Mereological Syntax and Grammatical Locality

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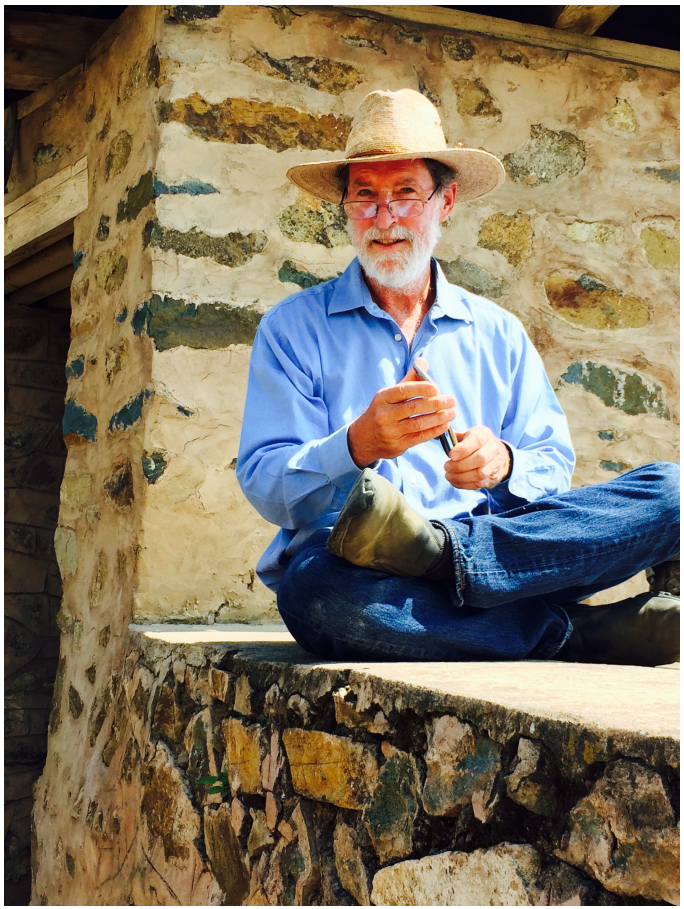
Dick Oehrle Memorial Lecture
ESSLI 2024, Leuven

What is Syntax?



"The critical property for a complex expression is that it be partitionable into a structured set of atomic component sub-expressions whose properties we may assume are available directly. In particular, if E is a complex expression with atomic components $w_1 \ldots w_k$, we may represent the structure of these components in E by writing $C(w_1 \ldots w_k)$, where the operator C represents how the atomic components of E are put together. From this point of view, the problem of composition is to provide a general characterization of the relation between the properties of the atomic components of E and the properties of E itself." *Oehrle (2011)*

What is Syntax?

- Oehrle's perspective was to take expressions as the object that was to be analysed, where an expression is "an abstract analysis of the (subjective representation of) the physical entity in question" (Oehrle 1988).
- Expressions, in this sense, are given a compositional analysis, and they have, in Oehrle's work, the character of a (logical) language: strings of concatenated symbols.
- There is a more general alternative, noted by Curry in the late 50s.

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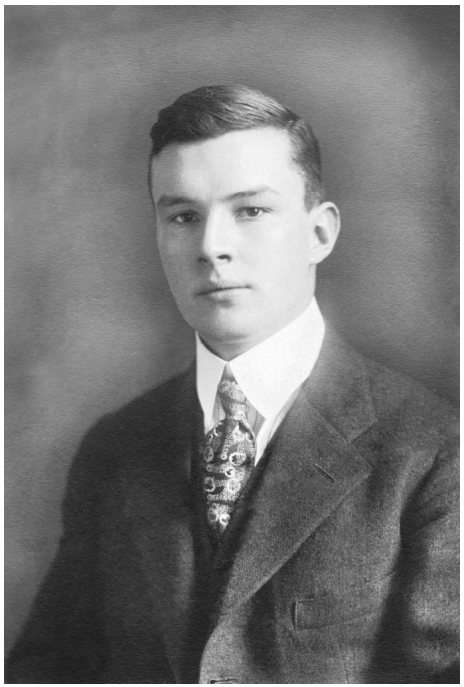

"In combinatory logic these formal objects, called obs, were wholly unspecified; it was merely postulated that there was a binary operation of application among them, that the obs be constructed from the primitive objects, called atoms, by these operations, and that the construction of an ob be unique. This means that the obs were thought of, not as strings of atoms, but as structures like a genealogical tree. Now of course there are various ways in which such a tree can be associated with a string. "
Curry (1961)

What is syntax?

- Chomsky's early work (e.g. in The Logical Structure of Linguistic Theory, 1955) took expressions to be, much as Oehrle suggested, characterizable via concatenation algebras. Syntactic structures were sets of strings.
- More recent work (Bare Phrase Structure, Chomsky 1994) has theorized syntax not via expressions but via Syntactic Objects which are not concatenative, but are hierarchical in nature, requiring a kind of applicative system to generate them, much as Curry suggested.
- Bare Phrase Structure style Syntactic Objects are set theoretic:

  (1) $\{\text{the } \{\text{happy, cat}\}\}$

- I'm going to argue for an alternative: they are part-theoretic.

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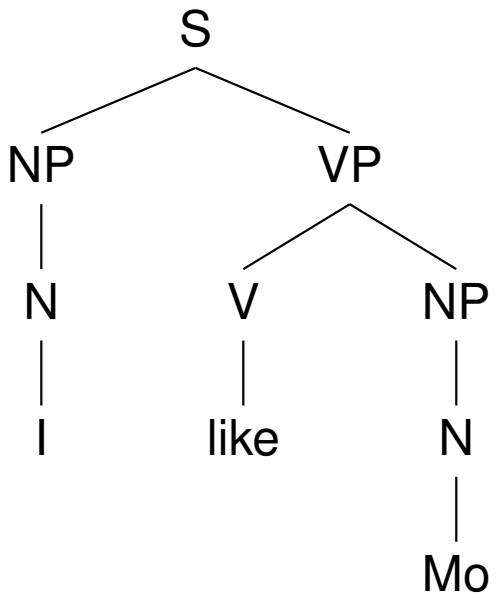
- So the ingredients of syntax are really the categories, which are combined by operations ... words are secondary

Three Theories

(4)



Phrase Structure Rules

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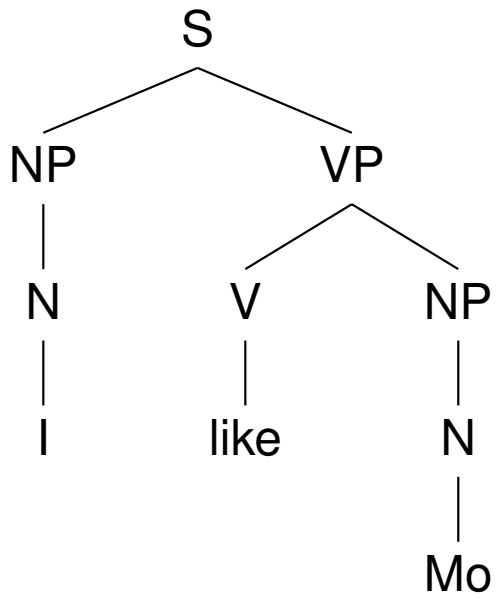

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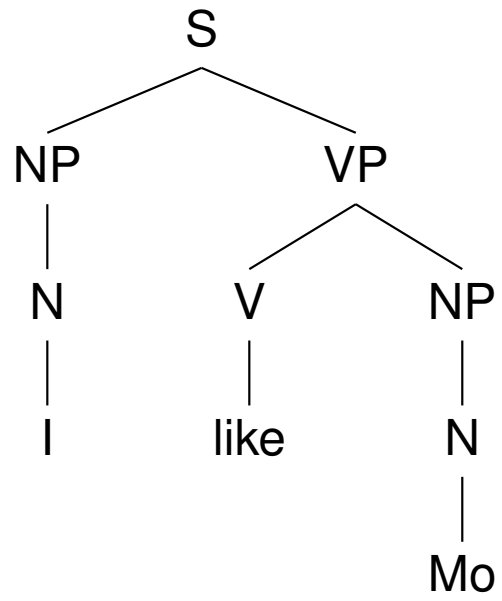

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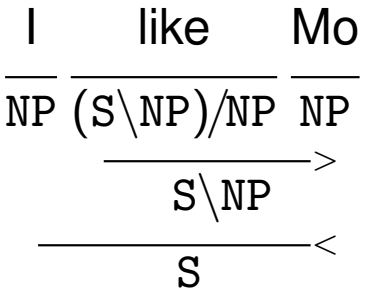

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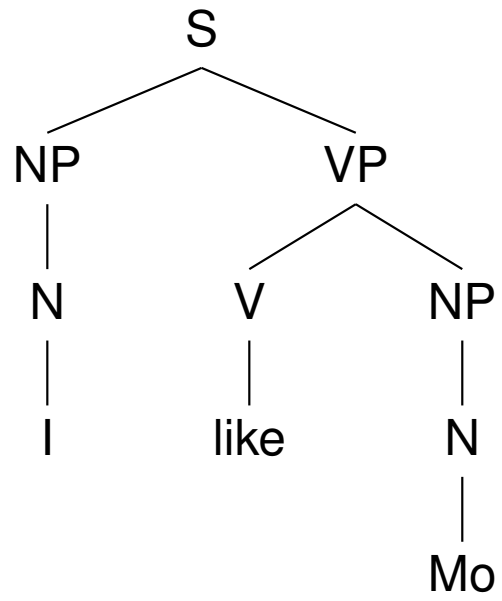

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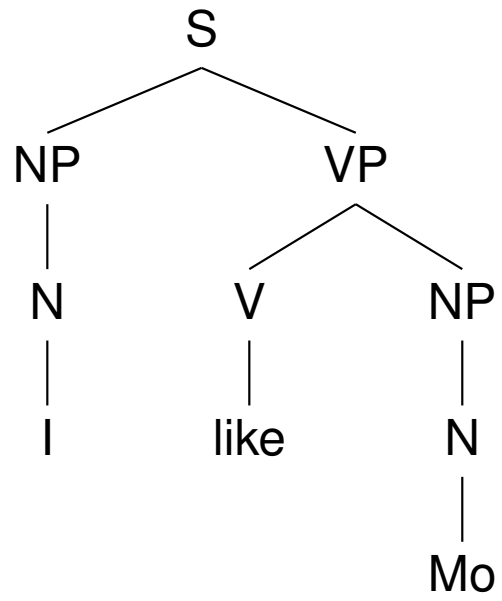

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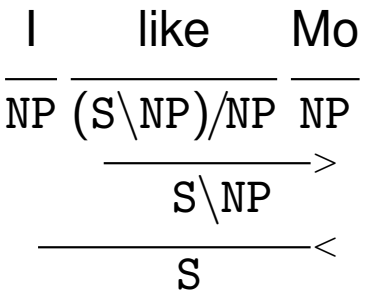

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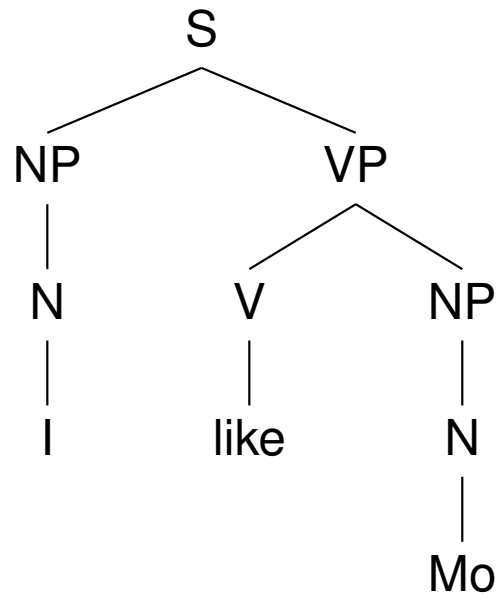

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But needs a separate theory to integrate categories with the structures (Labelling Theory)

Non-local dependencies

(7) a. The cat that I like ⟨the cat⟩
b. (guess) which cat I like ⟨which cat⟩
c. Mo, I like ⟨Mo⟩

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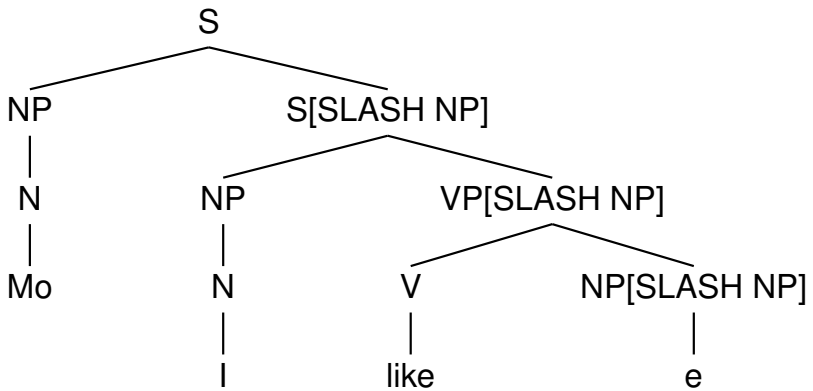
And these can get quite non local:

(8) a. (I saw) the cat that everyone knows that the neighbours refused to look after ⟨the cat⟩
b. (guess) which cat Anson told Karen that he thought it would be difficult for Hedvig to like ⟨which cat⟩
c. Mo, I definitely know that people have always given food to ⟨Mo⟩ on our street.

