Theories of Binding

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1. Introduction

In contrast to the chapter on pronominal anaphora (cf. Fischer, this volume), where the distribution and occurrence of reflexives and pronouns in different syntactic environments has been scrutinized, this chapter focuses on analyses that have been developed to account for these facts. In other words, different theories of binding will be presented and discussed here in detail.

Chomsky (1981) can certainly be considered to play a pioneering role in this field, and the basic essence of this theory is well-known to everyone dealing with binding. However, the original formulations have often become blurred over time, since (i) there have been proposed many refinements in the meantime, and (ii) people have often used simplified versions of it. Hence, the aim of section 2 will be to thoroughly discuss the orignial version.

Of course, since Chomsky (1981) a huge amount of other theories has been developed, some of them in a similar spirit, some of them on the basis of completely different premises. Obviously, this chapter can only cover a fraction of the analyses proposed, so what I will do here is pick out some assorted samples with different background assumptions.

Section 3 will be concerned with one of the first renowned alternative approaches, Reinhart and Reuland's (1991, 1993) theory of reflexivization. Like Chomsky (1981), this analysis is based on a representational view of syntax. Due to lack of space, we will then jump to more recent theories from the last decade, starting in section 4 with one of the first (and arguably most radical) approaches that have been developed within a derivational framework, namely Hornstein (2001).[1] What Fischer (2004a,b, 2006) additionally takes into account is the concept of competition – this is what section 5 is concerned with. While Fischer (2004a) provides a non-derivational version, Fischer (2004b, 2006) translates the basic ideas into a local derivational approach; in section 5 the latter version is discussed.

The selection presented so far thus reflects the general shift syntactic theory has undergone from a representational setting (cf. G&B theory) to a derivational view (cf. minimalism). A second dichotomy that can generally be found in syntactic theory concerns the question of whether global or local constraints are applied. While Fischer (2004b, 2006) serves as an example for a local derivational theory, Kiss (to appear), which is discussed in section 6, adopts a local representational view. Kiss develops an HPSG-based theory of binding and provides in particular an elaborate analysis of picture NP reflexives in English and German. Hence, section 6 discusses both data and a framework that have not been dealt with in the previous sections. Finally, the chapter closes with a brief conclusion.

2. Chomsky (1981) – The Emergence of the Binding Principles A, B, and C

2.1 An Informal Approach

Before turning to Chomsky's original approach from 1981, let us briefly recapitulate informally what linguists generally know as the gist of this theory. The reason for this proceeding is that it is easier to keep track of the orignial proposals if we keep in mind the quintessence of it.

[1]The theories by Chomsky (1981), Reinhart and Reuland (1991, 1993), and Hornstein (2001) are also discussed in detail in Fischer (2004b).

On the basis of data as in (1) and (2), the distribution of anaphors, pronouns, and R-expressions, respectively, can roughly be described as follows:[2] (i) Anaphors must be bound in a relatively local domain;[3] (ii) pronouns must be free in this domain; and (iii) R-expressions may not be bound at all.

(1) a. Anna_1 recognized herself_1/*her_1 in the picture.
b. She/*Herself/*Sheself likes the picture.
c. Her_1 brother recognized *herself_1/her_1 in the picture.
d. Anna_1 said that Paul recognized *herself_1/her_1 in the picture.

(2) a. *Anna_1 recognized Anna_1 in the picture.
b. Anna likes the picture.
c. Her_1 brother recognized Anna_1 in the picture.
d. *Anna_1 said that Paul recognized Anna_1 in the picture.

2.2 The Notion of Government

Let us now turn to the more formal terminology that is used in Chomsky (1981) to capture these observations. The aim of this work was basically to overcome (at least some of) the technical and conceptual problems the theory of binding proposed in Chomsky's (1980) article "On Binding" had brought up (cf. Chomsky 1981, section 3.3.1.).[4]

One of the conceptual problems concerned certain redundancies between this theory and other modules of the grammar. For example, Chomsky observes that both Case and binding theory single out one particular NP position in a clause, namely the subject position of an infinitive; however, the two theories provide seemingly unrelated reasons for this fact.[5]

In order to express the close relation between these two modules, Chomsky (1981) therefore proposes that not only Case but also binding theory should be based on the central notion of government. In fact, he proposes three slightly different definitions and discusses their impact; however, for reasons of space, I will concentrate on the third version he presents, which is based on an extended definition of c-command (cf. (3)-(5)).

(3) $[_\beta \ldots \gamma \ldots \alpha \ldots \gamma \ldots]$, where
a. $\alpha = X^0$,
b. where ϕ is a maximal projection, if ϕ dominates γ then ϕ dominates α,
c. α c-commands γ. (cf. Chomsky 1981:165)

[2] Cf. also the chapter on pronominal anaphora (Fischer, this volume) as regards a more detailed discussion of the data in (1).

[3] As far as the concrete nature of this domain is concerned, different definitions and different terminology have been proposed. According to Chomsky (1981), it is the *governing category* (cf. the following sections); Chomsky (1986b) refers to the *complete functional complex* (= the minimal domain in which all grammatical functions compatible with the head are realized). Moreover, the notion of *binding domain* is wide-spread in order to use a neutral term in the definition of the binding principles – the concrete definition of the term differs.

[4] The two central principles in Chomsky (1980) are the *Opacity Condition* and the *Nominative Island Condition*. The Opacity Condition subsumes the *Specified Subject Condition* and the *Propositional Island* (or *Tensed-S*) *Condition* (cf. also Fischer, this volume), which were already proposed in Chomsky (1973).

[5] "Consider the three basic positions for NP in S: nominative subject of Tense, subject of an infinitive, complement of a verb. The theory of Case singles out the subject of an infinitive as the one position that is not marked for Case. The theory of binding independently selects this position as the single transparent domain." (Chomsky 1981:157)

(4) α governs γ in (3).

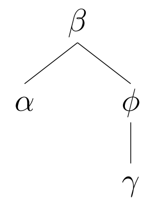
(5) α *c-commands* γ iff

a. α does not contain γ

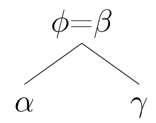
b. Suppose that $\delta_1, \ldots, \delta_n$ is the maximal sequence such that
   (a) $\delta_n = \alpha$
   (b) $\delta_i = \alpha^j$
   (c) δ_i immediately dominates δ_{i+1}
   Then if ε dominates α, then either (I) ε dominates γ or (II) $\varepsilon = \delta_i$ and δ_1 dominates γ. (cf. Chomsky 1981:166)

Let us first take a closer look at the configuration described in (3). As far as the double occurrence of γ in the underlying structure is concerned, it indicates that γ may either occur to the right or to the left of α. Furthermore, (3-a) constrains the set of potential governors to heads. As to the effects of (3-b) and (3-c), consider the abstract illustrations in (6)-(8): In (7), α governs γ; in (6), this is not the case if ϕ is a maximal projection; and in (8), it depends on the nature of ϕ and β – if both are projections of α, α governs γ in this scenario.[6]

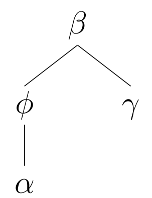
(6) *Here, requirement (3-b) is violated if ϕ is a maximal projection; (3-c) is satisfied following the definition in (5) (with $\varepsilon=\beta$, (5-b) (c-I) is fulfilled):*



(7) *This structure satisfies both, (3-b) and (3-c) (with $\varepsilon=\beta$, (5-b) (c-I) is again fulfilled):*



(8) *If ϕ and β are projections of α, (3-c) is satisfied (with $\varepsilon=\beta$, (5-b) (c-I) is fulfilled; with $\varepsilon=\phi$, (5-b) (c-II) is fulfilled):*



After this brief revision of the original definition of the central notion of government, let us now take a closer look at the orignial versions of Chomsky's binding principles.

2.3 The Binding Principles

Basically, there are two notions of binding. First, binding can refer to the relation between

[6] In fact, structure (8) reveals that this definition of government differs from earlier versions in that it is more liberal; according to the other definitions of government proposed in Chomsky (1981), the government relation would either be generally blocked or would hold only if ϕ were no maximal projection. Following (3), a government relation can even be established if ϕ is a maximal projection (as long as it is a projection of α).

anaphors/pronouns and their antecedents, and second, operators may bind variables, which means that there is also a logical notion of binding. One way to distinguish between these two types of binding is to look at the position occupied by the binder, since binders of the first type are generally located in A-positions, whereas binders of the second type are located in A′-positions. Thus, we can refer to the two notions of binding as A- vs A′-binding and introduce the following definition, where $X \in \{A, A'\}$.

(9) a. α is X-bound by β iff α and β are coindexed, β c-commands α, and β is in an X-position.
b. α is X-free iff it is not X-bound. (cf. Chomsky 1981:185)

In the following, this explicit distinction between A- and A′-binding will be neglected for the sake of convenience, and binding is generally to be understood as A-binding since this is what binding theory is concerned with.

On the basis of the notion of governing category (cf. (10)), Chomsky finally proposes the binding principles in (11), which are referred to as Principle A, B, and C, respectively.[7]

(10) β is the governing category for α iff β is the minimal category containing α and a governor of α, where β=NP or S. (cf. Chomsky 1981:188)

(11) *Binding Principles:*
Let β be a governing category for α.
(A) If α is an anaphor, it is bound in β.
(B) If α is a pronominal, it is free in β.
(C) If α is an R-expression, it is free. (cf. Chomsky 1981:188; 225)

Let us now consider which predictions these principles make with regard to the examples from above. In (1-a) and (2-a), repeated in (12), the bound element (= α) is in the object position and the subject is the antecedent.

(12) [$_{S^*}$ Anna$_1$ [$_{VP}$ recognized herself$_1$/*her$_1$/*Anna$_1$ in the picture]]

In this configuration, the verb governs α, and hence the governing category for α is the matrix clause, S*. Obviously, S* also comprises the subject, thus α is bound in its governing category. This means that Principle A is fulfilled, whereas Principle B and Principle C are violated. Hence, (12) is only grammatical if α is realized as an anaphor.

Since INFL governs the subject position in structures like these, the governing category for the subject NP in (1-b) and (2-b) (repeated in (13)) is again S*. However, the subject NP in these examples is not bound at all, thus Principle A rules out the anaphor in (13) (independent of Case), whereas the pronoun and the R-expression are correctly predicted to be grammatical.

(13) [$_{S^*}$ *Herself/She/Anna likes the picture]

As far as the examples (1-c) and (2-c) (repeated in (14)) are concerned, V is again a governor for α, and hence S* corresponds to its governing category.

(14) [$_{S^*}$ Her$_1$ brother [$_{VP}$ recognized *herself$_1$/her$_1$/Anna$_1$ in the picture]]]

[7]At the beginning, Chomsky assumes that the binding principles apply at LF (cf. Chomsky 1981:188; 194); however, in the course of the discussion he finally proposes that the level of application should rather be S-Structure (cf. Chomsky 1981:196ff.; fn. 34). This is mainly motivated by reconstruction sentences.

However, since the c-command requirement is not fulfilled, the coindexed possessive pronoun does not bind α; hence, Principle A is violated, whereas Principle B and C are fulfilled. Consequently, only the anaphor is ungrammatical in example (14).

In (1-d) and (2-d) (repeated in (15)), the embedded verb serves as a governor for α; its governing category is therefore the embedded S.

(15) $[_{S^*}$ Anna$_1$ said $[_{S'}$ that $[_S$ Paul $[_{VP}$ recognized *herself$_1$/her$_1$/ *Anna$_1$ in the picture]]]]

Thus, anaphors are ruled out by Principle A, since binding takes place outside the governing category, whereas pronouns satisfy Principle B. Moreover, R-expressions violate Principle C, which is independent of the notion of governing category. As a result, it can be concluded that Chomsky's binding principles in (11) make correct predictions with respect to the examples introduced in section 2.1.

However, in view of the contrast observed in (16), Chomsky proposes some further refinements as far as the notion of governing category is concerned. Following the definition in (10), NP* is the governing category for the reciprocal in both cases, since P serves as a governor for α. Accordingly, α is not bound within its governing category, and hence we should expect Principle A to rule out both sentences.[8]

(16) a. We$_1$ heard $[_{NP^*}$ some stories about each other$_1$].
b. *We$_1$ heard $[_{NP^*}$ John's stories about each other$_1$].

(cf. Chomsky 1981:207f.)

Interestingly, the *Specified Subject Condition* assumed formerly can capture the difference, since it is sensitive to the fact that (16-b) contains an intervening subject (the possessor), whereas (16-a) does not. Hence, Chomsky tries to integrate some of the old insights into the present theory by introducing the notion of SUBJECT and proposes a modification of the definition of governing category, which is given in (18).

(17) a. S $\longrightarrow$ NP INFL VP, where INFL=[[$\pm$ Tense], (AGR)]
b. AGR and the subject of an infinitive, an NP or a small clause are a SUBJECT.

(cf. Chomsky 1981:209)

(18) a. AGR is coindexed with the NP it governs.
b. β is a *governing category* for α iff β is the minimal category containing α, a governor of α, and a SUBJECT accessible to α.

