Interpretation of an XP-YP Structure at the Interfaces:
A Division of Labor between Syntax and Phonology

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ABSTRACT. Extending Shiobara (2018, to appear), this article investigates what it means that a syntactic object must be labeled for interpretation at the interfaces (Chomsky 2013). Shiobara (2018, to appear) argued that what labelling the XP-YP structure for interpretation means at the sensori-motor (SM) interface is determining the pattern of prosodic prominence. This article revisits this claim and considers its implications in terms of a broader architecture of the language faculty.[*]

Keywords: XP-YP, coordinate structure, interface, prosodic boundary, subgroup reading

1. Introduction

Coordinate structure is analyzed as an instance of an XP-YP structure in the following way in Chomsky (2013: 45-47):

(1) a. $[_\alpha$ Conj $[_\beta$ XP   YP]]]
     b. $[_\gamma$ XP $[_\alpha$ Conj $[_\beta$ XP   YP]]]

The underlying structure of coordination of XP and YP is (1a). To label β, XP raises as in (1b), and β receives the label of YP. Due to minimal search, γ receives the label of XP. Assumptions behind (1) include (i) that a label is necessary for interpretation at the interfaces, and (ii) the syntactic object (SO) {XP, YP} must be modified to be labelled by, for example, internal-merge of XP.

A theoretical problem with this analysis of coordination is that it is not clear how an SO gets interpreted at the interfaces, in particular, phonetically at the sensori-motor (SM) interface (Dobashi 2017a,b, 2018). An empirical problem is that it is not clear how Conj gets realized phonetically (Kubo 2017). Faced with these problems, Shiobara (2018, to appear) aimed to

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spell out the spellout of the coordinate structure in the phonological component. Extending Shiobara (2018, to appear), this paper aims to further spell out the spellout of the coordinate structure in the phonological component, by attempting to tie up the loose ends of Shiobara (2018, to appear). We will start by looking at basic examples of coordination in English and Japanese (section 2), and my previous analysis of them (section 3). Then, we will consider loose ends of the previous analysis and what they tell us about the architecture of the language faculty (section 4). Section 5 is the conclusion.

2. Examples of Coordination in English and Japanese

First, let us look at coordination with two conjuncts in English (2) and Japanese (3).

(2) a.   [John] and [Mary] went to the movies.

     b.   John always [pushes the table] and [makes the vase fall].

(3) a.   [Tatu]   to/,   [Minami]   (to)-ga,   eiga-o   miniitta.

             T   *to*   M   *to*-Nom.   movie-Acc.   went.to.watch

             'Tatu and Minami went to watch a movie.'

     b.   Tatu-wa   itumo   [teeburu-o   osi]-(te),   [kabin-o   otosu.

             T-Top   always   table-Acc.   push-*te*   vase-Acc.   drop

             'Tatu always pushes the table and drops the vase.'

The (a) sentences involve the coordination of nominals, and (b), verbal phrases. In English, Conj is realized as *and*, optionally accompanied by a prosodic break (PB) preceding the Conj, whereas in Japanese Conj is realized as *to* or a PB in (a), and a PB with optional *te* in (b).

Next, let us look at coordination with three conjuncts, which Winter (2018) calls "coordinate structure complexes":

(4) a.   Dylan, Simon, and Garfunkel wrote songs in the sixties.

                                   (distributive, collective, #subgroup)

     b.   Dylan and Simon and Garfunkel wrote songs in the sixties.

                                   (distributive, collective, subgroup)

(5) a.   Minami,   Tatu,   (⁇to/sosite)   Kazu-ga   siai-de   tatakatta.

             M   T   *to/sosite*   K-Nom.   competition-at   competed

             'Minami, Tatu, and Kazu competed in a competition/competitions.'

                                   (distributive, collective, subgroup)

b.   Minami   to   Tatu   to   Kazu (to)-ga, siai-de   tatakatta.

      M   *to*   T   *to*   K   *to*-Nom competition-at   competed

      'Minami, Tatu, and Kazu competed in a competition/competitions.'