Extra Mechanisms

(9)



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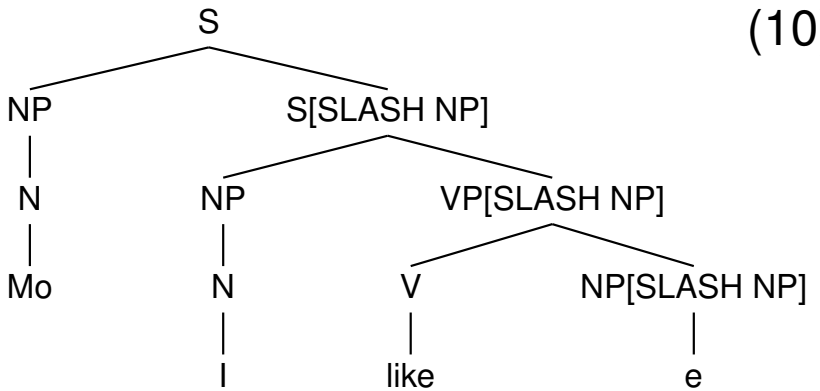

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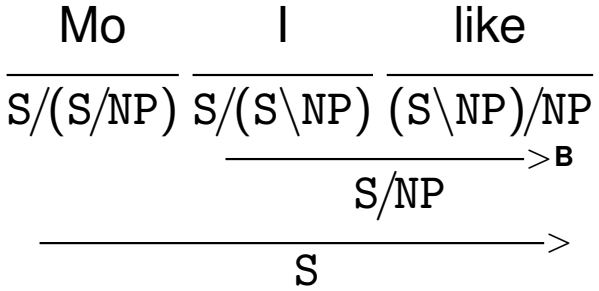

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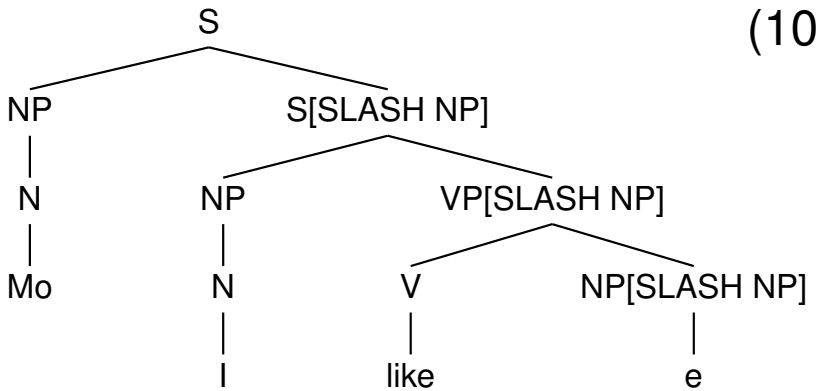

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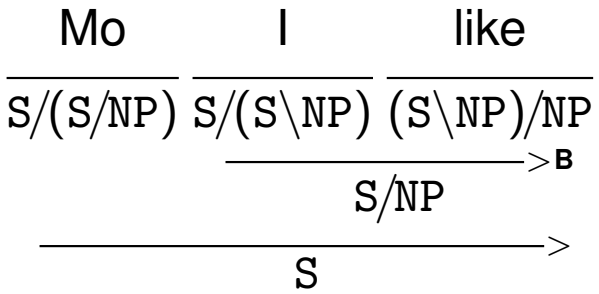

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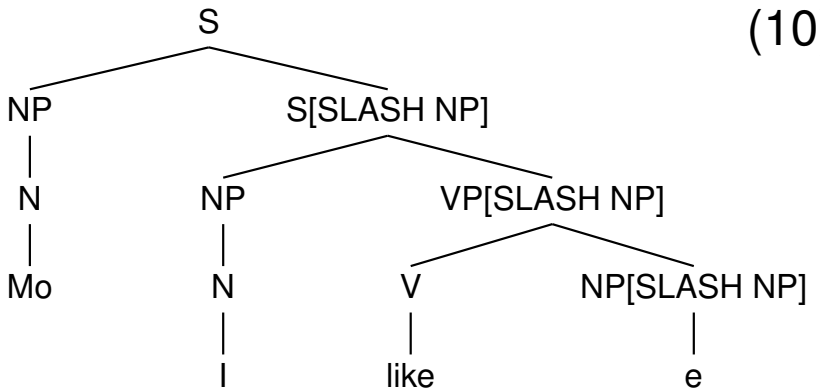

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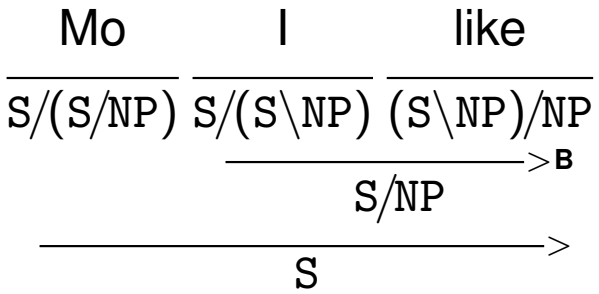

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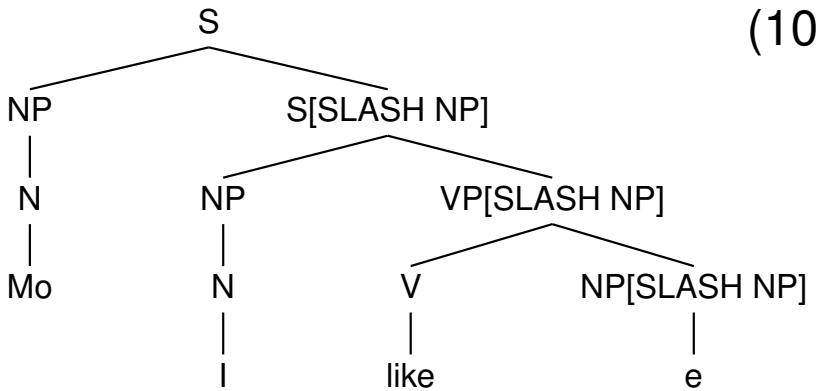

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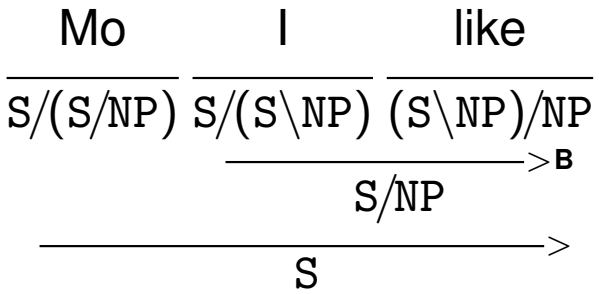

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- slash passing: category valued feature plus special inheritance mechanism
- composition rules: special type raising of the topic and Functional Composition

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One mechanism with two modes of application: External (Merging two separate things) and Internal (Merging part of something with that thing) but there is a well known problem ...

Copies vs Repetitions

Distinguishing copies from repetitions

(12) a. Mo grew
b. Mo grew Mo

(13) a. Merge(Mo, grew) = {grew, Mo}
b. Merge(Mo, {grew, Mo}) = {Mo, {grew, Mo}}

So BPS needs an extra mechanism too, to distinguish (12a) and (12b). Lots of ways of doing this (indices, appealing to theta-theory, etc.) but it would be good to not have this problem.

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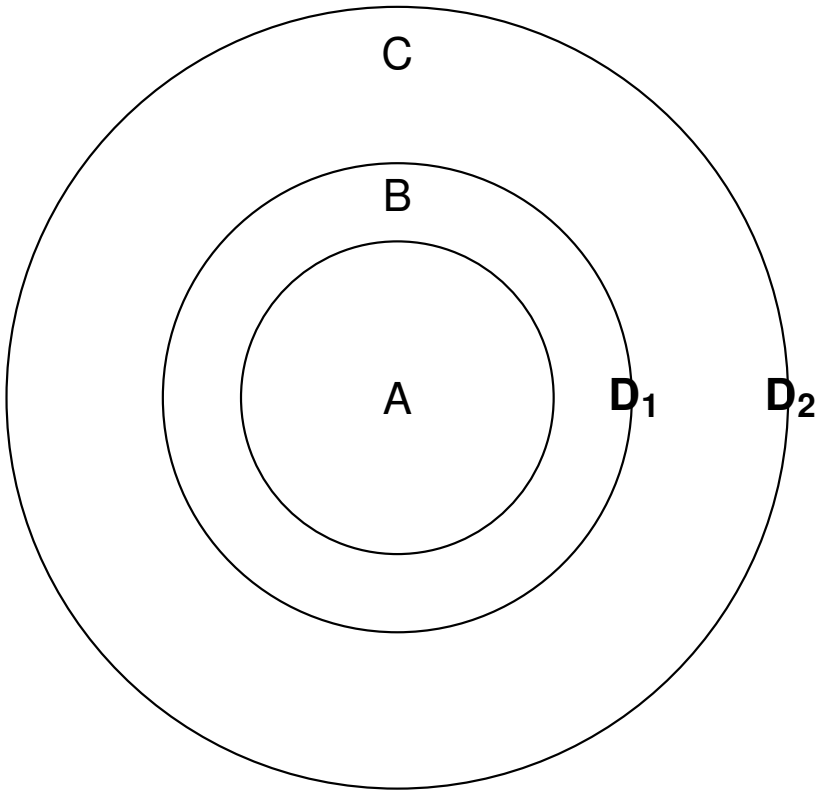
- Merge is a theory of Phrase Structure, not Locality

The Theory of Locality



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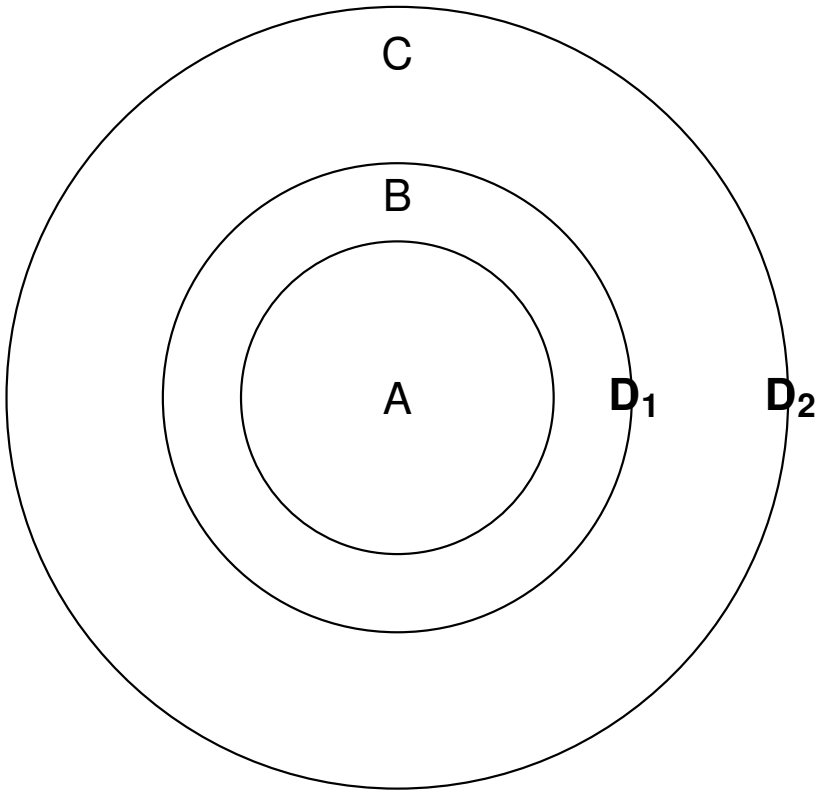

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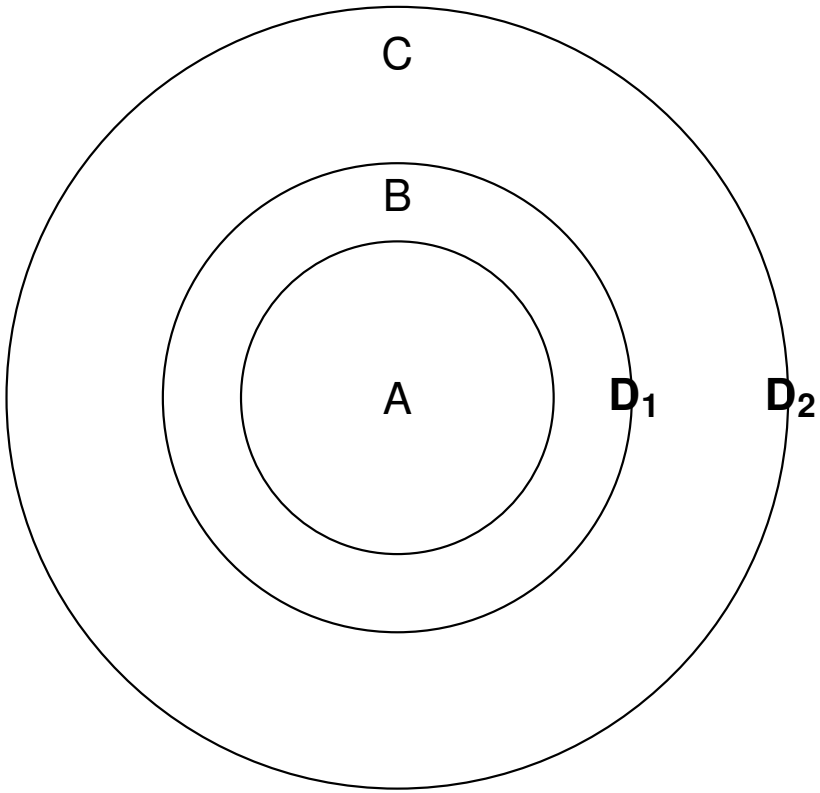

