Object Positions in a topological sentence model for Danish

A Linearization-based HPSG approach

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Introduction

Danish grammatical tradition following Diderichsen 1946: hierarchical relations and linearization separate issues

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Head-Driven Phrase Structure Grammar (Pollard & Sag 1994)

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Linearization-based HPSG (Kathol 1995, 2000)

HPSG

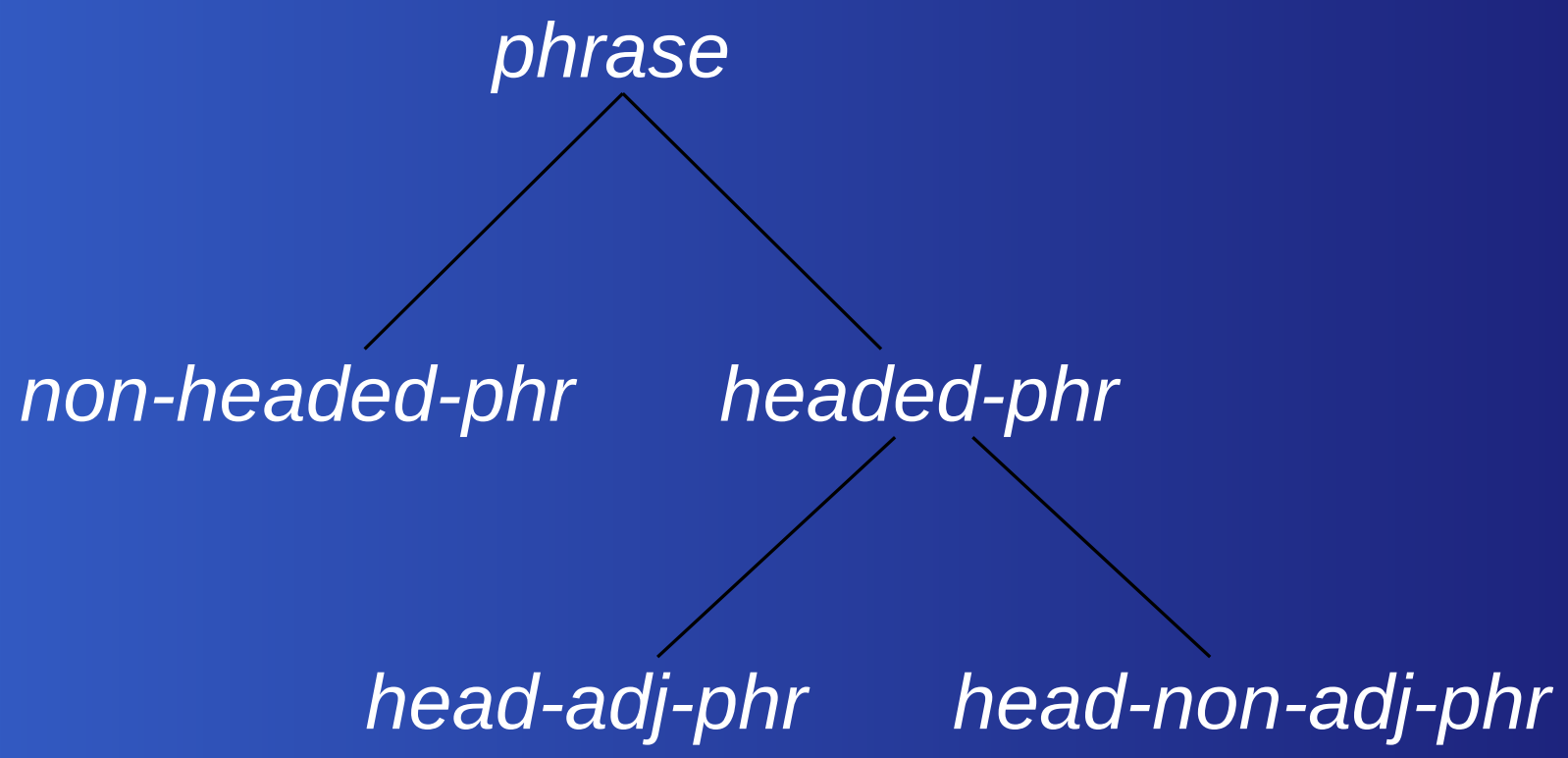
$$\begin{bmatrix} \textit{sign} \\ \text{PHON } \textit{list} \\ \text{SYNSEM} \begin{bmatrix} \textit{synsem} \\ \text{LOCAL} \begin{bmatrix} \textit{local} \\ \text{CAT } \textit{cat} \\ \text{CONT } \textit{cont} \\ \text{CONX } \textit{conx} \end{bmatrix} \\ \text{NONLOCAL } \textit{nonlocal} \end{bmatrix} \end{bmatrix}$$

