On the linearization of syntactic structures: Linear order and the workings of Vocabulary Insertion

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1. Introduction: The creation of linear order

• Traditional assumption: linear order is understood as a property encoded in the syntax:
  (i) Phrase markers directly represent the left-to-right order of the constituents (cf. e.g. Chomsky 1965: 123ff.).
  (ii) Language-specific differences in (basic) word order are attributed to different settings of the Head Parameter,
  (iii) Restrictions on possible precedence relations are interpreted as restrictions on the well-formedness of syntactic trees (see Partee et al. 1993: 439ff.; this point of view is also taken up in recent work by Kayne 1994, Uriagereka 1998: 196, Fox and Pesetsky 2003, 2005, Müller 2007).

• Syntactic linearization is generally taken to be governed by two basic constraints on possible phrase markers, the Exclusivity Condition, and the Nontangling Condition (Partee et al. 1993: 440):

  (1) The Exclusivity Condition
  In any well-formed constituent structure tree, for any nodes \( x \) and \( y \), \( x \) and \( y \) stand in the precedence relation \( P \), i.e., either \( <x, y> \in P \) or \( <y, x> \in P \), if and only if \( x \) and \( y \) do not stand in the dominance relation \( D \), i.e., neither \( <x, y> \in D \) nor \( <y, x> \in D \).

  (2) The Nontangling Condition
  In any well-formed constituent structure tree, for any nodes \( x \) and \( y \), if \( x \) precedes \( y \), then all nodes dominated by \( x \) precede all nodes dominated by \( y \).

• Exclusivity Condition:
  (i) The linear ordering of terminals must be total, including ordering statements for each terminal node.
  (ii) The relations of dominance and linear order are mutually exclusive, that is, no ordering statements can be given for nodes that stand in a dominance relation.

• Nontangling Condition: A precedence relation between two nodes includes all material dominated by these nodes, ruling out
  (i) structures with crossing branches;
configurations where a given node is immediately dominated by more than a single node.

\( \text{(ii)} \)

\( \text{Kayne (1994): linear order unambiguously reflects syntactic hierarchical structure (asymmetric c-command relations map into precedence relations):} \)

\( \text{(4) Linear Correspondence Axiom (LCA)} \)

Let \( X, Y \) be nonterminals and \( x, y \) terminals such that \( X \) dominates \( x \) and \( Y \) dominates \( y \). Then if \( X \) asymmetrically c-commands \( Y \), \( x \) precedes \( y \).

- The LCA derives a number of generalizations on properties of phrase structure:
  (i) Specifiers precede heads;
  (ii) Alleged impossibility of rightward movement.
- Problems:
  (i) LCA leads to an otherwise unmotivated proliferation of structure and a massive increase of derivational complexity (see e.g. Kremers 2003, Richards 2004).
  (ii) No basic OV-orders, which must be analyzed as the result of leftward movement of objects (and other complements) up to a higher functional projection. The triggers for these processes often remain unclear or have to be stipulated (see Koizumi 1995, Kural 1997).
  (iii) LCA requires that each projection have only a single specifier position, ruling out additional adjunction to \( XP \) (Kayne 1994: 22). Again, this leads to a proliferation of empty functional heads to provide landing sites for movement.

2. Symmetric c-command and a phonological Head Parameter
- Current (minimalist) assumptions:
  (i) Structure-building operation Merge creates a mutual (i.e., symmetric) c-command relation between two syntactic objects \( A \) and \( B \).
  (ii) If \( B \) is a complex category, \( A \) is taken to c-command all nodes dominated by \( B \).
• Still, syntactic hierarchical structures must contain some information that can be put to use by phonological operations to map the output of the syntax into a sequence of words/phonological exponents.

• Epstein et al. (1998), Richards (2004, 2007): Linearization of syntactic structures should exploit the most basic (and most local) structural relation created in the syntax, namely simple (symmetric) c-command:

(5) Revised LCA (Epstein et al. 1998: 151)
If X c-commands Y, then the terminals in X precede the terminals in Y.