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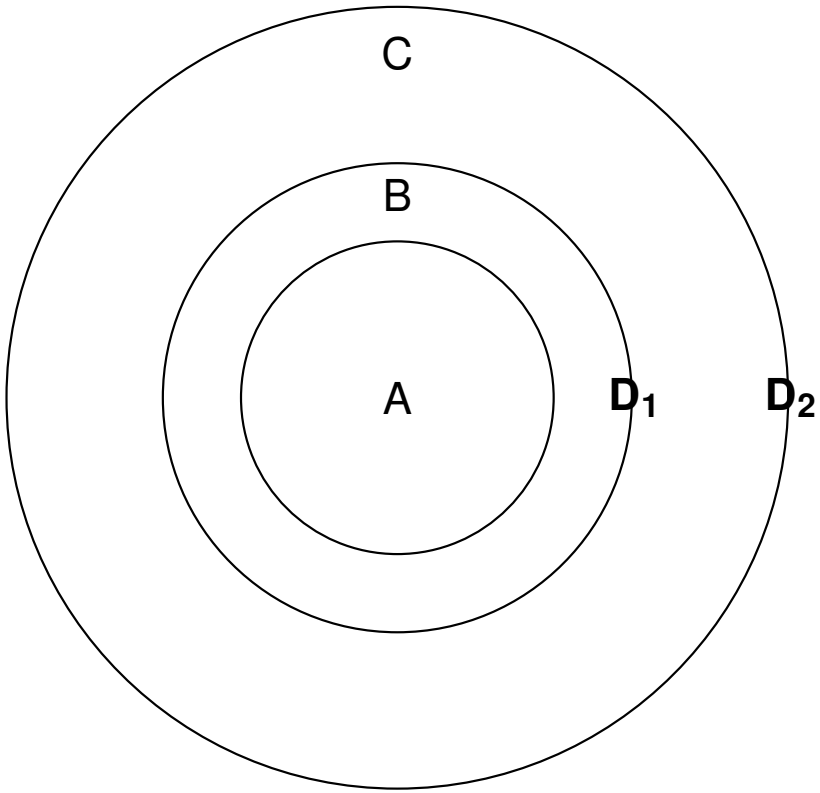

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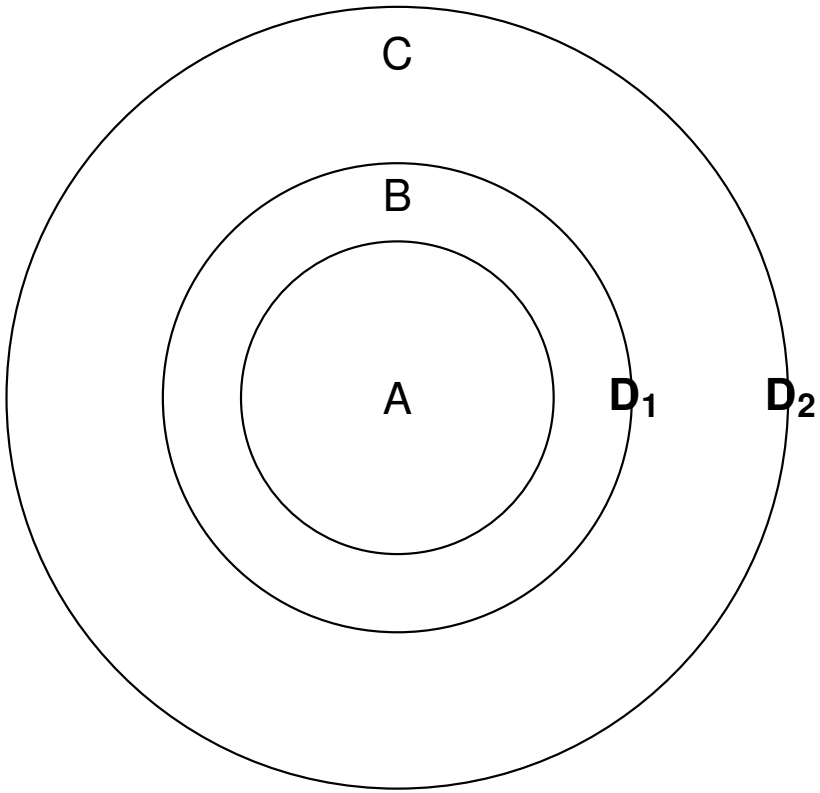

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In Gaelic an AB relation is morphologically signalled by *a*, and the absence of one by *gu(n)*, which then precludes an AC relationship

Phases

Domains like D1 are called cyclic domains (now rechristened phases).
Derivations that cross phases via their edge are called successive cyclic.

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(20)
a. Attract Closest plus a bar on multiple specifiers for certain CPs Wh-Islands
b. Edge Condition (don't look inside phase edges) plus ...
c. Inactivity Condition (don't mess with phrases that have had all their features checked) Subject Islands
d. AntiLocality (movements can't be too short) plus Conditional Phasehood (NP a phase for elements it doesn't theta mark) Complex Noun Phrase Islands

The absence of a good theory here leaves open the space for a rich set of principles that are proposed, somewhat willy-nilly, to capture these various phenomena (I've just listed a few - there are more). I'm not sure other approaches are in a much better position

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Remedy: not more ingredients for our theory but start from scratch with the basics of how structure is built.

Replacing Merge with Subjoin

Thinking back to Curry's notion that the relevant formal objects have a hierarchical structure, I'll pursue the idea that that structure is organized via parthood not set membership, so syntactic objects are mereological, not set-theoretic. The operation is then one that creates part-relations.

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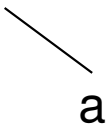

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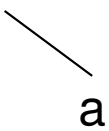
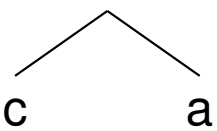


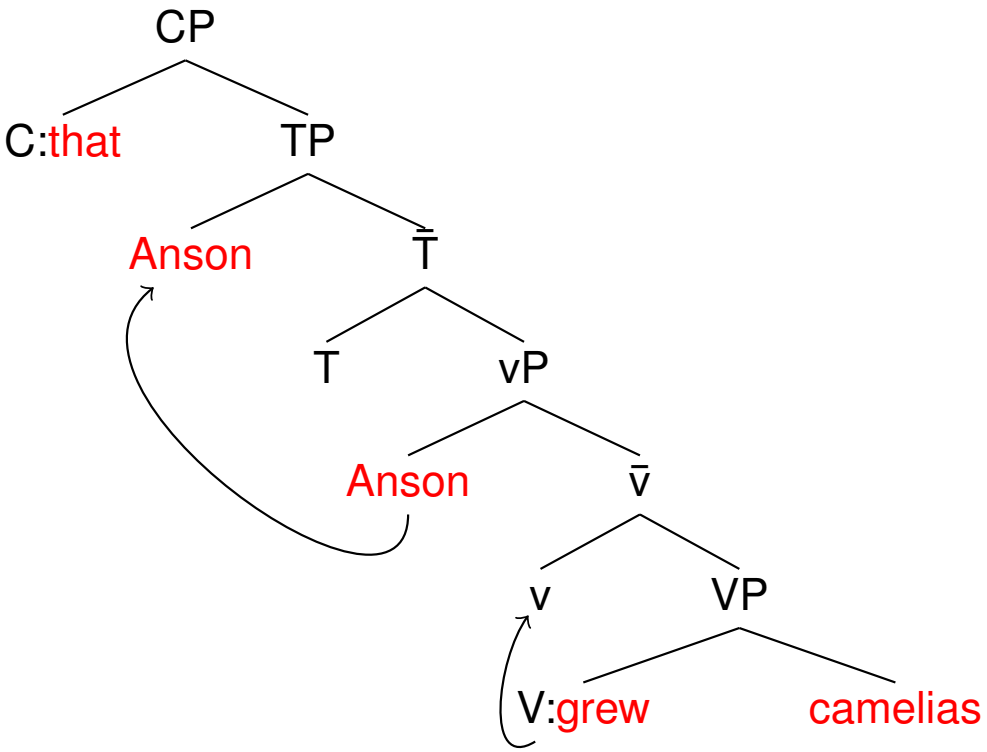
Subjoin(*c*, *b*) $\Rightarrow$



We are adding part relations to an object (after subjunction, *b* has *a* as a part)

Standard Analysis of a Sentence

(25) ... that Anson grew camelias



- v introduces an event variable e; its specifier is interpreted as the Agent of e (Kratzer 1996)
- Different positions of subjects and verbs in different languages arise via movement (Emonds 1978, Koopman and Sportiche 1991)
- T adds temporal semantics and morphology to the verb (Stowell 1993)
- V-v-T-(C) are the Extended Projection of the verb (Grimshaw 1990)

'Officially' this is a big complex set-theoretic structure

Dimensionality

How can we rethink this using Subjoin?

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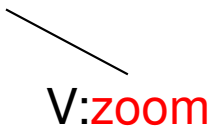

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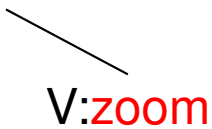

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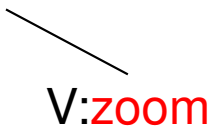

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How is such a structure linearized and phonologized? Come back to this.

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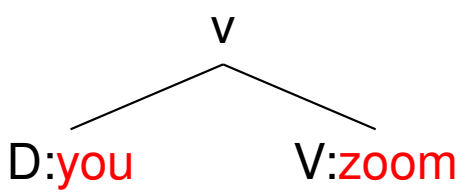

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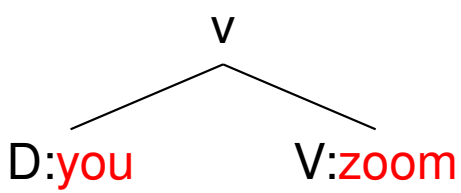

(30) Dimensionality (Part 3)
The maximal dimension is 2 (for now)

Subjunction

Now add tense information in, assuming v is the complement of T, in *You zoomed*.

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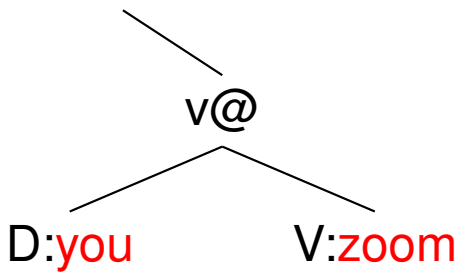

The 'span' (string in dimension 1) zoom⌢v@⌢/D/ is interpreted by the phonology and linearized at the point in the structure marked with @ (following Brody 2000).

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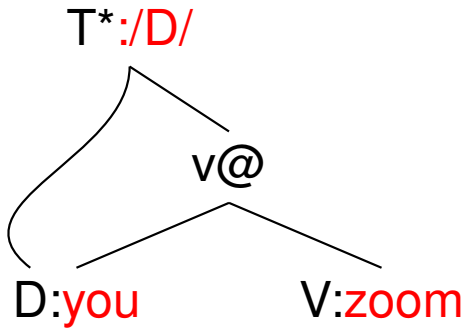

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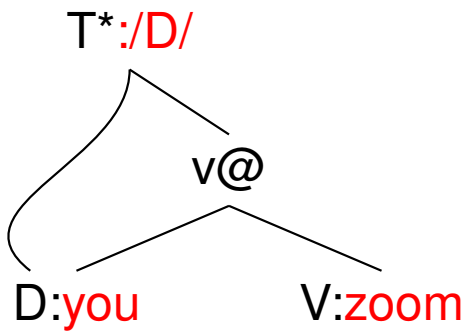

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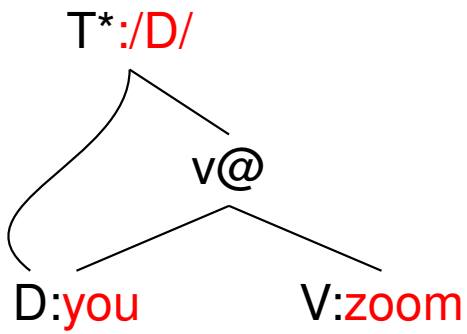

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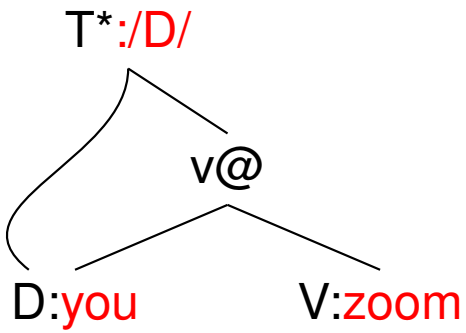
Again, thinking of Curry's point that 'there are various ways in which [a structure] can be associated with a string', how do we linearize this?

Linearization

For English:

- * says put T's 2-part (spec) to the left of (the linearization of) T.



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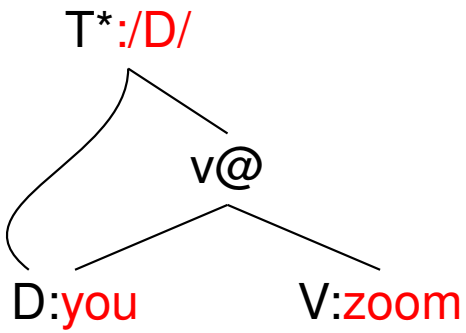

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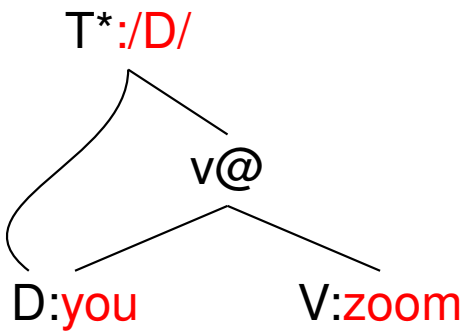

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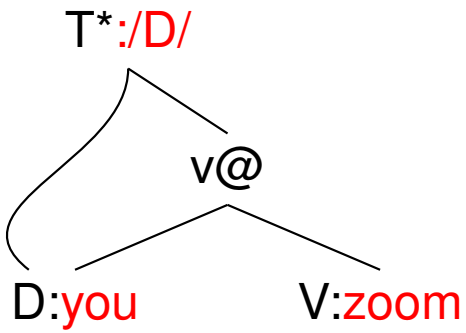

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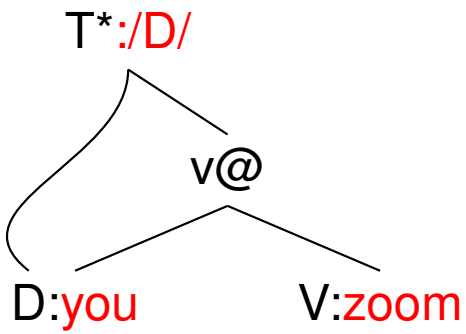

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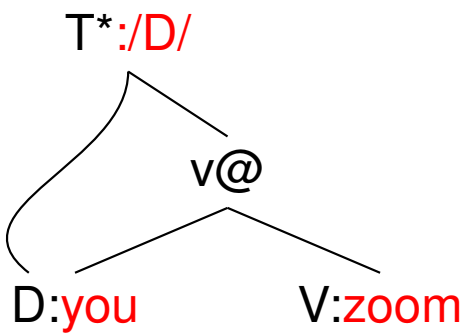

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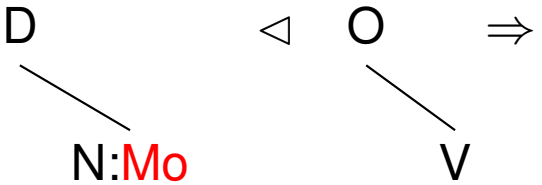
- v@ says put all of the zoom⌢/D/ information at v.
- v's 2-part is already linearized so no change
- V without @ has a zero exponent
- The result for the phonology is the (abstract sequence) *you 0⌢zoom+/D/⌢0*.

