

# Reconstruction Effects and Optimization at PF\*

**Abstract:**

*This article presents an analysis of sentences which apparently allow a Principle C configuration in the course of the derivation if it is later undone by further movement operations (e.g., Which claim that John<sub>1</sub> made did he<sub>1</sub> later deny?). I suggest that these sentences are syntactically equivalent to sentences like Which claim that he<sub>1</sub> made did John<sub>1</sub> later deny? and emerge as a result of optimal linearization at PF. According to the syntactic derivation, the pronoun linearly precedes its antecedent (an R-expression); but since it is preferable if R-expressions linearly precede coindexed pronouns, the forms are optionally ‘exchanged’. Technically, it is not an exchange of lexical items; instead, one feature is shifted from the linearly preceding item to the other one (Feature Shift), and as a result (after Vocabulary Insertion; cf. Distributed Morphology), the bindee is realized as R-expression and the antecedent as pronoun.*

**Keywords:** reconstruction effects, reflexivity, optimal PF linearization, Distributed Morphology, Feature Shift

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## 1. Introduction

In this paper I want to discuss the well-known asymmetry that surfaces in examples like (1-a) *vs* (1-b).

- (1) a. \*[Which picture of John<sub>1</sub>]<sub>2</sub> does he<sub>1</sub> like t<sub>2</sub> best?  
b. [Which claim that John<sub>1</sub> made]<sub>2</sub> did he<sub>1</sub> later deny t<sub>2</sub>?

At first sight, the sentences in (1) seem to have the same derivational history. Both examples involve a *wh*-phrase which is base-generated in the object position and then moved over the subject pronoun to its sentence-initial scope position. What is special about these *wh*-questions is that the *wh*-phrase contains an R-expression which is coindexed with the subject pronoun, and this seems to be the cause of the deviant status of the first example, whereas it does not have any impact on the grammaticality of the second sentence.<sup>1</sup>

On the assumption that the *wh*-phrase already contains the R-expression that is coindexed with the subject pronoun before movement takes place, the ungrammaticality of (1-a) is expected since it violates Principle C in the course of the derivation – just as its counterpart in (2-a), which does not involve *wh*-movement. Since this explanation offers a straightforward

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<sup>1</sup>Note that the phenomenon does not depend on *wh*-movement but can also be observed with topicalization; cf., for instance, example (6-b). Furthermore, the data are not English-specific. In German, for instance, the same effects can be observed (cf. (i)).

- (i) a. \*Welches Bild von Timo<sub>1</sub> mag er<sub>1</sub> am liebsten?  
which picture of Timo likes he at best  
'Which picture of himself<sub>1</sub> does Timo<sub>1</sub> like best?'  
b. Welche Behauptung, die Timo<sub>1</sub> gemacht hat, hat er<sub>1</sub> später wieder  
which claim that Timo made has has he later again  
zurückgenommen?  
taken back  
'Which claim that Timo<sub>1</sub> made did he<sub>1</sub> later take back?'  
c. Dass Timo<sub>1</sub> verloren hat, hat er<sub>1</sub> mir natürlich verschwiegen.  
that Timo lost has has he me of course not told  
'Of course, Timo<sub>1</sub> did not tell me that he<sub>1</sub> had lost.'

(Note that for some German speakers, (i-b) seems to be worse than (i-c); cf. Tibor Kiss (p.c.).)

account of example (1-a), many analyses have used it as a starting point (cf. also the discussion in section 1.1). However, what remains to be explained in analyses of this type is the grammaticality of (1-b); after all, (2-b) shows that the structure would be ill-formed if no movement had taken place.<sup>2</sup>

- (2) a. \*He<sub>1</sub> likes this picture of John<sub>1</sub> best.  
 b. \*He<sub>1</sub> denied the claim that John<sub>1</sub> had made before.

What I would like to suggest is an alternative approach according to which neither of the sentences in (1) is based on the underlying structures exhibited in (2). Instead, I will show that there are grounds for the assumption that the grammatical sentence in (1-b) results from the successful application of a PF optimization process based on the structure in (3-b); in the case of (3-a), by contrast, this process cannot apply, and hence (1-a) cannot be derived.

- (3) a. [Which picture of him<sub>1</sub>/himself<sub>1</sub>]<sub>2</sub> does John<sub>1</sub> like t<sub>2</sub> best?  
 b. [Which claim that he<sub>1</sub> made]<sub>2</sub> did John<sub>1</sub> later deny t<sub>2</sub>?

### 1.1 The Argument-Adjunct Approach

One proposal that has been put forward in the literature to account for the above-mentioned asymmetry is based on the assumption that the crucial difference between sentences like (1-a) and (1-b) relates to the argument *vs* adjunct status of the phrase embedding the coindexed R-expression. The central assumption in analyses of this kind is that reconstruction examples are ungrammatical if the R-expression is contained in an argument (as in (1-a)), whereas (1-b), for example, is well formed because the R-expression is part of an adjunct (a relative clause in this case).<sup>3</sup>

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<sup>2</sup>As regards terminology, note that in minimalist terms the violation of Principle C in (1-a) does not really take place in the course of the syntactic derivation but at LF, when part of the *wh*-phrase (including the R-expression) is reconstructed to its base position; thus, sentences like (1-a) are said to exhibit a reconstruction effect, whereas sentences like (1-b) are known as anti-reconstruction examples. Although I do not use the term reconstruction in this technical sense, I refer to both types of examples as reconstruction sentences as a cover term.

