

Syntax Phase Theory

Modul 04-006-2002
Phonology – Morphology – Syntax

Institut für Linguistik

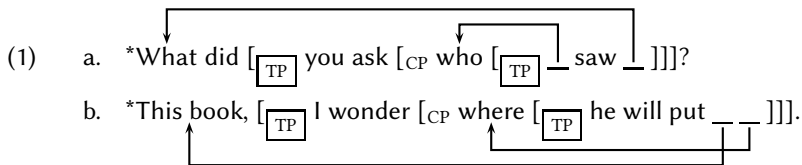
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Subjacency

Chomsky (1977) (cf. already Chomsky 1973):

- In order to account for the ungrammaticality of examples such as (1-a,b), the grammatical principle in (2) is introduced. ((1-b) is a case of “topicalization” out of CP.)
- The idea is that if TP is a *bounding node* (in the sense of (2)), then the long movement paths in (1-a,b) violate Subjacency because two TP nodes are crossed.



- (2) *Subjacency Condition:*
No rule can relate X and Y in the structure
... X ... [_{α} ... [_{β} ... Y ...
if α and β are bounding nodes.

Subjacency

Side notes:

- The phenomenon in (1-a,b) is also known as a *wh*-island effect: the *wh*-phrase (question word) in the lower SpecC (*who/where*) creates an “island” which cannot be left by movement of another phrase.
- A similar effect can also be observed with relativization, see (3), where the lower SpecC is filled by an empty relative pronoun OP.
- When we discussed Minimality, it was noted that the ungrammaticality of (1-a) also follows from Superiority/the MLC. This may be less evident for (1-b) or for (3) (because the features involved are different), but it is not impossible. In any event, there is a certain overlap here.

(3) *Who did [_{TP} you meet [_{NP} a man [_{CP} OP that [_{TP} likes]]]]?

The diagram illustrates movement paths in the sentence. A box labeled 'TP' is positioned under 'you meet'. A box labeled 'CP' is positioned under 'that'. Inside the 'CP' box, there is a box labeled 'TP' under the blank space before 'likes'. A long arrow starts from the blank space before 'likes' and points to the 'Who' at the beginning of the sentence. A shorter arrow starts from the blank space before 'likes' and points to the 'OP' inside the 'CP' box. Another arrow starts from the blank space before 'likes' and points to the blank space before 'you meet'.

Subjacency

Question:

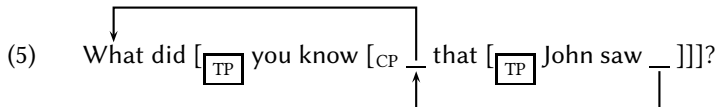
If Subjacency is relevant for English (and also for other languages), why then are (4-a,b), which also involve movement across two TP nodes, grammatical?

- (4) a. What did [_{TP} you say [_{CP} that [_{TP} John saw]]]?
- b. This book, [_{TP} I know [_{CP} that [_{TP} John will put away]]].
-

Subjacency

Answer:

- The difference between (1) and (4) is that in (1) the specifier of the embedded CP is filled (by *who/where*) while this is not the case in (4) (no *wh*-island is created).
- Suppose there is a derivation of (4) such that *what* first moves to the embedded SpecC and from there to the higher SpecC, see (5). Such a derivation does not violate Subjacency because every movement step only crosses one TP node.
- Moreover, such a derivation is excluded for (1) under the assumption that there can be only one SpecC-position since SpecC in the embedded CP is already filled in (1). Thus, the examples in (1) still violate Subjacency.



Successive cyclic movement

Hypothesis:

- *Wh*-movement as hypothesized in (5) is enforced by the Subjacency Condition. If it cannot apply, then a violation of Subjacency (and therefore ungrammaticality) is the result.
- The analysis has led to the hypothesis that, generally, any movement out of CP must first undergo an intermediate movement step to SpecC. This is called *successive-cyclic* movement.

