THE PROPER TREATMENT OF BINDING IN PSEUDO CLEFT CONSTRUCTIONS*

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1. INTRODUCTION

In this paper I investigate some properties of scope and binding in pseudo cleft sentences. As a starting point I have chosen Higgins' (1973) pioneering work on clefts, whose main thesis is stated in (1):

(1) *Higgins' Null Hypothesis:*
"The surface structure of a specificational pseudo cleft sentence is essentially identical to its deep structure form." (Higgins 1973: 22)

In modern terminology, (1) implies that, as far as specificational pseudo cleft sentences are concerned, S-structure and LF must coincide in all relevant respects. More specifically, Higgins denies that the analysis of clefts necessitates a specific mechanism of reconstruction. Since by definition a Null-Hypothesis cannot actually be a principle (of grammar), and since it is accepted methodology to avoid construction-specific assumptions, it is plausible to assume that (1) should in fact be a theorem, resulting from deeper principles which in turn do not explicitly mention the specificational pseudo cleft construction. In the context of this volume, I take it that the more general thesis to be defended is that UG does not provide for any mechanism of reconstruction as a syntactic device that maps S-structures onto LFs.

I will first discuss some traditional arguments in favor of reconstruction and how these are dealt with by Higgins. Assuming Higgins' syntactic arguments against previous analyses are correct, what needs to be examined is the question

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of whether they still hold today, against the background of more recent developments. In re-examining some of the problems that arise with (1) and some of the proposed solutions, I will concentrate on the issue of connectivity as discussed by Akmajian (1970), Higgins (1973), Barss (1986), Heycock (1995), and others.

I will then go on to present some new evidence in favor of (1) that is derived from negative and positive polarity. The basic argument proceeds along the following lines. Assuming the Minimalist Program to be basically correct, all properties of constructions should be statable either as derivational conditions, or as constraints on the interface levels PF or LF. If it can then be shown that some properties of the construction seemingly rely on properties of the surface expression, and if these properties invoke structural conditions on scope, the Minimalist Program will imply that these properties are LF properties, so that in fact LF and the surface structure must be identical, as required by the Null Hypothesis in (1) above.

In the remaining sections I will show that reconstruction can be handled within truth conditional semantics. In other words, it will be demonstrated that semantic binding is possible without invoking the condition of c-command.

2. Anaphoric Binding and Connectivity

Let me first discuss the standard example sentences in (2):

(2) a. What nobody$_1$ did was buy a picture of himself$_1$
b. Buy a picture of himself$_1$ was what nobody$_1$ did

The obvious problem is that the anaphor is not c-commanded by its antecedent. If I understand Higgins correctly, he pursues two different strategies to solve problems with anaphoric expressions. One is based on the observation that anaphors can be exempt from the c-command requirement in certain contexts. To this I will turn further below in this section. The second is to assume an understood big-PRO-like subject which serves as the local c-commanding antecedent of the anaphor. Accordingly, *buy a picture of himself* would require a silent subject-NP in D-structure which serves as the antecedent of the anaphor *himself*, as shown in (3):

(3) a. What nobody$_1$ did was [PRO$_1$ buy a picture of himself$_1$]
b. [PRO$_1$ buy a picture of himself$_1$] was what nobody$_1$ did

According to the theory of the early seventies, the binding theory is checked cyclically, i.e. before the empty subject of *buy* is erased by an EQUI-NP-deletion rule.

Such a solution, however, simply shifts the problem of binding the overt anaphor to the problem of binding PRO. That is, even if we grant an invisible subject PRO, Higgins does not explain how this subject can in turn be bound by its antecedent. To illustrate, consider the structure in (3-a). The relevant observation is that the antecedent of PRO is a quantifier, and that binding by a quantifier is possible only in a configuration of c-command. This traditional assumption can be made explicit by the Binding Hypothesis formulated in (4):

(4) *The Binding Hypothesis:*
For a pronominal (overt or covert) to be semantically interpretable as a bound variable, it must be c-commanded by its binder.

Examples like (3) reveal that, unless one is prepared to postulate Quantifier Raising out of a relative clause—which seems to be a wild and unmotivated device —, the Binding Hypothesis is inconsistent with Higgins' Null Hypothesis.

Moreover, it has frequently been pointed out that cases like (5-a) cannot plausibly be accounted for by an invisible internal subject-PRO. Such a theory—proposed e.g. by Chomsky (1986) but rejected by Heycock (1995)—would presumably place a PRO subject into the specifier position of a DP, as shown in (5-b):

(5) a. What $nobody_1$ bought was a picture of $himself_1$
b. What $nobody_1$ bought was $[_{DP}$ PRO_1 $[_{D'}$ a $[_{NP}$ picture of $himself_1$]]]

A straightforward counterargument can be derived from the analysis of (6) taken from Barss (1986):

(6) [$What_i$ *Joyce and Shaw* read t_i] are each other's plays

Since *each other* in (6) has no overt c-commanding antecedent, one would have to assume an invisible PRO subject somewhere within the DP. However, the natural position to look for such a subject is the specifier position of DP. But this position is already taken by the reciprocal itself, and there is no syntactic motivation for assuming a furthur subject position above SpecDP.

