WHAT IS WRONG AND WHAT IS RIGHT WITH I-WITHIN-I

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1. Introduction.

There is, in the Government and Binding literature, a condition on binding and coindexation which is referred to more often than motivated and which, in spite of frequent invocations, seems to be treated as the stepchild of the binding theory. Clearly, we are not referring to one of the three famous clauses A, B and C of Chomsky's (1981) Binding Theory. While there are many articles and even books devoted to these crown jewels of GB, our target, the i-within-i condition, is usually mentioned only when it can be of service to shed light on something else. We suspect that there is a reason for this. Whenever one takes a hard look at the i-within-i condition, it appears to wither away. While some of the evidence for it is real, it has been forced to carry a greater explanatory burden than it should have and that many of the phenomena which it is supposed to explain are either spurious or better accounted for by other means. Our paper has two main parts: After a brief introduction, we discuss a number of well-known proposals which appeal in one way or another to the i-within-i condition and show that they are incorrect insofar as they assume this condition to apply to anything but circular reference cases; in the second part of the paper we discuss the nature of the condition, arguing that it does not apply to bound anaphora but only to unbound or free pronouns and propose a condition on circular chains, originally suggested by Higginbotham and May, as an alternative to the i-within-i condition.

2. What is i-within-i?

The i-within-i condition informs us that no phrase be coindexed with one of its proper constituents, and is commonly stated as in (1):

(1) *[...@j...]i

A look at the history of the i-within-i condition is a generalization of Vergnaud's (1974: 34) Disjunction Condition on Anaphora, which was stated as in (2):

(2) *Disjunction Condition on Anaphora*

If, in a string, two noun phrases NP₁ and NP₂ are anaphorically related, then the string must be analyzable as ...NP₁...NP₂...or as...NP₂...NP₁...

In other words, anaphoric NPs must not be contained in their antecedents or vice versa. The main motivation for this condition was that it correctly characterizes circular anaphoric dependencies such as the ones exemplified in (3) as illegal:

(3) a. *[The son of the woman who killed him_i]_i was a Nazi
 b. *[The book by the man who designed it_i] cover]_i will be coming next week.
 c. *[A proof is it_i] existence]_i is not forthcoming.

The modern i-within-i condition is a generalization of Vergnaud's constraint. 1 First, it applies to expressions of all categories, not just NPs and second, it constrains all relationships expressed by coindexation, not just anaphoric dependencies. The second extension crucially changes the nature of the condition. Cases such as the ones in (3) are often viewed as semantically odd, because of the circular way in which reference is established. The more recent extensions of the scope of the condition push it in the direction of a purely syntactic condition on any relation expressed in terms of indices.

3. What i-within-i is not: Three examples.

3.1 For an illustration of the extended scope of the i-within-i condition in modern GB, let us take a look at Chomsky's (1981) account of the grammaticality of picture-noun reflexives in sentences such as (4):

(4) John_i saw that [a picture of himself_i]_j INFL_j was on the wall

The issue here is to find a way to enlarge the domain in which the reflexive can be bound so as to include the antecedent in the matrix clause. Chomsky proposes to do this by defining this domain partly in terms of the notion "accessible SUBJECT". A SUBJECT is INFL just in case INFL contains AGR (the agreement marker), otherwise it is the structural subject. A SUBJECT is accessible to some phrase just in case that phrase is c-commanded by it and coindexation with the SUBJECT would not lead to an i-within-i violation. Given that the INFL of the embedded clause in (4) is coindexed with the subject NP *picture of himself* by virtue of the agreement relation, it is not accessible to *himself* because coindexation would violate the i-within-i condition. For similar reasons, the structural subject cannot be a SUBJECT accessible to *himself*. So the accessible SUBJECT must be found in the matrix clause and the nonlocal binding of the reflexive follows. Notice what is going on here. The potential violation of i-within-i has nothing to do with coreference or anaphoric dependencies between the reflexive and the container NP. Rather, the violation would stem from the fact that two other relations, viz. subject-predicate agreement and the accessible SUBJECT relation, are expressed in the same way by coindexation. It is useful at this point to recall a point made by Higginbotham (1983), namely that coindexation is just a device, and often not a very appropriate one, to express syntactic relationships. Had we used different notational devices for each syntactic relation, this particular violation of i-within-i would have never arisen. For some, this may be an illustration of the explanatory power of notational conventions. For us, it is somewhat unsatisfactory, because we would like to know why entirely different relationships pattern in the same way, if indeed they do. One might object, at this point, that subject-predicate agreement may