Subjunction

An unaccusative like *grow* will work just the same. So think of our previous example of *Mo grew*. Assume that the argument of an unaccusative is the specifier of a functional head, as Borer, Ramchand, and others have argued. I'll just call that head O, leaving it to others to figure out the details:

(33)



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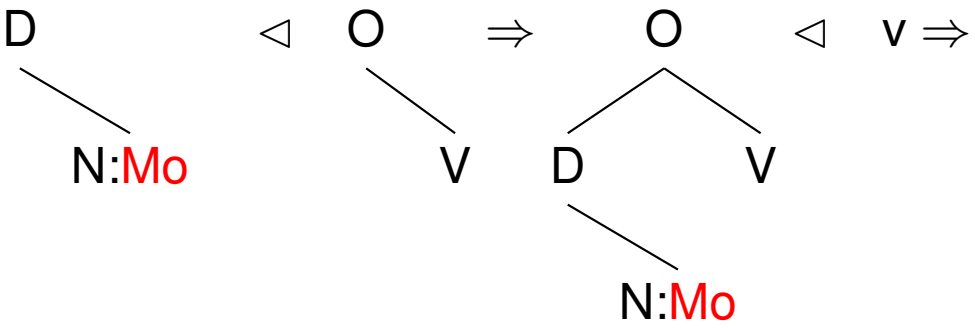

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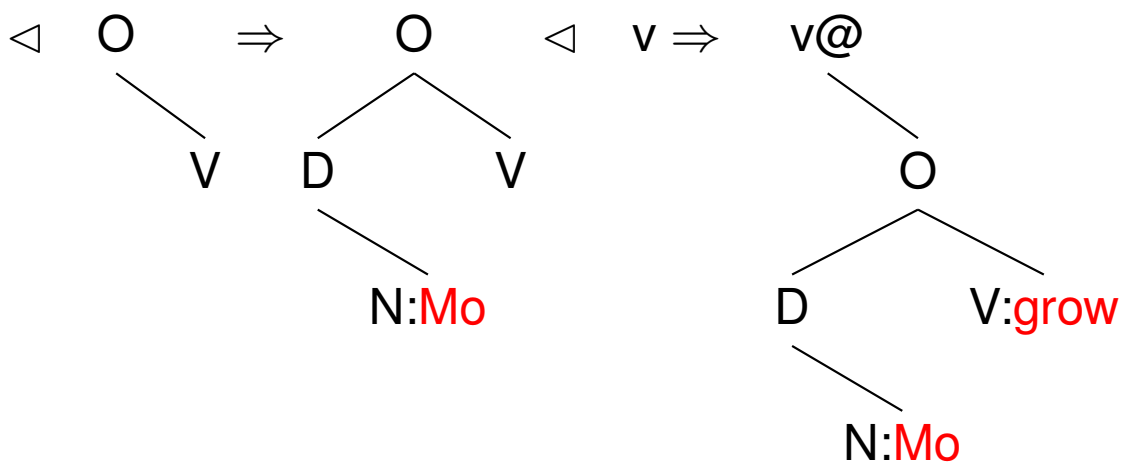

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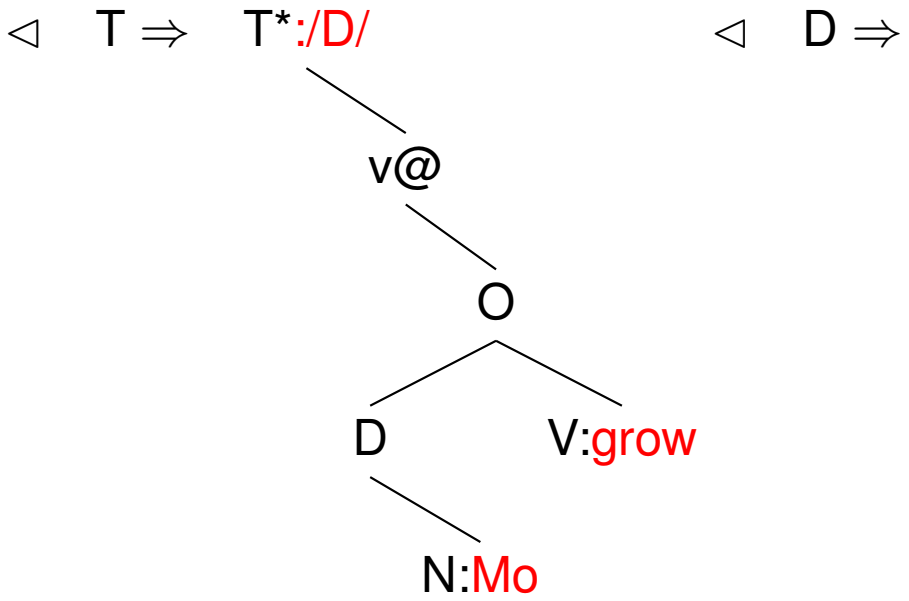

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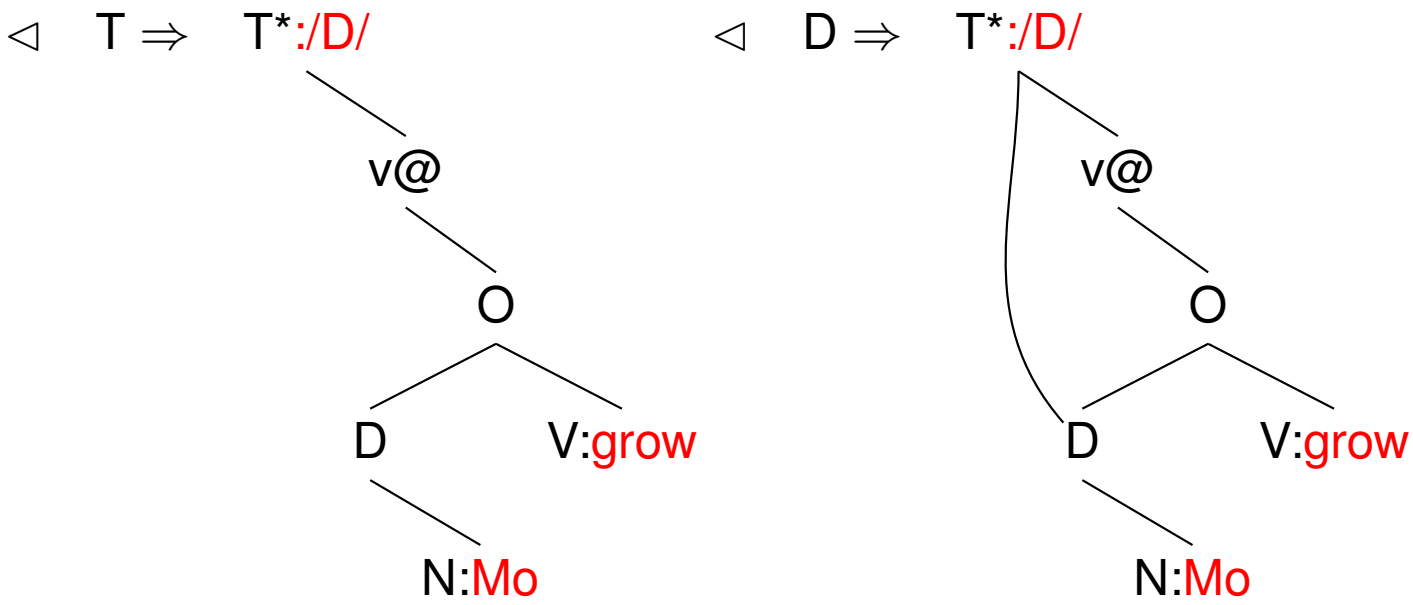

The ‘span’ of categories V⌢O⌢v@⌢T has a single associated exponent grew (Svenonius passim)

Copies vs Repetitions Again

Internal Subjunction of the unaccusative subject vs External Subjunction of an unergative subject result in quite different structures: so no copy vs repetition problem in this system

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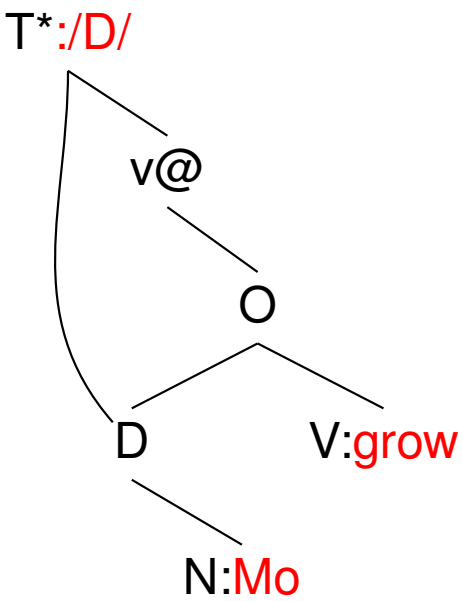

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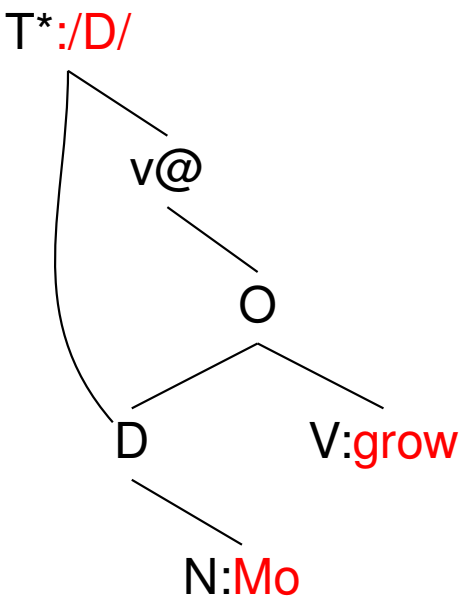

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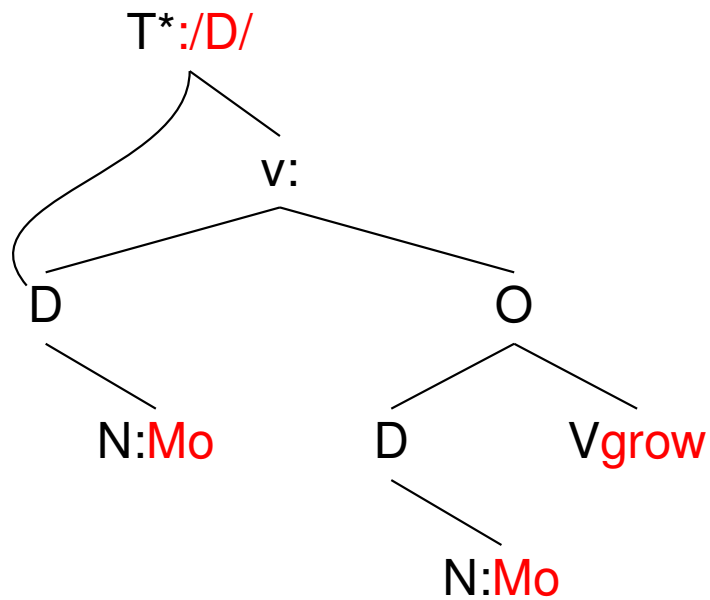

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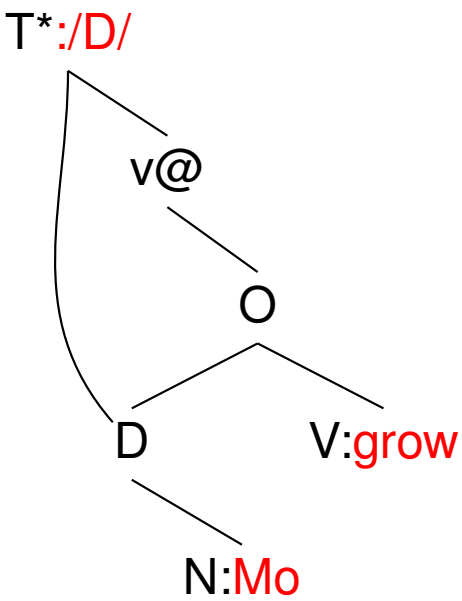