(cf. Chomsky 1981:211)

(19) a. $*[_\gamma \ldots \delta \ldots]$, where γ and δ bear the same index.[9]
b. β is *accessible* to α iff α is in the c-command domain of β and assignment to α of the index of β would not violate (19-a).

(cf. Chomsky 1981:212)

These definitions yield the correct result for example (16): In (16-a), the governing category is now the matrix clause, S*, which contains AGR as accessible SUBJECT; hence, Principle A is fulfilled. In (16-b), by contrast, NP* is the governing category of the reciprocal, since it

[8]Note that Chomsky follows the structural approach to account for picture NP reflexives. Cf. section 6 and Fischer (this volume) as regards different ways to tackle these data.

[9](19-a) is also known as the *i*-within-*i* filter, which prohibits coindexation of γ and δ if the latter is contained inside the former: $*[\gamma_i \ldots \delta_i \ldots]$.

contains an accessible SUBJECT (namely the possessor); as a result, Principle A is violated and the sentence correctly predicted to be ungrammatical.[10]

2.4 Problems

In this section, I will briefly outline four main problems Chomsky's theory of binding faces. First, the way in which Principle A and B have been defined (cf. (11)) suggests that anaphors and pronouns generally occur in complementary distribution. However, although the prediction is correct in many contexts, it is not always borne out (neither in English nor in other languages); cf., for instance, (20) (and also the Dutch and Italian examples in (25)).[11]

(20) Max$_1$ glanced behind himself$_1$/him$_1$.

Further problems arise because Chomsky (1981) focuses on English. In many other languages, two different types of anaphors can be observed which differ with respect to their distribution (cf. the Dutch data in (21)-(23)). As it stands, Principle A cannot account for these facts; it treats all anaphors alike.

(21) Max$_1$ wast zich$_1$/zichzelf$_1$.
Max washes SE/himself
'Max$_1$ washes himself$_1$.'

(22) Max$_1$ haat zichzelf$_1$/*zich$_1$.
Max hates himself/SE
'Max$_1$ hates himself$_1$.'

(23) Max$_1$ keek achter zich$_1$/*zichzelf$_1$.
Max glanced behind SE/himself
'Max$_1$ glanced behind himself$_1$.'

Furthermore, Principle A suggests that anaphoric binding is a local phenomenon; however, as the case of long distance binding in other languages shows, this is not always true (cf. the overview in Fischer, this volume). In the Icelandic example in (24), for instance, the matrix subject can bind the anaphor regardless of an intervening subject in the embedded clause.

(24) Jón$_1$ skipaði Pétri [PRO að raka ??sjálfan sig$_1$/sig$_1$/hann$_1$ á hverjum degi]
John ordered Peter to shave$_{inf}$ himself/SE/him on every day
'John$_1$ ordered Peter to shave him$_1$ every day.'

But even in more local binding relations we can observe a wide range of crosslinguistic variation, as the comparison between English, German, Dutch, and Italian in (25) reveals.[12]

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[10] The definition in (18) does not only capture the contrast between (16-a) and (16-b); it also has the positive side effect that it accounts for the question as to why governing categories are generally $\in$ {NP, S}. While this had to be stipulated in the old definition (10), it now follows from the fact that we usually find SUBJECTS in NP or S. Note, moreover, that the modified definition in (18) does not have an effect on the analysis of the previous examples: The governing categories remain the same in all cases (matrix/embedded S), since they all contain an accessible SUBJECT, namely AGR.

[11] Note that although the so-called *BT-compatibility algorithm*, which was introduced in Chomsky (1986b), makes it possible to predict a non-complementary distribution in certain configurations, this is not the case in (20); cf. Hestvik (1991) as far as a corresponding modification is concerned.

[12] Note that some Dutch native speakers prefer the weak pronoun *'m* instead of the strong pronoun *hem* in (25-c).

(25) a. *English*: Max_1 glanced behind himself_1/him_1.
b. *German*: Max_1 blickte hinter sich_1/??sich selbst_1/*ihn_1.
c. *Dutch*: Max_1 keek achter zich_1/*zichzelf_1/hem_1.
d. *Italian*: Max_1 ha dato un'occhiata dietro di sé_1/*dietro se stesso_1/?dietro di lui_1.
Max has given a look behind of SE/himself/him

To sum up, it can be concluded that the unsolved problems concern in particular the broad range of crosslinguistic variation (including non-local anaphoric binding) and optionality as regards the realization form of the bound element.[13]

3. Reinhart and Reuland (1991, 1993) – A Theory of Reflexivity

3.1 The Theory

Another influential approach to binding which has been developed as an alternative to the Chomskyan binding theory and which addresses some of its drawbacks has been developed by Reinhart and Reuland. Based on Dutch examples like those in (21), (22), and (23) (*Max_1 wast $zich_1$/$zichzelf_1$; Max_1 haat $zichzelf_1$/*$zich_1$; Max_1 keek achter $zich_1$/*$zichzelf_1$*), their starting point is that many languages exhibit a three-way distinction as regards bound elements, which means that the simple classification into anaphors and pronouns is not sufficient. Instead, they assume that within the former group we have to distinguish between two different types of anaphors which display a different binding behaviour. In Dutch, they correspond to the forms *zich* vs *zichzelf*.

Reinhart and Reuland refer to these two types of anaphors as SE (simplex expression) vs SELF anaphors. What these two elements have in common, they argue, is that they are referentially defective, which means that they depend on their antecedents in order to pick out a referent – a property that distinguishes them from pronouns.[14] However, the two anaphors differ from each other in one important aspect. According to Reinhart and Reuland, only SELF anaphors can function as reflexivizers, which means that they can ensure that a coargument of theirs refers to the same entity, which makes the predicate they belong to reflexive. By contrast, SE anaphors and pronouns have no reflexivizing function. On the basis of these assumptions, Reinhart and Reuland propose to replace Chomsky's binding principles A and B with the following conditions:[15,16]

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[13]What has been proposed to capture crosslinguistic variation in this framework was in particular that governing categories/binding domains might be subject to parametrization; cf., among others, Huang (1983), Vikner (1985), and Manzini and Wexler (1987).

[14]For a different view cf. Kiss (to appear), who argues that it contradicts the concept of exemptness (which is adopted by Reinhart and Reuland) if anaphors are assumed to be referentially defective.

[15]The *Condition on A-Chains* is also referred to as *Chain Condition.*

[16]The conditions are based on the definitions in (i):

(i) a. The *syntactic predicate* of (a head) P is P, all its syntactic arguments, and an external argument of P (subject).
b. The *syntactic arguments* of P are the projections assigned θ-role or Case by P.
c. The *semantic predicate* of P is P and all its arguments at the relevant semantic level.
d. A predicate P is *reflexive* iff two of its arguments are coindexed.
e. A predicate P is *reflexive-marked* iff either P is lexically reflexive or one of P's arguments is a SELF anaphor.
f. *Generalized Chain Definition:*
C=(α_1, ..., α_n) is a chain iff C is the maximal sequence such that there is an index i such that for

(26) *Condition A:*
A reflexive-marked (syntactic) predicate is reflexive.

(27) *Condition B:*
A reflexive (semantic) predicate is reflexive-marked.

(28) *Condition on A-Chains:*
A maximal A-chain (α_1, ..., α_n) contains exactly one link – α_1 – which is +R.

As regards the standard examples from the previous section (repeated in (29)), the new principles make correct predictions.

(29) a. Anna$_1$ recognized herself$_1$/*her$_1$ in the picture.
b. She/*Herself/*Sheself likes the picture.
c. Her$_1$ brother recognized *herself$_1$/her$_1$ in the picture.
d. Anna$_1$ said that Paul recognized *herself$_1$/her$_1$ in the picture.

In (29-a), the predicate *recognized* is reflexive because it has two coindexed arguments. Hence, Condition B requires reflexive-marking – however, this requirement is only fulfilled if the bound element is realilzed as SELF anaphor. Pronominal binding in (29-a) violates Condition B. As far as Condition A is concerned, it only applies non-vacuously in (29) if the SELF anaphor is involved. In this case, it is satisfied in (29-a) since the predicate is reflexive. As regards the Chain Condition, the maximal A-chain which contains the bound element is (*Anna*$_1$*, bound element*$_1$); if the bound element is realized as SELF anaphor, which is [-R], the condition is fulfilled – a pronoun, however, would violate it, since it is [+R] in this position (a structural Case position; cf. the discussion in section 3.2). To sum up, pronominal binding is excluded in (29-a) by both Condition B and the Condition on A-Chains.

In (29-b)-(29-d), the situation is different insofar as no reflexive predicate is involved: In (29-b), there are no coindexed elements at all, and in (29-c) and (29-d), they are not arguments of the same predicate. (In (29-c), *her* functions as possessor and is only part of the subject, the only coargument of the SELF anaphor; in (29-d), the coindexed elements are not arguments of the same clause.) Thus, Condition B applies vacuously and Condition A rules out the SELF anaphor in all three sentences. (In the case of pronominal binding, Condition A is again irrelevant.) As regards the Chain Condition, the maximal A-chain which contains the bound element corresponds in all three examples to a trivial one-member chain: In (29-c) and (29-d), the coindexed elements are not part of it because in this case the government requirement could not be fulfilled (cf. footnote 16, (i-f)). As a result, the Condition on A-Chains excludes the SELF anaphor in all three cases, since it is always [-R]. By contrast, pronominal realization of the bound element satisfies the Chain Condition, since pronouns are [+R] in these positions.

Against the background of these standard examples, it might remain unclear what the Condition on A-Chains is needed for, since it only confirms the results predicted by Condition A and B, and furthermore, one might wonder where the difference between syntactic and semantic predicates plays a role. Let us therefore briefly turn to some examples which shed light on these questions before we come back to the sentences that proved to be problematic

all j, $1 \leq j \leq n$, α_j carries that index, and for all j, $1 \leq j < n$, α_j governs α_{j+1}.

g. An NP is +R iff it carries a full specification for ϕ-features (gender, number, person, Case). The absence of contrasts within the domain of a class implies the absence of a specification for that class (cf. Reuland and Reinhart 1995:255).

for Chomsky's binding theory.

In contrast to Condition A and B, the Condition on A-Chains explicitly distinguishes between NPs which are [+R] and those that are [-R]. Hence, it generally helps to differentiate between pronominal and anaphoric binding and furthermore imposes restrictions on the binder; i.e., it makes sure that anaphors do not function as antecedents, and pronouns occur only as bound elements if a barrier intervenes. Here, the question might arise of whether the latter configuration is not generally subsumed under Condition B, which excludes pronouns in a relatively local binding relation (namely if binder and bindee are coarguments of the same semantic predicate). However, although Condition B and the Condition on A-Chains make the same predictions in many contexts (as in (29-a)), this is not always the case. ECM constructions as in (30) serve as an example where only the Chain Condition is violated – the maximal A-chain involved in this sentence is (*Henk*$_1$, *hem*$_1$) and the pronoun is [+R]. However, Condition B is not violated; there is no reflexive semantic predicate because the coindexed elements are not coarguments, hence the condition applies vacuously.

(30) *Henk$_1$ hoorde [hem$_1$ zingen].
Henk heard him sing
'Henk$_1$ heard himself$_1$ sing.' (cf. Reinhart and Reuland 1993:710)

It also happens that only Condition B is violated and the Condition on A-Chains is fulfilled (in which case the ungrammaticality appears to be weaker). A case in point are coordination structures as in (31) and (32), which show moreover why Condition B must refer to semantic predicates and reflexive-marking "at the relevant semantic level". Although there does not seem to occur a reflexive predicate in these examples from a syntactic point of view, the semantic interpretations in (31-b) and (32-b) show that there is indeed a semantic level at which we find a reflexive predicate that is not correctly licensed via reflexive-marking. Hence, Condition B is violated; the (syntactically defined) Chain Condition, by contrast, is satisfied in these examples.

(31) a. *[Felix but not Lucie$_1$] praised her$_1$.
b. [Felix (λx (x praised her))] but not [Lucie (λx (x praised x))]
(cf. Reinhart and Reuland 1993:676f.)

(32) a. *[The queen$_1$] invited both [Max and her$_1$] to our party.
b. the queen (λx (x invited Max & x invited x))
(cf. Reinhart and Reuland 1993:675)

As regards Condition A, it refers to syntactic predicates and explicitly takes into account external and Case-marked arguments of the predicate under consideration and not only θ-marked arguments. This is motivated by raising and ECM constructions of the type illustrated in (33).

(33) a. Lucie$_1$ seems to herself$_1$ [t_{Lucie} to be beyond suspicion].
b. Lucie$_1$ expects [herself$_1$ to entertain Max].
(cf. Reinhart and Reuland 1993:679f.)

In (33-a), the matrix subject is not θ-marked by the raising verb, but still the former and the anaphor are coarguments from a syntactic point of view and make the syntactic predicate *seem* reflexive; hence, Condition A is fulfilled and the sentence is grammatical. Similarly, in (33-b), the anaphor counts as syntactic argument of the matrix verb *expect* since it is Case-marked by the latter, although it is θ-marked by the embedded verb.[17] Thus, Condition A is again fulfilled, because the syntactic predicate which *herself* reflexive-marks is reflexive.[18]

3.2 Predictions

Let us now come back to some of the problems the Chomskyan binding principles face (cf. (34), repeated from (20)).