HPSG

spiser

$$\begin{bmatrix} \textit{local} \\ \text{CAT} \begin{bmatrix} \text{HEAD} & \begin{bmatrix} \textit{verb} \\ \text{VFORM} & \textit{finite} \end{bmatrix} \\ \text{SUBJ} & \left\langle \begin{bmatrix} \text{LOC} \begin{bmatrix} \text{CAT} \begin{bmatrix} \text{HEAD} & \textit{noun} \\ \text{SUBJ} & \langle\rangle \\ \text{COMPS} & \langle\rangle \end{bmatrix} \end{bmatrix} \end{bmatrix} \right\rangle \\ \text{COMPS} & \left\langle \begin{bmatrix} \text{LOC} \begin{bmatrix} \text{CAT} \begin{bmatrix} \text{HEAD} & \textit{noun} \\ \text{SUBJ} & \langle\rangle \\ \text{COMPS} & \langle\rangle \end{bmatrix} \end{bmatrix} \end{bmatrix} \right\rangle \end{bmatrix} \end{bmatrix}$$

Type Hierarchy



Constraint

Head Feature Principle

The HEAD value of any headed phrase is structure-shared with the HEAD valuse of the head daughter
Pollard & Sag (1994, p. 34)

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headed-phrase $\longrightarrow$

$$\begin{bmatrix} \text{SS} \mid \text{LOC} \mid \text{CAT} \mid \text{HEAD} \ \boxed{1} \\ \text{HEAD-DTR} \mid \text{SS} \mid \text{LOC} \mid \text{CAT} \mid \text{HEAD} \ \boxed{1} \end{bmatrix}$$

Linearization-based HPSG

$$\begin{bmatrix} \textit{sign} & \\ \text{PHON} & \ldots \\ \text{SYNSEM} & \ldots \\ \text{DOM} & \left\langle \begin{bmatrix} \textit{sign} \wedge \textit{topo} & \\ \text{PHON} & \ldots \\ \text{SYNSEM} & \ldots \end{bmatrix}, \begin{bmatrix} \textit{sign} \wedge \textit{topo} & \\ \text{PHON} & \ldots \\ \text{SYNSEM} & \ldots \end{bmatrix}, \ldots \right\rangle \end{bmatrix}$$

Kathol (2000, p. 77)

Topological LP Statement

$vf \prec cf \prec mf \prec vc \prec nf$

Kathol (2000 p. 79)

vf: Vorfeld ('pre-field')
cf: complementizer field, linke Satzklammer ('left clause bracket')
mf: Mittelfeld ('middle field')
vc: verb cluster, rechte Satzklammer ('right clause bracket')
nf: Nachfeld ('final field')

$$\begin{bmatrix} \textit{sign} \\ \text{PHON} \ \boxed{1} \oplus \boxed{2} \oplus \ldots \boxed{n} \\ \text{DOM} \ \left\langle \begin{bmatrix} \textit{sign} \\ \text{PHON} \ \boxed{1} \end{bmatrix}, \begin{bmatrix} \textit{sign} \\ \text{PHON} \ \boxed{2} \end{bmatrix}, \ldots, \begin{bmatrix} \textit{sign} \\ \text{PHON} \ \boxed{n} \end{bmatrix} \right\rangle \end{bmatrix}$$

Kathol (2000, p. 77)

Recursivity

$$\boxed{1}\begin{bmatrix} \textit{sign} & \\ \text{PHON} & \ldots \\ \text{SYNSEM} & \ldots \\ \text{DOM} & \left\langle \boxed{1}\begin{bmatrix} \textit{sign} & \\ \text{PHON} & \ldots \\ \text{SYNSEM} & \ldots \\ \text{DOM} & \left\langle \boxed{1}\begin{bmatrix} \textit{sign} & \\ \text{PHON} & \ldots \\ \text{SYNSEM} & \ldots \\ \text{DOM} & \left\langle \boxed{1}\textit{etc.} \right\rangle \end{bmatrix} \right\rangle \end{bmatrix}, \ldots \right\rangle \end{bmatrix}$$

$$\begin{bmatrix} \textit{sign} & \\ \text{PHON} & \ldots \\ \text{DOM} & \left\langle \begin{bmatrix} \textit{dom-obj} & \\ \text{PHON} & \textit{list} \\ \text{SYNSEM} & \textit{synsem} \end{bmatrix}, \ldots \right\rangle \\ \text{SYNSEM} & \textit{synsem} \end{bmatrix}$$

$$\begin{bmatrix} \textit{sign-or-domobj} & \\ \text{PHON} & \textit{list} \\ \text{SYNSEM} & \textit{synsem} \end{bmatrix}$$

$$\begin{bmatrix} \textit{sign} & \\ \text{DOM} & \textit{list} \end{bmatrix}$$

dom-obj

Shuffle

The *shuffle* relation, $\bigcirc$, merges two lists allowing any order of elements on the output list as long as the relative order of elements on the two lists is preserved:

$\langle a,b \rangle \bigcirc \langle c,d \rangle$

$\langle a,b,c,d \rangle$,

$\langle a,c,b,d \rangle$,

$\langle a,c,d,b \rangle$,

$\langle c,a,b,d \rangle$,

$\langle c,a,d,b \rangle$,

$\langle c,d,a,b \rangle$

Compaction

$$\textit{compaction}\left(\begin{bmatrix}\textit{sign} \\ \textsc{phon}\ \boxed{1}(\boxed{2} \oplus \boxed{3} \oplus \ldots \oplus \boxed{n}) \\ \textsc{dom}\left\langle \begin{bmatrix}\textit{dom-obj} \\ \textsc{phon}\ \boxed{2}\end{bmatrix}, \begin{bmatrix}\textit{dom-obj} \\ \textsc{phon}\ \boxed{3}\end{bmatrix}, \ldots, \begin{bmatrix}\textit{dom-obj} \\ \textsc{phon}\ \boxed{n}\end{bmatrix}\right\rangle \\ \textsc{ss}\ \boxed{4}\end{bmatrix}, \begin{bmatrix}\textit{dom-obj} \\ \textsc{phon}\ \boxed{1} \\ \textsc{ss}\ \boxed{4}\end{bmatrix}\right)$$

Compaction of a sign has two purposes:

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And it eliminates information on the internal structure of the sign (information on its daughters) which is not needed and should not be available in the further derivation

Heltoft's revision of Diderichsen 1946

Modality field		Nucleus field						Free Adv field	Heavy field
F field		Nexus field			Content field				
F/a	m	n	a1	v	V	N	A	a2	H
så *then*	har *has*	hun *she*	også *also*	-	glemt *forgotten*	para-plyen *umbrel-la-the*	-	her *here*	som hun fik i Holland *that she got in Holland*

Heltoft (1986, p. 108)

New slot in front of *F*

Embedded V2 sentences

Double complementizers

Mood particles

sc	Modality field		Nucleus field					
	F field		Nexus field			Content field		
	F/a	m	n	a1	v	V	N	A
hvis	ikke	(at)	du	snart	stopper			
if	*not*	*that*	*you*	*soon*	*stop*			

Slots and fields

Slot:
’a position for simple topological units of the sentence’

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Field:
’a position for complex or compounded topological units’

Heltoft (1986, p. 121)

Constituency

’Det infinitte verbum + indholdsled er et verbalhypotagme der udgør en konstituent, og neksusfeltet er pladsen for det komplekse neksusled.’

’*The nonfinite verb + content sentence members is a verb phrase which constitutes one constituent, and the nexus field is the place for the complex nexus sentence member*’
Heltoft (1986, p. 111)

’Der [i modalitetsfeltet, TB] kan stå en kompleks konstituent, nemlig hovedsætningens primære neksus.’

’*There [in the modality field, TB] can be placed a complex constituent, namely the primary nexus of the main clause*’
Heltoft (1986, p. 112)

sc	Modality field		Nucleus field					
	F field		Nexus field			Content field		
	F/a	m	n	a1	v	V	N	A
hvis *if*			han *he*	så *then*	husker *remembers*		bogen *book-the*	
	han *he*	husker *remembers*		sgu *by God*			bogen *book-the*	

Also the nucleus field (nexus + content field) is supposed to contain one constituent which semantically can be the first argument of a preposition heading a free adverbial:

(1) hvis de tror på ham i Moskva
if they believe in him in Moscow

In main clauses this argument does not hold:

sc	Modality field		Nucleus field						
	F field		Nexus field			Content field			a2
	F/a	m	n	a1	v	V	N	A	
hvis *if*			de *they*		tror *be-* *lieve*			på ham *on him*	i M. *in M.*
	de	tror						på ham	i M.