not be different from anaphora if we take Chomsky's idea seriously that AGR is a pronominal. Then coindexation of the subject with AGR would be entirely similar to the binding relation between a dislocated topic, say, and the pronominal argument to which it is linked. And so appealing to the i-within-i condition here would be entirely natural. Bresnan and Mchombo (1987) have motivated such an analysis for Chichewa object-agreement, but we do not believe such an analysis is feasible for English subject-verb agreement. The properties which they give of anaphoric agreement, such as discourse or long-distance binding, simply do not characterize English subject-agreement. As a matter of fact, there is good reason to reject Chomsky's account on empirical grounds. For example, Kuno (1987) notes that Chomsky's proposal is still too restrictive in that it rules out examples like (5a) and Keenan (1988) points out examples such as (5b) where the problematic reflexive is located in the object, rather than the subject:

(5) a. They made sure that nothing would prevent each other's pictures from being put on sale.
 b. Mary complained that the teacher gave extra help to everyone but herself.

(See also Johnson 1987 for a critique of the notion "accessible SUBJECT".) In one of Chomsky's more recent works, *Knowledge of Language*, (Chomsky 1986), he suggests a radically different approach to long-distance anaphora in English, using movement to INFL at the level of Logical Form. As one of the advantages of this new approach he cites that it allows him to eliminate the i-within-i condition, and so to simplify the binding theory. This alternative theory still makes wrong predictions in cases such as (5), but we can't discuss it in detail here because it does not concern our main topic. We just mention it to illustrate the extent to which Chomsky seems to view the i-within-i condition merely as a rider on various clauses of his binding theory, rather than an independently motivated constraint. Whatever one thinks of picture-noun reflexives with nonlocal antecedents, there are still other phenomena which are usually delegated to the i-within-i condition, so an alternative account of long-distance anaphors does not necessarily allow one to drop it. However, in the remainder of this paper we argue that there may be great wisdom in Chomsky's desire to eliminate i-within-i.

3.2 As our next illustration of the extended use of the i-within-i condition we discuss the explanation in Williams (1982) for the ungrammaticality of examples such as (6):

(6) *John's arrival dead
 * Fred's departure drunk

The observation to be explained is that nominalizations do not support the adjectival adjuncts which can be found in the corresponding verbal constructions. Williams proposes an account of this observation which appeals to the i-within-i condition. More precisely, he appeals to a condition ruling out coindexation of two NPs if one is contained in the other. Another constraint, the Strict Opacity Condition, requires that all expressions, including therefore adjectival adjuncts, either be coindexed with a sister NP or else with the node immediately dominating them. In the case of nominalizations such as the ones in (6), this phrase is the N'. This N' in turn is

coindexed with its mother node so as to express the head-of relationship. The genitive NP is coindexed with the adjective to express the predication relation. This creates the desired violation of NP-i within NP-i, since the genitive NPs are now coindexed with the container NPs. Notice how this account rests on the use of the notational device of coindexation for three distinct syntactic relations. In particular the use of coindexation to express the head-of relation is surprising, given that X-bar notation is already available to express it. It is also peculiar that Williams explicitly notes that his NP-i within NP-i constraint only applies to referential NPs and is intended to bar circular referential dependencies of the kind discussed by Vergnaud and others. But of course there is absolutely no referential dependency between the phrase *John's arrival nude* and its genitival specifier. There is good reason then to be suspicious of this account. We cannot deal with Williams' proposal in detail here, so we just note some empirical problems. It seems to us that Williams' initial observation must be modified, because certain nonadjectival adjuncts can occur in nominalizations, as we see in (7):

(7) Jones' exposure as a Nazi by Wiesenthal
Graham's unexpected death at only 64
Juliana's abdication as Queen of the Netherlands
Bush's election as president of the US
Harry's arrival with hardly any clothes on
Betty's first deed as a doctor

Another set of cases which we consider to be significantly better than the cases in (6) involve either constrastive intonation or heavy adjuncts (the second example is taken from Napoli 1989):

(8) Hunter's explanation sober was no better than his explanation drunk
Gary's arrival at precisely 8:15 buck naked threw the party into chaos
his first appearance dressed as a nurse

Given that these adjuncts exhibit the same predication relationship as the adjectives in (6) and assuming that there is no reason to use a different device than coindexation in this case, these examples ought to be equally bad, but they are not. Therefore the i-within-i account fails in our opinion to shed any light on these cases. It seems more likely that the contrast we find between regular adjectival adjuncts on the one hand and *as*-phrases and heavy adjectival phrases on the other is simply due to the general constraint against regular adjectives in postnominal position in English, which does not apply to the latter.