<sup>3</sup>Analyses along this line have been proposed, for instance, by Lebeaux (1988, 1991,

Although these proposals differ with respect to the concrete technical implementation, they all share the underlying idea that adjuncts behave differently from arguments insofar as they can be merged into the derivation noncyclically, i.e. later than the constituent they modify (Late Merge). As a result, a Principle C configuration can be avoided in examples like (1-b) (*Which claim that John<sub>1</sub> made did he<sub>1</sub> later deny?*) if the relative clause containing the R-expression does not enter the derivation before *wh*-movement takes place: On this assumption, the R-expression is at no point in the derivation c-commanded by the coindexed pronoun. Hence, the contrast in (1) (repeated in (4-a) and (5-a)) is accounted for as follows:

- (4) a. \*[Which picture of John<sub>1</sub>]<sub>2</sub> does he<sub>1</sub> like t<sub>2</sub> best?  
 b. *before wh-movement takes place:*  
 pronoun<sub>1</sub> ... [*wh*-phrase ... [argument ... R-ex<sub>1</sub> ...] ...]  
 → Principle C violation
- (5) a. [Which claim that John<sub>1</sub> made]<sub>2</sub> did he<sub>1</sub> later deny t<sub>2</sub>?  
 b<sub>1</sub>. *before wh-movement takes place:*  
 pronoun<sub>1</sub> ... [*wh*-phrase ...]; Num={R-ex<sub>1</sub>...}  
 → Principle C satisfied  
 b<sub>2</sub>. *Late Merge after wh-movement has taken place:*  
 [*wh*-phrase ... [adjunct ... R-ex<sub>1</sub> ...] ...]<sub>2</sub> ... pronoun<sub>1</sub> ... t<sub>2</sub>  
 → Principle C satisfied

So, what we would obviously not expect according to the argument-adjunct approach are ungrammatical reconstruction examples where the R-expression is embedded in an adjunct, and grammatical ones where the R-expression is part of an argument. However, examples of both types do exist, as, for instance, (6-a) and (6-b) show.

- (6) a. \*[<sub>adj.</sub> In Ben<sub>1</sub>'s office] he<sub>1</sub> lay on the desk.  
 b. [<sub>arg.</sub> That John<sub>1</sub> had seen the movie] he<sub>1</sub> never admitted.

Hence, it must be concluded that the argument-adjunct approach does not  


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 2000), Chomsky (1995), Epstein *et al.* (1998), Fox (2000). The claim as such has already been brought up by Freidin (1986).

provide a satisfactory solution to the aforementioned problem.<sup>4</sup>

## 1.2 The Role of Depth of Embedding

One alternative that has been suggested in the literature and which might be better suited to capture the examples in (1) *and* (6) relates to the depth of embedding of the involved R-expression (cf., for instance, van Riemsdijk & Williams 1981, Huang 1993, Kuno 1997, Fischer 2002, 2004b). Analyses of this type are based on the following observation: What the grammatical examples seem to have in common is that the R-expression is embedded ‘relatively deeply’ in the displaced constituent, whereas it is not as deeply embedded in ungrammatical sentences such as (1-a) (*\*Which picture of John<sub>1</sub> does he<sub>1</sub> like best?*) and (6-a) (*\*In Ben<sub>1</sub>’s office, he<sub>1</sub> lay on the desk*).<sup>5</sup>

In the following analysis, I will also assume that differences with respect to depth of embedding (a notion which evidently needs to be specified more precisely) are the crucial criterion that distinguishes grammatical from ungrammatical reconstruction examples, because it leads to different morphological realizations of the binding relation and therefore provides different preconditions for PF optimization.

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<sup>4</sup>Objections against this approach have also been raised in Müller (1995), Kuno (1997), Lasnik (1998), Safir (1999), Kayne (2002), Zwart (2002), Fischer (2002, 2004b), among others.

Heycock (1995) provides a semantic explanation for the fact that not all sentences of this type involving adjuncts are grammatical, her central assumption being that Late Merge of adjuncts is sometimes precluded for semantic reasons because some adjuncts must be interpreted in the lower position. However, there is still the problem with the grammatical argument examples (cf. (6-b)), and moreover it seems to me that her account cannot be extended to cover all ungrammatical adjunct sentences.

<sup>5</sup>Note that some of the ungrammatical sentences which are supposed to show that a sentence is ill formed because the R-expression is contained in an argument seem to be deviant for independent reasons; cf. in particular examples of the following type in which the R-expression is embedded in a complement clause, but which is pragmatically odd (as already observed, for example, by Heycock 1995 and Lasnik 1998).

- (i) \*Which claim that John<sub>1</sub> was asleep was he<sub>1</sub> willing to discuss?

### 1.3 Central Assumptions

Following Chomsky (1995 and subsequent work), I adopt a local derivational syntactic approach according to which structure is built up incrementally from bottom to top and evaluated step by step in the course of the derivation.

As far as binding relations are concerned, I assume that the morphological form of a bound element is not specified from the beginning; instead, it is determined in the course of the derivation depending on the locality of the binding relation. This viewpoint makes it possible to evaluate binding relations in the course of the derivation and hence integrate binding into a local derivational approach (cf. also Fischer 2003, 2004b). To illustrate this point more clearly, consider the following Dutch example.

- (7) a.  $\text{Max}_1$  haat zichzelf<sub>1</sub>/ $\ast$ zich<sub>1</sub>/ $\ast$ hem<sub>1</sub>.  
 Max hates himself/SE/him  
 ‘Max<sub>1</sub> hates himself<sub>1</sub>.’
- b. *Underlying numeration:*  
 $\text{Num} = \{\text{Max}_{[\ast\beta\ast]}, \text{haat}, x_{[\beta]}/[\text{SELF}, \text{SE}, \text{pron}, \text{Max}]\}$

In the numeration (cf. (7-b)), the bound element surfaces as  $x$  and is equipped with a  $[\beta]$ -feature and the realization matrix [SELF, SE, pron, Max]. The  $[\beta]$ -feature indicates coreference, and hence its occurrence on  $x$  and  $\text{Max}$  encodes that they will establish a binding relation.<sup>6</sup>

As far as the realization matrix of  $x$  is concerned, it contains specifications of all possible realization forms that could in principle express this binding relation, i.e. all forms that can have the same reference as  $\text{Max}$ . In (7-b), it thus contains specifications for both types of anaphors (morphologically simple and complex ones), a pronominal realization, and in addition the R-expression  $\text{Max}$ .<sup>7</sup> Note, however, that an R-expression can only be part of

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<sup>6</sup>Following Sternefeld’s 2000 notation, features on probes are starred. Note moreover that a c-command relation between  $\text{Max}$  and  $x$  is enforced by the need to check the  $[\beta]$ -feature, which takes place in a c-command relation (cf. also Chomsky’s (2000:122) definition of Agree).