(34) Max$_1$ glanced behind himself$_1$/him$_1$.

In contrast to Chomsky's binding theory, the reflexivity approach no longer predicts a complementary distribution of anaphors and pronouns, and with respect to examples like (34), the conditions in (26)-(28) (Condition A, Condition B, and the Condition on A-Chains) make correct predictions: Since the preposition lacks a subject, it does not form a syntactic predicate and hence Condition A does not apply, even if a SELF anaphor occurs as an argument of the preposition (in this case, it would be an exempt anaphor). Condition B does not apply either, because the coindexed elements are not coarguments; so there is no reflexive predicate involved. As far as chain formation is concerned, Reuland and Reinhart (1995:261) assume that there is a chain between the bound element and its antecedent.[19] Thus, it is clear that the anaphor fulfils the Condition on A-Chains in (34) because anaphors are generally [-R] – but what about the pronoun? Reinhart and Reuland (1995:262) suggest that since the pronoun bears inherent Case in these positions and English shows no contrast within the inherent Case system, the pronoun is not specified for Case in these sentences. As a result, it is [-R] in (34) and thus does not violate the Condition on A-Chains.[20]

The German and Dutch counterparts of example (34) (cf. (35-b) and (35-c), respectively, repeated from (25)) cannot be analysed as straightforwardly.

[17] Note that the matrix and the embedded subject are not coarguments with respect to the *semantic* predicate *expect*; the latter takes the matrix subject and the embedded TP as argument – hence, Condition B does not apply; cf. also (30).

[18] Being θ-marked by the embedded verb, we should expect that the SELF anaphor also reflexive-marks this predicate and causes a violation of Condition A. Reinhart and Reuland therefore assume that the embedded verb raises at LF and forms a complex predicate with the matrix verb (via adjunction). As a result, *herself* is no longer the external argument of *entertain*, which is therefore not reflexive-marked. However, the SELF anaphor still functions as syntactic argument of the embedding (complex) predicate and thus reflexive-marks it. Hence, Condition A is satisfied at last.

(i) *V-raising at LF:*
Lucie [to-entertain$_i$-expect$_j$]$_j$ [herself t$_i$ Max] (cf. Reinhart and Reuland 1993:708)

[19] This is not the case in Reinhart and Reuland (1993:702), where they assume that the preposition in these sentences forms a minimality barrier (following Chomsky 1986a). (However, on this assumption the Chain Condition would rule out the anaphor, because the trivial chain (*himself*$_1$) would then be a maximal A-chain but would not contain a [+R]-element.)

But since the Chain Condition has to rule out the pronoun in sentences like (34) in languages like German (cf. (35-b)), Reuland and Reinhart (1995) propose a modified analysis based on Rizzi's (1990b) framework, according to which P does not block government.

[20] However, it seems to me that this analysis also suggests that sentences like the following should violate the Chain Condition on the assumption that the pronoun is [-R] in this position:

(i) Max glanced behind her.
A-chain violating the Chain Condition: (*her*$_{[-R]}$)

(35) a. Max_1 glanced behind $\text{himself}_1/\text{him}_1$.
b. Max_1 blickte hinter sich_1/??sich selbst_1/*ihn_1.
c. Max_1 keek achter zich_1/*$\text{zichzelf}_1/\text{hem}_1$.

As in English, the Dutch pronoun satisfies the Chain Condition, since it is unspecified for (inherent) Case. In German, the situation is different. Since German shows a Case contrast within the inherent Case system, the pronoun is fully specified for all ϕ-features; hence, it is [+R] and violates the Condition on A-Chains.

However, the question remains open as to why SELF anaphors are ungrammatical in Dutch and German. As argued above, neither Condition A nor Condition B apply, which accounts for the grammaticality of the SE anaphors, since they do not violate any condition. But in order to rule out the SELF anaphors, it would have to be assumed that they violate either Condition A or the Chain Condition. The first possibility must be rejected because the English account crucially relies on the fact that Condition A does not apply in these examples; and a violation of the Chain Condition would only occur if there was a barrier between the anaphor and its antecedent and the trivial chain ($anaphor_1$) was a maximal A-chain. However, this solution must also be excluded, because Reinhart and Reuland's (1995) account of the ungrammaticality of pronouns in German sentences like (35-b) is based on the assumption that (Max_1, ihn_1) forms a chain that violates the Chain Condition. Hence, the ungrammaticality of the SELF anaphors in (35-b) and (35-c) cannot be derived directly from the three conditions in (26)-(28) – Condition A, Condition B, and the Condition on A-Chains – and something more needs to be said with respect to these cases.[21] So again crosslinguistic variation seems to be a challenge for the theory.

4. Hornstein (2001) – Bound Elements as Spelt-Out Traces

In the previous two sections, two of the most influential binding theories have been introduced – Chomsky (1981) (which has been developed further in Chomsky 1986b) and Reinhart and Reuland (1993)/Reuland and Reinhart (1995). In this section, we will take a closer look at a more recent theory which has been developed within a derivational framework.[22] Hornstein's (2001) approach to binding seeks to eliminate binding theory as a separate module by subsuming it under the theory of movement. What he basically proposes is that anaphors are "the residues of overt A-movement" (Hornstein 2001:152); pronouns, on the other hand, are considered to be the elsewhere case: formatives, i.e. no real lexical expressions, which are licensed if the movement option is not available and the derivation cannot converge otherwise.

4.1 The Role of Case Checking

Let us first consider a standard example like (36). A derivation like the one indicated in (36-a), where *John* starts in the object position, then moves to the subject position, and the remaining copy is phonetically realized as *himself*, must be rejected for Case reasons, Hornstein argues:[23]

[21] Further problematic aspects concerning Reinhart and Reuland's theory of reflexivity have been discussed, for example, in Safir (1997), Burzio (1998), and Menuzzi (1999).

[22] Two related proposals have been put forward by Kayne (2002) and Zwart (2002). In a nutshell, these three theories can be characterized as follows: They all share the underlying assumption that an antecedent and its bindee start out as or even *are* (cf. Hornstein 2001) one constituent before the antecedent moves away to a higher position.

[23] Note that Hornstein generally tolerates derivations in which an argument receives two θ-roles (for instance, in the object and subject position); in fact, his theory involves movement into θ-positions (cf. the discussion

As subject, *John* – and hence also the copy – must have Nominative Case features. However, the verb *like* bears Accusative Case features, which cannot be checked by the Nominative Case features on the copy *John*. Hence, Hornstein suggests that it is not the copy *John* which satisfies the verb's Case requirements but the morpheme *self*, a semantically inert morpheme that is adjoined to *John* in the beginning and prevents a Case clash in examples like (36) (cf. (36-b)).[24]

(36) John likes himself.

a. *impossible derivation:*
[$_{TP}$ John [$_{vP}$ <John> likes <John> (PF=*himself*)]]

b. *proposed derivation*:
[$_{TP}$ John [$_{vP}$ <John> likes [[<John>]self]]]

The derivation then proceeds as indicated in (37). After *John* (with Nominative Case features) and *self* (with Accusative Case features) have been merged into the object position (where *John* is assigned the object θ-role), *John* moves to the subject θ-position (Specv in (37)),[25] where it receives the subject θ-role. Then it moves on to SpecT, where it finally checks its Nominative Case features and satisfies the EPP. The Accusative Case features of the verb are checked against the Case features on *self*, which therefore has to move to Specv at LF.[26]

(37) a. *overt movement:*
[$_{TP}$ John$_{[-nom]}$ [$_{vP}$ <John$_{[+nom]}$> likes [$_{VP}$ <likes> [[<John$_{[+nom]}$>] self$_{[+acc]}$]]]]

b. *covert movement:*
[$_{TP}$ John$_{[-nom]}$ [$_{vP}$ self$_{[-acc]}$ [$_{vP}$ <John$_{[+nom]}$> likes [$_{VP}$ <likes> [[<John$_{[+nom]}$>] <self$_{[+acc]}$>]]]]]

What remains to be explained is where the phonetic form *himself* finally comes from. According to (37-a), we find a copy of *John* plus *self* in the object position, which could at most result in the form *Johnself*. However, Hornstein argues that in order to satisfy the LCA (*Linear Correspondence Axiom*; cf. also Kayne 1994) all copies except for one must be deleted at PF, since otherwise linearization is impossible (cf. Hornstein 2001:79f., 85, 160 and Nunes 1995, 1999).[27]

Thus the question arises as to which of the copies are deleted. Since the derivation can only converge if no uninterpretable features survive at the interface (cf. the principle of *Full Inter-*

below).

[24]In this section, copies which do not function as the head of a chain occur in pointed brackets for the sake of clarity. Moreover, I follow Hornstein's notation as far as features are concerned: unchecked features are marked as "+", checked features are marked as "–" (i.e., these symbols are not used to reflect interpretability/uninterpretability).

[25]Hornstein himself is not consistent with his notation and uses both the IP/VP and the TP/vP/VP model. I restrict myself to the latter and leave the question open as to whether *John* moves via SpecV on its way from the object to the subject position.

[26]As Hornstein points out in his footnote 28, it is not relevant to him as to whether this movement is overt or covert. However, if this movement were overt, the LCA (*Linear Correspondence Axiom*) would require the deletion of the *lower* copy of *self* (not of the higher one) and thus predict the wrong linear order; cf. the argumentation below (37). Hence, this option is not really available.

[27]According to Nunes (1999) this deletion operation is triggered by a principle called *Chain Reduction*:

(i) *Chain Reduction*
Delete the minimal number of constituents of a nontrivial chain CH that suffices for CH to be mapped into a linear order in accordance with the LCA. (cf. Nunes 1999:228)

pretation), the best option is to keep the copy of *John* in SpecT and delete the others, because the former is the only one where the Case features have been checked and are therefore invisible at the interfaces.[28] However, if the lowest copy of *John* is deleted, the bound morpheme *self* gets into trouble because it needs some morphological support. Hence, a last resort expression must be inserted to ensure the convergence of the derivation – and this is the pronoun *him*, which agrees in Case with *self*. The correct LF and PF representations of sentence (36) therefore look as follows, where deleted copies are crossed out.[29]

(38) a. *deletion before Spell-Out:*
$[_{TP}$ John$_{[-nom]}$ $[_{vP}$ $\cancel{\text{<John}_{[+nom]}\text{>}}$ likes $[_{VP}$ $\cancel{\text{<likes>}}$ $[[\cancel{\text{<John}_{[+nom]}\text{>}}]$ self$_{[+acc]}]]]]$
b. *LF:*
$[_{TP}$ John$_{[-nom]}$ $[_{vP}$ self$_{[-acc]}$ $[_{vP}$ likes $[_{VP}$ $[\cancel{\text{<self}_{[+acc]}\text{>}}]]]]]$
(*John*: bears subject and object θ-role)
c. *PF:*
$[_{TP}$ John$_{[-nom]}$ $[_{vP}$ likes $[_{VP}$ [HIM+self$_{[+acc]}]]]]$

4.2 The Linear Correspondence Axiom and the Scope Correspondence Axiom

What the derivation of example (36) suggests is that *self* is inserted to prevent a Case clash; however, there is more behind it, since SELF anaphors also occur in contexts in which their antecedents bear the same Case (cf. (39)).

(39) a. I expect John to like himself.
b. *I expect John to like.

If *self* were only needed if there was no other way to check the verb's Accusative Case features, we would expect a sentence like (39-b) to be grammatical, because all copies of *John* would

[28]Hornstein argues that the choice is motivated as follows: The copy in SpecT could not be deleted since it is not defective (it does not bear an unchecked uninterpretable feature), which he considers to be a licensing criterion for deletion (cf. also the discussion below). According to Nunes (1999), the choice follows from economy considerations based on the application of *Formal Feature Elimination* (FF-Elimination) (cf. (i)).

(i) a. *Formal Feature Elimination* (FF-Elimination)
Given the sequence of pairs $\sigma = \langle(\text{F, P})_1, (\text{F, P})_2, \ldots, (\text{F, P})_n\rangle$ such that σ is the output of *Linearize*, F is a set of formal features, and P is a set of phonological features, delete the minimal number of features of each set of formal features in order for σ to satisfy *Full Interpretation* at PF. (cf. Nunes 1999:229)
b. *Linearize* corresponds to the operation that maps a phrase structure into a linear order of X° elements in accordance with the LCA. (cf. Nunes 1999:fn. 5)
c. The principle of *Full Interpretation* states that linguistic levels of representation (LF and PF) consist solely of +Interpretable elements. (cf. Martin 1999:1)
d. Checking operations render −Interpretable features invisible at LF and PF. (cf. Nunes 1999:229)

If the highest copy of *John* in (36-b) is kept, no unchecked Case feature must be deleted by FF-Elimination (cf. also the illustration in (37-a)). By contrast, if another copy survives instead, its unchecked Case feature will have to be eliminated additionally. Hence, to keep the highest copy is the most economical option.