• Obvious problem: Conflicting instructions for linearization.
• Epstein et al. (1998: 152): a subset of the relevant symmetric c-command relations are ignored at PF (see also Richards 2004: 24f., 2007: 216):

(6) The Precedence Resolution Principle
If two (not necessarily distinct) categories symmetrically c-command each other by virtue of some syntactic operation O, ignore all c-command relations of one of the categories to the terms of the other with respect to establishing precedence via the LCA.

• Head Parameter works at PF (cf. e.g. Richards 2007: 217):

(7) VP
\[
\begin{array}{c}
\text{c-command relations} \\
\text{[V>DP, DP>V]}
\end{array} \quad \Rightarrow \begin{array}{c}
\text{ignore} \\
\text{PF-order}
\end{array}
\]
\[
\begin{array}{cc}
V & DP \\
\text{DP>V} & V>DP \ (=OV)
\end{array}
\]

• Richards (2004, 2007): For any given pair of elements (e.g., V and O) a consistent subset of c-command relations is deleted/ignored in the mapping to PF throughout the whole derivation:¹

(8) Parametrized LCA (Richards 2004: 25)
Merge(α,β) → {<α,β>, <β,α>}

a. VO = Ignore all O > V [i.e., {<α,β>, <β,α>} → {<α,β>}] 
b. OV = Ignore all V > O [i.e., {<α,β>, <β,α>} → {<β,α>}] 

• Shape conservation effects: movement operations preserve the original order in the base (e.g., Holmberg’s Generalization, Holmberg 1986, 1999):

(9) a. Nemandinn las (bókina) ekki (bókina).
   student-the read book-the not book-the

¹ Note that (8) must be open to parametrization for individual syntactic categories to be able to account for mixed OV/VO languages such as German, which exhibits basic OV with all [+V] categories, but otherwise VO (C, N, D, P etc.).
‘The student didn’t read the book.’

b. Nemandinn hefur (*bókina) ekki leisið (bókina).
   student-the has book-the not read book-the
   ‘The student hasn’t read the book.’

• Anti-HG effects (unpronounced copy marked by strikethrough):

(10) Which book did the student read (which book)?

(11) Der Student liest das Buch (liest).
    the student reads the book
    ‘The student reads the book.’

• Richards (2004, 2007): Parametrized LCA in (8) “must be relativized to the phase”:

(12) a. Shape-preserving movement is phase-internal.
    b. Shape-destroying movement is trans-phasal.

(13) Final landing sites only count for linearization of phase PHn in so far as they
    are contained within the projection of PHn. (Richards 2007: 219)

• C-command relations which have already been transferred to the phonological
  component are no longer accessible for the computation:

   “The logic of our dynamic linearization system is such that the derivational
   information that feeds the linearization algorithm in [(8)] is lost (‘forgotten’) beyond
   the immediate phase level. Once a phasal domain is sent to Spell-Out, there is no
   memory of the c-command relations and ordering partners (merge-sisters) created within
   that phase.” (Richards 2007: 218)

• Further assumptions (Richards 2004/2007):

   (i) Elements carrying uninterpretable (activating) features are invisible for the
       purposes of linearization.

   (ii) PIC in the version of Chomsky (2001, Derivation by phase): complement of a
       phase head is transferred upon Merge of the next higher phase head.

   (iii) C-command relations relevant for linearizing a spell-out domain (e.g., VP) may
       include material which is not part of that spell-out domain (e.g., V moved to T
       to ensure Shape preservation effects with OS).

   (iv) Linearization as a purely interpretative operation: “Ungrammatical” orders do
       not violate any constraints; rather they simply cannot be created by the
       workings of the PF component (e.g., if an object cannot be linearized in its

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2 Accordingly, “all” in (8) is confined to c-command relations within a single phase.
(preverbal) shifted position, it must be linearized in its “trace” position, giving rise to VO order).

(v) OS targets a vP-internal position (SpecvP).