As Hentze remarks

> ’... unless the empty n and v positions are assumed to be coindexed in some way with the corresponding constituents in the Modality field, the material in the Nexus field (the remaining object PP) can hardly be viewed as an argument of the adjunct PP; nothing in his analysis though, suggests that Heltoft (1986) is adopting such a move.’
> Hentze (1996, p. 32)

It seems in conflict with the whole idea of topology as an independent level of linguistic analysis to try and express syntactic and semantic generalizations in linear terms.

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A purely linear model with slots but no fields seems preferable

Heltoft (1986, p. 108)										
sc	Modality field		Nucleus field						Free Adv field	Heavy field
	F field		Nexus field			Content field				
	F/a	m	n	a1	v	V	N	A	a2	H
-	så	har	hun	også	-	glemt	para-plyen	-	her	som hun fik i Holland
rc	vf	cf	mf		vc		of			(nf)
Kathol (2000, p. 262)										

Scrambling in *mf*?

(2) a. Hvis alligevel Peter ikke kommer.
If after all Peter not comes

b. Hvis alligevel ikke Peter kommer.

c. Hvis Peter alligevel ikke kommer.

d. Hvis Peter ikke alligevel kommer.

e. Hvis ikke Peter alligevel kommer.

f. Hvis ikke alligevel Peter kommer.

Hentze (1996, p. 49–50)

In general no scrambling

(3) a. I går gav hun ham den alligevel.
Yesterday gave she him it after all

b. *I går gav ham hun den alligevel.

c. *I går gav ham den hun alligevel.

d. *I går gav alligevel hun ham den.

A model like Heltoft's with separate *n* and *a1* slots (and additional *l* slot between them, see below) is preferable

Object shift

A full NP object follows a sentence negation, (4a), while an unstressed, pronominal direct object may precede it, (4b):

(4) a. Peter læste ikke **bogen**.
Peter read not book-the

b. Peter læste ∘**den** ikke.
Peter read it not

The same goes for indirect objects as shown in (5):

(5) a. Ole gav ikke **Peter** bogen.
Ole gave not Peter book-the

b. Ole gav ○**ham** ikke bogen.
Ole gave him not book-the

In Danish, unstressed, pronominal objects must shift if they can:

(6) *Peter læste ikke ○den.
Peter read not it

Two factors block object shift. If the main verb occupies the *V* slot also unstressed, pronominal objects must occur in the *N* slot.

(7) a. *Peter har ₒden ikke læst.
Peter has it not read

b. Peter har ikke læst ₒden

(8) a. *at Peter ₒden ikke læste.
that Peter it not read

b. at Peter ikke læste ₒden

In double object constructions the direct object can shift only in case the indirect object is out of the way, either because it has also shifted or because it is placed in the *F* slot.

(9) a. *Ole gav ₒden ikke Peter.
Ole gave it not Peter

b. Ole gav ₒham ₒden ikke.
Ole gave him it not

c. (?)Peter gav Ole ₒden ikke (til).
Peter gave Ole it not

The indirect object may shift even if the direct object does not.

(10) a. Ole gav ikke Peter bogen.
Ole gave not Peter book-the

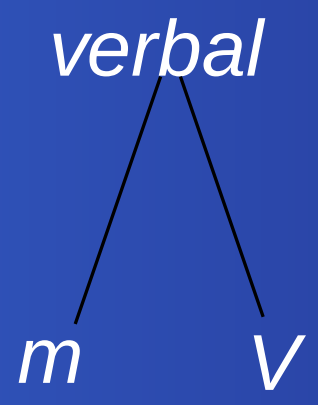
b. Ole gav ₒham ikke bogen.
Ole gave him not book-the

Formalization

The order of elements on the DOM list of any sign is restricted by the following constraint:

$$sign \longrightarrow \left[\text{DOM} \left\langle sc \prec F \prec m \prec n^* \prec l^* \prec a1^* \prec V^* \prec N \prec A \prec a2^* \prec H \right\rangle\right]$$

Finite verbs are lexically assigned a *domain-object* of type *verbal* subsuming *m* and *V*:



Part of the lexical entry for the verb *giver*, ’give(s)’:

$$\begin{bmatrix} \textit{word} \\ \text{DOM} \left\langle \begin{bmatrix} \textit{verbal} \\ \text{PHON} \left\langle \textit{giver} \right\rangle \\ \text{SS} \mid \text{LOC} \mid \text{CAT} \begin{bmatrix} \text{HEAD} \mid \text{VFORM } \textit{finite} \\ \text{SUBJ} \left\langle \left[\textit{synsem} \right] \right\rangle \\ \text{COMPS} \left\langle \left[\textit{synsem} \right], \left[\textit{synsem} \right] \right\rangle \end{bmatrix} \end{bmatrix} \right\rangle \end{bmatrix}$$

head-comps-phr $\longrightarrow$

$$\begin{bmatrix} \text{SS} \mid \text{LOC} \mid \text{CAT} \begin{bmatrix} \text{SUBJ} & \boxed{1} \\ \text{COMPS} & \langle\rangle \end{bmatrix} \\ \text{HEAD-DTR} \mid \text{SS} \mid \text{LOC} \mid \text{CAT} \begin{bmatrix} \text{SUBJ} & \boxed{1} \\ \text{COMPS} & \langle \boxed{2}, \boxed{3} \rangle \end{bmatrix} \\ \text{NON-HEAD-DTRS} \langle \boxed{4}\begin{bmatrix} \text{SS} & \boxed{2} \end{bmatrix}, \boxed{5}\begin{bmatrix} \text{SS} & \boxed{3} \end{bmatrix} \rangle \end{bmatrix}$$

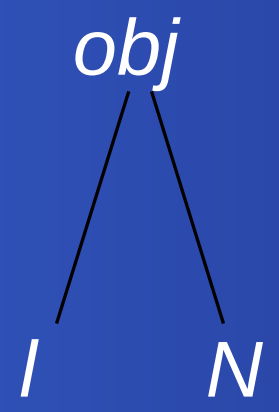
$\wedge$

$\mathit{compaction}(\boxed{4}, \langle \mathit{obj} \rangle)$

$\wedge$

$\mathit{compaction}(\boxed{5}, \langle \mathit{obj} \rangle)$

Objects are compacted to a *domain-object* of type *obj* subsuming *I* and *N*:



In any *headed-phr* non-head daughters are compacted and shuffled into the mothers DOM list:

$$\textit{headed-phr} \longrightarrow \begin{bmatrix} \text{DOM} & \boxed{1} \bigcirc \boxed{4} \, (\bigcirc \boxed{5}) \\ \text{HEAD-DTR} & \begin{bmatrix} \text{DOM} & \boxed{1} \end{bmatrix} \\ \text{NON-HEAD-DTRS} & \left\langle \boxed{2}, (\boxed{3}) \right\rangle \end{bmatrix}$$

$$\wedge \ \textit{compaction}\left(\boxed{2}, \boxed{4}\right) \wedge \left(\textit{compaction}\left(\boxed{3}, \boxed{5}\right)\right)$$

(11) a.

$$\begin{bmatrix} \textit{head-comps-phr} \\ \text{DOM} \left\langle \begin{bmatrix} m \\ \text{PHON} \left\langle \textit{giver} \right\rangle \end{bmatrix}, \begin{bmatrix} N \\ \text{PHON} \left\langle \textit{Peter} \right\rangle \end{bmatrix}, \begin{bmatrix} N \\ \text{PHON} \left\langle \textit{bogen} \right\rangle \end{bmatrix} \right\rangle \end{bmatrix}$$

b.

$$\begin{bmatrix} \textit{head-comps-phr} \\ \text{DOM} \left\langle \begin{bmatrix} m \\ \text{PHON} \left\langle \textit{giver} \right\rangle \end{bmatrix}, \begin{bmatrix} I \\ \text{PHON} \left\langle \textit{ham} \right\rangle \end{bmatrix}, \begin{bmatrix} I \\ \text{PHON} \left\langle \textit{den} \right\rangle \end{bmatrix} \right\rangle \end{bmatrix}$$

c.

$$\begin{bmatrix} \textit{head-comps-phr} \\ \text{DOM} \left\langle \begin{bmatrix} m \\ \text{PHON} \left\langle \textit{giver} \right\rangle \end{bmatrix}, \begin{bmatrix} I \\ \text{PHON} \left\langle \textit{ham} \right\rangle \end{bmatrix}, \begin{bmatrix} N \\ \text{PHON} \left\langle \textit{bogen} \right\rangle \end{bmatrix} \right\rangle \end{bmatrix}$$

(11) d.

$$\begin{bmatrix} \textit{head-comps-phr} \\ \text{DOM} \left\langle \begin{bmatrix} V \\ \text{PHON} \left\langle \textit{giver} \right\rangle \end{bmatrix}, \begin{bmatrix} N \\ \text{PHON} \left\langle \textit{Peter} \right\rangle \end{bmatrix}, \begin{bmatrix} N \\ \text{PHON} \left\langle \textit{bogen} \right\rangle \end{bmatrix} \right\rangle \end{bmatrix}$$

e.