[29]Hornstein does not explain explicitly what happens to the unchecked uninterpretable Accusative Case feature on the lower copy of *self* at PF. I suppose he has something like Nunes's *Formal Feature Elimination* in mind, according to which this feature would simply be eliminated at PF to ensure convergence (cf. the previous footnote).

have an Accusative feature, and thus a lower copy could check Case against the features of the embedded verb *like* (cf. (40-b)).[30]

(40) a. *neglecting Case checking:*
[$_{vP}$ expect [$_{TP}$ John$_{[+acc]}$ to [$_{vP}$ <John$_{[+acc]}$> like <John$_{[+acc]}$>]]]
b. *Case-driven movement:*
[$_{vP}$ John$_{[-acc]}$ expect [$_{TP}$ <John$_{[+acc]}$> to [$_{vP}$ John$_{[-acc]}$ [$_{v'}$ <John$_{[+acc]}$> [$_{v'}$ like <John$_{[+acc]}$>]]]]]]

Now the question arises as to why this derivation is ruled out, independent of whether Accusative Case checking takes place in overt syntax or at LF. According to Hornstein, the answer is that the derivation inevitably results in a violation of the LCA or the LF counterpart he proposes, the so-called *Scope Correspondence Axiom* (SCA), which assigns elements at LF a scope order (cf. Hornstein 2001:85).[31] Both the LCA and the SCA basically require that all copies but one be deleted to allow linearization or "scopification", respectively. However, Hornstein argues that deletion can only occur if an expression is defective in some way, for example if it bears an unchecked uninterpretable feature. On the assumption that Accusative Case checking (as indicated in (40-b)) takes place overtly, we find two instances of *John* with checked Case features in the overt syntax already; hence, none of these two copies will be deleted, and both the LCA and the SCA are violated.[32] If Case checking takes place covertly, the uninterpretable Case features are still unchecked at PF; thus deletion of all copies except for one can take place and the LCA will be satisfied.[33] However, at LF, again two of the copies check their Accusative Case feature, and as a result they will not be deleted, in violation of the SCA. By contrast, if it is assumed that the morpheme *self* is inserted to check the embedded verb's Case features, these LCA/SCA violations do not occur.

To sum up, it can be concluded that *self* is not only required to avoid a Case clash in sentences like (36) (*John likes himself*); as examples like (39-a) (*I expect John to like himself*)

[30] Hornstein suggests that in order to do so, "one of these copies moves to the outer Spec of the lower [vP]" (Hornstein 2001:162); however, the motivation of this additional movement step is not clear to me, since one of the copies already occurs in the lower Specv, where Accusative Case can be checked (cf. (40-a)).

[31] The *Scope Correspondence Axiom* is defined as follows:

(i) *Scope Correspondence Axiom* (SCA):
If α c-commands β at LF, then α scopes over β.

Scope is assumed to be irreflexive, which means that an expression cannot scope over itself. Hence, in order to be able to assign a coherent scope order, the SCA forces the deletion of all copies but one at LF. If this is not respected, the derivation will crash, since the SCA is a convergence requirement just like the LCA.

[32] Note that in this case the higher one of the two copies would occupy the specifier position of the matrix vP and would thus be predicted to linearly precede the matrix verb *expect* in v.

[33] Again, Hornstein is not very explicit about the concrete process at PF, but he probably has in mind something like the following: Since all the copies bear an unchecked uninterpretable Case feature in this case, they are all defective and could therefore in principle be deleted. However, an operation like *Chain Reduction* ensures that not all copies are deleted (which would be possible according to the defectiveness approach) and one member survives. But in order to guarantee the convergence of the derivation, the remaining unchecked uninterpretable feature on this copy must be rendered invisible at the interface, which can be settled by a rule like *FF-Elimination*. The latter would also ensure that it is the highest copy which is not deleted, because even if all the members share the same amount of unchecked uninterpretable Case features, only the highest copy (in this scenario, the copy in embedded SpecT) has its N-feature checked (against the EPP feature of the embedded T), and therefore it requires the minimal number of features to be eliminated.

show, it is also needed in order to avoid a violation of the LCA and the SCA.

4.3 Principle B

One basic assumption in Hornstein's approach is that neither reflexives nor bound pronouns are part of the lexicon. They are considered to be functional morphemes that can only be used if required for the convergence of a derivation. Hence, they do not occur in the numeration but can be added in the course of the derivation if necessary. This means that sentences which differ only with respect to the question of whether the bound element is realized as pronoun or anaphor have the same underlying numeration, and Hornstein assumes that pronouns only emerge as last resort expressions if reflexivization is not available, i.e., if movement is not possible.[34] Hence, the approach captures the near-complementary distribution of pronouns and anaphors; however, it remains unclear as to how those cases have to be treated that allow both forms.

In the standard examples in (41), the proposal leads to the following result: (41-b) is ungrammatical, because the alternative derivation in (41-a) is licit and therefore blocks pronominalization, which is assumed to be more costly. In (41-c), on the other hand, the bound pronoun occurs in the subject position of an embedded finite clause, a position in which a DP can check its Case and ϕ-features; if it moved on to the matrix subject position, it could therefore not check these features anymore, which means that the derivation would crash under the movement approach. Hence, instead of an anaphor, the overt residue of DP movement, we find a pronoun in (41-c), which is inserted to save the derivation.

(41)
a. John_1 likes himself_1.
b. *John_1 likes him_1.
c. John_1 said that he_1 would come.
d. John_1 likes him_2.

However, why is (41-d) not blocked by (41-a), the derivation in which *John* receives both θ-roles and *self* is inserted in the object position? The answer Hornstein provides is that deictic pronouns, unlike bound pronouns, do occur in the numeration and are permitted because they are needed "to support the stress/deixis feature" (Hornstein 2001:176). Hence, sentences involving pronouns fall into two groups, because those involving unbound pronouns are not based on the same numeration as examples involving bound pronouns. Thus, the derivation of the former cannot be compared to the latter.

However, as to the problems that have been brought up in section 2.4, it can be concluded that Hornstein's approach does not provide any answers; as it stands, it does not seem to leave room for optionality, the distinction between simple and complex anaphors, or crosslinguistic variation, including long distance binding. So although it might be tempting to subsume binding under the notion of movement, it is unclear how an adequate attempt of parametrization could look like.

5. Fischer (2004b, 2006) – Derivational Binding and Local Optimization

As shown above, what remains largely unanswered in many theories of binding is in particular the question of how optionality and the broad range of crosslinguistic variation can be accounted

[34] As regards the concrete technical implementation, cf. Hornstein (2001:178f.).

for. Against this background, a competition-based analysis would seem to be a good alternative; here, the underlying principles can be formulated in such a general way that they reflect the universal tendencies, while violable constraints keep the system flexible enough to account for all the language-specific differences. In this section, I will first consider some general advantages of competition-based approaches to binding,[35] before I will then present one concrete example in detail, namely the optimality-theoretic account proposed in Fischer (2004b, 2006) (which also adopts a derivational view of the syntactic component).[36] For reasons of space, I will again restrict myself to a general outline of the theory and will only apply it to selected examples to demonstrate how the mechanism works.

5.1 The Merits of Competition-Based Approaches to Binding

Many competition-based binding theories have been motivated by the observation that the standard Binding Principles A and B are to a certain extent redundant, because they constitute two isolated principles which refer to exactly the same domain of application and are therefore completely symmetric. As a consequence, it has often been proposed to replace the two principles with one generalized constraint which works in the following way: It imposes requirements on one of the two forms, and if these requirements can be met, the insertion of the second form is blocked.[37]

Note that this kind of analysis a priori also predicts a strictly complementary distribution of anaphors and pronouns, and different strategies have been proposed to solve the problem concerning optionality in a competition-based approach. Thus, it is sometimes queried whether these are real instances of true optionality, or whether they exhibit subtle structural or interpretational differences (cf., for instance, Fanselow 1991, Safir 2004); on this assumption, the two forms would result from different underlying competitions. Altenatively, a common way to handle optionality in optimality theory is to adopt the concept of ties, which means that constraints can be equally important; as a result, violations of these constraints weigh the same (cf., for instance, Fischer 2004b, 2006).

Let us now turn to some general advantages that competition-based approaches to binding have. First, the (near-)complementary distribution of anaphors and pronouns does not have to be stipulated by the underlying principles; instead, it is expected, since pronouns emerge whenever the requirements for anaphors cannot be fulfilled. Second, in contrast to the standard Binding Theory, it is not excluded a priori that pronouns might occur in a relatively local binding relation – it is only barred if anaphoric binding is available instead. However, if the latter option is not available, pronominal binding is not blocked by locality restrictions. Hence,

[35] I would like to thank an anonymous reviewer for drawing my attention to some of the issues discussed in the subsequent section.

[36] The OT-analysis proposed in Fischer (2004a) (which is also described in Fischer 2004b) differs from the one presented here in that it adopts a representational view and does not outline a local derivational analysis. Cf., for instance, Epstein *et al.* (1998), Chomsky (2000), Heck and Müller (2000), Epstein and Seely (2002), Fischer (2002), Müller (2003, 2004, 2010), Heck and Müller (2007), as regards conceptual and empirical advantages of derivational approaches.

[37] A straightforward implementation has been proposed by Fanselow (1991), who proposes a generalized version of Principle A. Pronouns, by contrast, can in principle occur everywhere – however, they only emerge if anaphors are blocked by Principle A. Cf. also Burzio's (1989, 1991, 1996, 1998) and Safir's (2004) accounts, which are roughly based on the same underlying idea. Further competition-based theories of binding include, for instance, Newson (1997), Menuzzi (1999), Wilson (2001); as regards a famous predecessor of blocking theory, cf. also Chomsky's (1981) *Avoid Pronoun Principle*.

a competition-based analysis also straightforwardly accounts for the fact that we never find syntactic configurations in which a binding relation cannot be expressed by either an anaphor or a pronoun: As soon as anaphoric binding is blocked, pronouns typically step in, even if this implies local pronominal binding.[38]

One well-known case in point is (local) binding by first or second person antecedents, which involves in many languages (like German or the Romance languages) pronouns instead of anaphors.[39]

Another example involves the so-called *Anaphor Agreement Effect*, which states that "anaphors do not occur in syntactic positions construed with agreement" (Rizzi 1990a:27, Woolford 1999:257).[40] It accounts for the fact that we do not find anaphors in the subject position of tensed clauses in languages with agreement. In standard approaches, this has often been captured by defining the binding domain in such a way that it never contains the antecedent of bound subjects in tensed clauses; however, this typically led to a rather inhomogeneous notion of binding domain (cf. also Chomsky's 1981 formulations in (17) and (18-b)). Instead, it might be more plausible to view these cases as instances of locally bound pronouns which occur as "elsewhere case" since anaphors are blocked due to the *Anaphor Agreement Effect*.[41] This becomes in particular apparent in the following Icelandic example: As (42-a) shows, anaphoric binding into a subjunctive complement is in principle possible, even if the anaphor occurs in the subject position – however, only as long as the subject bears a lexical Case and hence does not agree. In (42-b), by contrast, where the bound element bears Nominative Case and thus agrees, anaphoric binding is ruled out (cf. Everaert 1991: 280f., Woolford 1999:260f.). With a pronominal subject in the embedded clause, (42-b) would be grammatical. In view of (42-a), we thus have another example of a bound pronoun which only emerges because the anaphor is ruled out in this particular configuration (which is not related to locality in this case, as (42-a) shows).

(42) a. Hún$_1$ sagði að sér$_1$ Þætti vænt um mig.
she$_1$[nom] said that herself(SE)$_1$[dat] was$_{sub}$ fond of me
'She said that she was fond of me.'

b. *Jón segir að REFL$_1$ elski Maríu.
John$_1$[nom] says that SE$_1$[nom] loves$_{sub}$ Maria
'John says that he loves Maria.'

The issue of locally bound pronouns also raises the important question of how to define anaphors versus pronouns independent of their syntactic occurrence. In fact, locally bound pronouns have sometimes also been argued to be instances of anaphors; however, if we rely on their syntactic

[38]By contrast, in a theory based on two independent principles, it is imaginable that neither of them is fulfilled and both forms are excluded in a given context. That this does not happen in binding theory has to be implemented in the formulation of Principle A and B in the standard theory; in a competition-based approach, this follows automatically from the architecture of the system.

[39]One way to distinguish the binding behaviour of third vs first/second person antecedents is to assume an underlying hierarchy according to which agreement relations between first/second antecedents and simple anaphors are worse than combinations involving a simple anaphor and a third person antecedent; cf. Burzio (1991 and subsequent work).

[40]Cf. also Everaert (1991), who focuses on Germanic and therefore associates the unavailability of anaphors in these positions with Nominative Case.

[41]Note also that in more recent work, the connection between anaphoric binding and agreement has often been taken up by suggesting that the former might in fact be syntactically encoded as Agree (cf., for instance, Chomsky 2008, Kratzer 2009, Reuland 2011).

behaviour to define these terms, we end up with a circular line of reasoning – anaphors have to be locally bound, and whatever is locally bound is considered to be an anaphor.

