

Direct compositionality and word structure*

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Fukushima, Kazuhiko. 2015. Direct compositionality and word structure. *Linguistic Research* 32(1), 21-59. Based on morphological phenomena found in Japanese, a highly agglutinative language, this paper investigates how we might approach intra-word compositionality. First, we elucidate the concept of compositionality to properly frame the central issue. Second, we observe some word-formation phenomena that seem to apparently contradict lexical (or morphological) integrity as well as word-internal compositionality. These involve mismatches—bracketing paradoxes—between morphological constituency vis-à-vis syntactic or semantic constituency. Then, the center piece phenomena of this paper displaying even more drastic bracketing paradoxes are introduced as case studies, namely, the ones involving the negative morpheme and the sized inalienable possession construction. These serve as a testing ground for the concept of word-internal compositionality. The viability and, arguably, advantage of a (direct) compositional approach to word-formation is demonstrated in light of their behavior and the current accounts furnished for them. Finally, after a summary of the paper, further conceptual issues regarding compositionality and word-formation are taken up. (Kansai Gaidai University)

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1. Introduction

The concept of compositionality plays a central role in both philosophy of language and linguistics. In this paper we consider the relationship between compositionality and word structure in the context of Japanese.

We open with some background information regarding the concept of compositionality and its role in the study of language. This is important since the concept has simply been taken for granted without much thought given to its origin or content. We ought to have a clear idea regarding what we are dealing with so that we can properly understand further development based on it. Then, the central assumption of this paper is introduced, namely, the notion of ‘direct compositionality’, which obviously is derivative of the original concept (section 2). Next, challenges to compositionality found in the domain of word formation are discussed focusing on morpho-semantic bracketing paradox in general. Following that, two specific case studies are introduced regarding drastic and intriguing bracketing paradoxes in Japanese involving the negative morpheme *-nai* and the size-indicating morphemes *ko-/oo-* of the sized inalienable possession construction. The implications of the case studies are such that (i) bracketing paradoxes do not constitute an obstacle for word-internal compositionality, and (ii) in some cases a direct compositional (lexical) account is preferable/superior to syntactic (cartographic) approaches (section 3). Finally, I discuss broader implications of the current paper suggesting that for the sake of balanced and fruitful morphological investigation, scholars ought to be creative and free from a single-minded and inflexible conception of morphology-syntax-semantics interface (section 4). A word of caution: what is done here is not so much specialized in depth research focusing on a specific phenomena as a kind of conceptual and illustrative overview regarding the relationship between compositionality and word structure. This paper cites and summarizes what has already been published to put the results in a unified perspective based on the concept of compositionality. For this reason, the exposition in the text may admittedly be abridged here and there.

2. Compositionality

The concept of compositionality is so central to the study of language and is given a special status in the form of the Principle of Compositionality (PoC) or Frege's Principle. It is standardly, informally, and theory-neutrally rendered as "the meaning of a complex expression is a function of the meanings of its constituents and the way they are combined" (Szabo 2012: 64). (See Janssen (1986/2011), Hogdes (2001), and Hendriks (2001) for formal/mathematical definitions.) To properly orient the issue of compositionality within the morphological domain, in this section we take a brief look at some historical aspects of the concept/principle of compositionality, controversies surrounding its theoretical/conceptual status, and the role it plays in linguistics including morphology. A recent incarnation of the concept, namely, the notion of 'direct compositionality' is introduced as well.

2.1 Philosophy of language and compositionality

Among the numerous contentious issues that compositionality or the PoC gives rise to, we count: (i) the historical origin of it and (ii) the theoretical/conceptual status of it (see the chapters in Werning, Hinzen, & Machery (2012) for both comprehensive and detailed expositions of wide-ranging issues surrounding compositionality including the items mentioned here).

First, attribution of the PoC to Frege is controversial since he did not state the principle explicitly (if at all). Regarding whether he believed the concept, there are conflicting views: Frege would always reject compositionality (Janssen 2001) and he may have believed compositionality (Pelletier 2001). In contrast, Frege did state the principle of contextuality ('Never ask for the meaning of a word in isolation, but only in the context of a sentence.') which seems to be in conflict with the principle of compositionality.

How then did the PoC ever come to be called Frege's Principle? According to Pelletier (2001) and Janssen (2012), Rudolf Carnap (Frege's student) is responsible for attributing the PoC to Frege for the first time. Carnap (1947: 121) formulates Frege's Principles of Interchangeability that states: "First principle [...] the nominatum of the whole expression is a function of the nominata of the names occurring in it. [...] Second principle [...] the sense of the whole expression is a

function of the senses of the names occurring in it”. The reader can see how close these principles are to the informal definition of the PoC seen above.

When developing his own idea of intension and extension (playing an important role in Montague’s theory introduced below), Carnap retraced and analyzed Frege’s theory of sense and reference and considered his argument regarding substitutivity to be fundamental (see its reflection in Frege’s Principles above). Thus, in actuality, the PoC should be designated as Carnap’s Principle. Janssen (2011: 497) states that “[c]ompositionality is not Frege’s, but it was called ‘Fregean’ to honor his contribution to the semantic analysis of language”.

Second, independent of the issue of the origin of the PoC, there is a debate regarding the theoretical/conceptual status of it. For example, Janssen (2011) considers it a methodological guideline/standard rather than a principle, while upon considering various issues Groenendijk & Stokhof (2005) give it a status of principle. Szabo (2012: 65) labels it “an interesting hypothesis on a par with other bold hypotheses”. Adding to this uncertainty is the problem of exact definition of and ambiguities found in the PoC. For example, what does ‘meaning’ or ‘a function of’ mean in the informal definition seen above? (See Szabo’s (2012) remarks about ambiguities found in the PoC.)

