Apparent Non-Constituent Coordination in Japanese

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Abstract

Coordination in Japanese poses various puzzles which defy the standard notion of syntactic category. On the one hand, one can conjoin structures which one usually would not expect to form any constituent, and on the other hand, there are various conjunction particles that are sensitive to the kind of conjuncts that they combine with. In this paper we argue against abandoning the usual notion of constituency, and redefining the entire grammar of Japanese. We provide a novel construction-based account of the data in which the phenomena result from the interaction of the coordination construction, ellipsis, and allomorphy of the conjunction particle.

1 Introduction

In Japanese, one of the ways by which conjunction can be expressed it by the usage of two suffixes, *to* and *te*. The common assumption is that these have complementary distributions. While *to* is a nominal coordinator as seen in (1a) and (2b), *te* is a predicate coordinator as (1b) and (2a) show. If *te* is employed to conjoin non-predicates, or if *to* is used to conjoin non-nominals, then ungrammaticality ensues.

(1) a. Mary-ga [[ringo] -to [banana]]-o tabe-ta.
mary-NOM apple and banana-ACC eat-PAST
'Mary ate [[the apple] and [the banana]].'

b. Mary-ga [[eiga-o mi] -te [keeki-o tabe]]-ta.
Mary-NOM film-ACC watch and cake-ACC eat-PAST
'Mary [[watched the movie] and [ate the cake]].'

(2) a.*Mary-ga [[ringo] -te [banana]]-o tabe-ta.
Mary-NOM apple and banana-ACC eat-PAST
'Mary ate [[the apple] and [the banana]].'

b.*Mary-ga [[eiga-o mi] -to [keeki-o tabe]]-ta.
Mary-NOM film-ACC watch and cake-ACC eat-PAST
'Mary [[watched the movie] and [ate the cake]].'

In this paper, we refer to the suffix *to* as a nominal conjunction particle, and *te* as a predicate conjunction particle. As we will show later, *to* conjoins either nouns or numeral classifiers, while *te* conjoins either verbs or adjectives. The *pos* hierarchy we assume here is illustrated in Figure 1.

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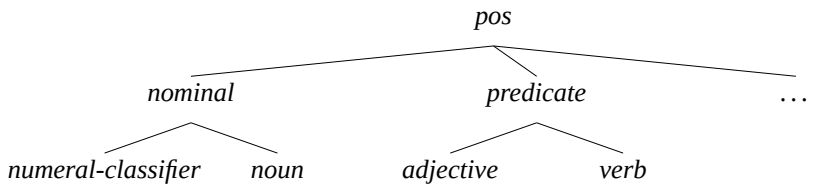


Figure 1: Part of speech type-hierarchy

There are other differences between *te* and *to* that are worth mentioning. Although *to*-coordination allows for either asyndeton or polysyndeton coordinations, there is one restriction specific to *te*-coordination, which is that the conjunction suffix *te* cannot attach to the final conjunct.

(3) a. [ringo-(to) banana-(to) orenzi-(to)] -o
apple-and banana-and orenge-and ACC

b. [arui-(te), hasi-(te), odot-(*te)] -ta
walk-and run-and dance-and PAST

Secondly, the predicate conjunction *te* attaches only to non-finite predicates, and establishes an asymmetric semantic relation between conjuncts. Thus, while the order of conjuncts in *to*-conjunction can typically be altered without semantic contrast, altering the conjunct order in *te*-conjunction yields semantic contrast.

(4) a. Mary-ga ringo-o kat -te sore-o tabe-ta.
Mary-NOM apple-ACC buy and it-ACC eat-PAST
'Mary bought the apple and ate it.'

b.*Mary-ga ringo-o kat-ta -te sore-o tabe-ta.
Mary-NOM apple-ACC buy-PAST and it-ACC eat-PAST
'Mary bought the apple and ate it.'

So far it seems that there is a clear line between *to* and *te* coordination, both with regard to the syntactic and semantic nature of the conjuncts. However, there are other cases where *to* is employed, rather than *te*. These cases are instances of so-called 'non-constituent coordination'. In the data below, *to* can also coordinate *sequences* of co-argument phrases (Koizumi 1995; 2000; Takano 2002; Fukui and Sakai 2003; Fukushima 2003; 2007). As shown in (5a) and (5b), not only [I-Obj D-Obj] coordination but also [Subj I-Obj D-Obj] coordination are allowed.

(5) a. Mary-ga [[John-ni ringo-o 2-tu] -to [Bob-ni banana-o]
Mary-NOM John-DAT apple-ACC 2-CL and Bob-DAT banana-ACC
age-ta.
give-PAST
'Mary gave two apples to John and the bananas to Bob.'

b. [[Mary-ga John-ni ringo-o 2-tu] -to [Sue-ga Bob-ni
Mary-NOM John-DAT apple-ACC 2-CL and Sue-NOM Bob-DAT
banana-o]] age-ta.
banana-ACC give-PAST

'Mary (gave) two apples to John and Sue gave the bananas to Bob.'

This is puzzling for two reasons. First, it is not clear what syntactic category should be assigned to a constituent like [Subj I-Obj D-Obj]. Second, although such a structure is closer to a clause rather than to a NP, it is the *to* conjunction particle that is used, not *te*. The goal of this paper is to provide a simple account of the distribution of *to* and *te* conjunctions, and to capture the various kinds of coordinate structure in a general way. In Section 2 we discuss previous accounts that have been proposed in the literature, and point out their shortcomings. In Section 3 we show that there is good evidence for an ellipsis account, in spite of the fact that the conjunction particle is not the expected one. Finally, section 4 provide an HPSG analysis of the phenomena.

2 Previous Approaches

There are two main lines of analysis that have been discussed in the literature. One assumes that such non-constituents do form a constituent, and that such structures can be coordinated just like a regular NP. Other accounts argue that standard constituents can be coordinated, and that the phenomena result from some form of ellipsis or movement operation. Let us consider these in turn.

2.1 Non-constituent-based accounts

Takano (2002) and Fukushima (2003; 2007) propose a direct coordination analysis. Takano argues that the apparent non-constituent are derived from one NP adjoining to another NP, which eventually forms a *surprising constituent* (αP in Figure 2). In the unlike coordination, he assumes such a surprising constituent is base-generated (βP) and the whole coordinate structure (&P) would then merge (adjoin) to the parallel co-argument strings.