Higgins' second line of reasoning concerns the fact that anaphors in English may escape the strict c-commanding requirement in other constructions as well. That is, he demonstrates that *picture*-nouns behave somewhat exceptionally anyhow, so that his second reaction to problems with anaphors amounts to a *reductio ad insolubile*, i.e. assimilating the problematic cases to other hitherto unresolved problems in the theory of binding that are independent of the specific properties of the construction under discussion. From today's persepective, it seems that most of these problems have been solved in the binding theory of Reinhart and

Reuland (1993). This theory proposes a way to analyze the logophoric use of anaphors not c-commanded by their antecedents, and extends this analysis to other cases of long distance anaphora.

Reinhart and Reuland, like Higgins, explicitly deny the need for reconstruction for the purpose of condition (A), that is, they claim that reconstruction is not needed to explain the distribution of anaphors. Adopting such a theory will then account for all problems of unbound anaphors, since c-command by an antecedent is not a relevant condition for semantic binding in that theory. At the same time, however, Reinhart and Reuland admit that "this does not entail, though, that the problem of reconstruction is eliminated altogether. The contexts we have examined still pose a problem for the theory of variable binding . . . Generally, variable binding requires that the antecedent c-command the variable at some level, which is not the case at S-Structure for the structures under consideration. In sum, then, our analysis can shed no new light on the general issue of the precise formulation of variable binding . . . " (p. 684). What remains unresolved is the semantic issue of variable binding which still seems to require some kind of (semantic) reconstruction mechanism.

Below I will show that S-structural theories of binding, like those developed by Reinhart and Reuland (1993), Barss (1986), Koster (1982/83), and others, are not in danger of being undermined by semantic constraints. Before doing so I will briefly discuss some residual cases where reconstruction still has an undeniable impact on the theory of binding.

3. PRINCIPLE (C) EFFECTS

In this section I will collect evidence showing that, contrary to what we concluded in the last section, binding theory still has to be sensitive to reconstruction. Note that we only looked at Principle (A) effects in the last section, and that the binding theory of Reinhart and Reuland (1993) only accounts for Principle (A) and (B) effects. We now consider phenomena traditionally explained by condition (C) of binding theory.

First consider examples like (7-a) from Bach (1969) and (8-b) from Higgins (1973):

(7) a. *What he_1 smashed was John's$_1$ car
    b. *What he_1 discovered was a proof of Descartes'$_1$ existence
    (okay only with predicational reading)

The ungrammaticality of coreference in these sentences corresponds to that of their unclefted counterparts. This clearly suggests an analysis in terms of obligatory reconstruction, in fact one which is indeed independent of any understood subject mechanism. But in the context of Higgins' dissertation any explanations via reconstruction would have been inconsistent with his Null Hypothesis; so the question is whether alternative explanations are available. When discussing examples like (7-a) and (7-b), Higgins seems to subscribe to the view that backwards anaphora are restricted to a special context that requires the referent to be already known or given. Arguing along these lines, he cites *Hankamer's Conjecture:* "All pronominalization is from left to right" and comments: "Hankamer's conjecture may well be too strong, but Specificational pseudo cleft sentences probably fall into the class of cases which can be explained by it." (p. 316) He also cites examples showing that backwards pronominalization is ungrammatical even though it is okay in the unreconstructed form:

(8) *What the man who lived next door to him_i also discovered was a proof that Descartes_i existed

The point is that the ungrammaticality of (8) cannot be explained by condition (C), regardless of whether or not we reconstruct. Here again, one strategy is to resort to other, then still unexplained properties of binding. In an attempt to explain these properties, Higgins briefly discusses an analysis that relies on the meaning of a pseudo cleft as specifying a *list*. He observes that something from within a list can never pronominalize an element outside it. This is exemplified in (9):

(9) *He_i discovered the following: Mary's books, John's_i trousers, . . .

As evidenced by other contributions to this volume it seems to have become a widely shared semantic intuition that *lists* are essential for the semantics of the construction under discussion. I am not convinced, however, that this can help to explain the properties of the construction satisfactorily. For one thing, the generalization itself is still left unexplained; for another, it does not square well to other connectivity effects to be discussed further below. Moreover, I do not see why lists should do better than sets: Lists are ordered sets, but it is precisely this aspect of an ordering which never plays a role in any explanation based on lists. For sure, we sometimes allude to *incomplete* or *open* lists, and it seems to be a commonly shared intuition that clefts specify *complete* lists. The preference for lists could then be expained by the fact that this difference has no counterpart in sets: we simply do not have any notion of an *incomplete set*. But since sets are "complete" by definition, it seems to me that a proper formalization cannot take advantage of the concept of a list, simply because sets are all we need to formalize complete "lists". Since we do not want to formalize incomplete entities, an adequate formalization should proceed in terms of sets, as one would expect from ordinary model theoretic semantics.

Putting aside the issue of lists, observe that inverted structures like (10) still show reconstruction effects, although this time Hankamer's rule cannot work:

(10) a. *John's$_i$ car was what he$_i$ smashed
b. *Shave John's$_i$ beard was what he$_i$ forced Mary to do

I conclude from (10) that applying condition (C) at a reconstructed LF still yields correct results (although examples like (8) suggest that additional factors might also come into play).

