Deriving Locality Constraints in the Minimalist Program: The State of the Art

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(1) Sentential Subject Constraint (Ross (1967)):
No element dominated by a CP may be moved out of that CP if that CP is a subject.

(2) A consequence of the Sentential Subject Constraint:

a. $[_{\mathrm{DP}_1}$ Who] did the reporters expect $[_{\mathrm{CP}}$ that the principal would fire t_1] ?
b. *$[_{\mathrm{DP}_1}$ Who] was $[_{\mathrm{CP}}$ that the principal would fire t_1] expected by the reporters ?
c. *$[_{\mathrm{DP}_1}$ Who] did $[_{\mathrm{CP}}$ that Mary was going out with t_1] bother you ?

(3) Sentential Subject Constraint (representational version):
*... α_1 ... $[_{\mathrm{CP}}$ ... t_1 ...] ... if CP is a subject.

Note:
The Sentential Subject Constraint can be generalized: DP subjects are also islands, even if they do not qualify as complex in the sense of the Complex NP Constraint.

(4) Subject Condition (Chomsky (1973), Huang (1982), Chomsky (1986), Freidin (1992)):
No element may be moved out of a subject.

(5) Subject Condition:
a. *[$_{\mathrm{DP}_2}$ Who(m)] has [$_{\mathrm{DP}_1}$ a comment about t_2] annoyed you ?
b. *[$_{\mathrm{PP}_3}$ About whom] has [$_{\mathrm{DP}_1}$ a comment t_3] annoyed you ?

(6) Subject Condition (representational version):
*... α_1 ... [$_\beta$ ... t_1 ...] ... if β is a subject.

Observation:
Items which do not enter the derivation via selectional Merge (modifiers, so-called adjuncts) are always islands. This can be formulated in a preliminary way as the Adjunct Condition:

(7) Adjunct Condition:
Movement must not take place from an XP that has been merged without a deletion of selectional features.

The Adjunct Condition straightforwardly excludes Complex NP Constraint constructions in which a relative clause is crossed by movement. Furthermore:

(8) A consequence of the Adjunct Condition:

a. [$_{\mathrm{DP}_1}$ Who] did you get jealous [$_{\mathrm{CP}}$ because I talked to t_1] ?
b. [$_{\mathrm{PP}_1}$ To whom] did they leave [$_{\mathrm{CP}}$ before speaking t_1] ?
c. [$_{\mathrm{DP}_1}$ Who] did they leave [$_{\mathrm{CP}}$ before speaking to t_1] ?

Observation:

The Subject Condition and the Adjunct Condition can be unified as the Condition on Extraction Domain (CED). The basic insight was arguably first formulated by Cattell (1976). The notion CED is due to Huang (1982).

(9) Condition on Extraction Domain (CED, Huang's original version):
A phrase A may be extracted out of a domain B only if B is properly governed.

Kayne (1984) employs a similar concept. Chomsky (1986) is the most comprehensive and careful study in this area; it centers around the notion of barrier. Cinque (1990) and Manzini (1992) have useful simplifications and modifications. The following definition freely draws on all the concepts developed in these approaches.

(10) Condition on Extraction Domain (CED):

a. Movement must not cross a barrier.
b. An XP is a barrier iff it is not a complement.

Note:
Conceptually, this is a step in the right direction because we move from an intrinsic definition to a contextual definition of locality domains: Whether some XP is a bounding node or not (in the sense of the Subjacency Condition) is simply listed; whether some XP is a barrier or not can be determined by looking at the syntactic context in which it occurs.

Consequence:
A barriers-based approach to locality in terms of the Condition on Extraction Domain can account for Subject Condition and Adjunct Condition effects. It also derives the relative clause case of the Complex NP Constraint. If argument clauses selected by N are in fact not merged in complement position (as suggested by Stowell (1981), Kiss (1986), among others), Complex NP Constraint phenomena can be explained in toto. A further constraint that can (hopefully, see below) be dispensed with if the Condition on Extraction Domain is adopted is the Freezing Principle. The reason is that movement can never end in a complement position.

(11) Freezing Principle (based on Ross (1967), Wexler & Culicover (1980)):
Movement cannot take place from a moved XP.

Note:
Given that subject DPs are DPs that have been moved to SpecT, their opacity follows from both the Subject Condition and the Freezing Principle.

(12) Consequences of the Freezing Principle:

a. *Who$_1$ do you think [$_{CP}$ t$'_1$ that [$_{DP_2}$ pictures of t$_1$] were painted t$_2$] ?
b. *Who$_1$ do you think [$_{CP}$ t$'_1$ that [$_{DP_2}$ pictures of t$_1$] John would like t$_2$] ?
c. *Who$_1$ do you think [$_{CP}$ [$_{PP_2}$ to t$_1$] he will talk t$_2$] ?
d. *Who$_1$ don't you know [$_{CP}$ [$_{DP_2}$ which picture of t$_1$] Mary bought t$_2$] ?
e. *[$_{PP_1}$ Über Fritz]$_1$ glaube ich [$_{CP}$ [$_{DP_2}$ ein Buch t$_1$] hat Maria t$_2$ geschrieben]
about Fritz believe I a book has Maria written

(13) Relativized Minimality (original version, Rizzi (1990)):

a. (Certain) chain links require antecedent-government.

b. X antecedent-governs Y only if there is no Z such that (i) and (ii) hold.

   (i) Z is a typical potential antecedent-governor for Y.

   (ii) Z c-commands Y and does not c-command X.

(14) Typical Potential Antecedent Governor:

a. Z is a typical potential antecedent governor for Y, Y in an A-chain = Z is an A specifier c-commanding Y.

b. Z is a typical potential antecedent governor for Y, Y in an A′-chain = Z is an A′ specifier c-commanding Y.

c. Z is a typical potential antecedent governor for Y, Y in an X^0-chain = Z is a head c-commanding Y.

(15) Relativized Minimality (updated version, Rizzi (2001)):
 a. Chain links require a Minimal Configuration (MC).
 b. Y is in a Minimal Configuration (MC) with X iff there is no Z such that (i) and (ii) hold.
  (i) Z is of the same structural type as X.
  (ii) Z intervenes between X and Y.