Successive cyclic movement

Side notes:

- The fact that *wh*-movement, topicalization, and relativization are all subject to the Subjacency Condition is one of the traditional reasons why these movement types are often subsumed under the cover term of \bar{A} -movement (speak: “A-bar-movement”).
- The fact that *wh*-islands may already follow from Superiority/the MLC suggests that the notion of Subjacency was, perhaps, not so well-motivated from the beginning. And since it was Subjacency that lead to the hypothesis of successive cyclicity, this hypothesis was not well-motivated at first either.
- In the meanwhile, a fair amount of independent empirical evidence in favor of the hypothesis has been found (see, e.g., Murphy 2018 and van Urk 2019 for overviews).

Evidence for successive cyclicity (CP)

Copying:

- In some languages (Afrikaans, Plessis 1977 (6-a); Frisian, Hiemstra 1986 (6-b); German (6-c), Höhle 2000), “long” *wh*-movement (i.e., *wh*-movement out of CP) can generate a copy of the *wh*-phrase in the hypothesized intermediate landing site under certain conditions.
- Interpretation: If copying is contingent on movement, then the copies in (6-a-c) provide evidence for an intermediate landing site in SpecC.

- (6) a. [PP Waarvoor] dink julle [CP [PP waarvoor] werk ons __]?
where.for think you where.for work we
‘What do you think we are working for?’
- b. Wêr tinke jo [CP wêr’t Jan wennet __]?
where think you where=C Jan lives
‘Where do you think that Jan lives?’
- c. Wen meint Karl [CP wen wir __ gewählt haben]?
who thinks Karl who we voted.for have
‘Who does Karl think that we voted for?’

Evidence for successive cyclicity (CP)

Quantifier stranding:

- In West Ulster English (McCloskey 2000) the floating quantifier *all* may not only show up in the final landing position of *wh*-movement (together with the *wh*-phrase) (7-a) but also in the thematic position of the *wh*-phrase (7-b), (8-a), and, crucially, also in an intermediate SpecC position (8-b).
- Interpretation: The quantifier is “stranded” (left behind) by movement, thereby indicating the initial and intermediate Merge sites in (7-b), (8-a), and, (8-b).

(7) a. [_{NP} What all] did you get __ for Christmas?

b. What did you get [_{NP} __ all] for Christmas?

(8) a. What did he say [_{CP} that he wanted [_{NP} __ all]]?

b. What did he say [_{CP} [_{NP} __ all] that he wanted __]?

Evidence for successive cyclicity (CP)

P-stranding:

- Something similar may happen with stranding a preposition in Afrikaans (Plessis 1977), see (9-a,b).
- Interpretation: The stranded preposition indicates the initial (9-a) and intermediate (9-b) Merge site of the PP. The whole PP undergoes movement (“pied-piping”) to the intermediate SpecC in (9-b) (cf. also (6-a)) with subsequent movement of the bare *wh*-phrase out of the PP.

- (9) a. Waar dink julle [_{CP} werk ons [_{PP} __ for]]?
where think you work we for
‘What do you think we are working for?’
- b. Waar dink julle [_{CP} [_{PP} __ for] werk ons __]?
where think you for work we

Evidence for successive cyclicity (CP)

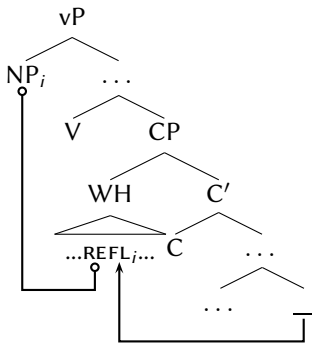
Reflexive binding:

- Recall (slides “VP-Structure and C-Command”), that reflexives in English require a c-commanding co-referential antecedent (co-indexation = co-referentiality): the reflexive is “bound” by the antecedent. Normally, such binding must happen locally (within the minimal CP).
- A reflexive can exceptionally (and optionally) be bound non-locally from an antecedent in a higher CP if it is part of a *wh*-phrase that moves past that antecedent (“pit-stop reflexive”, Weisler 1982, Barss 1986): (10-a) vs. (10-b).
- Interpretation: While non-local binding from the higher CP (the reflexive sits deeply within the lower CP) is impossible (10-a), local binding becomes possible when the *wh*-phrase (containing the reflexive) moves to the SpecC-position of the lower CP and the antecedent is merged within (what is to become) the higher CP (10-b).

