Verb Clusters and the Semantics of Head Movement

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- *Main Claims:*

  1. Head movement can have semantic effects. It can hence not be a PF operation (*pace* Chomsky 2001).

  2. To obtain the desired semantic effects of head movement, the direct combination of functors must be possible ⤳ Function Composition

  3. The instance of head movement we discuss is an instance of symmetry-breaking movement. Structures can be unlabelable and movement is employed to rescue them.

- *Data:*
  Scope restrictions in infinitival complementation structures in German

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1 Introduction: Long Passive and Scope

- It is well-known that certain verbs embedding *zu*-infinitives allow for Long (Distance) Passives in German (Höhle 1978, von Stechow & Sternefeld 1988, Haider 1993). Passivization of such verbs may have two outcomes:

  1. The properties of the embedded clause remain unchanged (Local Passive).

  2. An otherwise accusative-bearing element in the embedded clause receives nominative case and controls agreement on the matrix verb (Long Passive).

- (1) and (2) provide examples. (1) is the active clause. (2a) exemplifies the corresponding local passive; (2b) provides the long passive counterpart.

(1) *Active:*
weil   er **den Traktor**   zu reparieren vergessen hat
because he the tractor.ACC to repair   forgotten has
'because he forgot to repair the tractor'

(2) a. *Local passive:*
weil   **den Traktor**   zu reparieren vergessen wurde
because the tractor.ACC to repair   forgotten was

  b. *Long passive:*
weil   **der Traktor**   zu reparieren vergessen wurde
because the tractor.NOM to repair   forgotten was
'because it was forgotten to repair the tractor'

- Note that it is the matrix verb that undergoes passivization in (2b) but an argument of the embedded (infinitival) verb whose case value changes.

- *Scope:*
  As Bobaljik & Wurmbrand (2005) emphasize, the change in case is accompanied by a change in scope. The embedded object may have embedded scope if it receives accusative but it obligatorily takes scope over the matrix verb in the long passive:

(3) *Active:*
weil   er **alle Traktoren**   zu reparieren vergessen hat
because he all   tractors.ACC to repair   forgotten has   [*forget* ≫ ∀]
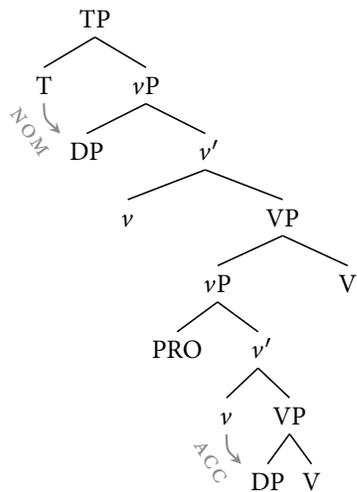
(4) a. *Local passive:*
weil   **alle Traktoren**   zu reparieren vergessen wurde
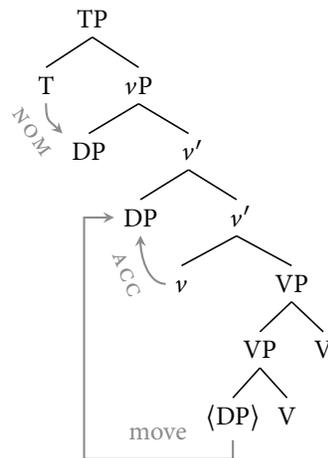because all   tractors.ACC to repair   forgotten was   [*forget* ≫ ∀]

b. *Long passive:*
weil **alle Traktoren** zu reparieren vergessen **wurden**
because all tractors.NOM to repair forgotten were
$$[\textit{*forget} \gg \forall; \forall \gg \textit{forget}]$$

- Bobaljik & Wurmbrand (2005) pursue an analysis that ties the emergence of the wide scope reading to case: Scope is a consequence of case assignment.

- In particular, they assume, following Wurmbrand (2001):

  1. The complement clause of the verb *vergessen* 'forget' is alternatively a VP or a *v*P.

  2. Accusative case is assigned by non-defective (i.e., active) *v* heads.

  3. Passivization involves projection of a defective *v* head, which does not introduce an external argument and does not assign case.

  4. To receive case from matrix material, an element inside the infinitival clause has to raise.

  5. *Crucial assumption:*
     AGREE for case takes place at LF. Therefore, an element cannot take scope below the position in which its case is valued.

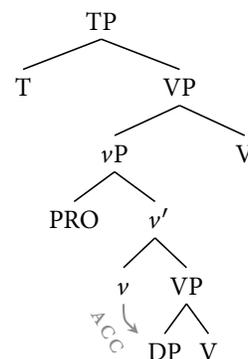- The relevant structures are given below:

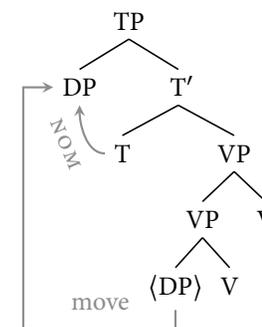(5) *Active clause with vP*

(6) *Active clause with VP*

(7) *Passive clause with vP*

(8) *Passive clause with VP*

- The trees on the left will result in a low scope reading, the structures on the right in a high scope reading. The upper structures will be identical in the surface form, leading to scope ambiguity. The lower trees correspond to local and long passive, respectively.