3.3. Our third illustration comes from Hornstein (1984). Hornstein argues that the i-within-i condition applies to all indexing dependencies, including the predication relation. One of his concerns is sentence (9), which does not appear to allow the possessive pronoun *his* to be construed with *John* as its antecedent.

(9) John is his cook

If we indicate the fact that *his cook* is predicated of *John* by coindexation, and also express the antecedency relation in this way, we see that the illegal reading is ruled

out by i-within-i. There is reason to believe that predication is involved here, since there is no comparable restriction in (10):

(10) John fired his cook.

However, other examples suggest that the matter is not so simple:

(11) a. Michael is his own cook.
b. Sam is his father's best friend
c. She is the last of her tribe.

In order to handle such cases, Hornstein (1984: 113) is led to propose a modification of the i-within-i condition so that "it applies only to a phrase that is both coindexed with a containing phrase and of relatively low embedding in that phrase". In Hornstein's hands, i-within-i comes to resemble another old acquaintance, the A-over-A condition. This move narrows the scope of the condition down too much. For example, Vergnaud's original data now can not be treated anymore, since they involve fairly deep levels of embedding (see the examples in (3)). Furthermore, we have found crosslinguistic variation with examples such as (9) which we did not find for Vergnaud's data. Whatever rules out (9) appears to be a capricious condition that varies by individual languages and calls for more study. While Dutch and German present facts parallel to those found in English, Swedish presents a slightly different picture. This language has both reflexive and nonreflexive possessive pronouns. In predication structures we find that the nonreflexive possessive is ungrammatical, while a reflexive possessive followed by the word for "own" is allowed:

(12) *$Sven_j$ ar [$hans_j$ $lakare$]$_j$
Sven is his doctor
(13) $Sven_j$ ar [sin_j egen $lakare$]$_j$
Sven is his own doctor

So far, these data are compatible with Hornstein's theory, provided we assume that the occurrence of *egen* makes the pronoun *sin* occur more deeply embedded. In Norwegian, however, the word for *own* can be omitted:

(14) Per er doktoren sin
Per is doctor his
"Per is his own doctor"

When the nonreflexive pronoun[2] is used, the word for *own* must be present as well:

(15) Per er hennes egen doktor
Per is own doctor

However, before we jump to conclusions here, we note that in a third Scandinavian language, Danish, nonreflexive possessives without *egen* are fine:

(16) Jens er hans laege
   Jens is his doctor

This sentence is ambiguous as to whether Jens is his own doctor or someone else's. To make it unambiguous, the reflexive pronoun cannot be used in Danish, in striking contrast to Norwegian and Swedish. We are not sure what causes the variation among these closely related languages. Our main goal here is to establish that the exact counterpart to example (9) is grammatical with internal coreference in a number of languages. Among the languages we identified as differing from English in this regard is Armenian, exemplified in (17) and possibly Finnish (in the case of Finnish we obtained conflicting judgments, so we do not discuss it here):

(17) Janu er Ipujheesk ehl
   John is doctor his

On the other hand, Russian, Malaysian, Japanese, Turkish, Amharic, Hebrew, Chinese, Igbo and several Romance languages all disallow the counterpart to our English example (9).

A further complication in this story arises when we distinguish identity statements from predicational statements. It seems to us that as an identity statement (18) is acceptable:

(18) Eddie$_i$ is not his$_i$ boss

Compare this to example (19):

(19) Eddie$_i$ is not his$_i$ own boss

Sentence (18) is only an identity statement, saying that Eddie and his boss are two different individuals. Sentence (19) has a very different reading, which says that Eddie does not work for himself. Similarly, the sentence *John is his own doctor* is interpreted as meaning that John "doctors" himself, so to speak. If these observations are correct, then we have evidence here for distinguishing two kinds of sentences involving the copula *be*, statements of identity and statements of predication. We are aware that this is a matter of some controversy in the literature (cf. Montague (1974) for a defense of a single meaning of *be* (and Partee 1986 for a very interesting elaboration of Montague's theory in terms of type-shifting operations) and Williams (1982) and Doron (1988), among others, for opposite points of view). It seems to us that differences such as those exemplified in (18) and (19) are important in resolving this debate. We also note that with other predicational structures, where there is no separate identity interpretation, one does not find good counterparts to (18), but plenty of counterparts to (19), compare e.g. (20) and (21):