- (10) a. John_i thinks [_{CP} that Fred_j likes himself_{j/*i}].
b. [Which pictures of himself_{j/i}] does John_i think [_{CP} __ that Fred_j likes __]?

Evidence for successive cyclicity (CP)

(11)



Excursus: Principle C/ variable binding

Background:

- Principle C (Chomsky 1981, Reinhart 1983): A referential expression (“R-expression”, such as the proper name *John*) must not be bound (where binding = c-command + coreference) by some other expression, such as the pronoun *he* in (12-a,b).
- Bound variable: a pronoun can be interpreted as a variable that is interpretationally dependent on (semantically bound by) a quantifier (such as *everyone*) if it is c-commanded by the quantifier (12-c,d).

- (12)
- a. * He_i believes [_{CP} that $John_i$ is smart].
 - b. $John_i$ believes [_{CP} that he_i is smart].
 - c. $Everyone_i$ believes [_{CP} that he_i is smart].
 - d. *[The mother of $everyone_i$] believes [_{CP} that he_i is smart].

Evidence for successive cyclicity (CP)

Variable binding (VB):

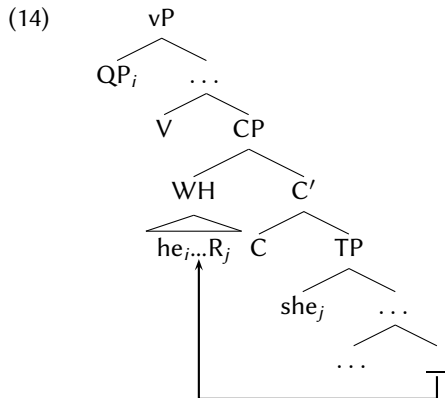
- A pronoun in English (e.g. *he* in (13-a,b)) can be interpreted as a variable bound by a quantifier in a higher CP even if it moved out of the c-command domain of the quantifier (as part of a *wh*-phrase).
- Interpretation: VB in (13-a,b) must apply before the *wh*-phrase moves out of the c-command domain of the quantifier.
- Crucially, VB is even possible in cases where it could not have applied when the *wh*-phrase was in its thematic position (13-b) (see Fox 1999).
- Namely, if VB were evaluated at this point in (13-b), this would lead to a violation of Principle C (assuming that Principle C and VB are computed during the derivation): the referential expression *Mrs. Brown* would be bound by *she*.

- (13) a. [Which of the papers that he_i wrote] did [every student]_j hope [CP that Mrs. Brown would read __]?
- b. [Which of the papers that he_i gave to Mrs. Brown_j] did [every student]_i hope [CP that she_j would read __]?

Evidence for successive cyclicity (CP)

Variable binding (continued):

- Conclusion (Fox 1999): The *wh*-phrase must be able to target a landing site outside the c-command domain of *she* to avoid a violation of Principle C, unlike its thematic position, but inside the c-command domain of *every student* (= QP) to enable variable binding.
- This additional position is SpecC of the embedded CP, see (14).



Evidence for successive cyclicity (CP)

Note:

- The phenomena described above may seem to provide good arguments for successive cyclicity at the CP-level.
- However, as pointed out in Keine (2016), to the extent that they apply optionally, they do not force the conclusion that movement out of CP *must* pass via SpecC.
- Rather, they are merely *compatible* with such a conclusion. (For instance, we don't know whether such movement passes via SpecC if there is no reflexive pronoun contained in the *wh*-phrase.)
- This caveat, however, does not apply to the arguments that follow since these refer to phenomena that obligatorily show up in the context of long movement out of CP.