- **Problems/Open questions:**
  
  (i) **Empirical issues (shape conservation/object shift):** (a) object shift must be assumed to target a position in the vP-phase (SpecvP), despite empirical counterevidence (shifted objects occur to the left of adverbs/negation); (b) Unclear: How to derive HG effects with elements other than verbs (particles, low adverbs, other complements etc.);

  (ii) **Conceptual issues (shape conservation/object shift):** (a) Unclear: Rationale for deciding which C-command relations are members of the set L (relevant for linearization). Richards (2007: 225): V moved to T is part of L, since

  “[t]he latter movement precedes transfer of the vP-phase, by the assumed version of the PIC (Chomsky [2001]), and its tail is again VP-internal;”.

  In contrast – discussing non-HG effects with passivization (p. 223) –,

  “[t]he set L passed to PF for linearization of VP at this point does not include the c-command relation created by the final movement of the object to spec-T, since no part of this c-command relation is contained inside VP (the vP phasal domain).”

  • **Problem:** Distinction between object movement to SpecTP and V movement to T unclear; both movement operations pass through the vP (spec and head, respectively), so they should behave similarly with respect to membership in L (compare (12)).

  (iii) **Condition on PF-visibility of intermediate ‘traces’ (uninterpretable features):**

  Interplay/timing between the operation Agree (which values and eliminates uninterpretable features) and Move/external Merge (which is triggered by EPP or edge features)? (further related problems are raised by the phenomenon of wh-in-situ, it seems)

2.1 The status of specifiers

(14) **Generalization: The position of specifiers**

Across languages, specifiers uniformly precede the head of a projection.

• (14) follows directly from Kayne’s (1994) LCA based on asymmetric c-command: The specifier asymmetrically c-commands and precedes all material dominated by
its sister node (Kayne analyzes \(X'\)-categories as segments of an adjunction structure which may not enter into c-command relations):

(15) \[
\begin{array}{c}
\text{XP} \\
\downarrow \\
\text{YP} \quad \text{X'} \\
\end{array}
\]

- **Problem**: Under the assumption that linear orderings are determined by symmetric c-command relations, the special status of specifiers with respect to precedence cannot be derived in a straightforward manner (this problem is left open in Richards 2004, 2007; Epstein et al. 1998 consider a couple of solutions, which will be discussed shortly).
- **Illustration**: movement to a specifier position:

(16) \[
\begin{array}{c}
c\text{-command relations} \\
(A>B, B>A) \\
\end{array}
\]

- Mutual c-command relation between the moved category \(A\) and the node \(B\) with which it is merged give rise to contradictory precedence relations, which must be repaired/resolved at PF:
  
(i) **Appealing to some form of the Head Parameter**: misses a generalization, namely that in fact only one of the options is attested.
  
(ii) **Possible stipulations**: (a) Specifiers must precede everything else (lacks explanatory force); (b) \(X'\)-categories may not take part in c-command relations (basically restates Kayne’s approach & ignores the fact that under a derivational approach to structural relations such as c-command, there appears to be no difference between derivational sisterhood accomplished by internal vs. external Merge).
  
(iii) Epstein et al. (1998: 153): Movement must lead to new ordering relations (i.e., ‘have an effect on the output’, see also Chomsky 2001).
- **Illustration**: shape-destroying *wh*-movement in English:

(17) Which book did the student read (**which book**)?
• What must be ruled out is an alternative ordering where the material dominated by C’ precedes *which book* (linearizing the c-command relation C’ > *which book*)?

(18) *did the student read *which book* which book?

• Epstein et al. (p. 153): requirement that movement have an effect on the (PF) output is not satisfied in (18) (string vacuous movement).

• Problem: Embedded interrogatives in OV-languages like German, where the wrong ordering of C’ and the *wh*-phrase has an effect on the output:

(19) Ich weiß nicht *[CP wen [C C [TP Peter (wen) gesehen hat]]].
I know not who.ACC Peter who.ACC seen has
‘I don’t know who Peter saw.’

(20) *Ich weiß nicht *[CP C C [TP Peter (wen) gesehen hat]] wen].

