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# Auxiliation, Atransitivity, and Transitivity Harmony in Japanese V-V Compounds

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Japanese V-V compounds have two structures of head-head and complement-head, and both types show atransitivity, where the internal argument(s) of a transitive or ditransitive verb are not realized. There are two independent reasons for atransitivity. One is the clause structure where the internal argument is not licensed by a verb but by a functional head, in accordance with the recent constructionist hypothesis. The other is auxiliation, a process in which a lexical verb is reanalyzed as an auxiliary. This insight roots in traditional grammar of Japanese, and we translate the insight in current theoretical terms. Depending on the subtype of compound, head-head compounds do or do not show the harmony of transitivity between the two items of the compound, and we offer an analysis of it in terms of the auxiliation of the second verb of the compound.

KEYWORDS: V-V compounds, auxiliation, atransitivity, constructionalist

## 1. Introduction: Remarkable Insights in Traditional Grammar

Japanese traditional grammar has a long history of more than a hundred years, and enormous amount of knowledge has been accumulated in this tradition. However, due to the lack of perspectives on universality from general linguistics, traditional grammar is often overlooked in recent theoretical discussion, and the situation is no different for V-V compounds. Thus, although there are many theoretical works on V-V compounds (see Nishiyama (2008) for an overview), few of them are built on traditional analyses. In this paper we advocate to re-evaluate traditional grammar by translating their insights in modern theoretical terms.

Specifically, we claim that there are two types of V-V compounds in Japanese, i.e. *head-head compounds* and *complement-head compounds*, and atransitivity is involved in both types of compounds in different ways. Atransitivity is defined as the situation where an apparently transitive verb cannot realize its object. We claim that there are two reasons for atransitivity: in one case, atransitivity can be a consequence of the clause architecture where arguments are licensed by specific functional heads, and this kind of atransitivity is observed in head-head compounds; in the other, it is due to the valency reduction by “auxiliation”, which is essentially equivalent to grammaticalization from a lexical category (or a root) to a functional category, and this kind of atransitivity is observed in both head-head compounds and complement-head compounds.

There are two theoretical implications from our analysis of Japanese V-V compounds. One is that it supports Jelinek's (1998) and Borer's (2005) version of the constructionist hypothesis that not only external arguments but also internal arguments are to be severed from verbs. Second, our analysis sheds new light on the scope of auxiliation in Japanese V-V compounds. Recently, Fukuda (2007, 2009) and Yashima (2008) have proposed that auxiliation is involved in aspectual V-V compounds, and we extend their analysis to V-V compounds with motion verbs and temporal verbs, as well as what Takebe (1953) calls *hozyo-doosi*, lit. “supplementary verbs”.

This paper is organized as follows. Section 2 reviews both traditional and theoretical analyses of V-V compounds in Japanese, and sees which parts are overlapped and which parts are different. The section also classifies V-V compounds according to which part is atransitive. Section 3 discusses head-head compounds consisting of verb roots. Section 4 mainly takes up what we call the “spatio-temporal” compounds, a type of V-V compounds to be clarified below, and analyze them as complement-head compounds. Section 5 returns to another type of head-head compounds which Matsumoto (1996) refers to as “compounds with adverbial meanings”, and analyzes them, too, as cases where the second item has become an auxiliary. It also critically reviews Kageyama's (1993) and Yumoto's (2005) analyses of what they refer to as “lexical V-V compounds involving complementation”. In section 6, we deal with the issue of transitivity harmony for each type of compounds analyzed up to section 5. Section 7 is a conclusion.

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## 2. A Brief Overview of Previous Analyses and Classification of V-V Compounds

### 2.1 Dichotomy of V-V Compounds and the Auxiliary Analysis

Representative examples of Japanese V-V compounds are illustrated as follows:

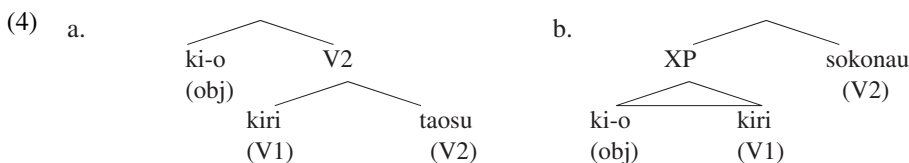
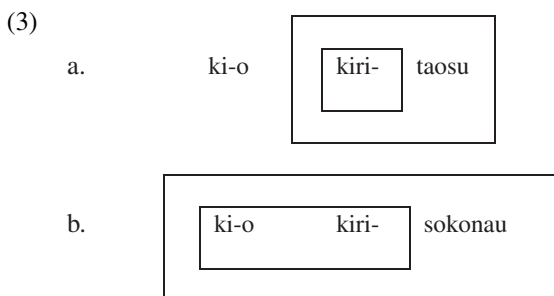
- (1) a. John-ga hon-o yomi-hazime-ta  
 J.-NOM book-ACC read-begin-PAST  
 ‘John began to read a book.’  
 b. John-ga Bill-o osi-taosi-ta  
 J.-NOM B.-ACC push-topple-PAST  
 ‘John pushed Bill down.’

(We refer to the first element in the compound as V1, and the second element as V2. Although whether the element is a verb or an auxiliary will be crucial throughout this paper, we use the notation of V1 and V2 for expository purposes only, without any implication regarding the categorial status of the element.) In (1a), V2 is aspectual and the structure is likely to involve complementation (as *John began [PRO/t to read a book]*). In (1b), in contrast, an ordinary transitive verb is used as V2, and it is not straightforward whether complementation is involved.

According to Takebe (1953), the recognition of the existence of V-V compounds in Japanese dates back to as early as Didaco Collado’s *Ars Grammaticae Iaponicae Lingvae (Nihon Bunten)* published in Rome in 1632. The study on V-V compounds is resumed by Oowada (1891), who says that in some V-V compounds, one verb “supports” the other. This is the first insight that auxiliation is involved in V-V compounds. Kobayashi (1922) then proposes explicitly that V2 in aspectual compounds as in (1a) is an *auxiliary (hozyo-doosi, lit. ‘supplementary verb’)*, and this insight has been followed by Sakuma (1936), Kindaichi (1941), Takebe (1953), Martin (1975), Teramura (1984), Seki (1977) and Takahashi (1991), among others. In a similar vein, Kieda (1933) proposes that the V2s in some V-V compounds (basically the ones analogous to (1a)) are *suffixes*, and Tokieda (1950:158f [1978:134]) also proposes the suffix analysis of V2 in some V-V compounds. The suffix analysis of V2 of V-V compounds can be regarded as a version of the auxiliary analysis thereof, on the assumption that auxiliation is an example of grammaticalization, and phonological reduction (i.e. the loss of independent status of words) is an important ingredient of grammaticalization, in addition to semantic bleaching.

In our view, the most important breakthrough in the study of V-V compounds has been brought about by a series of work by Atsuyoshi Sakakura (1952, 1966a, 1966b). Adopting the auxiliary analysis mentioned above, he analyzes examples like (2) as (3), which is translated in tree diagrams as in (4):<sup>1</sup>

- (2) a. ki-o kiri-taosu  
 tree-ACC cut-fell  
 ‘cut and fell a tree’  
 b. ki-o kiri-sokonau  
 tree-ACC cut-fail  
 ‘fail to cut a tree’



The essence of Sakakura’s analysis is that while *kiri* and *taosu* form a compound from the beginning in (4a), *kiri* first combines with its object *ki-o* in (4b). In other words, two heads (V1 and V2) are directly combined to form a compound

in (4a), but V2 is combined with its complement in (4b). We refer to the compounds with the structure in (4a) as *head-head compounds*. In contrast, the compounds with the structure in (4b) are referred to as *complement-head compounds*. Note that in (3a), as well as in (3b), V1 is contained in V2. This intuition is expressed in (4a) as the structure where V2 is the head of the compound and V1 is adjoined to V2. This is a precursor of the theoretical finding that Japanese V-V compounds obey the right-hand head rule (cf. Kageyama (1993), Nishiyama (1998, 2008)).

Turning to theoretical linguistics, it is widely acknowledged that Kageyama (1989, 1993) is a seminal work on Japanese V-V compounds that laid out grounds for subsequent works. He proposes that (1a) and (1b) have fundamentally different structures, which are virtually the same as (4), and this part seems to be almost unchallenged ever since. Although we by no means deny the importance of Kageyama (1989, 1993) in theoretical contexts, we emphasize that the same distinction had been noted some forty years earlier by Sakakura.

While it seems straightforward that the structure in (4b) is formed in the syntax, it is controversial whether head-head compounds as in (4a) are formed in the lexicon or in the syntax. Kageyama and many subsequent lexical works propose that they are formed in the lexicon, but Nishiyama (1998) propose that they are formed in the syntax. Although our analysis is different from Nishiyama's (1998), we take the syntactic approach to the analysis of the compound as in (4a).

We also depart from Kageyama in the treatment of V2 of complement-head compounds as in (4b): While Kageyama claims it is a verb, we claim it is an auxiliary, following the long tradition in Japanese linguistics. In fact, most of theoretical works do not adopt the auxiliary analysis, claiming that V2 in (1a) and (2b) is a verb. Such analyses focus on whether V2 is a control verb or a raising verb. This move was initiated by Shibatani (1973) (cf. Perlmutter 1970) and has been strengthened by Kageyama (1989, 1993) and Nishigauchi (1993).

Kageyama (1993:95f) cites Martin (1975 [1988/2003]:438) and Teramura (1984:167) as examples of traditional auxiliary analysis and criticizes them, motivating his verb analysis. He first notes that V2 conjugates like an ordinary verb, but this argument is weak. Morphology often reflects syntax, but not always. Classical Japanese has numerous tense and aspect auxiliaries that conjugate exactly like ordinary verbs. One example is the perfective *-tari*, the ancestor of the modern *-ta*, which conjugates like the verb *ari* 'exist'. A second motivation for the verb analysis is that the tense marker *-ru* or *-ta* attaches to V2. But this merely shows that V2 lacks tense, and does not exclude the possibility that V2 is an auxiliary without the tense feature.<sup>2</sup>

In formal terms, auxiliation is captured as reanalysis of verbs as functional categories. This is a proposal of Fukuda (2007, 2009) and Yashima (2008), who have proposed that V2 of aspectual compounds is an auxiliary.<sup>3</sup> Although neither of them mentions the traditional auxiliary analysis, they essentially resurrect the old analysis in the context of the current clause architecture involving functional categories advocated by Cinque (2003, 2004). In section 4, we extend their analysis of aspectual compounds to compounds whose V2 is a motion or temporal verb.

## 2.2 Classification of V-V compounds in Terms of Atransitivity

### 2.2.1 V1 Retains Its Object, But V2 Is Atransitive

Auxiliation of a verb is illustrated by English modals (such as *can* and *will*), which used to be a verb in OE but no longer so in ModE. See Bybee et al. (1994) and Kuteva (2001) for extensive examples and discussion of auxiliation, and Roberts and Roussou (2003) for a formal account of this process. This change is often couched in terms of grammaticalization (cf. Kuteva 2001 and Heine & Kuteva 2002), which is characterized as phonological reduction and semantic bleaching of what used to be lexical items. In Japanese V-V compounds as well, V2 has undergone phonological reduction, given that it is not a free word. As for semantic bleaching, consider the following:

- (5) *kaki-naguru*      *sikari-tukeru*  
       write-punch      scold-attach  
       'write illegibly' 'scold harshly'

Matsumoto (1996:218) characterizes compounds as in (5) as having taken on adverbial meanings, for V2 seems to be "deverbalized" and modifying the action or resultant state denoted by V1. Another related characteristic of V2 in (5) is that, although *naguru* and *tukeru* are transitive when used independently, its object is not realized in (5). We refer to this situation as atransitivity. Below we classify V-V compounds according to whether V1 and V2 each become atransitive or not. Concretely, there are four possibilities:<sup>4</sup>

- (6) a. V1 retains its object, but V2 is atransitive.  
       b. V2 retains its object, but V1 is atransitive.  
       c. Neither V1 nor V2 is atransitive, and V1 and V2 share the same object.  
       d. Neither V1 nor V2 is atransitive, and V1 and V2 realize distinct objects.

Examples in (5) are of type (6a), and we present our analysis of this type in section 5. As for (6d), such a pattern is almost always prohibited (see Nishiyama (1998) for examples and discussion), but in very limited cases, namely when

V2 is a motion or temporal verb, V1 and V2 realize distinct objects, as observed by Kageyama (1993:108). However, even such examples are not perfect, due to the occurrence of two distinct accusative-marked NPs. Instead of discussing such examples with two distinctive objects, we focus on the examples like the following:

- (7) John-ga kaban-o moti-arui-ta  
 J.-NOM bag-ACC hold-walk-PAST  
 ‘John carried the bag around.’

We refer to compounds like above as *spatio-temporal compounds*. They are analyzed by Kageyama (1993) and their followers as head-head compounds, but in section 4, we analyze them as complement-head compounds that involve auxiliiation of V2.

In the following two subsections, we illustrate the types of (6b) and (6c).

### 2.2.2 Neither V1 nor V2 is Atransitive, and V1 and V2 Share the Same Object

Of the four types in (6), (6c), illustrated in (1b) and (2a), is the most common, and naturally this is the major focus of previous studies. Object sharing is illustrated in the following paradigm::

- (8) a. John-ga Bill-o osi-ta  
 J.-NOM B.-ACC push-PAST  
 ‘John pushed Bill.’  
 b. John-ga Bill-o taosi-ta  
 J.-NOM B.-ACC topple-PAST  
 ‘John toppled Bill.’  
 c. John-ga Bill-o osi-taosi-ta  
 J.-NOM B.-ACC push-topple-PAST  
 ‘John pushed Bill down.’ (= (1b))

Kageyama (1993) proposes that object sharing is due to the merger of argument structures of the two verbs. In contrast, Nishiyama (1998) proposes that control is involved in this type of compounds. In section 3, we present our analysis of this type, where we claim that the object is that of V2 only, and that the interpretation of argument sharing is due to an inference rule.