<sup>7</sup>Following Reinhart & Reuland (1993), I use the terms SE and SELF anaphor; however, unlike them, I use them in a strictly morphological sense: morphologically simple anaphors are referred to as SE anaphors, morphologically complex ones as SELF anaphors.

the matrix if the antecedent itself is an R-expression. If the latter surfaces as pronoun, the matrix corresponds to [SELF, SE, pron] since it cannot contain more semantic information than the antecedent provides.

As to the concrete realization of the bound element, it is determined as follows: The longer  $x$  remains free in the course of the derivation, the more specifications are deleted from the matrix, starting from the left to the right, which means that the anaphoric forms are deleted first. In the end, the most anaphoric specification that remains in the matrix determines the concrete realization of the bound element, which is eventually inserted at PF.<sup>8,9</sup> In sentence (7-a), for instance, no specification is deleted before the antecedent enters the derivation, hence the bound element surfaces as SELF anaphor.

## 2. The Numeration in Reconstruction Examples

As alluded to before, there are in principle two possibilities concerning the numeration if a binding relation is involved. First, the antecedent might not be an R-expression. This means that the bound element,  $x$ , cannot contain an R-expression in its realization matrix either but is equipped with the matrix [SELF, SE, pron]. Moreover,  $x$  bears a  $[\beta]$ -feature and its antecedent the corresponding  $[\ast\beta\ast]$ -feature. Obviously, this numeration (cf. (9-a)) is the starting point for sentences like the following.<sup>10</sup>

- (8) a. Which picture of  $\text{him}_1/\text{himself}_1$  does  $\text{he}_1$  like best?  
 b. Which claim that  $\text{he}_1$  made did  $\text{he}_1$  later deny?

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<sup>8</sup>As regards Late Insertion, cf. also Halle & Marantz (1993) and subsequent work on Distributed Morphology. As to the concrete domains whose crossing triggers the deletion of specifications from the matrix, cf. Fischer (2003, 2004a, 2004b).

<sup>9</sup>*Anaphoricity hierarchy*: SELF anaphor > SE anaphor > pronoun > R-expression, where  $A > B := A$  is *more anaphoric* than B. (Cf. also the similar referential hierarchy in Burzio 1989 and subsequent work.)

<sup>10</sup>Note that in (9-a) the antecedent is also encoded in terms of a realization matrix since it is assumed that this is the general way in which pronouns are derived. In the case of apparently unbound pronouns, the corresponding  $[\ast\beta\ast]$ -feature is associated with matrix C, and the scenario can be interpreted as discourse binding. For the sake of clarity, I use different indices to distinguish the beta-features associated with  $x$  from those associated with  $y$  (the antecedent), although they are in principle identical.

Alternatively, the antecedent might be encoded in the numeration as R-expression, which means that  $x$  is equipped with the realization matrix [SELF, SE, pron, R-ex] (cf. (9-b)).

(9) *Possible underlying numerations:*

a. *antecedent = pronoun:*

$$\text{Num} = \{y_{[*\beta_1*, \beta_2]/[SELF, SE, pron]}, x_{[\beta_1]/[SELF, SE, pron]}, C_{[*\beta_2*]}, \dots\}$$

b. *antecedent = R-expression:*

$$\text{Num} = \{R\text{-ex}_{[*\beta*]}, x_{[\beta]/[SELF, SE, pron, R\text{-ex}]}, \dots\}$$

Since these are the only possible numerations, we can conclude that whenever an R-expression is involved in a binding relation, the derivation must be based on the latter one. Hence, the following examples ((10-a), (10-b), (11-a), and (11-b)) must be derived from numeration (9-b) (the (a)-sentences are repeated from (1)). (10-c) and (11-c) illustrate the underlying binding configurations of the respective sentences, abstracting away from the concrete antecedents/bound elements. What can be seen at this stage in the derivation is that the matrix subject functions as binder and the bound element is contained in the *wh*-phrase.

(10) a. \*[Which picture of John<sub>1</sub>]<sub>2</sub> does he<sub>1</sub> like t<sub>2</sub> best?

b. [Which picture of him<sub>1</sub>/himself<sub>1</sub>]<sub>2</sub> does John<sub>1</sub> like t<sub>2</sub> best?

c. *Underlying vP:*

$$[_{VP} \text{Binder}_1 \text{ like } [_{VP} \text{t}_{like} [\text{which picture of } x_1]]]$$

(11) a. [Which claim that John<sub>1</sub> made]<sub>2</sub> did he<sub>1</sub> later deny t<sub>2</sub>?

b. [Which claim that he<sub>1</sub> made]<sub>2</sub> did John<sub>1</sub> later deny t<sub>2</sub>?

c. *Underlying vP:*

$$[_{VP} \text{Binder}_1 \text{ deny } [_{VP} \text{t}_{deny} [\text{which claim that } x_1 \text{ made}]]]$$

As regards (10-b) and (11-b), they come out as expected: the R-expression *John* functions as binder, and in the former case,  $x$  can be realized as an anaphor or pronoun, whereas in the latter case it must be pronominal.<sup>11</sup> But what about (10-a) and (11-a)?

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<sup>11</sup>For reasons of space, I will neglect the concrete derivation of  $x$ 's realization form; for this purpose cf. Fischer (2003, 2004b).



At first sight, it is not surprising that (10-a) is ungrammatical. Since the binder is realized as a pronoun (*he*), we expect  $x$  not to have an R-expression in its realization matrix at all, and hence it seems to be trivial that  $x$  cannot be realized as *John*. However, then what about (11-a)? Here the preconditions are the same, and still it is possible to realize  $x$  as R-expression. This is unexpected against the background of the discussion above, according to which this sentence should not be derivable. But since it obviously can be derived, why can (10-a) not be derived in the same way?