3. Linear order in a realizational model of grammar

(21)

lexicon (morphosyntactic/semantic features)

\[\downarrow\]

syntactic derivation (merge, move, copy)

\[\downarrow\]

spell-out

morph. operations \[\Rightarrow\] ms

vocabulary insertion \[\Rightarrow\] pf

\[\downarrow\]

sensorimotor system (sm)

conceptual-intentional system (c-i)

\[\uparrow\]

encyclopedia (non-linguistic knowledge)

(i) **Late insertion**: Morphology operates post-syntactically; abstract feature bundles assembled in the syntactic derivation are realized via the insertion of phonological material in a process called Vocabulary Insertion (Distributed

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*Moreover, clause-final positioning of *wh*-phrases (due to rightward movement) is an option that is apparently not attested cross-linguistically (cf. e.g. Uriagereka 1998: 215). However, note that Neidle et al. (1997) claim that American Sign Languages exhibits rightward movement of *wh*-phrases (but see Pretonio and Lillo-Martin (1997) for an alternative analysis in terms of leftward *wh*-movement). See also Bokamba (1976) for the claim that rightward *wh*-movement can be observed in a couple of Bantu languages.*
Morphology; Halle & Marantz 1993). Individual Vocabulary Items stored in the lexicon link phonological features with morphosyntactic specifications:

\[ \text{[3sg, pres., indic., act.]} \leftrightarrow /-z/ \]

(ii) **Vocabulary Insertion**: subject to the Subset Principle (Halle 1997: 428) –
(a) the feature specification of the phonological component must be compatible with the insertion context;
(b) the existence of a more specified exponent (compatible with the insertion context) blocks the use of less specified exponents (“blocking”).

- **Illustration**: 3sg.pres.indic.act. /-z/ in English – availability of a more specific form or rule blocks the use of a less specific form or rule:

\[ \text{he/she/it run-s vs. *he/she/it run-Ø} \]

- Assignment of precedence relations is another function of the operation of Vocabulary Insertion (Embick and Noyer 2001: 562):

\[ \text{(24) The Late Linearization Hypothesis} \]

The elements of a phrase-marker are linearized at Vocabulary Insertion.

- **Syntactic derivation**
  
  \[ \text{PF/LF branching} \]
  
  \[ \text{Lowering/Morphological Merger, Fission, Fusion, Impoverishment} \]
  
  \[ \text{Hierarchical arrangement of morphemes} \]
  
  \[ \text{Vocabulary Insertion} \]
  
  \[ \text{Linearization imposed by Vocabulary Insertion} \]
  
  \[ \text{Local Dislocation} \]
  
  Building of prosodic domains
  
  \[ \text{(Prosodic Inversion)} \]

**PHONOLOGICAL FORM**

- Linearization of hierarchical syntactic structures is taken to be a late process at the PF branch of grammar (applying after other operations such as Morphological
Merger, Fission etc.) which converts the output of the syntactic computation into a linear representation that can be read off at the serial interface to the sensorimotor (SM) systems.

- The fact that the hierarchical structure generated in the syntax may be modified by operations of the PF-branch implies that linear order is not fully determined by the syntactic structure, contra Kayne (1994).

4. Cyclic linearization and Vocabulary Insertion

- **Assumptions:**

  (i) Vocabulary Insertion converts hierarchical structures into linear strings of exponents \( \Rightarrow \) the linearization process (henceforth LIN) is part of the workings of Vocabulary Insertion and may access the hierarchical information made available by the syntax.

  (ii) **Linear order is built up incrementally via successive applications of Vocabulary Insertion:** Upon insertion of a phonological exponent \( /a/ \), LIN determines the position of \( /a/ \) relative to the linear string that has been established by previous applications of Vocabulary Insertion.

  (iii) The realization of word order (i.e., of exponents that constitute phonological words) proceeds along the same lines as the linearization of word-internal structure.\(^4\)

- Similar to the realization of affix sequences and the prefix/suffix distinction, word order is determined by a combination of

  (i) lexical properties of certain Vocabulary items, and

  (ii) properties of hierarchical structures generated by the syntactic component.