- *Overview:*
  1. We will argue that the scope facts cannot plausibly be attributed to case. The reason is that *every element* inside the embedded clause has to take matrix scope.

  2. We propose that the obligatory wide scope is the result of **semantically contentful head movement.** Specifically, we suggest that the infinitival verb has to incorporate into the matrix verb in VP complementation structures.

  3. Given standard assumptions about the output of head movement and the semantics of movement, **the entire verbal complex, including the matrix verb, will be interpreted in the position of the embedded verb.** It will hence be outscoped by everything.

  4. The motivation for this movement is **symmetry-breaking.** VP–V structures are symmetric and as such incur a labeling paradox. This paradox is avoided by incorporating one verb into the other.

2 The Ubiquity of Wide Scope

- *Section Summary:*
  This section shows that systematically every scope-bearing element inside the embedded clause must take scope over the matrix predicates in long passives.

- *Upshot:*
  This is unexpected under Bobaljik & Wurmbrand's (2005) analysis because even elements that do not depend on matrix material to get case-licensed must take high scope.

2.1 Quantifier Scope

- (9) and (10) demonstrate that the same scope facts witnessed above for the direct object hold for the **indirect object:** If the direct object receives nominative case, the indirect object has to take matrix scope.

  (9) *Active:*
  weil er den Fritz **allen Studenten** vorzustellen vergessen hat
  since he the Fritz.ACC all students.DAT to.introduce forgotten has
  'since he forgot to introduce Fritz to all students'   [*forget* ≫ ∀]

  (10) a. *Local passive:*
  weil *den Fritz* **allen Studenten** vorzustellen vergessen wurde
  since the Fritz.ACC all students.DAT to.introduce forgotten was
  [*forget* ≫ ∀]

  b. *Long passive:*
  weil *der Fritz* **allen Studenten** vorzustellen vergessen wurde
  since the Fritz.NOM all students.DAT to.introduce forgotten was
  [**forget* ≫ ∀; ∀ ≫ *forget*]

- The same holds for **adjuncts:**

  (11) *Active:*
  weil er **in jedem Zimmer** Äpfel zu essen vergessen hat
  since he in every room apples to eat forgotten has
  'since he forgot to eat apples in every room'   [*forget* ≫ ∀]

  (12) a. *Local passive:*
  weil **in jedem Zimmer** Äpfel zu essen vergessen *wurde*
  since in every room apples to eat forgotten was   [*forget* ≫ ∀]
  b. *Long passive:*
  weil **in jedem Zimmer** Äpfel zu essen vergessen *wurden*
  since in every room apples to eat forgotten were
  [**forget* ≫ ∀; ∀ ≫ *forget*]

- *Remark:*
  The adjunct *in jedem Zimmer* 'in every room' can in principle be merged in either the embedded or the matrix clause. In the latter case, it takes matrix scope. What is crucial for the argument is that a low construal is absent in (12b). As a consequence, even if the adjunct is merged inside the infinitival clause, it must wind up taking matrix scope.

2.2 Event-Modifying Adverbs

- Adverbs that modify verbal events exhibit the same pattern: If the embedded object bears accusative case, a high or low construal is possible. In the long passive, by contrast, the adverb has to modify the matrix verb.

  (13) *Active:*
  weil er **dreimal** *den Aufsatz* einzureichen vergessen hat
  since he three.times the article.ACC to.submit forgotten has
  'since he forgot to submit the article three times'
  [*3.times(forget); 3.times(submit)*]

  (14) a. *Local passive:*
  weil **dreimal** *den Aufsatz* einzureichen vergessen wurde
  since three.times the article.ACC to.submit forgotten was
  'since it was forgotten to submit the article three times'
  [*3.times(forget); 3.times(submit)*]
  b. *Long passive:*
  weil **dreimal** *der Aufsatz* einzureichen vergessen wurde
  since three.times the article.NOM to.submit forgotten was
  'since it was forgotten three times to submit the article'
  [*3.times(forget); *3.times(submit)*]
  c. *Long passive:*
  weil *der Aufsatz* **dreimal** einzureichen vergessen wurde
  since the article.NOM three.times to.submit forgotten was
  'since it was forgotten three times to submit the article'
  [*3.times(forget); *3.times(submit)*]

2.3 NPIs

- NPIs like *auch nur ein einziger* 'even a single' are licensed in the scope of *vergessen* 'forget,' which semantically contains negation.

- As expected, if the embedded object is an NPI, it is illicit in long passives.