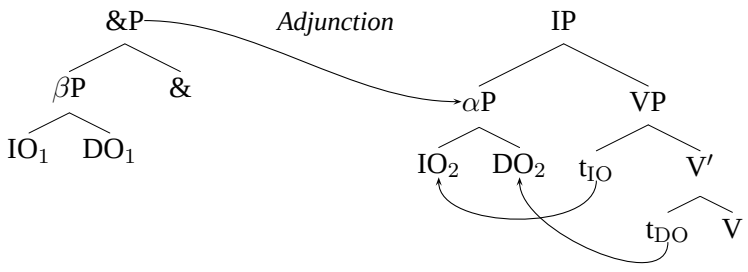


Figure 2: Adjunction and Base-Generation

This proposal has several problems. First, it is unclear how such co-arguments can be base-generated and be properly case-assigned without the presence of a verb predicate. The verb-less *surprising constituents* will not link to their right thematic roles, neither. Secondly, allowing such co-argument sequence to form a constituent gives rise to spurious ambiguity. This is (informally) depicted in Figure 3 below.

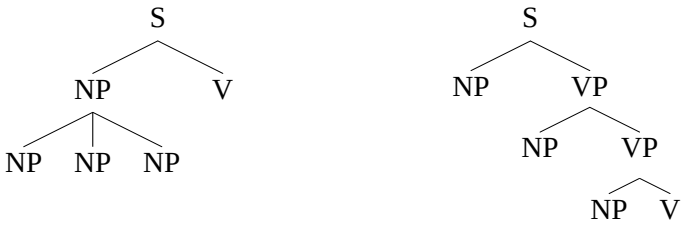


Figure 3: Spurious ambiguity (simplified)

Fukushima (2003; 2007) also argues for base-generation analyses. In his account, sequences like [NP *Mary John apple* CL] correspond to a nominal constituent headed by a numeral classifier, with optional full-fledged case-marked NP. Since these sequences form constituents, they can of course be conjoined. But since this analysis crucially hinges on the existence of a numeral classifier in each conjunct, it predicts that unlike coordinations without a classifier are ungrammatical. This prediction is not born out however, as shown in (6).

(6) Sanoku.en atatta ra, okaasan-ni (futa-tu-no) daiano yubiwa -to
300million.yen won if, mother-DAT two-CL-GEN diamond rings and
otousan-ni bentu-o katteage-tai.
father-DAT Mercedes-ACC buy-want

'If I won 300 million yen, I would buy my Mom (two) diamond ring(s) and my Dad a Mercedes.'

One must of course also consider the possibility that there is a phonologically null numeral classifier rescuing the structure from ungrammaticality. However, in (6) the first conjunct can have its own classifier *futa-tu-no*. It is then dubious that a null classifier is obligatory in such a NP (*futatu-no ringo*). Indeed, with a overt classifier, the null classifier head position, if any, cannot be filled by another classifier. Thus, one must stipulate not only the existence of phonologically null classifiers, but also extra grammar constraints on its distribution different from that of overt classifiers. In sum, the classifier-based account suffers from various shortcomings.

(7) a. [[futa-tu-no daiano yubiwa] [ϕ]]
two-CL-GEN diamond rings

b.*[[futa-tu-no daiano yubiwa] [futa-tu]]
two-CL-GEN diamond rings two-CL

Like Takano's adjunction analysis, Fukushima (2003; 2007) cannot avoid the problem of spurious ambiguity. Even if one stipulates homophonous classifiers just for non-coordinate structures – in order to rule out one of the possible parses – additional grammar constraints must be added in order to exclude the occurrence of coordination-related classifiers in non-coordinate structures.

He also makes some other non-standard assumptions about adjunction. It is claimed that the subject (thematically) proper noun *John-ga* and the NP *ringo-o* ('apple') attaches to the classifier as adjuncts. However, we can see no independent semantic motivation for *John* adjoining to another NP like *apples*. Another related problem lies in full-fledged case markings within the strings. He argues that the case markings for the adjoining NPs within the sequences are not licensed by some verb, but function just as pragmatic cues. Assuming that the sequences are a NP in syntax and a VP in semantics, Fukushima (2007: 981) claims that 'the case-markers are included base on the need for pragmatic recovery of a missing predicate meaning'. Such an assumption predicts that case-less NPs adjoining to a head classifier may cause pragmatically unnatural parse, but never syntactically unacceptable parse. However, (8b) is crucially different from (8a) in grammaticality.

(8) a. Okurimono-wa [Taroo-ga bara-o Hanako-ni ni-hon] -da.
gift-TOP Taroo-NOM rose-NOM Hanako-DAT 2-CL cop
'As for the gift, Taro (will/give/send/etc.) two roses to Hanako.'
(Fukushima 2007:975)

b.*Okurimono-wa [Taroo-ϕ bara-ϕ Hanako-ϕ ni-hon] -da.
gift-TOP Taroo-ϕ rose-ϕ Hanako-ϕ 2-CL cop

Many researchers have claimed that the presence/absence of case particles in cleft constructions gives rise to syntactic and semantic differences (See Hoji 1987, Hiraiwa and Ishihara 2002, among many others). Fukushima's argument that the case-markings within a complex NP are optional is thus not convincing. The account that we will pursue is free from all of these problems, and does not require redefinition of the notion of adjunction, nor of the process of semantic composition, nor of the entire grammar at large.

2.2 Constituent-based accounts

Koizumi (1995; 2000) and Fukui and Sakai (2003) propose to maintain the strict existence of constituent coordination. Koizumi argues that the non-constituent coordination of subjects and objects is in fact an instance of a VP(vP) coordination, coupled with rightward movement. The VP conjuncts are headed by the trace of a verb, which has been raised by Across-The-Board movement as illustrated below in Figure 4.