To put these issues aside, the following position of Dowty (2007: 26-27), who considers compositionality to be basically on the right track, is followed here. He notes that “debating which exact definition of compositionality is correct, then arguing over alleged counterexamples to it” is counter-productive. Doing so would focus “too much attention on validating or falsifying a claim about one particular definition, generating rounds of criticisms and rebuttals, *while many other important questions about compositionality in natural language semantics tend to be ignored*” [K.F.’s emphases]. He suggests that “[c]ompositionality really should be considered ‘an empirical question’. But it is not a yes-no question, rather a ‘how’-question”. This is the basic orientation adhered to in this paper.

2.2 Linguistics and compositionality

Virtually all formal linguists whose research has some bearing on meaning—morphologists, syntacticians, semantists, among others—explicitly or more often implicitly assume some version of PoC or the concept of compositionality. One of

the first references to the concept within modern linguistics is found in Katz & Fordor (1964: 171) who state that “the way [a speaker of a language] understands sentences which he has never previously encountered is compositional”. The earlier versions of transformational grammar along with generative semantics, for example, presupposed the notion in conjunction with the deep structure (the beginning point of syntactic derivation) serving as the basis of semantic composition. This trend survived into more contemporary versions of transformational grammar where an abstract level of syntax, called Logical Form (LF, the end point of syntactic derivation), is designated as the input for semantic composition (see below for discussion on the relationship between grammatical architecture and compositionality). However, compositionality remained to be taken for granted for the most part within the tradition of generative grammar.

In contrast, functionally oriented researchers tend to undervalue compositionality, if not a complete rejection. We find a position like Contini-Morava (1995: 6) who states that “the meanings of individual linguistic signs are not always readily identifiable as functional components of a notional whole”. She continues, “some sign based [functional] linguists prefer to describe the relationship between meaning and message as one of contribution rather than composition”. Also, in conjunction with awkwardness of morphological decomposition, for example, treating *came* as *come* + ‘past’, Halliday & Matthiessen (2004: 9) say that “[c]omposition is an important semogenic (meaning-creating) resource, but it should not be allowed to dominate our thinking about grammar”. It appears, then, that compositionality plays a role (albeit non-predominantly) for creation of meaning even for functionalists.

It was Richard Montague’s landmark paper, ‘The Proper Treatment of Quantification in Ordinary English’ (PTQ), published in 1973 that catapulted the notion of compositionality onto the center stage in linguistics (semantics in particular). Montague revolutionized the perceptions of linguists and philosophers then regarding the (im)possibility of giving explicit, formal, and compositional semantic interpretation to natural language: e.g., Montague’s treatment of quantificational NPs like *everyone* as a generalized quantifier (GQ)—the terminology due to Barwise & Cooper (1981)—allowing such an NP to be a constituent both syntactically and semantically, and his handling of quantifier scope ambiguity involving quantificational NPs. Compositionality is technically accomplished as a homomorphism (informally, one-to-one correspondence) between a syntactic algebra

and a semantic algebra (Montague 1970), which is often described as the rule-by-rule requirement, meaning that when a syntactic constituent is built, there is an accompanying semantic rule that calculates the meaning of the syntactic constituent.

After describing the massive development that took place in the domain of (formal) semantics since Montague, Partee (2011: 81) tells us that “Montague’s legacy endures in the continuing centrality of his theoretical contributions and the influence of his particular proposals about the semantics of natural language”, and “this domain [the Montagovian research tradition] is a robust one and [...] the kind of approach which Montague illustrated so masterfully in his work has not come close to exhausting its potential usefulness for understanding natural language semantics and its relation to syntax”. This paper shows that the very last point holds for frequently overlooked formal characterization of morphology-semantics interface as well.

One of the consequences of the Montagovian approach is that natural language expressions can be interpreted as is—the surface structure can thus be the basis of semantic composition. This state of affairs is epitomized by Partee (1996: 24-25) in the following way.

With the rich tools that Montague’s typed intentional logic (with lambdas!) provided, it was suddenly possible to provide semantic analyses that captured the kinds of generalizations the generative semantics had called attention to [...]. The real excitement of this was that *natural language syntax suddenly looked much less crazy*; instead of the great mystery of how English syntactic structure related to its putative logical form [...], there suddenly arose the remarkable possibility that *surface structure or something close to it [...] might be very well designed as a logical form* for expressing what natural languages express [K.F.’s emphases].

This situation provided impetus to very active and productive explorations of surface-based grammatical theories like GPSG (Gazdar, Klein, Pullum & Sag 1985), HPSG (Pollard & Sag 1987/1994), and versions of categorial grammar (e.g., Oehrle, Bach & Wheeler 1988) inter alia. These approaches have activated and facilitated reconsideration/reevaluation of the relationship between (morpho)syntax and semantics, and contributed to crystallization the notion of compositionality in the

context of linguistics. Ultimately, out of the surface-based grammatical tradition, emerged the notion of ‘direct compositionality’ (Jacobson 1999/2000/2002/2012 and Barker & Jacobson 2007b) which constitutes one of the basic conceptual guidelines of this paper.

2.3 Direct compositionality

The concept of direct compositionality is summarized as the following:

[T]he syntactic combinatory system and the semantic combinatory system work in tandem. The syntax can be seen as a recursive system which proves the well-formedness of expressions in a language (the base of the system being of course words, or—more accurately—the *morphemes*). DC [direct compositionality] claims each syntactic rule/principle which proves an expression well-formed is coupled with a semantics which specifies the meaning of the expression (Jacobson 2012: 109) [K.F.’s emphases].

And therefore, “there is actually no ‘level of representation’ [like LF of transformational grammar] which feeds into the compositional semantics”. It is interesting that Jacobson points to morphemes as the base of the system. The approaches to bracketing paradoxes introduced below that adhere to morphological integrity¹ and elucidates semantic contributions of individual bound morphemes embodies direct compositionality on the most fundamental level.