  (15) *Active:*
  weil er **auch nur einen einzigen Traktor** zu reparieren vergessen hat
  since he also only a single tractor to repair forgotten has
  'since he forgot to repair even a single tractor'

(16) a. *Local passive:*
weil **auch nur einen einzigen Traktor** zu reparieren vergessen wurde
since also only a single tractor.ACC to repair forgotten was

b. *Long passive:*
*weil **auch nur ein einziger Traktor** zu reparieren vergessen wurde
since also only a single tractor.NOM to repair forgotten was

- As it turns out, no element in the embedded clause may be an NPI in long passives:

(17) *Active:*
weil er den Fritz **auch nur einem einzigen Studenten** vorzustellen
since he the Fritz.ACC also only a single student.DAT to.introduce
vergessen hat
forgotten has
'since he forgot to introduce John to even a single student'

(18) a. *Local passive:*
weil *den Fritz* **auch nur einem einzigen Studenten** vorzustellen
since the Fritz.ACC also only a single student.DAT to.introduce
vergessen wurde
forgotten was

b. *Long passive:*
*weil *der Fritz* **auch nur einem einzigen Studenten** vorzustellen
since the Fritz.NOM also only a single student.DAT to.introduce
vergessen wurde
forgotten was

2.4 Intensional Predicates

- A final instance of the overall generalization that long passive correlates with matrix scope of material inside the infinitival clause comes from intensional predicates. In other words, a *de dicto* reading is impossible in the long passive.

- As before, this generalization holds for all embedded arguments.

(19) *Active:*
weil er **zwei gute Studenten** zu finden versucht hat
since he two good students.ACC to find tried has
'since he tried to find two good students'   [*de dicto*]

(20) a. *Local passive:*
weil **zwei gute Studenten** zu finden versucht *wurde*
since two good students.ACC to find tried was   [*de dicto*]
b. *Long passive:*
weil **zwei gute Studenten** zu finden versucht *wurden*
since two good students.NOM to find tried were   [*de re*]

(21) *Active:*
weil er **zwei guten Studenten** Stipendien zu geben versucht hat
since he two good students.DAT fellowships.ACC to give tried has
'since he tried to give fellowships to two good students'   [*de dicto*]

(22) a. *Local passive:*
weil **zwei guten Studenten** Stipendien zu geben versucht *wurde*
since two good students.DAT fellowships.ACC to give tried was
[*de dicto*]

b. *Long passive:*
weil **zwei guten Studenten** Stipendien zu geben versucht *wurden*
since two good students.DAT fellowships.NOM to give tried were
[*de re*]

2.5 Interim Summary

- The data presented so far strongly suggest that the link between long passives and scope is more pervasive than Bobaljik & Wurmbrand (2005) make it out to be.

(23) **Generalization** (*to be revised*)
In long passives, every element inside the embedded clause has to take scope over the matrix verb.

- This is unexpected under Bobaljik & Wurmbrand's (2005) analysis, which treats the emergence of wide scope as a result of case assignment from the matrix clause.

3 The Limits of Obligatory Wide Scope

- *Section summary:*
In all the cases discussed so far, long passives led to matrix scope of material inside the infinitival clause. In this sense, case correlates with scope indirectly: If some element inside the embedded clause receives case from the matrix clause, everything inside the embedded clause has to take matrix scope.

- As it turns out, this implication breaks down if the infinitival clause is moved. In such cases, an embedded reading is again possible even in long passives.

3.1 Topicalization

- If the embedded clause is topicalized, embedded scope of a quantifier inside it is possible.
- Note that (24) is still a long passive, as the embedded direct object receives nominative case.
- Furthermore, if the embedded object is topicalized along with the VP (or inside it), ungrammaticality results, a point to which we return below.

(24) **Quantifiers:**
[Allen Studenten   vorzustellen]$_1$ wurde der Fritz   schon wieder t$_1$
  all   students.DAT to.introduce   was   the Fritz.NOM yet   again
vergessen
forgotten
'It was forgotten yet again to introduce Fritz to all teachers.'   [$forget \gg \forall$]

(25) **Adverbs:**
[Dreimal   einzureichen]$_1$ wurde der Aufsatz   schon wieder t$_1$ vergessen
  three.times to.submit   was   the article.NOM yet   again   forgotten
'It was yet again forgotten to submit the article three times.'
[$3.times(submit);$ *$3.times(forget)$]

(26) **NPIs:**
[Auch nur einem einzigen Studenten   vorzustellen]$_1$ wurde der Fritz   t$_1$
  also only a   single   student.DAT to.introduce   was   the Fritz.NOM
vergessen
forgotten
'It was forgotten introduce Fritz to even a single student.'

3.2 Verb Projection Raising

- A second instance of VP movement is so-called verb projection raising or extraposition.
- As before, material inside the extraposed clause can have embedded scope. Likewise as before, the embedded direct object cannot be extraposed.

(27) **Quantifiers:**
Der Fritz   wurde t$_1$ vergessen [allen Studenten   vorzustellen]$_1$
the Fritz.NOM was   forgotten all   students.DAT to.introduce
[$forget \gg \forall$]

(28) **Adverbs:**
Der Aufsatz   wurde t$_1$ vergessen [dreimal   einzureichen]$_1$
the article.NOM was   forgotten three.times to.submit
[$3.times(submit);$ *$3.times(forget)$]

(29) **NPIs:**
Der Fritz   wurde t$_1$ vergessen [auch nur einem einzigen Studenten
the Fritz.NOM was   forgotten also only a   single   student.DAT
vorzustellen]$_1$
to.introduce

3.3 Scrambling

- The final type of VP movement is scrambling.
- A low scope reading is available here as well.