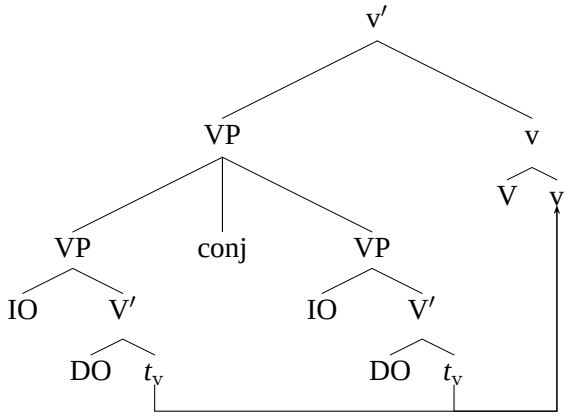


Figure 4: ATB rightwards verb movement

In this analysis, the particle *to* is allowed to conjoin verbal conjuncts, and the structure that is subject to rightwards ATB movement is ungrammatical to begin with, as shown in (9). It is thus unclear why the ATB counterpart becomes grammatical (cf. (5a)).

(9)*Mary-ga [John-ni ringo-o 2-tu age]-to [Bob-ni banana-o
Mary-NOM John-DAT apple-ACC 2-CL give-and Bob-DAT banana-ACC
age]-ta.
give-PAST
'Mary gave John two apples and gave Bob the banana.'

One can perhaps assume that verb raising is obligatory in such a coordinate structure, but the coordination with a disjunctive particle *ka* in (10) – which also allows for the non-constituent coordination phenomena presently under discussion – crucially shows that the verb raising would have to be obligatory only in conjunction, and optional in disjunction. Clearly, a more uniform account is desirable where all kinds of coordinate phenomena fall out from the same unique constraints.

(10) Mary-ga [musuko-ni baiku-o 1-dai (katta)] ka [musume-ni
Mary-NOM son-DAT motorbike-ACC 1-CL bought or daughter-DAT
TV-o katta] rasii.
TV-ACC bought seem
'It seems that Mary (bought) her son a motorbike or bought her daughter a TV set.'

Fukui and Sakai (2003) argue that the conjuncts in these *to* conjunctions are in fact nominals derived from VPs via PF deletion. The conjuncts are VPs only in narrow syntax, and the verb in the first conjunct is deleted at PF. The conjuncts without a verb can be then reanalyzed as NPs.

(11) <Narrow Syntax>

[[$_{VP}$John-ni ringo-o 2-tu age]-to [$_{VP}$Bob-ni banana-o
John-DAT apple-ACC 2-CL give-and Bob-DAT banana-ACC
age]]-ta.
give-PAST

<PF>

[[$_{NP}$John-ni ringo-o 2-tu ~~age~~]-to [$_{NP}$Bob-ni banana-o]]
John-DAT apple-ACC 2-CL give-and Bob-DAT banana-ACC
age-ta.
give-PAST

Again, this deletion account must resort to extra conditions in order to rule out (9), where the conjunction *to* coordinates verbal conjuncts. This is a fundamental issue which is not addressed by the theory. Furthermore, there is no empirical evidence for a categorical reanalysis at PF given that PF is supposed to contain only phonological information. Also, it is not clear how a conjunct having a verb in syntax, becomes an NP at PF.

3 Evidence for Ellipsis

We have argued that neither the base-generation coordination nor the deletion account is without major problems. There is however good reason to believe that the *to*-coordination is elliptical: a verb is missing. First, it is evident from the occurrence of two different locative adjuncts or temporal adverbials that the coordination structure is semantically an instance of verbal coordination (cf. Koizumi 2000).

(12) a. Mary-ga kinou John-ni ringo-o 2-tu-to kyou Bob-ni
Mary-NOM yesterday John-DAT apple-ACC 2-CL-and today Bob-DAT
banana-o ageta.
banana-ACC gave

'Mary gave John two apples yesterday and Bob the bananas today.'

b. Mary-ga konbini-de ringo-o 2-tu-to
Mary-NOM convenience.store-LOC apple-ACC 2-CL-and
suupaa-de banana-o katta.
supermarket-LOC banana-ACC bought

'Mary bought two apples at the convenience store and the banana at the supermarket.'

Second, sentential negation can have the distributive reading in the unlike coordination. Consider first an NP coordination in a single clause. The negation can scope over the conjuncts ¬ (A & B), and (13) is true if Mary didn't buy the apple or didn't buy the banana.

(13) Mary-ga ringo-to banana-o kawa-naka-tta.
Mary-NOM apple-and banana-ACC buy-NEG-PAST
'Mary didn't buy the apple and the banana.'

In the 'non-constituent' coordination, the negation has the narrow scope reading with respect to the conjuncts: (¬ A) & (¬ B). The reading in (14a) is indeed parallel to the non-elliptical full clause in (14b).

(14) a. Mary-ga rakusatusya-A-ni sinamno-o 2-ko-to John-ga
Mary-NOM winning.bidder-A-DAT item-ACC 2-CL-and John-NOM
rakusatusya-B-ni sinamono-o okura-naka-tta node...
winning.bidder-B-DAT item-ACC send-NEG-PAST because
'Because Mary (didn't send) two items to winning bidder A and John didn't send one item to winning bidder B, ...'

b. Mary-ga rakusatusya-A-ni sinamno-o 2-ko okura-nai-de
Mary-NOM winning.bidder-A-DAT item-ACC 2-CL send-NEG-and
John-ga rakusatusya-B-ni sinamono-o okura-naka-tta node...
John-NOM winning.bidder-B-DAT item-ACC send-NEG-PAST because
'Because Mary didn't send two items to winning bidder A and John didn't send one item to winning bidder B,...

Further evidence for ellipsis comes from the interpretation of anaphora. In (15), only a sloppy reading of a reflexive *zibunzisin* 'self' is possible. If the structure was not elliptical, one would expect that such a reading would not be available.

(15) John$_i$-ga ringo-o 2-tu [e] [e] to Bill$_j$-ga banana-o
John-NOM apple-ACC 2-CL and Bill-NOM banana-ACC
zibunzisin$_{i/j}$-ni kat-ta.
self-to buy-PAST
'John (bought) three apples for himself and Bill bought the bananas for himself.'

If these *to* conjunctions are elliptical, then the next question is what kind of ellipsis. There are some striking parallels with medial Gapping in English and many other languages. For example, one can also observe that the second conjunct in (16) looks like [Subj D-Obj I-Obj]:

(16) I charged a total of 5000 Yen to a student, and my colleague, a total of 10000 Yen to a professor.