Jacobson (2012) lists four different levels or stages of direct compositionality: Type 1 through Type 4. (Different labels are employed for the same concepts in Jacobson (2002).) In each of these, we count the following grammatical theories: GPSG and versions of categorial grammar without ‘wrap’ (Wrapping is an order changing operation giving rise to, for example, both *turn off the radio* and *turn the*

¹ The notion of ‘morphological integrity’ is that of Ackerman & Webeluth (1998: 18): “Syntactic mechanisms neither make reference to the daughters of morphological words nor can they create new morphological words in constituent structure”. Their conception of lexicalism—encompassing two other components like ‘lexical adicity’ and ‘morphological expression’ along with morphological integrity—is more perspicuous and precise than other definitions under the more familiar rubric of ‘lexical integrity’ (Lapointe 1980, Di Sciullo & Williams 1987, Bresnan & Mchombo 1995, inter alia). I adopt Ackerman & Webeluth’s version of lexicalism here.

radio off.) (Type 1); versions of categorial grammar with wrap (Type 2); Montague's framework with quantifying-in and Partee (1975) (Type 3); and generative semantics (Type 4).

These frameworks are different from each other but they share the unifying assumption that syntax and semantics work in tandem. So for each type of direct compositionality listed here, it is the case that whenever a constituent is formed by a syntactic combinatory system, its meaning is determined. This holds even for generative semantics which can be considered as equipped with 'two-stage' syntax. The first stage syntax comes with phrase structure rules (i.e., concatenative operations) that build a tree structure. Compositional semantics works in tandem with the phrase structure rules and furnish an interpretation for each constituent as it is built by the syntax. Then the second stage syntax kicks in and maps an entire tree into another tree (reflecting quantifier lowering, etc.) but crucially leaves the semantics intact.

According to Jacobson, syntactic theories assuming a 'surface-to-LF' view (e.g., newer versions of transformational grammar) are not directly compositional. This is somewhat surprising considering the fact that the surface-to-LF approach appears to be the mirror image of generative semantics. However, there is a crucial difference between the two (and the rest of the directly compositional frameworks): in the surface-to-LF approach the syntax builds a surface structure first but does not assign any interpretation to it. Then the surface structure is transformed into an LF (reflecting quantifier raising, etc.) the latter of which is finally sent to some semantic component to be interpreted. Thus the surface-to-LF system is not directly compositional due to the fact that the rules building syntactic structure have nothing whatsoever to do with semantic interpretation. Structure building takes place in a separate component from the one calculating meanings (see also Janssen (2011) who echoes a similar point).

Jacobson (2002/2012) objects to the designation of (syntactic) LF as the basis for semantic composition. Her objection is three fold. First, the surface-to-LF view is theoretically/conceptually inelegant. Any theory needs a compositional syntax where well-formedness of a larger expressions is determined by those of smaller ones. In addition, to characterize the meanings, any theory cannot forgo a compositional semantics calculating the meanings of larger expressions based on those of smaller ones. Given this situation, the most effective and elegant hypothesis is the one where

syntax and semantics work in tandem—the meanings fall out as a simple consequence of structure building. So with other things being equal (we will come back to this point immediately below), a direct compositional approach is simpler.

Second, the surface-to-LF approach requires unnecessary duplication of information both in syntax and in semantics. This is the result of not calculating meanings as structures are built. For example, the approach has to make reference to an LF representation of a single sentence two times: (i) after the LF representation is constructed in syntax as output and (ii) when the representation is used as input to semantic rules. Jacobson (2002) demonstrates this situation with the illustration in (1) below regarding a simple declarative sentence.

- (1) a. syntactic rule: $S \rightarrow NP VP$
 b. semantic rule: $\| [{}_S NP VP] \| ^g = \| VP \| ^g (\| NP \| ^g)$
 [N.B.: g is an assignment function.]

The structural information for the local tree $[{}_S NP VP]$ needs to be referred to twice regardless of the fact that semantic rules are stated with/without construction specificity.

Third, for the surface-to-LF view, it is rather mysterious that semantic composition is accomplished locally as well. Under such architecture, a full LF tree is the input to semantic interpretation. This means that there is no intrinsic correspondence between syntactic locality and semantic locality. Though we would expect that there can be semantic rules that interpret an entire LF tree or a huge portion of such a tree, no such rule has been proposed so far. The surface-to-LF view then, does not offer any reason for locality of semantic interpretation and it remains a pure accident that both syntactic and semantic composition proceed observing locality. In contrast, for any type of direct compositionality, there is no actual ‘level’ that is subjected to semantic interpretation, i.e., a tree structure does not feed the interpretation process. Since syntax and semantics do their work in tandem, the fact that syntactic locality corresponds to semantic locality is a simple consequence of the direct compositional architecture.

Jacobson’s argument introduced above goes through, provided that the other-things-being-equal condition is upheld. To be sure, there have been apparent arguments for the surface-to-LF framework—and against direct compositionality—

based on type mismatch, the interaction of quantification and antecedent contained deletion, *wh*-questions, etc. I refer the reader to Jacobson's (2002/2012) rebuttals of the anti-direct compositionality arguments employing these. Instead, we consider the implications of bound morphemes and their behavior in section 3.

2.4 Morphology and compositionality

Close attention directed towards syntax-semantics mapping in terms of compositionality seen above has somehow evaded the domain of morphology-semantic mapping. There have, however, been some exceptions to the scarcity of formal/compositional (and/or Montagovian) research in morphology, among them we count Hoeksema (1985), Moortgat (1988a,b), and Stump (2001/2007/2009) covering Dutch, German, English, Latin, Swahili, Twi, and Sanskrit.

With respect to the semantics of bound morphemes in languages with polysynthetic morphology, Bittner (1994a,b) stands out as one rare attempt at offering a Montagovian compositional account. She outlines how the interaction of bound morphemes (e.g., negation) and other elements (e.g., a quantificational element) in Inuit can be captured. In fact, her attempt is much more ambitious to the extent that a universal semantic system called 'cross-linguistic semantics' (with six supposedly universal semantic rules) is envisaged.

