
Section 5: Basic Concepts in LFG
Section 6: References

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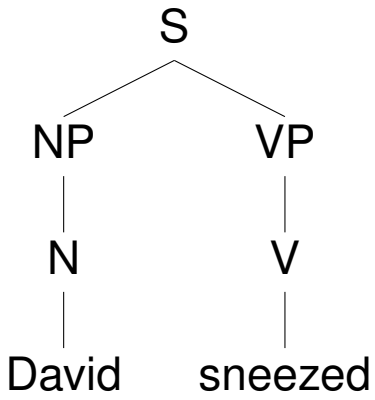
Constituent Structure (C-Structure)

However: We will use classical **binary PSG rules** for reasons of simplicity. Note that Bresnan et al. (2016) also use classical PSG rules in their introduction to f-structures and c-structures instead of $\overline{X}$ rules.

Classic PSG **c-structure** for *David sneezed*:



Section Q&As
Section 1: Recap of Lecture 13
Section 2: Basic Definitions in LFG
Section 3: Syntactic Structure in LFG
Section 4: Syntactic Phenomena
Section 4: Pros and Cons of LFG
Section 5: Basic Concepts in LFG
Section 6: References

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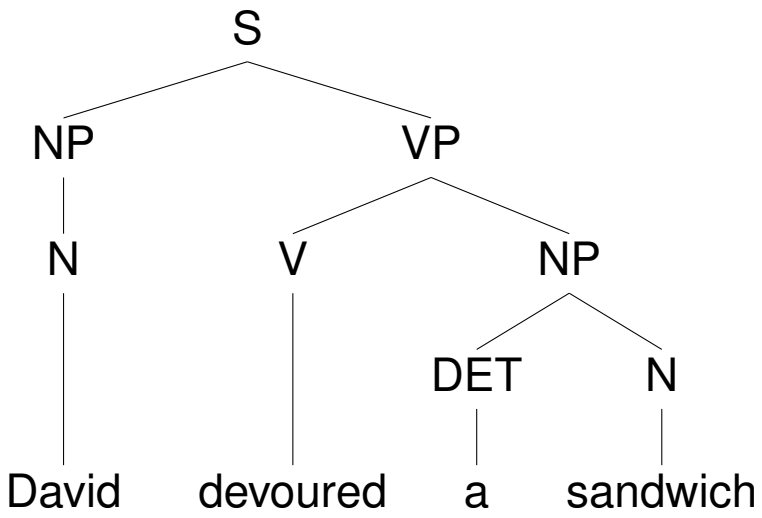
Example

c-structure for *David devoured a sandwich*:



Section Q&As
Section 1: Recap of Lecture 13
Section 2: Basic Definitions in LFG
Section 3: Syntactic Structure in LFG
Section 4: Syntactic Phenomena
Section 4: Pros and Cons of LFG
Section 5: Basic Concepts in LFG
Section 6: References

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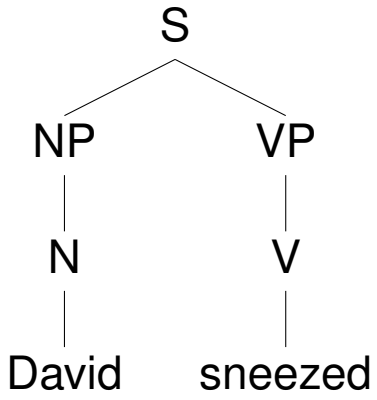
Constituent Structure (C-Structure)

Nodes in the c-structure tree can be connected to the corresponding **feature description (f-structure)**. This will here be indicated with *red color*, while arrows are used in Bresnan et al. (2016) and Müller (2019) to the same effect.