### 2.2.3 V1 is Atransitive, But V2 Retains Its Object

The type in (6b), illustrated below, is superficially similar to that in (6c), but the manner of argument realization is different. Compare (8) with (9):

- (9) a. John-ga huku-no yogore-o /\*huku-o otosi-ta  
 J.-NOM clothes-GEN dirt-ACC / clothes-ACC drop-PAST  
 ‘John removed the clothes’ dirt/\*the clothes.’  
 b. John-ga huku-o/ \*huku-no yogore-o arat-ta  
 J.-NOM clothes-ACC / clothes-GEN dirt-ACC wash-PAST  
 ‘John washed the clothes./\*John washed the clothes’ dirt.’  
 c. John-ga huku-no yogore-o /\*huku-o arai-otosi-ta  
 J.-NOM clothes-GEN dirt-ACC / clothes-ACC wash-drop-PAST  
 ‘John removed the clothes’ dirt by washing the clothes.’

In (9c), the surface object cannot be the internal argument of V1, for one does not wash dirt (cf. (9b)). Based on the observation that there is a possessive relation between the internal argument of V1 (the dress) and that of V2 (the dirt), Kageyama (1993:106) analyzes (9c) as involving the “possessive composition” in argument structure. In section 3, we present an alternative analysis, according to which V1 is atransitive in (9c), and this is due to the clausal architecture with a particular way of argument licensing.

## 3. Head-head Compounds and Atransitivity

In this section, we provide an analysis of head-head compounds. Crucial in the analysis is atransitivity, a phenomenon where a transitive verb cannot realize its internal argument. We start by reviewing the recent arguments that in certain contexts, verbs often show atransitivity.

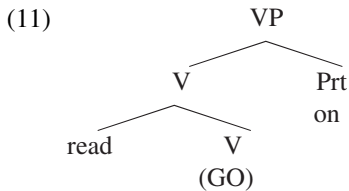
### 3.1 Atransitivity in Particle Constructions, Resultatives, and Directed Motion Constructions

McIntyre (2004:524, 528) notes that a transitive verb sometimes cannot realize its object when it cooccurs with a

particle:

- (10) a. read (\*notes) on  
 b. sing (\* a song) along  
 c. play (\*a silly game) around

The essence of McIntyre's syntax for structures like (10a) is (with certain simplifications irrelevant here) as in (11):



In this structure, the main predicate is an abstract verb GO, and the interpretation is that “an event of reading goes on.” The overt verb *read* is adjoined to the main predicate GO. Regarding why the object of *read* cannot be realized, McIntyre (2004:556) states as follows:

the lexical verb is a non-head of a compound, and thus unable to license arguments outside of the compound (cf. the standard observation that “the arguments of the nonhead are not part of the argument structure of the compound” [Di Sciullo and Williams 1987:30]). Thus, the factors blocking *\*scrubwomen of floors*, ..., *\*a bakehouse of cakes* are one source of ungrammaticality in cases like *\*scrub floors on*, ..., *\*bake cakes on*.

That is, since *read* is not the head of the compound, it cannot license its object.

McIntyre extends the analysis to resultatives. He refutes what he terms *the inheritance hypothesis*, whereby the argument structure of the verb is inherited in resultative constructions. For example, Carrier & Randall (1992) cite data like the following:

- (12) a. The bears frightened \*(the hikers).  
 b. The bears frightened the hikers speechless.  
 c. \*The bear frightened the campground.  
 d. \*The bear frightened the campground empty. (adapted from McIntyre's (41))

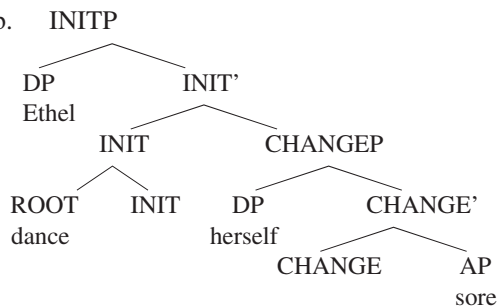
The data seem to suggest that unselected objects do not occur in resultative constructions with obligatory transitive verbs, which leads Carrier & Randall (1992) to claim that the verb's object-selection properties are preserved in resultative constructions.

However, McIntyre (2004:543) claims that the pattern in Carrier & Randall's data do not generalize, citing the following examples:

- (13) a. I tore the buttons off the shirt. [but: \*I tore, \*I tore the buttons.]  
 b. They frightened/scared/bored the hell out of me.  
 c. He didn't draw music out of his players; he frightened it out of them.

Here, although the verbs are transitive, its canonical objects are not realized at the complement of the verb. Based on these and many other examples, McIntyre proposes that, whether the verb is transitive or intransitive, the surface object is a fake object.<sup>5</sup> He (p. 550) proposes the following analysis for resultatives in general:

- (14) a. Ethel danced herself sore.  
 b. INITP



INIT stands for “initiate”, and the sentence means that Ethel initiates an action that induces a change where she (herself) becomes sore. In (14b), the verb *dance* is adjoined to the abstract verb INIT, as in (11). McIntyre refers to this

operation as *Morphological Conflation*.

Importantly, the analysis holds even for resultatives with a transitive verb like (15a):

- (15) a. They hammered the metal flat.  
 b. A little more hammering should get the metal flat. (McIntyre 2004:545)

Just like *herself* is not the object of *dance* in (14a), *the metal* is not the object of *hammer* in (15a). The “object-like” interpretation of *the metal* is pragmatic, which is illustrated by (15b), originally due to Kayne (1985:122). Here, although the verb *hammer* has no object, the interpretation is that the metal is hammered, and this is due to pragmatics. This is summarized as follows:

- (16) Formally, the direct object of the [resultative] construction is the argument introduced by resultative formation, which is pragmatically identified with the argument of the verb. (Kaufmann & Wunderlich (1998:19), cited from McIntyre 2004:545)

Zubizarreta & Oh (2007) propose an analysis of directed motion construction that is essentially similar to McIntyre’s. According to them, (17a) has the structure in (17b):

- (17) a. John kicked the ball to the garden.  
 b. [<sub>VP</sub> John [[kick v( $\phi$ )] [<sub>VP</sub> the ball [GO [to the garden]]]]]

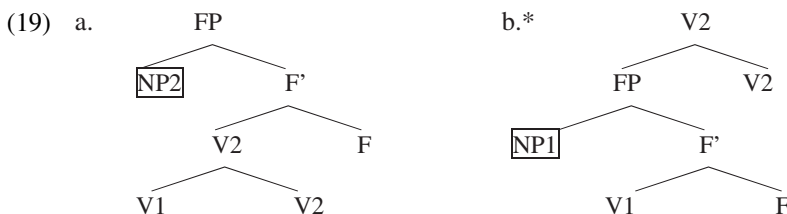
The verb *kick* is adjoined to *v*, which licenses the agent. *The ball* is the subject of the abstract verb GO, and the sentence means that John caused (by kicking) the ball to go to the garden. Crucially, there is no thematic relation between *kick* and *the ball*, and its relation, if any, is pragmatic.

### 3.2 Atransitivity Generalization and the Source of the Internal Argument

In the analysis of the three constructions we have reviewed in the last subsection, the internal argument of the verb is not realized. The situation is summarized as follows:

- (18) *Atransitivity Generalization*  
 When a verb is adjoined to another head, it cannot realize its internal argument.<sup>6</sup>

How can we derive this generalization? Although neither McIntyre nor Zubizarreta & Oh directly address the question of why the internal argument of a transitive verb is not realized just in the case of (18), we claim that (18) is a consequence of Jelinek’s (1998) and Borer’s (2005) hypothesis that not only external arguments but also internal arguments should be severed from verbs. That is, verbs have no arguments in and of themselves, and they are basically modifiers.<sup>7</sup> In the same way as the external arguments are introduced by a functional head (Voice, cf. Kratzer 1996), internal arguments are also introduced by a functional head, which we label F for the time being. The process goes as in (19a):



In (19a), the internal argument of V2 (NP2) is introduced in the Spec of F that selects V2. For the internal argument of V1 (NP1) to be licensed, we must have a structure of (19b). However, the structure is illicit, for it contains a phrase within a head (compound).<sup>8</sup>

In ordinary transitive sentences like *I kicked the ball*, F selects the verb. Because this selection happens in most cases, we have an impression that a verb can and thus must license its internal argument. However under the revised view of the internal argument, we predict that a verb cannot realize its internal argument only when it is not selected by F, and this is exactly the situation in (19a). Here, by adjoining to V2, V1 is not selected by F and thus does not have its internal argument realized syntactically.

As for the label for F, we utilize *v*, the verbalizing head in the sense of Marantz (1997). This is motivated by the fact that the licensing of the internal argument depends on the verbalized status of the root in zero derivation. For example, the noun *hammer* has no object, but the verb *hammer* has its object, as *I hammer the metal*. In Arad’s (2003) analysis of zero derivation, roots are categorially neutral, and categories are obtained when a root is selected by a categorizing

head such as *v* or *n*. Thus, the noun *hammer* is analyzed as [*n*  $\sqrt{\hspace{-0.5em}}\text{hammer}$ ] and the verb *hammer* as [*v*  $\sqrt{\hspace{-0.5em}}\text{hammer}$ ], and since only the latter licenses the object, we can conclude that it is *v* that is responsible for it. Basilico (2008) is another work that utilizes *v* as the head that licenses the internal argument.

Note that the verbalizing head *v* as characterized above is different from “small” *v* that selects VP and licenses the external argument (cf. Chomsky 1995). Therefore, rather than positing two *v*Ps with different characteristics (cf. Basilico 2008), we adopt Voice (cf. Kratzer 1996) for the head that licenses the external argument.

In the next subsection we show that Atransitivity Generalization holds in Japanese V-V compounds and argue that the same head-adjunction analysis as in section 2.1 holds. The significance of extending the analysis to V-V compounds is as follows. First, it provides morphological corroboration of McIntyre’s (2004) abstract compounding (Morphological Conflation) analysis. It also strengthens Zubizarreta & Oh’s (2007) analysis, where Korean provides morphological evidence for their hypothesized abstract verb. They analyze English *I dance to the garden* as involving an abstract verb GO<sup>9</sup> as the main predicate, and *dance* is attached to it. The abstract GO is motivated by the Korean equivalent of *I dance to the garden*, where the abstract GO is an overtly realized verb. But there is a linker between ‘dance’ and ‘go’, as ‘dance-LK go’ (see also Shibatani and Chung 2007). Thus, their Korean examples are not compounds in a strict sense. Since Japanese examples we discuss below are bona fide compounds, our discussion supports both McIntyre’s and Zubizarreta & Oh’s analyses of adjunction of a head to another head as the source of atransitivity.

### 3.3 Atransitivity of V1 in Japanese V-V compounds

As noted in section 2.2.3, Kageyama (1993:106) analyzes (9c), repeated below, as involving the “possessive composition” in argument structure, for there is a possessive relation between the internal argument of V1 (the dress) and that of V2 (the dirt):

- (9) c. John-ga huku-no yogore-o arai-otosi-ta  
 J.-NOM clothes-GEN dirt-ACC wash-drop-PAST  
 ‘John removed the clothes’ dirt by washing the clothes.’

Another example with a similar possessive relation is the following:

- (20) John-ga bin-no nakami-o huri-maze-ta  
 J.-NOM bottle-GEN content-ACC shake-mix-PAST  
 ‘John mixed the content of the bottle by shaking the bottle.’

Like in (9c), the object of V1 ‘shake’ should be just ‘the bottle’, and cannot be ‘the content of the bottle’ in (20). As a result of the ‘possessive composition’, the internal argument of V1, a non-head of the V-V compounds, is left unrealized, as exemplified in (9).

We note some conceptual and empirical problems for the possessive composition analysis of sentences like (9c) and (20). First, as noted by Nishiyama (1998:195), the same situation holds in particle constructions:

- (21) John washed the dirt off.

The sentence does not have the reflexive reading and the verb must be transitive, but somehow the object is unrealized (cf. \**wash the dirt*). Given that the verb and the particle do not constitute a compound in (21) and the possessive composition is meant for compounds only, Kageyama’s analysis is not applicable for accounting for the atransitivity in (21). But intuitively, the source of atransitivity in (9c) and (21) seems to be the same, and it is desirable to give the same account for them.

In addition to the conceptual problem as above, the possessive composition analysis faces empirical problems:

- (22) a. John-ga Bill-o ii-makasi-ta  
 J.-NOM B.-ACC say-defeat-PAST  
 ‘John defeated Bill by saying words.’  
 b. John-ga zaisan-o nomi-tubusi-ta  
 J.-NOM fortune-ACC drink-use.up-PAST  
 ‘John drank his fortune away.’ (cf. Matsumoto 1996:216)  
 c. John-no tiimu-ga kessyoosen-ni kati-agat-ta  
 J.-GEN team-NOM the.final-DAT win-rise-PAST  
 ‘John’s team won the game and proceeded to the final.’

In all the examples in (22), the surface object is that of V2, not of V1. The canonical objects of V1s above are as follows:



- (23) a. kitui koto-o iu ‘say harsh things’  
 b. sake-o nomu ‘drink alcohol’  
 c. aite-ni katu ‘defeat the opponent’

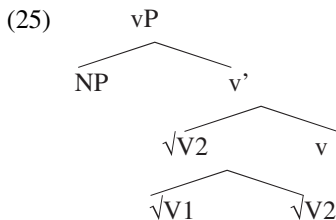
Note that there is no possessive relation between the objects in (22) and those in (23). Even in such contexts, atransitivity of V1 is attested. Just one example, based on (23a), is illustrated below, though the same thing applies to (23b-c) as well:

- (24) \*John-ga kitui koto-o ii-makasi-ta  
 J.-NOM harsh things-ACC say-defeat-PAST  
 ‘Intended meaning: John defeated someone by saying harsh things.’

For these reasons, we do not adopt Kageyama’s analysis of argument structure merger, but analyze atransitivity in (9c), (20), and (22) as an instantiation of Atransitivity Generalization described in (18), repeated below:

- (18) *Atransitivity Generalization*  
 When a verb is adjoined to another head, it cannot realize its internal argument.

Thus, the compounds in (9c), (20), and (22) have the following structure:



In (25) the root of V1 is directly merged with the root of V2 and the latter projects, and hence it heads the compound. Thereafter,  $\sqrt{V2}$  is merged with the verbalizer, whose Spec can host an internal argument of  $\sqrt{V2}$ . Since  $\sqrt{V1}$  is not merged with  $v$ , the former cannot realize its internal argument in [Spec,  $v$ ]. The atransitivity of V1 is explained in this way.