If we stick to the assumption that  $x$  can be realized as R-expression only if its binder is an R-expression (cf. numeration (9-b)), the grammaticality of (11-a) leaves only two possibilities. Either  $x$  turns out to be optimally realized as an R-expression and the realization form of the binder is ‘demoted’ for some reason such that it surfaces as pronoun, although it is encoded as R-expression in the numeration. Alternatively, (11-a) could be considered to be the result of an optimal linearization derived at PF, which is based on a different outcome in the syntactic component, according to which the antecedent is an R-expression and  $x$  is predicted to be optimally realized as pronoun. In the following, I will explore the latter possibility.<sup>12,13</sup>

### 3. Optimized PF Linearization

In a nutshell, the hypothesis looks as follows: The derivation of a sentence like (11-a) (repeated in (12-a)) starts with the numeration  $\{\text{R-ex}_{[*\beta*]}, x_{[\beta]}/[\text{SELF}, \text{SE}, \text{pron}, \text{R-ex}], \dots\}$ . In the course of the syntactic derivation,  $[\text{pron}, \text{R-ex}]$  is predicted to be  $x$ ’s optimal realization matrix and its binder keeps the form of an R-expression, as encoded in the numeration. At PF, when it is determined in which position  $x$  is spelled out, it turns out that there are two possibilities: if no further operation takes place, the bound element, which linearly precedes its antecedent, will eventually be realized as pronoun and

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<sup>12</sup>As regards the demotion approach, it is outlined in Fischer (2004b); however, as discussed there, it is conceptually inferior to the PF alternative.

<sup>13</sup>That reconstruction data might be treated best as PF phenomena has already been proposed before. However, the PF movement approaches developed by Aoun & Benmamoun (1998) and Sauerland & Elbourne (2002), for instance, only deal with Scope Reconstruction.

its antecedent as R-expression (as in (12-b)); alternatively, however, the two forms can optionally be interchanged, which finally yields the word order in (12-a). Thus, the following two sentences are identical from a syntactic point of view and only differ at PF.

- (12) a. [Which claim that John<sub>1</sub> made]<sub>2</sub> did he<sub>1</sub> later deny t<sub>2</sub>?  
 b. [Which claim that he<sub>1</sub> made]<sub>2</sub> did John<sub>1</sub> later deny t<sub>2</sub>?

The questions that arise and therefore need to be addressed in the following sections are:

- (i) What is the motivation for this exchange at PF and how is optionality accounted for?  
 (ii) When is this exchange licit and thus a reconstruction sentence grammatical and at which point in the derivation does it take place?  
 So: what is the difference between grammatical and ungrammatical reconstruction sentences?  
 (iii) What exactly is exchanged at PF, i.e., how can this operation be technically implemented?

### 3.1 Motivation and Optionality

The optional exchange of pronoun and R-expression at PF can be motivated as follows. The syntactic derivation yields the linear order *pronoun*  $\succ$  *R-expression*.<sup>14</sup> On the assumption that it is in principle preferable if R-expressions are uttered before coreferent pronouns (which coincides with our intuition), the two forms can optionally be interchanged: in order to yield the preferred linear order, an additional operation is needed which ‘exchanges’ the two affected items (cf. section 3.4 for the technical details); however, a further step is costly in terms of economical considerations – that is why it is optional.<sup>15</sup>

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<sup>14</sup>A  $\succ$  B := A *linearly precedes* B.

<sup>15</sup>That the linear order of antecedent and bound element has an impact on binding relations has also been suggested by Featherston & Sternefeld (2003), who propose the

### 3.2 Licensing and Timing of the PF ‘Exchange’

Before we turn to the discussion of how this exchange can be technically implemented, let us investigate more thoroughly when this kind of reconstruction is licit. Let us therefore turn to the following question: If (12-a) (*Which claim that John<sub>1</sub> made did he<sub>1</sub> later deny?*) and (12-b) (*Which claim that he<sub>1</sub> made did John<sub>1</sub> later deny?*) are based on the same syntactic derivation and differ only insofar as the former involves an additional optional exchange at PF, why is it not possible to derive (10-a) (repeated in (13-a)) in a similar way from (13-b)?

- (13) a. \*[Which picture of **John**<sub>1</sub>]<sub>2</sub> does **he**<sub>1</sub> like t<sub>2</sub> best?  
 b. [Which picture of **him**<sub>1</sub>/**himself**<sub>1</sub>]<sub>2</sub> does **John**<sub>1</sub> like t<sub>2</sub> best?

A first tentative answer could be that a genuine change of bound element and antecedent in (13-b) (= (14-a)) would not really yield (13-a), but rather something like the sentences in (14-b<sub>1</sub>)/(14-b<sub>2</sub>). However, they are illicit because the antecedent must occur in the Nominative, which differs phonologically from the given form in (14-b<sub>1</sub>) and does not exist at all in the anaphoric case in (14-b<sub>2</sub>).

- (14) a. [Which picture of **him**<sub>1</sub>/**himself**<sub>1</sub>]<sub>2</sub> does **John**<sub>1</sub> like t<sub>2</sub> best?  
 b<sub>1</sub>. \*[Which picture of **John**<sub>1</sub>]<sub>2</sub> does **him**<sub>1</sub> like t<sub>2</sub> best?  
 b<sub>2</sub>. \*[Which picture of **John**<sub>1</sub>]<sub>2</sub> does **himself**<sub>1</sub> like t<sub>2</sub> best?

In (12-a), on the other hand, the two forms are phonologically identical to the forms in (12-b) (repeated in (15-b) and (15-a), respectively).

- (15) a. [Which claim that **he**<sub>1</sub> made]<sub>2</sub> did **John**<sub>1</sub> later deny t<sub>2</sub>?  
 b. [Which claim that **John**<sub>1</sub> made]<sub>2</sub> did **he**<sub>1</sub> later deny t<sub>2</sub>?

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(violable) *Binding Direction Rule:*

- (i) *Binding Direction Rule*  
 A binder must linearly precede its bound element.

(Featherston & Sternefeld 2003:39)

However, as the following German example shows, the exchange at PF does not really hinge on the identity of the phonological form.