The following data from Heycock (1995) confirm this conclusion. Consider first the contrast in (11):

(11) a. [How many lies aimed at exonerating Clifford$_i$]$_j$ did he$_i$ claim that he$_i$ had no knowledge of t$_j$
b. *[How many lies aimed at exonerating Clifford$_i$]$_j$ is he$_i$ planning to come up with t$_j$

The contrast does not lie in the surface structure of the clauses; rather it is the semantics of the embedded verbs that makes the difference. In (b), the verb is intensional, and any meaningful interpretation of the sentence must reconstruct the *wh*-phrase into its scope. The verb in the (a)-sentence, however, is extensional, hence no reconstruction is called for and coreference is grammatical.

Consider next the parallel cleft constructions in (12) to be compared with (11-a):

(12) *What he$_i$ claimed that he$_i$ had no knowledge of were lies aimed at exonerating Clifford$_i$

Although coreference is okay in the transparent unclefted construction, it must be ruled out in the also transparent cleft construction. This behavior suggests that reconstruction of *what* in clefts is obligatory, even if there exists an extensional interpretation that does not semantically enforce reconstruction.

Although this assumption deserves an explanation in and of itself (which I am unable to present), it should be noted that the observed necessity of reconstruction is exactly what Barss assumes when dealing with condition (B) effects like (13):

(13) a. *What John$_1$ is is proud of him$_1$
b. *What John$_1$ read was a book about him$_1$
(okay only on predicational readings)

It seems, then, that the least one can say by now is that the application of condition (C) at a reconstructed level is consistent with the observed facts.

Summarizing the evidence we collected thus far, principle (C) of the binding theory interacts with and depends on reconstruction in an interesting way. Although this seems to contradict Higgin's Null Hypothesis, a number of linguists, notably Barss (1986) and Koster (1982/83) have shown how to reconcile these requirements with Higgins' thesis: By reformulating binding in such a way that the effects of movement and reconstruction are captured at S-structure, Barss and Koster have shown that there is in principle no need to postulate an LF that differs from surface structure in crucial respects, a matter to which I return in section 8. However, what still remains troublesome is the semantic issue, namely the conflict between the Null Hypothesis and the Binding Hypothesis. That is, the theories of Barss, Koster, Reinhart and Reuland would be undermined if it finally should turn out that reconstruction is still necessary for independent semantic reasons, e.g. (4). Before demonstrating that semantic binding does not require c-command, let us look at two further arguments in favor of reconstruction.

4. NEGATIVE POLARITY ITEMS

Another well-known problem is NPIs in pseudo clefts, as exemplified in (14):

(14) [What John$_1$ *didn't* do] was buy *any* picture of himself$_1$

The surface structure of (14) seems to contradict the commonly held view that *any* must be in the scope of (and thereby be c-commanded by) negation. This view, like (4), seems to imply the unavoidability of reconstruction.

By way of generalizing the Binding Condition we thus arrive at the Scope Condition given in (15):

(15) *The Scope Condition:*
NPIs as well as bound variables must be in the scope of (i.e. c-commanded by) the operators they depend on.

Cleft constructions show that this condition cannot be met at S-structure, a conclusion that seems to contradict Higgins' Null-Hypothesis.

However, clefts exhibit an interesting asymmetry that emerges in inverted structures like (16):

(16) *Buy *any* picture of himself$_1$ was [what John$_1$ *didn*'t do]

Note that if reconstruction were independently necessary for the binding of *himself*, it follows that the reason for the grammaticality contrast between (16) and

(14) cannot be stated at the reconstructed level. Rather, there seems to exist an analogue of Hankamer's rule, namely a linear precedence condition that holds for NPIs at surface structure. Note that such a condition is already contained in Ladusaw's Polarity Hypothesis stated in (17):

(17) *The Polarity Hypothesis* (Ladusaw, 1980, p. 112):
"A NPI must appear in the scope of a trigger (a downward entailing element). If its trigger is in the same clause as the NPI, the trigger must precede the NPI."

This condition, however, seems to be inapplicable to the case at hand, because Ladusaw restricted precedence to elements of the same clause. The reason for this was his awareness of grammatical examples like (18), where the NPI *precedes* the negative verb:

(18) [That *anyone* invited her on Monday] Mary *forgot*

Here the negative trigger is not in the same clause as *anyone* and therefore must be allowed to precede the NPI. However, if we adopt Progovac's (1993) analysis—namely that there is something inherently negative in the COMP position of sentential complements of certain downwards entailing verbs, and that this invisible element of the fronted clause is the trigger for the NPI—the *if*-clause in Ladusaw's condition can be dropped. We may thus generalize the condition by saying that the trigger must *always* precede the NPI. This explains the contrast between (14) and (16): in the grammatical sentence (14) the trigger precedes the NPI, whereas in the ungrammatical (16), the NPI precedes the trigger.