Evidence for successive cyclicity (CP)

Inversion:

- Some languages (Spanish, Torrego 1984; Belfast English, Henry 1995) require inversion of the subject and the finite verb/auxiliary in the case of non-subject *wh*-movement, which is interpreted as verb-movement to C.
- Crucially, this effect also shows up in intermediate SpecC/C-positions that have been crossed by *wh*-movement (see (15) for Belfast English; and (16) for German, see Thiersch 1978, Tappe 1981, Grewendorf 1988, Haider 1993; but cf. Reis 1995b, Reis 1995a).
- Interpretation: Verb-movement to C signals filling of SpecC.

- (15) a. What did Mary claim [_{CP} __ did they steal __]?
b. What did John say [_{CP} __ did Mary claim [_{CP} __ had John feared __]]?
- (16) Was sagte Karl [_{CP} __ wolle Maria __ kaufen]?
what said Karl want.SUBJ Maria buy
'What did Karl say that Maria wanted to buy?'

Evidence for successive cyclicity (CP)

Morphological reflexes:

- In some languages, a C-head crossed by *wh*-movement exhibits special morphology (see, e.g., McCloskey 1979 on Irish; Muriungi 2003 on Kîitharaka; Schneider-Zioga 2007 on Kinande; Torrence 2012; Martinović 2017 on Wolof; van Urk 2015 on Dinka; and Baier 2018 on Seereer).
- This phenomenon is often referred to as *wh*-agreement.
- Interpretation: *wh*-agreement is tied to movement to SpecC (the movement-inducing feature on C, e.g. an EPP-feature, is accompanied by particular agreement probes).

Evidence for successive cyclicity (CP)

Morphological reflexes (continued):

- (17-a,b) and (18) illustrate for Kinande. In Kinande, the C-head agrees with respect to noun class of the *wh*-phrase. This is the case for the C-head that provides the final landing site of the *wh*-phrase (17-a,b).
- Crucially, it also holds for every intermediate C-head that is crossed by *wh*-movement (18).

- (17) a. ekihi kyo Kambale a-alangira __
what C.WH Kambale AGR-saw
'What did Kambale see?'
- b. iyondi yo Kambale a-alangira __
who C.WH Kambale AGR-saw
'Who did Kambale see?'

- (18) ekihi kyo Kambale a-asi nga [CP __ kyo Yosefu
what C.WH Kambale AGR-know COMPL C.WH Joseph
a-kalengekanaya nga [CP __ kyo Mary' a-kahuka __]]
AGR-thinks COMPL C.WH Mary AGR.cooks
'What did Kambale know that Joseph thinks that Mary is cooking
(for dinner)?'

A new interpretation: Phases

Chomsky (2000, 2001, 2008):

- CP and vP can be distinguished from other categories in that they are *phases*.
- As phases, CP and vP are subject to the Phase Impenetrability Condition in (19).

(19) *Phase Impenetrability Condition (PIC):*

If Ψ is a phase with head H, then the complement of H (the “domain”) is not accessible for operations involving a position outside Ψ . Only H and its specifiers (the “edge”) are accessible for such operations.

Consequenc:

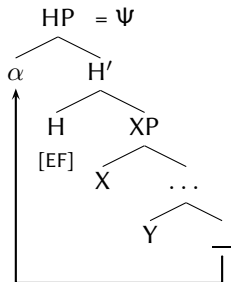
Since CP is a phase, every phrase that is supposed to move out of CP (to ultimately check some EPP-feature outside CP) must first move to the edge of CP in order to remain potentially accessible for this EPP-feature.