We believe that *to*-coordination actually involves a form of *inverted* gapping, since it does not target the final conjunct. Gapping does not require phonological identity,

but rather, tense identity as shown in (17).[1] As one can see, in (17a) the verbs in each conjunct (the overt one and the covert one) are in the future tense, whereas in (17b) they are in different tenses.

(17) a. Kim arrives today, and her friends, tomorrow. ([e]=*arrive*)

b.*Kim arrived yesterday, and her friends, tomorrow. ([e]=*arrive*)

A similar fact is observed in the Japanese data. We begin with the tense-identity requirement. When the elided verb in the first conjunct is construed as past tense, which is identical to that of the second conjunct, the sentence (18a) patterns with the English gapping counterpart (17a).[2] Likewise, when violating tense-identity, (18b) becomes ungrammatical.

(18) a. Mary-ga kinou John-ni ringo-o 2-tu [e] -to kyou
Mary-NOM yesterday John-DAT apple-ACC 2-CL and today
Bob-ni banana-o *age-ta*. ([e]=*age-ta* 'give-PAST')
Bob-DAT banana-ACC give-PRES
'Mary (gave) John two apples yesterday and gave Bob the bananas today.'

b.*Mary-ga kinou John-ni ringo-o 2-tu [e] -to asita
Mary-NOM yesterday John-DAT apple-ACC 2-CL and tomorrow
Bob-ni banana-o *age-rudesyou*. ([e]=*age-ta* 'give-PAST')
Bob-DAT banana-ACC give-will
'Mary (gave) John two apples yesterday and will give Bob the bananas tomorrow.'

Next consider agreement feature mismatches. Most of the verbs in Japanese do not have agreement morphology with respect to person, number and gender. Here we use existential verbs, *iru* and *aru*, which are distinguished according to their subject animacy — *iru* is used for an animate subject, whereas *aru* is used for an inanimate subject.

(19) a. Heya-ni kodomo-ga {*iru/*aru*}.
room-LOC child-NOM exist$_{anim/inan}$
'There is a child in the room.'

b. Heya-ni sofaa-ga {**iru/aru*}.
room-LOC sofa-NOM exist$_{anim/inan}$
'There is a sofa in the room.'

[1] Although there are some controversial exceptions, it is usually assumed that typical Right-Node Raising construction requires phonological identity. See for example *Fred claimed that THE DOG, and Kim argued that THE CAT, was/*were sick.*

[2] Note that the gapped site cannot be filled by a past-tensed verb *age-ta*, because the conjunction *to* is a non-verbal coordinator. We will come back and explain this issue later.

Look at the coordination example (20), where the inanimate and the animate subject appear in each conjunct. We expect that the inanimate existential verb *aru* may be missing in the initial conjunct since the subject is 'latest five tractors'. On the other hand, the verb form in the final conjunct is animate verb *iru*, which agrees with its animate subject '100 domestic cows'. This supports the claim that inverted gapping in Japanese *to*-coordination does not need phonological identity, but imposes some kind of semantic identity, much like English gapping in (17b).

(20) Kono-nouzyou-ni-wa saisingata-no trakutaa-ga 5-dai [e] -to kokusan
this-farm-LOC-TOP latest.model-GEN tractor-NOM 5-CL and domestic
usi-ga 100-tou iru. ([e]=*aru* 'exist$_{\text{inani}}$')
cow-NOM 10-CL exist$_{\text{anim}}$
'There are latest five tractors and 100 domestic cows on this farm'.

4 A Morphophonological Account

We have addressed the elliptical properties of Japanese non-consistent coordinations. There are various ellipsis-based accounts of non-constituent coordination in HPSG (Yatabe 2001; Crysmann 2003; Beavers and Sag 2004), and these allow us to avoid the problem of redefining the notion of constituency and of having to make the grammar more complex with special semantic composition machinery introduced just for non-consituent coordination.

We will couple an ellipsis account in Japanese with an allomorphy analysis for *to* and *te* coordinations. Basically, we propose that there is a unique coordinator lexeme 't-', which has two possible realizations, depending on the category of the host. This kind of sensitivity is found elsewhere in other languages. There are cases in which the distribution of a word is determined not only by syntax, but also by the morphological, categorial, and phonological properties of the adjacent elements (see for instance Zwicky 1985; Asudeh and Klein 2001). One well-known example of this concerns the English indefinite determiners '*a*' and '*an*'. These are semantically identical but have a complementary distribution. For example, the former combines only with nominal phrases that begin with consonants (as in '*a large animal*', with consonantal vowels (as in '*a unique animal*', or '*a European individual*'), and with h- words with an unstressed syllable (e.g. '*a HIStory book*', as opposed to '*an hisTORical moment*'). Given that the phenomenon only occurs with the indefinite determiner, it is not a purely phonological effect. Thus, a word like *Sofia* does not become *Sofian* when followed by a vowel-initial word.

Rather than assuming that there are two lexical entries for the singular indefinite (one has the phonology *a* and attaches only to nominal hosts that have certain phonological properties, and another lexical entry with the phonology *an*, attaching only to nominal hosts with the opposite set of phonological properties), it is more reasonable to capture the allomorphy by resorting to a single lexical entry. The various realizations arise at the syntax-phonology interface. This can be done

via a language-specific function F_{Ing} that computes phonological processes, as illustrated in (21).

(21) $$F_{Ing}\left(\left\langle\begin{bmatrix}\text{PHON } \langle \text{ə}\rangle \\ \text{FORM } \langle a_{det}\rangle\end{bmatrix}\right\rangle, \left\langle\begin{bmatrix}\text{PHON } \boxed{1}\langle \textit{vowel}\rangle \oplus \textit{list} \\ \text{FORM } \boxed{2}\end{bmatrix}\right\rangle\right) = \left(\left\langle\begin{bmatrix}\text{PHON } \langle \text{ən}\rangle \oplus \boxed{1} \\ \text{FORM } \langle a_{det}\rangle \oplus \boxed{2}\end{bmatrix}\right\rangle\right)$$

If we adopt this single lexeme view for the affixes *te* and *to*, then it leads us to the notion that both a nominal conjunction *to* and a predicate conjunction *te* have the same basic semantics. This is independently motivated by Lasersohn (1995) and Chaves (2007), who show that one and the same meaning for conjunction *and* is observed cross-categorically, and that the Boolean/Non-Boolean dichotomy is empirically flawed. With this in mind, the same conjunction meaning can be attributed for the Japanese suffixes. We will discuss matters of conjunction symmetry later in the paper.