Section Q&As
Section 1: Recap of Lecture 13
Section 2: Basic Definitions in LFG
Section 3: Syntactic Structure in LFG
Section 4: Syntactic Phenomena
Section 4: Pros and Cons of LFG
Section 5: Basic Concepts in LFG
Section 6: References

c-structure:



f-structure:

$$\begin{bmatrix} \text{PRED} & \text{‘sneeze}\langle \text{SUBJ} \rangle\text{’} \\ \text{TENSE} & \textit{past} \\ \text{SUBJ} & \begin{bmatrix} \text{PRED} & \text{‘david’} \end{bmatrix} \end{bmatrix}$$

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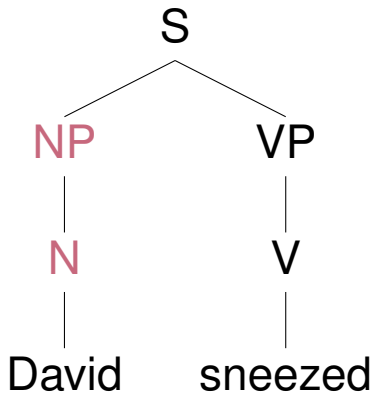
Constituent Structure (C-Structure)

For example, the subject in the NP is equivalent to the SUBJ|PRED feature in the f-structure.

c-structure:



f-structure:

$$\begin{bmatrix} \text{PRED} & \text{‘sneeze}\langle \text{SUBJ} \rangle\text{’} \\ \text{TENSE} & \textit{past} \\ \text{SUBJ} & \begin{bmatrix} \text{PRED} & \text{‘david’} \end{bmatrix} \end{bmatrix}$$

Section Q&As
Section 1: Recap of Lecture 13
Section 2: Basic Definitions in LFG
Section 3: Syntactic Structure in LFG
Section 4: Syntactic Phenomena
Section 4: Pros and Cons of LFG
Section 5: Basic Concepts in LFG
Section 6: References

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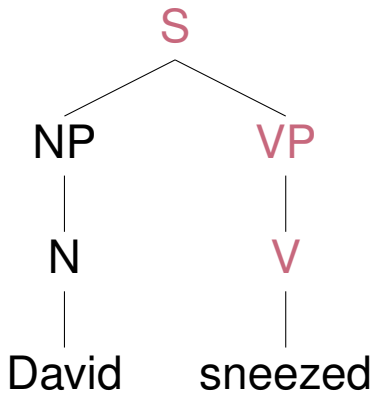
Constituent Structure (C-Structure)

The **highest level node** (e.g. S in PSGs) together with the **overall head** of the sentence (e.g. VP and V) is connected to the entire f-structure. Note that S and VP can here not be teased apart since the outermost brackets scope over both the VP and the other elements of the sentence.

Section Q&As
Section 1: Recap of Lecture 13
Section 2: Basic Definitions in LFG
Section 3: Syntactic Structure in LFG
Section 4: Syntactic Phenomena
Section 4: Pros and Cons of LFG
Section 5: Basic Concepts in LFG
Section 6: References

c-structure:



f-structure:

$$\begin{bmatrix} \text{PRED} & \text{‘sneeze}\langle \text{SUBJ} \rangle\text{’} \\ \text{TENSE} & \textit{past} \\ \text{SUBJ} & \begin{bmatrix} \text{PRED} & \text{‘david’} \end{bmatrix} \end{bmatrix}$$

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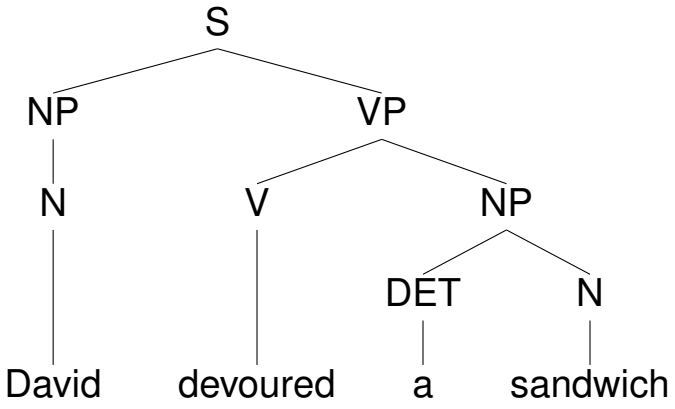
Constituent Structure (C-Structure)

Here is another example with the transitive sentence from above.