Due to the fact that s-structure (or default/alternative LFs) is assumed to be the basis for 'interpreted LFs' in her system (i.e., another surface-to-LF approach), word-semantics takes a back seat to all the operations of syntax such as head movement, NP movement, and quantifier raising. This situation also holds for bound morphemes, and complex words exist as a consequence of word-building in syntax. In this way, there is no distinction between word-formation and syntax (a prevalent practice among contemporary transformational grammarians and distributed morphologists), rendering (Montagovian) semantics rather irrelevant for lexical word-formation or morphology per se—there is no morphology after all. In Bittner's system, then, compositionality is a pure byproduct of syntax to the extent that 'iconicity' (i.e., strict iconic correspondence, see below) between syntax (LF) and semantics is of at most importance.

This sort of approach is fine as long as s-structure or LF can properly determine and furnish all the relevant factors/aspects for compositional semantic interpretation.

However, as demonstrated in the rest of this paper, to the extent that this s-structure/LF centrality leads to empirical problems and the breakdown of syntax-semantics iconicity, cross-linguistic semantics may not be that attractive after all.

Morphology in Japanese also exhibits a shortage of compositional and/or formal semantic treatment. A notable exception is Bekki (2010a) who formally explicates morphological combinatory properties (morphotactics in particular) of numerous verbal bound morphemes. And then, the accompanying semantic effects of stem-morpheme combinations are documented explicitly. Bekki's coverage is impressively comprehensive encompassing an extensive list of morphemes. It catalogues simplex single stem to single morpheme combinations in piecemeal fashion and serves as the basis for further exploration of complex issues involving bound morphemes such as bracketing paradox.

Other explicit compositional semantic approaches to Japanese morphology (including the ones predating Bekki) are found in Fukushima (1998/1999/2004/2005/2014/in progress) who formally deals with morphology-semantics bracketing paradoxes of various sorts and semantic composition of argument structures exhibited by lexical V-V compounds. The case studies below draw on some of these.

3. Challenges to compositionality: morphological bracketing paradox

Dowty (2007: 28) states that natural language semantics is overwhelmingly compositional in a straightforward way. According to him, the real issue is, rather than whether it is so or not, "where exactly transparent compositionality stops (if it does) and how compositionality works from there on". One candidate that belongs to the domain beyond transparent compositionality is morphology-semantics bracketing paradox. In this section let us focus on bracketing paradoxes to examine their implications for proper characterization of compositionality in the domain of word-formation. Morphological challenges to compositionality in the general well-known domain are mentioned first. And then those found in Japanese are introduced next. Different accounts with syntactic and lexical orientations are introduced and examined in light of the facts given below.

3.1 Morpho-semantic bracketing paradoxes in general

Well-known cases of bracketing paradox are English expressions seen in (2). In the first example (2a), phonology requires *-ity* suffixation first due to a stress shift but the suffix, however, must be semantically wide scope. While two morphologically independent words are combined in (2b), *-ian* assumes wide scope. For (2c), though a phonological (mono-syllabicity) condition needs a right branching structure, the interpretation the comparative suffix *-er* necessitates left branching. The problem (2d) gives rise to is unique in that the supposed base *four leg* does not exist.

(2) a. ungrammaticality:

[un[grammaticality]] vs. [[ungrammatical]ity]

b. transformational grammarian:

[[transformational] [grammarian]] vs. [[transformational grammar]ian]

c. unhappier:

[un[happier]] vs. [[unhappi]er]

d. four legged (cf., *four leg):

[four [legged]] vs. [[four leg]ed]

Similar problems are found in other languages including Japanese (below). Pesetsky (1985) discusses Russian examples and examples in Breton are found in Stump (2001).

Solutions proposed for these cases are diverse and we find, among others, those drawing on Lexical Phonology (Kiparsky 1983), LF movement of morphemes (Pesetsky 1985), categorial grammar based on the Lambek calculus (Moortgat 1988a), and Paradigm Function Morphology (Stump 2001). Instead of going into the details, I simply refer an interested reader to these and the references therein (see also Spencer's (1991) overview and discussion regarding the subject matter).

3.2 Introducing bracketing paradoxes in Japanese morphology: A brief encounter

Let us witness the fact that Japanese is not exempted from bracketing paradox.

We do that by looking at two illustrative examples. The material in this subsection simply serves to illustrate the existence of such phenomena in the language and will not be the central focus of the current paper. Nevertheless, together with the two case studies introduced below, they demonstrate the extent and variety of bracketing paradox in the language. First, it is well-known that causative verbs with the suffix *-sase* gives rise to a bracketing paradox. The sequence *tabe-sase* ‘eat-cause’ is a single word morphologically (with morphological integrity)² and displays mono-clausal behavior as in (3a): the case marking pattern (*-ga*, *-ni*, *-o*) in a regular simplex sentence and refusing syntactic intrusion of a free-standing word (the adverb *isoide*). However, it also gives rise to ambiguities regarding adverbial modification as in (3b).

- (3) a. Taroo -ga Hanako -ni gohan-o tabe-(*isoide)-sase-ta.
 -NOM -DAT meal-ACC eat-quickly-CAUS-PAST
 ‘Taroo made Hanako eat a meal.’
 b. Taroo -ga Hanako -ni isoide gohan-o tabe-sase-ta.
 -NOM -DAT quickly meal-ACC eat-CAUS-PAST
 ‘Taroo made Hanako eat a meal—she did it (eating)—quickly.’
 ‘Taroo made Hanako eat a meal—he did it (making)—quickly.’

Given that *tabe-sase* is a single word, the pattern of adverbial modification is puzzling—morphology and semantics are in conflict. Though I do not get into the details here, the reader is referred to (more-or-less recent) syntactic accounts along the lines of Miyagawa (1999), Kuroda (2003), and Harley (2008) and lexical accounts like Manning et al. (1999) and Kubota (2007) for possible explanations for these facts. (See Yuhara (2008) for his detailed review and discussion of ‘clausality’ issues regarding complex predicates including causatives.)