If something like this is correct—and in fact the following data kindly provided by Chris Wilder (p.c.) further illustrate the relevance of precedence—:

(19) a. *Any picture of Fred was what John didn't buy
b. *Steal anything was what nobody did
c. *Pictures of anyone John didn't buy.
d. *It was pictures of anyone that John didn't buy
e. *Pictures of anyone are easy to ignore
f. *... but steal anything, nobody did

it would seem that the licensing conditions for NPTs would require two different levels: Since reconstruction reverses the surface order, it is obvious that the *linear* licensing condition must apply at the level of surface structure. This level must be different from PF, since the licensing conditions explicitly relate a NPI to its trigger, and this relationship cannot be defined in purely linear PF-terms.

On the other hand, it seems that the *structural* licensing condition for *any* is not met at the surface of pseudo clefts. This again calls for a solution in terms of an LF that differs from the surface.

However, when looking at NPIs other than *any*, we find that such a conclusion might be premature. For example, although sentence (20-a) is perfectly grammatical, the corresponding cleft in (20-c) is not:

(20) a. John didn't give a talk until he was 25.
b. *John gave a talk until he was 25.
c. *What John didn't do was give a talk until he was 25.

Here again it is the surface structure that counts. Marcel den Dikken pointed out to me that the same might be true for idioms. For example, the idiomatic interpretation is lost in (21):

(21) What Mary didn't lift was a finger

These findings militate against an LF-reconstruction account of negative polarity in general. Thus, one might argue that the above counterexamples call for S-structure locality, whereas *any* requires locality at LF. However, such a solution would, perhaps unduly, multiply levels beyond Occam's razor, thus contradicting the minimalist assumption that S-structure conditions should not exist. Further evidence in favor of such a conclusion will be adduced in the next section.

5. POSITIVE POLARITY

This evidence is based on Linebarger's (1987) observation that the local licensing of NPIs is sensitive to the scope of quantifiers at LF. She gives the following examples:

(22) a. *John didn't give *a red cent* to every charity
b. *She didn't wear *any* earrings to every party
(Available reading: Wide scope of *any* over *every*) NOT available for (b): It wasn't to every party that she wore any earrings

At S-structure the NPI is as close to the negation as can be; nonetheless, the reading with *every* having wide scope over the NPI is impossible. This can be explained by looking at LF, where the quantifier is closer to the negation than the NPI. This produces an intervention effect: there is an intervening operator between the NPI and its licenser which blocks the strictly local licensing requirement of the NPI.

Interestingly enough it turns out that a switch from the negative to the corresponding positive polarity item *rules in* the previously unavailable reading. For example, compare (22-b) with (23), which seems fairly acceptable in the intended reading:

(23) ?She didn't wear *some* earrings to every party

This is unexpected if we check licensing conditions only at surface structure where the positive polarity item is immediately preceded by the negation. We must conclude, then, that LF is the relevant level not only for *any* but also for positive PIs. Accordingly, the PPI *some* is grammatical in (23) because at LF an operator intervenes.

Given all this, consider next (24):

(24) What John (also) didn't do was drink any/some wine

The grammaticality of both *some* and *any* in this context is unexpected if the LF of the sentence involves (obligatory) reconstruction. This observation supports Higgins' thesis. If the locality condition for *some* must be checked at LF — as suggested by (23) — then this LF should be identical to the surface, for otherwise the PPI would be in the immediate scope of negation. On the other hand, given that no syntactic reconstruction is involved, the licensing conditions of *any* seem to go hand in hand with those of bound variable pronouns, which can be demonstrated by (25):

(25) What nobody_i did was beat some/any (friends) of his_i children

As noted above, the analysis of *some* in (25) would become paradoxical on the view that binding requires reconstruction at LF: such an LF would clearly violate the licensing condition for *some*. I conclude that neither the LF required for binding nor the LF required for *any* can involve real reconstruction, and that the licensing conditions for *some* and NPIs other than *any* can be satisfied only if LF and S-structure are identical.

To summarize this section, the polarity item *any* behaves much like an anaphor in that it can be licensed only via reconstruction. Other PIs, however, are incompatible with reconstruction, although an analysis of their distribution crucially involves considerations of LF. From the latter fact I conclude that Higgins' hypothesis is in fact the correct generalization, so that binding conditions as well as the locality condition for *any* must be stated in a Barssian way, at a level of LF that is not different from the surface in relevant respects, but which incorporates a notion of semantic scope that is not necessarily identical to the syntactic notion of c-command. Given this, it only remains to be shown how semantic binding can be accounted for without presupposing syntactic binding. Before going into this, I would like to discuss one final argument that was designed to establish a genuine semantic argument in favor of Higgins' thesis.

6. CONJUNCTION

As pointed out by Sharvit (1997), the following pseudo cleft has a cumulative reading:

(26) What John read and what Mary bought is/was Huck Finn, Tom Sawyer, A Connecticut Yankee, and The Prince and the Pauper.

Syntactic reconstruction at LF cannot account for this reading, hence no reconstruction can ever be involved in the analysis of pseudo clefts.

This would, if correct, establish an excellent argument in favor of Higgins' hypothesis. Unfortunately, however, I am not convinced that the argument reveals anything about specificational clefts. Consider first similar examples with predicates that call for a plural subject:

(27) a. What John bought and what Mary bought go together well
b. What John believes and what Mary claims is (mutually) incompatible.