4.1 LIN and X\(^0\)-structures

- Linearization of head adjunction structures:

\[^4\] DM does not recognize a theoretically significant distinction between morphosyntactic features which are realized as (i) bound or (ii) free formatives, that is, words (“syntactic hierarchical structure all the way down”). Cf. Harley and Noyer (1999: 7): “Features which will eventually be realized as a subpart of a phonological word are treated no differently from features which will eventually be realized as an autonomous word.”
• **Mirror Principle (Baker 1985, 1988):** The morphological derivation must mirror the syntactic derivation.

• **Linearization of (26):** Phonological exponents of lower functional heads must be closer to the verb stem than phonological exponents of higher functional heads.\(^5\)

• **Fuß 2005:** Effects of the Mirror Principle can be derived if Vocabulary Insertion is taken to proceed in a bottom-up fashion (as widely assumed in Distributed Morphology; see Legate 1999 and Phillips 1996, 2003 for top-down insertion).

• ‘root-out insertion’: Vocabulary Insertion affects the verbal or nominal root before it affects functional heads the root adjoins to.

• **Sequence of insertion processes realizing (26):** Vocabulary Insertion targets

  (i) the category-neutral root (\(\sqrt{\cdot}\)).

  (ii) the closest functional head (\(v\)), creating a verb stem.

  (iii) the next closest head (Asp).

  (iv) T.

• Each application of Vocabulary Insertion enlarges the existing string of exponents by adding another element either to the right (\(\Rightarrow\)suffixation) or to the left (\(\Rightarrow\)prefixation).

• Illustration for a uniformly suffixing language (phonological exponents are referred to as \(\phi\) and set in slashes):

\[\text{(27) a. } \quad \text{b. } \]

\[\text{Asp} \quad \text{Asp} \]

\[\sqrt{\cdot} \quad \sqrt{\cdot} \]

\[\text{Vocabulary Insertion to } \sqrt{\cdot} \quad /\phi/ \]

\[v \quad v \]

\[\text{prefixation} \quad \text{suffixation} \]

\[n \quad n \]

\[\text{Asp} \quad \text{Asp} \]

\[\sqrt{\cdot} \quad \sqrt{\cdot} \]

\[v \quad v \]

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\(^5\) Note that these effects can only be detected if the relevant inflectional markers are located on the same side of the verb stem and if their order is not affected by other processes that take place at MS.
(28) a. \( T \)
   \( \text{Vocabulary Insertion to } v \)
   \( v \)
   \( /ϕv/ \)

b. \( T \)
   \( \text{Vocabulary Insertion to } v \)
   \( v \)
   \( /ϕv/ \)
   \( /ϕv/ \)

(29) a. \( T \)
   \( \text{Vocabulary Insertion to Asp} \)
   \( \text{Asp} \)
   \( /ϕ_{\text{Asp}}/ \)

b. \( T \)
   \( \text{Vocabulary Insertion to Asp} \)
   \( \text{Asp} \)
   \( /ϕ_{\text{Asp}}/ \)
   \( /ϕ_{\text{Asp}}/ \)

(30) a. \( T \)
   \( \text{Vocabulary Insertion to } T \)
   \( T \)
   \( /ϕ_{\text{Asp}}/ \)

b. \( T \)
   \( \text{Vocabulary Insertion to } T \)
   \( T \)
   \( /ϕ_{\text{Asp}}/ \)
   \( /ϕT/ \)

**Result:** Exponent of Asp cannot intervene between exponents of \( \sqrt{ } \) and \( v \); likewise, an exponent of \( T \) can only occupy the outermost position in the string of inflectional markers.

**Thus,** (26) may give rise to the sequences in (31), but excludes those in (32) ("\( V \)" = combination of root and category-defining \( v \)).