(20) #Let's make Eddie$_i$ his$_i$ boss

(21) Let's make Eddie$_i$ his$_i$ own boss

Of course, in eliciting informant judgments, one must be careful and we did not in all cases control for the subtle distinction between identity and predicational uses of the copula. It seems to us that genitives function as arguments in cases such as (21), while the identity statements as well as nonpredicative statements in general allow the genitives to act as specifiers. In the latter case the semantic role of the genitive is much freer. Consider for example the possible interpretations of ((22) and (23):

(22) Grace wants to be her own doctor
(23) Grace wants to be her doctor

In (22), Grace is said to want to doctor herself, while (23) says that Grace wants to swap identities with her doctor. In the second case, her doctor does not have to be the person who doctors her at all. It could be any doctor who is in some salient way connected to Grace, maybe the doctor she is dating or the doctor she is working for or the doctor she is painting. The specifier reading is also available *for her own*, but then calls for a contrastive reading of (22). Argument readings depend on the possibility of interpreting the noun as a relational concept. However, the argument reading appears not to be available to regular possessive pronouns in English, presumably due to the same factors which bar personal pronouns from argument positions when their antecedent is a c-commanding clause-mate, if we accept Higginbotham's (1983) suggestion that possessive pronouns modified by *own* can sometimes function as local anaphors. It is this , and not i-within-i, which accounts for the perceived unacceptability in languages such as English of sentences such as (9) with internal coreference.

4. Constraining i-within-i.

In this section we consider the question of what the proper domain of the i-within-i condition is, and how it can be stated in the most general way. First of all, we argue that it is strictly a condition on anaphora, and does not concern coreference in general. This point can be made quickly by considering cases such as:

(24) a. that madman Hitler
 b. my friend the Governor
 c. Ivan the Terrible

In each case there is a noun phrase coreferential with the noun phrase containing it. Analogous examples can be found in many languages, we just cite here some counterparts to (24a):

(25) a. quel matto di Giorgio (Italian)
  "that idiot (of) George"
 b. die oen van een Jaap (Dutch)
  "that idiot (of a) Jaap"
 c. dieser Schwachkopf Schulze (German)
  "this weakhead Schulze"
 d. mon cretin de mari (French)
  "my cretin of a husband"

In other cases, it may take some computation to see that the i-within-i condition is violated:

(26) a. John's father's only son
b. the square of 1
c. the egotist's favorite person

None of these cases involve anaphoric dependencies and we have not found any examples of this type where the i-within-i condition holds. This makes sense if the real reason why the Vergnaud examples in (3) were bad is the circular way in which reference is established there. In a compositional semantics, the interpretation of a complex expression is a function of the interpretations of its parts. When the interpretation of a part in turn depends on the interpretation of the whole, this is viewed as paradoxical. In the cases we just looked at, there is no such circularity. While a part is coreferential to the containing NP, it is dependent on that NP for its interpretation or reference.

Let us now turn to examples where the inner index is attached to a pronominal. The first relevant observation is that pronouns linked to a wh-operator are always exempt from the condition:

(27) a. [the man who $_i$ gave his $_i$ paycheck to his $_i$ wife]$_i$
b. [the rocket$_i$ that$_i$ destroyed itself too soon]$_i$
c. [a manager who$_i$ does not have to prove herself $_i$]$_i$

This makes sense on the assumption that pronouns bound to an operator are sensitive only to that operator and effectively shut off from their environment. It is interesting to note now that other kinds of modifiers seem to behave in much the same way as relative clauses, as is evidenced by the examples in (28):

(28) a. [a cat too tired to lick itself]
b. [a woman looking for her cat]
c. [a professor in love with himself]
d. [people with children of their own]
e. [characters in search of their author]

It seems attractive to us to explain these cases in the same terms as the earlier examples with relative clauses, by appealing to an operator, invisible in this case, which binds the pronouns in question. This analysis may be viewed as an interpretive version of the old whiz-deletion analysis of adjectival modifiers which postulated a wh-operator in underlying form that is deleted together with the verb *to be*. As semantic representations of the modifiers in (29), we propose the formulas in (30), which express the binding relations explicitly in terms of binding by a lambda-operator:

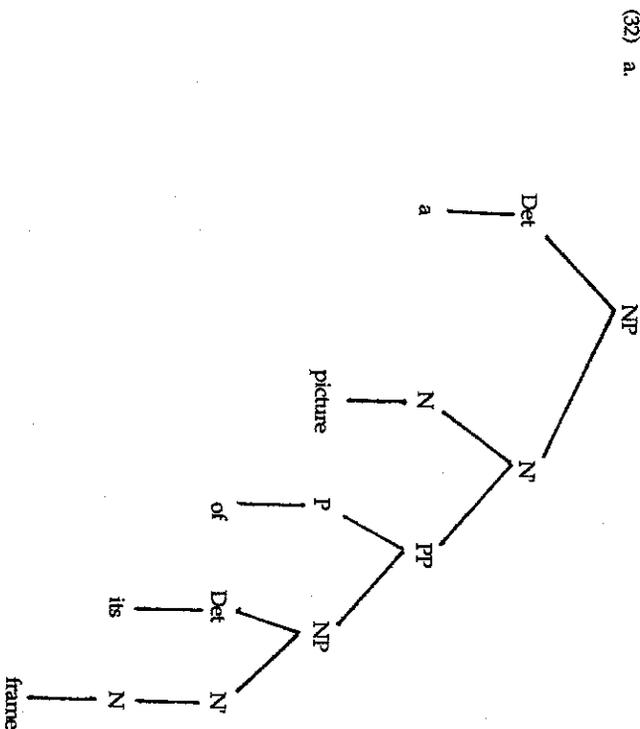(29) a. a woman cooking for herself
b. a woman cooking for Richard

(30) a. λx: (cooking for x)(x)
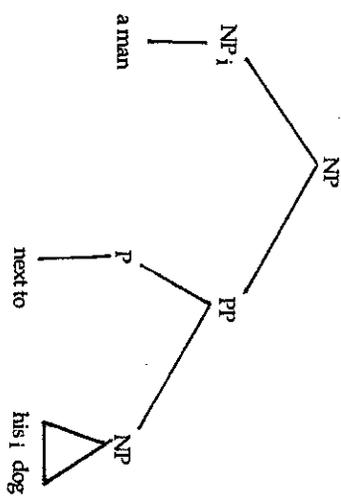b. λx: (cooking for Richard)(x)

This representation predicts correctly the pattern of reflexive and nonreflexive forms that we find in such modifiers: we find reflexives in the same positions which may contain reflexives in corresponding relative clauses and nonreflexive pronouns elsewhere.3 In argument phrases, on the other hand, no binding is apparent, which follows naturally from the fact that arguments are not predicative in any way and the observation that lambda-operators formalize the notion of predication.

We may compare this account with the analysis given in Haik (1987,), who notes the difference between (31) a and b:

(31) a. a picture of its frame
b. a man next to his dog

In (31a), *it* must find its antecedent outside the containing NP, whereas (31b) allows *his* to have a man as its antecedent. This modifier-argument asymmetry is given a structural interpretation by Haik. In particular, she proposes the following two tree to indicate the structural differences:

(32) a.

```
            NP
          /    \
        Det     N'
         a     /  \
              N    PP
           picture /  \
                  P    NP
                  of  /  \
                    Det   N'
                    its   N
                        frame
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b.

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        NP i
       /    \
     NP      PP
   a man    /   \
          P'     NP
        next to  △
               his i dog
```

In the first diagram, there is a violation of the i-within-i condition, but the second one is acceptable because the modifier is adjoined to the antecedent of the pronoun it, and this makes it unnecessary to use the containing NP as the antecedent. This account is fairly similar to ours, in that it makes the i-within-i condition sensitive to the presence of local binders which preclude circular anaphoric dependency chains from arising. The main difference from our proposal is that Haik's does not rely on abstract or invisible operators but rather on differences in syntactic constituency. The tree structure given by Haik is unlikely to be correct however and does not extend to languages such as Dutch or German where modifiers may precede the head noun. In these languages we find clear evidence that the modifiers which concern us here are not sisters of NP but of N (or N'), because the modifier is placed between the determiner and the head and not, as we would expect, before the entire NP:

(33) a. een op zichzelf verliefde professor (Dutch)
         a on himself in-love professor
         "a professor in love with himself"
     b. die mit sichselbst zufriedene Frau (German)
         the with herself content woman
         "the woman content with herself"

Such examples do not pose any problems for our proposal.