This virtually adopts Sakakura’s analysis introduced in section 2 as (3a) and (4a). See Kageyama (1993) and Nishiyama (1998, 2008) for evidence that V2 is the head in the compounds in question. We discuss cases where V1 seems to be the head of the compound (as in (5)) in section 5.

At this point, we note that our syntactic analysis of head-head compounds is not radically different from previous lexical analyses, in that both utilize a version of the Lexical Conceptual Structure (LCS) to some extent. While lexicalists postulate the LCS in the lexicon, our articulated syntactic structure including functional heads like Voice and  $v$  can be regarded as a version of the LCS. The difference is only where the relevant structure is, but we believe that both share the same insight. Recall also that McIntyre’s (2004) analysis of resultatives in (14b) is also a syntactic implementation of the LCS. Moreover, our adjunction analysis of V1 in (25) can be interpreted as a syntactic implementation of the lexicalists’ LCS analysis utilizing the BY operator for the semantic structure of V1, given that the clause containing the BY operator is an adjunction to a main clause. See also Spencer & Zaretskaya (1998) for a similar view, as we will see in note 10.

### 3.4 Object Sharing

Next we discuss object sharing, as attested below (repeated):

- (1) b. John-ga Bill-o osi-taosi-ta  
 J.-NOM B.-ACC push-topple-PAST  
 ‘John pushed Bill down.’

We propose that the compound in (1b) has basically the same structure as the ones in (9c), (20), and (22), namely (25). Thus, the object (*Bill*) is primarily that of V2. This is analogous to McIntyre’s analysis of the resultative constructions discussed in the last subsection, where *I hammer the metal flat* and *Mary danced herself sore* have the same structure. In this analysis, *the metal* in the former is primarily the argument of *flat*, not the object of *hammer*.<sup>10</sup>

A piece of evidence for this proposal comes from a minimal pair like the following:

- (26) a. John-ga Bill-no senaka-o osi-ta.  
 J.-NOM B.-GEN back- ACC push-PAST

- 'John pushed Bill's back.'
- b. \*John-ga Bill-no senaka-o taosi-ta.  
J.-NOM B.-GEN back- ACC topple-PAST  
'\*John toppled Bill's back.'
- c. \*John-ga Bill-no senaka-o osi-taosi-ta.  
J.-NOM B.-GEN back- ACC push-topple-PAST  
'\*John pushed and toppled Bill's back.'

The contrast between (26a) and (26b) shows that using the verb *osu* 'push,' we can refer to the body part which we push, while the verb *taosu* 'topple' is not compatible with a direct object which refers to the specific body part on which the power triggering the toppling event is added, because toppling is an axis-tilting movement of the entire body by overbalancing. And the ill-formedness of (26c) shows that the compound verb *osi-taosu* 'push-topple' is compatible with a direct object of V2 rather than V1. In other words, even when there appears to be object sharing between V1 and V2, what is syntactically realized is the object of V2 but not V1. This fact immediately follows from our proposal that V1 in a head-head compound whose V2 is the semantic head is always atransitive.

If *Bill* is the object of V2 in (1b), the immediate question is why it is also interpreted as the object of V1. This contrasts with the situation in (9c), (20), and (22), where V1 is atransitive and has no object. For this problem, we adopt the following inference rule, paraphrased from Parsons (1990:119) and Williams (2009:20):

(27) If there is a causal relation between two eventualities, Theme is shared by the two eventualities.

For example, in *the door closed*, there is an eventuality of motion that takes the door as its argument (=Theme), and another eventuality of the result state of something being closed, which also takes the door as its argument (=Theme), and the two Themes are identical. In a similar vein, given that there is a causal relation between the pushing event and the toppling event in (1b), the Theme is identified.

Williams (2009:21) takes inferences derived from (27) as "default inferences," implying that they can be cancelled. Indeed, this is the case with (9c), (20), and (22); in principle, (27) can apply to (9c), (20), and (22), but our world knowledge precludes this interpretation. For example, one can push a person, but one does not wash dirt.<sup>11</sup>

## 4. Auxiliation in Complement-head Compounds

### 4.1 Spatio-temporal Compounds as Involving Complementation and Auxiliation

In the last section we analyzed head-head compounds, featuring atransitivity. This section shifts to complement-head compounds, illustrated in the following examples:

- (28) a. John-ga hon-o yomi-hazime-ta  
J.-NOM book-ACC read-begin-PAST  
'John began to read a book.' (= (1a))
- b. John-ga kaban-o moti-sat-ta  
J.-NOM bag-ACC hold-leave-PAST  
'John took the bag away.' (cf. (7))

(28a) is aspectual, and (28b) involves a motion verb. As noted in section 1, V2 in (28a) has long been analyzed as an auxiliary, and this insight has recently been resurrected by Fukuda (2007, 2009) and Yashima (2008). We provide no further insight regarding this type of compounds, and focus on spatio-temporal compounds as in (28b).

Kageyama (1993) proposes that while V2 takes a complement in (28a), there is no complementation in (28b). Among several tests that are supposed to distinguish between the two types is the *soo si-* 'do so' substitution test:

- (29) a. John-ga hon-o yomi-hazime-te, Bill-mo **soo si**-hazime-ta  
J.-NOM book-ACC read-begin-and B.-also **so do**-begin- PAST  
'John began to read a book and Bill began to do so, too.'
- b. \*John-ga kaban-o moti-sat-te, Bill-mo **soo si**-sat-ta  
J.-NOM bag-ACC hold-leave-and B.-also **so do**-leave- PAST  
'John left, taking the bag, and Bill left, by doing so, too.'

*Soo si-* substitution is possible with the aspectual compound, but not with the motion compound. However, not all complements can be substituted with *soo si-*:

- (30) ?? John-ga hon-o yomi-wasure-te, Bill-mo **soo si**-wasure-ta  
J.-NOM book-ACC read-forget-and B.-also **so do**-forget-PAST

‘John forgot to read a book and Bill forgot to do so, too.’

(30) is a psychological compounds and likely to involve complementation, but the substitution is not very successful.<sup>12</sup>

There are other tests, such as passivization and honorification, which are supposed to tell whether a compound involves complementation or not. But the judgments are often obscure, and Yumoto (2005:175f) notes that the patterns that are assumed by Kageyama to be ungrammatical are actually attested. In short, there is no single test that unambiguously differentiates between aspectual/psychological compounds and motion compounds.

In fact, there is a test, discovered by Kagemaya, that groups (28a) and (28b) together, as opposed to head-head compounds discussed in the previous section, and that has to do with the presence of the light verb *si-* as V1:

- (31) a. *aspectual/psychological compounds*  
 benkyoo-si-hazimeru      syuuri-si-wasureru  
 study-do-begin            fixing-do-forget  
 ‘begin to study’            ‘forget to fix’
- b. *spatio-temporal compounds* (cf. Kageyama 1993:364)  
 huityoo-si-aruku            giron-si-akasu  
 telling-do-walk              discussion-do-spend.the.night  
 ‘walk around telling’        ‘spend the night discussing’
- c. *head-head compounds*  
 \*gekitotu-si-taosu            (cf. tuki-taosu)  
 clash-do-topple              thrust-topple  
 ‘topple by clashing’        ‘topple by thrusting’  
 \*syoori-si-agaru              (cf. kati-agaru)  
 victory-do-rise                win-rise  
 ‘proceed with victory’       ‘proceed by winning’

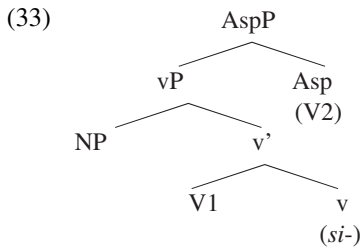
We take the paradigm in (31) as revealing the underlying structure of compounds. That is, contrary to Kageyama’s dichotomy, aspectual/psychological compounds and spatio-temporal compounds form a natural class. Concretely, on the assumption that the light verb *si-* is the overt realization of the verbalizing head *v*, we interpret (31) as indicating that both aspectual/psychological compounds and spatio-temporal compounds involve complementation of (at least) *vP*.<sup>13</sup>

In addition to the evidence showing that spatio-temporal compounds involve complementation, there is also evidence that they involve auxiliation of V2. There are cases of spatio-temporal compounds where the original meaning of V2 is reduced to that of aspect:

- (32) a. iyana omoide-o            wasure-saru  
 bitter memory-ACC          forget-leave  
 ‘forget bitter memories completely’
- b. zenkoku-no                  raamen-o      tabe-aruku  
 all.over.the.country-GEN    noodle-ACC    eat-walk  
 ‘eat noodle around all over the country’
- c. mikka-miban      odori-akasu  
 3.days-3.nights    dance-spend.the.night  
 ‘keep on dancing for the whole three days’

*Saru* in (a) refers to a completive aspect, rather than the act of leaving.<sup>14</sup> In the situation of (b), rather than walking, it is more likely that one uses trains or planes to travel all over the country. In this sense, *aruku* ‘walk’ has lost its original meaning and refers to a repetitive aspect. In (c), although *akasu* originally means ‘spend the night’ and usually only one night is involved, the situation refers to a festival that goes on for the whole three days. It is arguably a continuative aspect.

We assign the following structure to spatio-temporal compounds:<sup>15</sup>



v can be covert as in (32) or can be realized as the light verb *si-* as in (31b). Asp stands for the aspectual head, and we leave open the question of whether Asp can be articulated as proposed by Cinque (1999, 2004).

Even in cases where the original meaning of V2 seems to be retained, there is semantic bleaching, as in the following examples (repeated):

(7) John-ga kaban-o moti-arui-ta  
 J.-NOM bag-ACC hold-walk-PAST  
 ‘John carried the bag around.’

(28) b. John-ga kaban-o moti-sat-ta  
 J.-NOM bag-ACC hold-leave-PAST  
 ‘John took the bag away.’

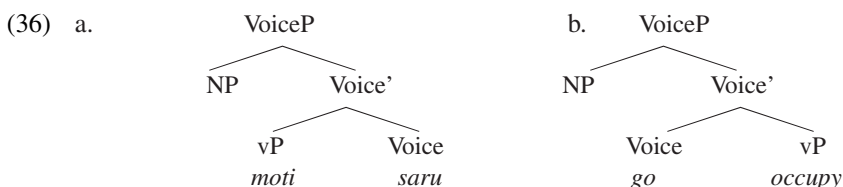
(7) can be used in a situation where John always drives and never walks. In (28b), agentivity is required for the subject, for an inanimate subject is prohibited, as shown in (34a). This contrasts with an independent use of *saru* ‘leave’, whose subject can be inanimate, as in (34b):

(34) a. \*taihuu-ga ie-o moti-sat-ta  
 typhoon-NOM house-ACC hold-leave-PAST  
 b. taihuu-ga sat-ta  
 typhoon-NOM leave-PAST

This is reminiscent of the animacy restriction on the so-called double verbs as discussed by Shopen (1971:259f):

(35) a. They deliberately go and occupy the land.  
 b. They deliberately go occupy the land.  
 c. Our sewage might go and pollute the town water supply.  
 d. \*Our sewage might go pollute the town water supply.

In an ordinary sentence, the subject of *go* can be inanimate (35c), but not in double verb construction (35d). For the double verb construction, we can assume, following the insights by Cardinalletti and Giusti (2001) and Kume (2009), that the motion verbs in (35b, d) have been grammaticalized into Voice, as a result of which they have come to license only an Agent argument, not a Theme argument nor a Goal argument. The parallelism between *moti-saru* ‘hold-leave’ and *go occupy* is schematized as in (36a,b):



One piece of evidence for the identification of *go* in (35b) as Voice comes from its failure to license a Goal PP, as in (37):

(37) Let’s go eat at/\*to McDonald’s. (cf. Cardinalletti and Giusti (2001))

In our terms, this instance of *go* is identified as atransitive, since it cannot license an internal argument (whether Theme or Goal). Similarly, *saru* of *oki-saru* ‘put-leave’ cannot license its Goal argument, as shown in (38), where the *ni*-marked phrase can only be interpreted as the location argument of *oki* ‘put’, even if NP-*ni* is otherwise compatible with *saru* ‘leave’:

- (38) Taroo-ga heya-ni kaban-o oki-sat-ta.  
 T.-NOM room-NI bag-ACC put-leave-PAST  
 ‘Taroo put a bag in the room and left.’  
 ‘\*Taroo put a bag (somewhere) and left for the room.’  
 cf. Taroo-ga heya-ni sat-ta.  
 T.-NOM room-NI leave-PAST  
 ‘Taroo left for the room.’

The reanalysis of a motion verb as an auxiliary is quite common cross-linguistically, as in English *be going to do* (cf. Sweetser 1988).<sup>16</sup> For Japanese, Shibatani (2007a, b) are recent discussions on grammaticalization of *iku* ‘go’ and *kuru* ‘come’, and Miyagawa (1986) is an early formal analysis on restructuring in such verbs. But to our knowledge there has been no work that focuses on motion and temporal verbs in compounds in terms of auxiliatation, grammaticalization and/or restructuring.

## 4.2 Auxiliation, Grammaticalization and Restructuring

In section 2.1, we saw that traditional grammar of Japanese has long analyzed V2 of certain types of V-V compounds as an auxiliary. This subsection provides further motivations for this position.

In (5), we saw semantic bleaching of what Matsumoto (1996) calls adverbial compounds, and we present our analysis of such compounds in the next section. Below we note that aspectual compounds also manifest semantic bleaching. Consider:

- (39) John-ga hasiri-dasi-ta  
 J.-NOM run-start-PAST  
 ‘John started to run.’

*Das-* means ‘take out’ when used independently, but when it is used as V2 in compounds, the aspectual meaning emerges (cf. Shibatani (1990:247), Tsujimura (2007:169)). Thus, there is semantic bleaching in (39).

In addition to semantic bleaching, (39) shows another property of grammaticalization: morphological neutralization. *Das-* ‘take out’ is a transitive verb as an independent verb, and its intransitive counterpart is *de-* ‘go out’. However, when used in a compound with an aspectual meaning, only *das-* can be used, and *de-* cannot be used even for intransitive V1 as in (39) (cf. Shibatani (1973, 1990)).<sup>17</sup> Morphological neutralization is also observed in inceptive *hazime* (cf. (61); Shibatani 1990:247, Yashima 2008:24f).