(31) a. \( V+\text{Asp}+T \) (uniformly suffixing)
   b. \( T+\text{Asp}+V \) (uniformly prefixing)
   c. \( T+V+\text{Asp} \) (T prefix, Asp suffix)
   d. \( \text{Asp}+V+T \) (T suffix, Asp prefix)

(32) a. \( ^*V+T+\text{Asp} \)
   b. \( ^*\text{Asp}+T+V \)

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* The sequences in (31c-d) represent possible but typologically marked options which are not very frequent across the world's languages. This can be attributed to the assumption that there is normally a default orientation for inflectional affixes in a given grammar, that is, languages prefer to be uniformly prefixing or suffixing (cf. e.g. Bybee et al. 1990, Hale 1996). Alternatively, it is conceivable that affixes select not only the direction where their host must appear, but also its category. Then, the marked sequences (31c-d) might follow from the fact that cross-linguistically, T preferably attaches to Asp.
As illustrated in (27) to (30), successive applications of Vocabulary Insertion serve to ‘flatten’ the hierarchical structure created in the syntax, producing a linear string of phonological exponents.

**Prefix/suffix distinction:** linked to lexical properties of individual Vocabulary items: Prefixes select a host to their right; suffixes require a host to their left.⁷

**Prefix/suffix distinction in terms of a phonological head parameter:** Dependent on lexical properties of individual Vocabulary items, LIN ignores one c-command relation for each sister pair in a head adjunction structure such as (26).⁸

**Illustration:** Vocabulary item realizing a suffixal past tense T head in English (with “β” presumably corresponding to v if no other functional heads intervene):³⁹¹⁰

\[
\begin{align*}
&[\text{T PAST}] \leftrightarrow /d/ \\
&\{<T, \beta>, <\beta, T>\} \rightarrow \{<\beta, T>\}
\end{align*}
\]

### 4.2 LIN and XP-structures

**Observation:** Linearization of phrasal structures is more restricted (specifiers are always to the left, parametric variation is confined to the ordering relation between the head and its complement):

\[
\begin{align*}
\text{HP} & \\
\text{spec} & \xrightarrow{H'} \\
H & \xrightarrow{XP}
\end{align*}
\]

Note that it is always the projecting head that determines affix order. **Tentative assumption:** Parametric variation is determined by lexical properties of a (closed) class of (exponents of) functional categories. As a result, lexical entries for category-neutral roots are not specified for settings of the Head Parameter. (Ouhalla 1991) and Chomsky 1991, 1995).

**Background assumption:** In a head adjunction structure, the adjoined element and the target of adjunction (i.e., the lower segment) symmetrically c-command each other, contra Kayne (1994).

**Problem:** It is not very attractive to assume that the relevant linearization instructions are stored separately for each possible phonological exponent of T. In most languages, different realizations of a particular inflectional category (such as present vs. past tense forms of T) do not behave differently with respect to their ordering relative to other inflectional formatives. This may be attributed to a default setting of the Head Parameter (possibly in the form of a redundancy rule). Furthermore, the existence of exceptions to the rule (e.g., the small number of postpositions in German) suggests that individual Vocabulary items may be endowed with a fixed lexical value for the Head Parameter which may override the default value (cf. Hale 1996: 120f. for some discussion).

Furthermore, note that the exponent ϕ that is inserted at the top of a head-adjunction structure has to fulfill a double role with respect to LIN. Its lexical properties determine the order of ϕ relative to (i) the exponents of other heads of the head complex, and (ii) the exponent(s) realizing the XP-complement of the relevant head. Thus, the Vocabulary item realizing T in (30) must also contain a linearization instruction that determines the linear order of T and (the exponents of) vP. In the case of English T, this can be stated as follows:

\[
\begin{align*}
&[\text{PAST}] \leftrightarrow /d/ \\
&\{<T, v>, <v, T>\} \rightarrow \{<v, T>\} \\
&\{<T, vP>, <vP, T>\} \rightarrow \{<T, vP>\}
\end{align*}
\]
13

(35)  a. spec > H > XP
     b. spec > XP > H

- **Claim:** differences between affix order and word order should be attributed to independent (structural) asymmetries between head-adjunction structures and phrasal structures.