We arrive at the correct readings only if the free relative clauses are referring expressions and the entire cleft construction is predicational. Similarly Sharvit's example (26) can be accounted for by analyzing the free relatives as terms and by adopting Schwarzschild's (1991) union theory of coordination as shown in (28):

(28) $\{X$: John *read $X\} \cup \{X$: Mary *bought $X\}$ = {Huck Finn, Tom Sayer, A Conneticut Yankee, The Prince and the Pauper}

Here '*' denotes Link's plural operator, cf. Link (1991) or Sternefeld (1994). However, according to Higgins' typology, (26) would be classified as *identificational*. And as is well known, neither predicational nor identificational clefts show the usual connectivity effects.

A genuine testing case would be true specificational sentences, perhaps of the form in (29):

(29) What Max also wanted to buy and what Mary intended to read was a book on syntax and a book on semantics

Due to the presence of the intensional verbs, (29) should be specificational. But now the relevant question is this: do we get a cumulative reading? Here I only get the distributional construal, with Max wanting to buy both books.

The conclusion is that the coordination of the free relatives in specificational clefts can not involve a conjunction of terms. Rather, conjunction has to apply to open propositions, with *what* serving as a placeholder for the post-copular material. This is corroborated by the behavior of reciprocals. First note that these are grammatical in specificational constructions like (30-a) and (30-b), which sharply contrast with the ungrammatical sentences in (30-c) and (30-d):

(30) a. The only people they really liked were each other (Chomsky (1971))
b. What those two like even more than they like themselves is each other (from Oren Percuss: Unmasking the Pseudocleft, 1997, unpublished)
c. *What John really liked and what Mary really liked was each other
d. ??What John did and what Mary did was send letters to each other

One might argue that these sentences are out for reasons of agreement; the real testing case should therefore be:

(31) ??What some critics really admire and what some authors really dislike is/are each other

But this, if grammatical at all, only has the distributional reading, with the critics admiring each other and the authors disliking each other.

In conclusion, then, coordinations in real specificational clefts do not, contrary to first appearance, provide evidence against a reconstruction account. On the contrary, examples like the above suggest that across the board reconstruction is essential in order to get the semantics right.

It emerges, then, that there are a number of semantic properties that are left unexplained by Higgins' thesis, and these are precisely the properties that would speak against his Null Hypothesis.

7. AN IN SITU SEMANTICS FOR RECONSTRUCTION

Now, in order to maintain the Null Hypothesis, we need a surface semantics which solves the connectivity problems in a straightforward way. A major task therefore is to develop an alternative theory that interprets variable binding at the surface, without c-command. As it turns out, this problem is largely independent of the properties of cleft sentences, hence any solution to it will still satisfy the Null Hypothesis. On the other hand, any such semantics is in conflict with the

Binding Hypothesis (4) and the Scope Condition (15), which therefore must be assumed to be wrong.

In fact, there are several possibilities to interpret variable binding without c-command. A particularly simple solution is implicitly contained in Bennett (1979). It is simple because it is very general. Although Bennett does not address the issues of reconstruction and of interpreting pronouns, his framework easily allows expression of the idea that referential pronouns and bound variables do not have the same meaning. Whereas referential pronouns do, as usual, denote individuals, this no longer holds for bound variable pronouns, whose meaning must be something more complex.

To see this, let us first look at the interpretation of quantified sentences in predicate logic. The usual semantics given to a universally quantified sentence like (32-a) is the metalinguistic statement in (32-b):

(32) a. $(\forall x_1)(P(x_1) \rightarrow Q(x_1))$
b. $(\forall a \in D)(\forall g' \in G)(g'[a/1]g \rightarrow (I_P(g'(1)) \rightarrow I_Q(g'(1))))$

Here, D is the domain of discourse, g and g′ are assignment functions, I_p and I_a are the interpretations of P and Q respectively, and g′[a/1]g means that g′ differs from g at most in assigning a to be the variable x_1. Now, the logical problem with doing semantic reconstruction by means of lambda conversion is that (33-a) is not equivalent to (32). Rather, a logically equivalent alphabetic variant of (33-a) would be (33-b), with x_1 still being a free variable not bound by the universal quantifier:

(33) a. $\lambda x_2(\forall x_1)(P(x_1) \rightarrow Q(x_2))(x_1)$
b. $(\forall y)(P(y) \rightarrow Q(x_1))$

Lambda conversion is not permitted in a context where a formerly free variable such as the last occurrence of x_1 in (33-a) would become bound as the result of that operation.

Let us illustrate the problem with a lingustic example. Assume that P stands for *man*, and R for *loves*. Adopting the notation of (32-b), *every man*$_1$ *loves him*$_2$ would have the following truth conditions:

(34) $(\forall a \in D)(\forall g' \in G)(g'[a/1]g \rightarrow (I_P(g'(1)) \rightarrow I_R(g'(1), g'(2))))$

Next consider a slight modification of (34).