We start by establishing the feature geometry that we use to encode the relevant constraints at syntax-phonology interface. In this paper we adopt a feature M(ORPHO)P(HONOLOGY) which contains the more standard features PHON and FORM. The former contains phonological representations and the latter contains morphological forms.[3] Crucially, the elements in FORM have some information about part-of-speech. For example, in English it is assumed that there are at least two lexical entries for the verb *lie*. One contains a verb form lie_1 that inflects as *lay*, *lain*, *laid*, while the other lexical entry contains lie_2, which inflects as *lied* and derives the nouns *lie* and *liar*. The boolean CRD feature is used to identify which structures are marked by a coordination particle.

(22) $$\begin{bmatrix} \textit{sign} \\ \text{MP} \quad \textit{list}\left(\begin{bmatrix}\text{PHON } \textit{list(phon)} \\ \text{FORM } \textit{list(form)}\end{bmatrix}\right) \\ \text{SYN } \textit{syn} \\ \text{SEM } \textit{sem} \\ \text{DOM } \textit{list(sign)} \\ \text{CRD } \textit{bool} \end{bmatrix}$$

The phonological mapping functions compute the morphophonological interactions between the MP values of the daughters of any constructions of a given language (this includes phonological phenomena such as coarticulation, liaison, main stress assignment, phonological phrasing, etc.). The application of this language-specific function F is formalized below, inspired in the principle proposed in Reape (1994):

[3]The feature FORM and CORD are taken from Beavers and Sag (2004).

(23)
$$\textit{sign} \Rightarrow \left[\text{MTR}\left[\begin{array}{l}\text{MP } F(\boxed{1}\oplus\ldots\oplus\boxed{n})\\ \text{DOM}\left\langle\left[\text{MP }\boxed{1}\right],\ldots,\left[\text{MP }\boxed{n}\right]\right\rangle\end{array}\right]\right]$$

Since both conjunctions *to* and *te* are taken to be allomorphic suffixal markers, we assume that there is a basic conjunction morpheme *t-* which is attached to a word by the following *conjunction suffixation lexical rule* in (24). The rule takes a non-coordinate stem (CRD-) and yields a word that is specified as [CRD +]. This indicates that the word is now marked as a conjunct, and that the lexical rule cannot apply recursively. In the process, a suffix is introduced into the linearization domain of the stem (and consequently, appended in the end of the phonological representation).

(24) LEXICAL RULE FOR CONJUNCTION SUFFIXATION

$$\textit{lex-coord-suffix} \Rightarrow \left[\begin{array}{l}\text{MOTHER}\left[\begin{array}{l}\text{SYN }\boxed{1}\\ \text{DOM }\boxed{2}\oplus\left\langle\left[\begin{array}{l}\textit{suffix}\\ \text{MP}\left\langle\left[\begin{array}{l}\text{PHON }\langle t\rangle\\ \text{FORM }\langle t_{cnj}\rangle\end{array}\right]\right\rangle\\ \text{SYN}\,|\,\text{HEAD }\textit{conj}\end{array}\right]\right\rangle\\ \text{CRD }+\end{array}\right]\\ \text{DTRS}\left\langle\left[\begin{array}{l}\text{SYN }\boxed{1}\\ \text{DOM }\boxed{2}\\ \text{CRD }-\end{array}\right]\right\rangle\end{array}\right]$$

We now turn to how the function F in (23) constrains the distribution of the allomorphs *to* and *te*, from the base *t-* suffix. When the rightmost element in the host's DOM is nominal, then *t-* is resolved as *to* by (25a). On the other hand, when the rightmost element is predicative, *t-* is resolved as *te*, by (25b).

(25) a.
$$F\left(\left\langle\left[\begin{array}{l}\text{PHON }\boxed{1}\\ \text{FORM }\boxed{2}\oplus\boxed{3}\langle\textit{nominal}\rangle\end{array}\right]\right\rangle,\left\langle\left[\begin{array}{l}\text{PHON }\langle t\rangle\\ \text{FORM }\langle t_{cnj}\rangle\end{array}\right]\right\rangle\right)=\left(\left\langle\left[\begin{array}{l}\text{PHON }\boxed{1}\oplus\langle\text{ to }\rangle\\ \text{FORM }\boxed{2}\oplus\boxed{3}\oplus\langle t_{cnj}\rangle\end{array}\right]\right\rangle\right)$$

b.
$$F\left(\left\langle\left[\begin{array}{l}\text{PHON }\boxed{1}\\ \text{FORM }\boxed{2}\oplus\boxed{3}\langle\textit{pred}\rangle\end{array}\right]\right\rangle,\left\langle\left[\begin{array}{l}\text{PHON }\langle t\rangle\\ \text{FORM }\langle t_{cnj}\rangle\end{array}\right]\right\rangle\right)=\left(\left\langle\left[\begin{array}{l}\text{PHON }\boxed{1}\oplus\langle\text{ tɛ }\rangle\\ \text{FORM }\boxed{2}\oplus\boxed{3}\oplus\langle t_{cnj}\rangle\end{array}\right]\right\rangle\right)$$

We can now proceed to the coordination structure *per se*. It has been cross-linguistically observed that there are at least two kinds of coordinate structure: symmetric and asymmetric. In symmetric coordination, conjuncts are reversible without semantic contrast and extraction must be ATB, while in asymmetric coordination, conjuncts are not reversible without contrast and extraction can violate

Ross's Coordinate Structure Constraint. In both cases, any number of conjuncts greater than two is allowed. We make this distinction explicitly, by positing two kinds of coordinate constructions as seen in Figure 5.

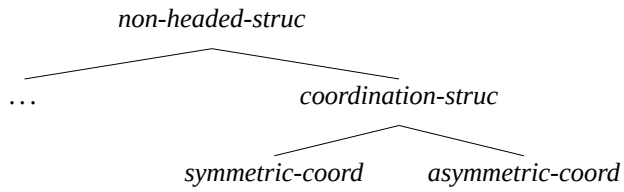


Figure 5: Type-hierarchy of coordinate structures

In Japanese, all coordination markings are conjunct-initial. We can neatly capture this in (26) by simply stating that the initial conjunct is specified as [CORD +], assuming a binary branching analysis.

