Comparison of the Ellipsis-Based Theory of Non-Constituent Coordination with its Alternatives*

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Summary. In this paper, I compare the ellipsis-based theory of non-constituent coordination proposed in Yatabe (2001) with three of its alternatives, namely the theory that has been widely accepted within the context of Categorial Grammar, Mouret's HPSG-based theory, and the theory proposed by Bachrach and Katzir in the framework of the Minimalist Program. It is found (i) that the CG-based theory of non-constituent coordination cannot deal with medial RNR, i.e. a subset of right-node raising constructions in which either all or a part of the right-node-raised material is realized at a location other than the right edge of the final conjunct, (ii) that Mouret's theory encounters similar difficulties when applied to RNR, and (iii) that Bachrach and Katzir's theory overgenerates by allowing the right edge of a conjunct and the left edge of the immediately following conjunct to be fused. This leaves the ellipsis-based theory as the only viable theory.

Keywords: non-constituent coordination, right-node raising, quantification, Categorial Grammar

1 Introduction

In this paper, I compare the ellipsis-based theory of non-constituent coordination that has been proposed in Yatabe (2001), Crysmann (2003), Yatabe (2003), and Beavers and Sag (2004) with three of its alternatives, namely the theory that has been widely accepted within the context of Categorial Grammar (CG) (Steedman (2000)), the HPSG-based theory of Mouret (2006), and the theory proposed in Bachrach and Katzir (2007) and Bachrach and Katzir (2009) in the framework of the Minimalist Program (MP). I will examine, among other things, a subset of right-node raising (RNR) constructions in English and Japanese in which either all or a part of the right-node-raised material is realized at a location other than the right edge of the final conjunct, and argue that the properties of such constructions favor the ellipsis-based theory.

2 Levine's criticism of the ellipsis-based theory

Before embarking on the main discussion of this paper, I will make a few brief remarks concerning Levine's criticism of the ellipsis-based theory of non-constituent coordination (Levine, 2011).

First, the ellipsis-based theory of non-constituent coordination that will be defended below is one in which a linearization-related operation such as RNR-inducing ellipsis is allowed to affect semantic interpretation, namely the type of theory proposed in Yatabe (2001) and Beavers and Sag (2004). This theory is compatible with the fact that the meaning of a sentence involving non-constituent coordination (e.g. sentence (1a), from Crysmann (2003)) can be different from that of its supposed counterpart involving no ellipsis (e.g. sentence (1b), also from from Crysmann (2003)).

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(1) a. I gave few men a book on Friday and a record on Saturday.
b. I gave few men a book on Friday and gave few men a record on Saturday.

As Levine notes, the question of under what circumstances the meaning of a sentence involving a right-node-raised or left-node-raised quantifier *must* be different from that of its counterpart involving no ellipsis is unresolved in the ellipsis-based theory. However, it is equally unresolved in other theories and thus should not be regarded as a reason to favor one theory over another.

Second, I concur with Levine (2011) that Beavers and Sag (2004) are wrong in claiming that the ellipsis-based theory of non-constituent coordination provides a solution for the problem of coordination of unlikes and the problem posed by an example like *every man and woman*. However, this observation does not constitute a reason to be skeptical of the theory, since there is no reason why a theory of non-constituent coordination has to provide a solution for these problems.

And third, it is possible to augment the ellipsis-based theory with a mechanism that makes it capable of delivering the correct truth conditions for sentences like (2) as well as sentences such as (3).

(2) Robin reviewed, and Leslie read, the same book.

(3) John gave Mary, and Joan presented to Fred, books which looked remarkably similar. (Abbott (1976))

In the theory to be presented in the full paper, in which semantic interpretation is performed largely within order domains as suggested in Yatabe (2001), a sentence like (2), which is the result of right-node-raising the noun phrase *the same book* out of the two clauses whose order domains are depicted in (4) and (5) respectively, is optionally assigned an order domain like (6), where $\boxed{2+4}$ is an index whose interpretation is the sum of the interpretations of $\boxed{2}$ and $\boxed{4}$.