Movement to the Edge

Movement to the phase edge:

- In (20), α must leave the domain of H by moving to the edge of Ψ in order to remain accessible from outside Ψ .
- Since movement must be driven by some feature, movement to the edge has been assumed to be triggered by a particular feature (similar to the EPP-feature) that is instantiated on the phase head H: the edge feature (EF).
- Let assume that EFs (juste as EPP-features) are relativized to certain goals (e.g. EF_{wh} attracts *wh*-phrases).

(20)



Cyclic Spell-Out

Question:

Why should something like the PIC exist?

Chomsky (2000, 2001):

- The mapping from syntax to the interfaces (LF and PF) does not apply in one fell swoop. Rather, syntax first constructs the most inclusive phase Ψ (with head H). The complement of H (say XP) is sent to the interfaces (“spell-out”). Once XP has been sent off, it (alternatively: its internal structure) is no longer accessible to the syntax.
- Then the next higher phase Ψ' (containing Ψ) is constructed; again, spell-out applies, sending the complement of Ψ' 's head K (say ZP) to the interfaces. This renders ZP opaque.
- Cyclic spell-out continues until the whole tree is constructed and sent off to LF/PF.

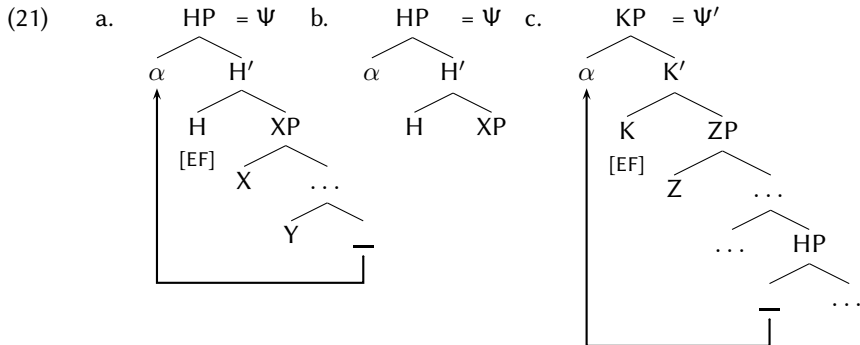
Note:

Predecessors of this model of cyclic spell-out are Bresnan (1971, 1972), Epstein et al. (1998) and Uriagereka (1999).

Cyclic Spell-Out

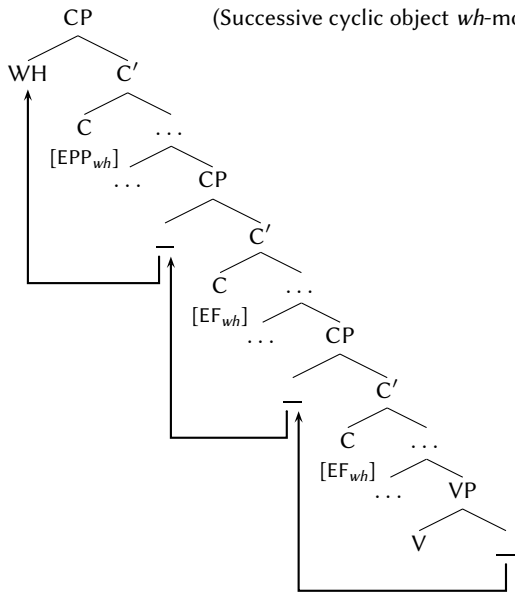
Consequence:

- α must first leave XP (21-a) before XP undergoes spell-out (21-b). Once XP has been spelled-out, its internals are no longer accessible for the syntax. This derives the PIC.
- Therefore, α moves to the edge of the phase Ψ (the “escape hatch”), then to the edge of the next higher phase Ψ' (21-c), etc. until its final landing site is reached. This derives successive cyclic movement (22).