(30) **Quantifers:**
a. dass [allen Studenten   vorzustellen]$_1$ der Fritz   schon wieder t$_1$
   that all   students.DAT to.introduce   the Fritz.NOM yet   again
   vergessen wurde
   forgotten was   [$forget \gg \forall$]
b. dass der Fritz   [allen Studenten   vorzustellen]$_1$ schon wieder /
   that the Fritz.NOM all   students.DAT to.introduce   yet   again   /
   leider   t$_1$ vergessen wurde
   unfortunately   forgotten was   [$forget \gg \forall$]

(31) **Adverbs:**
dass [dreimal   einzureichen]$_1$ der Aufsatz   schon wieder t$_1$ vergessen
that three.times to.submit   the article.NOM yet   again   forgotten
wurde
was   [$3.times(submit);$ *$3.times(forget)$]

(32) **NPIs:**
dass [auch nur einem einzigen Studenten   vorzustellen]$_1$ der Fritz   t$_1$
that also only a   single   student.DAT to.introduce   the Fritz.NOM
vergessen wurde
forgotten was

3.4 Consequences

- In all the sentences in (24)–(30b) the embedded direct object receives nominative case. Yet a low scope reading is available.
- ⇒ We conclude that case is not a reliable predictor of scope and that the emergence of wide scope in the long passive cannot be analytically tied to case (*pace* Bobaljik & Wurmbrand 2005, Takahashi 2012).
- The generalization we want to derive is given in (33).

  (33) GENERALIZATION
  In long passives, every element inside the infinitival clause has to take scope over the matrix predicate if the infinitival clause remains in situ.
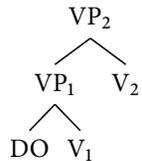
4 Proposal: Verb Incorporation
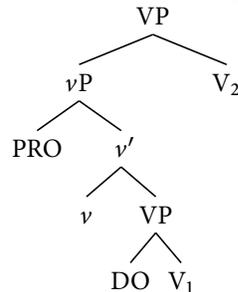
- *Background assumptions:*
  We will follow Wurmbrand (2001) and Bobaljik & Wurmbrand (2005) in the following points:

  1. Verbs allowing for long passives optionally embed either a VP or a vP.
  2. Accusative case is assigned by agent-introducing v heads.
  3. Passivization involves the projection of a defective v head that does not assign case.

- As a consequence, and again in line with Bobaljik & Wurmbrand (2005), long passives involve a VP complement while local passives are built from a vP complement.

(34) *Base structure of long passive*

(35) *Base structure of local passive*

- *Proposal:*
  The wide scope of VP-internal material in (34) is due to HEAD MOVEMENT of the infinitival verb to the matrix verb *forget,* a process we will dub VERB INCORPO-RATION (VI).

- The resulting verbal complex is interpreted via FUNCTION COMPOSITION (Ades & Steedman 1982, Steedman 1985, Jacobson 1990, 1992; also see the concept of *c-locality* in Lidz & Williams 2002, 2005).

- Adopting a standard procedure for the interpretation of movement structures (Heim & Kratzer 1998), we take movement to leave a variable in the launching site and a **λ-binder of that variable in the position immediately below the landing site.**

- Because head movement does not extend the phrase marker, the binder will appear **below the verbal complex.**

- As a consequence, **the entire verbal complex will be interpreted in the base position of the lower verb.**
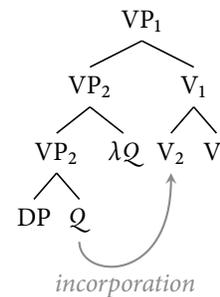
  (36) a. SIMPLE FUNCTION COMPOSITION
  $$(B \to C) \circ (A \to B) = (A \to C)$$

  b. GENERALIZED FUNCTION COMPOSITION
  $$(C \to D) \circ (A \to (B \to C)) = (A \to (B \to D))$$

  (37) *General structure of verb incorporation*
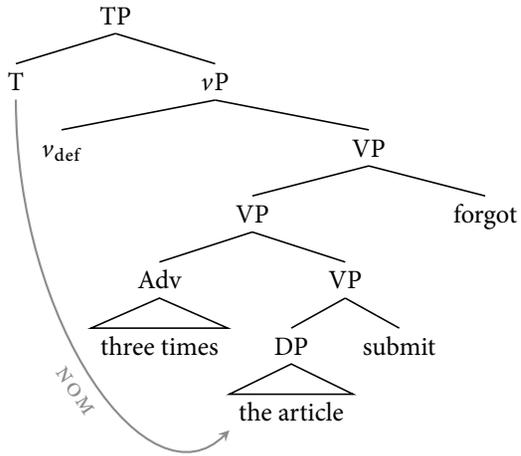

- EXAMPLE 1:
  Consider, for instance, the sentence in (38). As we have seen, the long passive lacks a reading in which the adverb modifies the lower verb.