Finally, let us consider the proper formulation of the i-within-i condition. First of all, we state it as a condition on the relationship between free pronominals and their antecedents. In other words, we side with Reinhart (1983) and others who distinguish the binding conditions for free pronouns from those for bound variables (whether personal pronoun or reflexive pronoun). Second, we agree with Haik (1987) and others (e.g. Higginbotham and May (1981), Brody (1982)) that the i-within-i condition falls under a larger constraint on circular readings, which also includes cases of circularity without containment, such as the example in (34), discussed in Jacobson (1977):

(34) *[His_i wife]_j hates [her_j husband]_i.

This example is ungrammatical under the given interpretation provided that the pronouns are not resolved by sentence external antecedents. In context, such examples can be acceptable:

(35) Most men have loving wives but not John. His wife hates her husband.

An interesting observation, due to Jacobson, is that substitution of one of the pronouns by its antecedent leads to violations of i-within-i which are unacceptable:

(36) Her husband's wife hates him.

On the other hand, so-called Bach-Peters sentences show acceptable cases of crossing coreference:

(37) The pilot who shot at it downed the MIG that followed him

And here substitution leads to acceptable results:

(38) The pilot who shot at the MIG that followed him downed it

This suggests very clearly, of course, that the same constraint is at work in Jacobson's crossing coreference cases which we saw at work earlier on in Vergnaud's evidence for the Disjunction Condition on Anaphora. We cannot give an account of Bach-Peters sentences here, but will adopt a constraint which deals with both Vergnaud's and Jacobson's data. This constraint is the one given in Higginbotham and May (1981), which we formulate thus:

(39) Condition on Circular Chains

Let * stand for either $\rightarrow$ (the antecedency relation) or < (the containment relation).
A chain $X1* X2*...*Xn$ is circular just in case $Xi = Xj$ for some i,j such that $i = j$ and $1 < i,j < n$. Circular chains are ungrammatical.

As an illustration of this condition, consider example (40):

(40) *[her_i childhood friend's wife]_i

The chain corresponding to this example is:

(41) her childhood friend's wife > her $\rightarrow$ her childhood friend's wife

which is obviously circular. A similar chain shows the circularity in (34). Higginbotham and May claim that their condition is not a principle of grammar, but a principle of language use. To interpret the noun phrase in (40), one must interpret its parts, and to interpret the pronominal part, one must have the antecedent and so we seem to be in an infinite loop -- clearly not something a language user would want to be in. Brody (1982) has taken issue with this claim and notes that cases such as (40) ought

serious problems of use such as infinite loops in their interpretation procedure. After all, if it were grammatical, it would just mean "the one who is the wife of her childhood friend", which is not that difficult to process. Note that we predict this paraphrase to be grammatical, because the pronoun is bound to a relative clause operator. We conclude therefore that we are dealing with a grammatical constraint which is sensitive to the structural environment of the pronoun.

Notes.

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1. Besides Chomsky's (1981) formulation of the i-within-i condition and Vergnaud's (1974) Disjunction Condition, we also note the existence of variants such as Zwarts' (1976) extension of Vergnaud's condition to all projections of N, and Aoun's (1985) restriction of i-within-i to overt elements with an overt binder. Aoun's restriction is not compatible with the analysis we present of "whiz-deletion" exceptions to i-within-i below.

2. Hellan (1986) argues that the Norwegian reflexive anaphor sig is acceptable only if it is contained in a constituent understood as predicated of the antecedent. If this is correct, then Norwegian reflexives are more than just exceptions to the i-within-i condition as interpreted by Hornstein: They are acceptable only if they violate this constraint.

3. Jullens (1983) draws attention to the interesting case of prepositional phrases introduced by with or without , or rather, their Dutch counterparts - we use English examples. Here we find nonreflexive forms rather than the expected reflexive forms:

(i) socks with holes in them/*in themselves
(ii) skies without stars in them/*in themselves

This seems to tally with the pronominal forms found in semantically related clauses with the verb have :

(iii) These socks have holes in them

Jullens also makes the crucial observation that anaphora which seem to violate the i-within-i condition (or Vergnaud's Disjunction Condition) are bound variables.

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