Successive cyclicity: Intermediate and final steps

(22) (Successive cyclic object *wh*-movement)



The vP-Phase

The vP-phase:

- Above, it was said that vP is also a phase, alongside CP. This raises the question whether the same arguments that were made for the phase status of CP can also be adduced in the case of vP.
- In fact, the evidence for the phase-hood of vP is somewhat sparser than it was for the phase-hood of CP. But some of the arguments can be reproduced for vP.

Evidence for successive cyclicity (vP)

Quantifier stranding:

- In contrast to what is the case in West Ulster English (McCloskey 2000, see above), South Derry English (Henry 2012) appears to allow for stranding the floating quantifier *all* in a position that can be analyzed as the edge of vP (23-b).
- Interpretation: The quantifier is “stranded” (left behind) by successive-cyclic movement that passes via Specv.

- (23) a. What did he do [_{NP} __ all] on holiday?
b. What did he [_{vP} [_{NP} __ all] say [_{CP} __ that he did __ on holiday]]?

Aside:

Curiously, while West Ulster English does not allow stranding of *all* in Specv but does allow it in SpecC, South Derry English appears to be the mirror image: there is no *all*-stranding in SpecC (Henry 2012). Similarly, Dutch appears to exhibit stranding of the floating quantifier *allemaal* at the vP-edge (Koopman 2010).

Evidence for successive cyclicity (vP)

Variable binding (Fox 1999):

- The logic is the same as for the case of CP. In (24-a), the pronoun can only be interpreted as a bound variable while at the same time avoiding a Principle C violation if there is an intermediate landing site in between the subject (*every student*) and the indirect object (*her*).
- (24-b) illustrates a state of affairs where Principle C must be violated if the variable is to be bound. In this case, ungrammaticality results.

- (24) a. [Which of the papers that he_i asked Mrs. Brown_j for] did [every student]_i [_{vP} __ get her_j to grade __]?
- b. *[Which of the papers that he_i asked Mrs. Brown_j for] did she_j [_{vP} __ get [every student]_i to grade __]?

Note:

As was the case for CP, the criticism by Keine (2016) is also relevant to stranding and binding at the vP-level. However, there are, again, arguments for the phase-hood of vP that are not subject to this criticism.

Evidence for successive cyclicity (vP)

Morphological reflexes:

- In some languages, the verb exhibits a particular morphology if movement crosses the vP-domain (see Chung 1982, 1994 on Chamorro; Cole and Hermon 1998 on Malay; Aldridge 2008, Sato 2012 on Indonesian; Korsah and Murphy 2020 on Asante Twi; Bennett et al. 2012 on Defaka).
- Interpretation: Again, the movement inducing feature on v is accompanied by some special agreement probe.
- (25-a-d) illustrate with focus movement in Defaka. (Verb movement is not indicated.)

Evidence for successive cyclicity (vP)

Comments:

- The reflex (the suffix *kè*) shows up on any v that is *crossed* by movement (of object or subject) (25-a,c,d). It does not show up on the v that hosts the Specv-position which the subject is merged to (25-b).
- This suggests that the reflex is tied to movement (internal Merge), not to Merge in general. (The last point also holds for Malay/Indonesian but seems to differ in Chamorro and in Asante Twi.)

- (25) a. èbèrè ndò [_{vP} __ ì __ bàà-kè ntà tè]
dog FOC I kill-KE today P
'It's (the) dog that I killed today.'
- b. ì kò [_{vP} __ èbèrè bàà-mà ntà tè]
I FOC.SBJ dog kill-NFUT today P
'It's me that killed (the) dog today.'
- c. áyá jíkái ndò Bòmá ì bíè-*(kè) [_{CP} ì isò __ sónó-mà-*(kè)]
new house FOC Boma I ask-KE I ISO buy-NFUT-KE
'It's a new house that Boma asked me if I'm going to buy.'
- d. Bruce indò Bòmá jírí-*(kè) [_{CP} __ á ésé-mà]
Bruce FOC Boma know-KE her see-NFUT
'It's Bruce that Boma knows saw her.'