c-structure:



f-structure:

$$\begin{bmatrix} \text{PRED} & \text{‘devour}\langle \text{SUBJ,OBJ} \rangle\text{’} \\ \text{TENSE} & \textit{past} \\ \text{SUBJ} & \begin{bmatrix} \text{PRED} & \text{‘david’} \end{bmatrix} \\ \text{OBJ} & \begin{bmatrix} \text{SPEC} & \text{a} \\ \text{PRED} & \text{‘sandwich’} \end{bmatrix} \end{bmatrix}$$

Section Q&As
Section 1: Recap of Lecture 13
Section 2: Basic Definitions in LFG
Section 3: Syntactic Structure in LFG
Section 4: Syntactic Phenomena
Section 4: Pros and Cons of LFG
Section 5: Basic Concepts in LFG
Section 6: References

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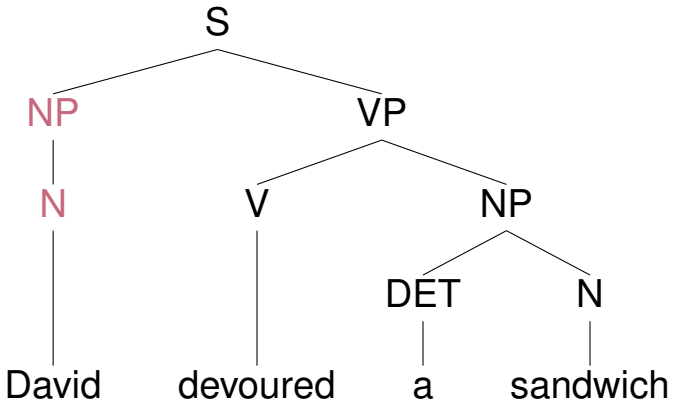
Constituent Structure (C-Structure)

The NP representing the subject in c-structure is equivalent to the value of SUBJ in f-structure.

c-structure:



f-structure:

$$\begin{bmatrix} \text{PRED} & \text{‘devour}\langle \text{SUBJ,OBJ} \rangle\text{’} \\ \text{TENSE} & \textit{past} \\ \text{SUBJ} & \begin{bmatrix} \text{PRED} & \text{‘david’} \end{bmatrix} \\ \text{OBJ} & \begin{bmatrix} \text{SPEC} & \text{a} \\ \text{PRED} & \text{‘sandwich’} \end{bmatrix} \end{bmatrix}$$

Section Q&As
Section 1: Recap of Lecture 13
Section 2: Basic Definitions in LFG
Section 3: Syntactic Structure in LFG
Section 4: Syntactic Phenomena
Section 4: Pros and Cons of LFG
Section 5: Basic Concepts in LFG
Section 6: References

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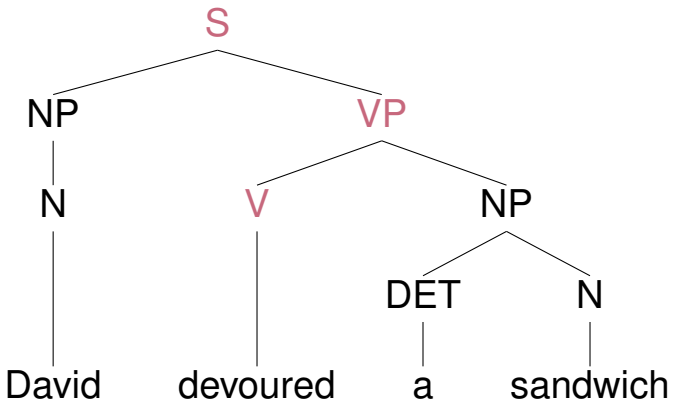
Constituent Structure (C-Structure)

The highest node (S) together with the overall head (VP) in c-structure are equivalent to the overall f-structure.

c-structure:



f-structure:

$$\begin{bmatrix} \text{PRED} & \text{'devour}\langle \text{SUBJ,OBJ} \rangle\text{'} \\ \text{TENSE} & \textit{past} \\ \text{SUBJ} & \begin{bmatrix} \text{PRED} & \text{'david'} \end{bmatrix} \\ \text{OBJ} & \begin{bmatrix} \text{SPEC} & \text{a} \\ \text{PRED} & \text{'sandwich'} \end{bmatrix} \end{bmatrix}$$