Aspectual compounds such as (28a) and (39) are usually analyzed as involving control or raising, and one might wonder why “auxiliaries” have such constructions. One way out of this problem is to claim that neither control nor raising is involved, and this is what Fukuda (2007, 2009) and Yashima (2008) have recently proposed. Concretely, they propose that restructuring is involved in aspectual V-V compounds, and we review one argument from Yashima (2008).

Kayne (1989) notes that virtually all restructuring verbs that allow clitic climbing is either raising or subject control, and object control is curiously absent. Cinque (2004:142f [2006:22]) takes this as evidence that restructuring verbs are functional verbs located in functional heads. Specifically, Cinque states that the lack of object control indicates that “no verbs with an object complement (i.e., assigning a thematic role) can be used as a functional verb.” Yashima (2008) notes that the same restriction holds in Japanese V-V compounds:

- (40) \* Taroo-wa Hanako-ni sono hon-o yomi-tanon-da  
 T.-TOP H.-DAT the book-ACC read-ask-PAST  
 ‘Taro asked Hanako to read the book.’

An imaginary V-V compound involving object control would look like (40), but such a pattern is never attested. This systematic gap is explained if complement-head compounds involve auxiliatation of the head, and the head is not a verb that thematically licenses a complement. Thus, despite the terminology “complement”, we assume that there is no thematic relation between the head and the complement in complement-head compounds. The term is purely structural, where V2 takes a projection of V1 as its *sister*. This notion is quite pre-theoretical, going back to Sakakura’s insight in the 1950s, as we saw in (4b) in section 2.

## 5. Auxiliation and Atransitivity of V2 in Head-head Compounds

### 5.1 The Auxiliary Status of the V2 of Adverbial Compounds

In section 2.2.1, we have classified V-V compounds in terms of whether each of V1 and V2 becomes atransitive. Among the four classes, we have identified (6b) and (6c) as the head-head compounds of the *arai-otosu* type as in (9c) and the *osi-taosu* type as in (8c), respectively, and (6d) as the complement-head compound of the *moti-saru* type as in

(7), which we call the “spatio-temporal compounds”. In this section, we return to the fourth type, which is the head-head compound of the *kaki-naguru* type as in (5) and (6a).

This type of compounds more or less overlaps with what Matsumoto (1996) refers to as ‘compounds with adverbial meanings’, for V2 seems to modify the action or resultant state denoted by V1. Thus, *kaki-naguru* ‘(lit.) write-punch’ does not denote a way of punching but a way of writing, so that it means ‘writing as if punching’, ‘writing violently’ or the resultant state of ‘writing illegibly’. In this sense, the semantic head of the compound is V1, and V2 simply modifies V1.<sup>18</sup>

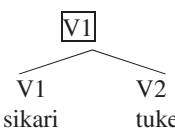
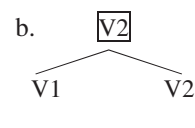
This type of compounds shares four more significant properties, as summarized in (41):

- (41) a. The V2 has undergone semantic bleaching.  
 b. The V2 has become atransitive, even if it is morphologically transitive.  
 c. Although the V2 is not a semantic head, it is a morphological head, in that it is suffixed by a tense/aspectual/modal marker, in the same way as the main verb in a tensed clause.  
 d. The V1 can retain its internal argument, just like the V1 of the complement-head compound of type (6d).

To take *sikari-tukeru* ‘(lit.) scold-attach’ as another example of this type, it does not mean a way of attaching but a way of scolding, and *tukeru* in this context has lost its original meaning. Alongside, *tukeru*, which is a ditransitive verb taking Agent, Goal, and Theme arguments in its independent use, has lost its ability to license either a Goal or Theme argument here. Compare *sikari-tukeru*, as in (42a), with *sibari-tukeru* ‘fasten-attach’, as in (42b):

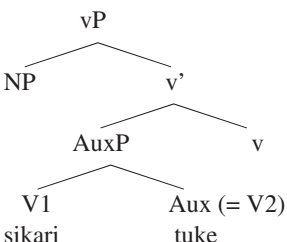
- (42) a. Taro-ga musuko-o (\*hasira-ni) sikari-tuke-ta.  
 T.-NOM son-ACC (\*pillar-to) scold-attach- PAST  
 ‘Taro scolded his son harshly (\*to the pillar).’  
 b. Taro-ga musuko-o \*(hasira-ni) sibari-tuke-ta.  
 T.-NOM son-ACC \*(pillar-to) fasten-attach-PAST  
 ‘Taro fastened his son on the pillar.’

Matsumoto (1996:217-219) points out the modificational relation between V1 and V2 of the adverbial compounds like (42a), and analyzes this type of compounds as “left-headed” compounds, in which V2 is semantically bleached and “deverbalized”, as in (43a). Given (43a), however, it remains unclear why all the other endocentric compounds in Japanese are subject to Williams’s (1981) ‘Right-hand Head Rule’ and have the structure in (43b), whereas only the adverbial V-V compounds are not:

- (43) a.  b. 

Moreover, in Matsumoto’s assumptions, it is left unexplained why the V2 has been semantically bleached and “deverbalized” if it has the structure in (43a). In fact, Matsumoto (1996:218; fn.15) notes that “these verbs are not grammatically deverbalized, however.” Given this, how to reconcile this mismatch between the semantic and grammatical properties will remain a non-trivial problem.

In the face of these problems, we propose that the V2 of the adverbial compounds is a kind of auxiliary, and that *sikari-tukeru*, for example, has the following structure:

- (44) 

Note that (44) differs from (25) in that V2 is not a verbal root but an auxiliary. It is semantically bleached simply because it is a grammaticalized functional category. Also importantly, (44) is a right-headed structure, not left-headed, because *tuke* is the right-hand head of AuxP whose complement is *sikari*.

(44) is not a new analysis envisaged by us, but is essentially a generative syntactic resurrection of what Takebe (1953), Sakakura (1966), and Seki (1977) suggested in the field of Japanese traditional grammar, as we saw in section 2. Among others, Takebe (1953) examines how many verbs can be used as the V2 of a V-V compound, and

identifies the number as 1066, among which he estimates that 175 verbs should be regarded not as the (right-hand) semantic head of the compound, but as an auxiliary that ‘supports’ the meaning of V1 (in his term, *hozyo-doosi* ‘supplementary verb’). He then classifies the 175 V2’s into three subtypes, in terms of their semantic relation to V1:<sup>19</sup>

- (45) a. V2 functions as the intensifier of the meaning denoted by V1:  
*akire-kaeru* ‘(lit.) be.dumfounded-be.turned.over (be thoroughly dumfounded)’,  
*tidimi-agaru* ‘(lit.) shrink-go.up (shrink with fear, shame, etc)’, etc.
- b. V2 denotes the direction of the action denoted by V1:  
*huki-orosu* ‘(lit.) blow-take.down ((wind) blow down)’,  
*tati-agaru* ‘(lit.) stand-go.up (stand up)’,  
*kiki-nagasu* ‘(lit.) listen-drain (let sth go in one ear and out the other)’, etc.
- c. V2 expresses how the event denoted by V1 take place:  
*moe-sakaru* ‘(lit.) burn-reach.a.peak (burn briskly)’,  
*yomi-kiru* ‘(lit.) read-cut (finish reading)’,  
*kaki-morasu* ‘(lit.) write-let.leak (leave out sth in writing (by mistake))’, etc.

Although Takebe himself does not include *kaki-naguru* or *sikari-tukeru* in his list, it is relatively clear that these are instantiations of (45c) and (45a), respectively.

We essentially accept Takebe’s classifications, because what we have identified as Aux in (44), in terms of semantic bleaching and atransitivity, can cover most, if not all, instances of the V2 which he identifies as supplementary verbs. It is important to note here that Aux does not refer to a specifically labeled functional category, such as T, Agr, C, but is a cover term for verbal functional categories that can occupy that specific syntactic position.<sup>20</sup>

As another illustration of the atransitivity of the V2 of the adverbial compounds, let us look at *mi-orosu* ‘look down’, which is composed of *mi* ‘look’ and *orosu* ‘drop’. If anything can be brought down in the act of looking down, it is one’s gaze. But an NP referring to one’s gaze cannot occur as the direct object of *mi-orosu*: when *orosu* is used as V2, it is atransitive, as in (46b), even if *orosu* must be transitive when it is used as a single verb, as in (46c).

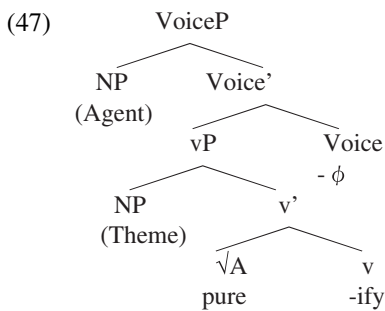
- (46) a. **mati-o mi-orosu oka**  
town-ACC look-brought.down hill  
‘the hill from which one can overlook the town’
- b. \***sisen-o mi-orosu-to kimotiyoi oka**  
gaze-ACC look-brought.down-if pleasant hill  
‘the hill which is pleasant if you overlook from there’
- c. **sisen-o orosu-to mati-ga hirogat-tei-ru.**  
gaze-ACC brought down-if town-nom spread-ASP-NONPAST  
‘If you brought down your gaze to a lower place, you can see the town spreading over.’

This fact is no surprising if we assume that *orosu* in *mi-orosu* is Aux, since an auxiliary has generally lost its ability to license an internal argument, due to valency reduction (cf. (37), (38)).

As in (44), we propose that what Matsumoto (1996) calls the “compounds with adverbial meanings” is the head-head compound whose V2 is an auxiliary. (44) differs from (25) in terms of whether V2 is a verbal root or an auxiliary. The difference seems to be subtle, but brings a significant consequence in the way the internal argument is realized in [Spec, v].

Recall that, in (25), which is a structure of the head-head compound of the *osi-taosu* ‘push-topple’ type, we noted that the internal argument of  $\sqrt{V2}$ , but not of  $\sqrt{V1}$ , can be realized in [Spec, v], since  $\sqrt{V2}$  is directly merged with v. On the other hand, Aux in (44) is a kind of functional category, and a functional category is always an “extended projection” of the closest lexical category that shares the same verbal or nominal categorial feature with it (Grimshaw 1991). Given the separation of a lexical category into a root and a categorizing functional head (cf. Maranz 1997, Arad 2003), a set of functional categories that share the same verbal or nominal categorial feature and that project from the same (lexical) root can be redefined as an “extended projection” of the root. Thus, both AspP and vP are extended projections of V1 in (44). This is why a designated thematic property of  $\sqrt{V1}$  can be projected onto vP, and the internal argument of V1 can be realized in [Spec, v], even though AuxP intervenes between the root and vP. The NP that is syntactically realized in [Spec, v] is semantically interpreted as the internal argument of V1, without violating any locality condition. This situation is quite parallel to the cases in which the NP syntactically realized in [Spec, Voice] is interpreted as the external argument of V1, despite the intervention of vP and AspP between the root and VoiceP.<sup>21</sup>

In contrast to the way the internal argument of a verb is determined exclusively on the property of the root, we can *not* claim that whether a verb can license its external argument or not is *always* determined exclusively on the property of the root. Consider (47), where the root *pure* is merged with the verbalizer *-ify*, which heads vP.



In this case, too, Voice can license an external argument in its Spec, but this property is not determined by the root  $\sqrt{\text{pure}}$ , which we cannot argue is lexically specified as [+transitive]. In fact, we claim that Voice in (47) can license an external argument because it Agrees with the closest head which it c-commands and which is featurally specified in terms of transitivity, and the latter head in (47) happens to be  $v$  specified as [+transitive].<sup>22</sup> As for a theoretical implication of this claim on the licensing of external argument, see section 6, where we will syntactically explain Kageyama's (1993) principle of transitivity harmony.

Now, returning to (44), let us explain two more properties of the adverbial compounds. First, V2 in this structure must be atransitive and cannot realize its own internal argument. This is simply because V2 is a kind of auxiliary: due to the grammaticalization of V2 into a functional category, it has lost its ability to license an internal argument (cf. (37, (38)). If it were grammaticalized into Voice, it could license an external argument, as in the *saru* 'leave' of *moti-saru* or *go/come* of the double verb construction (cf. (36a,b)). However, since it remains in vP, no such possibility is left here. Hence, (42a) with PP, (46b) and similar examples constructed from the V-V compounds in (45a-c) are all ruled out.

Second, (44) is distinct from (33), a structure of a complement-head compound, in terms of the relative hierarchy of V2 and  $v$ . However, this enables us to make a crucial prediction about the replaceability of V1 by VN+*si*: the adverbial compound of the (44) type cannot, while the complement-head compound of the (33) type can, have the V1 part replaced by VN+*si*. This prediction is indeed borne out. Compare (31a, b), repeated below, with the ill-formedness of the following examples:

- (31) a. *benkyoo-si-hazimeru syuuri-si-wasureru*  
 b. *syakkin-si-aruku giron-si-akasu*
- (48) a. *kaki-naguru* → \* *memo-si-naguru*  
 write-punch note-do-punch  
 b. *sikari-tukeru* → \* *sisseki-si-tukeru*  
 scold-attach scolding-do-attach

In short, the minimal difference in the categorial status of V2 (whether it is a root or an auxiliary) has created a number of differences between the adverbial head-head compounds and the other type of head-head compounds, and made the former type closer to the complementation-head compounds, though the adverbial head-head compounds also differ from the complementation-head compounds in terms of whether the auxiliary V2 is below or above vP, which makes a difference in the morphological freedom of V1 just noted.<sup>23</sup> In a sense, the V2 of the adverbial compounds can be regarded as the first stage of grammaticalization from a lexical root into various types of functional categories ranging from Aux,  $v$ , Asp, Voice, and Modal, among many others.

## 5.2 Various Status of the Same V2

Now, let us consider cases in which the same V2 can sometimes license its internal argument and otherwise not. It is shown that when the V2 can license its internal argument, the associated V1 cannot license one, whereas the V2 cannot license its internal argument when the associated V1 can license one. The former case is (i) a head-head compound in which V2 is a verbal root. The latter case is divided into two subtypes in terms of whether the compound is (ii) a head-head compound or (iii) a complement-head compound. The case in (ii) is head-head compound in which V2 is an auxiliary below vP, and the case in (iii) is a complement-head compound in which V2 is an auxiliary above vP. Such a minimal pair is illustrated in (49a-c), where the V2 of the compounds is *tukeru* 'attach':

- (49) a. *Taroo-ga boohan kamera-o genkan-ni sue-tuke-ta.*  
 T.-NOM security camera-ACC entrance-on set-attach-PAST  
 'Taroo installed a security camera on the entrance.'  
 b. *Taroo-ga musuko-o sikari-tuke-ta.*  
 T.-NOM son-ACC scold-attach-PAST  
 'Taro scolded his son harshly.' (cf. (42a))



- c. Boku-wa hudan-kara genmai-o tabe-**tuke**-te-i-ru.  
 I-TOP daily.life-from unmilled.rice-ACC eat-attach-CON-PROG-PAST  
 ‘I have been eating unmilled rice ordinarily.’