Next, what is known as ‘suspended affixation’ (e.g., Kornfilt 2012) observed in coordination is another instance of morpho-semantic bracketing paradox. In conjunction with data like (4), Fukushima (1999/in progress) notes that verbal suffixes necessary for semantic interpretation can be absent from a surface string (note the continuative verbal morphology of the first conjunct). But the first conjunct

² This is the null hypothesis regarding the surface integrity of the verb-causative combination. There is nothing more needed to be said about the fact that the combination behaves as a single word.

sentence here is interpreted as if the missing morphemes are present. But if the suffixes are part of a verb, how can they extend their semantic effects beyond the second conjunct over to the first conjunct sentence? Again, morphology and semantics do not see eye to eye (for similar instances in Korean involving the past tense morpheme *-ess*, see Yoon 1994).

- (4) a. [_s Taroo-ga uta-i] (sosite) [_s Hanako -ga
 -NOM sing-CONT and -NOM
 odori-soodat-ta-daroo].
 dance-be.about.to-PAST-MIGHT
- (i) strict reading: ‘[Taroo might have been about to sing] and [Hanako might have been about to dance].’ (with aspect, tense, and modal recovered)
- (ii) sloppy reading: ‘[Taroo might have sung] and [Hanako might have been about to dance].’ (with tense and modal recovered)
- (iii) very sloppy reading: ‘[Taroo sang] and [Hanako might have been about to dance].’ (with only tense recovered)
- (iv) impossible reading: ‘[Taroo was about to sing] and [Hanako might have been about to dance].’ (with aspect and tense recovered)

One way to proceed is *semantically* recover the meanings of the missing morphemes and apply them to the first conjunct to obtain proper interpretations. While it is not surprising that the interpretation of the second conjunct sentence corresponds strictly to the surface arrangement of the morphemes, the range of (im)possible interpretations for the first conjunct turns out to be complex, in particular, as in the contrast between (iii) and (iv). Flexibility is observed but not every recovery is acceptable. This suggests that simple-minded account based on syntactic configuration and movement like right node raising assumed by Kornfilt (2012) alone would not do. (See Fukushima (1999/in progress) for a much wider range of morphemes displaying a perplexing array of interpretations and a formal semantic account for them.) Here getting into imaginable solutions for the problem and comparing them are not what is intended and the reader is referred to the sources cited above.

Among many other cases of morpho-semantic bracketing paradox, we will focus

on the following two sets of data as test cases in this paper: (i) the scope of the negative morpheme *-nai* ‘not’ as in *utawa-nai* ‘sing-not’ and (ii) the behavior of size-indicating morpheme *oo-/ko-* ‘big/small’ in the sized inalienable possession construction, e.g., *oo-guti-o akeru* ‘big-mouth open’. Though there are other instances of intriguing bracketing paradoxes in the language, (i) and (ii) are chosen specifically for their unique and intricate implications for the issues of compositionality and theoretical architecture—they point to the fact that approaches based on direct compositionality (section 2.3 above) is superior to those based on indirect compositionality represented by the surface-to-LF approach.

For semantic treatment of more or less straightforward but heavily agglutinative concatenative morphology per se, see Fukushima (in progress). His framework—Montagovian Morphology—is directly compositional in that each time morpheme attachment takes place in the lexicon there is a corresponding meaning assignment for the new lexical item. For example, a complex word like *odor-ase-hazimete-morawa-nakatta-daroo* ‘dance-causative-begin-benefactive-NEG-PAST-MIGHT’ gets translated strictly compositionally (i.e., morpheme by morpheme) as: $\lambda x \lambda y \lambda z. \text{MIGHT}(\neg \text{PAST}(\text{get-benef}(\text{begin}(\text{cause}(\text{odor}(x), y), z)))$ which gives rise to a proposition that ‘it might not have been the case that *z* benefitted by *y*’s beginning to bring about a situation where *x* danced’.

3.3 Case studies of compositionality in word-formation in Japanese

The examples taken up in this subsection are different from those seen in section 3.1 above. For those, the domain of paradox is that of a word (albeit complex) or at most a projection of a word, confining paradox resolution in an endocentric environment. The current data along with (3-4) above show more drastic paradoxical patterns. A bound morpheme extends its semantic effect(s) from within a single word into an exocentric domain encompassing the entire sentence. A word of caution before proceeding any further: due to illustrative conciseness, the exposition in the following sections is abridged both empirically and conceptually. The reader is asked to consult Fukushima (1998/1999/2004/2014/in progress) for factual/technical details regarding the phenomena and accounts for them.

Faced with such challenging bracketing paradoxes, a common response found in the literature is to fall back on the concept of (morpho)syntax-semantics ‘iconicity’. With regard to the concept of iconicity, Egg (2004: 120)—after examining various

bracketing paradoxes (mismatches) found in English and German—notes that “some conclude [...] that semantic structure reflects (and is iconic to) a not directly visible layer of syntactic structure like Logical Form. This layer may differ considerably from syntactic surface structure, but in this way the iconicity of syntax and semantics could be upheld”. (A careful reader can detect that this is what Jacobson (2002) calls ‘the surface to LF’ approach.) And the crucial notion for establishing this iconicity is ‘c-command’. In the case studies below, we contrast iconic and non-iconic accounts in light of further bracketing paradox data.

3.3.1 Case study 1: Scope of negation

The negative morpheme *-nai* figures in scope phenomena of various sorts. Here we focus on two types of negation, namely, (i) compositional and (ii) attributive, and examine their scope interaction with a negative polarity item (NPI) with *-sika* and quantificational NPs. The two types are shown in (5). The compositional type (5a) is familiar and straightforward. The attributive type (5b) is used for ascribing an attribute (the lack thereof) to people, things, and eventualities. The latter is not idiomatic and has an equally transparent affirmative counterpart (*mikomi-arui* ‘likelihood-exist’ which is not directly relevant here).