(35) $(\forall a \in D)(\forall g' \in G)(g'[a/1]g \rightarrow (I_P(g'(1)) \rightarrow I_R(g'(1), X_2(g'))))$

In (35) we replaced $g'(2)$, which is the translation of the pronoun *him*$_2$, by a complex variable that ranges over assignments. Now assume that this variable

X_2, which applies to the assignment function g' used at the current stage of semantic evaluation, is the semantic interpretation of a syntactic trace. That is, the sentence we want to interpret is (36):

(36) Himself$_1$, every man$_1$ loves t

Since *himself*$_1$ must be interpreted as bound by *every man*$_1$, its meaning must be $\lambda g.g(1)$, so that by lambda abstraction over X_2 and by applying the lambda abstract to the meaning of *himself*$_1$ we get (37):

(37) $\lambda X_2(\forall a \in D)(\forall g' \in G)(g'[a/1]g \rightarrow (I_P(g'(1)) \rightarrow$
$I_R(g'(1), X_2(g'))))(\lambda g.g(1))$

But observe now that lambda conversion (of X_2) has become unproblematic, since the converted material no longer contains any free variables. The result of lambda conversion applied to X_2 is shown in (38-a). Applying conversion again to g' yields (38-b). In traditional object language notation this is equivalent to (38-c):

(38) a. $\forall a \in D)(\forall g' \in G)(g'[a/1]g \rightarrow (I_P(g'(1)) \rightarrow$
$I_R(g'(1), \lambda g.g(1)(g'))))$
b. $\forall a \in D)(\forall g' \in G)(g'[a/1]g \rightarrow (I_P(g'(1)) \rightarrow I_R(g'(1), g'(1))))$
c. $\forall x(P(x) \rightarrow R(x, x))$

This demonstrates that lambda conversion can bring a syntactically free pronoun into the scope of its semantic binder, but only if the semantic value of a semantically bound pronoun is not the same as that of ordinary variables. Rather it must be the meaning of a variable in the meta-language, where assignments (or simply: sequences of individuals) are part of the language we are talking about. In what follows, I will assume that part of what I called the meta-language above is in fact the object language used to represent the meaning of natural language expressions.

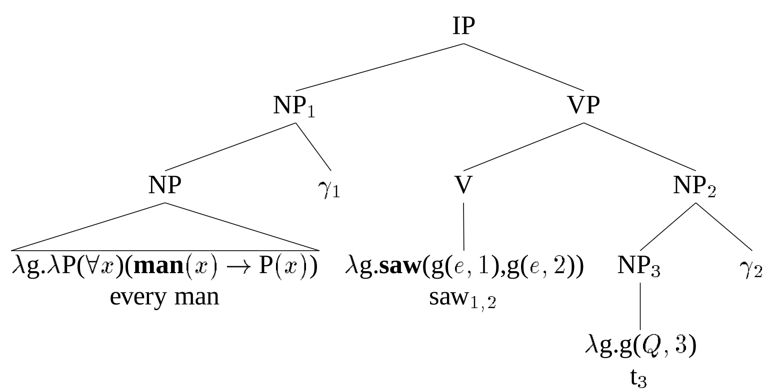
Of course it remains to be shown that all this can be done in a systematic way. But this is exactly what Bennett has shown in his seminal paper, where all translations of natural language expressions into a typed predicate logic are of the general form "$\lambda g.\alpha$". Accordingly, if an expression is to be interpreted as dependent on a quantifier, its value depends on an assignment, as illustrated by $\lambda g.g(i)$ as the translation of *himself*$_i$. By contrast, referential expressions cannot depend on an assignment, so that lambda abstraction over g applies vacuously. An example is the translation of a referential pronoun him$_i$, being represented as $\lambda g.x_i$.

A systematic exposition of the semantics can be found in Sternefeld (1997). For reasons of space this analysis cannot be repeated here; but it should have become clear that semantic binding does not rely on c-command. As a relevant example, let me illustrate what happens in a pseudo cleft construction like *What every man saw was a picture of himself*. Let us begin with the free relative clause:

(39) $[_{\mathrm{CP}}$ What $[_{\mathrm{NP}_1}$ every man] saw $[_{\mathrm{NP}_2}$ t]

In the translation of (39), *every man* is a generalized quantifier, *saw* is a kind of “open proposition” with argument slots 1 and 2, represented as λg.**saw**(g$(e,1)$,g$(e,2)$), where e denotes the logical type of individuals, and the value of g$(e,1)$ is an entity of type e. i.e. an individual. The trace will be presented as a pseudo variable with some arbitrary but fixed index, say 3. Pseudo variables consist of a logical type α and a numeral n, such that the assignment function g will map such pairs onto entities of the corresponding type α. Note that pseudo variables (like the meaning of bound variable pronouns and of semantically interpreted traces) are so called because they represent what is traditionally called a bound variable, but in fact do not contain any free variable whatsoever. The indeces of the NPs in (39) will finally be interpreted as shown in (40):

(40)