(16) Consequences of Relativized Minimality for A-movement:
 *John$_1$ seems that it is likely [$_{\rm TP}$ t$_1$ to win]

(17) Consequences of Relativized Minimality for A′-movement:
 a. *Combien$_1$ a-t-il beaucoup consulté [t$_1$ de livres] ?
 how many did he a lot consult of books
 b. *How$_1$ do you wonder [$_{\rm CP}$ who$_2$ could solve this problem t$_1$] ?

(18) Consequences of Relativized Minimality for head movement:
 a. Could$_1$ they t$_1$ have left ?
 b. *Have$_2$ they could t$_2$ left ?

Note:
Relativized Minimality thus derives effects of the Head Movement Constraint (Travis (1984)).

(19) General assumptions:

a. Constraints are general.
This excludes construction-specific constraints like the Complex NP Constraint, the Sentential Subject Constraint, the Subject Condition, the Wh-Island Condition, the Post-Sentential Subject Extraction Constraint, and the Adjunct Condition.

b. Constraints are not complex.
This excludes global constraints (like the Projection Principle (Chomsky (1981)) and translocal constraints (like Avoid Pronoun (Chomsky (1981)). It also excludes and transderivational constraints like the Fewest Steps Condition (Chomsky (1991), Epstein (1992), Collins (1994), Kitahara (1997)), the Shortest Paths Condition (Chomsky (1993), Chomsky (1995), Collins (1994), Nakamura (1998)), and Merge before Move (Chomsky (2000, 2001)).

c. Constraints are compatible with the minimalist requirements in (20).

(20) Minimalist requirements (Chomsky (2005b): 'Strong Minimalist Thesis' (SMT)):

a. Constraints are of type (i) or (ii).
   (i) principles of efficient computation (local economy constraints)
   (ii) interface conditions (constraints imposed by phonological and semantic interfaces)

b. Constraints do not rely on concepts that lack independent motivation (like, e.g., L-marking, (proper) government, barrier, and so forth).

The situation now:

Currently, there are two local constraints that are widely adopted: the Condition on the Extraction Domain on the one hand, and the (Generalized) Minimal Link Condition (i.e., the combined F-over-F Principle/Superiority Condition) on the other. However, whereas the latter constraint may perhaps be viewed as a principle of efficient computation, the former cannot straightforwardly be construed in such a way. Therefore, attempts have bewen made to derive it in some way.

The problem with most of the constraints discussed so far is the lack of generality; these constraints often look construction-specific. Should syntactic constraints be permitted to mention specific categorial features, or specific selectional features? Ideally, the answer is no. Still, some of the constraints are not subject to this critique. Most notably, this holds for the the A-over-A principle (in particular, its F-over-F version) and for the Superiority Condition (Minimal Link Condition). It therefore does not come as a surprise that the combination of these two conditions is widely considered valid nowadays. The combined constraint can be referred to as the Generalized Minimal Link Condition.

(21) F-over-F Principle:
In a structure $\alpha_{[\bullet F \bullet]}$... [$_{\beta_{[F]}}$ ... [$_{\gamma_{[F]}}$ ...] ...] ..., movement to [•F•] can only affect the category bearing the [$_{\mathrm{F}}$] feature that is closer to [•F•].

Empirical evidence for the F-over-F Principle:
This constraint blocks certain illicit instances of remnant movement in languages like German and Japanese (Takano (1994), Koizumi (1995), Kitahara (1997), Müller (1998)).

(22)

a. $[_\alpha$ t_1 Zu lesen $]_3$ hat $[_{NP}$ das Buch $]_1$ keiner t_3 versucht
to read has the book no-one tried

b. $[_\alpha$ t_1 t_2 Zu reparieren $]_3$ hat der Frank dem Matthias$_1$ den Drucker$_2$ t_3 versprochen
to fix has ART Frank ART Matthias$_{dat}$ the printer$_{acc}$ promised

(23)

a. *dass $[_\alpha$ t_1 zu lesen $]_3$ $[_{NP}$ das Buch $]_1$ keiner t_3 versucht hat
that to read the book$_{acc}$ no-one tried has

b. *dass der Frank $[_\alpha$ t_1 t_2 zu reparieren $]_3$ dem Matthias$_1$ den Drucker$_2$ t_3 versprochen hat
that ART Frank to fix ART Matthias$_{dat}$ the printer$_{acc}$ promised has

(24)

a. [$_{CP}$ Mary-ga [$_{NP}$ sono hon-o]$_1$ yonda-to]$_2$ Bill-ga [$_{CP}$ John-ga t_2
   Mary$_{nom}$ that book$_{acc}$ read-COMP Bill$_{nom}$ John$_{nom}$
   itta-to] omotteiru (koto)
   said-COMP think fact

b. *[$_{CP}$ Mary-ga t_1 yonda-to]$_2$ [$_{NP}$ sono hon-o]$_1$ John-ga t_2 itta (koto)
   Mary$_{nom}$ read-COMP that book$_{acc}$ John$_{nom}$ said fact

(25)

a. *[$_{NP}$ Which book about t_1]$_2$ don't you know [$_{CP}$ who$_1$ to read t_2] ?
b. *[$_{NP}$ Which picture of t_1]$_2$ do you wonder [$_{CP}$ who$_1$ she likes t_2] ?

In (23), (24), and (25), there is a stage of the derivation where a movement-inducing feature (like [•Σ•] for scrambling, and [•wh•] for wh-movement) on a target head could in principle attract either the more inclusive category or another category dominated by the latter (both bearing, by assumption, a matching feature [Σ] or [wh]). The F-over-F Principle then demands movement of the higher category first, and subsequent will invariably be excluded by whatever derives the c-command constraint on movement (because it involves lowering), plus the CED.

(26) Superiority Condition/Minimal Link Condition:
In a structure $\alpha_{[\bullet F \bullet]}$... [... $\beta_{[F]}$ ... [... $\gamma_{[F]}$ ...] ...] ..., movement to [•F•] can only affect the category bearing the [F] feature that is closer to [•F•].

(27) Generalized Minimal Link Condition (Takano (1994), Kitahara (1997), Müller (1998), Fitzpatrick (2002), Rackowski & Richards (2005)):
In a structure $\alpha_{[\bullet F \bullet]}$... [... $\beta_{[F]}$ ... $\gamma_{[F]}$ ...] ..., movement to [•F•] can only affect the category bearing the [F] feature that is closer to [•F•] (where β is closer to α than γ if β dominates or c-commands γ).