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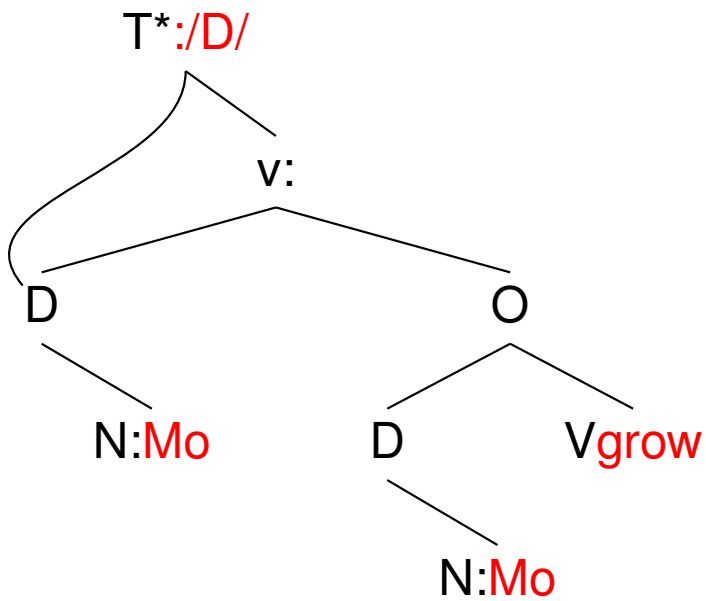
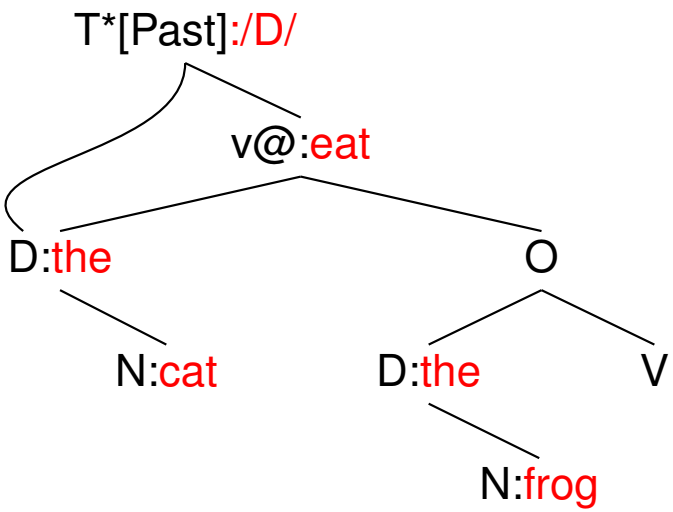


(36) { Mo { T { Mo {v {grow, Mo} }}}}

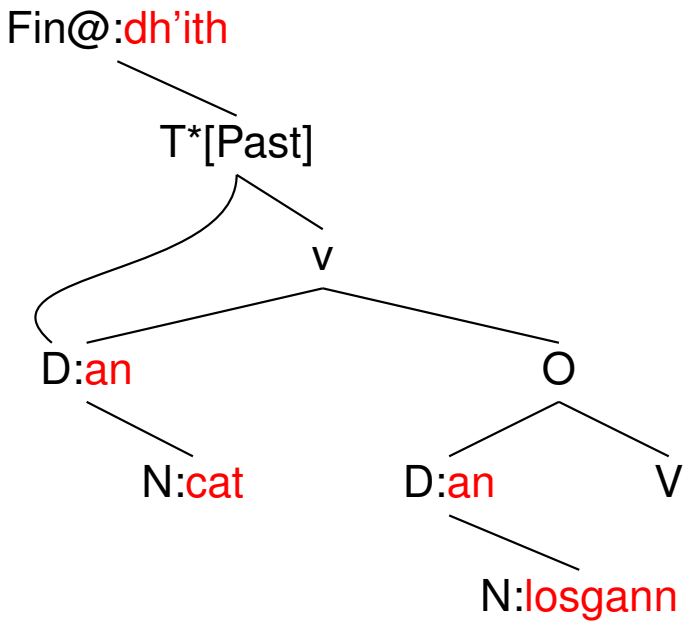
Cross Linguistic Variation



- In English, the verb is pronounced ‘at’ v, and the subject is subjoined to and pronounced ‘as the specifier of’ T
- In English, D is linearized to the left of the linearization of its complement, so the⌢cat precedes eat⌢/D/ which itself precedes the⌢frog

Cross-Linguistic Variation

Scottish Gaelic VSO vs Malayalam SOV



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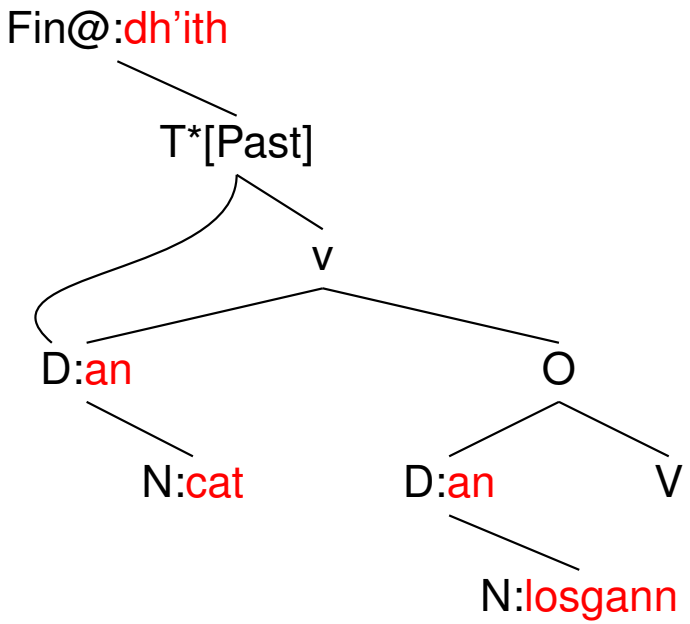

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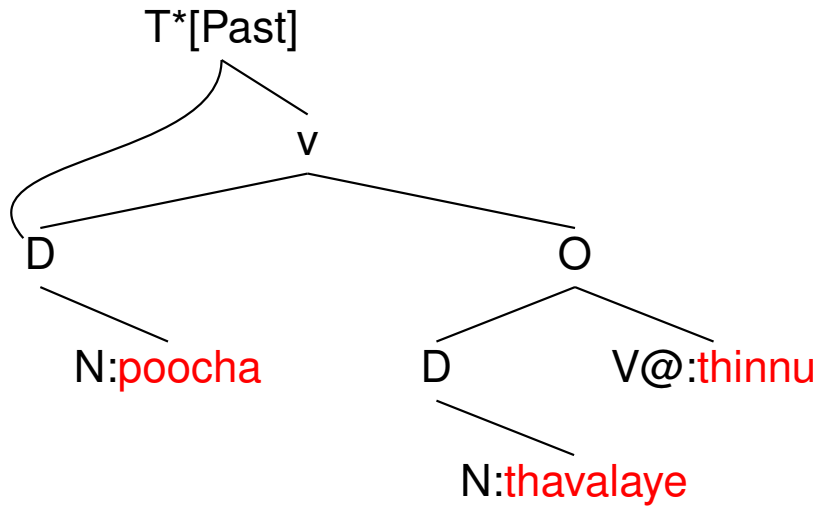

(38) poocha thavalaye thinnu
cat frog eat.PAST
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Locality and Transitivity

(39) Subjoin(α,β) $\Rightarrow$ β modified so that $\alpha < \beta$

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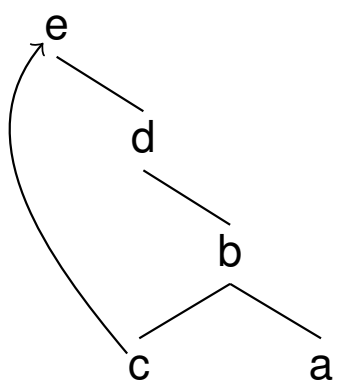

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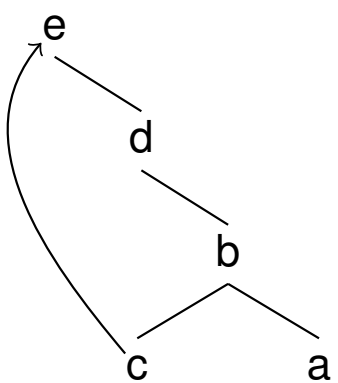

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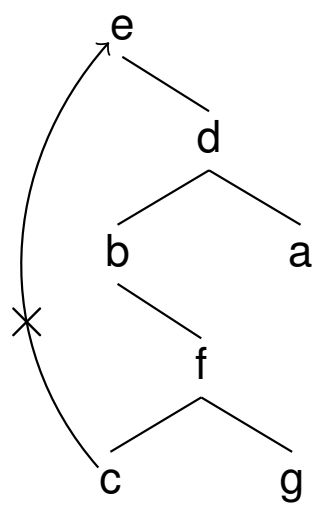

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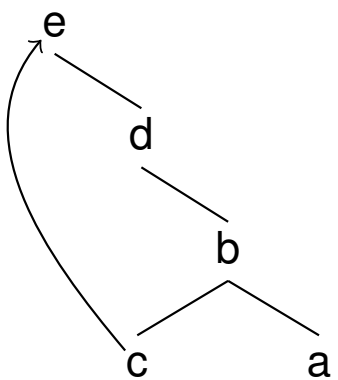

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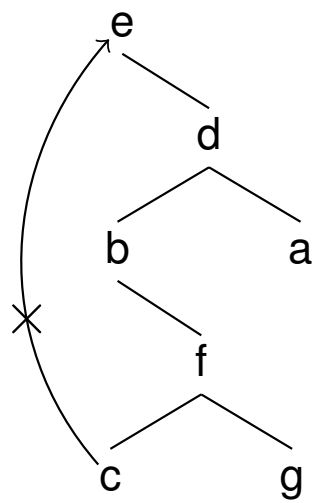

Angular Locality

(41) if γ is a part, then it can subjoin to β only if there is an α s.t. γ is an n-part of α and α is a 1-part of β

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‘Long-distance’ subjunction (from inside a 2-part/‘specfier’ of some object to a higher object (i.e. subjunction across extended projections) is ruled out by Angular Locality

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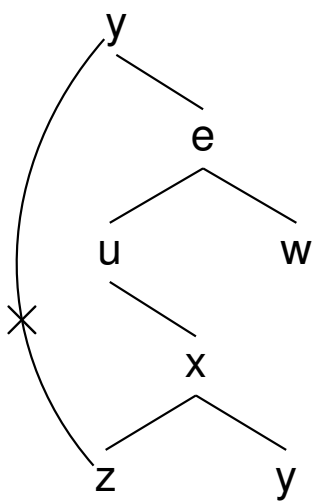

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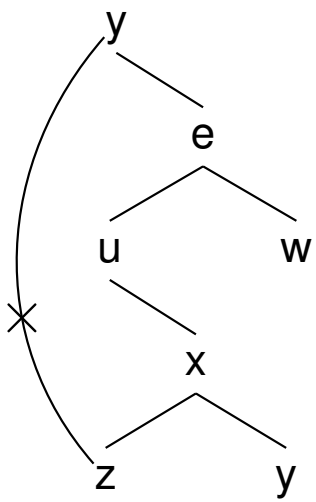

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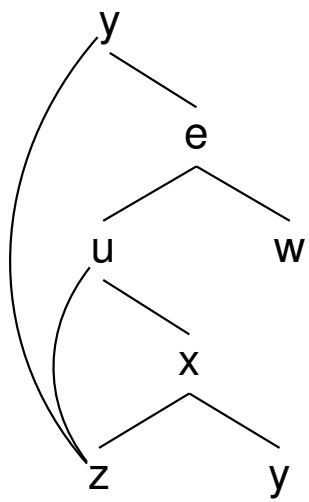

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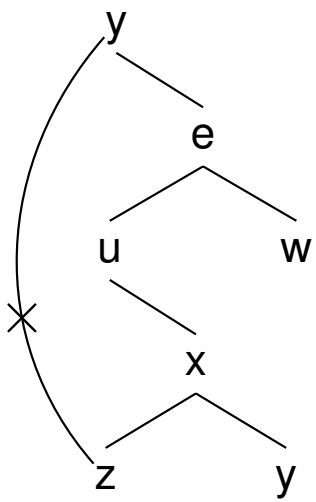

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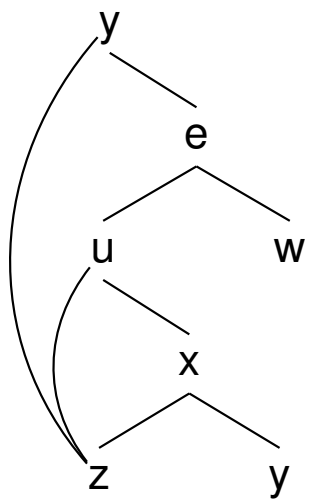

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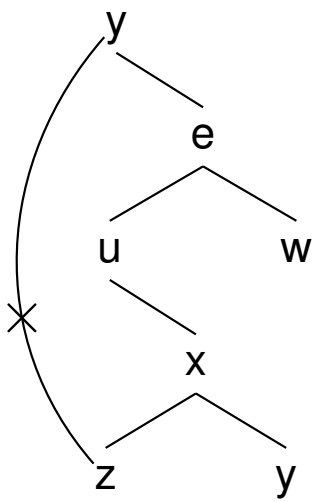

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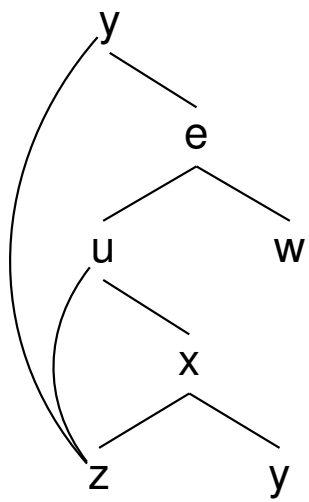

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b. Dimensionality entails that there is only one 'escape hatch' (objects can have only one 2-part, and lower objects are inaccessible because Dimensionality restricts transitivity)