The V2 in (49a) is a verbal root, with the meaning of ‘attach’, and the accusative NP is its internal argument. In this case, V1 is adjoined to V2 and modifies the event denoted by V2. This is why V1 can be omitted without changing the meaning, as in (50a). The V2 in (49b) is an auxiliary below vP, and adds an intensive meaning of relentlessness to the event denoted by V1. Here, the accusative NP is the internal argument of V1 rather than V2. Hence, the omission of V2 can retain the same logical meaning as (49b), though the omission of V1 does not make sense, as shown in (50b). The V2 in (49c) is auxiliary above vP. Here, too, the accusative NP is the internal argument of V1, and V2 denote a habitual aspect. Hence, as in (50c), although the exclusive merger of V1 and the NP can retain the same logical meaning as (49c), the direct merger of V2 and the NP does not make sense.

- (50) a. Taroo-ga boohan kamera-o genkan-ni take-ta.  
 T.-NOM security camera-ACC entrance-to attach-PAST  
 b. Taro-ga musuko-o sikar-ta. /\*Taro-ga musuko-o take-ta.  
 T.-NOM son-ACC scold-PAST /\*T.-NOM son-ACC attach-PAST  
 c. genmai-o tabe -ru /\*genmai-o take-te-i-ru.  
 unmilled rice-ACC eat-NONPAST / unmilled rice-ACC attach-TE-PROG-PAST

In both (50b) and (50c), the internal argument of the entire compound is that of V1, and V2 is a functional category. However, they crucially differ with respect to whether the V1 can be replaced by VN+*si*: the V2 in (50c) allows it, while the V2 in (50b) does not:

- (51) a. torakku-ni nori-take-ru / torakku-o unten-si-take-ru (V2 = habitual aspect)  
 truck-on ride-attach-NONPAST/truck-ACC driving-do-attach-NONPAST  
 ‘be accustomed to riding on a track/be accustomed to driving a truck.’  
 b. musuko-o sikari-take-ta. /\*musuko-o sisseki-si-take-ta. (V2 = intensifier)  
 son-ACC scold-attach- PAST/\*son-ACC scolding-do-attach- PAST  
 ‘Taro scolded his son harshly.’

This contrast can be straightforwardly explained in our analysis, since only the V2 that selects vP as its complement, as in (33), can replace its complement by the VN+*si*.

At this point, one might wonder under what condition a lexical category is grammaticalized into a functional category and which instance of V2 in a V1-V2 combination receives an aspectual interpretation. For example, *tukeru* ‘attach’ of *sue-tukeru* ‘(lit.) set-attach (install)’ in (49a) must be interpreted as a lexical action verb and cannot be interpreted as ‘be accustomed to set’, an interpretation that would be obtained if *tukeru* were a functional category denoting a habitual aspect. Although it is beyond the scope of this paper to provide a full answer to this question, we suggest that Shibatani’s (2007) insight into the converb construction in Japanese can be applied to the case under discussion.

Specifically, Shibatani (2007:130) proposes the following:

- (52) Semantically incongruous contexts facilitate grammaticalization.

On the basis of (52), he suggests that Manner + Motion is more congruous than Location Change + Motion, and the latter is more congruous than Action + Motion.<sup>24</sup> It is reasonable to assume that a similar condition to (52) is applied to the V-V compounds so that only certain instances of the V2 can be grammaticalized into Aux or an aspectual functional category. A support for this proposal comes from the fact that *hari-tukeru* ‘(lit.) spread-attach (paste)’, a combination of Manner + Motion, can only be interpreted as a head-head compound whose V2 is a lexical verb, whereas *ue-tukeru* ‘(lit.) plant-attach, a combination of Location Change + Motion, may be analyzed as involving grammaticalization of V2 into Aux below vP, as a result of which V2 comes to intensify the event denoted by V1, and *tabe-tukeru* ‘(lit.) eat-attach’, a combination of Action + Motion, means ‘be accustomed to eat’, and V2 come to have an aspectual meaning. Although we cannot argue, on the basis of these few examples, that Shibatani’s tricotomy fully corresponds to our syntactic theory of grammaticalization of the V2 of V-V compounds in terms of roots, Aux below vP, and Aux above vP, we can safely conclude that there is a tendency of semantically less congruous contexts facilitating grammaticalization in the cases of V-V compounds, too.

### 5.3 Head-parameter as a Trigger of the Grammaticalization of V2

A brief note on the grammaticalization of V2 is in order here. We claim that V2 in Japanese can be analyzed as either a root or an auxiliary, depending on the different choice of the V1 to its left, because it satisfies the necessary condition

for being reanalyzed as any functional category if it occurs to the right edge of a verb phrase, but not if it is to the left edge. We can assume that this is a simple result of the fact that Japanese is a head-final language, and whatever functional head is allowed in this language occurs to the right of a lexical head/root. For this reason, the same linear order V1-V2 can be analyzed as having the structure of either (53a) or (53b):

- (53) a.  b. 

A support for this claim is the fact that the V1 in a V-V compound in Japanese is not likely to be an aspectual head (for example, *tuke-kuwaeru* can have the transparent meaning of ‘attach-add’, but does not refer to the habitual aspect of ‘be accustomed to add’).<sup>25</sup> In contrast, the verb *go* in English, which is a head-initial language, can be analyzed as being grammaticalized into a Voice head, when it has another verb to its right in the same phase, as in the double verb construction.

#### 5.4 Yumoto’s (2005) Analysis of ‘Lexical Complementation’ Compounds

Before closing this section, a review of Kageyama’s (1993) and Yumoto’s (2005) analyses of what they call ‘lexical complementation’ compounds is in order, for the following reasons. Kageyama (1993:110-113) observes that there is a type of what he calls “lexical V-V compounds” whose V2 seems to require a complementation relation with respect to V1 in the argument structure, only two of which are exemplified below:

- (54) a. *hibiki-wataru* ‘(lit.) be.heard.far.away-go.across (sound was carried a long way)’  
 b. *kaki-otosu* ‘(lit.) write-drop (fail to write)’

Kageyama (1993: 113) argues that, unlike a normal type of “lexical V-V compounds” for which  $\theta$ -identification in an argument structure is established between a Theme argument of V1 and a Theme argument of V2 as in (55a), in the ‘lexical complementation’ compounds, the entire event denoted by V1 is identified with an Event argument of V2, as in (55b):

- (55) a.  $\theta$ -identification: V1 (Ag <Th>) V2 (Ag <Th>)  
 b. complementation relation: V1 (Ag <Th>) V2 (<Ev>)

Building on this idea, Yumoto (2005:125-129) argues that, in this type of compounds, V2 has Event in its argument structure and the LCS of V1 is substituted in the variable part of the Event component in V2 as a result of LCS composition, as in (56a, b):

- (56) a. *hibiki-wataru*:  
 $[[x_i] \text{ SOUND}] + [[_{\text{Event}} (y)] \text{ EXTEND}] \rightarrow [_{\text{Event}} [[x_i] \text{ SOUND}] \text{ EXTEND}]$   
 b. *kaki-otosu*:  
 $[[x_i] \text{ CONTROL } [[y_i] \text{ WRITE}[z_j]]] + [[x_i] \text{ FAIL } [\text{IN } [_{\text{Event}} (y)]]] \rightarrow$   
 $[[x_i] \text{ FAIL } [\text{IN } [_{\text{Event}} [[x_i] \text{ CONTROL } [[y_i] \text{ WRITE}[z_j]]]]]$

Kageyama’s (1993) and Yumoto’s (2005) analyses of the lexical complementation compounds are relevant here because this type of compounds is essentially overlapping with what Takebe (1953) classifies into V-V compounds whose V2 is a ‘supplementary verb’ or what Matsumoto (1996) refers to as ‘compounds with adverbial meanings’, and what we have argued involves V2 as Aux below vP. Yumoto (2005:126-127) is slightly different from Kageyama (1993) in arguing that the V2 of this type of compounds can take either two arguments, Agent and Event, or only one argument, Event, and that in either case, Event is satisfied by the LCS of V1; in the latter case, there remains no argument that has a direct semantic relationship with V1, and this is why the semantic center of the compounds shifts to V1 and V2 comes to have a meaning that is remote from what it would have when it were used as a single verb, and V2 simply intensifies or supplements the meaning of V1. She also suggests that what would be the direct object of the original V2 is always satisfied here by the LCS of V1, and hence, V2, even if it is semantically transitive, cannot realize its direct object syntactically.

Our theory shares with Yumoto’s two insights into this type of compounds: the semantic bleaching and atransitivity of V2. However, our theory departs from Yumoto’s in one important respect: V2 is a lexical verb in her theory, whereas it is Aux in our theory. Below we point out at least two problems with her analysis.

In the first place, it is doubtful whether a verb with the argument structure of (Agent, <Theme>) can be altered into a verb with the argument structure of (Agent, <Event>), like a control verb. She may claim that a bunch of control

verbs in English which can alternate between taking an NP object and taking an infinitive clause supports this view. However, if we take a closer look at English, the control verbs that can take Event as its internal argument must always take it from the beginning, even when it seems to take an NP complement. Thus, *begin a sentence* usually means *begin to write a sentence* (cf. Rochette (1999)). Hence, it is improbable that a verb that originally did not take Event as its internal argument, such as *otosu* ‘drop’ and *wataru* ‘go over a distance’, can freely be altered into a verb that can. If such an alteration can take place, this is nothing more than the grammaticalization that could take place in a diachronic scale, which Yumoto’s analysis does not intend to capture. Indeed, we are taking this standpoint, following Cinque’s (2006) analysis of restructuring verbs (either control verbs or raising verbs) as functional categories and Takebe’s (1953) analyses of Japanese V-V compounds.

Second, if all the lexico-syntactic change in the verbs (for example, *otosu* ‘drop’ and *kaki-otosu* ‘(lit) write-drop’ ‘fail to write’) is the replacement of the internal argument of V2 from Theme to Event, then the Case-assigning property of the verb should be retained, and hence we would predict that there is a single use of the verb *otosu* which can take an NP complement denoting Event. But this prediction is not borne out. Thus, (57b) is severely ill-formed, even with the intended meaning of (57a):

- (57) a. Taroo-ga Hanako-no kotoba-o kaki-otosi-ta.  
 T.-NOM H.-GEN words-ACC write-drop-PAST  
 ‘Taro failed to write some words by Hanako.’
- b.\* Taroo-ga Hanako-no kotoba-no kakitori-o otosi-ta.  
 T.-NOM H.-GEN words-GEN taking.note-ACC drop-PAST  
 ‘Taro failed to write some words by Hanako.’
- cf1. Taroo-ga Hanako-no kotoba-no kakitori-ni sippai-si-ta.  
 T.-NOM H.-GEN words-GEN taking.note-DAT failure-do-PAST  
 ‘Taro failed to write some words by Hanako.’
- cf2. Taroo-ga nikai-kara booru-o otosi-ta.  
 T.-NOM second.floor-from ball-ACC drop-PAST  
 ‘Taroo dropped a ball from the second floor.’

In fact, this state of affairs seems to hold true with all the V2’s which Takebe (1953) identifies as “supplementary verbs”. Hence, this is not accidental but must be theoretically ensured. But Yumoto’s theory would be unable to ensure this fact. On the other hand, if V2 in such an example is an auxiliary, it will require a main verb or a VP as its complement (i.e. to the left of V2 in Japanese). Hence, in our theory, the auxiliary use of *otosu* can never take an NP complement directly.<sup>26</sup>

## 6. Transitivity Harmony

In the foregoing sections, we have argued that not only Kageyama’s (1993) “syntactic V-V compounds” but also most, if not all, of his “lexical V-V compounds” should be formed in the syntax, by the syntactic operation of ‘Merge’. More specifically, we have taken up what Kageyama classifies into lexical V-V compounds and divided them into three subtypes: (i) those whose V1 and V2 seem to retain their lexical meanings and hence should be analyzed as lexical roots, in the sense of Marantz (1997) (Type I) (ii) those whose V2 appears to be a spatio-temporal motion “verb” but have undergone semantic bleaching (Type II), (iii) those whose V2 has an adverbial function with respect to V1, because of which Matsumoto (1996, 1998), Takebe (1953) and Sakakura (1966a, b) analyze them as a “deverbalized category”, “auxiliary verbs”, and “suffixes”, respectively (Type III). We then have analyzed Type II as complementation-head compounds in which V2 is an aspectual functional head that takes vP as its complement, along the lines of Cinque (2006), Fukuda (2007, 2009), and Yashima (2008). We have analyzed Type I and Type III as head-head compounds, but provided different syntactic structures for them: Type III involves a direct merger of the V1 as a lexical root and V2 as an auxiliary below vP, while Type I involves a direct merger of the V1 and V2, both being lexical roots. Behind this distinction lies the observation that, with Type I, V1 cannot realize its own internal argument distinct from that of V2 (i.e. V1 is atransitive), whereas with Type III, V2 cannot realize its own internal argument distinct from that of V1 (i.e., V2 is atransitive).

In this section, given this three-way distinction, we will examine whether each of the so-called “lexical” V-V compounds is subject to a certain morphological principle which Kageyama argues should constrain the combinations of V1 and V2 in *all* lexical V-V compounds. We then provide a syntactic explanation of why such a constraint holds in some cases but not in others. Kageyama (1993) argues that the pairing of V1 and V2 is subject to what he calls “the principle of transitivity harmony”, because of which the combinations like transitive-unaccusative and unaccusative-transitive are ruled out. The essence of this principle can be written as follows:

(58) *The Principle of Transitivity Harmony*

In a V-V compound, if V1 is a verb that has an external argument (i.e. a transitive or unergative verb), V2 must

also be a verb that has an external argument, whereas if V1 is a verb that lacks an external argument (i.e. an unaccusative verb), V2 must also be a verb that lacks an external argument.

