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Some issues in the linking between syntax and semantics in relative clauses

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Relative clauses present an interesting challenge for theories of the syntax-semantics interface, because one element functions simultaneously in the matrix and relative clauses. The exact nature of the challenge depends on whether the relative clause is externally-headed or internally-headed. Standard analyses of relative clauses are grounded in the analysis of English-type externally-headed constructions involving a relative pronoun, e.g. *The horse which the man bought was a good horse*, despite its typological rarity, and such accounts typically involve movement rules, both overt and covert, and phonologically null elements. The analysis of internally-headed relative clauses often involves the positing of an abstract structure including a null external head, with covert movement of the internal head to that position. The purpose of this paper is to show that the essential features of both types of relative clause can be captured in a syntactic theory that eschews movement rules and phonologically null elements, Role and Reference Grammar. It will be argued that a single set of linking principles can handle the syntax-to-semantics linking for both types.

Keywords: Externally-headed relative clauses; internally-headed relative clauses; Role and Reference Grammar; linking syntax and semantics

1. Introduction[1]

Relative clauses present an interesting challenge for theories of the syntax-semantics interface, because one element functions simultaneously in the matrix and relative clauses. The exact nature of the challenge depends on whether the relative clause is externally-headed, as in (1a), or internally-headed, as in (1b).

1. I would like to thank Ranko Matasović and Dejan Matić for comments on an earlier draft.

(1) a. [*nuna-Ø* *ranti-shaq-n*] ***bestya-Ø*** *alli*
man-NOM buy-PERF-3 horse-NOM good
bestya-m *ka-rqo-n* *Ancash Quechua*
horse-EVID be-PAST-3[2] (Cole 1987)

b. [*nuna-Ø* ***bestya-ta*** *ranti-shaq-n*] *alli* *bestya-m* *ka-rqo-n*
man-NOM horse-ACC buy-PERF-3 good horse-EVID be-PAST-3
'The horse that the man bought was a good horse.'

The head noun of the relative clauses in both of these sentences is *bestya* 'horse'. In the externally-headed relative clause in (1a), the head noun appears after the relative clause and is case-marked for its matrix clause function, namely, that of subject. It does not occur in the relative clause at all, and consequently there is no direct marking of its function in the embedded clause at all. Conversely, in the internally-headed relative clause in (1b), the head noun appears inside it and is case marked for its function in it, namely, that of direct object. There is no direct indication of its matrix clause function. Thus, the hearer faces the problem of determining the function of the head noun within the relative clause in externally-headed relative clauses and the problem of determining the function of the head noun within the matrix clause in internally-headed relative clauses.

Standard analyses of relative clauses are grounded in the analysis of English-type externally-headed constructions involving a relative pronoun, e.g. *The horse which the man bought was a good horse*, despite their typological rarity, and such accounts typically involve the mechanisms used for handling long-distance dependencies, i.e. movement rules (or the equivalent, e.g. slash categories) and phonologically null elements (e.g. traces, empty WH-operator). With respect to internally-headed relative clauses, generative analyses (e.g. Cole 1987; Basilico 1996) posit a null external head, so that they are structurally similar to externally-headed relative clauses; furthermore, they posit covert movement of the head noun, usually to the same position occupied by the head noun in externally-headed relative clauses.

In this paper the issue of the determination of the function of the head noun in the clause in which it does not appear will be carried out in a theory which eschews all of these theoretical mechanisms, namely, Role and Reference Grammar [RRG] (Van Valin 2005; Van Valin & LaPolla 1997). RRG is a a parallel architecture theory

2. Abbreviations: ACC - accusative, ANTI - antipassive, ATV - active voice, CLM - clause-linkage marker, DAT - dative, DET - determiner, EHRC - externally-headed relative clause, ERG - ergative, EVID - evidential, IHRC - internally-headed relative clause, LS - logical structure, NOM - nominative, PASS - passive, PAST - past tense, PERF - perfect, PRCS - precore slot, PRFV - perfective, PSA - privileged syntactic argument, REFL - reflexive, REL - relative pronoun/marker, RP - reference phrase.

(Jackendoff 2002), featuring a monostratal syntax, with the single morphosyntactic representation given to a sentence in a language being concrete, not abstract, in the sense that it should represent the actual form of the sentence, including the linear sequence of its constituent elements and their morphological properties; there are no phonologically null elements in the syntax. Having a monostratal syntax excludes movement rules, both overt and covert, and the prohibition against phonologically null elements rules out traces, null heads, and empty WH-operators. The organization of RRG is given in Figure 1.