(4) $\left\langle \left[\text{SEM} \mid \text{EP} \left\langle \left[\begin{array}{ll} \text{HNDL} & \boxed{5} \\ \text{RELN} & \textit{named} \\ \text{NAME} & \textit{Robin} \\ \text{NAMED} & \boxed{1} \end{array} \right] \right\rangle \right], \left[\text{SEM} \mid \text{EP} \left\langle \left[\begin{array}{ll} \text{HNDL} & \boxed{5} \\ \text{RELN} & \textit{reviewed} \\ \text{AGENT} & \boxed{1} \\ \text{THEME} & \boxed{2} \end{array} \right] \right\rangle \right], \left[\text{SEM} \mid \text{EP} \left\langle \left[\begin{array}{ll} \text{HNDL} & \boxed{7} \\ \text{RELN} & \textit{the-same} \\ \text{INST} & \boxed{2} \end{array} \right], \left[\begin{array}{ll} \text{HNDL} & \boxed{7} \\ \text{RELN} & \textit{book} \\ \text{INST} & \boxed{2} \end{array} \right] \right\rangle \right] \right\rangle$

(5) $\left\langle \left[\text{SEM} \mid \text{EP} \left\langle \left[\begin{array}{ll} \text{HNDL} & \boxed{6} \\ \text{RELN} & \textit{named} \\ \text{NAME} & \textit{Leslie} \\ \text{NAMED} & \boxed{3} \end{array} \right] \right\rangle \right], \left[\text{SEM} \mid \text{EP} \left\langle \left[\begin{array}{ll} \text{HNDL} & \boxed{6} \\ \text{RELN} & \textit{read} \\ \text{AGENT} & \boxed{3} \\ \text{THEME} & \boxed{4} \end{array} \right] \right\rangle \right], \left[\text{SEM} \mid \text{EP} \left\langle \left[\begin{array}{ll} \text{HNDL} & \boxed{7} \\ \text{RELN} & \textit{the-same} \\ \text{INST} & \boxed{4} \end{array} \right], \left[\begin{array}{ll} \text{HNDL} & \boxed{7} \\ \text{RELN} & \textit{book} \\ \text{INST} & \boxed{4} \end{array} \right] \right\rangle \right] \right\rangle$

(6) $\left\langle \left[\text{SEM} \mid \text{EP} \left\langle \left[\begin{array}{ll} \text{HNDL} & \boxed{5} \\ \text{RELN} & \textit{named} \\ \text{NAME} & \textit{Robin} \\ \text{NAMED} & \boxed{1} \end{array} \right] \cdot \left[\begin{array}{ll} \text{HNDL} & \boxed{5} \\ \text{RELN} & \textit{reviewed} \\ \text{AGENT} & \boxed{1} \\ \text{THEME} & \boxed{2} \end{array} \right] \right\rangle \right] \cdot \left[\text{SEM} \mid \text{EP} \left\langle \left[\begin{array}{ll} \text{HNDL} & \boxed{7} \\ \text{RELN} & \textit{and} \\ \text{CONJUNCTS} & \langle \boxed{5}, \boxed{6} \rangle \end{array} \right] \cdot \left[\begin{array}{ll} \text{HNDL} & \boxed{6} \\ \text{RELN} & \textit{named} \\ \text{NAME} & \textit{Leslie} \\ \text{NAMED} & \boxed{3} \end{array} \right] \cdot \left[\begin{array}{ll} \text{HNDL} & \boxed{6} \\ \text{RELN} & \textit{read} \\ \text{AGENT} & \boxed{3} \\ \text{THEME} & \boxed{4} \end{array} \right] \right\rangle \right] \cdot \left[\text{SEM} \mid \text{EP} \left\langle \left[\begin{array}{ll} \text{HNDL} & \boxed{7} \\ \text{RELN} & \textit{the-same} \\ \text{INST} & \boxed{2+4} \end{array} \right] \cdot \left[\begin{array}{ll} \text{HNDL} & \boxed{7} \\ \text{RELN} & \textit{book} \\ \text{INST} & \boxed{2+4} \end{array} \right] \right\rangle \right] \right\rangle$

Thus Levine's criticism based on (2) is invalid.