Kageyama (1993:123-139) does acknowledge counterexamples to the generalization, and proposes some remedies to save them. Matsumoto (1996:230), Fukushima (2005:603), and Yumoto (2005:138-139) point out problems of such remedial mechanisms and provide an alternative account of the restriction, which they argue to be *semantic* in nature. However, they all admit that something like (58) is at work in order to rule out illicit combinations of V1 and V2.

As a related and important fact, any approach to V-V compounds, whether semantic or syntactic, must be able to account for the following contrast showing that, if a transitive V1 can be combined with either a transitive or unaccusative V2 at all (in violation of (58)), the transitivity of the entire V-V compounds is determined on the basis of the transitivity of V2, if they belong to what Kageyama (1993) calls “lexical V-V compounds”:

- (59) a. Suupu-ga ni-tumar-ta.  
 soup-NOM boil<sub>tr</sub>-be.packed<sub>intr</sub>-PAST  
 ‘The soup was boiled down.’  
 b. \* Mary-ga suupu-o ni-tumar-ta.  
 M.-NOM soup-ACC boil<sub>tr</sub>-be.packed<sub>intr</sub>-PAST  
 ‘Mary boiled down the soup.’  
 c. Mary-ga suupu-o ni-tume-ta.  
 M.-NOM soup-ACC boil<sub>tr</sub>-stuff<sub>tr</sub> -PAST

If *ni-tumaru* is an instance of lexical V-V compound, as Kageyama argues, then the priority of V2 in determining the transitivity of the whole compound may be captured by Williams’s (1981) Right-hand Head Rule. If, on the other hand, *ni-tumaru* is a syntactic V-V compound, and if *tumaru* takes a VP as its complement whose head is *ni* ‘boil’, as Nishiyama (1998) would argue, then we can argue that the transitivity of the matrix verb (namely V2) determines the transitivity of the entire clause. Hence, the pattern observed in (59) does not favor one analysis over the other; what matters is simply how we should explain the well-formedness of (59a), an apparent counterexample to the principle of transitivity harmony, without undermining the explanation of the transitivity harmony observed in most cases.

Nishiyama (1998:201) and Nishiyama (2008:325ff) point out problems with Kageyama’s treatments of (59) in terms of “back-formation”, and proposes a *syntactic* treatment of *all* V-V compounds. However, even he would not reject the possibility that some *semantic* restriction is at work in order to rule out examples like the following, in which a transitive V1 cannot be combined with an unaccusative V2, since his *syntactic* theory has no way to explain their ill-formedness:

- (60) a. \*Taroo-ga osi-taore-ta.  
 Taoo-NOM push<sub>tr</sub>-topple<sub>intr</sub>-PAST  
 ‘Taroo toppled because someone pushed him.’  
 b. \*Nagasaki-iki-no syaryo-ga kiri-hanare-ta.  
 Nagasaki-bound.for-GEN carriage-NOM cut<sub>tr</sub>-become.free<sub>intr</sub>-PAST  
 ‘The carriages bound for Nagasaki were cut out.’

All in all, it seems safe to conclude that a version of (58) is indispensable as either a syntactic or a semantic device, in order to rule out the combinations of V1 and V2 that are illicit in terms of transitivity.

It is important to note here that the so-called syntactic V-V compounds (*complement-head compounds* in our terminology) are generally not subject to this principle (cf. Shibatani (1973), Seki (1977)). Thus, (61) shows that a morphologically transitive verb *hazimeru* ‘begin’ can be combined with an unaccusative verb *huru* ‘rain’, though the former is used intransitively here; in fact, a combination that keeps the transitivity harmony is ill-formed (cf. Perlmutter (1970)):

- (61) Ame-ga huri-hazime-ta. /\*Ame-ga huri-hazimat-ta.  
 rain-NOM fall-begin<sub>tr</sub>-PAST/\*rain- NOM fall-begin<sub>intr</sub>-PAST  
 ‘It began to rain.’

We will return to (60a,b), (61), and (59a) in the following three subsections, respectively.

### 6.1 Transitivity Harmony in Head-head Compounds Whose V2 Is the Lexical Root

First, recall our claim that all the V-V compounds, whether they are head-head compounds or complement-head compounds, are formed in the syntax, by the operation of “Merge”. Chomsky (1995:226) argues that Merge is the simplest, and hence “optimal”, operation that takes a pair of syntactic objects (SO<sub>i</sub>, SO<sub>j</sub>) and replaces them by a new combined syntactic object SO<sub>ij</sub>. Given that both V1 and V2 in V-V compounds are free morphemes, the null hypothesis

is that they can be separately included in the initial numeration of a derivation, *Selected* from the numeration, and *Merged* with each other. It is also important to assume that the V1 in the head-head compounds is adjoined to V2, rather than substituting it.

Second, suppose, following Chomsky (1995), that a lexical verb has an interpretable V feature which may but need not be checked, while a functional head that is an extended projection of the verb (in the sense of Grimshaw (1991)) has an uninterpretable V feature that must be checked and deleted against the verb. Suppose also, following Chomsky (2001), that if *local* (P, G), where P is the probe and G is a goal, match and are active, their uninterpretable features must be eliminated at once, as fully as possible; partial elimination of features under Match, followed by elimination of the residue under more remote Match, is not an option. This assumption can be restated as in (62):

(62) Maximize matching effects. (Chomsky (2001:15))

As for “locality” or “closeness”, let us assume the usual assumptions as defined below:

(63)  $\beta$  is closer to HP than  $\alpha$  if  $\beta$  c-commands  $\alpha$  and is not in the minimal domain of CH. (Chomsky (1995: 299))

(64) If  $\alpha$  and  $\beta$  are in the same minimal domain, they are equidistant from  $\gamma$ . (ibid.: 184)

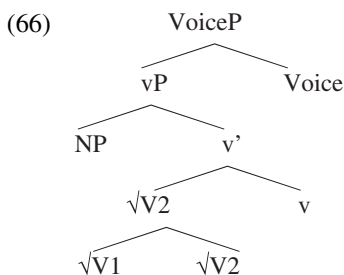
Suppose also that the Agree relation between a probe and a goal can eliminate features without Move, if the probe does not have an EPP feature. Finally, let us assume (65):

(65) Features cannot be checked under feature mismatch. (ibid.:308)

Given (62), (65), and also that V2 and V1 that is adjoined to the V2 are equidistant from the probe, it follows that an uninterpretable feature of a functional head (= probe), if it Matches with the interpretable feature of V2 (= goal) in a head-head V-V compound, should also Match with that of V1, and they both must Agree with the probe, through which the uninterpretable feature of the probe is deleted. Let us call this situation “Multiple Agree between Heads (MAH)”.<sup>27</sup>

MAH can in principle be established for any kind of formal feature. But suppose now that the feature is [transitive], whose positive or negative value can be determined on the basis of whether a verb requires an external argument ([+transitive]) or not ([-transitive]).<sup>28</sup> Since we assume, following Kratzer (1996), that an external argument is licensed by Voice, it is reasonable to assume that Voice has the formal feature [+/-transitive], which is uninterpretable because the featural value of Voice is determined on the basis of what lexical verb it is an extended projection of. On the other hand, the [+/-transitive] feature on the verb root is interpretable, since it is lexically determined before it is included in the numeration.<sup>29</sup> Thus, the Voice which is projected from the transitive verb *destroy* or the unergative verb *walk* should have the uninterpretable [+transitive] feature, whereas the Voice which is projected from the unaccusative verb *arrive* or *happen* should have the uninterpretable [-transitive] feature.

With these assumptions, we can now explain why the transitive harmony holds in the cases of head-head compounds. Consider (60a), for instance. Here, *osi* ‘push’ is a verb root with the feature [+transitive], while *taore* ‘topple<sub>intr</sub>’ is a verb root with the feature [-transitive], and the former is adjoined to the latter. The complex head is merged with *v*, whose projection is merged with Voice, creating the structure in (66):



Here, if Voice has an uninterpretable feature [-transitive], it must Match with the same feature of V2. However, since  $\sqrt{V1}$  is adjoined to  $\sqrt{V2}$ , they are equidistant from Voice, and hence, given (62), (63), and (64), Voice must Match with both  $\sqrt{V1}$  and  $\sqrt{V2}$ . If  $\sqrt{V1}$  had the [-transitive] feature, MAH would be established between Voice on one hand and  $\sqrt{V1}$  and  $\sqrt{V2}$  on the other and the uninterpretable feature of Voice could be checked and deleted to result in a convergent derivation. However, in (60a),  $\sqrt{V1}$  has the feature [+transitive]. Hence, given (65), the uninterpretable [-transitive] feature of Voice cannot be checked against the V1-V2 complex, and the derivation crashes at LF. If Voice has an uninterpretable [+transitive] feature, the same situation occurs between Voice and  $\sqrt{V2}$ , and the derivation crashes equally. Hence, as a corollary, we can derive (67):

- (67) When V1 and V2 of a head-head compound have a [transitive] feature whose value contradicts with each other, the uninterpretable [transitive] feature of Voice remains unchecked and the derivation crashes at LF.

This is why the principle of transitivity harmony holds for the V-V compounds of Type I.

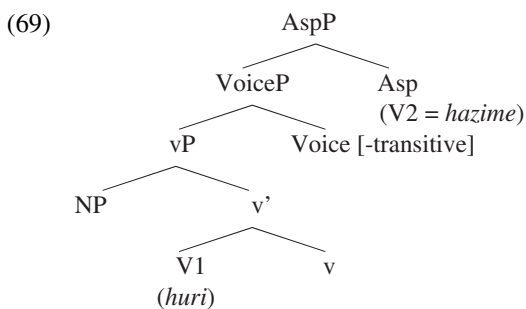
## 6.2 The Lack of Transitivity Harmony in Complement-head Compounds

Given the *syntactic* explanation of transitivity harmony, we make one important prediction. When V1 and V2 are not in the same minimal domain but V1 is in the complement domain of V2, there occur two possibilities: in one case, the uninterpretable [transitive] feature of Voice should Agree only with V2 if V2 is lower than Voice, since V2 is closer to Voice than V1. In the other case, if V2 is higher than Voice, the uninterpretable [transitive] feature of Voice should agree only with V1, since Voice does not c-command V2. In either case, V1 does not have to match with V2 in terms of transitivity.

In this subsection, we argue that it is for this reason that the principle of transitivity harmony does not apply to complement-head compounds, and the latter tend to allow a combination of unaccusative-transitive pair, as noted in (61) (repeated). (68) is another such combination, using a spatio-temporal compound:

- (61) Ame-ga huri-hazime-ta./\*Ame-ga huri-hazimar-ta.  
rain-nom fall-begin<sub>tr</sub>-PAST/\*rain-nom fall-begin<sub>intr</sub>-PAST  
'It began to rain.'
- (68) Kare-wa nihon-zyuu-o nagare-arui-te-i-ru.  
he-TOP Japan-all.over-ACC flow<sub>intr</sub>-walk<sub>tr</sub>-CON-PROG-NONPAST  
'He is wandering all over the country of Japan.'

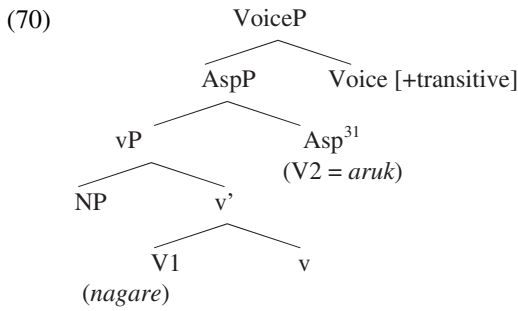
Let us first consider (61). Fukuda (2007, 2009) argues that *hazimeru* 'begin' that occurs as the V2 of a V-V compound whose subject is inanimate (and an idiom chunk) is the functional category of Higher Aspect in the sense of Travis (1991) and Borer (1994). Yashima (2008) also makes essentially the same claim in the framework of Cinque (2006). We adopt their proposal and assume that *hazimeru* in (61) is AspP above VoiceP. Given this, the fact that, in (61), an unaccusative verb is combined with what appears to be a morphologically transitive verb to form a semantically intransitive verb is exactly what our theory predicts. Concretely, as shown in (69), Voice in this structure has an uninterpretable [-transitive] feature, which can be properly checked against the interpretable [-transitive] feature of V1, *huri*, which is the (only) closest c-commanding verbal head that shares the [-transitive] feature. V2 is higher than VoiceP and is not c-commanded by Voice, and hence it cannot Agree with Voice:



This is why the transitivity harmony is not imposed and V1 exclusively determines the transitivity of the entire compound in (61).<sup>30</sup>

Next, let us consider (68). *Aruku* means 'walk (on foot)' in its single use, though it means 'move from one place to another' when used as the V2 of a spatio-temporal compound. Importantly, the movement does not have to be on foot; he or she may travel by trains or hitchhikes. In fact, what is implied in *nagare-aruku* 'flow-walk' is a repetition of purposeless travels from one place to another. In this sense, we assume that *aruku* here has been grammaticalized into an aspectual functional category above vP. Moreover, as noted in (31b), the light verb *si* may be substituted for the V1 in V+*aruku*. For these reasons, we have assumed that *aruku* in *nagare-aruku* is also Asp just above vP (cf. (33)).

If this is the case, we can give the following (partial) structure to (68):



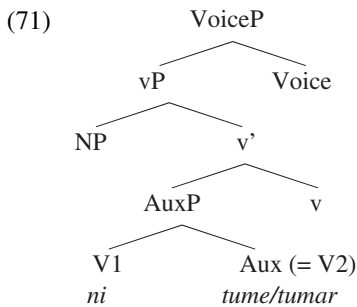
Here, *aruku* should have the feature [+transitive], since it is an unergative verb. By contrast, *nagareru* is an unaccusative verb that has the feature [-transitive], since it has a transitive counterpart *nagasu* ‘flush/draw off’. Although there is a feature mismatch between V1 and V2, the sentence is well-formed. In our theory, this is because the [+transitive] feature of Voice has only to Agree with V2, but not with V1, which is more remote from Voice than V2 because V2 asymmetrically c-commands V1.