Note:

The constraints discussed here are all local (derivational or representational). Is it possible to reformulate constraints like, e.g, the F-over-F Principle and the Superiority Condition as, e.g., transderivational constraints? Indeed, there is a straightforward reformulation, even though it is not fully equivalent.

(28) Shortest Paths Condition (Chomsky (1993)):
Minimize the length of movement paths.
(Given the set of derivations RS that are based on the same LA, choose the derivation in RS in which movement paths have minimal length.)

(29) Movment path (informal):
A movement path is the set of nodes that are crossed by movement operation. A movement path α is shorter than a movement path β if α has fewer nodes than β.

However:

If transderivational constraints are to be dispensed with (if possible), (28) is not a viable alternative to (27).

(30) Condition on Extraction Domain (CED):
  a. Movement must not cross a barrier.
  b. An XP is a barrier iff it is not a complement.

Properties of the CED:

- The CED is a general constraint.
- The CED is a local constraint.
- The CED does not seem to qualify as a principle of efficient computation.
- The CED does not seem to be an interface condition.
- The CED relies on concepts that lack independent motivation (barrier).

Consequence:
Attempts have been made to derive the CED (or CED effects) in a way that respects all meta-requirements for constraints.

Three kinds of analyses:

- CED effects are derived by invoking assumptions about elementary operations like Merge and Agree.
  → Sabel (2002), Rackowski & Richards (2005)
- CED effects are derived by invoking assumptions about cyclic spell-out.
  → Uriagereka (1999), Nunes & Uriagereka (2000), Nunes (2004)
- CED effects are derived as freezing effects.
  → Kitahara (1994), Takahashi (1994), Boeckx (2003), Rizzi (2006, 2007), Gallego & Uriagereka (2006), Stepanov (2007)

Observations:

1. The first kind of analysis relies on special assumptions that mimic assumptions in Chomsky's (1986) theory of barriers.
2. The second kind of analysis is incompatible with the assumption that only the complement of a phase head is affected by spell-out (whereas the specifier domain and the head itself remain available for further operations on subsequent cycles).
3. The third kind of analysis is incompatible with the existence of CED effects where an XP is a barrier in its in situ position.

Merge in Sabel (2002)

In Sabel's (2002) approach, extraction from subjects and adjuncts is argued to be impossible because these items are not merged with a lexical head, and a required S-projection cannot be formed. Sabel starts out with (31), which is assumed to follow as theorem: "I will argue [...] that [(31)] is motivated by θ-theoretic considerations" (Sabel (2002, 292)).

(31) Barrier:
A category A may not be extracted from a subtree T_2 (X^{max}) of T_1 if T_2 was merged at some stage of the derivation with a complex category (i.e., with a non-head).

"I assume that transparency and barrierhood in the case of CED-islands is a consequence of θ- (or [...] 'selection'-) theory." (p. 295).

(32) Assumptions about Merge:
a. Head/complement Merge results in co-indexing; it establishes a selectional (superscript) index on a head and its complement (head/specifier Merge does not, and adjunction does not create co-indexing either).
b. Selectional indices are projected from a head to its XP.

(33) Selection-Projection:
X heads the smallest projection containing α_n. Then Y is an S-projection of X iff
a. Y is a projection of X, or
b. Y is a projection of Z, where Z bears the same index as X.

(34) Uniform Domain (UD):
Given a nontrivial chain CH = $<\alpha_i,...,\alpha_n>$ with n>1, there must be an X such that every α is included in an S(election)-projection of X.

Consequence:
(i) As soon as the path from a base position to a (final) landing site of movement includes a specifier or adjunct, propagation of the original selectional index stops.
(ii) If selectional index transmission stops, the S-projection ends, because of clause (b) of (33).
(iii) Therefore, in such a case, there cannot be some node X anymore such that every member of the movement chain is included in an S-projection of X. Members of the movement chain will invariably belong to the dominance domains of more than one S-projection.

Comments:

(i) Uniform Domain is a constraint that does not seem to qualify as either an economy constraint or an interface condition (perhaps the latter?).

(ii) The analysis is incompatible with the concept of a phase (Chomsky (2000, 2001, 2005a)) because checking whether UD is violated or not requires scanning the large portions of syntactic structure.

(iii) The analysis requires special concepts that do not seem to be needed otherwise (S-projection, selectional indices).

(iv) The crucial assumption is (32-a), which introduces a difference between head/complement and head/specifier (or head/adjunct) relations and thereby mimicks the concept of L-marking in Chomsky (1986) (or clause (b) of (30)).

Agree in Rackowski & Richards (2005)

In contrast to Sabel (2002), Rackowski & Richards (2005) derive (a version of) the CED by invoking special assumptions about Agree.

(35) Assumptions about movement:

a. A probe must Agree with the closest goal that can move.

b. A goal α can move if it is a phase (CP, vP, DP).

c. A goal α is the closest one to a probe if there is no distinct goal β such that for some X (X a head or a maximal projection – note that X′ categories must not count), X c-commands α but not β.

d. Once a probe P is related by Agree with a goal G, P can ignore G for the rest of the derivation.

e. v has a Case feature that is checked via Agree. It can also bear EPP-features that move active phrases to its edge.

f. [+wh] C has a [+wh] feature that is checked via Agree (and sometimes Move).

(36) Condition on Extraction Doman (Rackowski & Richards's (2005) version):
Only those CPs and DPs that Agree with a phase head on independent grounds (e.g., direct objects and complement clauses) are transparent for wh-extraction.

(37) $[_{\text{CP}}$ Who do you $[_{\text{vP}}$ think $[_{\text{CP}}$ that we should $[_{\text{vP}}$ hire –]]]] ?

Remarks on (38):
(i) "We will sketch the derivation as though movement begins once the tree has been completed" (p. 283).
(ii) The 'Forget' operations in (38) are not in the original paper.