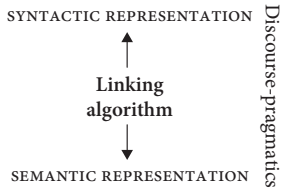

Figure 1. General structure of Role and Reference Grammar

There is a direct mapping between the semantic representation and the syntactic representation, unmediated by abstract syntactic representations, and this mapping is codified in the RRG linking algorithm. The system maps between syntax and semantics in both directions, i.e. from the semantic representation to the syntactic representation, and from the syntactic representation to the semantic representation. This mirrors what speakers and hearers do in speech production and comprehension.[3] The question of determining the function of the head noun in the clause in which it does not occur is a problem for the hearer, not for the speaker, and therefore it is a problem for the syntax-to-semantics linking system. Accordingly, we will limit this discussion to the syntax-to-semantics linking in both types of relative clauses. A central question is whether the two types of relative clause require different linking rules. One of the motivations for positing a null external head in generative analyses is to assimilate the analysis of internally-headed relative clauses to that of externally-headed ones. Can a monostratal syntactic theory which rejects movement rules and phonologically null elements give a unified treatment of the two types of relative clause?

The discussion will proceed as follows. The basics of the RRG representation of relative clauses and of the linking algorithm from syntax to semantics will be

3. See Van Valin (2006) for discussion of how the RRG linking system fits into models of sentence processing.

summarized. Section 3 will investigate the linking in externally-headed relative clauses, and in Section 4 the focus will be on internally-headed relatives. Summary and conclusions will be given in Section 5.

2. The RRG analysis of clause structure and the linking algorithm

RRG features a non-endocentric syntax; that is, the major phrasal categories are not projections of lexical heads. The head of the clause is the nucleus, which contains the predicate, which may be a verb, a combination of verbs, a nominal phrase, an adjective phrase, or a prepositional phrase. Argument expressions are analyzed as 'reference phrases' [RP] (Van Valin 2008), which are typically headed by a nominal expression but need not be in many languages. The approach to clause structure is called 'the layered structure of the clause', with a nucleus, a core containing the nucleus and the arguments of the predicate, a clause, which contains the core and optionally a pre-core slot [PrCS], which is the position in which WH-elements and relative pronouns occur in languages like English and German; there are potentially adjuncts modifying each of these layers, and such adjunct modifiers occur in a periphery modifying the particular layer involved. In Figure 2 the layered structure of *What did Robin show to Pat in the library yesterday?* is given. Grammatical categories like tense, aspect, modality and illocutionary force, termed 'operators' in RRG, are represented in a separate projection of the clause which is not given here; the auxiliary verb *did* would be attached to the operator projection, since its function is to express tense and illocutionary force.

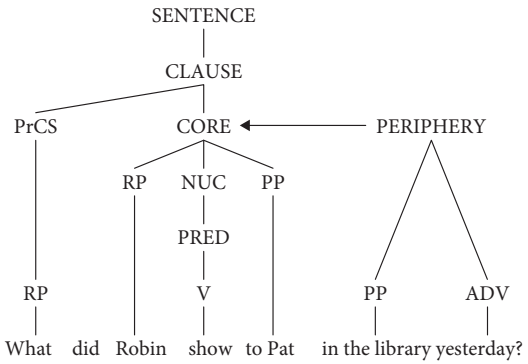

Figure 2. The layered structure of an English WH-question

RPs also have a layered structure, analogous to that of the clause.

The semantic representation of sentences is grounded in an Aktionsart-based system of lexical decomposition, the main details of which are beyond the scope of this discussion. The representation of a predicating element is called its 'logical structure'[LS]. Examples of simplified semantic representations for four English sentences are given in (2).

(2) a. *Kim is tall.* **be′** (Kim, [**tall′**])
b. *Kim is singing.* **do′** (Kim, [**sing′** (Kim)])
c. *I saw the window.* **see′** (1SG, window)
d. *Kim smashed the window.* [**do′** (Kim, Ø)] CAUSE [INGR **smashed′** (window)]

The **be′** in (2a) indicates that this is an attributive construction; it is not a reflex of English *be*, and it would occur in the semantic representation of attributive predications in languages which lack a copula. This is illustrated in Figure 3.

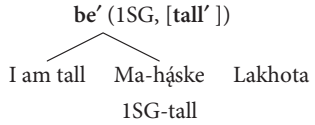

Figure 3. Attributive predications in English and Lakhota

In Lakhota the stative verb *haːką́ska* 'tall' occurs directly inflected for its subject, and there is no copula or other element corresponding to English *be*; yet it and its English translation have the same semantic representation.

Two additional components essential to the linking system are the semantic macroroles, actor and undergoer, and the notion of 'privileged syntactic argument' [PSA], which replaces the notion of 'subject' in RRG. There are substantial differences between PSA and subject, but for the purposes of this paper, they will be taken to be roughly equivalent.[4] In (2a), *Kim* would be the undergoer of the stative predicate *tall*, while in (2b) *Kim* would be the actor of the activity verb *sing*. In (2c) *I* is the actor and *the window* is the undergoer, and likewise in (2d) *Kim* is the actor and *the window* is the undergoer. The relationship between semantic macroroles and PSA can be summarized as follows: in an accusative language like English or German, the actor is the default choice for PSA in a core with a transitive verb, with the undergoer the non-default choice requiring a special construction, namely the passive.