  (38) weil dreimal der Aufsatz einzureichen vergessen wurde
  since three.times the article.NOM to.submit forgotten was
  'since it was forgotten three times to submit the article'
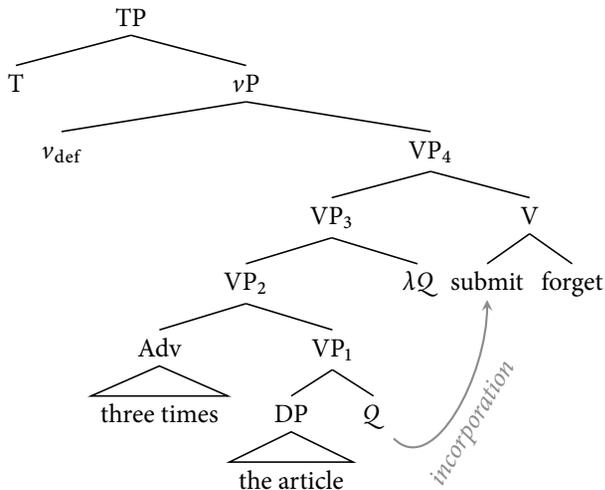 [*3.times(forget); *3.times(submit)*]

- The proposed base structure is given in (39). The infinitival clause is a bare VP and the embedded object receives its nominative case from matrix T.

(39) *Base structure of (38)*

- VI of *submit* into *forget* yields the structure in (40). The verbal complex is interpreted via function composition as shown in (41).

(40) *Structure of (38) after verb incorporation*

(41) a. $[\![\text{submit}]\!] = \lambda x_{<e>}\lambda e_{<s>}[\text{submit}'(e) \wedge \text{theme}'(e) = x]$
      b. $[\![\text{forget}]\!] = \lambda P_{<st>}\lambda e_{<s>}[\text{forget}'(e) \wedge \text{theme}'(e) = P]$
      c. $[\![\text{forget}]\!] \circ [\![\text{submit}]\!] =$
          $\lambda x\lambda e[\text{forget}'(e) \wedge \text{theme}'(e) = \lambda e'[\text{submit}'(e') \wedge \text{theme}'(e') = x]]$
      d. $[\![\text{the article}]\!] = \iota x.\text{article}'(x)$
      e. $[\![\text{VP}_1]\!] = \lambda e[\text{forget}'(e) \wedge \text{theme}'(e) = \lambda e'[\text{submit}'(e) \wedge$
          $\text{theme}'(e') = \iota x.\text{article}'(x)$

- *Consequence:*
  Only one event variable is accessible for modification by *three times*. It is the variable for the event of forgetting. Event-modifying modifiers will hence necessarily apply to the event denoted by the matrix verb. This is precisely what we were aiming to derive.

- **EXAMPLE 2:**
  A second example involving a ditransitive embedded verb is given in (42):

(42) weil der Fritz   allen Studenten   vorzustellen vergessen wurde
      since the Fritz.NOM all   students.DAT to.introduce forgotten was
      [*forget ≫ ∀; ∀ ≫ forget]

(43) *Base structure of (42)*

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(44) *Structure of (42) after verb incorporation*

```
                    TP
                  /    \
                 T      vP
                       /   \
                   v_def    VP₃
                           /    \
                        VP₂       V
                       /    \    / \
                    VP₁    λQ introduce forget
                   /   \
                 DP     V′
                /  \   /  \
          all students DP  Q
                       |
                    the Fritz
                                    ↑ incorporation
```

(45) a. $[\![\text{introduce}]\!] = \lambda x_{<e>}\lambda y_{<e>}\lambda e_{<s>}[\text{introduce}'(e) \wedge \text{theme}'(e) = x \wedge$
$$\text{goal}'(e) = y]$$
   b. $[\![\text{forget}]\!] = \lambda P_{<st>}\lambda e_{<s>}[\text{forget}'(e) \wedge \text{theme}'(e) = P]$
   c. $[\![\text{forget}]\!] \circ [\![\text{introduce}]\!] = \lambda x\lambda y\lambda e[\text{forget}'(e) \wedge \text{theme}'(e) =$
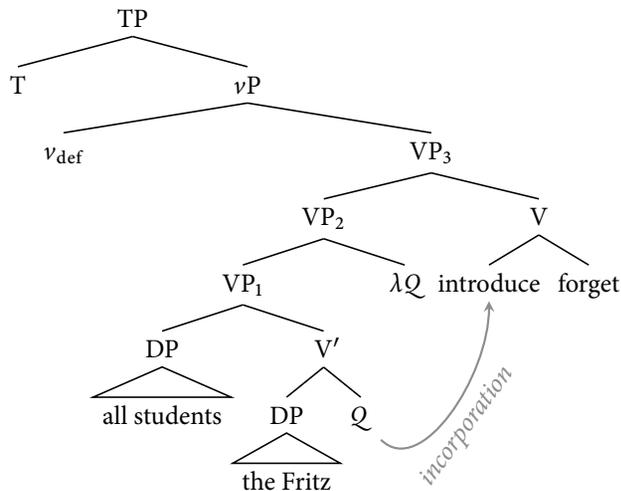$$\lambda e'[\text{introduce}'(e') \wedge \text{theme}'(e') = x \wedge \text{goal}'(e') = y]]$$
   d. $[\![\text{all students}]\!] = \lambda R_{<e<st>>}\forall x[\text{student}'(x) \rightarrow \exists e[R(x)(e)]]$
   e. $[\![V']\!] = Q(\text{Fritz}')$
   f. $[\![VP_1]\!] = \forall x[\text{student}'(x) \rightarrow \exists e[Q(\text{Fritz}')(x)(e)]]$
   g. $[\![VP_2]\!] = \lambda Q_{<e<e<st>>}\forall x[\text{student}'(x) \rightarrow \exists e[Q(\text{Fritz}')(x)(e)]]$
   h. $[\![VP_3]\!] = \forall x[\text{student}'(x) \rightarrow \exists e[\text{forget}'(e) \wedge \text{theme}'(e) =$
$$\lambda e'[\text{introduce}'(e') \wedge \text{theme}'(e') = \text{Fritz}' \wedge \text{goal}'(e') = x]]]$$