Reflexes of Successive Cyclicity

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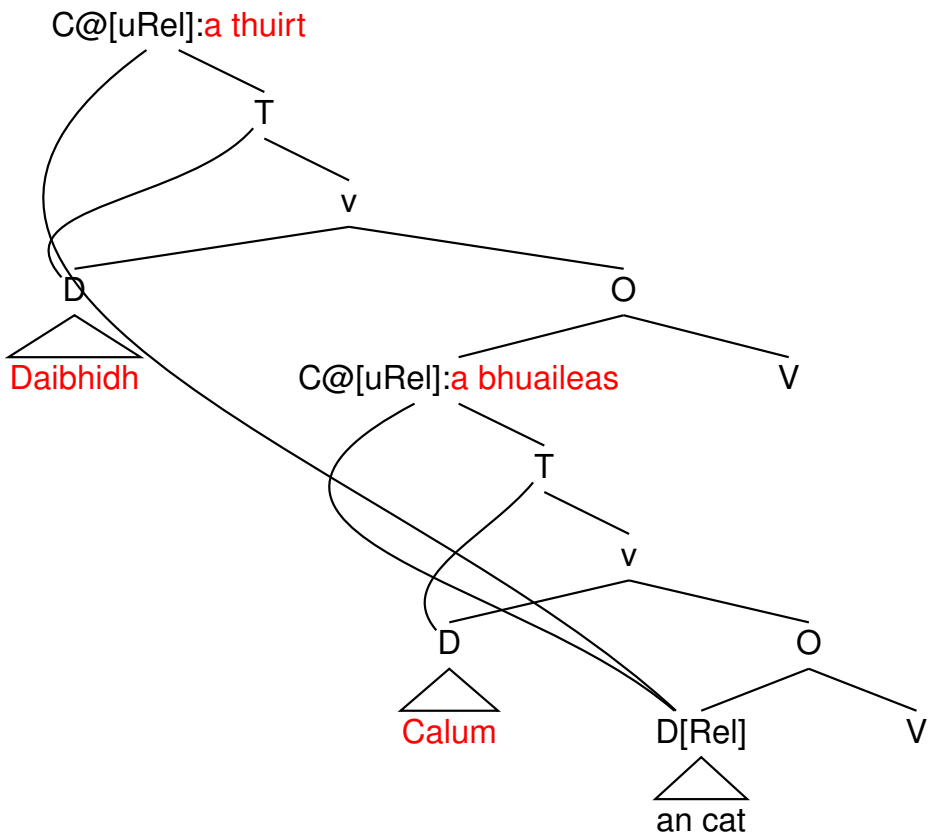

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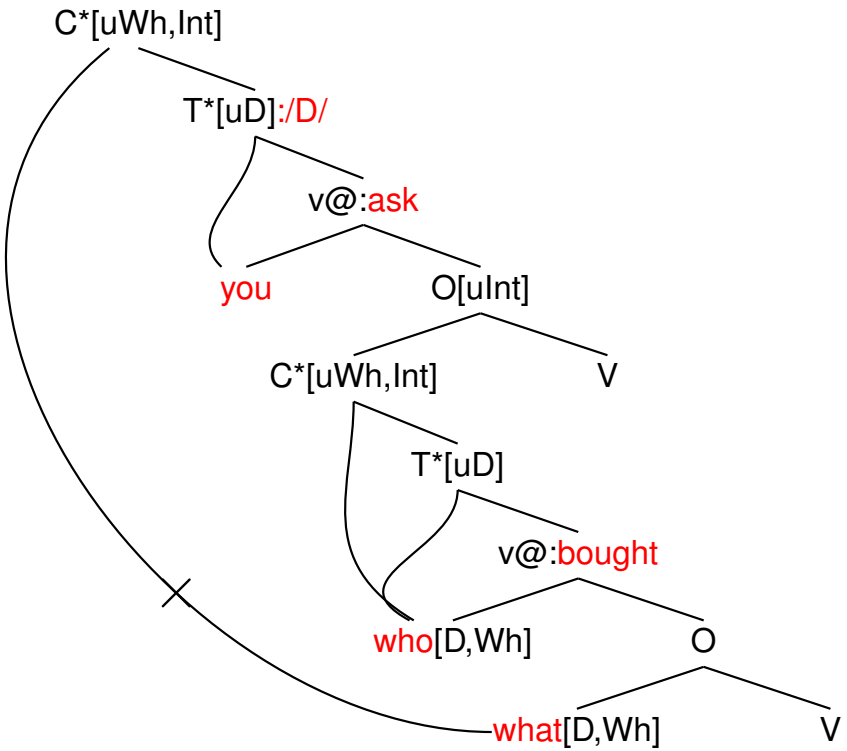
Dimensionality puts an upper limit on specifiers allowing us to begin to think about islands in terms of cyclicity, hence phrase structure, once more

Deriving Wh-Islands

(46) *(guess) what you asked who bought?



Wh-island Violations

Complex (D-linked, Pesetsky 1987) wh-DPs/relatives violate wh-islands (Maling 1978, Rizzi 1982, Cinque 1990 etc.):

(47) a. Which cake did Ans forget [that we had put ⟨which cake⟩ in the fridge]

b. ?/% Which cake did Ans forget [who had put ⟨which cake⟩ in the fridge]

c. ?/% This is the cake that Ans forgot [who had put ⟨which cake⟩ in the fridge]

Why is escape possible from wh-islands? (also Norwegian, Danish, Hebrew etc.)

(48) eyze sefer Yoni taha le-mi ha-mora natna
which book Yoni wondered to-whom the-teacher gave
'Which book did John wonder to whom the teacher gave?' Hebrew

An ‘extra’ escape hatch approach

An extra category c[uDef] above the apparent edge of embedded question (cf. Nyvad et al. (2017))

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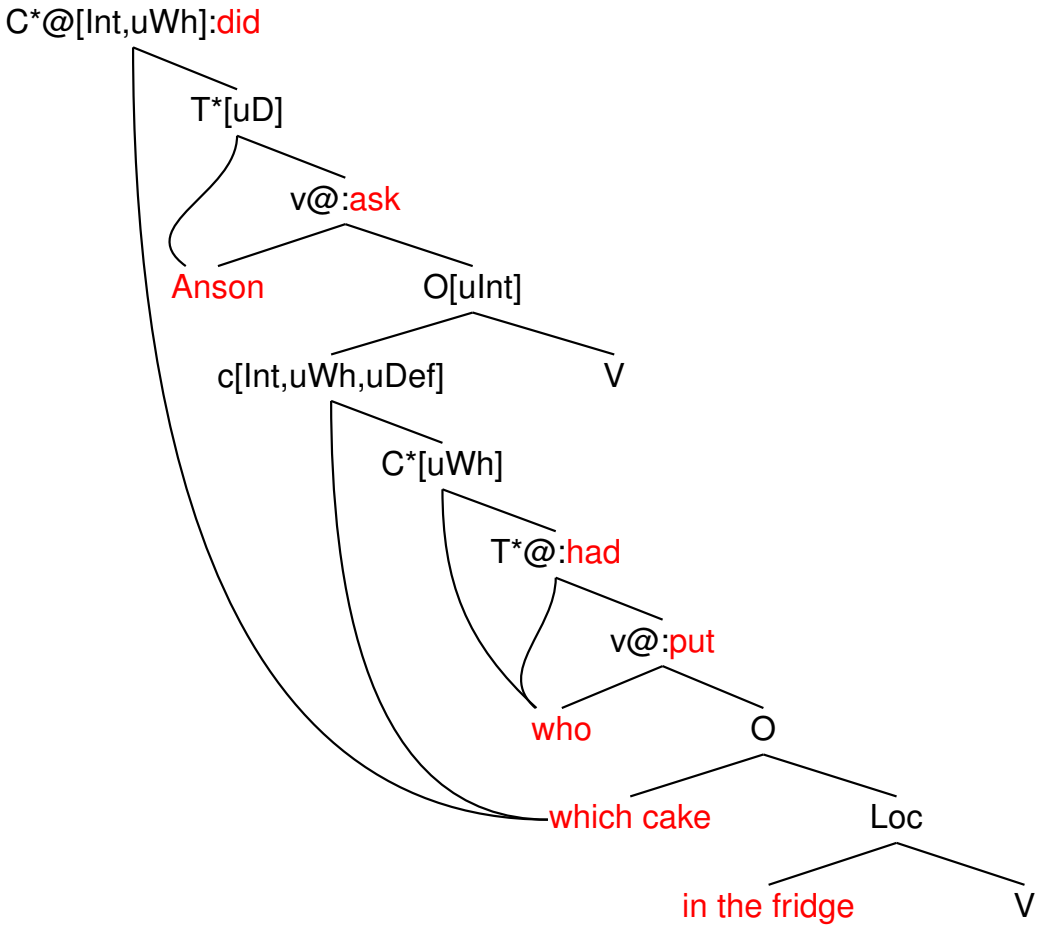

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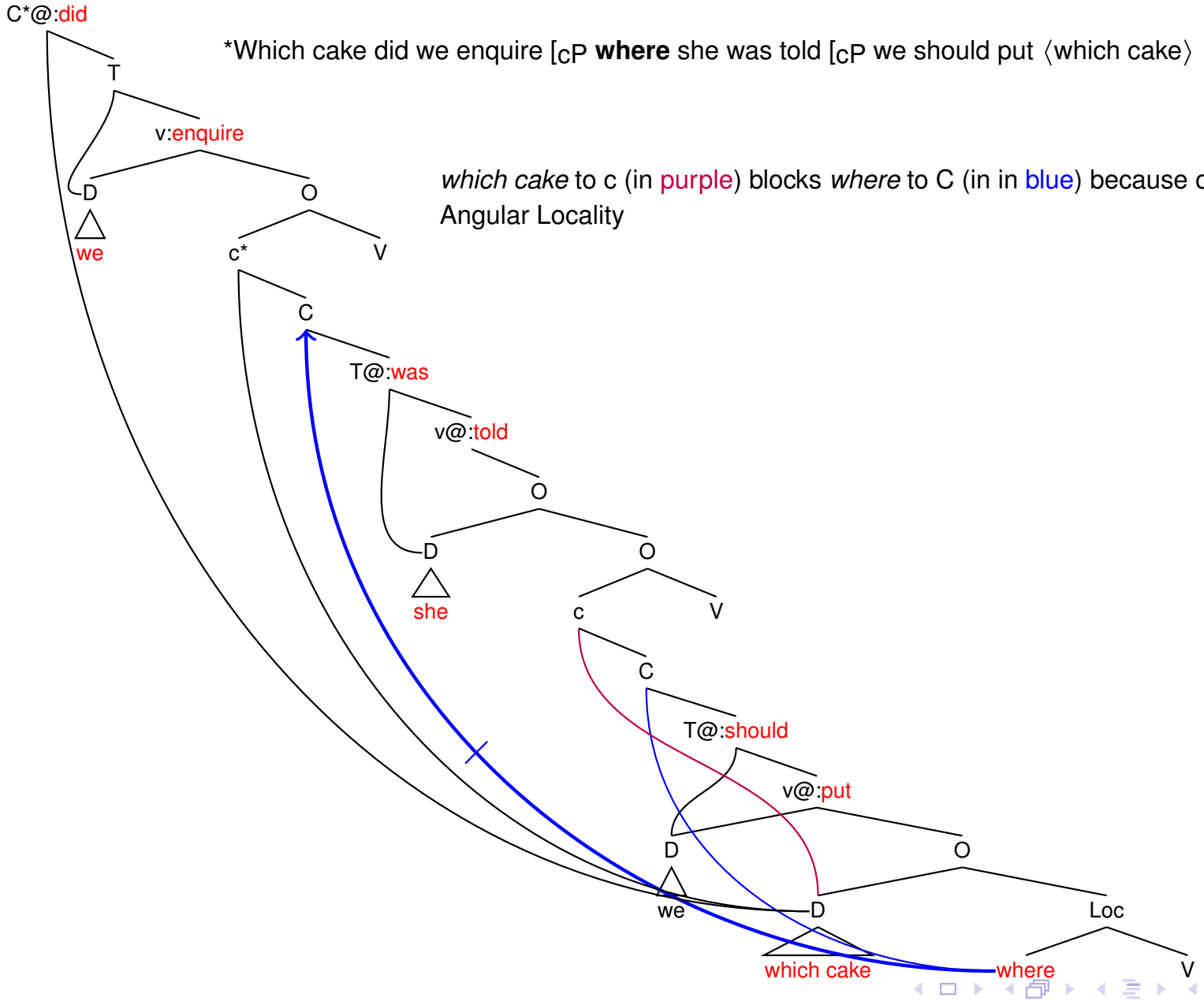
(51) Wh-Island Re-Emergence (WIRE):
If it is possible to form a long distance dependency across a wh-island, the expression that induces the island must remain in its original clause. If the island inducing expression extracts out of its clause, the long(er)-distance extractee cannot cross it.