(26) $\textit{coordination-struc} \Rightarrow \left[\text{DTRS} \left\langle \left[\text{CRD} +\right], \left[\ldots\right] \right\rangle\right]$

The Japanese symmetric coordinations include not only *to*-coordination but also *ka*-('or')-coordination. In (27), the conjuncts and the disjuncts are permutable without changing its original meaning. One difference between *to* and *ka* coordinations is that the disjunction *ka* is not category-sensitive, so that both nominal and predicative coordinations with *ka* are also possible.

(27) a. Mary-ga musuko-ni baiku-o 1-dai -to musume-ni TV-o
Mary-NOM son-DAT motorbike-ACC 1-CL and daughter-DAT TV-ACC
katta rasii.
bought seem

'It seems that Mary (bought) her son a motorbike and bought her daughter a TV set.'

b. Mary-ga musuko-ni baiku-o 1-dai (katta) ka musume-ni
Mary-NOM son-DAT motorbike-ACC 1-CL bought or daughter-DAT
TV-o katta rasii.
TV-ACC bought seem

'It seems that Mary (bought) her son a motorbike or bought her daughter a TV set.'

Another fact about *ka* is that the verb forms in both disjuncts are identical. We thus assume without prejudice for conjunction, that symmetric Japanese coordination in general requires syntactic identity, and allows ellipsis.

Japanese asymmetric coordinations on the other hand, include *te* conjunction and exclude *to* and *ka*. In asymmetric coordination a finite phrase is conjoined with non-finite phrases, as in (28). This type of coordination does not allow ellipsis, and

we assume that extra semantic content – which creates the asymmetric reading – is introduced by the construction.

(28) Mary-ga John-ni prezento-o {kat/*kat-ta} -te sore-o okut-ta.
Mary-NOM John-DAT present-ACC buy/buy-PAST and it-ACC send-PAST
'Mary bought the present to John and sent it (to him).'

Let us begin the syntactic stage of our analysis with symmetric coordination. Basically, we will allow ellipsis of the verbal DOM element in non-final conjuncts. As in many other languages, symmetric coordination in Japanese requires SYN identity (1). Only conjuncts with compatible valence and compatible head features can be conjoined.

With regard to the optional ellipsis operation, the DOM list of the first conjunct is non-deterministically split into three sublists: A, B and C. The B list optionally contains a predicate, and will not be not present in the mother node. The DOM list of the second conjunct is split into two lists, D and E, which are always present in the mother node. In order to ensure the semantic-based identity in ellipsis discussed above, we introduce an ancillary relation Id, which says that the B and E lists are either empty or they both contain a predicate under HEAD and RELN identity.

(29) *symmetric-coord* $\Rightarrow$

$$\left[\begin{array}{l}\text{MTR}\left[\begin{array}{l}\text{SYN } \boxed{1}\\ \text{DOM } \boxed{A}\oplus\boxed{C}\oplus\boxed{D}\oplus\boxed{E}\end{array}\right]\\ \\ \text{DTRS}\left\langle\left[\begin{array}{l}\text{SYN } \boxed{1}\\ \text{DOM } \boxed{A}_{ne-list}\oplus\boxed{B}\oplus\boxed{C}\left\langle[\textit{conj}]\right\rangle\end{array}\right],\left[\begin{array}{l}\text{SYN } \boxed{1}\\ \text{DOM } \boxed{D}_{ne-list}\oplus\boxed{E}\end{array}\right]\right\rangle\end{array}\right]$$

$\wedge\ Id(\boxed{C},\boxed{B},\boxed{E})$

Where Id is an identity relation defined via the two clauses below.

$$Id\left(\left\langle[\neg te]\right\rangle,\langle\,\rangle,\langle\,\rangle\right)$$

$$Id\left(\left\langle[te]\right\backslash\left[\begin{array}{l}\text{SYN}\mid\text{HEAD }\boxed{1}\textit{pred}\\ \text{SEM}\mid\text{RELS}\left\langle\left[\text{RELN }\boxed{2}\right]\right\rangle\end{array}\right]\right\rangle,\left\langle\left[\begin{array}{l}\text{SYN}\mid\text{HEAD }\boxed{1}\\ \text{SEM}\mid\text{RELS}\left\langle\left[\text{RELN }\boxed{2}\right]\right\rangle\end{array}\right]\right\rangle\right)$$

Note that Id only imposes HEAD and RELN identity, *not* identity of the predicate's arguments. The latter reside in not in RELN but in ARG_0, ARG_1 and so on.

Various coordination types can now be accounted for. If no predicate exists in B and E, no ellipsis occurs. The coordination must in this case be an instance of nominal coordination. However, if predicates appear in the linearization domains A and D, then this is symmetric S coordination, as for example the *ka* disjunction in (27b)).[4] In either case the same constraint $Id(\neg te,\langle\,\rangle,\langle\,\rangle)$ is applied, and no ellipsis occurs.

[4]The disjunction marker *ka* is a word. We can adopt a marking rule like the one for *and* in Beavers and Sag, specifying that the conjunct that *ka* attaches to is [CRD +].

$$\begin{bmatrix} \text{RELN } \boxed{2}\textit{give\_rel} \\ \text{ARG}_o\ s_1 \\ \text{ARG}_1\ i \\ \text{ARG}_2\ j \\ \text{ARG}_3\ k \end{bmatrix} \qquad \begin{bmatrix} \text{RELN } \boxed{2} \\ \text{ARG}_o\ s_2 \\ \text{ARG}_1\ w \\ \text{ARG}_2\ z \\ \text{ARG}_3\ y \end{bmatrix}$$

Figure 6: Id and an example of RELN identity

On the other hand, if both predicates are in $\boxed{B}$ and $\boxed{E}$, and if they have the same semantic relation, then we obtain an elliptical coordination since the $\boxed{B}$ list is not present in the mother node. This can therefore be either a conjunction with *t* or a disjunction with *ka*. The above constraints can in principle be extended to also deal with other coordination particles.