To resolve this dilemma, the morphological and semantic properties of the two forms are usually taken into account as a distinguishing criterion. Of course, different proposals along this line have been put forward; to give an example, I will briefly outline Burzio's (1991 and subsequent work) approach. He introduces the notion of *Referential Economy*, which says that "a bound NP must be maximally underspecified referentially"; this is based on the underlying referential hierarchy *anaphor* ≫ *pronoun* ≫ *R-expression* and refers to the question of "how much semantic content a term has" (cf. Safir 2004:71).[42]

5.2 Basic Assumptions and Observations in Fischer (2004b, 2006)

In this section we will now turn to one exemplary implementation of a competition-based approach to binding. Apart from the empirical goal to capture in particular crosslinguistic variation and optionality, the theoretical aim of Fischer (2004b, 2006) is to develop a theory of binding in a *local* derivational framework. In contrast to Hornstein's (2001) derivational theory outlined above, this means that we are restricted in two ways. A derivational theory in general implies that we do not wait until a derivation has been completed but compute the structure in the course of the derivation. This means that at a given point in the derivation, there is no look-ahead. In a local derivational theory, access to earlier parts of the derivation is also restricted. Technically, this is implemented by adopting Chomsky's *Phase Impenetrability Condition* (following Chomsky 2000 and subsequent work).[43]

(43) *Phase Impenetrability Condition* (PIC):
The domain of a head X of a phase XP is not accessible to operations outside XP; only X and its edge are accessible to such operations.

(44) The *domain* of a head corresponds to its c-command domain.

(45) The *edge* of a head X is the residue outside X′; it comprises specifiers and elements adjoined to XP.

Once it is assumed that we only have access to a small piece of the structure at a given point, it seems reasonable to make the system as restrictive as possible by minimizing the search space. This can be achieved if it is assumed that the PIC extends to all phrases.[44]

The basic problem we encounter in a local derivational approach with respect to binding concerns the observation that, on the one hand, binding is not a strictly local phenomenon, i.e., binding relations typically cover a distance which goes beyond one ph(r)ase. However, it would not be sufficient just to split up the non-local relation into several local ones (as it is done, for instance, in the case of *wh*-movement), because the locality degree of the binding relation

[42] Referential economy replaces Burzio's earlier notion of Morphological Economy, which assumed that "a bound NP must be maximally underspecified"; cf. also Safir's (2004:69ff.) discussion of these principles. Safir replaces "maximally underspecified referentially" with "most dependent", because the latter formulation does not hinge on the assumption that anaphors do not have any features.

[43] As far as the general idea is concerned that operations are restricted to some local domain, cf. also van Riemsdijk (1978) and Koster (1987).

[44] In fact, there are two possibilities how this can be implemented. It can either be assumed that instead of (43) a slightly modified version holds in which the term phase is replaced by the term phrase (cf. Müller 2004, Fischer 2004b, 2006); alternatively, we can stick to the formulation in (43) and assume that all phrases are phases (cf. Müller 2010).

overall determines the shape of the bound element (i.e., whether it is realized as SELF anaphor, as SE anaphor, or as pronoun). This means that in order to evaluate a binding relation, we need to know the exact configuration that holds between the bindee and its antecedent. However, since in a local derivational approach the surface position of the bound element (= x), might no longer be accessible when the binder is merged into the derivation, we have to make sure that x is dragged along until both elements are accessible at the same time.

In Fischer (2004b, 2006), this is ensured by assuming that a binding relation technically corresponds to feature checking between the antecedent (= the probe) and the bound element x (= the goal);[45] so movement of x is triggered by x's need to ckeck a feature with its antecedent.[46] Since feature checking can take place as soon as x and its binder are in the same accessible domain, the typical checking configuration for binding looks as follows (where β corresponds to the feature indicating a binding relation).[47]

(46) *Feature checking configuration for binding:*
$[_{ZP}\ XP_{[*\beta*]}\ Z\ [_{WP}\ YP_{[\beta]}\ W]]$, *where XP= antecedent, YP= bound element*

5.3 Technical Implementation

5.3.1 On Binding Domains and Realization Matrices

The general idea in Fischer (2004b, 2006) is that the concrete realization form of the bound element x is determined in the course of the derivation, depending on the locality degree of the binding relation. Before the derivation starts, we only know that there will be a binding relation between x and its designated antecedent; this is the only information we get from the numeration. However, we are familiar with all potential realizations of x. Hence, it is assumed that x is equipped with a realization matrix, i.e., a list which contains all possible realizations of x. Thus, the maximal realization matrix looks as follows: [SELF, SE, pron]. For the sake of concreteness, consider the Dutch example in (47) as an illustration; (47-b) corresponds to the underlying numeration, and (47-c) to x's realization matrix.

(47) a. Max$_1$ haat zichzelf$_1$/*zich$_1$/*hem$_1$.
Max hates himself/SE/him
'Max$_1$ hates himself$_1$.'
b. Num = {Max$_{[*\beta*]}$, haat, $x_{[\beta]}$}
c. fully specified realization matrix = [SELF, SE, pron]

In the course of the derivation we then benefit from the fact that – although we do not know when the antecedent will enter the derivation – we know at each point whether the binder has already been merged into the structure or not, i.e., whether [β] has already been checked. Each time x reaches one of the domains to which binding is sensitive and x remains unbound, its realization matrix might be reduced; this means that the most anaphoric specification might be deleted and henceforth no longer available (depending on the respective domain and the

[45]Cf. also Reuland (2001 and subsequent work) with respect to the assumption that binding involves feature checking. Schäfer (2008) also assumes that anaphors start out as variables and proposes that binding is syntactically expressed as an Agree relation between the bound element and its antecedent; he adopts the idea of upward-probing and assumes that the variable corresponds to the probe.

[46]Cf. also footnote 57 as far as the trigger of intermediate movement steps is concerned.

[47]I adopt Sternefeld's (2004) notation according to which features on probes are starred.

language under consideration).[48] In the end, x stops moving when it can establish a checking relation with its antecedent; at this stage, its concrete realization can be determined, which must match one of the remaining forms in the realization matrix. If there is only one element left in the realization matrix, the choice is clear, otherwise the remaining form that is most anaphoric is selected.[49,50] Once the form of x is known, the whole chain it heads can be aligned and x can then be spelled out in the appropriate position.

As to the domains that play a role, it is assumed that binding is sensitive to the six domains defined in (48)-(53).[51]

(48) *XP-domain (XP)*:
XP is a phrase containing x.

(49) *θ-domain (ThD)*:
XP is the *θ-domain* of x if it contains x and the head that θ-marks x plus its external argument (if there is one).

(50) *Case domain (CD)*:
XP is the *Case domain* of x if it contains x and the head that bears the Case features against which x checks Case.

(51) *Subject domain (SD)*:
XP is the *subject domain* of x if it contains x and either
(i) a subject distinct from x which does not contain x, or
(ii) the T with which x a checks its (Nominative) Case features.

(52) *Finite domain (FD)*:
XP is the *finite domain* of x if it contains x, a finite verb and a subject.

(53) *Indicative domain (ID)*:
XP is the *indicative domain* of x if it contains x, an indicative verb and a subject.

What will not be discussed here in detail is the role of the larger domains, i.e. the subject, the finite, and the indicative domain. These distinctions are used in order to account for the (syntactic) behaviour of long-distance anaphora, which are sensitive to the type of complement clause in which they occur (cf. Fischer, this volume, as regards an overview of the behaviour of LDA).

5.3.2 On Local Optimization and Universal Subhierarchies

[48]This is to be understood in the following way: SELF anaphors are more anaphoric than SE anaphors, which are in turn more anaphoric than pronouns, which can be compared to Safir's notion of dependency or Burzio's referential hierarchy; cf. also section 5.2. Moreover, the approach assumes that binding is sensitives to domains of different size; cf. also, among others, Manzini and Wexler (1987), Dalrymple (1993), Büring (2005), Fischer (this volume).

[49]I assume that this operation takes place at PF prior to *Late Insertion* (cf. Halle and Marantz 1993 and subsequent work on Distributed Morphology).

[50]I will neglect R-expressions and Principle C here, but note that they can be integrated into the theory straightforwardly by additionally inserting into the matrix a copy of the R-expression serving as antecedent. The same is moreover true for inherently reflexive predicates, in which case the realization matrix might get completely cleared (for instance in the English example *Max behaves like a gentleman*, which does not contain an anaphor/pronoun at all).

[51]Note that the definitions differ slightly from the formulations used in Fischer (this volume) since they have been adapted to the derivational framework adopted here.

What has been left unexplained so far is how the deletion of the matrix entries is governed. This is where competition comes into play.[52] The theory put forward in Fischer (2004b, 2006) first of all assumes that optimization is local and takes place cyclically. This means that there is not just one optimization process after the completion of the whole syntactic derivation (= global optimization); instead, optimization takes place repeatedly after the completion of each phrase. The winner of a competition then serves as input for the next optimization procedure; the initial input corresponds to the numeration.[53]

The competing candidates differ from each other with respect to the number of specifications that have been deleted from the realization matrix of x. Since we start with the maximal realization matrix, the first competition includes three candidates – the first candidate (= O_1) contains a realization matrix with full specifications ([SELF, SE, pron]); the second one (= O_2) contains a realization matrix from which the most anaphoric entry has been deleted ([SE, pron]); and in the realization matrix of the third candidate (= O_3), both the SELF and the SE specifications are deleted ([pron]).

As regards the constraints that apply, two different types can be distinguished. On the one hand, there is a group of constraints which refer to the different domains relevant for binding; they generally favour candidates with less anaphoric specifications and therefore facilitate the deletion of features from the matrix. They require that x be minimally anaphoric if binding has not yet taken place in XD (where XD $\in$ {XP, ThD, CD, SD, FD, ID}); cf. (54).

(54) PRINCIPLE $\mathcal{A}_{XD}$ (Pr.$\mathcal{A}_{XD}$):[54]
If $x_{[\beta]}$ remains unchecked in its XD, x must be minimally anaphoric.

If the derivation reaches one of the relevant domains and no binding relation is established, these constraints apply non-vacuously and are violated twice by candidate O_1 and once by O_2.

As to the ordering of these constraints, it is assumed that they are ordered in a fixed universal subhierarchy in which constraints referring to bigger domains are higher-ranked than those referring to smaller domains.

(55) *Universal subhierarchy 1:*
$\text{Pr.}\mathcal{A}_{ID} \gg \text{Pr.}\mathcal{A}_{FD} \gg \text{Pr.}\mathcal{A}_{SD} \gg \text{Pr.}\mathcal{A}_{CD} \gg \text{Pr.}\mathcal{A}_{ThD} \gg \text{Pr.}\mathcal{A}_{XP}$

The second type of constraint must function as counterbalance to the PRINCIPLE $\mathcal{A}$-constraints insofar as it must favour the more anaphoric specifications. This is achieved by the three FAITH-constraints in (56) in connection with their universal ordering indicated in (57).

(56) a. FAITH$_{SELF}$ (F$_{SELF}$): The realization matrix of x must contain [SELF].
b. FAITH$_{SE}$ (F$_{SE}$): The realization matrix of x must contain [SE].
c. FAITH$_{pron}$ (F$_{pron}$): The realization matrix of x must contain [pron].

[52] Note that the mechanism outlined so far does not involve any competition, and the idea of deleting specifications from the realization matrix does not really hinge on an optimality-theoretic implementation either. However, optimality theory provides smart strategies to capture crosslinguistic variation and optionality by means of constraint reranking and tied constraints.

[53] As to local optimization applying to phrases, cf. also Müller (2000), Heck and Müller (2000), Heck (2004), among others. Alternatively, local optimization has also been argued to apply to larger or smaller pieces of the structure; cf. Heck and Müller (2007) (who pursue an approach involving optimization after each step) and the references cited there.

[54] The effect of these constraints is similar to the standard version of Principle A: If x is unbound in a relatively local domain, we expect x not to be anaphoric.

(57) *Universal subhierarchy 2:*
$\text{FAITH}_{pron} \gg \text{FAITH}_{SE} \gg \text{FAITH}_{SELF}$

The choice of x's realization form is guided by one further principle (which is not violable); cf. (58).

(58) MAXIMALLY ANAPHORIC BINDING (MAB):
Checked $x_{[\beta]}$ must be realized maximally anaphorically.[55]

Once x is bound, the most anaphoric element of the optimal specification matrix is thus selected. In fact, (58) can be considered to be a PF instruction.

5.4 Derivational Binding in Dutch

In order to illustrate how the theory works in practice, consider the Dutch data in (59). They represent examples with the following binding behaviour: (a) binding inside the minimal θ-domain; (b) binding inside the minimal Case domain; (c) binding inside the minimal subject domain; (d) binding inside the minimal finite/indicative domain.