4. See Van Valin (2009) for detailed discussion of the differences between subject and PSA.

As mentioned above, the linking algorithm maps from semantics to syntax and from syntax to semantics. The linking from semantics to syntax for a sentence like (2d) would be roughly as in the following oversimplified description. The semantic representation is composed in the lexicon, and then actor and undergoer are assigned. Then the PSA is chosen, which is the actor *Kim* in this case. The appropriate syntactic structure is selected, and the PSA is linked to the core-initial argument position, and the undergoer is linked to the immediately post-nuclear position.[5] This is represented in the tree structure in Figure 4. The main concern in this paper, however, is the syntax-to-semantics linking, and this linking in simple sentences is summarized in (3)

(3) Linking from syntax to semantics (summary)
   a. The parser outputs a labeled tree structure.
   b. The first step is to derive as much information from the overt morphosyntactic features of the clause: case marking/word order, the voice of the verb, adpositions.
   c. The second step is to retrieve the LS of the verb from the lexicon and assign macroroles where possible.
   d. The information from these steps should link everything in the core to the argument positions in the LS; if there is an element in the special clause-initial position (the PrCS), it will be linked last to the remaining unlinked argument position in the LS.

The linking from syntax to semantics in (2d) is given in Figure 4; the numbers refer to the steps in (3).

The parser outputs a labeled tree structure, step (3a). Because English is a language with a voice system, an important first step in (3b) is to identify the voice of the verb, because it signals the semantic role of the PSA ('subject'), which is the first RP in the core in English.

In this instance the voice is active, meaning that the PSA, *Kim*, is an actor. The immediately post-nuclear RP, *the window*, must therefore be an undergoer. The next step, (3c), is to retrieve the LS for *smash* from the lexicon and assign macroroles, if possible. In this case it is straightforward: the *x* argument would be the actor and the *y* argument the undergoer. In the final step, (3d), the results of the second and third steps are matched up: *Kim* is an actor, the actor is the *x* argument in the verb's LS, and therefore *Kim* is the *x* argument. The same reasoning applies to the other argument, yielding the conclusion that *the window* is the *y* argument. The Completeness Constraint, which states that all referring expressions in the

5. See Van Valin (2005: 136–49) for a detailed discussion of semantics-to-syntax linking in simple sentences.

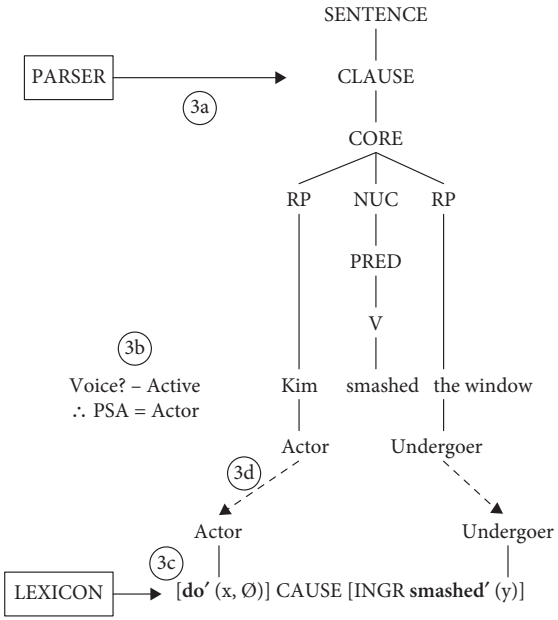

Figure 4. Example of linking from syntax to semantics in a simple English clause

syntax must be linked to something in the semantics (and vice versa), is satisfied. When it comes to relative clauses, the linking is more complex, but it follows these basic principles, in addition to some construction-specific rules.

3. Externally-headed relative clauses

As noted in the introduction, the issue with respect to externally-headed relative clauses [EHRC] is the determination of the function of the head noun within the relative clause. The problem is exemplified by English relative clauses, which are in square brackets.

(4) a. *The man* [*who/that won the lottery*] *ended up broke.*
   b. *The man* [*who/(that) the police interviewed*] *had no helpful information.*
   c. *The man* [*who/(that) the police showed the photo to*] *could not identify anyone in it.*

An English finite relative clause can be introduced by either a relative pronoun or a complementizer (*that*). Given the demise of *whom*, the form of the relative

pronoun does not signal the function of the head noun inside the relative clause, and the complementizer is likewise invariant. The only clue is that the complementizer *that* may be omitted when the head noun is not the subject of the relative clause, as in (4b, c). Thus, English presents a good example of a language in which there is no formal identification of the function of the head noun within the relative clause.