### 6.3 Adverbial Compounds and Transitivity Harmony

Given the *syntactic* explanation of transitivity harmony, we make one more important prediction. Even if V2 does not *asymmetrically* c-command V1, if V1 and V2 are directly merged and V1 is in the complement domain of V2, which is excluded from the checking domain of V2, then the uninterpretable [transitive] feature of Voice should Agree only with V2, so that V1 does not have to Match with V2 in terms of transitivity. In this subsection, we will argue that (59a), repeated below, where *ni-tumaru* is an instance of the V-V compounds of Type III, is well-formed for this very reason.<sup>32</sup>

- (59) a. Suupu-ga ni-tumar-ta.  
 soup-NOM boil<sub>tr</sub>-be packed<sub>intr</sub>-PAST  
 c. Mary-ga suupu-o ni-tume-ta.  
 M.-NOM soup-NOM boil<sub>tr</sub>-stuff<sub>tr</sub> -PAST

Note first that *tumaru* and *tumeru* in (59) are not lexical verbs but are classified into “supplementary verbs” in Takebe’s (1953) term. This is because they do not have the literal meaning of packing or stuffing but have undergone semantic bleaching, and become atransitive. This is why *ni-tumaru* and *ni-tumeru* cannot cooccur with an object that denotes something packed or stuffed: *kabotyā-o (\*tappaa-ni) ni-tume-ru* ‘(lit) boil-stuff a pumpkin (\*into a Tupperware) (boil down a pumpkin)’. For these reasons, we can assign to (59) the following structure:



Given that the uninterpretable [ $\pm$ transitive] feature of Voice in (71) must be checked against the closest head(s) with the same feature, which of V1 and V2 is qualified as “closest” to Voice? If V2 were the verbal root to which V1 is adjoined, as in (66), then V1 and V2 would be equidistant from Voice, and hence Voice would have to Agree with both. In (71), however, V2 is merged with V1, projects, and creates a new node (not another segment of itself), and hence V1 in this structure is regarded as being contained in the complement domain of V2:

- (72) Define the *complement domain* of  $\alpha$  as the subset of the domain reflexively dominated by the complement of the construction. (Chomsky (1995:178))

Given (72) and the assumption that the checking domain of  $\alpha$  is the residue of  $\alpha$ , which excludes the *complement domain* of  $\alpha$ , V1 in (71) is not included in the checking domain of V2, and hence, in terms of Agree between Voice and V2, it is possible to assume that V1 and V2 are not equidistant from Voice but V2 is closer to Voice than V1. Hence, Voice must Agree only with V2 in terms of the [transitive] features. The [transitive] feature of V1 can be left



unchecked, because it is interpretable. This is why the transitivity of the entire clauses in (59) is uniquely determined by the transitivity of V2, and a transitive V1 may be combined with an unaccusative V2, in this type of V-V compounds.

The same explanation can apply to essentially all the instances of V-V compounds whose V1 is transitive, whose V2 may alternate between transitive and unaccusative, and whose V2 determines the transitivity of the entire compounds, including *humi-katameru/humi-katamaru* ‘(lit.) tread-harden<sub>tr</sub>/ tread-harden<sub>intr</sub> (tread down/be trodden down)’ (Matsumoto (1996:230f)), *ki-kuzureru/ki-kuzusu* ‘wear-get.out.of.shape<sub>in</sub>/wear-make.out.of.shape (Nishiyama (1998:189)), *hane-kaeru/hane-kaesu* ‘bounce-return<sub>intr</sub>/ bounce-return<sub>tr</sub>’, *ni-tatu/ni-tateru* ‘(lit.) boil-stand<sub>intr</sub>/boil-stand<sub>tr</sub> (begin to boil)’, among many others, though we will not examine these cases one by one.

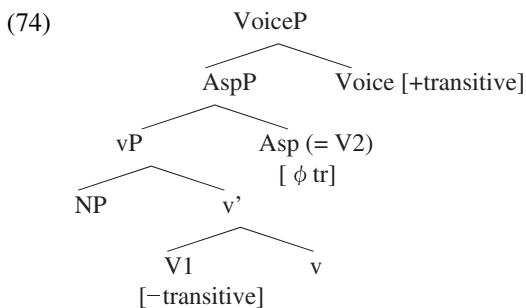
#### 6.4 The V2 of a Complement-head Compound Revisited

A set of apparent counterexamples to the explanation made above is the few cases in which the transitivity of the entire sentence is determined by that of V1, even if V2 should be lower than Voice, judging from the relative order between the passive morpheme and V2.<sup>33</sup> This is exemplified in (73a,b):

- (73) a. Karada-ga sukkari hie-kit-ta.  
 body-NOM completely cool<sub>unacc</sub>-cut<sub>tr</sub>-PAST  
 ‘My body is chilled to the bone.’  
 b.\* Watash-wa karada-o sukkari hie-kit-ta.  
 I-TOP body-acc completely cool<sub>unacc</sub>-cut<sub>tr</sub>-PAST

Here, the V2 *kiru* ‘cut’ does not have a literal meaning of cutting but has undergone semantic bleaching to assume a meaning of completive aspect. Hence, it is reasonable to assume that this V2 has been grammaticalized into the functional category Asp (below Voice).<sup>34</sup>

Now, the problem is that, if the V2 as Asp below Voice had a [+transitive] feature that corresponds to the morphological transitivity of *kiru* ‘cut’, then Voice would have to have a [+transitive] feature that agrees with this V2, and the entire sentence should be a transitive sentence with an external argument, and (73a) would be ill-formed, whereas (73b) would be well-formed. However, the fact is opposite to this prediction. In order to explain this example and other few examples of the same kind, we will propose that V2 in this case (= Asp) has lost its specification in transitivity (i.e. it has undergone morphological neutralization), due to the advanced stage of grammaticalization.<sup>35</sup> In other words, (73a) has the structure in (74):



As a result of the morphological neutralization, Voice agrees only with the V1 which is further from it than V2 is, and the transitivity of V1 determines that of the entire clause. Since *hie* ‘cool’ is unaccusative, taking only an internal Theme argument, the Voice that agrees with it must have the specification of [-transitive]. This is why (73a) is ruled in, whereas (73b) is out.<sup>36</sup>

#### 6.5 Remaining Issues

We have argued in this section that whether the combination of the V1 and V2 that differ in terms of morphological transitivity is possible or not is explained by the syntactic mechanism of “Agree under the local c-command” and “Multiple Agree between Heads (MAH)”, which requires an uninterpretable formal [ $\pm$ transitive] feature on the probe (= Voice) to Agree with all the same tokens of the interpretable [ $\pm$ transitive] features of the closest head(s) that it c-commands, where the notion of “closest” is relativized with the notions of “equidistance” and “checking domain” incorporated.

Although our explanation of transitivity harmony is purely syntactic, we believe that syntax alone is not responsible for predicting all the possible combinations in V-V compounds in Japanese. There are several semantic constraints for combinations of V-V compounds proposed in the literature (cf. Matsumoto 1996, 1998 and Yumoto 2005). Although some of them are merely descriptive and awaits further principled accounts (cf. Fukushima 2005:606, Nishiyama 2008:339), our syntactic analysis does not exclude semantics as a factor in determining what is possible in the combination of verbs.<sup>37</sup> In other words, this section has shown that previous semantic accounts of transitivity harmony



can be replaced by a syntactic account, but our proposal does not intend to replace all previous analyses regarding constraints of combination by syntactic devices.

A related issue will be how we should account for the existence of head-head compounds which are not subject to the principle of transitivity harmony (58) and whose V1 can be analyzed as prefixed to V2 (Kageyama 1993:102f), as exemplified below:

- (75) a. *sasi-semaru* ‘(lit.) put-come<sub>intr</sub>-close (be imminent)’  
 b. *tori-tuku* ‘(lit.) take-attach<sub>intr</sub> (obsess)’

A common property of this type of V-V compounds, which Kageyama himself notices, is that V1’s in these examples have lost their original meaning and undergone semantic drift, as a result of which each instance of these has acquired a varied meaning depending on which V2 it is associated with. To the data Kageyama (1993) points out, we may add (76), which Hasegawa (1998) and Nishiyama (2008: 325) argue cannot be derived by back-formation:

- (76) *Kouzyou-ga osui-o tare-nagas-u.*  
 factory-NOM polluted.water-ACC drip<sub>intr</sub>-pour<sub>tr</sub>-pres  
 ‘The factory drains polluted water.’

Recall that, when we discussed auxiliation of V2 in section 5, we attributed it to the head-final nature of Japanese in section 5.3. Therefore, prefixation in V-V compounds, which involve grammaticalization of V1, must involve a mechanism unrelated to headedness. We suggest that relabelling in Whitman’s (2000) sense is relevant here. Whitman discusses grammaticalization of V > P in the second verb of serial verb constructions in head-initial languages. The mirror-image of this is happening in prefixation of Japanese V-V compounds: grammaticalization of V1 in a head-final language.<sup>38</sup>

What we have argued so far about transitivity harmony can be summarized in the following chart:

(77) *Types of V-V compounds*

structure		examples	transitivity harmony
head-head	V2 as a verb root	<i>osi-taosu</i> (= (60a))	Observed V2 determines transitivity
	V2 as an auxiliary below vP	<i>ni-tumaru</i> (= (59a))	not observed V2 determines transitivity
	V1 as a prefix	<i>sasi-semaru</i> (= (75a))	not observed V2 determines transitivity
complement-head	V2 as Aspect below VoiceP	<i>nagare-aruku</i> (= (68))	not observed V2 determines transitivity
	V2 as Aspect above VoiceP	<i>huri-hazimeru</i> (= (61))	not observed V1 determines transitivity

## 7. Conclusion

Building on Sakakura’s analysis, we have proposed two distinctive structures for Japanese V-V compounds: head-head and complement-head. Head-head compounds are subclassified according to whether V2 is a verb or an auxiliary. Although both types show atransitivity, the reasons are quite different. When V2 is a verb, V1 is adjoined to V2, and the former is basically a modifier. This is because of the constructionist view of the clause architecture, according to which verbs do not license arguments in and of themselves, and arguments of verbs are licensed by functional heads. When V2 is an auxiliary, it cannot license an argument for the very reason that it is not a verb. Only the former type of head-head compound observes transitivity harmony, because Multiple Agree between heads applies only in this structure. Auxiliation is also involved in all instances of complement-head compounds.

Due to their complicated nature, Japanese V-V compounds have been predominantly given a lexical account so far. Even the prominent previous syntactic analysis of V-V compounds proposed by Nishiyama (1998) has limited empirical coverage. This paper intends to be a comprehensive syntactic analysis of V-V compounds by widening the empirical coverage of the syntactic approach to V-V compounds. Head-head compounds, for which we assign a head-adjunction structure, might look like a variant of a lexical analysis whereby all the X<sup>0</sup>-level items are lexical items. However, we crucially utilized a version of the Agree operation to capture transitivity harmony. This analysis, if successful, strongly confirms that head-head compounds are syntactic in nature. Head-head compounds and complement-head compounds have different structures, but we found that in both types, auxiliation is involved, as cross-linguistically seen in the path of grammaticalization of verbs. This insight, rooted in traditional grammar of

Japanese, is long overdue for its credit in the field of general linguistics, but we think it is time to acknowledge its correctness in theoretical terms, and this is what we hope to have done in this paper.

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## Notes

1. (2) and (3) are adapted from Sakakura (1966a:202f). Similar examples and diagrams are found in Sakakura (1952:104, 114 [1974:119f]) and Sakakura (1966b:128).
2. In fact, Kageyama (1993: 102, 127) claims that in some V-V compounds, V1 has become a prefix and V2 has become a bound morpheme.
3. If Cinque (2004) is correct in proposing that restructuring verbs are functional categories, our analysis implies that some V-V compounds involves restructuring, and this is Yashima's (2008) claim.
4. We do not discuss cases where both V1 and V2 are atransitive, as *tori-motu* 'take-hold, act as a mediator', for they are highly idiosyncratic. See Teramura (1984:167) for a related discussion.
5. Levin & Rappaport Hovav (1995:65f) and Kageyama (1996:272) also note similar data. However, they are not as explicit about atransitivity as McIntyre and draw different conclusions, basically endorsing Carrier & Randall (1992). As another attempt to deal with the issue of atransitivity in a larger context, see Goldberg (1995).
6. Since our concern is with the realization of objects, we formulate (18) in terms of internal arguments. But the statement applies to external arguments as well. For the so-called synthetic compounds like *truck driver*, we follow Rappaport Hovav & Levin (1992), who claim that the realization of an internal argument of a derived nominal is correlated with its eventive interpretation and that *coffee* in *coffee grinder* is not an argument of the verbal root, as opposed to *coffee* in *the grinder of coffee*, which is an argument. See also Grimshaw (1990) for the same argument on derived nominals.

Because we take (18) to be a cross-linguistic generalization, it should hold in English, too, more generally than we have observed in the verb-particle construction, the resultative constructions, and the directed motion construction. We argue elsewhere that the atransitivity imposed on the surface transitive verbs in the *Way* construction in (i), the "Time Away" construction in (ii), the "a hole" construction in (iii), and the Causative constructions with "Object Control" Infinitives in (iv), can be similarly explained (without recourse to Goldberg's (1995) notion of "constructions"), if we assume further the existence of empty verbs such as MAKE, PASS, and CAUSE, and so on, to which the overt transitive verb is adjoined via external merge:

- (i) They were **killing and robbing** their way across the Southwest. (Jackendoff 1997:545)
- (ii) Fred **drank** (\*scotch) the night away. (Jackendoff 1997:535)
- (iii) He **burned** a hole in his coat with a cigarette. (Levin & Rapoport 1988:278)
- (iv) He **gave** me to believe that he would help us.

See Zubizarreta and Oh (2007) for a purely syntactic approach to some of the constructions for which Rappaport Hovav & Levin (1998) and Goldberg (1995) propose a lexical rule of "template augmentation" and the "construction grammar", respectively.

On the other hand, if nominalization such as *examination* involves external merge of the verb root  $\sqrt{\text{examine}}$  to the nominalizing suffix *-ion*, one might wonder why the internal argument of the verb must be realized in an example with an aspectual modifier as in (v):

- (v) the doctor's frequent examination \*(of John) (Grimshaw 1990:50)

For a solution of this matter, see Ogawa (2001), who argues that derivation of an event nominal involves syntactic head-movement of a verb root to the functional category hosting a nominalizing suffix (Nz). If we assume, along with this proposal, that a projection of vP (as a projection of the head that licenses the internal argument; see below) resides between VP and NzP, then we can account for why the internal argument must be realized (in [Spec, v]) in (v).