(38) Extraction from object CP:

a. $[\text{C}_{[+wh]}$ [v [C [v who]]]]
b. $[\text{C}_{[+wh]}$ [v [C $[\text{v}_y$ who_y]]]] (Agree v-DP)
c. $[\text{C}_{[+wh]}$ [v [C $[\text{who}_y$ v_y $\cancel{\text{who}_y}$]]]] (Move DP)
d. $[\text{C}_{[+wh]}$ [v [C [who v ~~who~~]]]] (Forget Agree)
e. $[\text{C}_{[+wh]}$ $[\text{v}_z$ $[\text{C}_z$ [who v ~~who~~]]]] (Agree matrix v-CP)
f. $[\text{C}_{[+wh]}$ [v [C [who v ~~who~~]]]] (Forget Agree)
g. $[\text{C}_{[+wh]}$ $[\text{v}_x$ [C $[\text{who}_x$ v ~~who~~]]]] (Agree matrix v-DP)
h. $[\text{C}_{[+wh]}$ $[\text{who}_x$ v_x [C $[\cancel{\text{who}_x}$ v ~~who~~]]]] (Move DP)
i. $[\text{C}_{[+wh]}$ [who v [C [~~who~~ v ~~who~~]]]] (Forget Agree)
j. Now Agree of matrix C is possible with matrix vP, or with who (by stipulation – see (35-c) –, v′ does not count, and vP thus does not intervene).
k. $[\text{C}_{[+wh]\,w}$ $[\text{who}_w$ v [C [~~who~~ v ~~who~~]]]] (Agree C-DP)
l. $[\text{who}_w$ $\text{C}_{[+wh]\,w}$ $[\cancel{\text{who}_w}$ v [C [~~who~~ v ~~who~~]]]] (Move DP)
m. [who $\text{C}_{[+wh]}$ [~~who~~ v [C [~~who~~ v ~~who~~]]]] (Forget Agree)

Note:
(i) v must independently Agree with C (clauses, by assumption, need case).
(ii) The analysis predicts that there can be no intermediate traces in SpecC positions.

How CED effects are derived:
(i) Subjects, like adjuncts, never enter into an Agree relation with v (v cannot probe into its own specifier, given the c-command requirement on Agree).
(ii) If they do in some languages after all because Agree is possible under m-command (as assumed for Japanese), subjects become transparent.

An empirical problem:
The analysis does not permit successive-cyclic movement to take place via embedded SpecC positions. The counter-evidence from partial wh-movement in languages like German may be explained away by assuming an indirect dependency approach (Dayal (1994)). Such a way out is not available for the closely related wh-copy construction.

(39) Partial wh-movement and copy movement in German:

a. Was meinst du [$_{CP}$ wen$_1$ wir t$_1$ einladen sollen] ?
   what think you whom we invite should

b. Wen$_1$ meinst du [$_{CP}$ wen$_1$ wir t$_1$ einladen sollen] ?
   whom think you whom we invite should

Comments:

(i) The crucial assumption is that extraction from XP requires an Agree operation involving v and XP. Since v can Agree with (something in) its complement but not with its specifier or an adjunct, the latter two categories are derived as barriers.

(ii) Arguably, the "c-command by v" requirement mimicks the L-marking requirement of Chomsky (1986). Plus, the restriction to v (vs. T, C) is also very similar to the restriction to lexical categories that is part of the definition of L-marking.

(iii) There is a curious asymmetry: For the purposes of minimality, the vP-v′ distinction must be ignored; for the purposes of deriving the CED, this distinction must be maintained.

(iv) Agree relations between C or T and (e.g.) CP would undermine the account of CED effects (this is why intermediate movement steps to SpecC cannot be permitted in this system); but they can only be excluded by additional stipulations.

(Suppose that C (or T) first carries out Agree with a subject (CP or DP), and then with an item in the left edge of the subject (CP or DP). Then, extraction from a subject would be possible after all.)

This restriction is all the more peculiar since T does regularly undergo Agree with subjects.

Cyclic Spell-Out: Uriagereka (1999), Nunes & Uriagereka (2000), Nunes (2004)

Here, the attempt is made to derive (some version of) the CED, by invoking specific (though independently motivated) assumptions about cyclic spell-out. I focus on Uriagereka (1999).

Main goal:

The goal is to derive (a version of) the LCA from minimalist assumptions.

Claim:

This is possible if we assume cyclic (multiple) spell-out.

The original LCA:

(40) Linear ordering of terminal symbols (L):

a. transitive: $\forall$x,y: $\langle x,y\rangle \in L \wedge \langle y,z\rangle \in L \rightarrow \langle x,z\rangle \in L$

b. total: $\forall$x,y: $\langle x,y\rangle \in L \vee \langle y,x\rangle \in L$

c. antisymmetric: $\forall$x,y: $\neg(\langle x,y\rangle \in L \wedge \langle y,x\rangle \in L)$

(41) a. D = dominance relation between non-terminal symbols

b. d = dominance relation between non-terminal and terminal symbols

c. d(X) = set of terminal symbols that are dominated by a non-terminal X (the 'image' of X under d)

d. $d\langle X,Y\rangle$ (image of non-terminal $\langle X,Y\rangle$ under d) = $\{\langle a,b\rangle\}$: $a \in d(X) \wedge b \in d(Y)$

e. Let S be a set of ordered pairs $\langle X_i,Y_i\rangle$ (0<i<n). Then: $d(S) = \bigcup$ for all i (0<i<n) of $d(\langle X_i,Y_i\rangle)$

(42) a. $A = \{\langle X_j,Y_j\rangle\}$, such that for each j: X_j c-commands Y_j asymmetrically

b. T = set of terminal symbols of a phrase structure tree P

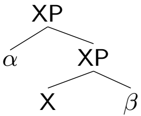
(43) Linear Correspondence Axiom (LCA; Kayne (1994)): d(A) is a linear ordering of T.

(44) Consequences:

a. A head precedes its complement (β).

b. A specifier (α) must formally qualify as an adjunct. It is unique and precdes its head.

(45) The shape of phrases under Kayne's LCA:



Difference between Kayne (1994) and Chomsky (1995):

- Kayne's original LCA restricts possible phrase markers.
- Chomsky's version of the LCA restricts possible linearizations of a priori unordered phrase markers at PF

Deducing the Base Step of the LCA

Assumption (Chomsky (1995)):
The LCA ensures linearization of a priori unordered phrase structures (in a bare phrase structure model).