Evidence for successive cyclicity (vP)

“Islands”:

- Recall the motivation for Subjacency that lead to the hypothesis of successive-cyclic movement: Movement to SpecC is impossible if SpecC is already occupied. This leads to ungrammaticality if SpecC must be used as an intermediate landing site for movement out of CP.
- van Urk and Richards (2015) argue that something similar can be observed on the vP-level in Dinka. Starting point is the fact that in Dinka, when there is no movement out of vP, the edge of vP has to be occupied by exactly one object (“object shift”, OS) (26-a-d).

- (26)
- a. $\gamma\hat{\epsilon}\epsilon\text{N } \underset{\cdot\cdot}{\text{c}\acute{\epsilon}}$ [_{vP} $\text{Ay}\acute{\epsilon}\text{n } \gamma\hat{\iota}\hat{\epsilon}\text{n}$ [_{vP} $_\ \text{k}\acute{\iota}\text{t}\acute{\alpha}\text{p}$]]
- I PRF Ayén give book
- ‘I gave Ayén a book.’
- b. $\gamma\hat{\epsilon}\epsilon\text{N } \underset{\cdot\cdot}{\text{c}\acute{\epsilon}}$ [_{vP} $\text{k}\acute{\iota}\text{t}\acute{\alpha}\text{p } \gamma\hat{\iota}\hat{\epsilon}\text{n}$ [_{vP} $\text{Ay}\acute{\epsilon}\text{n } _\]]$
- I PRF book give Ayén
- c. * $\gamma\hat{\epsilon}\epsilon\text{N } \underset{\cdot\cdot}{\text{c}\acute{\epsilon}}$ [_{vP} $\gamma\hat{\iota}\hat{\epsilon}\text{n}$ [_{vP} $\text{Ay}\acute{\epsilon}\text{n } \text{k}\acute{\iota}\text{t}\acute{\alpha}\text{p}$]]
- I PRF give Ayén book
- d. * $\gamma\hat{\epsilon}\epsilon\text{N } \underset{\cdot\cdot}{\text{c}\acute{\epsilon}}$ [_{vP} $\text{Ay}\acute{\epsilon}\text{n } \text{k}\acute{\iota}\text{t}\acute{\alpha}\text{p } \gamma\hat{\iota}\hat{\epsilon}\text{n}$ [_{vP} $_\ _\]]$
- I PRF Ayén book give

Evidence for successive cyclicity (vP)

“Islands” (continued):

- Interestingly, if an object undergoes movement that leaves the vP, then no other object may have shifted to Specv (27-a).
- This suggests that vP makes only one specifier available. If this specifier is occupied by an object that underwent OS, then it follows that movement out of vP becomes impossible (27-b) if it must pass via Specv (i.e., if vP is a phase).

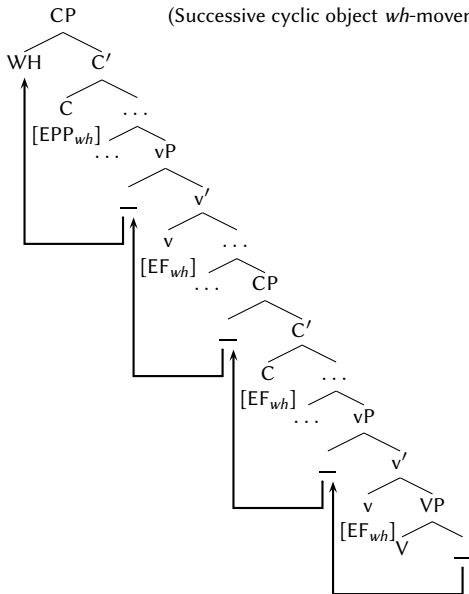
- (27) a. Yeŋa cùi môc [_{vP} __ yiệ̣n [_{VP} __ kìtáp]]?
 who PRF.NS man.GEN give book
 ‘Who did the man give the book to?’
- b. *Yeŋa cùi môc [_{vP} kìtáp yiệ̣n [_{VP} __ __]]?
 who PRF.NS man.GEN book give

Note:

As pointed out in Keine (2016), a problem with the argument arises when examples are considered that involve movement of a PP.