$$\begin{bmatrix} \textit{head-comps-phr} \\ \text{DOM} \left\langle \begin{bmatrix} V \\ \text{PHON} \left\langle \textit{giver} \right\rangle \end{bmatrix}, \begin{bmatrix} N \\ \text{PHON} \left\langle \textit{Peter} \right\rangle \end{bmatrix}, \begin{bmatrix} N \\ \text{PHON} \left\langle \textit{den} \right\rangle \end{bmatrix} \right\rangle \end{bmatrix}$$

(12) a.

$$* \begin{bmatrix} \textit{head-comps-phr} \\ \text{DOM} \left\langle \begin{bmatrix} \textit{I} \\ \text{PHON} \left\langle \textit{ham} \right\rangle \end{bmatrix}, \begin{bmatrix} \textit{I} \\ \text{PHON} \left\langle \textit{den} \right\rangle \end{bmatrix}, \begin{bmatrix} \textit{V} \\ \text{PHON} \left\langle \textit{giver} \right\rangle \end{bmatrix} \right\rangle \end{bmatrix}$$

b.

$$* \begin{bmatrix} \textit{head-comps-phr} \\ \text{DOM} \left\langle \begin{bmatrix} \textit{m} \\ \text{PHON} \left\langle \textit{giver} \right\rangle \end{bmatrix}, \begin{bmatrix} \textit{I} \\ \text{PHON} \left\langle \textit{ham} \right\rangle \end{bmatrix}, \begin{bmatrix} \textit{N} \\ \text{PHON} \left\langle \textit{den} \right\rangle \end{bmatrix} \right\rangle \end{bmatrix}$$

c.

$$* \begin{bmatrix} \textit{head-comps-phr} \\ \text{DOM} \left\langle \begin{bmatrix} \textit{m} \\ \text{PHON} \left\langle \textit{giver} \right\rangle \end{bmatrix}, \begin{bmatrix} \textit{I} \\ \text{PHON} \left\langle \textit{den} \right\rangle \end{bmatrix}, \begin{bmatrix} \textit{I} \\ \text{PHON} \left\langle \textit{ham} \right\rangle \end{bmatrix} \right\rangle \end{bmatrix}$$

d. etc.

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- Full NP objects cannot occur in *I*
- Objects cannot precede their verbal head
- IO must precede DO in *I* and/or *N*
- Unstressed pronominal objects cannot occur in *N* unless preceded either by an instantiated *V* slot or a full NP indirect object in *N*

Only unstressed pronouns can occur in *I*:

$$I \longrightarrow \begin{bmatrix} \text{PHON} \left\langle \begin{bmatrix} \text{STRESS} \ \ \textit{unstressed} \end{bmatrix} \right\rangle \\ \text{SS} \mid \text{LOC} \mid \text{CAT} \mid \text{HEAD} \ \textit{pron} \end{bmatrix}$$

head-comps-phr $\longrightarrow$

$$\begin{bmatrix} \text{SS} \mid \text{LOC} \mid \text{CAT} \begin{bmatrix} \text{SUBJ} & \boxed{1} \\ \text{COMPS} & \langle\rangle \end{bmatrix} \\ \text{HEAD-DTR} \mid \text{SS} \mid \text{LOC} \mid \text{CAT} \begin{bmatrix} \text{SUBJ} & \boxed{1} \\ \text{COMPS} & \langle \boxed{2}, \boxed{3} \rangle \end{bmatrix} \\ \text{N-HEAD-DTRS} \langle \boxed{4}\begin{bmatrix} \text{SS} & \boxed{2} \end{bmatrix}, \boxed{5}\begin{bmatrix} \text{SS} & \boxed{3} \end{bmatrix} \rangle \end{bmatrix}$$

$$\wedge\ \textit{compaction}(\boxed{4}, \boxed{6}\langle \textit{obj} \rangle)\ \wedge\ \textit{compaction}(\boxed{5}, \boxed{7}\langle \textit{obj} \rangle)\ \wedge$$

$$\begin{bmatrix} \text{DOM} \langle \begin{bmatrix} V \end{bmatrix} \prec \boxed{6} \prec \boxed{7} \rangle \end{bmatrix}$$

$$\begin{bmatrix} \textsc{dom}\ \textit{list} \bigcirc \left\langle \begin{bmatrix} N \\ \textsc{phon} \left\langle \begin{bmatrix} \textsc{stress}\ \textit{unstressed} \end{bmatrix} \right\rangle \\ \ldots \mid \textsc{head}\ \textit{pron} \end{bmatrix} \right\rangle \end{bmatrix} \longrightarrow$$