Section Q&As
Section 1: Recap of Lecture 13
Section 2: Basic Definitions in LFG
Section 3: Syntactic Structure in LFG
Section 4: Syntactic Phenomena
Section 4: Pros and Cons of LFG
Section 5: Basic Concepts in LFG
Section 6: References

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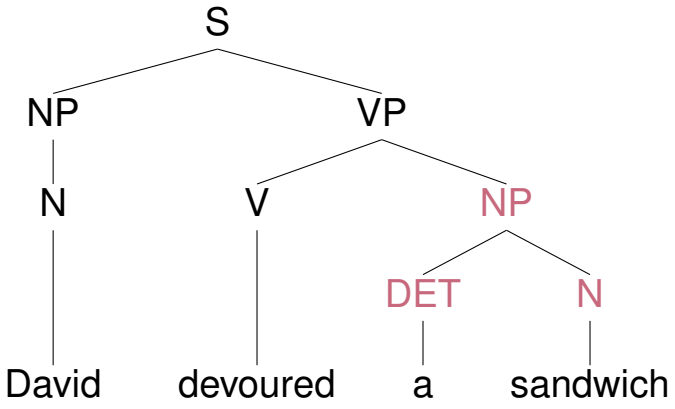
Constituent Structure (C-Structure)

The object NP of c-structure then corresponds to the OBJ value in f-structure.

c-structure:



f-structure:

$$\begin{bmatrix} \text{PRED} & \text{‘devour}\langle \text{SUBJ,OBJ} \rangle\text{’} \\ \text{TENSE} & \textit{past} \\ \text{SUBJ} & \begin{bmatrix} \text{PRED} & \text{‘david’} \end{bmatrix} \\ \text{OBJ} & \begin{bmatrix} \text{SPEC} & \text{a} \\ \text{PRED} & \text{‘sandwich’} \end{bmatrix} \end{bmatrix}$$

Section Q&As
Section 1: Recap of Lecture 13
Section 2: Basic Definitions in LFG
Section 3: Syntactic Structure in LFG
Section 4: Syntactic Phenomena
Section 4: Pros and Cons of LFG
Section 5: Basic Concepts in LFG
Section 6: References

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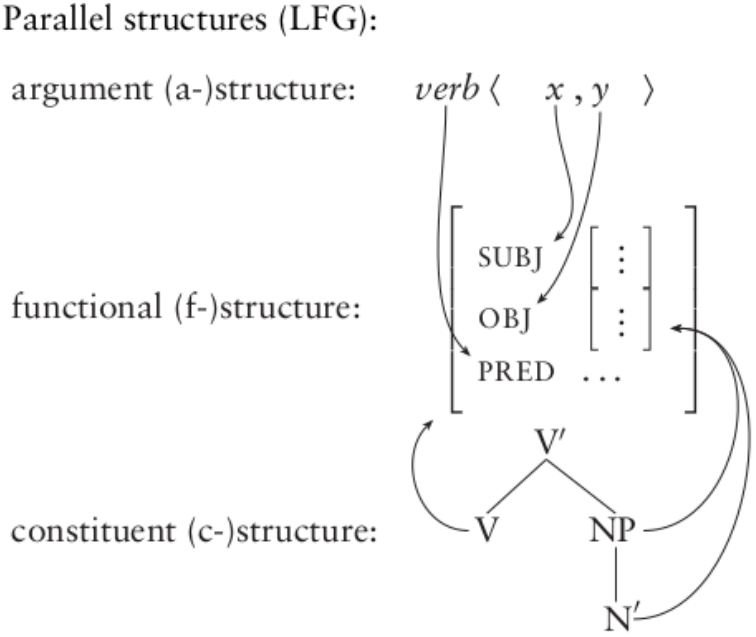
Summary: Structural Levels

"Each structure models a different dimension of grammatical substance: role, function, or category. **Roles** correspond to the grammatically expressible participants of eventualities (modeled by a-structure), **syntactic functions** belong to the abstract system of relators of roles to expressions (modeled by f-structure), and **phrase structure categories** belong to the overt structure of forms of expression (modeled by c-structure)."