3 Comparison with the CG-based theory and Mouret's theory

In this section, a comparison will be made between the ellipsis-based theory on one hand and the CG-based theory and Mouret's HPSG-based theory on the other. Mouret's HPSG-based theory of what the author calls argument-cluster coordination (Mouret (2006)) and the CG-based theory are both based on the view that there are cases where a string that is not considered to be a constituent in other theories nevertheless functions as a syntactic unit and that so-called non-constituent coordination is coordination of such unconventional syntactic units. For instance, the string *a book on Friday* and the string *a record on Saturday* in (1a) are regarded as such unconventional, conjoinable syntactic units in these theories.

I will begin by recapitulating Wilder's and Whitman's findings about RNR in English (Wilder, 1999; Whitman, 2009), which are arguably problematic for the CG-based theory and Mouret's theory alike. It has been noted in their respective work that English sometimes allows right-node-raised material to be realized at a location other than the right edge of the final conjunct, as in (7) and (8), where the right-node-raised expressions are shown in italics.

(7) John should fetch and give *the book* to Mary. (from Wilder (1999))

(8) After using dishes, please wash, dry, and put *them* away in the proper place. (from Whitman (2009))

Let us refer to the phenomenon illustrated by these examples as medial RNR. Whitman presents a CG-based theory of medial RNR in which the right-node-raised expression in each of these examples is in a sense located at the right edge of the final conjunct, but undergoes wrapping, i.e. a phonological process that inserts an expression into the phrase that it syntactically combines with. However, Whitman further notes that there are examples of medial RNR like (9) that are not amenable to his theory.

(9) Please move from the exit rows if you are unwilling or unable *to perform the necessary actions* without injury.

There is no reason to believe that the right-node-raised expression in an example like (9) has undergone wrapping. The result of subtracting the right-node-raised expression from the final conjunct (i.e. *unable without injury*) does not form a semantic unit, and hence is unlikely to be a discontinuous constituent.

An example like (9) strongly suggests that a right-node-raised expression can be syntactically part of the final conjunct. This is a problem for the CG-based theory of RNR in general. It will also be problematic for any attempt to apply Mouret's theory, which is originally intended for argument-cluster coordination (Mouret, 2006), to RNR in English, although that does not necessarily mean that Mouret's theory is incorrect as a theory of argument cluster coordination.

RNR in Japanese also poses a problem for these theories, especially for Mouret's theory. First of all, in Japanese, that part of a conjunct that does not undergo RNR in an RNR construction does not have to be a sequence of sister constituents, as shown by (10). It is therefore not possible to apply to RNR in Japanese Mouret's theory of argument-cluster coordination, which is designed to capture the more restricted nature of argument-cluster coordination in French.[1] Again, this does not necessarily mean that Mouret's theory is incorrect as a theory of argument-cluster coordination. However, since argument-cluster coordination in French and RNR in Japanese are mirror images of each other to a certain extent, a theory that treats the two in a uniform fashion seems preferable, other things being equal.

(10) [Hanako wa] Aizu, soshite [Taroo wa] [[Sendai no] sake o] nonda.
[Hanako TOP] Aizu and [Taroo TOP] [[Sendai GEN] sake ACC] drank
'Hanako drank sake from Aizu, and Taro drank sake from Sendai.'

(Here and elsewhere, when a Japanese example is used, words belonging only to the non-final conjunct are shown in purple, words belonging only to the final conjunct are shown in blue, and words shared by the two conjuncts are shown in red.)