(46) A Chomskyan version of the LCA:
  a. Base step: If α c-commands β, then α precedes β.
  b. Induction step: If γ precedes β and γ dominates α, then α precedes β.

Note:
(46-b) is essentially the Nontangling Condition (Partee et al. (1993, 437)):

(47) 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.

(48) Command Unit (CU):
A command unit emerges in a derivation through the continuous application of Merge to the same object.

Note: Labels are underlined in (49) and (50).

(49) Continuous application – command unit:

a. $\alpha + \{\underline{\beta} \ldots\} \rightarrow \{\ \underline{\alpha}, \{\ \alpha, \{\underline{\beta} \ldots\}\}\}$

b. $\gamma + \{\ \underline{\alpha}, \{\ \alpha, \{\underline{\beta} \ldots\}\}\} \rightarrow \{\ \underline{\alpha}, \{\ \gamma, \{\ \underline{\alpha}, \{\ \alpha, \{\underline{\beta} \ldots\}\}\}\}\}$

(50) Discontinuous application – not a command unit:

a1. $\alpha + \{\underline{\beta} \ldots\} \rightarrow \{\ \underline{\alpha}, \{\ \alpha, \{\underline{\beta} \ldots\}\}\}$

a2. $\gamma + \{\underline{\delta} \ldots\} \rightarrow \{\ \underline{\gamma}, \{\ \gamma, \{\underline{\delta} \ldots\}\}\}$

a. $\{\ \underline{\alpha}, \{\ \alpha, \{\underline{\beta} \ldots\}\}\} + \{\ \underline{\gamma}, \{\ \gamma, \{\underline{\delta} \ldots\}\}\} \rightarrow$
$\{\ \underline{\alpha}, \{\ \{\ \underline{\gamma}, \{\ \gamma, \{\underline{\delta} \ldots\}\}\}, \{\ \underline{\alpha}, \{\ \alpha, \{\underline{\beta} \ldots\}\}\}\ \}\}$

Question:
There are n! ways to “lay the mobile on the ground” – why is the Spec–Head–Comp order chosen (assuming the validity of the LCA)?

(51) Possible orders

a. Comp Head Spec
b. Head Comp Spec
c. Spec Comp Head
d. Spec Head Comp
e. Comp Spec Head

(violates Nontangling)

f. Head Spec Comp

(violates Nontangling)

Assumption:
(i) There is an order of Merge operations (a “Merge-wave of terminals”).
(ii) The most economical way to map phrase structure onto linear order is to “harmonize (in the same local direction) the various wave states, thus essentially mapping the merge order into the PF linear order in a homomorphic way.” (But: This is “hand-waving until one establishes what such a Merge-wave is.”)

Problem:
Why does the command relation collapse into precedence, and not the opposite ((51-d) vs. (51-a))?
Solution:
This is not a problem because we only need an optimal solution; there may not be the optimal solution.

Deducing the Induction Step of the LCA

Goal: The goal now is to derive the Nontangling Condition.
Idea: Multiple spell-out.
Question:
Assuming that the induction step of the LCA in (46) does not hold, how does linearization work in derivations with more than one CU?

(52) Induction step: If γ precedes β and γ dominates α, then α precedes β.

Answer:
There are various steps of linearization, each of which involves only CUs.

Two implementations:

1. Conservative approach:
   A collapsed Merge structure is no longer phrasal after spell-out; it's more like a giant lexical compound, or a word.
2. Radical approach:
   A spelled-out CU does not merge with the rest of the structure; interphrasal association is accomplished in the performative components.

Note:
In the remainder of the paper, the analysis simultaneously proceeds in two different directions, Uriagereka systematically giving two competing accounts of the relevant observations. To simplify matters, I focus on the conservative account throughout.

(53) How spell-out works:

a. $\{ \alpha, \{ \text{L, K} \} \} \Rightarrow \{ \alpha, < \text{L, K} > \}$

b. $\{ \alpha, < \text{L, K} > \} = \{ \alpha, \{ \{L\}, \{\text{L,K} \}\}\}$

c. $\{ \alpha, \{ \{L\}, \{\text{L,K} \}\}\}$ is not a syntactic object.

(54) Syntactic object (Chomsky (1995)):

a. Base step: A word is a syntactic object.

b. Induction step: $\{ \alpha, \{ \text{L, K} \}\}$ is a syntactic object, for L and K syntactic objects and α a label.

"[(54-b)] is obtained through Merge and involves a labeling function that Chomsky argues is necessarily projection."

(55) Within a syntactic object, a label α is not a term.

(56) K is a term iff (a) or (b):

a. Base step: K is a phrase marker.

b. Induction step: K is a member of a member of a term.

Consequence:

$\{ \text{L, K} \}$ in (53)-(c) is a term, but not a syntactic object. Therefore, it is not accessible to syntactic operations.

CED Effects

(57) Condition on Extraction Domain:

a. Movement must not cross a barrier.

b. An XP is a barrier iff it is not a complement.

(58) CED Effects:

a. Who$_1$ did you see [$_{\text{DP}}$ a critic of t$_1$] ?

b. *Who$_1$ did [$_{\text{DP}}$ a critic of t$_1$] see you ?

Analysis in terms of multiple spell-out:
"If a non-complement is spelled out independently from its head, any extraction from a non-complement will involve material from something that is not even a syntactic object; thus, it should be as hard as extracting part of a compound."

Problem (?):
Why are sentences with left-branch extractions like (59) possible?

(59) Which professor$_1$ did you say [t$_1$ left] ?

Note:
A similar problem arises in Gazdar's (1981) analysis in terms of the Generalized Left Branch Condition.

(60) Generalized Left Branch Condition (Ross (1967), Gazdar (1981)):
The leftmost item of an XP cannot be moved out of that XP.

Solutions:
(i) Gazdar's solution (not Uriagereka's solution!): There is no subject trace present in these cases.
(ii) "The answer to this puzzle relates to the pending question of wh-feature accessibility in spelled-out phrases."
Side remark:
The analysis of CED effects in Nunes & Uriagereka (2000) is basically identical (but the analysis is extended to parasitic gaps and their ability to circumvent CED violations, by adopting a sideward movement approach).