It should be noted that there are languages with EHRCs in which the function of the head noun in the embedded clause is clearly signaled grammatically. In German and a few other languages,[6] there is a relative pronoun whose case indicates the function of the head noun inside the relative clause. This is illustrated in (5).

(5) a. *Ich sah den Mann,* [*dem Maria das Buch gegeben hat*].
I saw the.ACC man, REL.DAT M. the book given has
'I saw the man [to] whom Maria gave the book.'

b. *Der Mann,* [*den Maria sah*], *ist Spion.*
the.NOM man, REL.ACC M. saw is Spy
'The man who Maria saw is a spy.'

The head noun *Mann* 'man' is case-marked for its matrix clause function (accusative for direct object in (5a) and nominative for subject in (5b)), and the relative pronoun is case-marked for the function of the head noun inside the relative clause (dative for indirect object in (5a) and accusative for direct object in (5b)). Hence there is no problem in principle with ascertaining the function of the head noun within the relative clause.

This can also be achieved by strictly syntactic means. Since the 1970's it has been recognized that some languages have strong restrictions on the possible function of the head noun within the relative clause (see Keenan & Comrie 1977), and the strongest restriction is that the head noun can only serve as the subject of the relative clause. This is exemplified in the following Malagasy data (Keenan 1976).

(6) a. *Na-hita ny vehivavy* [*(izay) nan-asa ny*
PRFV.ATV-see DET woman CLM PRFV.ATV-wash DET
zaza] *Rakoto.*
child Rakoto
'Rakoto saw the woman that washed the child.'
*'Rakoto saw the woman that the child washed.'

6. Indo-European languages provide the majority of languages with relative pronouns; outside of Indo-European relative pronouns, especially case-marked relative pronouns, are rare. (R. Matasović, personal communication).

b. *Na-hita ny zaza* [*(izay) nan-asa*
PRFV.ATV-see DET child CLM PRFV.ATV-wash
ny vehivavy] *Rakoto.*
DET woman Rakoto
'Rakoto saw the child that washed the woman.'
*'Rakoto saw the child that the woman washed.'

c. *Na-hita ny zaza* [*(izay) sas-an'ny vehivavy*] *Rakoto.*
PRFV.ATV-see DET child (CLM) wash-PASS-DET woman Rakoto
'Rakoto saw the child that was washed by the woman.'

In the first two Malagasy examples, the head noun, which precedes the relative clause, can only be interpreted as the the subject of the relative clause; since Malagasy is an accusative language and the voice of the verb is active, it is interpreted as the actor. In (6c) it is interpreted as the undergoer, because the voice of the verb in the relative clause is passive. Because of this syntactic restriction the function of the head noun within the relative clause is always unambiguous and immediately recoverable.[7]

The three are central aspects to the RRG analysis of EHRCs are (1) the syntactic representation, (2) the semantic representation, and (3) the construction-specific linking rules. The syntactic structures assigned to *I saw the window (that)/ which Kim smashed* are given in Figure 5.

Within the layered structure of the RP restrictive modifiers such as adjectives and restrictive relative clauses are modifiers at the nuclear_R level and occur in the periphery modifying the RP nucleus. There is no empty RP-slot for the head noun inside the core of the EHRCs; this is consistent with the point made in §1 that RRG does not allow phonologically null elements in syntactic representations. In the first example the relative clause is marked by the complementizer *that*, which functions as a clause-linkage marker, and in the second the relative pronoun *which* appears in the PrCS. It is possible to omit *that*, yielding a structure lacking a clause-linkage marker or a PrCS.

The second aspect is the semantic representation of the sentence. Like adjectives, relative clauses express attributes of the head noun, e.g. *the tall man* vs. *the man who is tall*, and accordingly the semantic representation of the relative clause is represented as filling the same slot in an attributive predication that an adjective does (see (2a), Figure 3) i.e. in **be′** (x, [**pred′**]), the LS of the relative clause occurs in the **pred′** slot. Hence the LSs for the EHRCs in Figure 5 are given in (7)