(59)
a. Max_1 haat zichzelf_1/*zich_1/*hem_1. (= (47-a))
Max hates himself/SE/him
'Max_1 hates himself_1.'
b. Max_1 hoorde zichzelf_1/zich_1/*hem_1 zingen.
Max heard himself/SE/him sing
'Max_1 heard himself_1 sing.'
c. Max_1 keek achter *zichzelf_1/zich_1/hem_1.
Max looked after himself/SE/him
'Max_1 glanced behind him_1/himself_1.'
d. Max_1 weet dat Mary *zichzelf_1/*zich_1/hem_1 leuk vindt.
Max knows that Mary himself/SE/him nice finds
'Max_1 knows that Mary likes him_1.'

As far as example (59-a) is concerned (repeated in (60)), it only allows the complex anaphor as bound element. This is correctly predicted if PRINCIPLE $\mathcal{A}_{XP}$ is ranked below FAITH_{SELF}. On this assumption, O_1 is the sole winner of the first competition (cf. T_1), and when the binder is merged into the derivation in the next phrase (cf. (61)), [SELF, SE, pron] is predicted to be the optimal realization matrix (cf. $T_{1.1}$). Hence, MAB finally selects the SELF anaphor as optimal realization.

(60) Max_1 haat zichzelf_1/*zich_1/*hem_1.
a. $[_{\text{VP}}\ x_{[\beta]}\ t_x$ haat$]$

T_1: VP optimization

[55] Note that this does not mean that PF needs to have access to semantic information. In fact, the choice at PF is made on the basis of morphological considerations: What we can see at PF are the feature specifications contained in the matrix when it is finally mapped to the interfaces, and the preferred realization is the SELF anaphor (if available), the second best realization is the SE anaphor (if available), and the third best realization is the pronoun. The notion of maximal anaphoricity thus refers to the morphological forms, which in turn of course reflect the degree of anaphoricity in a semantic sense (cf. also footnote 48).

(XP reached – $x_{[\beta]}$ unchecked)

	Candidates	F_{pron}	F_{SE}	F_{SELF}	$PR.\mathcal{A}_{XP}$
⇒	O_1: [SELF, SE, pron]				**
	O_2: [SE, pron]			*!	*
	O_3: [pron]		*!	*	

(61) b. $[_{vP}$ Max$_{[*\beta*]}$ $[_{VP}$ $x_{[\beta]}$ $[_{V'}$ ~~t_x~~ t_{haat}]] haat][56]

$T_{1.1}$: vP optimization
($x_{[\beta]}$ checked: PRINCIPLE $\mathcal{A}_{XD}$ applies vacuously)

	Input: O_1/T_1	F_{pron}	F_{SE}	F_{SELF}
⇒	O_{11}: [SELF, SE, pron]			
	O_{12}: [SE, pron]			*!
	O_{13}: [pron]		*!	*

In example (59-b) (repeated in (62)), both anaphors can function as bound elements, i.e., we have an example of optionality. In order to derive this, PRINCIPLE $\mathcal{A}_{ThD}$ must be tied with FAITH$_{SELF}$: As a result, both O_1 and O_2 win in the first competition (cf. T_2), because when optimization takes place not only an XP but also the θ-domain of x has been reached.

(62) Max_1 hoorde $zichzelf_1$/$zich_1$/*hem_1 zingen.

a. $[_{vP}$ $x_{[\beta]}$ zingen]

T_2: vP optimization
(XP/ThD reached – $x_{[\beta]}$ unchecked)

	Candidates	F_{pron}	F_{SE}	F_{SELF}	$PR.\mathcal{A}_{ThD}$	$PR.\mathcal{A}_{XP}$
⇒	O_1: [SELF, SE, pron]				**(!)	**
⇒	O_2: [SE, pron]			*(!)	*	*
	O_3: [pron]		*!	*		

When the next phrase is completed, no new domain relevant for binding has been reached, but x's θ-role assigner (*zingen*) is still accessible, hence, both PRINCIPLE $\mathcal{A}_{XD}$ and PRINCIPLE $\mathcal{A}_{ThD}$ apply again non-vacuously. In the competition based on the input [SELF, SE, pron], the first two candidates are therefore again predicted to be optimal (cf. $T_{2.1}$), and in the second competition, the matrix [SE, pron] wins (cf. $T_{2.2}$).

(63) b. $[_{VP}$ $x_{[\beta]}$ $[_{vP}$ t_x zingen] hoorde]

$T_{2.1}$: VP optimization
(XP/ThD reached – $x_{[\beta]}$ unchecked)

	Input: O_1/T_2	F_{pron}	F_{SE}	F_{SELF}	$PR.\mathcal{A}_{ThD}$	$PR.\mathcal{A}_{XP}$
⇒	O_{11}: [SELF, SE, pron]				**(!)	**
⇒	O_{12}: [SE, pron]			*(!)	*	*
	O_{13}: [pron]		*!	*		

[56]Those parts of the derivation that have become inaccessible are crossed out.

$T_{2.2}$: VP optimization
(XP/ThD reached – $x_{[\beta]}$ unchecked)

	Input: O_2/T_2	F_{pron}	F_{SE}	F_{SELF}	PR.$\mathcal{A}_{ThD}$	PR.$\mathcal{A}_{XP}$
⇒	O_{21}: [SE, pron]			∗	∗	∗
	O_{22}: [pron]		∗!	∗		

Now the binder enters the derivation, and so the FAITH-constraints alone determine the optimizations at the vP level. In $T_{2.1.1}$, the maximally specified matrix [SELF, SE, pron] wins, and according to $T_{2.1.2/2.2.1}$, [SE, pron] is optimal. Thus, MAB finally correctly predicts that either the SELF or the SE anaphor is the optimal realization of x.

(64) c. [$_{\text{vP}}$ Max$_{[*\beta*]}$ [$_{\text{VP}}$ $x_{[\beta]}$ ~~[$_{\text{vP}}$ t$_x$ zingen]~~ t$_{hoorde}$] hoorde]

$T_{2.1.1}$: vP optimization
($x_{[\beta]}$ checked: PRINCIPLE $\mathcal{A}_{XD}$ applies vacuously)

	Input: $O_{11}/T_{2.1}$	F_{pron}	F_{SE}	F_{SELF}
⇒	O_{111}: [SELF, SE, pron]			
	O_{112}: [SE, pron]			∗!
	O_{113}: [pron]		∗!	∗

$T_{2.1.2/2.2.1}$: vP optimization
($x_{[\beta]}$ checked: PRINCIPLE $\mathcal{A}_{XD}$ applies vacuously)

	Input: $O_{12}/T_{2.1}$ or $O_{21}/T_{2.2}$	F_{pron}	F_{SE}	F_{SELF}
⇒	O_{121}/O_{211}: [SE, pron]			∗
	O_{122}/O_{212}: [pron]		∗!	∗

In (65) (repeated from (59-c)), optionality arises between the pronominal and the simple anaphoric form.

(65) Max$_1$ keek achter zich$_1$/*zichzelf$_1$/hem$_1$.
a. [$_{\text{PP}}$ $x_{[\beta]}$ achter t$_x$]

This type of optionality can be captured if PRINCIPLE $\mathcal{A}_{CD}$ and FAITH$_{SE}$ are tied: When the prepositional phrase is completed, the domains XP, ThD, and CD are reached, which means that in addition to PRINCIPLE $\mathcal{A}_{XP}$ and PRINCIPLE $\mathcal{A}_{ThD}$, PRINCIPLE $\mathcal{A}_{CD}$ is now involved in the competition. On the assumption that the latter is tied with FAITH$_{SE}$, optionality between O_2 and O_3 is predicted (cf. T_3).[57]

[57]Note that in (65) x has not yet moved to its final checking position. To trigger intermediate movement steps which do not result in feature checking, Chomsky (2000, 2001, 2008) proposes the insertion of so-called edge features (cf. also the *Edge Feature Condition* in Müller 2010). Alternatively, Heck and Müller (2003) offer a solution on the basis of a constraint called *Phase Balance* (cf. also Fischer 2004b, 2006, following Müller 2004:297f.).

(i) *Phrase Balance* (PB):
Every XP has to be balanced: For every feature [∗F∗] in the numeration there must be a potentially available feature [F] at the XP level.

(ii) *Potential Availability*:

T_3: PP optimization
(XP/ThD/CD reached – $x_{[\beta]}$ unchecked)

Candidates	F_{pron}	F_{SE}	PR.$\mathcal{A}_{CD}$	F_{SELF}	PR.$\mathcal{A}_{ThD}$	PR.$\mathcal{A}_{XP}$
O_1: [SELF, SE, pron]			∗∗!		∗∗	∗∗
⇒ O_2: [SE, pron]			∗(!)	∗	∗	∗
⇒ O_3: [pron]		∗(!)		∗		

As a result, there are two optimization procedures when the next phrase boundary, VP, is reached.

(66) b. $[_{\text{VP}}\ x_{[\beta]}\ [_{\text{PP}}\ t_x$ achter ~~t_x~~] keek]

The competition based on the matrix [SE, pron] yields again two optimal outputs (cf. $T_{3.1}$), whereas in the competition based on the input [pron] a further reduction is not possible and this matrix remains optimal (cf. $T_{3.2}$).

$T_{3.1}$: VP optimization
(XP/ThD/CD reached – $x_{[\beta]}$ unchecked)

Input: O_2/T_3	F_{pron}	F_{SE}	PR.$\mathcal{A}_{CD}$	F_{SELF}	PR.$\mathcal{A}_{ThD}$	PR.$\mathcal{A}_{XP}$
⇒ O_{21}: [SE, pron]			∗(!)	∗	∗	∗
⇒ O_{22}: [pron]		∗(!)		∗		

$T_{3.2}$: VP optimization
(XP/ThD/CD reached – $x_{[\beta]}$ unchecked)

Input: O_3/T_3	F_{pron}	F_{SE}	PR.$\mathcal{A}_{CD}$	F_{SELF}	PR.$\mathcal{A}_{ThD}$	PR.$\mathcal{A}_{XP}$
⇒ O_{31}: [pron]		∗		∗		

In the next phrase, the binder is merged into the derivation, hence the FAITH-constraints predict that [SE, pron] is optimal in $T_{3.1.1}$, and [pron] wins in $T_{3.1.2/3.2.1}$.

(67) c. $[_{\text{vP}}$ Max$_{[*\beta*]}$ $[_{\text{VP}}\ x_{[\beta]}$ ~~$[_{\text{PP}}\ t_x{}'$ achter $t_x]$~~ $t_{keek}]$ keek]

According to MAB, the optimal choice is therefore the SE anaphor in the former derivation and the pronoun in the latter.

$T_{3.1.1}$: vP optimization
($x_{[\beta]}$ checked: PRINCIPLE $\mathcal{A}_{XD}$ applies vacuously)

Input: $O_{21}/T_{3.1}$	F_{pron}	F_{SE}	F_{SELF}
⇒ O_{211}: [SE, pron]			∗
O_{212}: [pron]		∗!	∗

A feature [F] is potentially available if (i) or (ii) holds:

(i) [F] is on X or edgeX of the present root of the derivation.
(ii) [F] is in the workspace of the derivation.

(iii) The *workspace* of a derivation D comprises the numeration N and material in the trees that have been created earlier (with material from N) and have not yet been used in D.

$T_{3.1.2/3.2.1}$: vP optimization
($x_{[\beta]}$ checked: Principle $\mathcal{A}_{XD}$ *applies vacuously)*

Input: $O_{22}/T_{3.1}$ or $O_{31}/T_{3.2}$	F_{pron}	F_{SE}	F_{SELF}
⇒ O_{221}/O_{311}: [pron]		*	*

In sentences in which binding takes place outside the Case domain (cf. (59-d), repeated in (68)), x must be realized as a pronoun, and this is captured by ranking Principle $\mathcal{A}_{SD}$ (and hence also Principle $\mathcal{A}_{FD}$ and Principle $\mathcal{A}_{ID}$) above Faith$_{SE}$ (cf. $T_{4.1}$).[58]

(68) Max$_1$ weet dat Mary hem$_1$/*zich$_1$/*zichzelf$_1$ leuk vindt.
  a. $[_{\text{VP}}\ x_{[\beta]}\ \mathrm{t}_x$ leuk vindt$]$

When the first optimization process takes place (cf. T_4), only Principle $\mathcal{A}_{XP}$ and the Faith-constraints apply non-vacuously, which means that O_1 serves as input for the next competition.

T_4: VP optimization
(XP reached – $x_{[\beta]}$ unchecked)

Candidates	F_{pron}	F_{SE}	F_{SELF}	Pr.$\mathcal{A}_{XP}$
⇒ O_1: [SELF, SE, pron]				**
O_2: [SE, pron]			*!	*
O_3: [pron]		*!	*	

When vP is completed, we reach at once all domains relevant for binding, which means that all Principle $\mathcal{A}$-constraints are involved in the next competition. According to the ranking assumed above, [pron] is therefore predicted to be the optimal realization matrix (cf. $T_{4.1}$).