This account, coupled with an ellipsis-based allomorphy account, yields the intended result. Suppose that the initial finite verb *ageta* is assumed to reside in $\boxed{B}$. The symmetric coordination then elides this verb in $\boxed{B}$ in the domain of the mother. In the mother node, the morpheme *t-* is realized as *to* through the function F. This ensures that the semantics is clausal, and computed as usual. An important consequence of our analysis is that – unlike in the accounts by Koizumi, or Fukui and Sakai – the nominal coordinator *to* never coordinates verbal conjuncts anytime.

(30) Mary-ga John-ni ringo-o 2tu to Bob-ni banana-o
Mary-NOM John-DAT apple-ACC 2-CL and Bob-DAT banana-ACC
age-ta.
give-PAST
'Mary gave two apples to John and the bananas to Bob.'

$$\begin{bmatrix} \text{MP } F(\textit{John-ni ringo-o 2tu t- Bob-ni banana-o age-ta}) = \\ \quad \textit{John-ni ringo-o 2tu-to Bob-ni banana-o ageta} \\ \text{SYN S} \\ \text{DOM} \left\langle \left[\text{MP } \textit{John-ni}\right], \left[\text{MP } \textit{ringo-o 2tu}\right], \left[\text{MP } \textit{t-}\right], \left[\text{MP } \textit{Bob-ni}\right], \left[\text{MP } \textit{banana-o}\right], \left[\text{MP } \textit{ageta}\right] \right\rangle \end{bmatrix}$$

$$\begin{bmatrix} \text{MP } F(\textit{John-ni ringo-o 2tu ageta t-}) = \\ \quad \textit{John-ni ringo-o 2tu ageta-te} \\ \text{SYN S} \\ \text{DOM} \left\langle \begin{matrix} \left[\text{MP } \textit{John-ni}\right], \left[\text{MP } \textit{ringo-o 2tu}\right], \\ \left[\text{MP } \textit{ageta}\right], \left[\text{MP } \textit{t-}\right] \end{matrix} \right\rangle \end{bmatrix} \qquad \begin{bmatrix} \text{MP } F(\textit{Bob-ni banana-o ageta}) = \\ \quad \textit{Bob-ni banana-o ageta} \\ \text{SYN S} \\ \text{DOM} \left\langle \begin{matrix} \left[\text{MP } \textit{Bob-ni}\right], \left[\text{MP } \textit{banana-o}\right], \\ \left[\text{MP } \textit{ageta}\right] \end{matrix} \right\rangle \end{bmatrix}$$

We can now turn to asymmetric coordination. We assume that this kind of

conjunction has an extra semantic import not because of the affix *te*, but because of a more general aspect of verbal conjunction. In many languages, VP and S conjunction can have a variety of asymmetric interpretations. Consider for example the following examples with *and*:

(31) a. I got on the horse and rode into the sunset. (time precedence)
b. We called an ambulance and it arrived within 5 minutes. (causality)
c. She can drink vodka and not get drunk. (while-interpretation)

Thus, this seems to be a phenomenon that is particular to how event-denoting conjuncts are integrated in the overall structure. If so, this can be seen as a constructional phenomenon, and the hierarchy in Figure 5 has cross-linguistic motivation. It is therefore not surprising that verbal conjunction in Japanese also has various asymmetrical readings. Moreover, in the case of Japanese there are also specific syntactic constraints at work, besides the extra semantic import. This construction requires that non-final conjuncts are non-finite, and that the final conjunct is finite. Also, the whole structure functions as if it were finite. For our account, this means that the rightmost daughter and the mother node of the coordination have the same HEAD value.

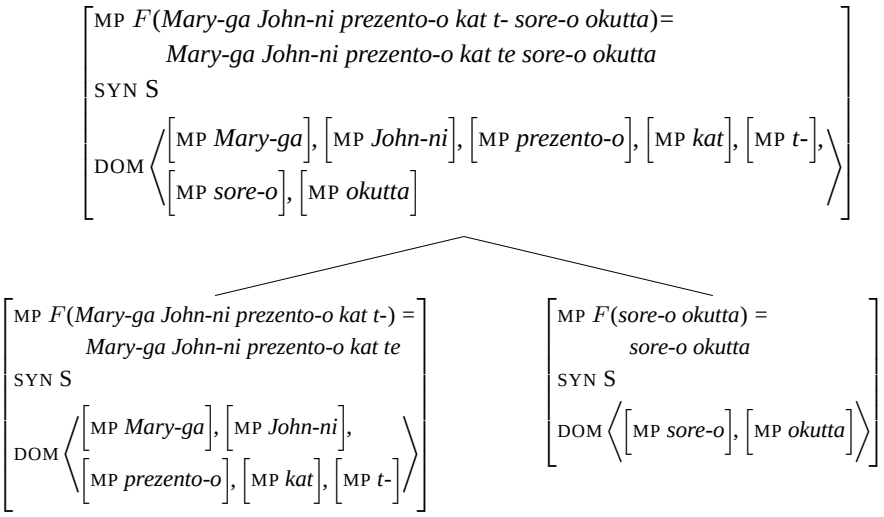
Since the conjuncts are semantically asymmetric, the construction also adds extra causal pragmatic content. This extra content will be introduced via BACKGROUND, and introduces a relation that holds between the two situational indices of the two conjuncts. For simplification, we will assume that there is only one kind of possible asymmetric meaning for *te* conjunction: causality. A more elaborate collection of pragmatic relations can be used, and be incorporated into our analysis.

(32) *asymmetric-coord* ⇒

$$\left[\begin{array}{l}\text{MTR}\left[\begin{array}{l}\text{SYN}\,|\,\text{HEAD}\ \boxed{0}\\ \text{DOM}\ \boxed{A}\oplus\boxed{B}\\ \text{BACKGROUND}\left\{\text{CAUSES}(\boxed{s1},\boxed{s2})\right\}\end{array}\right]\\ \text{DTRS}\left\langle\left[\begin{array}{l}\text{SYN}\,|\,\text{HEAD}\,|\,\text{VFORM}\ \textit{nfin}\\ \text{SEM}\,|\,\text{INDEX}\ \boxed{s1}\\ \text{DOM}\ \boxed{A}\end{array}\right],\left[\begin{array}{l}\text{SYN}\left[\text{HEAD}\ \boxed{0}[\text{VFORM}\ \textit{fin}]\right]\\ \text{SEM}\,|\,\text{INDEX}\ \boxed{s2}\\ \text{DOM}\ \boxed{B}\end{array}\right]\right\rangle\end{array}\right]$$

Consider the *te*-coordination in (33). While the verb form in the initial conjunct is non-finite (*kat* 'buy'), it is finite (*okut-ta* 'send-PAST') in the final conjunct. Since the asymmetric coordination establishes the causal relation, the conjuncts are not permutable. Below we can see the coordinator *t-* being resolved as *te* in the mother node, because it is adjacent to a verb predicate.