<div align="right">(distributive, collective, subgroup)</div>

According to Winter (2018), distributive and collective readings are available in (4a), and in (4b), in addition to distributive and collective readings, subgroup readings are also available. For example, in (4b), the subgroup reading where one artist wrote songs by himself while the other two wrote songs together is available. In the Japanese counterparts, three types of readings are available in both (5a) and (5b). It is worth noting here that subgrouping is only possible with two *adjacent* conjuncts both in English and Japanese. For example, in (5), while Minami and Tatu, or Tatu and Kazu can be grouped together, Minami and Kazu (excluding Tatu) cannot be grouped together. We will come back to this fact in 4.2.

3. Shiobara's (2018, to appear) Analysis

Shiobara (2018, to appear) adopted Winter's (2018) analysis of coordinate structure complexes in English and considered how they are *interpreted* phonologically. Winter assigns two different structures for coordination that allows a subgroup reading (4b) and for coordination that does not (4a). For (4b), he proposes the structure in (6), and for (4a), (7).

(6)   [XP   [Conj   [YP   [Conj   ZP]]]]

(7)   a.   [XP   [Conj   ZP]]

      b.   [XP   [YP   [Conj   ZP]]]

In (6), the conjunct and Conj are merged from bottom-up in the usual way. Notice here, however, that unlike Chomsky (2013), Winter does not assume internal merge in coordinate structure. In (7), *after* the first conjunct XP is merged as in (7a), the second conjunct YP is merged into the structure as in (7b), via what Winter calls "Penultimate-Merge." The difference in the structure corresponds to the difference in the availability of sub-group interpretation between (4a) and (4b). (See Winter (2018) for details.)

Regarding how the coordinated structures such as (6) and (7) are spelled out, Shiobara (2018, to appear) made the following assumptions. First, the general assumptions as to the spell-out of an SO in the phonological component are summarized in (8):

(8)   a.   Head-position is phonologically determined at spellout.

      b.   In the unmarked case, the complement phonological object (PO) receives prosodic prominence in each phonological phrase (Φ).

Following Nespor et al. (2008) and Tokizaki (2011) among others, I assume that head-position is determined based on phonological cues, and it is the complement that receives prosodic prominence (Cinque 1993).

     Second, specifically for coordination, I made the following assumptions:

(9)   a.   Conj determines the phase boundary.

      b.   Conj determines the phonological phrase (Φ) boundary.

Following Miwa (2014), I assumed that Conj determines the phase boundary. That is to say, when Conj is merged, the structure gets spelled out in the phonological component. Then in phonology, Conj determines the phonological phrase boundary (Dobashi 2017a,b, 2018).

     Based on these assumptions, English coordinated structures in (6) and (7) are spelled out as in (10) and (11), respectively.

(10) $[_\Phi$ $PO_{XP}]$ $[_\Phi$ *and* $PO_{YP}]$ $[_\Phi$ *and* $PO_{ZP}]$

(11) a. $[_\Phi$ $PO_{XP}]$ $[_\Phi$ *and* $PO_{ZP}]$ $\rightarrow$

          $[_\Phi$ $PO_{XP}]$ $[$ $PO_{YP}]$ $[_\Phi$ *and* $PO_{ZP}]$ (spellout $\rightarrow$ Penultimate-Merge) or

     b. $[_\Phi$ PO_{XP} $PO_{YP}]$ $[_\Phi$ *and* $PO_{ZP}]$ (Penultimate-Merge $\rightarrow$ spellout)

Let us look at (10). First, [Conj ZP] is spelled out as *and* PO_{ZP}, and constructs its own phonological phrase. Secondly, [Conj YP] is spelled out as *and* PO_{YP}, and constructs its own phonological phrase. Then, XP is spelled out as PO_{XP}, constructing its own phonological phrase.[1] This is compatible with the fact that in (6) every conjunct can be separated by a prosodic boundary (PB) (although it does not have to be, cf. Dobashi 2017b: 16).

     Notice that (7) can be spelled out in two different ways depending on the relative timing of spellout and Penultimate-Merge: if the first conjunct XP is spelled out before the Penultimate-Merge of YP, (11a) is derived, where each conjunct constructs its own phonological phrase; on the other hand, if the second conjunct YP is Penultimate-Merged and

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[1] I illustrate the coordinate structure alone for the present purpose, ignoring the surrounding structure.

then spellout applies, the first conjunct XP and the second one YP would be phonologically phrased together as in (11b).