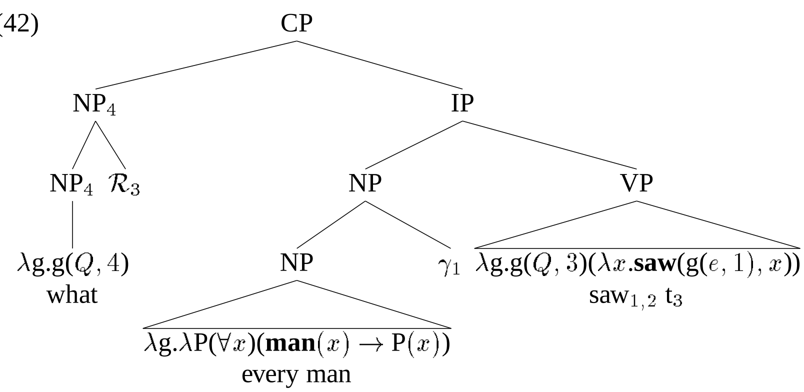
The value of g$(Q,3)$ is a generalized quantifier, with Q denoting the type of generalized quantifiers, and 3 being the index of the pseudo variable. γ_i is an operation that takes the translation of a generalized quantifier and an open proposition as arguments and yields an open proposition again, as defined in (41) (with s being the type of possible words, t the type of truth values, and n the type of integers):

(41) Bennett's rule of *Ordinary Quantification*, cf. Bennett (1979, p. 11):
Let s be the type $\langle n, e\rangle$ and s the variable $v_{0,s}$.
(sequences or "assignments")
Let p be the type $\langle s, t\rangle$ and p the variable $v_{0,p}$. (propositions)
Let P be the type $\langle e, t\rangle$ and P the variable $v_{0,P}$. (properties)
Let Q be the type $\langle s, \langle P, t\rangle\rangle$ and $\mathcal{Q}$ be the variable $v_{0,Q}$. (NPs)
Then

$$\gamma_i := \lambda\mathcal{Q}\lambda \text{p}[\lambda \text{s}.\mathcal{Q}(\text{s})(\lambda x.\text{p}(\text{s}[x/i]))].$$

The operation thus amounts to binding via lambda abstraction over the i-th argument position, together with functional application of the generalized quantifier to the lambda abstract. The result of applying γ_2 is shown as the meaning of the VP in (42). Here I also added *what* in SpecC and an operator $\mathcal{R}$ that semantically reconstructs *what* into the position of the trace. The meaning of $\mathcal{R}$ is defined in (43).

(42)



(43) **The Reconstruction Operator**:
If α is a meaningful expression of type $\langle s, \tau\rangle$, y is a variable of type τ, and p is a meaningful expression of type $\langle s, t\rangle$, then

$$\mathcal{R}_i(\alpha)(\text{p}) := \lambda\text{g}\lambda\text{y.p(g[y/i])}(\alpha(\text{g}))$$
$$= \lambda\text{g.p(g}[\alpha(\text{g})/\text{i}])$$

Since $\mathcal{R}$ corresponds to lambda abstraction over a higher type pseudo variable with index i, followed by application to an argument of the required type, the result of applying it to a pseudo variable is semantically vacuous: We simply replace the variable corresponding to the trace by the variable corresponding to *what*, as shown in (44):

(44) $\mathcal{R}_3(\lambda$g.g$(Q,4)$)(IP) =
$\mathcal{R}_3(\lambda$g.g$(Q,4)(\lambda$g.$\forall y$(**man**$(y) \rightarrow$ g[y/1]$(Q,3)(\lambda x.$**saw**(y,x)))))) =
λg.$\forall y$(**man**$(y) \rightarrow$ g[g$(Q,4)$)/3][y/1]$(Q,3)(\lambda x.$**saw**(y,x)) =
λg.$\forall y$(**man**$(y) \rightarrow$ g[y/1]$(Q,4)(\lambda x.$**saw**(y,x)))

The final step is to determine the truth conditions of the entire cleft construction *What every man saw was a picture of himself*. The relevant part of the structure is represented in (45):

(45) [$_{\text{IP}}$ [$_{\text{CP}}$ (44)] [$_{\text{VP}}$ was [$_{\text{NP}}$ [$_{\text{NP}}$ λg.λP($\exists x$)(**picture-of**(x,g$(e,1)$) $\wedge$ P(x))] $\mathcal{R}_4$]]]

Assuming that the copula is meaningless (or the identity function), this is equivalent to (46), where the *picture*-NP takes the CP as its argument and semantically reconstructs into the position of g(Q,4), so that (ignoring presuppositions and the more fine grained analysis of focus) the truth conditions come out identical to those of *Every man saw a picture of himself*:

(46) a. $\mathcal{R}_4(\lambda$g.λP($\exists x$)(**picture-of**(x,g$(e,1)$) $\wedge$ P(x)))(λg.$\forall y$(**man**$(y) \rightarrow$ g[y/1]$(Q,4)(\lambda x.$**saw**(y,x))))) =
b. λg.$\forall y$(**man**$(y) \rightarrow$ g[λP($\exists x$)(**picture-of**(x,g$(e,1)$) $\wedge$ P(x))/4][y/1]$(Q,4)(\lambda x.$**saw**(y,x)))) =
c. λg.$\forall y$(**man**$(y) \rightarrow$ g[λP($\exists x$)(**picture-of**(x,y)) $\wedge$ P(x))/4]$(Q,4)$ $(\lambda x.$**saw**(y,x)))) =
d. λg.$\forall y$(**man**$(y) \rightarrow \lambda$P($\exists x$)(**picture-of**(x,y)) $\wedge$ P(x))$(\lambda x.$**saw**(y,x)))) =
e. λg.$\forall y$(**man**$(y) \rightarrow$ ($\exists x$)(**picture-of**(x,y)) $\wedge$ **saw**(y,x)))