Furthermore, as the example in (11) shows, the phenomenon of medial RNR exists in Japanese as well.[2] This is problematic both for the CG-based theory and for Mouret's theory.

(11) [Too-densha wa], [ichi-ryoo-me kara roku-ryoo-me made wa]
[this train TOP] [Car No. 1 from Car No. 6 to TOP]
[Ebina de] Hon-atsugi-iki, [nana-ryoo-me kara saki wa]
[Ebina at] train bound for Hon-atsugi [Car No. 7 from beyond TOP]

[1] Abeillé and Mouret (2011) observe that the theory cannot be applied to RNR in French either.

[2] This example, which has the adverb *sorezore* 'respectively' inside the right-node-raised material, is another illustration of the fact noted in Section 2 that the type of ellipsis that yields non-constituent coordination is allowed to affect semantic interpretation.

[Katase-enoshima-iki ni] [Shin-yurigaoka de], sorezore
[train bound for Katase-enoshima DAT] [Shin-yurigaoka at] respectively
setsuzoku itashimasu.
will connect
'Cars No. 1 to No. 6 of this train will connect with a train bound for Hon-atsugi at Ebina Station, and the rest of the cars will connect with a train bound for Katase-enoshima at Shin-yurigaoka Station.' <5, 7, 3, 0>

In this example, the expression *Shin-yurigaoka de* 'at Shin-yurigaoka Station', which semantically belongs only to the second conjunct, appears sandwitched between two strings *ni* 'DAT' and *sorezore setsuzoku itashimasu* 'will connect respectively', which are both shared by the two conjuncts. There is no reason to believe that any of the words or phrases has undergone wrapping.

To demonstrate that sentences like this are in fact acceptable for native speakers, a questionnaire study has been conducted. The numbers following (11) and some other example sentences below show the result of that questionnaire study; the four figures indicate the number of respondents who stated 'The sentence is completely natural (under the intended reading)', 'The sentence is slightly unnatural (under the intended reading)', 'The sentence is considerably unnatural (under the intended reading)', and 'The sentence is completely impossible (under the intended reading)', respectively.[3] The figures above indicate that (11) is an acceptable sentence.

In the ellipsis-based theory of non-constituent coordination, sentences involving medial RNR in English and Japanese can be generated by abandoning the constraint that requires right-node-raised expressions to be pronounced contiguously at the right edge of the final conjunct. For instance, example (11) can be generated by allowing the two strings *ni* 'DAT' and *sorezore setsuzoku itashimasu* 'will connect respectively' to be deleted at the right edge of the first conjunct despite the fact that the two strings are not pronounced contiguously at the right edge of the final conjunct.

It might seem possible to reconcile the CG-based theory with the existence of medial RNR in Japanese by postulating a phonological rule that says that a particle such as *ni* can be optionally dropped when it occurs at the end of a conjunct, but such a move would be problematic for the following two reasons. First, such a phonological rule is arguably not a natural rule to have in the CG-based theory. In the ellipsis-based theory, such a phonological rule, if it existed, could be interpreted as saying that, when ellipsis takes place at the end of a conjunct, an extra word can be dropped as well as long as that extra word is merely a particle. In contrast, there is no way to make intuitive sense out of such a phonological rule in the CG-based theory. Second, such a phonological rule would make an empirically incorrect prediction. For example, a sentence like (13), which is the result of dropping *ni* at the end of the first conjunct in (12), would be incorrectly predicted to be acceptable.

(12) [Reijoo o] [okyakusama-gata ni], soshite [sono ato] [shoosetsu no
[thank-you note ACC] [guests DAT] and [after that] [novel GEN
tsuzuki o] kaita n desu. <4, 6, 1, 1>
continuation ACC] wrote
'(I) wrote thank-you notes to the guests and then (wrote) the continuation of the novel.'