- (16) a. [Welchen Brief, den ich **ihm**<sub>1</sub> geschickt habe,]<sub>2</sub> hat **Hans**<sub>1</sub>  
 which letter that I him<sub>dat</sub> sent have has John<sub>nom</sub>  
 t<sub>2</sub> laut vorgelesen?  
 loud read out  
 ‘Which letter that I had sent to him<sub>1</sub> did John<sub>1</sub> read out loud?’
- b. [Welchen Brief, den ich **Hans**<sub>1</sub> geschickt habe,]<sub>2</sub> hat **er**<sub>1</sub> t<sub>2</sub>  
 which letter that I John<sub>dat</sub> sent have has he<sub>nom</sub>  
 laut vorgelesen?  
 loud read out  
 ‘Which letter that I had sent to John<sub>1</sub> did he<sub>1</sub> read out loud?’

Hence, the ungrammaticality of (13-a) (*\*Which picture of John<sub>1</sub> does he<sub>1</sub> like best?*) must be explained differently. In fact, it seems to be the case that the bound element can only be realized as R-expression if the alternative grammatical possibility involves a pronominal realization and no anaphoric form. That is, an exchange of the realization forms is excluded if anaphors are involved. This assumption is supported by the observation that an exchange with anaphoric elements is even ruled out if the antecedent is not in a Nominative Case position but in a Case position for which anaphoric forms would in principle be available.

- (17) a. [Welches Bild von **sich**<sub>1</sub>] gefällt **Timo**<sub>1</sub> am besten?  
 which picture of SE<sub>dat</sub> pleases Timo<sub>dat</sub> best  
 ‘Which picture of him<sub>1</sub>/himself<sub>1</sub> does Timo<sub>1</sub> like best?’
- b. \*[Welches Bild von **Timo**<sub>1</sub>] gefällt **sich**<sub>1</sub> am besten?  
 which picture of Timo<sub>dat</sub> pleases SE<sub>dat</sub> best  
 ‘Which picture of him<sub>1</sub>/himself<sub>1</sub> does Timo<sub>1</sub> like best?’
- c. Timo<sub>1</sub> gefällt sich<sub>1</sub>.  
 Timo pleases SE<sub>dat</sub>  
 ‘Timo<sub>1</sub> pleases himself<sub>1</sub>.’

As the German example in (17-c) illustrates, the SE anaphor *sich* can be used as a Dative Experiencer. But although the target position of *sich* would be a Dative Experiencer position and the forms would even be phonologically

identical, it is not possible to exchange the bound anaphor and its antecedent, an R-expression, in sentences like (17-a) (as illustrated in (17-b)). So it must be concluded that it is not the identity of the phonological form that rules out an exchange at PF, but that it is simply an illicit operation for anaphors.<sup>16,17</sup>

However, it still remains to be seen why (13-a) (repeated in (18-b)) cannot be derived from the version of (13-b) which involves the pronominal form (cf. (18-a)).

- (18) a. [Which picture of **him**<sub>1</sub>]<sub>2</sub> does **John**<sub>1</sub> like t<sub>2</sub> best?  
 b. \*[Which picture of **John**<sub>1</sub>]<sub>2</sub> does **he**<sub>1</sub> like t<sub>2</sub> best?

Here, the derivation of this form becomes relevant (which I have neglected here; cf. Fischer 2003, 2004b). The crucial thing about it is that it is not based on the optimal matrix [pron, R-ex], but rather on the matrix [SE, pron, R-ex] – however, since English lacks simple anaphors, the most specific available form is chosen in this case, which is the pronoun (the mechanism can be compared to the Subset Principle in Distributed Morphology).

Thus we can account for the lack of exchange in (18) if it occurs *before* Late Insertion takes place; this means that it is the optimal realization matrix that is considered rather than the concrete form – and if this does not correspond to the matrix [pron, R-ex], the exchange is not licensed (as in the case of (18-b)). This timing also explains why the pronominal exchange does not

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<sup>16</sup>Note moreover that sentence (17-b) does not improve if the R-expression *Timo* is replaced with a pronoun.

- (i) \*[Welches Bild von ihm<sub>1</sub>] gefällt sich<sub>1</sub> am besten?  
 which picture of him<sub>dat</sub> pleases SE<sub>dat</sub> at best  
 ‘Which picture of him<sub>1</sub>/himself<sub>1</sub> does he<sub>1</sub> like best?’

Thus we can conclude that the exchange of R-expression and pronoun is not alone facilitated by the fact that these forms are adjacent on the anaphoricity hierarchy; otherwise we would expect (i) to be grammatical as well, since pronouns and (simple) anaphors are also adjacent (just like pronouns and R-expressions). It rather seems to be the case that anaphors are generally excluded from this kind of operation.

<sup>17</sup>Intuitively speaking, the hearer might have difficulties with the reconstruction of the syntactic structure if the anaphor occupies a position that has never been c-commanded by the coindexed item throughout the derivation.

necessarily presuppose identity in phonological form (cf. (16)) – at this stage, the concrete phonological forms have not yet been inserted.

Moreover, this also accounts for the fact that the PF exchange is not licensed if variable binding is involved, as illustrated in the following example, which contrasts with the grammatical sentence in (6-b) (*That John<sub>1</sub> had seen the movie he<sub>1</sub> admitted*).

- (19) a. That he<sub>1</sub> had seen the movie every man<sub>1</sub> admitted.  
 b. \*That every man<sub>1</sub> had seen the movie he<sub>1</sub> admitted.

- (20) *x = every man*:  
 meaning = ‘That every man had seen the movie every man admitted’

As a comparison between the meaning of sentence (19-a) and the meaning indicated in (20) shows, the meaning of the sentence is changed if  $x = \textit{every man}$  (cf. (20)) instead of  $x = \textit{pron}$  (cf. (19-a)). Hence, in the case of variable binding,  $x$ 's realization matrix must not contain an *R-ex* specification (derived from the antecedent), but only consists of the specifications [SELF, SE, pron]. As a result, the matrix can never take on the form [pron, R-ex], and therefore the exchange can never apply successfully (cf. also section 3.4).