8. AN *in situ* ACCOUNT OF CONDITION (C)

In the above section, I have shown that we can define binding and scope without c-command. In particular, the licensing of polarity items, which were shown to obey locality constraints against intervening operators at LF, cannot simply be reduced to a c-command requirement. The crucial observation, however, was that *any* functions differently from other polarity items, which do seem to rely on c-command. The difference can now be stated in the following way: whereas polarity items like *unless*, *some*, and idiomatic expressions obey a syntactic command requirement with respect to negation, *any* only obeys the semantic condition of being in the scope of negation. This semantic condition can be satisfied via semantic reconstruction.

Likewise, condition (C) effects seem to be sensitive to semantics, in particular to reconstruction. Sensitivity to semantics also holds of condition (B), as shown by Reinhart and Reuland (1993). In order to state condition (B) correctly, they have to refer to semantic notions like α being a co-argument of β. In general, co-arguments can be recognized on the basis of surface expressions only when chains of moved arguments are taken into account. Similarly, we might want to state condition (C) at LF by referring to traces of movement, in particular those traces that are represented by pseudo variables at LF. Higher order pseudo variables of this kind, such as the translation of *what* in pseudo clefts, are exactly the reconstruction sites, as should be obvious from the semantics developed above.

In order to make condition (C) precise, we have to integrate Heycock's finding that condition (C) effects at LF depend on semantic reconstruction. Moreover, I would like to formalize an LF analogue of Lebeaux's basic intuition that adjuncts can be inserted on the way to S-structure, which accounts for the difference between (47-a) and (47-b):

(47) a. Whose/Which claim that John_1 made did he_1 deny later?
b. *Whose/Which claim that John_1 liked Mary did he deny later?

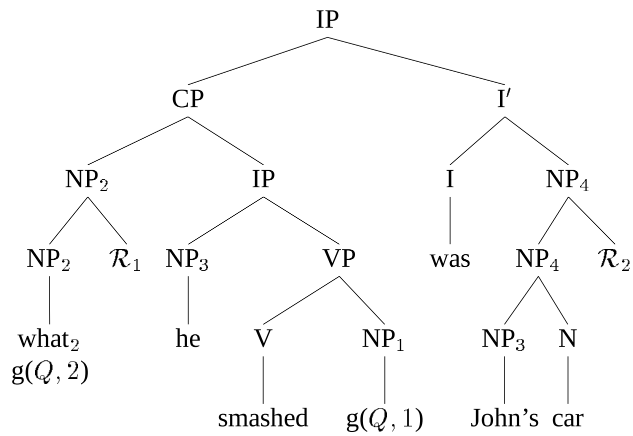
The basic intuition to begin with is to redefine Barss' accessibility paths as a subtree of the entire tree. That is, an ordered "Binding Tree" is roughly equivalent to a Barssian accessibility path. A condition (C) effect is encountered if and only if an R-expression γ has a Binding Tree that touches a coindexed binder β, i.e. there is a node α in the Binding Tree of γ such that some β is a sister of α and β is coindexed with γ. These notions can be defined as follows:

(48) **Binding Tree:**
Given a tree Σ and an R-expression $\alpha \in \Sigma$, the Binding Tree for α is the smallest subtree $T \subseteq \Sigma$ that satisfies the following conditions:
a. $\alpha \in T$,
b. the root of T is the root of Σ,
c. if $\beta \in T$ and γ is a reconstruction site of β, then $\gamma \in T$,
d. if $\beta \in T$ and γ is the local trace of β such that γ is not a reconstruction site, then $\beta \in T$ only if β does not (reflexively) dominates an adjunct that dominates α.

The **unless**-clause is a representational version of Lebeaux (1994). It implies that a trace is always an element of the tree if it is a reconstruction site. This was established by (11). Recall that a trace is a reconstruction site if and only if it is translated as a pseudo variable of the same type as the antecedent. Moreover, a trace may escape being an element of a Binding Tree for α if it is not a reconstruction site *and* its antecedent (reflexively) dominates an adjunct that dominates the R-expression α. This is basically Lebeaux's observation that R-expressions within adjuncts are not visible at D-structure, i.e. the trace of such an adjunct is not in the Binding Tree, unless it is a reconstruction site.

Let us look at an example of the relevant structure as depicted in (49):

(49)



Clearly, the binding tree of *John's* contains NP_3, NP_4, I′, and IP. Since NP_4 reconstructs into NP_2, the latter is also contained in the tree, which implies that CP is also an element of the tree that connects NP_2 with the root IP. By reconstruction of NP_2 into NP_1, the latter node plus all nodes dominating it are elements of the tree, including the VP immediately dominating NP_1. But since this VP has a sister node *he* that is coindexed with *John's*, we encounter a violation of the binding theory.

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