7. Parsons (1990) shares the same insight for the semantic representation of events.
8. Prohibition of a phrase within a head was self-evident with X-bar Theory. Although its status is not clear in current

minimalism, the effect of No Phrase Constraint (cf. Botha 1981, see also Roeper & Siegel 1978) should be captured anyway, as *oven cleaner* vs. \**[oven and dish] cleaner*. In this connection, it is instructive to compare (19b) with the so-called phrasal compounds as *wait-and-see attitude*. Here, it seems that what looks like a phrase is reanalyzed as a lexical item (head), like *bread-and-butter*. (In Sato (2010), such reanalysis is analyzed as “renumeration”, whereby an output in syntax is put back to numeration.) In contrast, vP in (19b) cannot be reanalyzed as a head, for it contains a Spec for the position of the object. More specifically, given that the object can be a variable, a variable within a head violates Postal’s (1969) Anaphoric Island Condition, like *I write on the blackboard, and you write on the \*whiteone*. (19b) is ruled out for the same reason.

9. See van Riemsdijk (2002) for an empty GO in Germanic.

10. Spencer & Zaretskaya (1998) propose a similar view on verb prefixation in Russian. According to them, in Russian prefixed verbs, the prefix is the primary predicate and the verb stem is subordinated. Like us, they feature analogy with English resultatives, saying that in *paint the house green*, “*green* expresses the primary (“core”) semantic predication, while *paint* is a secondary subordinate predicate” (p.1).

11. In (1b), not only the Theme, but also the Agent is shared. This is accounted for by extending (27) to the Agent. Like (27), this inference rule of the Agent can be canceled, for example in the following:

- (i) tutae-kiku  
inform-hear  
‘hear’

In (i), there is no Agent sharing, for the Agent of V1 is those who give information, not the receiver of the information (i.e. the hearer).

12. In fact, of the 27 instances of the V2 which Kageyama (1993:96) argues heads a complement-head compound (“syntactic compound” in his terminology), we estimate that 9 instances resist substitution of V1 by *soo si*: *-wasureru* ‘forget’, *-toosu* ‘go through’, *-nuku* ‘remove’, *-sokonau* ‘fail’, *-sonziru* ‘fail’, *-sobireru* ‘fail’, *-kaneru* ‘not like’, *-okureru* ‘be late for’, *-nokosu* ‘leave’, and *-tukeru* ‘attach’.

13. What Takebe (1953) identifies as the compounds whose V2 is a *hozyo-doosi* (supplementary verb) also includes our spatio-temporal compounds, as well as other types of V-V compounds which Kageyama (1993) classifies into lexical V-V compounds. This is the very reason why we reject Kageyama’s dichotomy between lexical and syntactic compounds and propose an alternative analysis. See also section 5 for a “syntactic head-merger” analysis of the other types of V-V compounds which Kageyama classifies into “lexical V-V compound” and whose V2 Takebe argues to be *hozyo-doosi*.

14. Matsumoto (2009:186f) discusses similar examples involving *-saru* and characterizes the meaning as “causal movement” involving a thing that is hard to move. Perhaps this interpretation is implicated because completion of an event is emphasized precisely when it involves removal of a recalcitrant thing.

15. Nishiyama (1998) also proposes that motion verb compounds involve complementation. Although he claims that all types of V-V compounds involve complementation, we assign no complement structures to other kinds of compounds, as in section 3.

16. Similar examples are reported for Spanish:

- (i) Lo andábamos cantando  
it go-around-1pl-Imperf singing  
‘We went around singing it.’ (Zagona 1988:137)

Note that the sentence involves clitic climbing, a sign of restructuring.

17. Cf. Seki (1977: 133-161) for the observation that in classical Japanese, *izu* ‘go out’ could be used in a compound with an aspectual meaning. This means that morphological neutralization is a relatively recent innovation in Japanese.

18. Yumoto (2005:138-147) argues for a similar classification of V-V compounds in terms of whether V1 or V2 projects its the internal argument onto the entire compound, and offers an analysis of the varieties in terms of LCS composition, the “subject harmony” principle, and the “preference of unaccusativity” principle. However, we will not adopt any one of her lexico-conceptual mechanisms, because the “subject harmony” principle and the “preference of unaccusativity” principle both have counterexamples: for evidence against the former, see note 11; for evidence against the latter, see note 33. See section 5.4 for more discussion on Yumoto’s (2005) analysis.

19. Sakakura (1966a) classifies some of them into “supplementary verbs (*hozyo doosi*)” and several types of “suffixes” that are distinguished from each other by their relative order with respect to the verb stem. This idea is surprisingly similar to Cinque’s (2004, 2006) classification of “restructuring verbs” of Italian into various aspectual functional categories.

20. Thus, Aux in (44) can include (i) Laka’s (1990) functional head  $\Sigma$ , as is corresponding to the *not/so* of *They didn’t leave* and *They did so leave* in English and is, in Japanese, exemplified by *otosu* ‘drop’ of *kaki-otosu* ‘fail to write’ or *tukeru* ‘attach’ of *sikari-tukeru*, and (ii) some of Cinque’s (2006) aspectual functional heads denoting completion (e.g., *harawu* ‘pay’ of *de-harawu* ‘(lit.) go.out-pay (all the members have gone out)’), termination (e.g., *agaru* ‘go up’ of *turi-agaru* ‘fish-go.up’), or repetition (e.g. *komu* ‘(lit.) be crowded’ of *hasiri-komu* ‘(lit.) run-be.crowded (run and run repeatedly)’), among others. On the other hand, some of Takebe’s supplementary verbs, such as *kiru* ‘cut’ of *yomi-kiru* ‘(lit.) read-cut (finish to read)’ are classified in our system into the head of AspP above vP, as

in (33).

21. We thank Fumikazu Niinuma for bringing this idea to us.

22. We have written head-final structures of English, just for ease of exposition; if we write them with a head-initial structure, the word order of *purify*, for example, can be derived by moving the root  $\sqrt{\text{pure}}$  and adjoining it to the left of the verbalizer *-ify*.

23. The head-head compounds of the *kaki-naguru* type share with the complement-head compounds another property: they are both free from the transitivity harmony principle. To this issue, we will return in section 6.

24. On this criterion, *kuru* ‘come’ in (ia) is more likely to be grammaticalized than that in (ib) because the combination of *hara-ga heru* ‘become hungry’ + *kuru* ‘come’ is semantically less congruous than that of *aruku* ‘walk’ + *kuru*:

- (i) a. Hara-ga           het-te           ki-ta.  
       stomach- NOM decrease- CON come-Past  
       ‘I began to become hungry.’  
    b. Taro-ga       arui-te       ki-ta.  
       Taro-NOM walk-CON come-Past  
       ‘Taro came here walking / on foot’

25. In some instances of the V-V compounds whose V1 is *tuke* ‘attach’, the V1 can lose the original meaning and assume the prefixal property. To this issue, we will return in section 5.4. See also Kageyama (1993:102-103).

26. When the embedded object raised to the minimal domain of V2 and the VP-complement of V2 undergoes ellipsis, there comes an example in which the auxiliary use of a verb (or an aspectual functional head) appears to take an NP directly, as in (i):

- (i) Taroo-ga piano-o hajime-ta.  
       T.-NOM piano-ACC begin-PAST

However, these cases involve selection of a VP-complement by V2. See Ogawa and Niinuma (2012) for a syntactic condition on the derivation of these sentences, which they refer to as ‘pseudogapping’.

27. This is similar but not identical to Hiraiwa’s (2001) notion of “Multiple Agree”, which can explain the Multiple Nominative or Accusative Constructions in Japanese, in that his system allows Multiple Agree between a probe and more than one goals even if the goals are not in the same minimal domain. Hiraiwa’s (2001: 70) description is cited below: the probe feature, being [+multiple], continues to probe for a next closest goal, resulting in matching with  $\gamma$ . This continues until the probe locates all the matching goals within an ‘accessible’ domain. Now, at the point of derivation, AGREE applies to all the matched goals derivationally simultaneously, establishing AGREE ( $\alpha, \beta, \gamma$ ).

28. Cf. (58). Cf. also Hale and Keyser (1993) for a reanalysis of unergative verbs as transitive verbs whose internal argument is incorporated into the higher verb.

29. We assume that this must be the case even in a framework in which a functional head licenses the external or internal argument, such as Kratzer (1996), Borer (2005), and Basilico (2008).

30. Why *hazimeru* in (61) cannot be replaced by *hajimaru* is a different matter. See note 17 for the same issue.

31. We are claiming that Asp in (70) is below Voice, unlike in (69), where Asp is above Voice. The claim that the semantically identical type of aspectual functional categories can be located below and above Voice is also made in Cinque (2003, 2006). We tentatively assume that the dual nature of aspectual functional categories is somehow related to the volitionality of the event denoted by V2 (which entails the animacy of the subject of the entire sentence). Thus, since *aruku* ‘walk’ is a volitional action, it must be in the scope of VoiceP. On the other hand, although *hazimeru* ‘begin’ is lexically ambiguous in terms of the volitionality of the inception (cf. Perlmutter 1970, Shibatani 1973), the inception of the rainfall in (61) cannot be a volitional event. This is why *hazimeru* in (61) is out of the scope of VoiceP, as in (69). As Guglielmo Cinque (personal communication) suggested to one of the authors (i.e. Yoshiki Ogawa), however, as for the ambiguity of the functional categories denoting inceptive aspect, there seems to be a language-particular complexity that does not necessarily extend to another language. First, in Italian, there are two restructuring ‘verbs’ denoting the inceptive aspect, *cominciare* and *iniziare*, whose semantics differ in terms of (what he calls) telicity: the former is ambiguous between a natural start and an arbitrary start, whereas the latter can only have a natural start reading. Second, when the direct object of the verb in the embedded clause undergoes long passivization, the Inceptive Aspect (I), which is higher than Voice, is compatible with both the telic and atelic readings (i.e. the Italian counterparts of *The houses began to be built* and *Houses began to be built* are both well-formed), whereas the Inceptive Aspect (II), which is lower than Voice, requires the telic reading (i.e. the Italian counterpart of *The houses were begun to build* is well-formed, but not *\*Houses were begun to build*). A similar asymmetry also lies between Completive and Terminative aspects (cf. Cinque (2006: 88-90, 96) for relevant discussions). It remains to be seen exactly how the corresponding differences occur in a couple of Japanese verbs denoting inceptive aspect, such as *hazimeru*, *dasu*, and *kakeru*. See Himeno (1999) for a related observation on *hazimeru* and *dasu*.

32. Kageyama (1993:126) notices the alternation between *ni-tumaru* and *ni-tumeru*, and assumes that the former is derived from the latter by “back-formation”. However, the precise mechanism of back formation is unclear, nor is it clear why the operation of ‘back-formation’ can apply after the application of the principle of transitivity harmony, for some V-V compounds but not others. See also Nishiyama (1998, 2008) and Hasegawa (1998) for arguments against the

“back-formation” analysis.

33. That the aspectual *kiru* must be lower than Voice is shown by the contrast:

- (i) a. Kono hon-wa yomi-kir-are-ta.  
       this book-TOP read-finish-PASS-PAST  
       ‘This book was finished to read.’  
    b.\* Kono hon-wa yom-are-kit-ta.  
       this book-TOP read-PASS-finish-PAST

We will assume, following Fukuda (2007, 2009) and Yashima (2008), that the relative morpheme order between *-rare* and V2 reflects the relative syntactic hierarchy of the two morphemes (cf. Cinque (2003) for parallel arguments for data in Italian). Note also that, although the contrast between (ia) and (ib) might not be as clear as we are showing here, a Google search on 1/12/2010 tells us that the sequence of “*yomi-kir-are-ta*” results in 122 hits, whereas the sequence of “*yomi-are-kit-ta*” results in 21 hits, if similar websites are excluded from the counting. Hence, it seems safe to say that, at present, *kiru*, unlike *hazimeru*, has not been fully grammaticalized into Asp above Voice. However, for reasons we have written in note 31, the selection of V1 can drastically change the results in many cases, so we need to be careful in deciding whether the supposed aspectual V2 is above or below Voice.

34. See Aoki (2010) for the historical change in the meanings of *kiru* as V2 of a V-V compound.

35. See also notes 17 and 30.

36. In sections 6.3 and 6.4, we have argued that while Aux below vP retains the [+/-transitive] feature, Asp above vP has lost its specification. However, one notable exception to this generalization is V+*ageru/agaru* ‘raise/go.up’, where *ageru/agaru* can mean ‘complete’, such as *kaki-ageru* ‘(lit.) write-raise (finish writing)’. See Ogawa and Niinuma (2011) for a detailed discussion about the peculiar behavior of V+*ageru/agaru*. (70) may also be another such exception. Also we have argued in section 4.1 that the verb which has grammaticalized to Voice must take an animate subject as an external argument, which means that the verb grammaticalized to Voice must have a [+transitive] feature, even if the original verb does not have one. As such, there is a contrast in the ability to possess a [+transitive] feature between the root, Aux, Voice, and a limited number of Asp on the one hand and most of the verbs grammaticalized to Asp on the other. We have no explanation about this mysterious contrast.

37. In this sense, we are adopting Allen’s (1978) overgenerating morphology, though in syntactic terms.

38. What remains to be explained is the fact that there are a few cases in which V1 is unaccusative, V2 is (only morphologically) transitive, V1 is less likely to be a prefix, unlike (75), and V2 is less likely to be an aspectual functional head, unlike (73a). These cases are divided into at least two subtypes in terms of whether the resulting compounds become transitive or unaccusative: the former type includes *huki-kobosu* ‘boil.over-spill’, *zuri-ageru* ‘slide-raise’, and *mai-ageru* ‘flutter-raise’, while the latter type includes *teri-tukeru* ‘(lit.) shine-attach (beat down relentlessly), *nobori-tumeru* ‘(lit.) go.up-stuff (go up to the top)’, *saki-hokoru* ‘(lit.) bloom-be proud (blossom in full glory)’, and *waki-dasu* ‘(lit.) gush-let.out (gush out)’. We will leave these cases open for future research; as far as we know, no lexico-semantic theory of V-V compounds, including Yumoto’s (2005) “preference of unaccusativity” principle, has succeeded in explaining all of these data successfully.

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