Explaining the contrast

*Which cake did we enquire [$_{CP}$ **where** she was told [$_{CP}$ we should put ⟨which cake⟩ ⟨**where**⟩

which cake to c (in purple) blocks *where* to C (in in blue) because of Angular Locality



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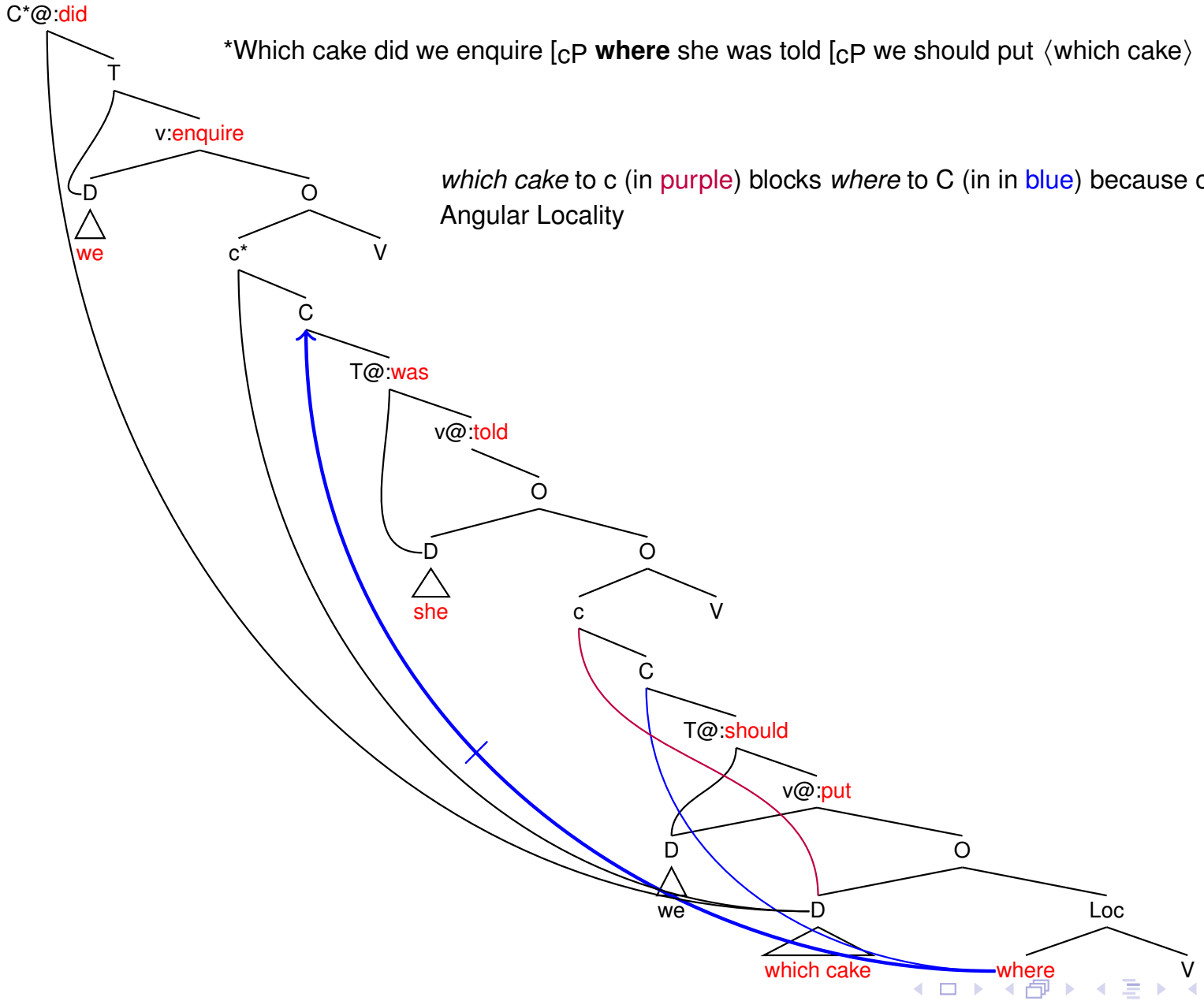

Wh-Island Re-Emergence (WIRE)

Same effects in Norwegian, Danish (not shown), Hebrew

(52) *Dette er kaka som vi spurte hvor hun ble bedt om å
this is cake.DEF SOM we asked where she was asked about to
plassere
put.
'This is the cake that we asked where she was asked about to put.'

(53) *eyze sefer$_2$ shaxaxta [$_{CP}$ le-mi$_1$ Rina xashva [$_{CP}$ she-Dan
which book forgot.2SG DAT-who Rina thought that-Dan
shalax t_1 t_2]]
sent
'Which book did you forget to whom Rina thinks that Dan sent?'

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While it is possible to extract two items from the same clause, one to the edge, one further, it should be impossible to extract three.

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Engdahl (1986) gives the magnificent:

(54) Var det Södersjukhuset som hälsovårdsmyndigheterna lät
was it South-Hospital-DEF that Public-Health-Department-DEF was
undersöka [$_{CP}$ **vilka färskvaror** det var oklart [$_{cP}$ ⟨vilka färskvaror⟩ [$_{CP}$
investigating which produce it was unclear
vilken grossist som ⟨*vilken grossist*⟩ levererat ⟨**vilka färskvaror**⟩ till
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'Was it the South Hospital that the Department of Public Health was investigating which produce it was unclear which caterer had delivered that produce to that place.'

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Engdalh remarks that (54) would 'sound extremely odd' but suggests that the theory could not mark it ungrammatical because that would involve 'counting', so she puts the unacceptability down to the parser. The current theory rules it out as a straightforward WIRE effect.

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- The system derives as a theorem the requirement that dependencies through local domains must go through their edges,
- and Dimensionality places a limit on the number of 2-parts a category can have (unlike in the Merge system). These two factors motivate why syntax is not local where it isn't.

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- The theory unifies these via Angular Locality in quite a different way to Subjacency (or to other 'geometrical' approaches like Connectedness)

Adger, David. to appear. *Mereological syntax: phrase structure, cyclicity, and islands*. Cambridge MA: MIT Press.

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Engdahl, Elisabet. 1986. *Constituent Questions*. Dordrecht: D. Reidel Publishing Company.

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Pesetsky, David. 1987. Wh-in-situ: Movement and unselective binding. In Eric J. Reuland and Alice G. B. ter Meulen, eds., *The Representation of (In)definiteness*, 98–129, Cambridge, Massachusetts: MIT Press.

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Rudin, Catherine. 1988. On multiple questions and multiple wh-fronting. *Natural Language and Linguistic Theory* 6:445–501.

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And violate wh-islands

(56) Vidjah edna kniga, kojato se čudja koj znae koj prodava
saw.1S a book which wonder.1S who know.3S who sells
⟨kojato⟩
⟨which⟩
'I saw a book which I wonder who knows who sells.' Bulgarian

Classical Cluster Analysis

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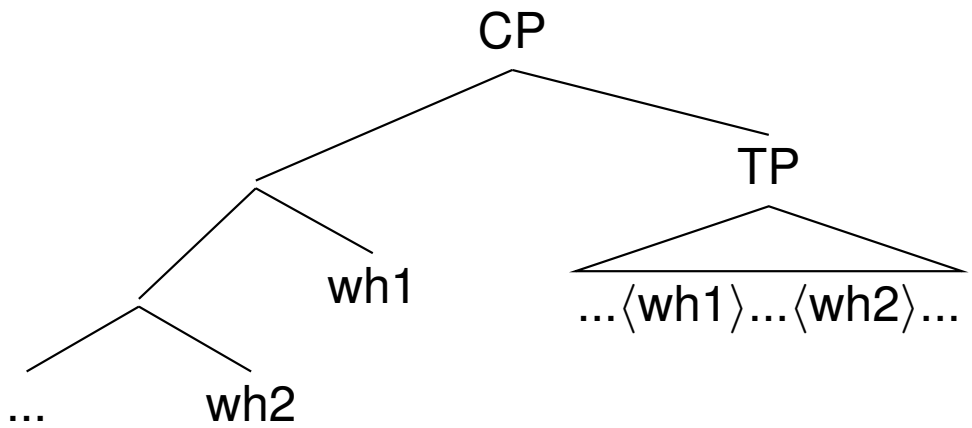

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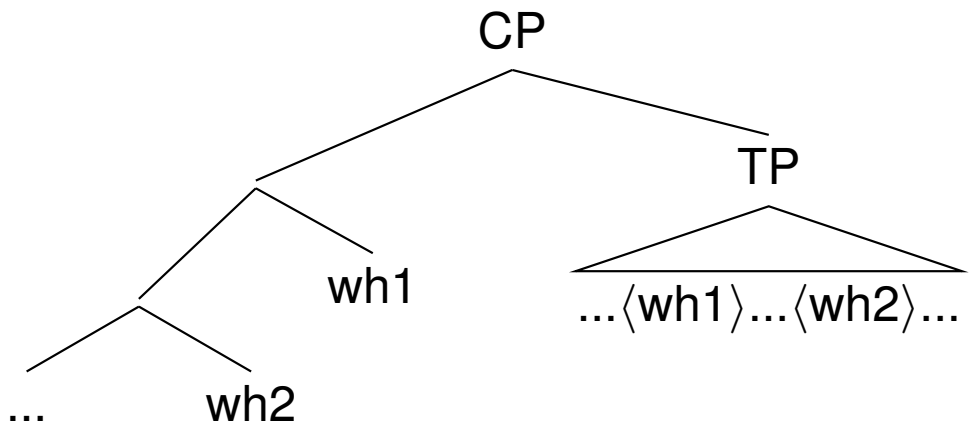

In current terms this requires a parallel (or sidewards) Merge analysis, where wh1 Merges with wh2 even though wh2 is Merged with some clausal projection already.

Parallel Merge Impossible

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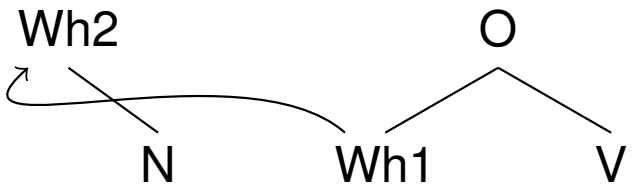

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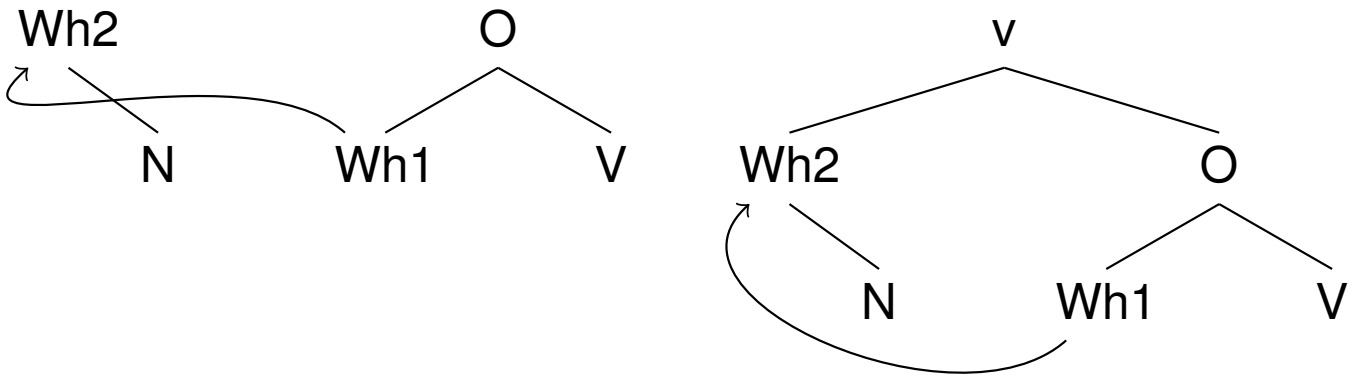

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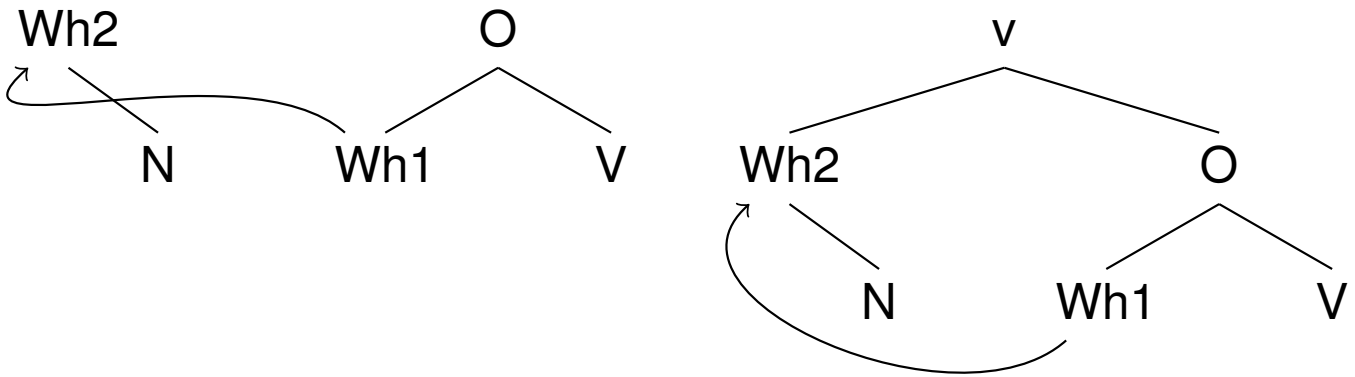
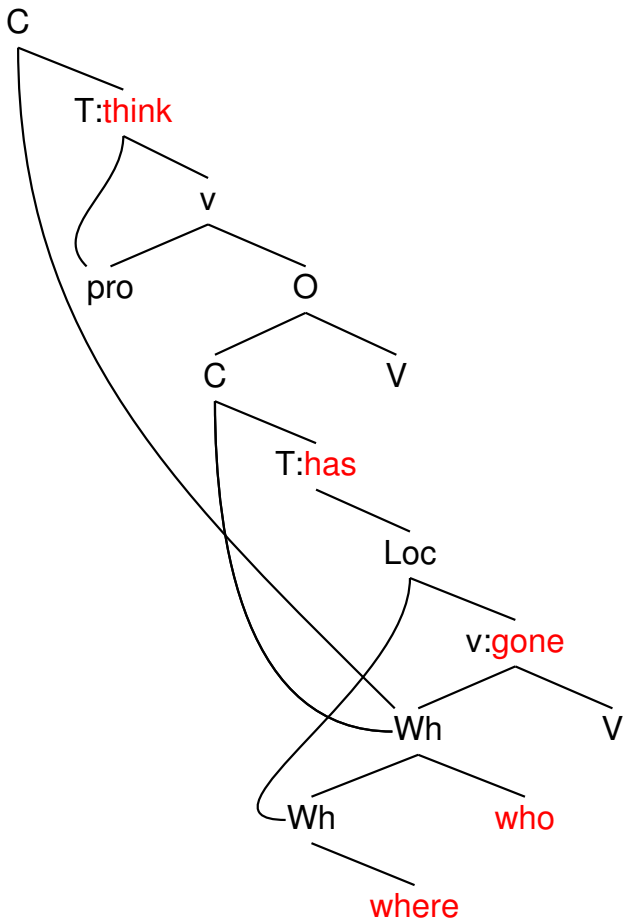