(69) b. $[_{\text{vP}}\ x_{[\beta]}$ Mary $[_{\text{VP}}\ \mathrm{t}_x{}'$ ~~t_x~~ $\mathrm{t}_{leuk\ vindt}]$ leuk vindt$]$

$T_{4.1}$: vP optimization
(XP/ThD/CD/SD/FD/ID reached – $x_{[\beta]}$ unchecked)

Input: O_1/T_4	F_{pron}	Pr.$\mathcal{A}_{ID/FD/SD}$	F_{SE}	Pr.$\mathcal{A}_{CD}$	F_{SELF}	Pr.$\mathcal{A}_{ThD}$	Pr.$\mathcal{A}_{XP}$
O_{11}: [S, S, pr]		*!*		**		**	**
O_{12}: [SE, pr]		*!		*	*	*	*
⇒ O_{13}: [pron]			*		*		

Since [pron] serves now as input for the next optimization procedure, it remains the only candidate, because the matrix cannot be further reduced. Hence, [pron] remains optimal in the following optimizations, and when $x_{[\beta]}$ is checked, MAB correctly predicts that x must be realized as a pronoun.

5.5 Predictions and Loose Ends

As the analyses of example (59-b) (*Max$_1$ hoorde zichzelf$_1$/zich$_1$/*hem$_1$ zingen*) and (59-c) (*Max$_1$ keek achter *zichzelf$_1$/zich$_1$/hem$_1$*) have shown, the theory outlined above can easiliy account for optionality by resorting to the optimality-theoretic concept of contstraint ties. Similarly, crosslinguistic variation does not pose a problem either, since optimality theory generally han-

[58]I treat the verbal predicate *leuk vindt* like a simple verb and ignore its inherent structure.

dles this by assuming a reranked constraint order for other languages. Against the background of the two universal subhierarchies proposed in (55) and (57), this means that language variation amounts to different interactions between these two subhierarchies. Despite its flexibility, the system is therefore relatively restrictive.[59]

As far as general predictions are concerned the theory makes, it can be concluded that it captures the following generaliztions (cf. also Fischer, this volume): If we deal with local binding, only few, low ranked PRINCIPLE $\mathcal{A}$-constraints can apply non-vacuously before checking takes place; since only these constraints favour a reduction of the realization matrix, it is very likely that the candidate with the full specification [SELF, SE, pron] is optimal and the SELF anaphor selected as optimal realization. In the case of non-local binding, more PRINCIPLE $\mathcal{A}$-constraints apply non-vacuously; hence, it is more likely that the realization matrix of x is gradually reduced in the course of the derivation and a less anaphoric form is selected as optimal realization in the end. Moreover, the following implications are predicted, which also seem to be true: If x is realized as SELF or SE anaphor if binding takes place in domain XD, these realizations are also licit if binding is more local; and if x is realized as pronoun, pronominal binding is also possible if binding occurs in a bigger domain.

What is not explicitly discussed in Fischer (2004b) are non-syntactic factors that have an impact on the occurrence of reflexives (cf. also Fischer, this volume). These discourse or pragmatic restrictions concern in particular locally free reflexives, and data of these types are only marginally addressed in Fischer (2004b). However, as pointed out in the chapter on pronominal anaphora (cf. Fischer, this volume), there are also quite a number of examples which point to the fact that syntactic and discourse-related factors should not be considered completely independent from each other because they seem to interact; an extension of the theory outlined above should therefore be perfectly possible given the fact that optimality theory easily allows for the interaction of different types of constraints. Hence, additional discourse constraints might be added.[60]

6. Kiss (to appear) – Reflexivity and Anaphoric Dependency

Since the theories oulined in the previous sections set out to develop overall approaches to reflexivity, they initially tend to neglect less salient occurrences of reflexives and start with the most basic data involving reflexives. One well-known example of the former type are picture NP reflexives. In this section, I will therefore turn to an explicit recent analysis of these data which is developed in an HPSG-framework. From a theoretical point of view, this analysis is based on a representational setting which involves local constraints (in the sense of Gazdar *et al.* 1985; cf. Kiss, to appear, fn. 14).

6.1 Picture NP Reflexives in English and German

One of the central observations in Kiss (to appear) concerns a notable difference between English and German: Although German does not have exempt reflexives (cf. also Kiss 2001),

[59] Cf. Fischer (2004b) as regards a detailed comparison in particular of Dutch, English, German, Italian, and Icelandic.

[60] As regards the analysis of unbound expressions within this theory, cf. also the treatment of unbound pronouns in Fischer (2004b); in this context, discourse binding is also briefly discussed. As far as first/second person antecedents are concerned, a corresponding hierarchy along the lines of Burzio's (1991 and subsequent work) proposal can be adopted; cf. also footnote 39.

it has picture NP reflexives; English, by contrast, allows both exempt reflexives and picture NP reflexives.[61] The latter observation has led Pollard and Sag (1992, 1994) and Reinhart and Reuland (1993) to propose an analysis of picture NP reflexives in terms of exemptness;[62] however, in view of the German data, this proposal does not seem to be tenable.

The question of whether a language has exempt reflexives or not can be clarified by the following tests. Typically, exempt reflexives need not be locally bound; instead, the antecedent (i) might occur in an embedding clause (cf. (70-a) vs (71-a)), (ii) need not c-command the reflexive (cf. (70-b) vs (71-b)), (iii) can occur intersententially (cf. (70-c) vs (71-c)), or (iv) can be a split antecedent (cf. (70-d) vs (71-d)). As (71) shows, German fails all these tests.

(70) a. Peter$_1$ believed that pictures of himself$_1$/him$_1$ were on sale.
b. Peter$_1$'s campaign required that pictures of himself$_1$ be placed all over town.
c. Peter$_1$ was upset. A picture of himself$_1$ had been mutilated.
d. Peter$_1$ told Mary$_2$ that pictures of themselves$_{1+2}$ were on sale.

(71) a. Peter$_1$ glaubte, dass Bilder von *sich$_1$/ihm$_1$ zum Verkauf stünden.
b. Peters$_1$ Kampagne machte es erforderlich, dass Bilder von *sich$_1$/ihm$_1$ überall in der Stadt platziert wurden.
c. Peter$_1$ war sauer. Ein Bild von *sich$_1$/ihm$_1$ war beschädigt worden.
d. Peter$_1$ erzählte Maria$_2$, dass Bilder von *sich$_{1+2}$/ihnen$_{1+2}$ zum Verkauf stünden.

On the other hand, picture NP reflexives do occur in German, as the following examples show. However, it has to be mentioned that pronouns are illicit in these examples and the antecedent must occur within the same clause.

(72) a. Warum hat Claude Cahun$_1$ die Bilder von sich$_1$/*ihr$_1$ zurückgehalten?
why has Claude Cahun the pictures of SE/her withheld
'Why has Claude Cahun$_1$ withheld the pictures of herself$_1$?'
b. Verständlich, dass er$_1$ keine konfusen Berichte über sich$_1$/*ihn$_1$ lesen mag.
it-stands-to-reason that he no confuse reports about SE/him read like
'It stands to reason that he$_1$ does not like to read confuse articles about himself$_1$.'

But although picture NP reflexives can be found in the previous examples (and are in fact the only grammatical option here), Kiss points out that the situation is slightly different in the case of object experiencer psych verbs with picture NPs functioning as subject. In the English example in (73), a reflexive can occur inside the subject picture NP.

(73) These pictures of himself$_1$ frighten John$_1$.

In German, by contrast, picture NP reflexives are ruled out in this context; cf. (74).[63] Following

[61]The term "exempt anaphora" has been coined by Pollard and Sag (1992, 1994) for reflexives which seem to be exempt from Binding Principle A insofar as they need not be locally bound. Note that Kiss points out that they should rather be termed "exempt reflexives"; cf. below.

[62]Pollard and Sag (1992:266), for instance, propose the constraint in (i) for anaphors; as a result, reflexives in picture NPs without possessor turn out to be exempt, because there is no "less oblique coargument" (cf. also Fischer, this volume). As to Reinhart and Reuland (1993), cf. also section 3.2, example (34).

(i) An anaphor must be coindexed with a less oblique coargument, if there is one.

[63]Kiss argues that topicalizing (cf. (i-a)) or scrambling (cf. (i-b)) the object experiencer *den Kindern* in front of the subject *die Bilder von sich* does not make a difference. In fact, I do get a contrast between (74) and (i) and

the exemptness approch by Pollard and Sag (1992, 1994) and Reinhart and Reuland (1993), this is in fact what we would expect for languages without exempt reflexives.

(74) a. *Die Bilder von $sich_1$ gefielen den $Kindern_1$.
the pictures of SE pleased the children
b. *Ich glaube, dass die Bilder von $sich_1$ den $Kindern_1$ gefielen.
I believe that the pictures of SE the children pleased

6.2 The Analysis

The analysis Kiss (to appear) proposes presumes first of all a strict division between the two notions of reflexives vs anaphors. While the former term is used in order to denote the lexical form as such, the term anaphor refers to reflexives that occur in an anaphoric dependency;[64] hence, the notion of anaphor depends on the syntactic context.

On the basis of this distinction, Kiss introduces the two features **R** and **D**. The feature **R** is inherently associated with reflexives; the feature **D**, by contrast, is dependent on the syntactic context because it indicates a dependency. The two features are furthermore associated with a value (n) which corresponds to the index of the respective reflexive or phrase. Crucially, **R** does not project; **D**, by contrast, projects until the dependency can be resolved by identifying **D**'s value with the index of another, minimally c-commanding phrase (which means that the latter turns out to be the binder in the end).

Depending on whether a dependency is introduced or not if a reflexive occurs, it is predicted that the reflexive functions as anaphor or not. The latter scenario corresponds to those cases in which the reflexive is exempt to syntactic restrictions; in the former case, the dependency must be resolved, which roughly means that the anaphor must be locally bound. Whether a dependency is introduced or not depends on the one hand on language-specific constraints (cf. (76), (77)), on the other hand on the question of whether a corresponding syntactic trigger is around. As to the latter point, Kiss assumes that such a trigger "will be any predicate that can have an articulated argument structure". In order to understand the concrete algorithm Kiss proposes, consider first the features defined in (75).

(75) a. [±ARG-S]:
Predicates that contain articulated argument structure will be marked as [+ARG-S], otherwise they will be marked as [−ARG-S].[65]

would rate the examples below as fully acceptable (these judgments are confirmed by an anonymous reviewer). The theoretical consequences of this variation depends to a large extent on the concrete analysis of psych verb constructions. (Note at this point that Kiss argues against the unaccusativity analysis by Belletti and Rizzi 1988 by citing counterarguments by Pesetsky 1995 and Pollard and Sag 1992.) In any case, my impression is that the judgments in (i) might very well be compatible with the approach outlined here; cf. footnote 67 below.

(i) a. Den $Kindern_1$ gefielen die Bilder von $sich_1$.
$[\text{the children}]_{acc}$ pleased $[\text{the pictures of SE}]_{nom}$
b. Ich glaube, dass den $Kindern_1$ die Bilder von $sich_1$ gefielen.
I believe that $[\text{the children}]_{acc}$ $[\text{the pictures of SE}]_{nom}$ pleased

[64]Of course, other langugages might choose different strategies to express anaphoricity (like clitics in Romance, particular verbal templates in Semitic languages, or particular suffixes in Russian; cf. Reinhart and Siloni 2005:390) – but in the languages discussed here, it is expessed by reflexives (for a more detailed overview and discussion, cf., for instance, Reinhart and Siloni 2005 or Everaert, to appear).

[65]Hence, verbs typically bear the feature [+ARG-S]; elements without an external argument are generally

b. [Comps <X>]:
This feature signals whether the valency of a predicate has already been fully discharged. Hence, a predicate whose argument structure is saturated bears the specification [Comps <>], if the external argument is still missing, it bears the feature [Comps <NP>], etc.

As far as the technical implementation of anaphoric dependencies is concerned, their introduction and resolution are governed by the rules indicated in (76)-(79). While (76) is the rule that introduces anaphoric dependencies in English, (77) applies in German. Hence, we get the following result: If an appropriate trigger is around (namely the feature [+Arg-S]), the two rules yield the same result – **D**(n) is introduced and has to be resolved in the course of the derivation, following (79).[66]

However, if there is no appropriate trigger is present, (76) and (77) make different predictions. In the former scenario (which corresponds to English), no anaphoric dependency is introduced, hence the reflexive finally turns out to be exempt from syntactic restrictions. In the latter scenario (which corresponds to German), the inactive dependency ~~**D**~~(n) is introduced. In contrast to **R**-features, ~~**D**~~ projects (just like **D**-features). When a ~~**D**~~-feature reaches a position in which it can be activated by a [+Arg-S]-feature, it turns into an active dependency (= **D**(n); cf. (78)), which in turn must be resolved via *Local Resolution* (cf. (79)). Hence, the absence of exempt reflexives in German is accounted for – sooner or later, **R** will inevitably introduce an anaphoric dependency, which has to be resolved, even if it is not yet active at the beginning of the derivation.

(76) *Active Dependency:*
Given a phrase Y with daughters X and ZP, where ZP bears the value **R**(n). ZP bears the value **D**(n) if and only if X is [+Arg-S].