7. See Van Valin (2005:260–65) for detailed discussion of the linking in Malagasy relative clauses.

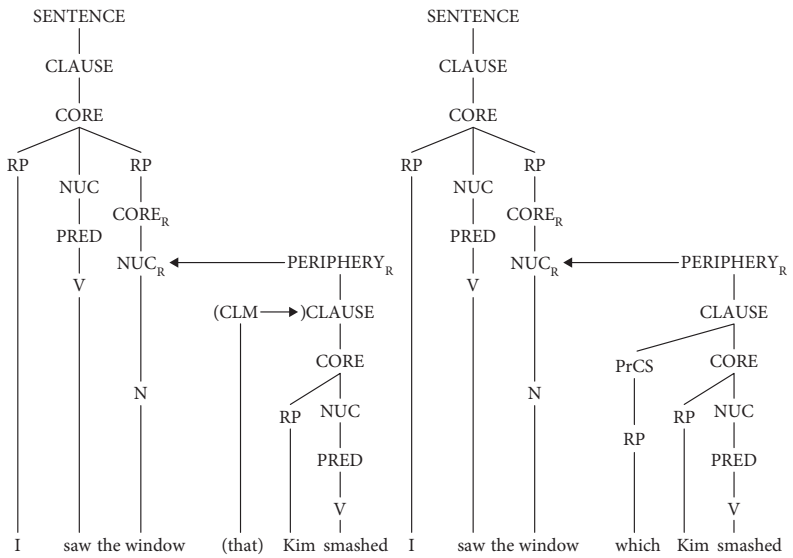

Figure 5. Structure of English EHRCs

(7) a. *I saw the window (that) Kim smashed.*
a′. **see′** (1SG, [**be′**(window$_i$, [[**do′** (Kim, Ø)] CAUSE [INGR **smashed′** (y_i)]])])
b. *I saw the window which Kim smashed.*
b′. **see′** (1SG, [**be′**(window$_i$, [[**do′** (Kim, Ø)] CAUSE [INGR **smashed′** (which$_i$)]])])

The attributive LS fills the second argument slot of **see′**, and the argument which is shared between the matrix and embedded clauses is indicated by dashed underlining. It is also co-indexed with one of the argument positions in the LS of the embedded predicate, and this co-indexed position may be filled by a relative pronoun.[8] The clause-linkage marker (complementizer) *that* is not represented in the LS of the relative clause; it would be a property of the syntactic template for EHRCs.

The third aspect is the construction-specific linking rules. In addition to the general syntax-to-semantics linking principles in (3), the rules in (8) apply to the linking of EHRCs.

8. If the head noun functions as an adjunct PP, the adjunct PP is represented by a LS and the co-indexing would be between the head noun and one of its argument positions.

(8) Rules governing linking from syntax to semantics in EHRCs
a. Retrieve from the lexicon an attributive LS and substitute the LS of the verb in the relative clause for the second argument.
b. Co-index the first argument in the attributive LS with either the unlinked argument position in the relative clause LS, or, if there is a relative pronoun, to the argument position linked to the relative pronoun.
c. Insert the attributive LS into the argument position in the matrix LS occupied by the head noun, replacing the variable in the first argument position in the attributive LS with the head noun.

The interaction of the rules in (3) and (8) is illustrated in Figure 6, which depicts the syntax-to-semantics linking in the EHRC in (7a).