To sum up, everything amounts to the following scenario: If  $x_{[\textit{pron}, R\textit{-ex}]}$  linearly precedes its antecedent (= an R-expression) at PF, they can optionally ‘exchange’ their specifications; afterwards Late Insertion takes place and assigns the antecedent a pronominal form while  $x$  is realized as R-expression. Optionality arises because the exchange is both costly and desired since it yields a better linearization.

### 3.3 Anaphoric Specifications vs CP Boundaries – Evidence from Icelandic

There is a further objection that might be raised against the assumption that it is the presence of anaphoric specifications that blocks the PF exchange. On the basis of the data discussed so far, the crucial contrast between grammatical and ungrammatical reconstruction sentences might as well be related to the sentence boundary CP: if it intervenes between bindee and antecedent, the examples are grammatical (cf. (21-a) and (21-b)), otherwise they are not

(cf. (21-c) and (21-d)).

- (21) a. [Which claim [<sub>CP</sub> that John<sub>1</sub> made]] did he<sub>1</sub> later deny?  
 b. [<sub>CP</sub> That John<sub>1</sub> had seen the movie] he<sub>1</sub> never admitted.  
 c. \*<sub>[DP</sub> Which picture of John<sub>1</sub>] does he<sub>1</sub> like best?  
 d. \*<sub>[PP</sub> In Ben<sub>1</sub>'s office] he<sub>1</sub> lay on the desk.

Whether it is the intervening CP or rather the anaphoric specification of the matrix associated with the bound element in (21-c) and (21-d)<sup>18</sup> is ideally tested in a language where anaphors can occur despite an intervening CP – for instance in Icelandic, where we can observe long distance binding.<sup>19</sup>

Since Icelandic does not allow Nominative anaphors, we need a test sentence with a non-Nominative matrix subject as antecedent – otherwise, the exchange would be blocked independently (due to the lack of a corresponding Case form); and a subject antecedent is necessary to license long distance binding. Thus, consider the following example, in which the bound element can either be realized as simple anaphor or as pronoun and where a CP boundary intervenes between binder and bound element.

- (22) Jóni<sub>1</sub> finnst frekar ólíklegt [<sub>CP</sub> að Maríu dreymi  
 John<sub>dat</sub> finds rather unlikely that Maria<sub>acc</sub> dreams<sub>subj</sub>  
 ?sig<sub>1</sub>/hann<sub>1</sub>]  
 SE<sub>acc</sub>/him<sub>acc</sub>  
 ‘John<sub>1</sub> finds it rather unlikely that Maria dreams of him<sub>1</sub>.’

If the CP containing the bound element is topicalized (and thereby moved in front of the antecedent), we get the configuration in (23), which is still grammatical.

- (23) [<sub>CP</sub> Að Maríu dreymi ?sig<sub>1</sub>/hann<sub>1</sub>] finnst Jóni<sub>1</sub> frekar  
 That Maria dreams<sub>subj</sub> SE<sub>acc</sub>/him<sub>acc</sub> finds John<sub>dat</sub> rather

<sup>18</sup>Note again that in both parallel sentences, *Which picture of himself<sub>1</sub>/him<sub>1</sub> does John<sub>1</sub> like best?* and *In his<sub>1</sub> office, John<sub>1</sub> lay on the desk*, *x*'s matrix contains anaphoric specifications, the matrices being [(SELF,) SE, pron, R-ex] in the former and [SE, pron, R-ex] in the latter case.

<sup>19</sup>I owe the Icelandic examples in this section to Gunnar Hrafn Hrafnbjargarson (p.c.).

ólíklegt  $t_{CP}$ .  
 unlikely  
 ‘John<sub>1</sub> finds it rather unlikely that Maria dreams of him<sub>1</sub>.’

The crucial test example is given in (24): What happens if the bound element is realized as R-expression and the antecedent as anaphor or pronoun? (As indicated before, an anaphoric form is in principle available for this position.)

(24) [<sub>CP</sub> Að Maríu dreymi **Jón<sub>1</sub>**] finnst \*sér<sub>1</sub>/?honum<sub>1</sub> frekar  
 That Maria dreams<sub>subj</sub> John<sub>acc</sub> finds SE<sub>dat</sub>/him<sub>dat</sub> rather  
 ólíklegt  $t_{CP}$ .  
 unlikely  
 ‘John<sub>1</sub> finds it rather unlikely that Maria dreams of him<sub>1</sub>.’

Although the syntactic structure is identical, the exchange is blocked in the case of the long distance anaphor but possible in the case of the pronoun. Hence, it can be concluded that it is not the intervening CP which makes the crucial difference between grammatical and ungrammatical reconstruction sentences, but rather the absence/presence of anaphoric specifications related to the bound element’s realization matrix.

### 3.4 Technical Implementation

What remains to be seen is how this ‘exchange’ of forms can be integrated technically into the model. Hence, the following issues need to be addressed: What exactly is exchanged? What are the licensing conditions for this operation? And what exactly does the rule look like?

As to the first question, it has been observed before that it is crucial that the exchange occurs before Late Insertion takes place, because not the lexical items as such change positions but their realization specification. This is a logical conclusion given the fact that the exchange might affect different Case positions (cf. (16): *Welchen Brief, den ich ihm<sub>1</sub> (=Dat) geschickt habe hat Hans<sub>1</sub> (=Nom) laut vorgelesen?* vs *Welchen Brief, den ich Hans<sub>1</sub> (=Dat) geschickt habe, hat er<sub>1</sub> (=Nom) laut vorgelesen?*). Apparently, it is possible that a Dative pronoun occurs in the Nominative Case after the exchange has taken place; this suggests that the crucial exchange operation does not affect



the complete set of features, but only the specifications concerning the form of  $x$  and its binder.

On this assumption, the Case features remain in their original position, and thus the exchanged forms take on the Case associated with their new positions. For the sake of concreteness, consider the situation in (16) (repeated in (25)).