$$\begin{bmatrix} \textsc{dom}\ \textit{list} \bigcirc \left\langle \begin{bmatrix} N \\ \ldots \mid \textsc{head}\ \textit{noun} \end{bmatrix}, \begin{bmatrix} N \\ \textsc{phon} \left\langle \begin{bmatrix} \textsc{stress}\ \textit{unstressed} \end{bmatrix} \right\rangle \\ \ldots \mid \textsc{head}\ \textit{pron} \end{bmatrix} \right\rangle \end{bmatrix} \vee$$

$$\begin{bmatrix} \textsc{dom}\ \textit{list} \bigcirc \left\langle \begin{bmatrix} V \end{bmatrix}, \begin{bmatrix} N \\ \textsc{phon} \left\langle \begin{bmatrix} \textsc{stress}\ \textit{unstressed} \end{bmatrix} \right\rangle \\ \ldots \mid \textsc{head}\ \textit{pron} \end{bmatrix} \right\rangle \end{bmatrix}$$

Verb-particle constructions

In Danish all objects (except when extraposed) precede the particle in verb-particle constructions:

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(13) a. Peter smed ikke alle bøgerne ud.
Peter threw not all books-the out

b. *Peter smed ud alle bøgerne
Peter threw out all books-the

Verb-particle constructions

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(13) a. Peter smed ikke alle bøgerne ud.
Peter threw not all books-the out

b. *Peter smed ud alle bøgerne
Peter threw out all books-the

(14) a. Peter smed dem ikke ud.
Peter threw them not out

b. *Peter smed ud dem.
Peter threw out them

The particle precedes free adjuncts in the *a2* slot and it is accordingly assigned to the *A* slot.

Verb and particle combine in a *head-copred-phrase*

head-copred-phr $\longrightarrow$

$$\begin{bmatrix} \text{SS} \mid \text{LOC} \mid \text{CAT} \begin{bmatrix} \text{SUBJ } \boxed{1} \\ \text{COMPS } \boxed{2} \\ \text{COPRED } \langle\,\rangle \end{bmatrix} \\ \text{H-DTR} \mid \text{SS} \mid \text{LOC} \mid \text{CAT} \begin{bmatrix} \text{SUBJ } \boxed{1} \\ \text{COMPS } \boxed{2}\langle \boxed{3} \rangle \\ \text{COPRED } \langle \boxed{4} \rangle \end{bmatrix} \\ \text{NON-H-DTRS} \langle \boxed{5} \begin{bmatrix} \text{SS } \boxed{4} \mid \text{LOC} \mid \text{CAT} \mid \text{SUBJ} \langle \boxed{3} \rangle \end{bmatrix} \rangle \end{bmatrix}$$

$\wedge$ *compaction*$(\boxed{5}, \langle A \rangle)$

In Swedish the object follows the particle:

(15) Sanna kastade ut alla böckerna.
Sanna threw out all books-the
Toivonen (2003, p. 1)

Following Kathol (2000) I suggest that in Swedish the particle is assigned not to *A* but to *V* (Kathol's *vc*).

The fact that object shift is blocked in verb-particle constructions in Swedish follows directly from one of the constraints on *head-comps-phr* on slide 46 that the object(s) cannot precede an instantiated *V* slot.

Objects in the *F* slot

Objects can also occur in the *F* slot:

(16) Den bog læste Peter ikke.
That book read Peter not

Objects in the *F* slot

Objects can also occur in the *F* slot:

(16) Den bog læste Peter ikke.
That book read Peter not

Pronominal objects may only be fronted if they are stressed:

(17) a. $*_{o}$Ham så jeg ikke.
Him saw I not

b. ’Ham så jeg ikke.
Him saw I not

The object may even occur in the *F* slot of a higher clause:

(18) Den bog tror jeg ikke Peter har læst.
That book think I not Peter has read

We introduce a *trace* to satisfy locally the need for an object. The trace has no phonology and no domain object:

$$\begin{bmatrix} \textit{word} \\ \text{PHON} \langle\, \rangle \\ \text{DOM} \langle\, \rangle \\ \text{SS} \begin{bmatrix} \text{LOC} \ \boxed{1} \\ \text{NONLOC} \ \Big| \ \text{SLASH} \langle \boxed{1} \rangle \end{bmatrix} \end{bmatrix}$$