- *Note:*
  The semantics we assume for the universal quantifier is an oversimplification, which we adopt for the purposes of this talk. A more accurate treatment would have the quantification range over situations (Elbourne 2005).

- *Consequence:*
  As before, because the matrix verb is semantically 'pulled down' as a result of VI, every quantifier inside the embedded clause will take scope over it, thus deriving the absence of a low scope reading of the universal.

- *Summary:*
  The fact that long passives require all material inside the embedded clause to take

wide scope with respect to the matrix verb (if the VP stays in situ), follows under a head movement analysis. The wide scope reading emerges because incorporation of the lower verb into the higher has the consequence that semantically both are interpreted in the base position. This follows from standard assumptions about the semantics of movement and the curious non-extension property of head movement.

- *A Detour: The Need for Case-Driven Movement:*
  The present analysis derives the observation that nothing inside the embedded clause can take low scope in long passives. Case-driven raising of the nominative object into the matrix clause is thus no longer necessary to get its scope right. Do we still need this movement step? The answer is yes. Word order shows that nominative objects cannot stay inside the infinitival clause while accusative ones can. (46) shows this for topicalization and (47) for verb projection raising. Both sentences are grammatical if the nominative DP remains in the middle field.'

- *Consequence: Agree and LF:*
  Unlike Bobaljik & Wurmbrand (2005), we do not have to assume that Agree for case holds at LF. In other words, the correct interpretation results even if the movement step reconstructs.

(46) [Den Traktor / *der Traktor zu reparieren] wurde erst gestern
 the tractor.ACC / the tractor.NOM to repair was just yesterday
 wieder versucht.
 again tried
 'Someone tried just yesterday to repair the tractor.'

(47) weil erst gestern wieder versucht wurde [den Traktor / *der Traktor zu
 since just yesterday again tried was the tractor.ACC / the tractor to
 reparieren]
 repair

5 Constraints on Verb Incorporation

- *Section Summary:*
  In this section we will consider various configurations in which only a narrow scope reading of embedded material is possible and VI hence must be blocked.

- *Upshot:*
  There is a one-to-one correspondence between the surface position of the embedded VP and scope: If the VP remains in situ, high scope is obligatory. If the VP moves, high scope is impossible.

- *Data:*
  To do so, we need quantifiers that allow us to diagnose a wide scope reading. Because of entailment relations between the two readings, the universal quantifier used so far only lets us probe for the existence of a low reading.

- We will use the quantifier *nur ein* 'only one,' which yields distinguishable readings when taking scope over and below of the matrix verb.

- An active clause is ambiguous:

(48) *Active:*
     weil er **nur einen Traktor**   zu reparieren vergessen hat
     since he only one   tractor.ACC to repair   forgotten has
     'since he tried to only repair one tractor'   [*only ≫ forget; forget ≫ only*]

- **Local passives** are in fact unambiguous and only allow a **narrow reading** of the embedded object, as shown in (49a). Long passives, as expected, only have a wide scope reading, as (49b) shows:

(49) a. *Local passive:*
        weil **nur einen Traktor**   zu reparieren vergessen wurde
        since only one   tractor.ACC to repair   forgotten was
                                                    [**only ≫ forget; forget ≫ only*]
     b. *Long passive:*
        weil **nur ein Traktor**   zu reparieren vergessen wurde
        since only one tractor.NOM to repair   forgotten was
                                                    [*only ≫ forget; *forget ≫ only*]

- This pattern generalizes to indirect objects:

(50) *Active:*
     weil er den Fritz   **nur einem Studenten**   vorzustellen vergessen hat
     since he the Fritz.ACC only one   student.DAT to.introduce forgotten has
     'since he forgot to introduce Fritz to only one student'
                                                    [*only ≫ forget; forget ≫ only*]

(51) a. *Local passive:*
        weil *den Fritz*   **nur einem Studenten**   vorzustellen vergessen wurde
        since the Fritz.ACC only one   student.DAT to.introduce forgotten was
                                                    [**only ≫ forget; forget ≫ only*]

     b. *Long passive:*
        weil *der Fritz*   **nur einem Studenten**   vorzustellen vergessen wurde
        since the Fritz.NOM only one   student.DAT to.introduce forgotten was
                                                    [*only ≫ forget; *forget ≫ only*]

- As we have seen above, material inside the infinitival clause can have a low construal if the embedded VP is moved. The data below demonstrate that this is in fact the only reading:

(52) **Topicalization:**
     [Nur einem Studenten   vorzustellen]₁ wurde der Fritz   t₁ vergessen
      only one   student.DAT to.introduce was   the Fritz.NOM   forgotten
                                                    [**only ≫ forget; forget ≫ only*]

(53) **Verb projection raising:**
     Der Fritz   wurde t₁ vergessen [nur einem Studenten   vorzustellen]₁
     the Fritz.NOM was   forgotten   only one   student.DAT to.introduce
                                                    [**only ≫ forget; forget ≫ only*]

(54) **Scrambling:**
     dass [nur einem Studenten   vorzustellen]₁ der Fritz   schon wieder t₁
     that only one   student.DAT to.introduce   the Fritz.NOM yet   again
     vergessen wurde
     forgotten was   [**only ≫ forget; forget ≫ only*]

- In the examples above embedded material may not have matrix scope. Because VI yields matrix scope, we can conclude that it must be ruled out in these configurations.

- *Generalization:*
  VI is impossible if the embedded clause is a *v*P (or larger) or if it is a VP that has undergone movement.

- Combining this generalization with the one in (33) yields (55):

(55) **Overall Generalization:**
     VI is obligatory if the embedded clause is a VP that stays in situ. It is blocked otherwise.

6 Where Does Verb Incorporation Apply?

- *Background:*
  Verb cluster formation has been proposed to take place in syntax proper (Evers 1975, Hageman & van Riemdsdijk 1986), at PF (Wurmbrand 2004, Salzmann to appear) or at LF (Salzmann 2011).

- *Not PF:*
  Due to its interpretative effects, VI cannot apply at PF. There is furthermore reason to believe it does not apply at LF, either. First, whether VI applies or not is entire predictable by the surface form. It may not be fed by, e.g., LF reconstruction.

- *Not LF:*
  Moreover, intonational differences between the relevant readings correlate with the proposed base and VI structures. This is shown in (56), where '|' marks intonational boundaries.

(56) *Active:*

    a. weil er | nur einen Traktor   zu reparieren | vergessen hat
       since he only one   tractor.ACC to repair   forgotten has
                                           [*only ≫ forget; forget ≫ only]

    b. weil er nur einen Traktor | zu reparieren vergessen hat
       since he only one   tractor.ACC   to repair   forgotten has
                                           [only ≫ forget; *forget ≫ only]

(57) a. *Local passive:*
       weil | nur einen Traktor   zu reparieren | vergessen wurde
       since   only one   tractor.ACC to repair   forgotten was
                                           [*only ≫ forget; forget ≫ only]

    b. *Long passive:*
       weil nur ein Traktor | zu reparieren vergessen wurde
       since only one tractor.NOM   to repair   forgotten was
                                           [only ≫ forget; *forget ≫ only]

- *Conclusion:*
  We conclude, then, that VI applies in the narrow syntax, feeding both PF and LF.

7 Verb Incorporation as Symmetry-Breaking Movement

- We have arrived now at the characterization of VI in (58):

(58) **Properties of Verb Incorporation**
    a. obligatorily applies if the embedded clause is a VP and stays in situ
    b. does not apply otherwise (i.e., if the embedded clause is a vP or the VP is moved)
    c. applies within syntax

- *The Puzzle:*
  VI must apply rather late so that it can be bled by VP movement. In this respect it seems to be acyclic.

- *Proposal:*
  VI is a last resort operation employed to obviate a labeling problem incurred by symmetric structures. This analysis adds to a growing body of literature that views local instability as a driving force of movement.

- *Symmetry:*
  A view that has gained popularity in the recent syntactic literature is that syntactic structures have to be **asymmetric** in order to be labeled (see Chomsky 1995: 337, 2008, 2012, Moro 2000, Ott 2012, to appear).

- *Underlying Idea:*
  Merge applies freely Chomsky (2004) but **labeling requires asymmetric structures.** Certain structures created by Merge are symmetric and can hence not be labeled (they are LOCALLY UNSTABLE). Movement of one element breaks the symmetry and enables labeling. Structures have to be well-formed at the interfaces only (see Boeckx 2008 for a rationale why labeling is required at the interfaces). Alternatively, all operations, including labeling, apply at the phase level (Chomsky 2007, 2008).

- Our proposal adopts the general outlook of these studies but differs considerably from the details of the execution. We adopt Starke's (2001a, 2001b) claim that the source of labeling is the functional sequence fseq. That is, upon merging an item of category V and one of category v, the fseq $\langle \ldots < v < V \rangle$ determines that it is v that projects.
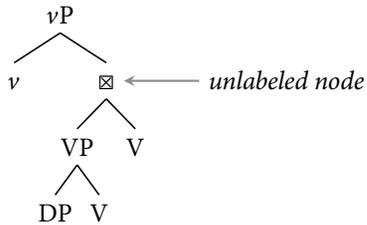
(59) **Labeling**
     Upon merging elements α and β, project the category that is higher in fseq.

- *The Problem:*
  A problem arises if two elements of the same category merge. These elements will be

indistinguishable with respect to fseq and the resulting constituent cannot be labeled, creating an unstable configuration. VP–V structures are an example of this.