Late Adjunct Insertion: Stepanov (2007)

Note:

Stepanov (2007) argues for a heterogeneous approach to CED effects that distinguishes between the Subject Condition and the Adjunct Condition. For the former, he adopts a version of the freezing approach (see below). For the latter, he suggests that late insertion of adjuncts provides the ultimate explanation: At the point where extraction takes place, the adjunct is not yet part of the structure. The effect is similar to the one occurring with subjects in Uriagereka's approach: XPs are islands because they are not present as syntactic objects at the relevant stage of the derivation where movement takes place – either not anymore (Uriagereka and Nunes), or not yet (Stepanov).

Conclusion

Comments:

Uriagereka & Nunes' analysis is fundamentally incompatible with the notion of a phase as the relevant domain for cyclic spell-out (Chomsky (2000, 2001, 2005a)). Uriagereka's spell-out domains are variable in size.

(i) They can be larger than the spell-out domain of a phase – in fact, extremely large (possibly, the whole sentence): As long as no complex specifier is merged (either no specifier, or specifiers consisting only of lexical items), a new spell-out domain will not be created.

(ii) They can be smaller than the spell-out domain of a phase: E.g., a complex specifier (belonging to any category) is always a spell-out domain.

Refs.:

→ Kitahara (1994), Takahashi (1994), Boeckx (2003), Rizzi (2006), Stepanov (2007)

Note:

All these analyses presuppose that (relevant subcases of) CED effects can be traced back to freezing effects; i.e., an item becomes a barrier after movement has taken place. They differ in what is taken to be responsible for the occurrence of freezing.

Freezing and Head Movement: Kitahara (1994)

The first freezing approach to be discussed here is actually not typical: The freezing effect does not arise from movement of the XP from which extraction is to take place, but rather from movement of a head to the domain in which XP is located. (This is in fact a bit more in the spirit of the proposal of Wexler & Culicover (1980).)

Goal:

A minimalist reformulation of the CED that makes the following predictions:
(i) A complement is never a barrier.
(ii) An adjunct is always a barrier.
(iii) A specifier is a barrier only if its head has been the target of head movement.

(61) Inner Minimal Domain Requirement (IMDR):
Extraction out of a category K is possible only if for every X^0-chain H such that K $\in$ the minimal domain of H, K $\in$ the inner minimal domain of H.

(62) Domain, minimal domain (basically as in Chomsky (1993)):
For any X^0-chain CH $<\alpha_1,\ldots,\alpha_n>$:
a. the domain of CH = the set of nodes (i.e., categories) contained in the least full-category maximal projection dominating α_1 that are distinct from and do not contain any α_i.
b. the minimal domain of CH = the smallest subset K of the domain of CH such that for any $\Gamma \in$ the domain of CH, some $\beta \in$ K reflexively dominates Γ.

(63) Inner minimal domain:
For any X^0-chain CH $<\alpha_1,\ldots,\alpha_n>$:
the inner minimal domain of CH = the (maximal) subset S of the minimal domain of CH such that each member of S is dominated by every maximal projection dominating α_i.

(64) Configurations:
a. $[_{\mathrm{XP}}$ $[_{\mathrm{XP}}$ Spec $[_{\mathrm{X'}}$ X Comp]]] Adj]

Adj barrier, Spec & Comp transparent

b. $[_{\mathrm{HP}}$ Spec_1 $[_{\mathrm{H'}}$ $[_{\mathrm{H}}$ X_i] $[_{\mathrm{XP}}$ Spec_2 $[_{\mathrm{X'}}$ t_i Comp]]]]

Spec_1 barrier, Spec_2 & Comp transparent

Note:
This is not per se incompatible with the view that head movement does in fact remove barriers (rather than create them). The evidence that head movement opens up barriers is originally only concerned with complements (see Baker (1988)); also see Bobaljik & Wurmbrand (2003), Gallego & Uriagereka (2006), and den Dikken (2007, 2008) for recent discussion, and below).

(65) Empirical evidence: English vs. Icelandic subjects:

a. *Who$_1$ do you think [$_{\text{CP}}$ that [$_{\text{DP}}$ pictures of t$_1$] are on sale] ?

b. ?Hverjum$_1$ heldur tú [$_{\text{CP}}$ ad [$_{\text{DP}}$ myndir af t$_1$] séu til sölu] ?
   who think you that pictures of are on sale

Account of (65):
(i) In both cases, the subject DP moves to SpecAgr/S, which dominates TP. (Note: this movement step, by itself, does not create a barrier, under Kitahara's assumptions. It is irrelevant for determining barrier status.)
(ii) In English, subject raising must follow T-to-Agr/S movement (for reasons having to do with case-checking).
(iii) In Icelandic, subject raising can precede T-to-Agr/S movement, and there is thus a legitimate order that respects the IMDR: (a) subject raising to SpecAgr/S; (b) extraction from subject; (c) T-to-Agr/S head movement that turns the subject into a barrier (but too late to block extraction) by removing it from the inner minimal domain of the T chain.

Comment:
Independently of various potential empirical problems, it can be noted that this analysis does not seem to meet minimalist requirements: The IMDR neither contributes to efficient compuation in an obvious sense, nor is it an interface requirement. In addition, it employs concepts that do not seem independently motivated (dominance vs. containment, minimal domain, inner minimal domain, etc.)

Freezing and Chain Uniformity: Takahashi (1994), Stepanov (2007)

Note:

The exposition here follows Takahashi (1994); Stepanov (2007) adopts a version of Takahashi's approach, but only for the Subject Condition part of the CED (as noted above, the Adjunct Condition part is treated differently).

(66) Chain Uniformity:
Chains must be uniform.

(67) Uniformity Corollary on Adjunction (UCA):
Adjunction to a part of a non-trivial chain or coordination is not allowed.

Assumptions:

Chain members are full copies. Therefore, after movement of some XP, no adjunction to either XP copy created by movement is permitted.

(68) Shortest Move (a transderivational constraint; see (28)):
Make the shortest move.

Assumption:

Every possible intermediate landing site (for a given movement type: A, A-bar, head) must be used in the course of movement, by adjunction to XP.

Observation:
Extraction from a subject that has undergone movement from Specv to SpecT will lead to a dilemma: It is impossible to satisfy both the UCA and Shortest Move simultaneously in this context. Either one of the two copies must be targetted by adjunction (as in (69-a)), or a non-local movement step must be carried out (skipping the DP adjunction site and moving to TP-Adj directly, as in (69-b)).