Successive cyclicity: Intermediate and final Steps

(28) (Successive cyclic object *wh*-movement)

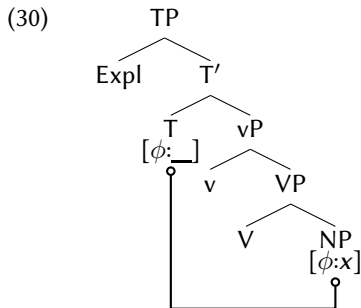


A Problem

Agreement into vP:

- It appears that, generally, agreement of T into the complement of v is not excluded.
- This can even be observed in English expletive constructions (which occur with unaccusative verbs), see (29-a,b).

- (29) a. There arrive-s/*- \emptyset a train.
b. There arrive*-s/- \emptyset many trains.



Four solutions

Chomsky (2000):

Only transitive vP is a phase, unaccusative/passive vP is not.

Comment:

- This trivially accounts for the facts in (29), and also covers cases with more than one non-transitive vP (Legate 2005), see (31-a).
- It has been argued that unaccusative vPs are also phases, but these arguments mainly rest on binding and scope facts (Fox 1999, Sauerland 2003, Legate 2003). As such, they are not as strong as one may want them to be (see above). It should be possible to approach the issue by considering morphological reflexes.
- If vPs with quirky subjects in Icelandic such as (31-b) count as truly transitive, then the solution does not suffice to account for agreement in such constructions (e.g., Sigurðsson 1996, 2002).

- (31) a. There [_{vP} seem to have [_{vP} arrived many trains]].
b. Henni leiddust þeir.
her.DAT bored.3PL they.NOM
'She was bored by them.'

Four solutions

Chomsky (2001, 2004):

The definition of the PIC has to be weakened in such a way that it allows for cases such as (31-b) while at the same time enforcing successive-cyclic movement.

(32) *Phase Impenetrability Condition, version 2 (PIC₂):*

If Ψ is a phase with head H, then the complement of H (the “domain”) is only accessible for operations involving a position outside Ψ *until the next higher phase-head has been merged*. At this point, only H and its specifiers (the “edge”) are accessible for such operations.

Consequence:

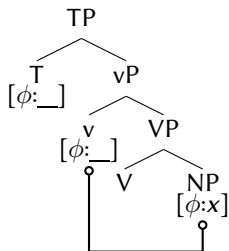
(32) will allow Agree to apply between T and NP in (31-b) because when Agree applies between T and the object “they”, the next higher phase-head C has not been merged yet. For (31-a), one still has to assume that non-transitive vP is not a phase.

Four solutions

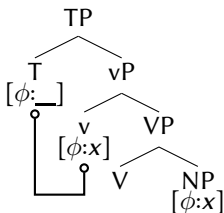
Legate (2005):

- Agreement can apply successive cyclically, just as movement can.
- To this end, phase heads are equipped with appropriate features that copy the relevant information to the phase edge (33-a), where it is then available for higher probes (33-b).

(33) a.



b.



Note:

One should expect to find morphological exponents realizing such intermediate probes in some language.

Four solutions

Bošković (2007) (also cf. Chomsky 2008):

While movement is subject to the PIC, Agree is not.

Comments:

- At first sight, this does not seem to go well together with the idea that the PIC reduces to cyclic spell-out: if a domain is no longer accessible to the syntax, it should be gone for all aspects of syntax (Move and Agree). (Possible way out: agreement applies at PF, Bobaljik 2008).
- Under the current conception of movement, Move is contingent on some kind of Agree: relativized EPP-features (EPP_x) probe their c-command domain on the search for some (matching) element to attract. If this is correct, then this solution cannot work.

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