- **Idea:** Existence of an additional projection level that contains the specifier represents a complication which does not exist for the computation of affix order in head adjunction structures.

- **Recall:** Linearization instructions (i.e., the phonological Head Parameter) are determined by lexical properties of individual Vocabulary items upon application of Vocabulary Insertion.

- **Note:** In many cases, specifiers are not heads (and therefore not directly subject to Vocabulary Insertion), and therefore may not determine linear order.

- **Even more important:** The sister category of a specifier (traditional referred to as an X’-category) is never subject to Vocabulary Insertion, since it is no terminal node.

- **Question:** How can LIN determine an ordering relation between two categories that are no terminal elements (and therefore invisible for Vocabulary Insertion and linearization)?

- **Assumption:** Insertion of phonological exponents targeting specifiers proceeds in parallel with Vocabulary Insertion operating on the main path of embedding, similar to principles governing the constructions of metrical grids (cf. Cinque 1993: 269f.):

(36)  a. \[ \text{HP} \]
     \[ \text{DP} \quad \text{H’} \]
     \[ \text{D} \quad \text{N} \quad \text{H} \quad \text{DP} \]

  b. \[ \text{HP} \]
     \[ /\text{φD} \text{φN}/ \quad \text{H’} \]
     \[ /\text{φN}/ \quad /\text{φD} \text{φN}/ \quad \text{H} \]
     \[ \text{DP} \quad \text{D} \quad \text{N} \]

- **Significant asymmetry between** (36b) **and the result of Vocabulary Insertion to a head adjunction structure:**

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Note that the decisive difference between head complexes and phrasal units depends on the way Vocabulary Insertion removes the hierarchical structure created in the syntax. Thus, I assume that inserting an exponent into a head adjunction structure serves to eliminate the relevant syntactic nodes, including a upper segment of an adjunction structure (e.g. Asp in (37) prior to insertion to T). In contrast, inserting material to H and its complement leaves H’ intact up to the point when the linear position of the specifier is determined. This asymmetry can perhaps be attributed to the fact
(37) a. $T$

$/$\phi\rangle $\phi_v \phi_{\lambda T}$/ $T$

Vocabulary Insertion to $T$

b. $T$

$/$\phi\rangle $\phi_v \phi_{\lambda T}$/

$/$\phi$/

- (37): At the point where Vocabulary Insertion applies to $T$, the insertion site and the existing string of phonological exponents are sisters $\Rightarrow$ symmetric c-command between between the relevant elements; we thus expect the possibility of parametrization.

- (36): The two sets of phonological exponents are not sisters, due to the intervening intermediate $H'$ category.

- Result: Material in the specifier position asymmetrically c-commands all other elements inserted so far.

- If c-command relations are taken to map into precedence relations, we may suppose that configurations such as (36b) are uniformly converted into a linear ordering where exponents inserted under the specifier precede all other elements inserted up to this point.

- In sum: In a situation where linear order cannot be determined by lexical properties of individual Vocabulary Items, the relevant ordering information is provided by the structure in terms of asymmetric c-command relations.

- This also serves to determine the relative order of elements in multiple specifier configurations:

(38) 

$/$\phi$/

$/$\phi$/

$/$\phi$/

that in the case of head adjunction, the upper segment is treated as being basically identical to the insertion site. In other words, the upper segment has no life on its own for the purposes of the post-syntactic computation. Note that this is required on independent grounds to ensure that the settings of the Head Parameter that determine the linear order of a head and its XP-complement are visible at the top of a head complex (e.g., $<T, vP>$ in (37)). In contrast, $X'$-nodes are syntactic terms on their own (cf. Chomsky 1995: 247), which are left unaffected by Vocabulary Insertion targeting nodes included in $X'$.
4.2.1 Linearization of XP-Adjunction structures: some speculations

(39) \[\begin{array}{c}
\text{HP} \\
\text{XP} \\
\text{YP} \\
\text{H'} \\
\text{H} \\
\text{ZP}
\end{array}\]