(69) A dilemma for extraction from moved subjects, part 1: *UCA:
*Who$_1$ has [$_{\mathrm{TP}}$ [$_{\mathrm{DP}_2}$ who$_1$ [$_{\mathrm{DP}}$ a comment about who$_1$]] T [$_{\mathrm{vP}}$ [$_{\mathrm{DP}_2}$ a comment about who$_1$] [$_{\mathrm{v}'}$ v-annoyed [$_{\mathrm{VP}}$ t$_V$ you]]]] ?

(70) A dilemma for extraction from moved subjects, part 2: *Shortest Move:
*Who$_1$ has [$_{\mathrm{TP}}$ who$_1$ [$_{\mathrm{DP}_2}$ a comment about who$_1$] T [$_{\mathrm{vP}}$ [$_{\mathrm{DP}_2}$ a comment about who$_1$] [$_{\mathrm{v}'}$ v-annoyed [$_{\mathrm{VP}}$ t$_V$ you]]]] ?

Prediction:
CED effects with subjects only show up if the subject is moved from its base position. External arguments in situ (in Specv) and derived subjects (as in passive clauses) are transparent as long as they can stay in situ (which they can in various languages).

Towards deriving the Adjunct Condition part of the CED:
By assumption, clauses with adjuncts are coordination-like structures; hence, adjunction to adjuncts is blocked.
(This part of the analysis raises various questions, see Stepanov (2007).)

Comment:
(i) The Chain Uniformity requirement makes it necessary to scan large domains of syntactic structure; as it stands, it does not seem compatible with a phase-based approach, where the active part of the derivation is very small at any given stage.
(ii) The analysis crucially relies on the copy theory of movement.
(iii) The analysis involves a transderivational constraint (but see lecture 2 for an alternative that does not but produces essentially the same results.)

Φ-Completeness: Boeckx (2003)

Assumption (Boeckx (2003):
The Adjunct Condition and the Subject Condition are to be treated differently.

- Adjunct Condition: Φ-Inertness
  Probes cannot undergo Agree with anything inside an adjunct. Therefore, if Move involves Agree, the barrier status of adjuncts is predicted.
- Subject Condition: Freezing
  The approach is designed to be a minimal variation of Takahashi's approach that captures his basic insight that "the ban on extraction out of displaced constituents results from what one might call a 'chain conflict"'(Boeckx (2003, 104)).

Takahashi's combination of UCA and Shortest Move is replaced with the constraint in (71): a version of the Freezing Principle that I call Constraint on Φ-complete Domains (Boeckx does not give it a name). (Note: There is a potential tension here when we recall Rackowski & Richards's (2005) hypothesis that Agree relations create transparency. Still, there is a relevant difference with respect to the locus in which the Agree relation is morphologically realized.)

(71) Constraint on Φ-complete Domains:
Agree cannot penetrate a domain that is already Φ-complete.

Analysis:
(i) When an XP has undergone movement and reached its final landing site, it freezes – it is Φ-complete.
(ii) Movement out of XP requires an Agree relation into XP.
(iii) Therefore, moved (Φ-complete) XPs are barriers.
Note:
The approach is supposed to cover all kinds of freezing effects.

Comments:
(i) Given the Phase Impenetrability Condition (Chomsky (2000, 2001, 2005a), (71) is a second constraint that imposes a locality requirement on syntactic operations. Neither constraint is reducible to the other one (not all phases are Φ-complete, not all Φ-complete items are phases, and phases provide a domain that is accessible from outside, which (71) must not do), but many redundancies arise.
(ii) There are freezing effects with categories where it does not seem to make sense to attribute them the property is/is not Φ-complete; cf. the VP and PP examples in (72).
(iii) There is an interesting potential tension between Boeckx's (2003) approach on the one hand, and Rackowski & Richards's (2005) on the other: In the latter approach, Agree with XP makes XP transparent for extraction out of it, in the former, Agree with XP (producing Φ-completeness) renders XP opaque.

(72) a. Ich denke $[_{\mathrm{CP}}$ $[_{\mathrm{VP}}$ das Buch gelesen $]_2$ hat keiner t_2]
I think the book read has no-one

b. $[_{\mathrm{DP}}$ Was $]_1$ denkst du $[_{\mathrm{CP}}$ t_1' hat keiner $[_{\mathrm{VP}}$ t_1 gelesen $]_2$] ?
what think you has no-one read

c. *$[_{\mathrm{DP}}$ Was $]_1$ denkst du $[_{\mathrm{CP}}$ $[_{\mathrm{VP}}$ t_1 gelesen $]_2$ hat keiner t_2] ?
what think you gelesen has no-one

(73) a. Who$_1$ do you think that he will talk $[_{\mathrm{PP}_2}$ to t_1] ?

b. *Who$_1$ do you think that $[_{\mathrm{PP}_2}$ to t_1] he will talk t_2 ?

Criterial Freezing: Rizzi (2006, 2007)

The approach developed in Rizzi (2006, 2007) and related work is not primarily concerned with CED effects, but it is based on a principle that is very similar to a number of freezing constraints that yield CED effects as a consequence.

(74) Criterial Freezing:
In a criterial configuration, the criterial goal is frozen in place.

However:
To account for the contrast between (75-a) and (75-b) in French, Rizzi (2007) actually assumes that the a criterially frozen subject is not a barrier. On his view, the construction is legitimate because the subject DP is endowed with "nominal and Φ-features", and these are maintained in the criterial subject position if only combien is extracted (in contrast to (75-a), where Criterial Freezing is violted). (The slight deviance of (75-b) is attributed to a Left Branch Condition violation.)

(75) a. *[$_{DP_2}$ Combien$_1$ de personnes] veux-tu [$_{CP}$ que [$_{TP}$ t$_2$ viennent á ton anniversaire]] ?
how many of people do you want that come to your birthday

b. ?Combien$_1$ veux-tu [$_{CP}$ que [$_{TP}$ [$_{DP_2}$ t$_1$ de personnes] viennent á ton anniversaire]] ?
how many do you want that of people come to your birthday

Phase Sliding: Gallego & Uriagereka (2006)

The basic assumption here is that there is a specific freezing constraint; the constraint is similar to Boeckx's Constraint on Φ-complete Domains and Rizzi's Criterial Freezing; but it also incorporates Uriagereka's idea of 'flattening' complex (non-complement) constituents.