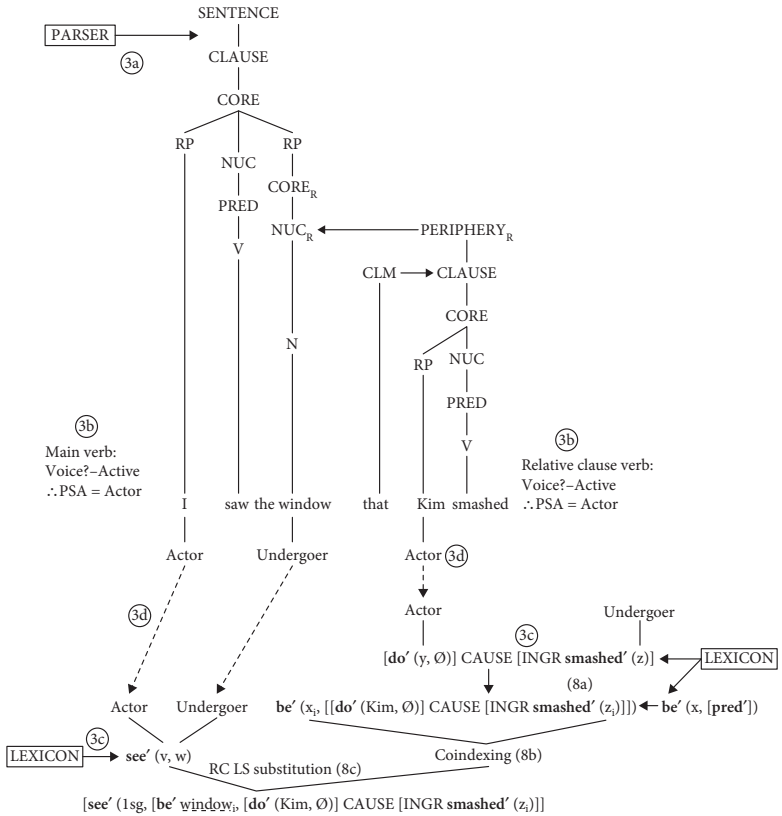

Figure 6. Syntax-to-semantics linking in English without relative pronoun

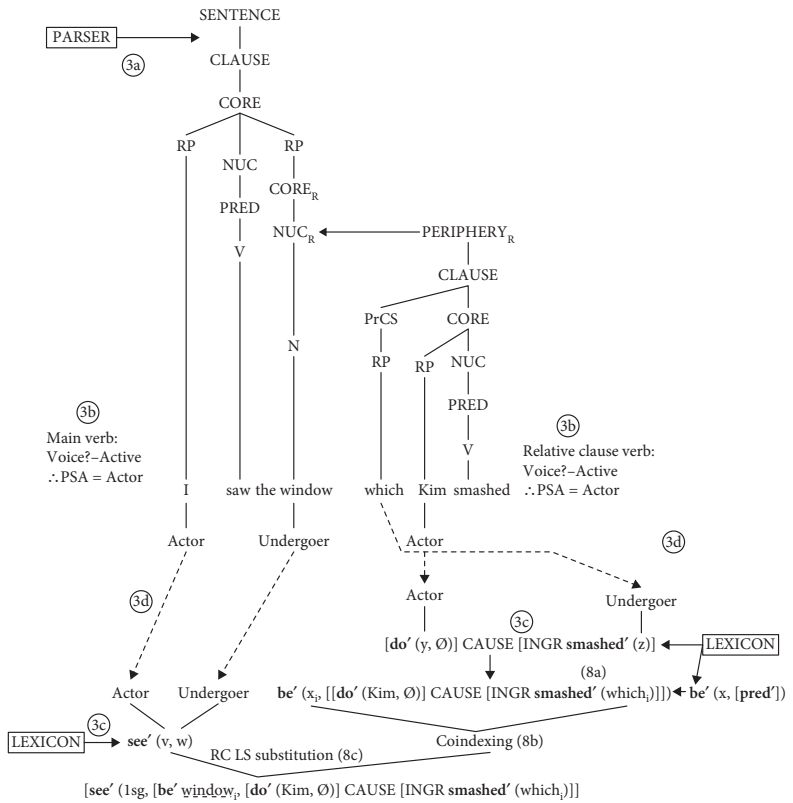

Figure 7. Syntax-to-semantics linking in English EHRC with relative pronoun

The linking principles in (3) apply to the relative clause just as they do to the main clause. When there is no relative pronoun, then the linking in the EHRC will be incomplete at this point, because the relative clause is missing an argument. After the linking within the main and subordinate clauses has been carried out following (3), the rules in (8) come into play. The first step, (8a), is the creation of the derived LS for the relative clause, an example of which was given in (7a′). The second step, (8b), involves the co-indexing of the first argument of the attributive LS with an argument position in the embedded LS. If there is no relative pronoun (which is the usual case cross-linguistically), then the head noun is co-indexed with a variable in the LS; this variable will remain lexically unfilled. This is the case in (7a). The final step, (8c), involves substituting the attributive LS for the head noun in the matrix LS and replacing the variable in the first argument position in the attributive LS with the head noun. The head noun is the noun in whose nuclear periphery the relative clause occurs. Because the lexically unfilled variable, *z* in Figure 6, is co-indexed with the head noun *window*, the Completeness Constraint is satisfied. The presence or absence of the complementizer *that* does not affect the linking.

The linking in EHRCs with relative pronouns differs in two respects; first, the relative pronoun in the PrCS must be linked to an argument position in the semantic representation, following step (3d), and second, the co-indexing in step (8b) necessarily involves the relative pronoun rather than a lexically unfilled variable. This is illustrated in Figure 7. During the first phase of the linking, following (3), the relative pronoun gets linked to the undergoer of the LS, due to its being the only unlinked argument position in the EHRC's LS, and this is required in order to satisfy the Completeness Constraint.

Thus, the general syntax-to-semantics linking algorithm, summarized in (3), together with the EHRC-specific linking rules, provides an account of how the head noun is correctly interpreted within the EHRC, and this is achieved without syntactic transformations or phonologically-null entities.

4. Internally-headed relative clauses

Unlike in EHRCs the function of the head noun within an internally-headed relative clause [IHRC] is readily recoverable, since the head noun occurs inside the IHRC; the issue, as noted in §1, is determining the main clause function of the head noun. An example of an IHRC from Bambara (Bird 1968) is given in (9a) along with its LS in (9b).