- (5) a. Taroo-ga utawa-nai. (compositional negation)
 -NOM sing-NEG.PRES
 ‘Taroo does not sing.’
 b. Ziroo-ga mikomi-nai. (attributive negation, i.e., attributive nominal
 + negation)
 -NOM likelihood-NEG.PRES
 ‘Ziroo is not promising.’

In the construction (5b), the attributive nominal *mikomi* forms a morphological unit with (i.e., not separable from) the negative morpheme and the construction is different from the one involving an additional nominative case marker where negation realizes as a free morpheme as in (6a).

- (6) a. Ziroo-ga mikomi-ga _____nai.
 -NOM likelihood-NEG NEG.PRES
 ‘Ziroo is not promising.’
- b. Mikomi-ga Ziroo -ga nai.
 likelihood-NOM -NOM NEG.PRES
 ‘=(a)’
- b'. *Mikomi Ziroo-ga -nai.
 likelihood -NOM NEG.PRES
 ‘(Int.) =(a)’
- c. Ziroo-wa [mikomi to funbetu]-ga nai.
 -TOP likelihood CONJ judgment-NOM NEG.PRES
 ‘Ziroo is not promising and is not/is judicious.’
- c'. *Ziroo-wa [mikomi to funbetu]-nai.
 -TOP likelihood CONJ judgment-NEG.PRES
 ‘(Int.) = (c)’

When the attributive nominal is scrambled as in (6b,b'), the case marker is obligatory. Also if attributive nominals (*mikomi* and *funbetu*) are to be coordinated, the presence of the nominative case marker is obligatory as the contrast between (6c) vs. (6c') shows. Thus the construction like (6a) is distinct from (5b) above and will not be pursued further in this paper.

Both types are compatible with NPI with *-sika* (7a,b) but only the compositional type is susceptible to quantifier scope ambiguity as (7c,d) demonstrate.³

³ A *wh*-indeterminate along with *-ka* ‘or’ gives rise to an existential (or *-mo* to a universal) GQ by default. An existential (not universal) GQ is employed here since a universal GQ and *-sika* seem to be pragmatically incompatible: **minna-sika* or **dare-mo-sika* ‘everyone-SIKA’ (cf., **only everyone* in English). Miyagawa (2001/2010) claims that a quantificational subject NP assumes wide scope over negation exclusively. This claim goes against an earlier observation by McGloin (1976) who points out that a quantificational NP (with the topic marker *-wa*) can be narrow scope with regard to negation. Also it has been contested by Fukushima (1998), Kataoka (2006), and Kishimoto (2007/2008) more recently. The demonstration in (i) is sufficient to show that both wide and narrow scope are possible with respect to a quantificational subject and negation. Here the sentence uttered after either scenario 1 or 2 is equally non-contradictory. Scenario 1 is preferred but it is simply a presupposition that can be canceled as in scenario 2. [N.B.: The nominalizer expresses colloquial confirmation.]

(i) Tumari, dare-ka(-kare-ka) utawa-nakat-ta (te-koto).
 therefore someone(-or another) sing-NEG-PAST TE-NOMINALIZER
 scenario 1: Of ten performers, three only danced. ‘Therefore, some did not sing.’

- (7) a. Taroo -sika utaw-anai/*uta-u.
 -SIKA sing-NEG.PRES/sing-PRES
 ‘Nobody but Taroo sings.’ (i.e., Taroo is the only one in the set of singers.)
- b. Ziroo -sika mikomi-nai/*-aru.
 -SIKA likelihood-NEG.PRES/exist.PRES
 ‘Nobody but Taroo is promising.’
- c. Dare-ka(-kare-ka) utawa-nai. (ambiguous)
 someone(-or another) sing-NEG-PAST
 ‘For someone, s/he does not sing.’
 ‘It is not the case that someone sings.’
- d. Dare-ka(-kare-ka) mikomi-nai. (unambiguous)
 someone(-or another) likelihood-NEG-PAST
 ‘For someone, s/he is not promising.’
 ≠ ‘It is not the case that someone is promising.’

What would an iconicity account with NegP say about these facts? Though there are many such accounts, e.g., Kato (1994/2000), Aoyagi & Ishii (1994), Tanaka (1997), Kataoka (2006), Kishimoto (2007/2008) inter alia, what is common to all of them is the fact that syntactic structure (most prominently c-command configuration) determines the outcome. We take Fukui & Takano’s (1998) (version 1) or Kishimoto’s (version 2) suppositions as representative clause cartography including NegP. In the former, already complex *utawa-nai* is moved to Neg and to T (+past) positions to ‘check off’ the features of the functional heads. For the latter, the verb *utaw* without the suffixes moves up to Neg and then to T picking up/acquiring functional features along the way to finally become *utawa-nai*. For either approach word-building is regulated by syntax.

(8) Syntactic cartography with NegP

version 1: [CP [TP [NegP [vP [VP Troo-ga utawa-nakat-ta] v] [Neg +neg]] [T +past]] C]

scenario 2: There were no performers to begin with. ‘Therefore, nobody sang.’

Miyagawa (2010) actually concedes that under sentence embedding, scope ambiguity in question is indeed observed. Given this, all the arguments developed below will hold at least in the embedded context even for Miyagawa.

version 2: [_{TP} Taroo-ga [_{TP} [_{NegP} [_{VP} (Obj) utawa] [_{Neg} -nakat]] [_T -ta]]]

The technical differences aside, the importance of these syntactic configurations is that it is used to state the distributional/licensing conditions (like c-command) in structural terms for scope-sensitive elements like NPIs. So [... [NPI] ... Neg] is needed for (7a,b), both [... GQ ... [Neg]] and [... [GQ] ... Neg] for (7c), and only [... GQ ... [Neg]] for (7d) (GQ stands for generalized quantifier). But this is a bit awkward since, given that a subject NP_{NPI} has to be narrow scope vis-à-vis negation for both compositional and attributive negation (7a,b), why shouldn't the subject GQ in attributive negation (7d) be narrow scope as well? After all, (7c) is scope ambiguous. (Of course, this line of observation is based on the assumption that the functional category NegP is involved for both types of negation, for the sake of NPI licensing.)