(76) Edge Condition:
Syntactic objects in phase edges become internally frozen.

Note:
(76) does not impose a ban on extraction from moved items per se; it only blocks extraction from items that have undergone movement to phase edges. (Of course, the two options may be identical, if all movement is movement to phase edge positions.)

The idea:
(76) is not radically different from what can be found in other approaches. Gallego & Uriagereka's (2006) main new contribution is that they assume that v-to-T movement may result in TP (rather than vP) becoming the relevant phase; i.e., movement of v carries the phase property along. This accounts for a curious asymmetry with extraction from subjects in Spanish: Preverbal subjects are barriers, postverbal subjects are not.

(77) Extraction from preverbal and postverbal subjects in Spanish:

a. De qué conferenciantes$_1$ te parece que me van a impresionar [$_{DP}$ las propuestas t$_1$]
   of what speakers to you seem-3.SG that to me go-3.SG to impress the proposals

b. *De qué conferenciantes$_1$ te parece que [$_{DP}$ las propuestas t$_1$] me van a impresionar
   of what speakers to you seem-3.SG that the proposals to me go-3.SG to impress

   'Which speakers does it seem to you that the proposals by will impress me?'

Observation:
Given that TP (not vP) is the phase in Spanish, the subject DP is in the edge domain of a phase in (77-b) but not in (77-a).

Comments:
(i) The proposal has a number of far-reaching empirical consequences (e.g., shouldn't we expect that postverbal subjects in verb-second clauses are always transparent for extraction?).
(ii) It is unclear whether the analysis is compatible with the idea that phases are first and foremost motivated by complexity considerations.
(iii) One might think at first sight that this approach predicts the opposite of Kitahara's (1994) approach discussed above: In one approach, head movement creates transparency of a specifier (Gallego & Uriagereka); in the other approach, head movement creates opacity of a specifier (Kitahara). However, this is not the case. In both approaches, head movement turns a specifier of the landing site into a barrier; and in both approaches, a specifier associated with the head in situ is predicted to be transparent for extraction.

Conclusion

Two problems with freezing analyses:
(i) All freezing analyses rely on additional constraints. It is far from clear whether these constraints can be taken to comply with basic minimalist tenets, as formulated above.
(ii) Freezing analyses have nothing to say about CED effects that arise in contexts where the barrier has not undergone movement. An example: Assuming that particles like denn, wohl, ja demarcate the vP edge in German, it seems clear that the subject DP (DP_3) is in situ in the German examples in (78). Nevertheless, a CED occurs with extraction out of the subject.

(78) CED effects with subject DPs in situ in German:

a. *Was$_1$ haben denn [$_{DP_3}$ t$_1$ für Bücher] [$_{DP_2}$ den Fritz] beeindruckt ?
what have PRT for books$_{nom}$ the Fritz$_{acc}$ impressed

b. *[$_{PP_1}$ Über wen] hat wohl [$_{DP_3}$ ein Buch t$_1$] [$_{DP_2}$ den Fritz] beeindruckt ?
about whom has PRT a book$_{nom}$ the Fritz$_{acc}$ impressed

Conclusions so far (repeated in modified form from above):

1. Analyses that are centered around the working of elementary operations like Move or Agree rely on special assumptions that mimic assumptions in Chomsky's (1986) theory of barriers.
2. Analyses that are based on specific concepts of cyclic spell-out are incompatible with the assumption that only the complement of a phase head is affected by spell-out (whereas the specifier domain and the head itself remain available for further operations on subsequent cycles), and with the notion of phase in general.
3. Analyses that rely on freezing are incompatible with the existence of CED effects where an XP is a barrier in its in situ position.
4. Furthermore, most of the approaches discussed so far make it necessary to stipulate separate constraints and/or concepts that are not independently motivated, and that may not always fall under either economy or interface constraints.

Finally:
All these analyses have nothing to say about melting effects, a class of data that I will discuss in detail in lecture 3. Here, it looks as though an XP may qualify as a barrier in one case and as transparent in another even though it has exactly the same structural relationship with the surrounding lexical items.

(79) A melting effect with local scrambling in German:

a. *Was$_1$ haben [$_{DP_3}$ t$_1$ für Bücher] [$_{DP_2}$ den Fritz] beeindruckt ?
what have for books$_{nom}$ the Fritz$_{acc}$ impressed

b. Was$_1$ haben [$_{DP_2}$ den Fritz] [$_{DP_3}$ t$_1$ für Bücher] t$_2$ beeindruckt ?
what have the Fritz$_{acc}$ for books$_{nom}$ impressed

(80) A melting effect with local scrambling in Czech:

a. *[$_{NP_1}$ Holka] neudeřila [$_{DP_3}$ žádná t$_1$] Petra$_2$
girl$_{nom}$ hit no$_{nom}$ Petr$_{acc}$
'No girl hit Petr.'

b. [$_{NP_1}$ Holka] neudeřila Petra$_2$ [$_{DP_3}$ žádná t$_1$] t$_2$
girl$_{nom}$ hit Petr$_{acc}$ no$_{nom}$
'No girl hit Petr.'

In the following lectures (2 & 3), I will argue that both MLC and CED effects follow from the Phase Impenetrability Condition (PIC), in interaction with independently motivated assumptions about movement and structure-building in general. In lecture 4, I address the fate of the Head Movement Constraint; and I argue that it can be derived without invoking a separate constraint, too – it follows from the properties of a certain type of categorial probe features (Münchhausen features).

(81) Claims:

a. Edge features that trigger intermediate movement steps to phase edges can only be inserted when they have an "effect on outcome", in Chomsky's (2001) terms. A simple way of making precise what this means implies that MLC effects follow from the PIC.

b. Edge features that trigger intermediate movement steps to phase edges can only be inserted "after the phase is otherwise complete", in Chomsky's (2001) terms. There is good theory-internal evidence for replacing "after" with "before"; this move implies that CED effects follow from the PIC.

c. Head movement by adjunction is known to be a problematic concept (Strict Cycle Condition, c-command requirement for traces, etc.). If head movement must involve reprojection, these problems are solved. In addition, HMC effects follow without further ado.

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