The prosodic structure in (11b) gives rise to a problem, because the first phonological phrase in (11b) contains two phrasal items (or complements), in which the prosodic prominence pattern cannot be determined. This is also incompatible with the fact that there *is* a PB between PO_{XP} and PO_{YP} in (7). One way to get around the problem is to simply say that Penultimate-Merge of YP must be applied *after* XP is merged. This is an extrinsic ordering of two operations, and hence should be avoided if possible. Instead, Shiobara (2018, to appear) claimed that (11b) contains a phonological XP-YP sequence, which should be modified by, for example, inserting a PB between them, as in (11'b) below. This insight was formulated as a phonological condition in (12).

(11') b. $[_\Phi$ $\boxed{PO_{XP}}]$ $[_\Phi$ $\boxed{PO_{YP}}]$ $[_\Phi \, and \, \boxed{PO_{ZP}}]$

(12) $PO_\Phi = \,< PO_{XP}, PO_{YP} >$ must be modified so the locus of prosodic prominence can be determined.

Going back to the simple coordination in (1a), I went on to claim that what labelling the XP-YP structure for interpretation means at the SM interface is determining the pattern of prosodic prominence. In other words, to modify the XP-YP structure in (1a) into (1b) is an operation that obviates the PO_{XP}-PO_{YP} sequence *before* it happens. Once it happens, the phonological condition in (12) works to insert a PB between PO_{XP} and PO_{YP}. Note in passing that in satisfying the condition in (12), the principle of minimal computation works to choose *covert* PB over any other *overt* coordinator (Chomsky 2013: 41) to change (11b) into (11'b).

Turning to Japanese, coordinate structure complexes in (5a) and (5b) should have the structure in (13), because both (5a) and (5b) allow subgroup readings as the English coordinate structure complex in (4b). When the syntactic structure in (13) is derivationally spelled out in the phonological component, the Conj head follows each conjunct in Japanese as in (14):

(13)   [XP   [Conj   [YP   [Conj   ZP]]]]
(14) $[_\Phi \boxed{PO_{XP}}$ (*to*)] $[_\Phi$ $\boxed{PO_{YP}}$ (*to*)] $[_\Phi \boxed{PO_{ZP}}$ (*to*)-*ga*]

The table below sums up the analysis of coordination in English and Japanese:

		English	Japanese
Phonetic realization of Conj		*and*	*to* or a PB
Coordinate structure complex	syntax	(6) or (7) (cf. (1))	(13)
	phonology	(10) or (11)	(14)
		(head-initial)	(head-final)

Table: Coordination in English and Japanese

We have seen that the coordinator *and* in English and the coordinator *to* and a PB in Japanese are phonetic realizations of the syntactic category Conj, whereas a PB in English is inserted after spell-out by the phonological condition in (12).[2]

4. Loose Ends and a Broad Picture

4.1. Syntax-Phonology-SM Interface

As was seen in section 3, the gist of Shiobara's (2018, to appear) claim is that the SO = {XP, YP} needs to be modified before spellout so that its PO counterpart = <PO_{XP}, PO_{YP}> can be interpreted at the SM interface. Otherwise, the locus of prosodic prominence cannot be determined in the PO = <PO_{XP}, PO_{YP}>. One way to modify the problematic PO is to insert a prosodic break (PB) between the two POs in the phonological component (e.g. (11'b)). The other is to modify the SO = {XP, YP} by internal merge, for example (e.g. (1)), *before* it leads to the problematic PO.

An issue that needs to be considered at this point is whether we need both: if we have the phonological condition in (12), we should be able to save the SO = {XP, YP} in (1a) by inserting a PB between XP and YP after spellout, giving rising to the ungrammatical sequence in (15):

(15)   *   *and*   [$_\Phi$ $\boxed{PO_{XP}}$] [$_\Phi$ $\boxed{PO_{ZP}}$]

Therefore, although we attributed the ill-formedness of the XP-YP in (1a) to its phonological ill-formedness, we still need to exclude the XP-YP structure *syntactically* before spellout.[3]

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[2] See Shiobara (2018, to appear) and footnote 4 for discussion on issues regarding the differences between English and Japanese.
[3] In this connection, we should note the typological fact that if a language has a Conj, it *always* appears between the two conjuncts, not before or after them. (I am indebted to Takaomi Kato

Another assumption in Shiobara (2018, to appear) as to the spellout of the coordinated structure was shown in (9), repeated below:

(9)   a.   Conj determines the phase boundary.

    b.   Conj determines the phonological phrase (Φ) boundary.