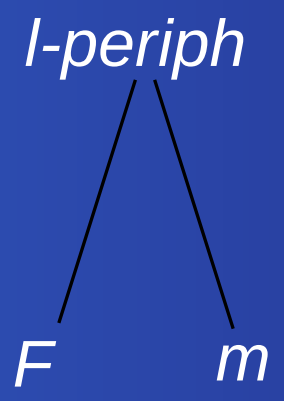
$$\begin{bmatrix} \textit{head-comps-phr} \\ \text{DOM} \left\langle \begin{bmatrix} \textit{m} \\ \text{PHON} \left\langle \textit{læste} \right\rangle \end{bmatrix} \right\rangle \\ \text{SS} \begin{bmatrix} \text{LOC} \mid \text{CAT} \begin{bmatrix} \text{SUBJ} \left\langle \boxed{1} \right\rangle \\ \text{COMPS} \left\langle \right\rangle \end{bmatrix} \\ \text{NONLOC} \mid \text{SLASH} \left\langle \boxed{2} \right\rangle \end{bmatrix} \\ \text{H-DTR} \mid \text{SS} \mid \text{LOC} \mid \text{CAT} \begin{bmatrix} \text{SUBJ} \left\langle \boxed{1} \right\rangle \\ \text{COMPS} \left\langle \boxed{3} \right\rangle \end{bmatrix} \\ \text{NONHEAD-DTRS} \left\langle \left[\text{SS} \boxed{3} \mid \text{NONLOC} \mid \text{SLASH} \left\langle \boxed{2} \right\rangle \right] \right\rangle \end{bmatrix}$$

$$\begin{bmatrix} \textit{head-subj-phr} \\ \text{DOM} \left\langle \begin{bmatrix} m \\ \text{PHON} \left\langle \textit{læste} \right\rangle \end{bmatrix}, \begin{bmatrix} n \\ \text{PHON} \left\langle \textit{Peter} \right\rangle \end{bmatrix} \right\rangle \\ \text{SS} \begin{bmatrix} \text{LOC} \mid \text{CAT} \begin{bmatrix} \text{SUBJ} \left\langle \right\rangle \\ \text{COMPS} \left\langle \right\rangle \end{bmatrix} \\ \text{NONLOC} \mid \text{SLASH} \left\langle \boxed{2} \right\rangle \end{bmatrix} \end{bmatrix}$$

$$
\textit{head-filler-phr} \longrightarrow \begin{bmatrix}
\text{SS} \begin{bmatrix} \text{LOC } \boxed{1} \\ \text{NONLOC} \mid \text{SLASH} \langle\rangle \end{bmatrix} \\
\text{HEAD-DTR} \mid \text{SS} \begin{bmatrix} \text{LOC } \boxed{1} \mid \text{CAT} \begin{bmatrix} \text{HEAD} \mid \text{VFORM } \textit{fin} \\ \text{SUBJ} \langle\rangle \\ \text{COMPS} \langle\rangle \end{bmatrix} \\ \text{NONLOC} \mid \text{SLASH} \langle \boxed{2} \rangle \end{bmatrix} \\
\text{NON-HEAD-DTRS} \left\langle \boxed{3} \begin{bmatrix} \text{PHON} \begin{bmatrix} \text{STRESS } \textit{stressed} \end{bmatrix} \\ \text{SS} \begin{bmatrix} \text{LOC } \boxed{2} \\ \text{NONLOC} \mid \text{SLASH} \langle\rangle \end{bmatrix} \end{bmatrix} \right\rangle
\end{bmatrix}
$$

$$
\wedge\ \textit{compaction}(\boxed{3}, \langle \textit{l-periph} \rangle)
$$

The filler is compacted to a *domain object* of the type *l(eft)-periph(eral)* with the subtypes *F* and *m*:



In our example the *m* slot is occupied by the verb and so the filler is forced to occupy the *F* slot.

$$\begin{bmatrix} \textit{head-filler-phr} \\ \text{DOM} \left\langle \begin{bmatrix} F \\ \text{PHON} \left\langle \textit{den bog} \right\rangle \end{bmatrix}, \begin{bmatrix} m \\ \text{PHON} \left\langle \textit{læste} \right\rangle \end{bmatrix}, \begin{bmatrix} n \\ \text{PHON} \left\langle \textit{Peter} \right\rangle \end{bmatrix} \right\rangle \\ \text{SS} \begin{bmatrix} \text{LOC} \mid \text{CAT} \begin{bmatrix} \text{HEAD} \mid \text{VFORM } \textit{fin} \\ \text{SUBJ} \left\langle \right\rangle \\ \text{COMPS} \left\langle \right\rangle \end{bmatrix} \\ \text{NONLOC} \mid \text{SLASH} \left\langle \right\rangle \end{bmatrix} \end{bmatrix}$$