The situation becomes paradoxical when the subject NP_{NPI} is itself is a GQ as in (9). On the one hand, the subject GQs here have to out-scope negation since the existence of someone is entailed. On the other hand, however, they have to be in the scope of negation for NPI licensing *simultaneously*.

- (9) a. Dare-ka(-kare-ka)-sika utawa-nai. (cf., (7c))
 someone(-or another)-SIKA sing-NEG.PRES
 ‘Nobody but someone sings.’ (unambiguous; negation narrow scope)
- b. Dare-ka(-kare-ka)-sika mikomi-nai. (cf., (7d))
 someone(-or another)-SIKA likelihood-NEG-PAST
 ‘Nobody but someone is promising.’ (unambiguous; negation narrow scope)

Now, provided that negation is part of a word as dictated by morphological integrity and direct compositionality, how would it ever interact with other elements like NPIs and GQs in the sentence? We will begin with NPIs and see how that is accomplished. But before that I shall define explicitly what counts as ‘negative’ semantically.

The key concept here is Modus Tollens (see Fauconnier, 1979, Ladusaw 1980, and Hoeksema, 2000) which is a term for entailment reversal: In the same situation, given *John is a Texan* → *John is an American* (affirmative), we get *John is not an*

American $\rightarrow$ *John is not a Texan* (negative). As we see, negation allows you to move from a superset to a subset and the same can be said about the two types of negation above, e.g., *Taroo-ga zyoozuni odoru* ‘Taroo dances well’ $\rightarrow$ *Taroo-ga odoru* ‘Taroo dances’ (affirmative) but *Taroo-ga odorar-nai* ‘Taroo does not dance’ $\rightarrow$ *Taroo-ga zyoozuni odora-nai* ‘Taroo does not dance well’ (negative; likewise for attributive negation). The concept figures in below as a function *Polarity* that checks the polarity of a predicate and returns ‘0’ if negative, ‘1’ otherwise.

Compositional negation (5a) with a regular subject is simple. The predicate *utaw*: $\lambda x.\textit{sing}(x)$ is lexically combined with the negative morpheme *-nai*: $\lambda P\lambda x.\neg P(x)$, resulting in $\lambda x.\neg\textit{sing}(x)$. With the subject *Taroo*: *taroo* brought in subsequently, the translation of the sentence comes about as $\neg\textit{sing}(\textit{taroo})$. The important point is that when the first two basic morphemes are combined into one, the meaning of the entire expression is calculated in accordance with the direct compositionality assumption. (Here we treat a name as a simple individual of type ‘*e*’ not as a GQ. Hereafter, tense and intentionality are ignored and semantic translations are shown without either intermediate conversion steps or applicable truth conditions. Also, when possible, examples are limited to one-place predicates for simplicity.)

The NPI marker *-sika* is given the (basic) translation (10a) and, when combined with an individual like *Taroo*, it yields a GQ (10b) looking for a VP meaning. (10b) says that Taroo is the only person who does not have a property corresponding to *P*. But, due to the lexical condition, $\textit{Polarity}(P) = 0$ (i.e., *P* being negative), after it combines with a negative predicate like *utawa-nai* ($\lambda P\lambda x.\neg P(x)$) as in (10c), Taroo becomes the only person who sings (due to double negation) completing the interpretation for (10a) above. In this way, it is not negation that licenses NP-*sika*; it is NP-*sika* (a GQ) that requires a negative predicate as its argument. In this way *-sika* is a polarity flipping exception marker.⁴

- (10) a. *-sika*_{basic}: $\lambda x\lambda P.\neg P(x) \ \& \ \forall y(y \neq x \rightarrow P(y))$ [where $\textit{Polarity}(P) = 0$]
 b. *Taroo-sika*: $\lambda P.\neg P(\textit{taroo}) \ \& \ \forall y(y \neq \textit{taroo} \rightarrow P(y))$
 c. *Taroo-sika utawa-nai* ‘Nobody but Taroo sings’ (= (7a)):

⁴ Semantic translation is accomplished via Type-driven Translation of Klein & Sag (1985) according to which the meaning of a syntactic constituent is calculated automatically based on the translations of its components taking advantage of the functor and argument relationship between them.

$$\neg \text{sing}'(\text{taroo}) \ \& \ \forall y(y \neq \text{taroo} \rightarrow \neg \text{sing}'(y))$$

Let us turn to attributive negation in (7b) the negative morpheme of which is translated as in (11a). This looks for a one-place predicate argument P corresponding to an attributive nominal like *mikomi*: $\lambda x.\text{likelihood}'(x)$ —positive likelihood—and gives rise to (11b). After tying in the subject *Ziroo*, the translation for the sentence (11c) says that there is no likelihood such that Ziroo is attributed with it, i.e., Ziroo is not promising.

- (11) a. attributive *-nai*: $\lambda P\lambda x.\neg\exists y(P(y) \ \& \ \text{attributed.with}'(y)(x))$ [TYPE(P)=
 $\langle e,t \rangle$]
 b. *mikomi-nai*: $\lambda x.\neg\exists y(\text{likelihood}'(y) \ \& \ \text{attributed.with}'(y)(x))$
 c. *Ziroo-ga mikomi-nai* ‘Ziroo is not promising’ (= (5b)):
 $\neg\exists y(\text{likelihood}'(y) \ \& \ \text{attributed.with}'(y)(\text{ziroo}))$
 d. *Ziroo-sika mikomi-nai* ‘Nobody but Ziroo is promising’ (= (7b)):
 $\neg\exists y(\text{likelihood}'(y) \ \& \ \text{attributed.with}'(y)(\text{ziroo})) \ \& \ \forall z(z \neq \text{ziroo} \rightarrow \neg\exists y(\text{likelihood}'(y) \ \& \ \text{attributed.with}'(y)(z)))$

It is not difficult to see how the translation for (7b) is obtained with NPI *Ziroo-sika*. Since the attributive negative predicate (11b) satisfies $\text{Polarity}(P) = 0$, it will be a legitimate semantic argument of *Ziroo-sika* (almost identical to (10b)) generating (11d) with the polarity flipping effect, which says that there is likelihood attributed to Ziroo and there is no such likelihood for anybody who is not Ziroo, i.e., Ziroo is the only person who is promising.