(77) *Dependency:*
Given a phrase Y with daughters X and ZP, where ZP bears the value **R**(n). ZP bears the value **D**(n) if X is [+Arg-S], and the value ~~**D**~~(n) if X is [−Arg-S].

(78) *Activation:*
Given a phrase Y with daughters X and ZP, where ZP bears the value ~~**D**~~(n). ZP bears the value **D**(n) if X is [+Arg-S].

(79) *Local Resolution:*
If a daughter of a phrase Y bears **D**(n) and Y is specified as [Comps <>], then the other daughter of the phrase *must* bear index n; if Y is specified with a non-empty value for Comps, then the index of the other daughter *can* bear index n.

To see how the analysis works in practice, consider the following example derivations.

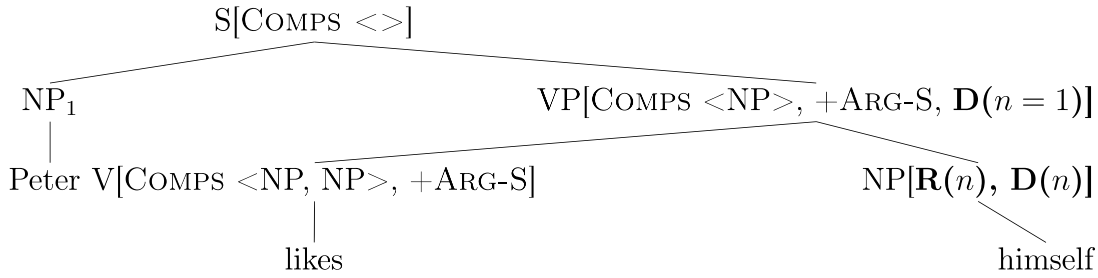
(80) a. Peter$_1$ likes himself$_1$.
b. Peter$_1$ mag sich$_1$.

[−Arg-S]. Cf. also the similarity to Chomsky's (1986b) notion of the complete functional complex (cf. also footnote 3).

[66]Note that these assumptions bear a resemblance to the analysis by Fischer (2004b, 2006): Here, the **D**-feature is passed up the tree until the binder resolves the dependency, which has to take place in a restricted domain and is guided by local constraints. Similarly, in Fischer (2004b, 2006), the bound element moves from phase edge to phase edge until the binder enters the derivation in order to establish a checking relation; anaphoric binding is also restricted by locality requirements, and the algorithm also applies strictly locally.

In (80), English and German pattern alike. Due to the occurrence of the reflexive forms *himself*$_1$/*sich*$_1$, the analysis of both sentences involves the feature $\mathbf{R}(n)$. The crucial point now is that the verb (= the sister node of the reflexive) bears the feature [+Arg-S], which means that the application of (76) and (77) yield the same result: In both cases, $\mathbf{D}(n)$ is introduced, which is then projected to the VP, where it is resolved (following (79)) by identifying its value n with the index of its sister (= the subject NP). In other words, we deal with an anaphoric depencency, and the subject NP functions as syntactic binder.

(81)



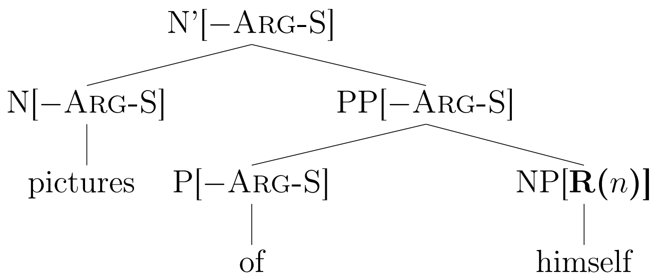
Let us now turn to the picture NP reflexives. Recall that the German example in (82-b) (repeated from (71-a)) is ungrammatical, in contrast to its English counterpart, whereas German allows picture NP reflexives in examples like (83-b) (like English).

(82) a. Peter$_1$ believed that pictures of himself$_1$/him$_1$ were on sale.
b. Peter$_1$ glaubte, dass Bilder von *sich$_1$/ihm$_1$ zum Verkauf stünden.

(83) a. Peter$_1$ prefers a pictures of himself$_{1/2}$.
b. Peter$_1$ bevorzugt ein Bild von sich$_{1/*2}$.

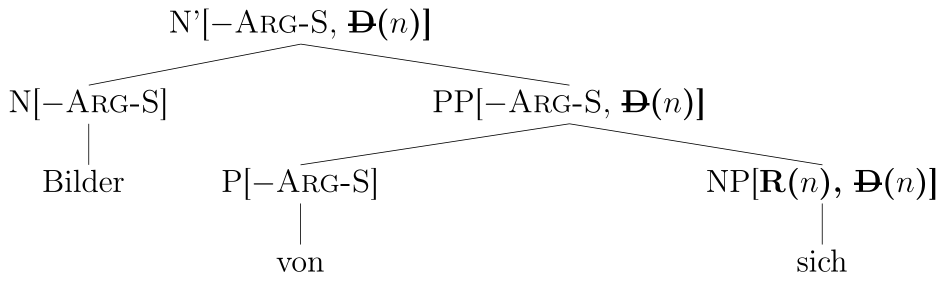
This difference is accounted for as follows. In English, the analysis of (82-a) and (83-a) is basically the same (cf. (84)). Since the preposition bears the feature [−Arg-S], no $\mathbf{D}(n)$ is introduced – neither at this point in the derivation (cf. (76)) nor later (since **R**-features do not project and English does not introduce inactive dependencies). Hence, we can conclude that English picture NPs simply do not involve anaphoric dependencies at all, which means that we do not deal with binding but rather with exemptness in terms of Pollard and Sag (1992, 1994) and Reinhart and Reuland (1993).

(84)



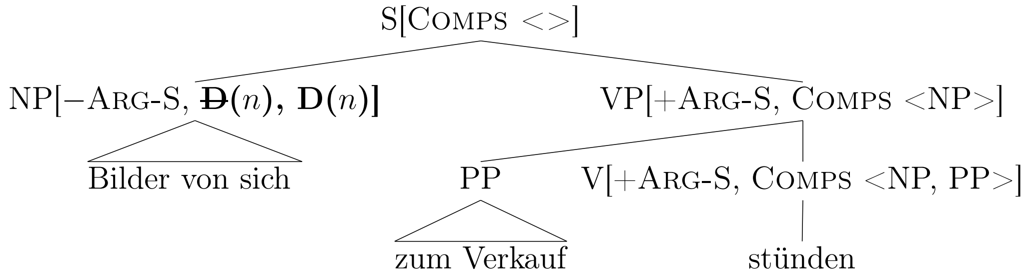
In German, the situation is different. The crucial point is that (77) applies instead of (76), which means that – although no active dependency is introduced inside the PP – the inactive dependency ~~**D**~~(n) comes into play; cf. (85). (Recall that in contrast to the **R**-feature, the ~~**D**~~-feature projects.)

(85)



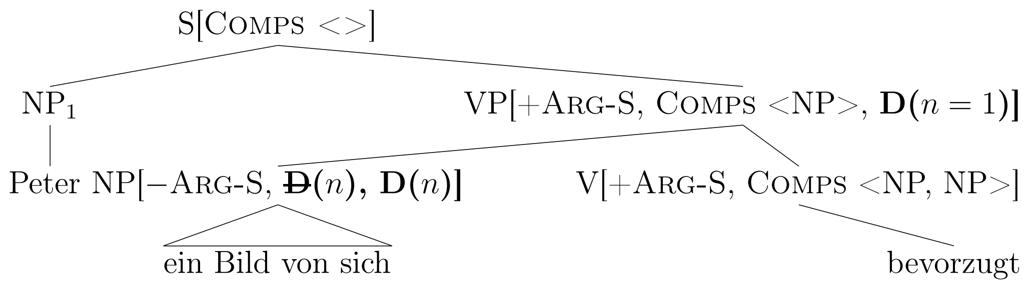
As to the ungrammatical example in (82-b), the derivation looks as indicated in (86). When the picture NP merges with the VP, the inactive dependency is activated (following (78)), since the VP bears a [+ARG-S]-feature. Hence, the resulting dependendy **D**(n) must be resolved, and since it is immediately dominated by a [COMPS <>]-feature, the resolution has to take place at this point in the derivation (cf. (79)) – however, this is not possible (there is no binder available), and therefore the derivation crashes.

(86)



The analysis of (83-b), the grammatical German example, is illustrated in (87). As in (86), the picture NP bears an inactive dependency (cf. also (85)), which is activated when it merges with the verb (due to the latter's [+ARG-S]-feature). However, in this case the mother node is not yet S but the VP, which does not bear an empty value for COMPS. Hence, the dependency need not be resolved at this point (cf. (79)), and since there is no potential binder around, resolution cannot take place – thus, the **D**-feature is projected to VP, since it still needs to identify its value. Now the dependency can (and must, following (79)) be resolved by the subject NP *Peter*, which means that n is identified with the index of the subject NP. So it can be concluded that the reflexive in this example turns out to be an anaphor (as in (82-b)); however, in this case it is grammatical because it can be locally bound in the end.

(87)



By now, the theory has accounted for the fact that German does not have exempt reflexives and that the picture NP reflexives that do occur are in fact locally bound anaphors (which also explains why pronouns are illicit here). The last question that needs to be addressed is how the data involving object experiencer psych verbs are handled (cf. (73), (74); *These pictures of himself*$_1$ *frighten John*$_1$).

For English, nothing more needs to be said, since all picture NP reflexives pattern as indicated in (84): Since no anaphoric dependency is introduced, these reflexives are exempt, which means that they basically have the same distribution as pronouns. As to German examples like (74), the problem is again that due to (77)/(78) (*Dependency* and *Activation*) a dependency is introduced (starting out as inactive dependency which is then activated in the course of the derivation). However, since the only potential binder (the object experiencer) is embedded more deeply in the structure, *Local Resolution* cannot apply successfully, and the derivation crashes.[67]

7. Conclusion

What has been presented in this chapter were five different ways to deal with binding facts. As point of departure, we first focused on Chomsky (1981), which has served as a basis for all future proposals (independent of whether they have been developed along the same lines or adopted another course). In the first section, we concentrated on the original version of Chomsky's binding theory and eventually discussed some of its major flaws, which can be subsumed, by and large, under the two categories crosslinguistic variation and optionality as regards the realization form of the bound element.

One of the leading alternative approaches developed in the early 1990s has been proposed by Reinhart and Reuland. The constraints on binding they assume are not merely structural (only their Chain Condition), but refer instead to the notion of predicate – roughly speaking, the grammaticality of anaphors depends on the question of whether their antecedent is a coargument or not; a strategy which leaves room for the occurrence of exempt anaphors.

The third type of analysis we dealt with was Hornstein (2001), which adopts a derivational view and suggests that bound elements are in fact spelt-out traces. In other words, the antecedent starts out in the position in which we find the bound element in the end. Hence, it can be considered a residue of movement which emerges in order to satisfy Case requirements as well as the *Linear Correspondence Axiom* and the *Scope Correspondence Axiom*.

A different derivational approach is put forward in Fischer (2004b, 2006). Here it is assumed that the concrete form of the bound element is determined in the course of the derivation on the basis of local optimization, which takes place after the completion of each phrase and is sensitive to binding domains of different size. In the beginning, the bound element is equipped with a feature matrix which contains all potential realizations. The longer it takes until the antecedent enters the derivation (and checks the features of the bound element), the more anaphoric specifications are deleted.

Finally, we considered the analysis proposed in Kiss (to appear), which crucially relies on a careful distinction between the two notions of reflexivity and anaphoric dependency, since a reflexive as such only designates a specific form and is not subject to syntactic conditions that demand an antecedent; only if the reflexive introduces a dependency (which depends on language-specific constraints), must it be resolved in the course of the derivation, which means that the reflexive eventually functions as anaphor that has to be bound. Hence, we get a clear

[67] Let me briefly come back to footnote 63, where I remarked that scrambling might in fact improve acceptability (as in: *Ich glaube, dass den Kindern*$_1$ *die Bilder von sich*$_1$ *gefielen*). I will not provide a detailed analysis here, the more so as it is not entirely clear which underlying syntactic structure Kiss assumes for psych verbs (except that he rejects the unaccusativity hypothesis; cf. also footnote 63). However, it is clear what the analysis would have to provide in order to make correct predicitons: It would have to make sure that the activated dependency can be resolved after all, so scrambling (or whichever operation is involved in the concrete example) would need to move the potential binder to a position minimally c-commanding the $\mathbf{D}(n)$-feature – on this assumption, the dependency could be resolved and the picture NP reflexive would be predicted to be grammatical.

contrast between bound anaphors and the so-called exempt reflexives.

The theories presented here do not only differ with respect to the different theoretical frameworks they adopt;[68] they also focus on diverse binding data and thereby reveal how many factors have to be taken into account in the field of binding, including the broad range of crosslinguistic variation that can be observed.

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[68] The different frameworks we have come across include G&B theory, minimalism (with or without optimization processes), and HPSG. Moreover, some of the proposals adopt a derivational view of syntax, others adhere to a representational view, some are based on local constraints, others use global constraints.

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