(13) ?*[Reijoo o] okyakusama-gata, soshite [sono ato] [shoosetsu no tsuzuki
[thank-you note ACC] guests and [after that] [novel GEN continuation

[3] Let us define the *average rating* for a linguistic expression L as $(1a + 2b + 3c + 4d)/(a + b + c + d)$, when the questionnaire result for L is $<a, b, c, d>$, and let us represent the average rating for L as $r(L)$. A linguistic expression L that is associated with a questionnaire result is shown in this paper with no diacritic if $1 \leq r(L) < 2$, with '?' if $2 \leq r(L) < 2.5$, with '??' if $2.5 \leq r(L) < 3$, with '?*' if $3 \leq r(L) < 3.5$, and with '*' if $3.5 \leq r(L) \leq 4$.

o] kaita n desu. <0, 2, 6, 4>
ACC] wrote
'(I) wrote thank-you notes to the guests and then (wrote) the continuation of the novel.'

The fact is that a particle can be dropped at the end of a non-final conjunct only when the same particle appears somewhere inside the final conjunct, as in (14), which is another instance of medial RNR.

(14) [Reijoo o] okyakusama-gata, soshite [sono ato] [yuujin-tachi ni]
[thank-you note ACC] guests and [after that] [friends DAT]
[nengajoo o] kaita n desu. <3, 7, 2, 0>
[New Year's card ACC] wrote
'(I) wrote thank-you notes to the guests and then (wrote) New Year's cards to my friends.'

In order to account for the contrast between (13) and (14) while retaining the CG-based theory, it would be necessary to postulate a phonological rule that says that a particle such as *ni* can be optionally dropped at the end of a non-final conjunct if the same particle appears somewhere inside the final conjunct. In other words, it would be necessary to incorporate the ellipsis-based theory into the CG-based theory, if our goal were to capture the contrast in question without abandoning the CG-based theory. The resulting theory would arguably be less credible than the ellipsis-based theory, in that the latter can handle all cases of RNR in a uniform manner while the former cannot. Besides, such a theory would not be applicable to cases of medial RNR in English, discussed above.

4 Comparison with Bachrach and Katzir's theory

Let us turn our attention to the MP-based theory proposed in Bachrach and Katzir (2007) and Bachrach and Katzir (2009). This theory builds on the idea (expressed by McCawley and others) that an expression can have more than one mother, and uses that idea to deal with RNR as well as phenomena that are analyzed in terms of movement in MP-based theories. For example, in this theory, the phrase *the same book* in (2) is analyzed as having two mothers (the first VP node and the second VP node), and the phrase *which book* in *Which book did you like?* is similarly analyzed as having two mothers (the root CP node and the VP node).

This theory is disproved by the existence of examples like (15) below.

(15) Who do you think, and who don't you think, that John will see?

This sentence is incorrectly predicted to be impossible by Bachrach and Katzir's theory. In their theory, the first *who* in this sentence is taken to be multiply dominated and to exist at the beginning of the first conjunct and in the object position immediately following the verb *see* simultaneously, although it is pronounced only at the former location. The second *who* is likewise taken to be multiply dominated and to exist at the beginning of the second conjunct and in the object position immediately following the verb *see*. The problem here is that the first *who* and the second *who* are both taken to be in the object position immediately following *see*. On one hand, two different expressions are not allowed to be present at the same location in this theory (or in any other theory), and on the other hand, the verb *see* can take at most one object, not two, so there is no coherent structure that can be assigned to this sentence.

Rather than rejecting the theory outright for this reason, I will recast their theory as a theory of RNR alone (rather than a theory of all types of *wh*-movement as well as RNR) and compare that theory with the ellipsis-based theory of non-constituent coordination.

When recast as a theory of RNR alone, Bachrach and Katzir's theory turns out to bear considerable similarities to the theory proposed in Yatabe (2001) and Beavers and Sag (2004). The

D-list in the former theory corresponds to the order domain in the latter theory, and SpellOut that is obligatorily triggered by a "phase node" in the former theory corresponds to total compaction in the latter theory.