- (25) a. Welchen Brief, den ich ihm<sub>1</sub> geschickt habe, hat Hans<sub>1</sub> laut  
 which letter that I him sent have has John loud  
 vorgelesen?  
 read out  
 ‘Which letter that I had sent to him<sub>1</sub> did John<sub>1</sub> read out loud?’
- b. Welchen Brief, den ich Hans<sub>1</sub> geschickt habe, hat er<sub>1</sub> laut  
 which letter that I John sent have has he loud  
 vorgelesen?  
 read out  
 ‘Which letter that I had sent to John<sub>1</sub> did he<sub>1</sub> read out loud?’

Let us start with sentence (25-a). At PF, before Late Insertion takes place, the bound element is encoded as a bundle of features including, *inter alia*, the realization matrix [pron, HANS] and a Dative Case feature.<sup>20</sup> Since the binder has been encoded as R-expression from the beginning in this example, the respective set of features does not contain a realization matrix but simply the form HANS plus all the other features like Case (here Nominative Case),  $\phi$ -features etc. (cf. (26-a)).

Until this stage, the derivation of example (25-b) is identical; but before Vocabulary Insertion takes place, an operation is triggered that derives (26-b) from (26-a). Informally speaking, it can be called an exchange of the realization specification (we will turn to this aspect immediately) – in any case, the illustration in (26) shows clearly that the other features are not affected, which has the effect that in its new position [pron, HANS] is no longer marked for Dative Case but for Nominative Case, whereas HANS is

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<sup>20</sup>I use capital letters for the (copy of the) R-expression to indicate that it is still an abstract form, because Late Insertion has not yet taken place; the “real” vocabulary item will have to be modified according to the other associated features.

now associated with Dative Case. As far as the  $\phi$ -features are concerned, they are not affected by the operation either, but since  $x$  and its antecedent refer to the same entity, they are identical anyway.

- (26) a. *bound element*:  
 {[**pron**, **HANS**], Dative, 3rd person, singular, masculine, ... }  
*binder*:  
 {**HANS**, Nominative, 3rd person, singular, masculine, ... }  
 b. *bound element*:  
 {**HANS**, Dative, 3rd person, singular, masculine, ... }  
*binder*:  
 {[**pron**, **HANS**], Nominative, 3rd person, singular, masculine, ... }

What has been assumed so far is that not the complete bundles of features change their positions, but only the part where the realization form is encoded. However, if we compare again (26-a) and (26-b), it can be seen that this operation can be restricted even further: It need not be the case that the complete specifications, [pron, HANS] and HANS, exchange their positions, it suffices if some part of  $x$ 's realization matrix is shifted to the antecedent's feature bundle – i.e., if we take (26-a) as a starting point, (26-b) can simply be derived by taking the specification *pron* and attaching it to the form HANS.<sup>21</sup>

At first sight, this operation might resemble the process called Lowering in the literature on Distributed Morphology (cf., for example, Embick & Noyer 2001). However, on closer inspection, it becomes clear that we are not dealing with an instance of Lowering here.

In general, Embick & Noyer (2001) distinguish between two types of mergers in morphology: Lowering and Local Dislocation. While the latter occurs after Vocabulary Insertion and can only affect linearly adjacent items, Lowering occurs prior to Late Insertion and makes reference to the hierarchical structure of the derivation. Since the operation we are dealing with must

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<sup>21</sup>Note that this operation does not leave a trace or copy of the shifted specification in its base position – i.e., after the shift, the specification *pron* has been deleted from the bound element's realization matrix (cf. (26-b)).

occur before Vocabulary Insertion and is not strictly local, it cannot be considered to be a type of Local Dislocation. But what about Lowering?

The goal of Lowering is to “unite syntactic terminals that are phonologically spelled together but not joined in overt syntax” (Embick & Noyer 2001:561). Briefly, this operation can lower a head to the head of its complement,<sup>22</sup> which accounts, for instance, for the fact as to why tense is realized on the verb in English, although verbs do not move to T in overt syntax.

This does not really look like the operation we are dealing with either, although it also takes place before Vocabulary Insertion and lowers some elements.<sup>23</sup> As discussed above, in the reconstruction examples only *some* feature specifications are shifted and not a complete head, the locality conditions are less strict, and the hierarchical structure does not play a role. In fact, the only thing which seems to count in our case is the linear order of two coreferent items. The operation which applies in our examples can hence be defined as follows.

(27) *Feature Shift (FS):*

- a. If  $\alpha$  and  $\beta$  are coreferent and  $\alpha$  linearly precedes  $\beta$  at PF ( $\alpha \succ \beta$ ), the most anaphoric element of  $\alpha$ 's realization matrix may be *shifted* to  $\beta$ 's realization specification if (i) it respects the requirement that matrices be not extended and (ii) this yields a licit specification.
- b. *Licit specifications* are either R-expressions or realization matrices of the form  $[e_n, \dots, e_1]$  ( $n \geq 1$ ), where  $e_i$  ( $n \geq i \geq 1$ ) are specifications  $\in \{\text{SELF}, \text{SE}, \text{pron}, \text{R-ex}\}$ , and  $e_j$  and  $e_{j-1}$  ( $n \geq j > 1$ ) are adjacent on the anaphoricity hierarchy.

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<sup>22</sup>According to Embick & Noyer (2001), the target of Lowering is in fact the closest morphosyntactic word (MWd) of the complement; MWd:= the highest segment of an  $X^\circ$  not contained in another  $X^\circ$  (cf. Embick & Noyer 2001:574; 589)

<sup>23</sup>Note that the operation proposed here cannot be considered to be an instance of Impoverishment either. Impoverishment means that “within a certain context, features at a node are deleted – and the context may be features of a different node in the tree” (cf. Marantz 2003:9). But although the feature *pron* in  $x$ 's realization matrix could be said to be blocked by the feature *R-ex* in the specification of the antecedent, the blocked feature is not deleted completely but emerges in another position, namely in the feature set of the blocking element.

Following this definition, the only environment in which Feature Shift can take place is the one illustrated in (28), where  $x$  has the optimal matrix [pron, R-ex] and its antecedent is encoded as R-expression from the beginning. Hence, the target of Feature Shift is not a matrix, and (27-a)-(i) is respected. Furthermore, if the feature *pron* combines with *R-ex*, it yields a licit specification for the antecedent (cf. (27-a)-(ii) and (27-b)), which can now be considered to be a new realization matrix.