(60) *A symmetric structure*

$$vP$$
```
        vP
       /  \
      v    ⊠  ⟵ —— unlabeled node
          /  \
        VP    V
       /  \
     DP    V
```

- *Two Solutions:*
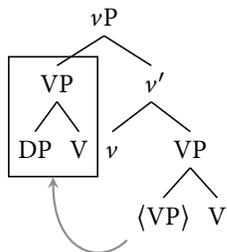 There are two ways to obviate this labeling problem. First, the VP can be moved away; second, VI applies.

- *VP Movement:*
  - Following Chomsky (2012) amd Ott (2012, to appear), we take intervention for labeling to be essentially **chain-based:** Only occurrences that c-command all lower occurrences are visible to the labeling algorithm. Lower copies, as a consequence, are invisible. This is why movement enables labeling.
  - The landing site of VP movement is Spec,vP, a position that satisfies the asymmetry condition on labeling.

(61) **Chain-Based Labeling** (Chomsky 2012, Ott 2012, to appear)
Only chains, not individual occurrences, are visible for the labeling algorithm.
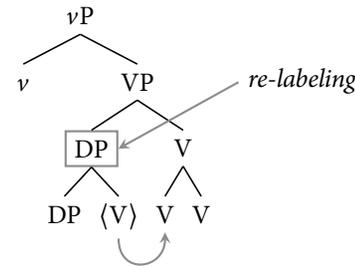
(62) *Structure after VP movement*
```
            vP
          /    \
       ┌─────┐  v′
       │ VP  │ / \
       │ / \ │v   VP
       │DP  V│   /  \
       └─────┘ ⟨VP⟩   V
```

- *Verb Incoporation:*
  - Incorporating the lower verb into the higher one deprives the lower VP of its categorial label as labeling is endocentric. The verbal complex hence merges to a category-less constituent, yielding a configurations that is clearly asymmetric.

- VI creates a complex V–V head, which at first glance appears symmetrical. Given (61), however, no labeling problem arises. This is because the copy in the landing site does not c-command the copy in the launching site. Both are hence irrelevant for labeling, creating an asymmetric structure as a result.

(63) *Structure after verb incorporation*
```
          vP
        /    \
       v     VP        re-labeling
            /  \
        ┌────┐  V
        │ DP │   / \
        └────┘  V   V
        /  \
      DP  ⟨V⟩
```
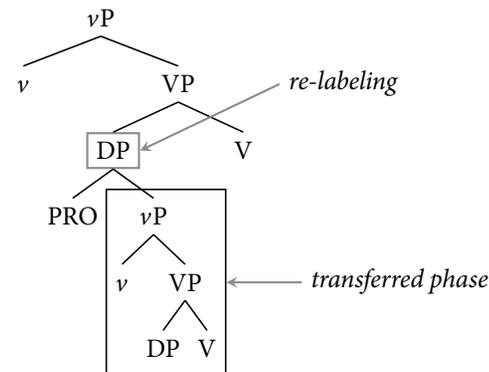
- Note that the embedded clause is re-labeled as a DP in (63). This is a direct consequence of the fact that the verb is moved away. DP hence combines with a category-less constituent and projects its label.

- *vP Clauses:*
  Why is VI unnecessary in vP–V structures? We assume that v is a phase head (following Chomsky 2000, 2001 *et seq.*). Phase transfer takes place as soon as the next higher head is merged (see Chomsky's (2000) Phase Impenetrability Condition). Finally, we assume that phase transfer targets the phase head as well (*pace* Chomsky 2000, 2001).

⇒ The embedded clause is a phase and labeling inside it is straightforward. Upon transfer, the lower vP will lose its label and the matrix V will combine with a category-less constituent, again enabling straightforward labeling.

(64) *Structure with vP complement after phase transfer*
```
          vP
        /    \
       v     VP        re-labeling
            /  \
        ┌────┐  V
        │ DP │
        └────┘
        /    \
      PRO  ┌─────┐
           │ vP  │
           │ / \ │
           │v   VP│  ⟵ transferred phase
           │   / \│
           │  DP  V│
           └─────┘
```

- *Upshot:*
  Having either a *v*P complement or moving a VP complement circumvents the labeling problem. It is only in the case of an in-situ VP clause that VI applies to rescue the structure. This accounts for the effect that the semantic effects of VI, namely matrix scope of clause-internal material, are limited to this particular configuration.

- *Constraints on Function Composition:*
  In this system, function composition has a very limited and highly constrained distribution. It only applies if VI takes place. VI, in turn, being a last resort, only applies a narrowly circumscribed environment, namely if two elements of type V combine.

8 Conclusion

- We have motivated a particular instance of head movement (verb incorporation), which has clear semantic effects. Head movement, then, may not be altogether restricted to PF.

- We have furthermore suggested that we need to include function composition as an operation available in our semantic toolbox.

- Verb incorporation is an instance of symmetry-breaking movement. Symmetric, and hence unlabelable, structures are rescued by head movement.

- The application of verb incorporation and thus function composition is heavily constrained by the fact that it only applies in cases of structural symmetry.

- Takahashi (2012) reports very similar data from Japanese, which are likely amenable to the account pursued here.

- The current analysis provides arguments that head movement may have semantic effects (see also Matushansky 2006, Lechner 2007, Roberts 2010).

———————————

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