One notable feature of Bachrach and Katzir's theory that sets it apart from the HPSG-based theories is that their theory contains no grammatical rule that is specifically responsible for generating RNR constructions or other types of non-constituent coordination. In their theory, the order of words is determined according to some general principles including (16), (17), and (19), and the existence of RNR constructions is a consequence of the way those principles interact.

(16) The D-list for a node X has all the terminals dominated by X as members, and only them.

(17) If y is completely dominated by X, then y appears on the D-list of X exactly once.

(18) **Complete Dominance:** A node X complete dominates a node Y iff (a) X is the only mother of Y, or (b) X completely dominates every mother of Y.

(19) In ordering $A = \langle a_1, \ldots, a_m \rangle$ to the left of $B = \langle b_1, \ldots, b_n \rangle$, written $A \bullet B$, the following must hold:

a. *Edge Alignment:* $a_1 \leq b_1$ and $a_m \leq b_n$

b. *Conservativity:* $a_1 \leq a_2 \leq \ldots \leq a_m$ and $b_1 \leq b_2 \leq \ldots \leq b_n$

When coupled with the operation of Parallel Merge, which allows an expression to be merged with multiple expressions simultaneously, these principles automatically give rise to RNR constructions while ruling out ungrammatical strings like (20), in which an expression has been right-node-raised from a medial position inside the first conjunct.

(20) *John should [give the book] and [congratulate] that girl.

Although the theory as it is presented in Bachrach and Katzir (2009) contains a stipulation that disallows medial RNR, it is possible to construct a variant of their theory that does away with that stipulation.

This ambitious and interesting theory, however, incorrectly predicts that a sentence like (21), in which the expression *Mary* serves as the final word of the first conjunct and as the first word of the second conjunct at the same time, is grammatical. This prediction is made even by the original version of their theory, which disallows medial RNR.

(21) *John met Mary laughed and Bill was surprised.
(as a sentence that means 'John met Mary, Mary laughed, and Bill was surprised')

The ungrammaticality of this example cannot be ascribed to the fact that the expression *Mary* here is shared by the first conjunct and the second conjunct but not by the third. As has been noted in Lakoff (1986), it is in general possible for an expression to be shared by some but not all of the conjuncts in a coordinate structure. For example, in (22), the right-node-raised phrase is a part of the second, the fourth, and the fifth conjunct but not of the first or the third.

(22) I went to the toy store, bought, came home, wrapped up, and put under the Christmas tree one of the nicest little laser death-ray kits I've ever seen. (from Lakoff (1986))

Examples like (21) that pose a problem for their theory are easier to construct in Japanese, since Japanese allows two clauses to be conjoined without any conjunction word between them. (23) is an ill-formed phrase in which the expression *yonda* is supposed to serve as the right edge of the first conjunct and as the left edge of the second conjunct simultaneously, and it is incorrectly predicted to be grammatical by Bachrach and Katzir's theory.

(23) *Taro ga yonda hito ga ooi hon
Taro NOM read person NOM numerous book
(as a phrase that means 'a book such that Taro read it and the persons who read it are numerous')

In Bachrach and Katzir's theory, the relative clause in this phrase can be generated as an amalgamation of (24) and (25).

(24) Taro ga yonda ('such that Taro read (it)')

(25) yonda hito ga ooi ('such that people who read (it) are numerous')

In order to rule out ill-formed expressions like (21) and (23) without ruling out licit cases of medial RNR, it seems necessary to have a rule that regulates what kinds of RNR are possible and what kinds are not.

5 Summary

To summarize, the CG-based theory of non-constituent coordination cannot deal with all instances of medial RNR in English and Japanese, Mouret's theory of argument-cluster coordination encounters similar difficulties when applied to RNR, and Bachrach and Katzir's theory overgenerates by allowing the right edge of a conjunct and the left edge of the immediately following conjunct to be fused. This leaves the ellipsis-based theory as the only viable theory.

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