'Parallel' or 'Sidewards' Subjoin is impossible

A ‘declustering’ analysis

cf. Grewendorf (2001)



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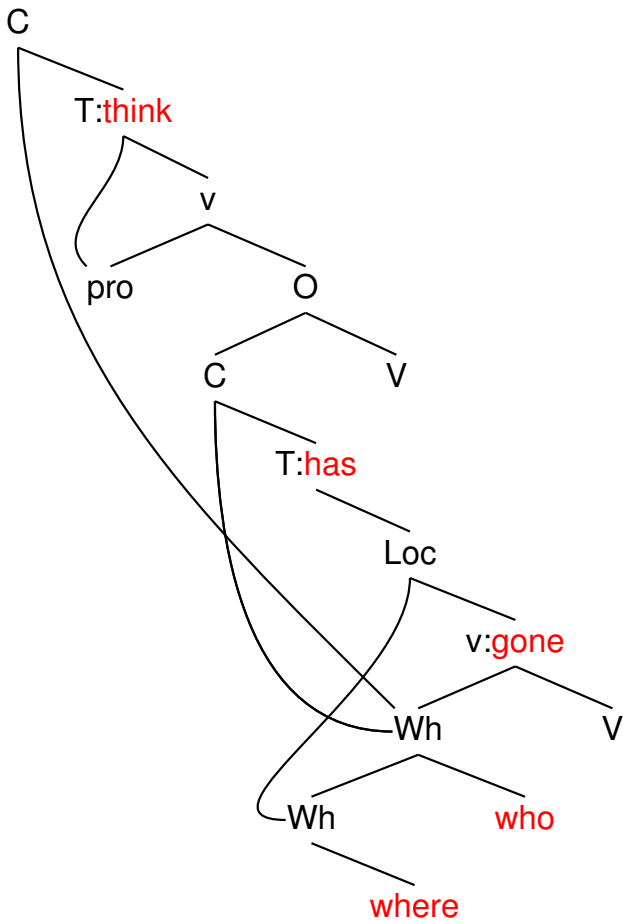

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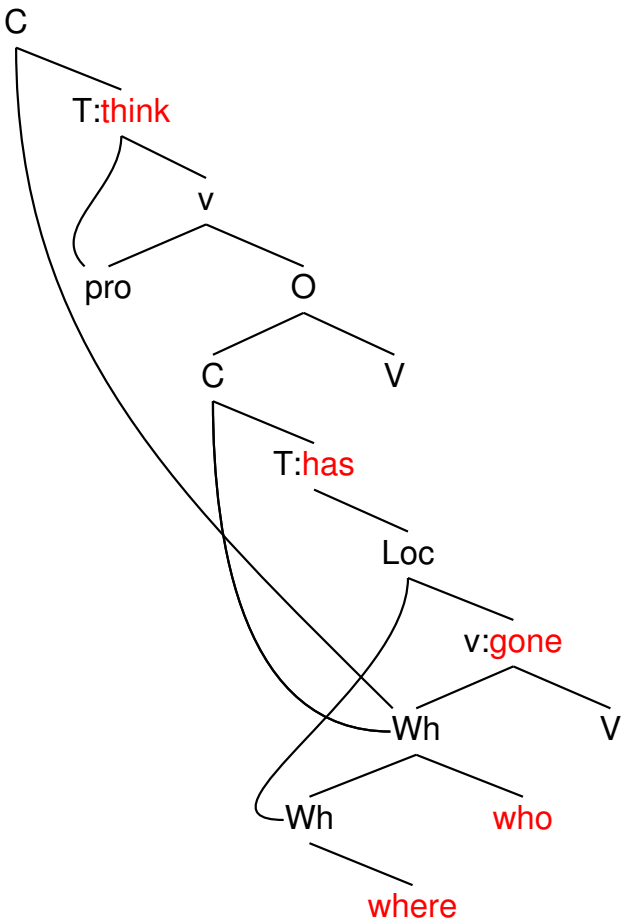

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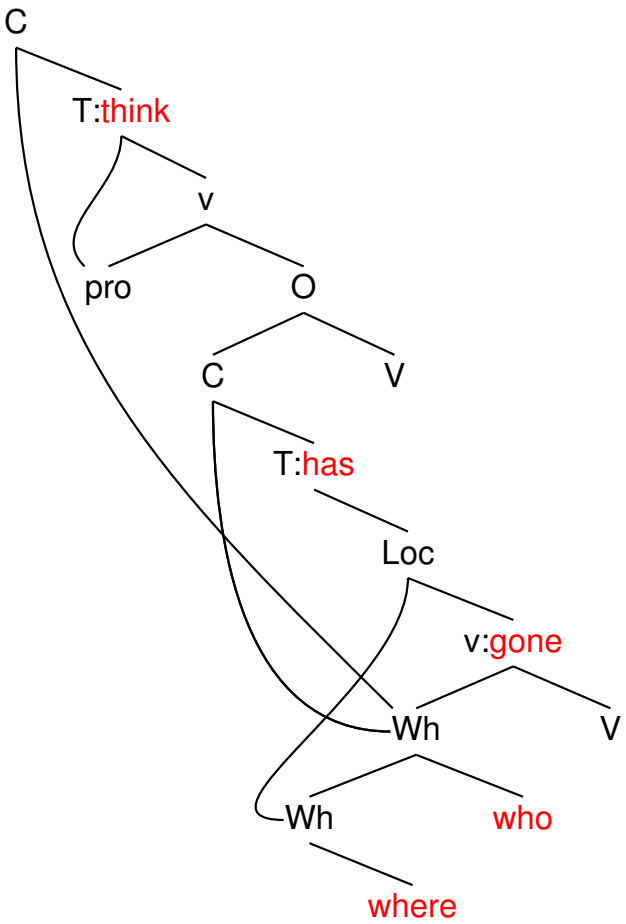

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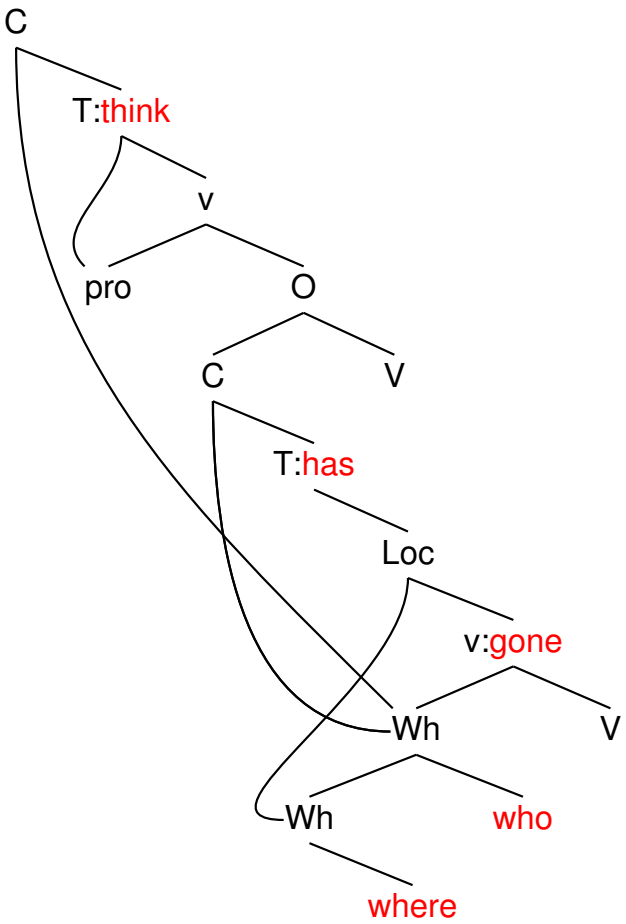

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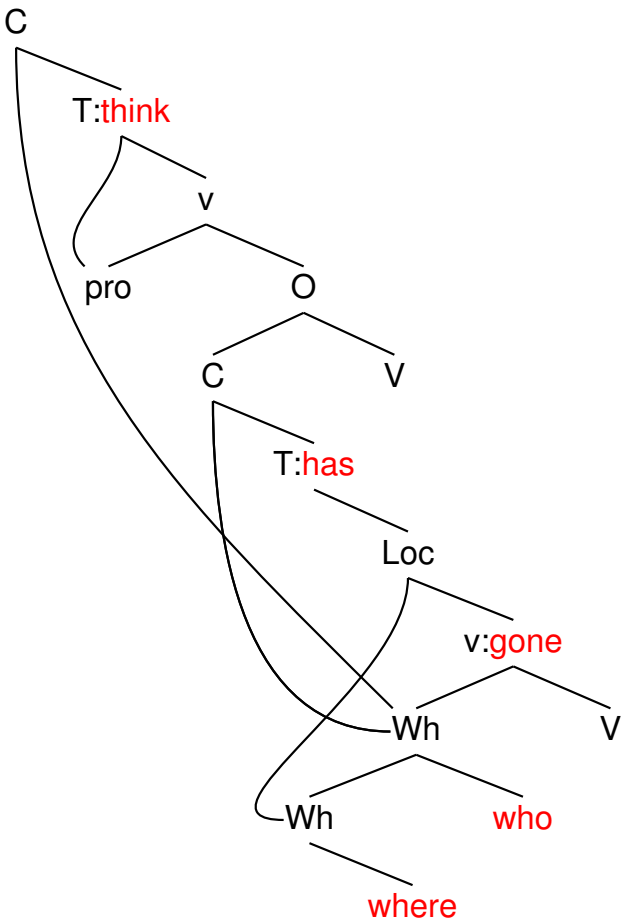

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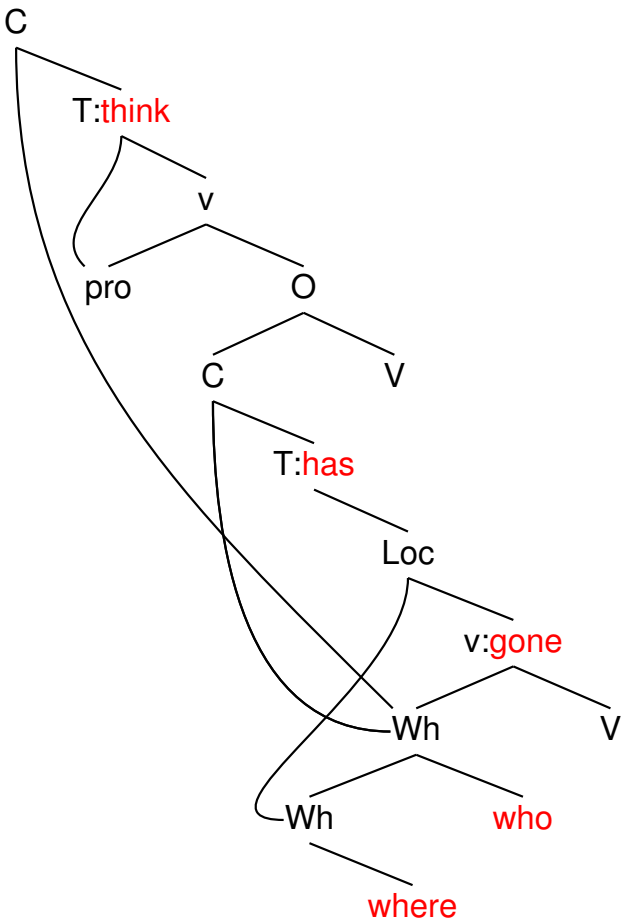

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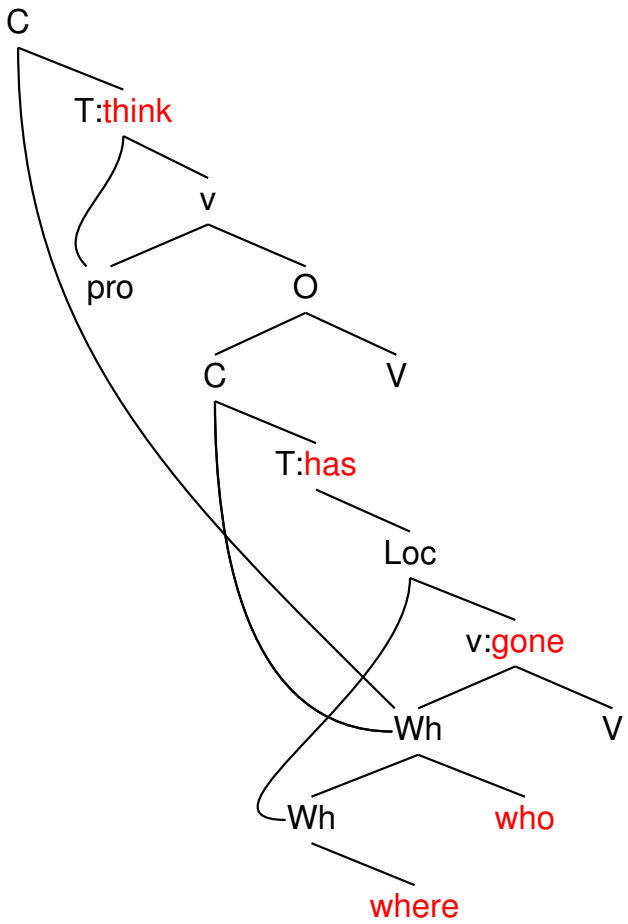

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- now because Angular Locality is satisfied, Subjoin the cluster to matrix C

A (correct) prediction

WIRE effect should vanish: subjunction of the cluster to a higher C will make any wh-expression which is a 2-part of that cluster also a 2-part of whatever the higher C is a 2-part of, and hence, by Angular Locality, able to subjoin outside of that higher C.

(61) Čoveka, kojto ne znaeš [$_{CP}$ kakvo kazvat [$_{CP}$ če e kupil]]
man who NEG know.2S what say.3P that has bought
'The man who you don't know what they say that he bought ...'