Bresnan et al. (2016), p. 15.



Section Q&As
Section 1: Recap of Lecture 13
Section 2: Basic Definitions in LFG
Section 3: Syntactic Structure in LFG
Section 4: Syntactic Phenomena
Section 4: Pros and Cons of LFG
Section 5: Basic Concepts in LFG
Section 6: References

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Section 4: Syntactic Phenomena

The Passive

In LFG, the passive construction is dealt with by having a simple mapping rule for the respective **active** and **passive** argument structures:

$$\textit{verb}\langle \text{SBJ,OBJ} \rangle \rightarrow \textit{verb}\langle (\text{OBL}_{AG}), \text{SBJ} \rangle$$

This is then also translated into differing f-structures. Notably, this is valid for both *configurational* and *non-configurational* languages (see examples on the next slides).

Bresnan et al. (2016), p. 22.

Note: In the passive a-structure, the oblique agent comes before the subject, which is the patient in a passive construction. So this again follows the thematic hierarchy: agent $>$ patient.

Section Q&As
Section 1: Recap of Lecture 13
Section 2: Basic Definitions in LFG
Section 3: Syntactic Structure in LFG
Section 4: Syntactic Phenomena
Section 4: Pros and Cons of LFG
Section 5: Basic Concepts in LFG
Section 6: References

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English Example (Configurational)

active f-structure:

$$\begin{bmatrix} \text{PRED} & \text{'worship}\langle \text{SUBJ,OBJ} \rangle\text{'} \\ \text{TENSE} & \textit{past} \\ \text{SUBJ} & \begin{bmatrix} \text{SPEC} & \text{the} \\ \text{PRED} & \text{'child'} \end{bmatrix} \\ \text{OBJ} & \begin{bmatrix} \text{SPEC} & \text{the} \\ \text{PRED} & \text{'elephant'} \end{bmatrix} \end{bmatrix}$$

The child worshipped the elephant.

passive f-structure:

$$\begin{bmatrix} \text{PRED} & \text{'worship}\langle (\text{OBL}_{AG}), \text{SUBJ} \rangle\text{'} \\ \text{TENSE} & \textit{past} \\ \textbf{VOICE} & \textit{passive} \\ \text{SUBJ} & \begin{bmatrix} \text{SPEC} & \text{the} \\ \text{PRED} & \text{'elephant'} \end{bmatrix} \\ (\textbf{OBL}_{AG}) & \begin{bmatrix} \text{PRED} & \text{'by}\langle \text{OBJ} \rangle\text{'} \\ \text{OBJ} & \begin{bmatrix} \text{SPEC} & \text{the} \\ \text{PRED} & \text{'child'} \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

The elephant was worshipped (by the child).

Section Q&As
Section 1: Recap of Lecture 13
Section 2: Basic Definitions in LFG
Section 3: Syntactic Structure in LFG
Section 4: Syntactic Phenomena
Section 4: Pros and Cons of LFG
Section 5: Basic Concepts in LFG
Section 6: References

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Malayalam (Dravidian) Example (Non-Configurational)

active f-structure:

$$\begin{bmatrix} \text{PRED} & \text{'worship}\left\langle \text{SUBJ,OBJ} \right\rangle\text{'} \\ \text{TENSE} & \textit{past} \\ \text{SUBJ} & \begin{bmatrix} \text{PRED} & \text{'child'} \\ \text{CASE} & \text{NOM} \end{bmatrix} \\ \text{OBJ} & \begin{bmatrix} \text{PRED} & \text{'elephant'} \\ \text{CASE} & \text{ACC} \end{bmatrix} \end{bmatrix}$$

(1) kutti aanaye aaraadicuu.
child.NOM elephant.ACC worship.PAST
"The child worshipped the elephant."