(9) a. [*Ne ye* ***so*** ***min*** *ye*] *tye ye san*
1SG PAST horse REL see man PAST buy
'The man bought the horse that I saw.' Bambara (Bird 1968)

b. [***do′*** (*tye, Ø*)] *CAUSE* [*BECOME* ***have′*** (*tye*, [***be′*** (x_i, [***see′*** (*ne, so*$_i$)])])]

Bambara is an SAuxOV language, and inside the IHRC the head noun is marked by the relativizer *min*. The LS has the same embedded attributive LS as in EHRCs, but it differs from the ones in (7a′, b′) in that it is the 'external variable', i.e. the argument of the attributive LS, which is left lexically unfilled. The structure of (9) is given in Figure 8; the past tense markers *ye* would be linked to the operator projection, which is not given here. Because the matrix undergoer argument *so* 'horse' is part of a relative clause, it precedes the actor 'man' in order to avoid a center embedding.

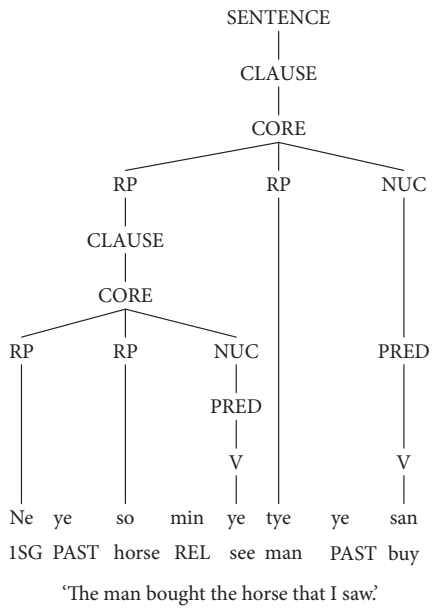

Figure 8. The structure of IHRC in Bambara in (9a)

The construction-specific linking rules for IHRCs are given in (10); they are very similar to the rules for EHRCs.

(10) Rules governing linking from syntax to semantics in IHRCs
   a. Retrieve from the lexicon an attributive LS and substitute the LS of the verb in the relative clause for the second argument.
   b. Co-index the first argument in the attributive LS with the argument in the relative clause LS identified as the head noun.
   c. Insert the attributive LS into the open argument position in the matrix LS.

There are two differences between the principles in (8) and those in (10). First, in (10b) there is no option involving a relative pronoun, since IHRCs never involve relative pronouns, and second, in (10c) there is no replacement of the external variable by the head noun, since it is already present in the LS of the relative clause. The linking from syntax to semantics for (9a) would go as in Figure 9.

The parser outputs a labelled tree structure, (3a). Step (3b) is executed with respect to the relative clause as well as the main clause; because Bambara has no passive construction and no case marking on RPs, the semantic roles are determined primarily by word order and adpositional marking. In the relative

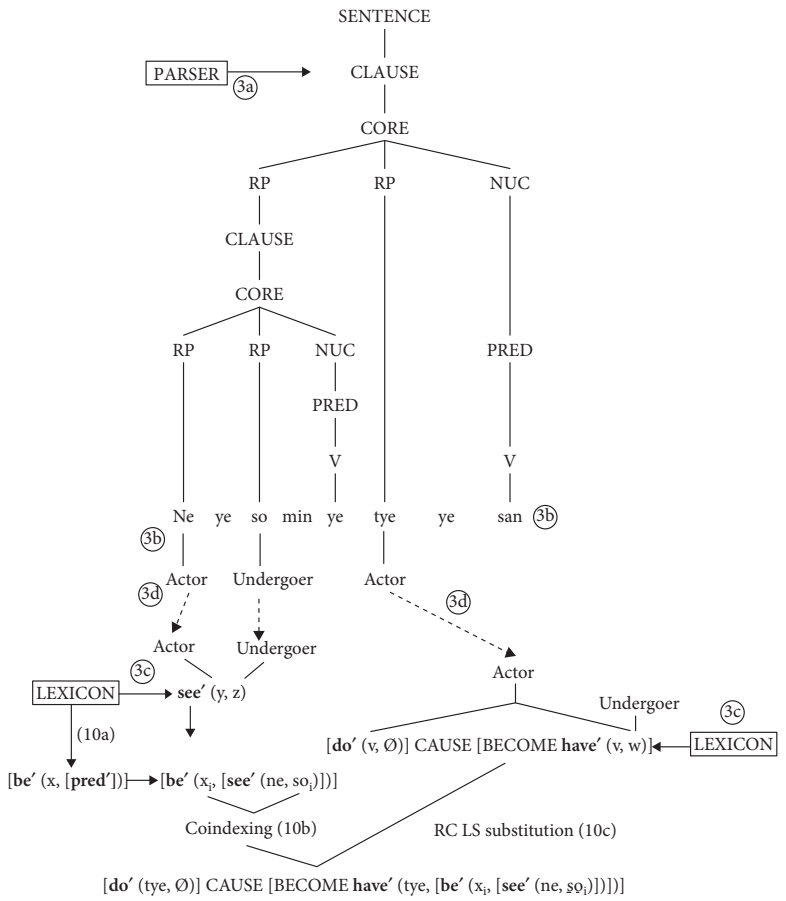

Figure 9. Syntax-to-semantics linking in Bambara IHRC in (9)