(33) Mary-ga John-ni prezento-o kat -te sore-o okut-ta.
Mary-NOM John-DAT present-ACC buy and it-NOM send-PAST
'Mary bought the present for John and sent it (to him).'



A word about verbal adjunctions in the *to*-coordination is in order here. Recall here that the 'non-constituent coordination' cases do allow for the presence of verbal adjuncts, as in (12). With temporal adverbials in (34a), our ellipsis account correctly predicts the verb-only ellipsis. If we assume that adverbs do not compact with the verb domain, in linearization terms – and because Japanese is a verb-final language – then the elements eligible for $\boxed{B}$ are always verbal domain elements.

(34) a. Mary-ga kinou John-ni ringo-o 2-tu to Bob-ni
Mary-NOM yesterday John-DAT apple-ACC 2-CL and Bob-DAT
banana-o kyou ageta.
banana-ACC today gave
'Mary gave John two apples yesterday and Bob the bananas today.'

b. $\left[\begin{array}{l}\textsc{mtr}\left[\textsc{dom}\left\langle[\textsc{np}_{\textsc{subj}}],[\textsc{adv}],[\textsc{np}_{io}],[\textsc{np}_{\textsc{do}}],[\textit{conj}],[\textsc{np}_{io}],[\textsc{np}_{\textsc{do}}],[\textsc{adv}],[\textsc{v}]\right\rangle\right]\\ \textsc{dtrs}\left\langle\left[\textsc{dom}\left\langle[\textsc{np}_{\textsc{subj}}],[\textsc{adv}],[\textsc{np}_{io}],[\textsc{np}_{\textsc{do}}],[\textsc{v}],[\textit{conj}]\right\rangle\right],\left[\textsc{dom}\left\langle[\textsc{np}_{io}],[\textsc{np}_{\textsc{do}}],[\textsc{adv}],[\textsc{v}]\right\rangle\right]\right\rangle\end{array}\right]$

5 Double Coordinators

Polysyndeton conjunction presents some other puzzles. Note that the accusative case marker *o* can appear after the conjunction *to* as shown in (35). In fact, the doubled coordination affixes cannot be conjunct-final if the structure is elliptical. In other words, the second *to* must always occur somewhere before the overt verb.

(35) Mary-ga John-ni ringo 2-ko *-to* Bob-ni banana 3-bon *-to* -o
Mary-NOM John-DAT apple 2-CL and Bob-DAT banana 3-CL and ACC
ageta.
gave
'Mary gave John two apples and Bob three bananas'.

Why does the final conjunction end up with residing between a nominal 'banana' and the accusative case? In this paper we will assume that only the leftmost *to* is a true conjunction particle, and that the other optional *to*s are semantically vacuous, and are used simply to emphasize each of the non-initial conjuncts. A similar phenomenon may be observed in English. For example, (36a) can be understood as simply a listing of the people who hate each other. In this case, there is only one conjunction that forms a collection of individuals {Fred, Mary, Tom, Sue}. This sentence is equivalent to the monosyndeton counterpart *Fred, Mary, Tom, and Sue hate each other*. On the other hand, (36b) can be interpreted as establishing a relation between pluralities {{Fred, Mary}, {Tom, Sue}}. Here, each of the three conjunctions *and* is semantically potent and forms a plurality.

(36) a. Fred, and Mary, and Tom, and Sue (all) hate each other.
b. Fred and Mary, and Tom and Sue love each other.

Assuming that there are two kinds of *to*, we will account for the Japanese data via linearization. One type of *to* is a true conjunction with semantic content, and it occurs in the initial conjunct and must be conjunct-final: X $\prec$ *t(rue)-coord*.

(37) a. ... [ringo-o 2-ko -to] banana-o katta.
apple-ACC 2-CL and banana-ACC bought
'(Someone) bought two apples and the banana.'

b.*... [ringo-(o) -to 2-ko] banana-o katta.
apple-ACC and 2-CL banana-ACC bought

The constraints in (25a) further ensure that it cannot attach to a case-marker, and must attach to a nominal host.

The other *to* affix is a vacuous conjunction which can optionally occur in non-initial conjuncts, and which floats leftward. Let us see a simple NP coordination with double coordinators first. The non-initial *to* is followed by accusative in (38a), whereas it is stranded in (38b). We will assume that the ungrammaticality in (38b) is due to the absence of the accusative marker.

(38) a. John-ga ringo-to banana-to-o katta.
John-NOM apple-and banana-and-ACC bought.
'John bought the apple and the banana.'

b.*John-ga ringo-to banana-to katta.
John-NOM apple-and banana-and bought.

The generalization is then that the vacuous *to* must precede a case marker: *v(acuous)-coord* $\prec$ case. This is further motivated by (39) (cf. with (35)).

(39) a.*... John-ni ringo 2-ko -to Bob-ni banana 3-bon-to ageta.
John-DAT apple 2-CL and Bob-DAT banana 3-CL-and gave
'(They) gave John two apples and Bob theree bananas'.

b. ... John-ni ringo 2-ko -to Bob-ni banana-to-o ageta.
John-DAT apple 2-CL and Bob-DAT banana-and-ACC gave
'(They) gave John two apples and Bob the bananas'.

c.*... John-ni ringo 2-ko -to Bob-ni banana-to ageta.
John-DAT apple 2-CL and Bob-DAT banana-and gave

6 Conclusion

In this paper we argued that the apparently paradoxical coordination phenomena in Japanese result from the interaction of two different kinds of phenomena. On the one hand, of V ellipsis – which explains the semantic interpretations that are obtained – and on the other, of a lexically-specific allomorphy phenomenon that operate at the syntax-phonology interface. This line of analysis allows us to avoid making the assumption that phrasal sequences like [Subj D-Obj I-Obj] form a constituent, as well as making stipulations about complex semantic composition machinery just for these structures.

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