However, if an anaphoric specification is involved, Feature Shift cannot apply successfully. If  $x$  is specified by the matrix [SE, pron] since the binder is not an R-expression but represented by the realization matrix [pron], Feature Shift is not possible because the antecedent is already equipped with a matrix, which would have to be extended in violation of (27-a)-(i). This case is illustrated in (29) If, as in (30) and (31),  $x$  has the matrix [SE, pron, R-ex] and its antecedent is not encoded as a matrix but as an R-expression, Feature Shift would not extend a given matrix. However, the shift of *SE* alone (cf. (30)) would yield the specification [SE, R-ex], which is illicit since the forms are not adjacent on the anaphoricity hierarchy; and the simultaneous shift of the two specifications *SE* and *pron*, as illustrated in (31), is not compatible with the definition either, because only the *most* anaphoric specification can be shifted.<sup>24</sup>

$$(28) \quad [\text{pron, R-ex}] \succ \text{R-ex} \xrightarrow{\text{Feature Shift}} [\text{R-ex}] \succ [\text{pron, R-ex}]$$

$$(29) \quad [\text{SE, pron}] \succ [\mathbf{pron}] \xrightarrow{*FS (27-a)-(i)} [\text{pron}] \succ [\mathbf{SE, pron}]$$

$$(30) \quad [\text{SE, pron, R-ex}] \succ \text{R-ex} \xrightarrow{*FS (27-a)-(ii)} [\text{pron, R-ex}] \succ [\mathbf{SE, R-ex}]$$

$$(31) \quad [\text{SE, pron, R-ex}] \succ \mathbf{R-ex} \xrightarrow{*FS (27-a)} [\text{R-ex}] \succ [\mathbf{SE, pron, R-ex}]$$

As mentioned before, Feature Shift is generally ruled out if variable binding is involved (cf. (19-b): *\*That every man<sub>1</sub> had seen the movie he<sub>1</sub> admitted*), because in this case the matrix does not contain an *R-ex* specification (even

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<sup>24</sup>If  $x$  involves the specification *SELF*, Feature Shift is ruled out along the same lines.

if the antecedent is non-pronominal).<sup>25</sup> The following illustration shows why Feature Shift cannot apply successfully:

- (32) a. [SE, pron]  $\succ$  R-ex  $\xrightarrow{*FS (27-a)-(ii)}$  [pron]  $\succ$  [SE, R-ex]  
 b. [pron]  $\succ$  R-ex  $\xrightarrow{*FS (27-a)-(ii)}$  [ ]  $\succ$  [pron, R-ex]

In the first scenario, (32-a), it is assumed that the matrix still contains an anaphoric specification when it is mapped to PF. Here, Feature Shift would yield an illicit specification (= [SE, R-ex]) for the antecedent. If no anaphoric specification were involved, as in (32-b), the antecedent's specification would be okay, but the bound element's matrix would be illicit (= [ ]); as (27-b) indicates, it must not be empty.

As alluded to before, Feature Shift can be considered to be functionally motivated, because it yields a better linearization. But since each additional operation is against the idea of economy, Feature Shift does not apply obligatorily, and hence optionality arises.

#### 4. Conclusion

To sum up, the contrast between sentence pairs like (33) and (34) can be accounted for as follows:

- (33) a. [Which claim that **he**<sub>1</sub> made]<sub>2</sub> did **John**<sub>1</sub> later deny t<sub>2</sub>?  
 b. [Which claim that **John**<sub>1</sub> made]<sub>2</sub> did **he**<sub>1</sub> later deny t<sub>2</sub>?  
 (34) a. [Which picture of **him**<sub>1</sub>/**himself**<sub>1</sub>]<sub>2</sub> does **John**<sub>1</sub> like t<sub>2</sub> best?  
 b. \*[Which picture of **John**<sub>1</sub>]<sub>2</sub> does **he**<sub>1</sub> like t<sub>2</sub> best?

In narrow syntax, the derivation of the (a)- and (b)-sentences in (33) and (34) is identical. However, at PF (b)-type sentences might be derived in addition to the (a)-type sentence via Feature Shift. This option is only available if the antecedent is an R-expression and  $x$  has the realization matrix [pron, R-ex].

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<sup>25</sup>In (32) I use the abbreviation *R-ex* as a cover term; obviously, in examples like (19) the antecedent is not a real R-expression but a quantifier.

The contrast between (33-b) and (34-b) results from differences with respect to depth of embedding. In (33-b),  $x$  is bound outside its binding domain; in (34-b), binding takes place within  $x$ 's binding domain. As outlined in Fischer (2003, 2004b), this means that  $x$ 's realization matrix is reduced to [pron, R-ex] in the former case in the course of the syntactic derivation, whereas the matrix still contains anaphoric specifications in the latter case. The initial questions of (i) why is (33-b) grammatical and (ii) why can (34-b) not be derived in the same way can therefore be answered as follows: Since (33-b) looks like (33-a) with respect to its syntactic derivation, there is at no point in the derivation a Principle C configuration; and as  $x$ 's matrix is reduced to [pron, R-ex], Feature Shift can apply at PF to optimize the linearization (cf. (28)). Finally, Late Insertion takes place and yields sentence (33-b).

As to (34),  $x$ 's final matrix corresponds to [SELF, SE, pron, R-ex] or [SE, pron, R-ex] (this optionality, which is derived more explicitly in Fischer 2003, 2004b, leads to the two realization forms *himself* or *him*) – in any case, there is no reduction to [pron, R-ex]. As a result, Feature Shift cannot apply successfully (cf. (30) and (31)), and thus only (34-a) can be derived but not (34-b).<sup>26</sup>

To sum up, reconstruction effects as in (33-b) reflect the successful application of a linearization optimization at PF which is blocked in the case of (34-b).

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<sup>26</sup>Note that the ungrammaticality of (34-b) is therefore not the result of a Principle C violation.

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