- Idea: Similar to head adjunction structures, the position of the adjunct relative to the adjunction site is underdetermined by the structure (BUT: adjunct is commonly assumed to c-command the content of HP...).
- As a result, the adjunct may be realized to the right or to the left of the phrase that it is adjoined to (language-specific choice).
- A possibility: linearization of adjuncts is dependent on the setting of the phonological head parameter for the head of the adjunction site.
- English: low event-related adverbs (temporal, spatial and manner adverbs) appear to the right of the VP in clause-final position;
- German: low event-related adverbs (temporal, spatial and manner adverbs) appear to the left of the VP in clause-medial position:

(40) a. dass Peter gestern im Büro sorgfältig gearbeitet hat
    b. that Peter worked carefully in the office yesterday

(41) a. Temporaladverbien – Lokaladverbien – Modaladverbien – V \hspace{1cm} (OV)
    b. V – Modaladverbien – Lokaladverbien – Temporaladverbien \hspace{1cm} (VO)

- Relative clauses in German and English: NP is head-initial, adjoined relative clauses appear to the right of N/NP.
- Relative clauses in German: always in extraposed position (in every kind of phrase):

(42) a. weil Otto gestern [den Mann [den Maria liebt]] getroffen hat
    b. weil Otto gestern [den Mann t] getroffen hat [den Maria liebt];

(43) a. *[Den Maria liebt]; hat Otto gestern [den Mann t] getroffen.
    c. *Otto hat [den Mann t] gestern [den Maria liebt]; getroffen.
    d. *[Den Mann t] hat Otto gestern [den Maria liebt]; getroffen.
(44) [VP [Hunde t i füttern [die Hunger haben];]] kann jeder.
    (Haider 1993: 175)

(45) a. Der Wissenschaftler war [AP [NP der Frau, die seine Kinder geboren hat,] treu].
   b. Der Wissenschaftler war [AP [NP der Frau treu], die seine Kinder geboren hat].
   c. [AP [NP Der Frau t i treu], [die seine Kinder geboren hat]] war der Wissenschaftler ein Leben lang.

(46) a. Ins Tal führt eine Straße [PP an dem Fluss [der den Stausee speist] entlang].
   b. Ins Tal führt eine Straße [PP an dem Fluss t i entlang] [der den Stausee speist]].
   c. [PP An dem Fluss t i entlang] [der den Stausee speist]] führt eine Straße ins Tal.

• Further examples:

(47) a. [PP Der Kinder t i wegen] [die Peter mit Maria zeugte]] arbeitet er jetzt nur noch halbtags.
   b. [PP Den Kindern t i zuliebe] [die Peter mit Maria zeugte]] arbeitet er jetzt nur noch halbtags.
   c. [PP Der Umstände t i halber] [die zu seiner Entlassung führten]] will Peter vor Gericht gehen.

(48) a. [AP [PP Auf den Sohn t i stolz], [der den Nobelpreis gewann]]] war der Wissenschaftler ein Leben lang.
   b. [AP [NP Das Geld t i wert], [das Peter für die alte Kiste ausgab]]] war sie nie und nimmer.
   c. [AP [PP Des Geldes t i überdrüssig], [das er in der Lotterie gewonnen hatte]]] wurde der Wissenschaftler schon bald.

• NPs:

(49) a. der Bezwinger des Matterhorns, [der nun für Toblerone wirbt]
       b.*der Bezwinger [der nun für Toblerone wirbt] des Matterhorns

(50) a. der Mann mit dem Gipsbein, [der nun für Toblerone wirbt]
       b.*der Mann [der nun für Toblerone wirbt] mit dem Gipsbein

• Alternative strategy for linearizing XP-adjunction structures: XP-adjuncts are inserted at the end of a derivational cycle (a phase) in the syntax (Nissenbaum 2000, Chomsky 2004).
• As a result, they can only appear at the edge of phases, either at the left edge, or at the right edge (dependent on a language-specific choice).
• German: relative clauses occupy the right edge of every phase/phrase they adjoin to.
• Heck & Müller 2000, Müller 2007: phase = phrase?