The assumptions in (9) are based on Dobashi (2017a,b, 2018), which proposes a general algorithm of syntax-phonology mapping in (16):

(16)   Syntax-Phonology Asymmetry (SPA)   (Dobashi (2017a: 4))
    Syntactically inert elements receive interpretation in the process of externalization.

According to his analysis, Conj cannot be a label and hence its edge corresponds to a prosodic boundary (Dobashi 2017a: 15).

Having seen this, what Shiobara's (2018, to appear) analysis of coordination implies for general syntax-phonology mapping is that once a syntactic object gets modified and is ready for SM interface interpretation, it is externaliazed (or spelled out). It remains to be tested with data other than coordination whether this claim is on the right track or not.

4.2. Syntax-Semantics-CI interface

One of the key data of coordination for Shiobara's (2018, to appear) analysis was the availability of subgroup readings in coordinate structure complexes in English and Japanese: In English, the availability of subgroup readings differs between (4a) and (4b) whereas in Japanese, subgroup readings are always available regardless of the presence/absence of Conj as we saw in (5). Both (4) and (5) are repeated here for ease of reference:

(4)   a.   Dylan, Simon, and Garfunkel wrote songs in the sixties.

                         (distributive, collective, #subgroup)

    b.   Dylan and Simon and Garfunkel wrote songs in the sixties.

                         (distributive, collective, subgroup)

(p.c.) for pointing this out to me.) This implies that the structure depicted in (1a) should be ruled out syntactically and universally.

(5) a.   Minami, Tatu,   (??to/sosite) Kazu-ga   siai-de   tatakatta.

          M   T   *to*/*sosite*   K-Nom.   competition-at competed

     'Minami, Tatu, and Kazu competed in a competition/competitions.'

                                             (distributive, collective, subgroup)

     b.   Minami   to Tatu   to   Kazu (to)-ga, siai-de   tatakatta.

          M   *to* T   *to*   K   *to*-Nom competition-at   competed

     'Minami, Tatu, and Kazu competed in a competition/competitions.'

                                             (distributive, collective, subgroup)

Let us further investigate into what kind of subgroup readings are available for what kind of coordination in Japanese. As we noted in section 2, subgrouping is only possible with two *adjacent* conjuncts both in English and Japanese. For example, in (5), while Minami and Tatu, or Tatu and Kazu can be grouped together, Minami and Kazu (excluding Tatu) cannot be grouped together. That is to say, the linear ordering is crucial for determining what kind of subgroup reading is available in coordinate structure complex sentences.

Furthermore, intuitively at least, semantic grouping seems to correspond to prosodic grouping in Japanese. For example, a prosodic boundary (indicated by "%", where "%%" refers to a longer prosodic break than "%")) determines the boundary of grouping, irrespective of the presence/absence of an overt Conj *to*:

(17) subgroup reading of {Minami} {Tatu, Kazu}

     a.   Minami %%% Tatu % Kazu-ga …

     b.   Minami-to % Tatu-to Kazu(-to)-ga …

     c.   Minami-to %% Tatu % Kazu(-?to)-ga …

This differs from English, where the availability of a subgroup reading changes depending on the presence/absence of an overt Conj *and* (as in (4a) vs. (4b)). In a nutshell, the semantics of coordination is prosodically dependent in Japanese whereas the semantics of coordination is morpho-syntactically dependent in English.[4] In either case, the present phonologically based approach to coordinate structure or XP-YP structures in general suggests that transfer into semantic and phonological components should happen at the same points of derivation.

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[4] The difference could be related to another difference between the two languages we noted in section 3: Conj is realized as an overt coordinator *and* in English, whereas it is realized as an overt coordinator *to* or a prosodic boundary in Japanese. I leave this issue for future research.

5. Conclusion

Based on and expanding from Shiobara (2018, to appear), this paper considered how coordinated structures in English and Japanese are *interpreted* at the interfaces. I believe that more detailed investigation into the semantics and prosody of subgroup readings in Japanese in comparison with English counterparts would lead us to deeper understanding of XP-YP phenomena, and the architecture of the language faculty.

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