passive f-structure:

$$\begin{bmatrix} \text{PRED} & \text{'worship}\left\langle (\text{OBL}_{AG}), \text{SUBJ} \right\rangle\text{'} \\ \text{TENSE} & \textit{past} \\ \textbf{VOICE} & \textit{passive} \\ (\textbf{OBL}_{AG}) & \begin{bmatrix} \text{PRED} & \text{'by}\left\langle \text{OBJ} \right\rangle\text{'} \\ \text{OBJ} & \begin{bmatrix} \text{PRED} & \text{'child'} \\ \text{CASE} & \text{INSTR} \end{bmatrix} \end{bmatrix} \\ \text{SUBJ} & \begin{bmatrix} \text{PRED} & \text{'elephant'} \\ \text{CASE} & \text{NOM} \end{bmatrix} \end{bmatrix}$$

(2) kuttiyaal aana aaraadhikkappettu.
child.INSTR elephant.NOM worship.PASS.PAST
"The elephant was worshipped (by the child)."

Adopted from Bresnan et al. (2016), p. 34-35.

Section Q&As
Section 1: Recap of Lecture 13
Section 2: Basic Definitions in LFG
Section 3: Syntactic Structure in LFG
Section 4: Syntactic Phenomena
Section 4: Pros and Cons of LFG
Section 5: Basic Concepts in LFG
Section 6: References

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Passive Without Transformations

"The order of NPs in the Malayalam sentences of these examples is **freely interchangeable**: only the case-marking of the NPs and the suffixation of -appet to the verb mark the passive construction [...]

The idea that passivization involves a syntactic transformation moving an NP (or a DP) in a sentence from the object position to the subject position is (from the vantage of LFG) an illusion, an **epiphenomenon of the lexical alternation**."

Bresnan et al. (2016), p. 33-36.

Section Q&As
Section 1: Recap of Lecture 13
Section 2: Basic Definitions in LFG
Section 3: Syntactic Structure in LFG
Section 4: Syntactic Phenomena
Section 4: Pros and Cons of LFG
Section 5: Basic Concepts in LFG
Section 6: References

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Section 4: Pros and Cons of LFG

Pros (Advantages)

- LFG is **fully formalized** and hence computationally implementable.
- LFG has the flexibility to deal with **configurational (fixed word order)** and **non-configurational (flexible word order)** languages.
- **Agreement** and **case assignment** are modelled explicitely in the feature descriptions (similar to GPSG).
- Feature descriptions allow for analyses of long-distance dependencies and passive constructions **without recurrence to transformations**.

Section Q&As
Section 1: Recap of Lecture 13
Section 2: Basic Definitions in LFG
Section 3: Syntactic Structure in LFG
Section 4: Syntactic Phenomena
Section 4: Pros and Cons of LFG
Section 5: Basic Concepts in LFG
Section 6: References

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Cons (Disadvantages)

- **Feature descriptions are untyped**, which means that generalizations in terms of type hiearchies such as inheritance of features are not available (in contrast to HPSG).
- The **interactions** between a-structure, f-structure, and c-structure are not straightforward, and will require a considerable amount of implementational details for any given language.

Section Q&As
Section 1: Recap of Lecture 13
Section 2: Basic Definitions in LFG
Section 3: Syntactic Structure in LFG
Section 4: Syntactic Phenomena
Section 4: Pros and Cons of LFG
Section 5: Basic Concepts in LFG
Section 6: References

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Section 5: Basic Concepts in LFG

Basic Concepts in LFG

- Constituency ✓
- POS ✓
- Heads ✓
- Valency ✓
- Grammatical Functions ✓

Section Q&As
Section 1: Recap of Lecture 13
Section 2: Basic Definitions in LFG
Section 3: Syntactic Structure in LFG
Section 4: Syntactic Phenomena
Section 4: Pros and Cons of LFG
Section 5: Basic Concepts in LFG
Section 6: References

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Section 6: References

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Section Q&As

Section 1: Recap of Lecture 13

Section 2: Basic Definitions in LFG

Section 3: Syntactic Structure in LFG

Section 4: Syntactic Phenomena

Section 4: Pros and Cons of LFG

Section 5: Basic Concepts in LFG

Section 6: References

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Thank You.

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