clause, *ne* 'I' is the 'subject' and actor, as it is RP immediately before the tense auxiliary, and *so* 'horse' is the undergoer, as it follows the auxiliary and precedes the verb; it is marked by the relativizer *min*, indicating that it is the head noun. In the main clause, *tye* 'man' is the RP immediately before the tense auxiliary, hence it is the main clause 'subject' (actor). In step (3c) the LSs for *ye* 'see' and *san* 'buy' are retrieved, and macroroles are assigned. In the next step, (3d), the information from steps (3b) and (3c) are matched up, yielding the linking of *ne* 'I' to the *y* argument of the LS for *ye* 'see' and *so* 'horse' to the *z* argument position in the

relative clause, and the linking of *tye* 'man' to the *v* argument of the LS of *san* 'buy'; there is nothing at this point to link to the *w* argument in this LS.

At this point the rules in (10) come into play. Following (10a) an attributive LS is retrieved from the lexicon, and the LS of the IHRC, in this case **see′** (ne, so), is inserted as the **predicate′** in the attributive LS. The next step, (10b), is to co-index the lexically unfilled *x* variable with the head noun *so* 'horse' (its head noun status is indicated by the double underlining). The final step, (10c), is to insert the attributive LS into the unlinked argument position in the matrix LS, satisfying the Completeness Constraint and yielding the LS in (9b).

While there is no major problem in terms of identifying the function of the head noun within an IHRC, it is not always as clear which RP should be interpreted as the head noun, as it is in Bambara with its relativizer *min*. There is, for example, no corresponding marker in the Quechua example in (1b). Languages with IHRCs have developed different strategies for indicating the head within the IHRC. In Lakhota, for example, the head noun must be indefinite (Williamson 1987), but this is only distinctive if there is only one indefinite RP in the clause; if both RPs are indefinite, then the result is ambiguity.

5. Conclusion

The purpose of this paper has been to investigate the linking between syntax and semantics in relative clauses, both EHRCs and IHRCs, within a monostratal syntactic theory that disallows phonological null elements in syntactic representations, Role and Reference Grammar. It has been necessary to augment the general syntax-to-semantics linking algorithm with construction-specific linking rules, given in (8) and (10). This is very much in the spirit of RRG, in which construction-specific linking properties interact with general linking properties (cf. Van Valin 2005, §5.1.1). The rules in (8) were presented as being for EHRCs, and those in (10) for IHRCs, but a close examination of them and their interaction with the general linking principles suggests that there is but a single set of rules, with the differences following from the different properties of EHRCs and IHRCs. The proposed unified relative clause linking rules are given in (11).

(11) Rules governing linking from syntax to semantics in relative clauses
   a. Retrieve from the lexicon an attributive LS and substitute the LS of the verb in the relative clause for the second argument.
   b. Co-index the first argument in the attributive LS with the argument in the relative clause LS identified with the head noun.
   c. Insert the attributive LS into the head noun's argument position in the matrix LS, with the head noun incorporated into the attributive LS.

(11a) is the same as both (8a) and (10a). (11b) specifies the co-indexing of the attributive LS argument with an argument within the relative clause LS, the argument "identified with" the head noun. In an EHRC with a relative pronoun, this would mean co-indexing with the relative pronoun; in an EHRC with no relative pronoun, this would mean co-indexing with the unlinked argument in the relative clause LS; it is unlinked because there is no RP in the relative clause corresponding to the head noun, hence there is nothing to link to it. Finally, in the case of IHRCs, it is the head noun itself which is co-indexed with the attributive LS argument. The final rule, (11c), specifies that the attributive LS is merged into the matrix LS in the position of the head noun argument; it furthermore states that the head noun must be incorporated into the attributive LS. How can this be accomplished? In an EHRC with a relative pronoun, as in Figure 7, all argument positions in the relative LS are lexically filled, but the first argument position is not, and therefore the head noun can fill that argument slot. In an EHRC without a relative pronoun, as in Figure 6, the head noun is not a constituent of the relative clause and therefore cannot be inserted into the unlinked argument position in it; it can, however, fill the argument position in the attributive LS, which is co-indexed with the unlinked argument position. Finally, the head noun fills an argument position in the relative clause LS in an IHRC, and consequently this requirement is met by definition. Thus, despite the formal differences between EHRCs and IHRCs, the rules in (3) and (11) can account for the linking from syntax to semantics in both types of relative clauses, without invoking movement (overt or covert) or phonologically null elements.

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PART II

Uto-Aztecan