Next, let us see how negation and quantification give rise to ambiguity for compositional negation but not for attributive negation. First of all, the attributive type and a GQ do not interact with each other as (7d) shows. This is due to the fact that the complex attributive negative morpheme *-nai* in (11a,b)—not being a simplex negation operator ‘ $\neg$ ’—comes with negation already tied into the innermost position the formula making the operator inaccessible/irrelevant for a further lexical manipulation. This renders negation exclusively narrow scope for (7d) as the translation in (12) shows.

$$(12) \exists x(\text{person}'(x) \ \& \ \neg \exists y(\text{likelihood}'(y) \ \& \ \text{attributed.with}'(y)(x)))$$

The mechanism for negation-GQ interaction for the compositional type (7c) is the following. Lexical attachment of simplex negative operator (in sync with morphology) can take place before or after a lexical type-raising operation affecting a predicate (called ‘argument raising’ found in Hendriks (1987/1993) with which a technically inclined reader is invited to consult). The rule lifts the type of an argument of a predicate like *utaw* from the individual type (*e*) to the GQ type ($\langle\langle e, t \rangle, t \rangle$).⁵ Depending on the order of application, this can change the scope properties of the type-raised argument with regard to other elements (like other quantificational arguments and negation) in the sentence to be constructed employing the predicate. With the lifting rule, we obtain two lexical entries for the verb *utawa-nai* as shown in (13a,b). After the predicates in (13a) and (13b) combine with the subject GQ $\exists x(\text{person}'(x) \ \& \ P(x))$, respectively, the two distinct readings are

⁵ This rule is a standard tool for direct compositionality as endorsed by Barker and Jacobson (2007) and Jacobson (2002/2012). With the help of the lifting rule, for example, we can account for scope ambiguity of the sentence like (ia) without syntactic operations like quantifier movement. If argument raising begins with the object as in (ib), then the subject ends up being wide scope. With the rule affecting the subject first as in (ic), the object comes out wide scope.

(i) a. *Everyone loves someone.*

b. Subject wide scope with *loves*₁: $\lambda y \lambda x. \text{love}'(x)(y) \Rightarrow \lambda T_1 \lambda T_2. T_2 (\lambda y_1. T_1(\lambda x_1. \text{love}'(x_1)(y_1)))$
loves someone:

$\lambda T_1 T_2. T_2(\lambda y_1. T_1(\lambda x_1. \text{love}'(x_1)(y_1)))(\lambda P. \exists x(\text{person}'(x) \ \& \ P(x)))$

reduction:

$\lambda T_2. T_2(\lambda y_1. \exists x(\text{person}'(x) \ \& \ \text{love}'(x)(y_1)))$

Everyone loves someone:

$\lambda T_2. T_2(\lambda y_1. \exists x(\text{person}'(x) \ \& \ \text{love}'(x)(y_1)))(\lambda P. \forall y(\text{person}'(y) \rightarrow P(y)))$

reduction:

$\forall y(\text{person}'(y) \rightarrow \exists x(\text{person}'(x) \ \& \ \text{love}'(x)(y)))$

c. Object wide scope with *loves*₂: $\lambda y \lambda x. \text{love}'(x)(y) \Rightarrow \lambda T_1 \lambda T_2. T_1(\lambda x_1. (T_2(\lambda y_1. \text{love}'(x_1)(y_1))))$
loves someone:

$\lambda T_1 \lambda T_2. T_1(\lambda x_1. (T_2(\lambda y_1. \text{love}'(x_1)(y_1))))(\lambda P. \exists x(\text{person}'(x) \ \& \ P(x)))$

reduction:

$\lambda T_2. \exists x(\text{person}'(x) \ \& \ (T_2(\lambda y_1. \text{love}'(x)(y_1))))$

Everyone loves someone:

$\lambda T_2. \exists x(\text{person}'(x) \ \& \ (T_2(\lambda y_1. \text{love}'(x)(y_1))))(\lambda P. \forall y(\text{person}'(y) \rightarrow P(y)))$

reduction:

$\exists x(\text{person}'(x) \ \& \ (\forall y(\text{person}'(y) \rightarrow \text{love}'(x)(y))))$

generated for (7c). ('*T*' stands for a GQ.)

- (13) a. Narrow scope negation for (7c)

utau_{basic}: $\lambda y.\text{sing}'(y)$

utawa-nai (pre-type raising negation): $\lambda x.\neg\text{sing}'(x)$

(or with subsequent type raising of the subject argument $\lambda T.T(\lambda x.\neg\text{sing}'(x))$; [TYPE(*T*)= << *e*, *t* >, *t* >])

$\exists x(\text{person}'(x) \ \& \ \neg\text{sing}'(x))$

- b. Wide scope negation for (7c)

utau_{raised}: $\lambda T.T(\lambda x.\text{sing}'(x))$

utawa-nai (post-type-raising negation): $\lambda T.\neg T(\lambda x.\text{sing}'(x))$

$\neg \exists x(\text{person}'(x) \ \& \ \text{sing}'(x))$

Finally, why is the subject GQ-*sika* in (9a) scope unambiguous vis-à-vis negation even in the context of compositional negation? This is particularly perplexing given the fact that the non-NPI GQ in (7c) gives rise to such ambiguity as demonstrated in (13) above. After all (9b) is not surprising since we already know from the exposition above, that negation of the attributive type is insensitive to (or inconsequential even if it is evoked by) a further lexical process like type-raising. So the same story for (12) can be retold here, mutates mutandis, yielding (14a) for attributive negation.

- (14) a. $\exists x(\text{person}'(x) \ \& \ \neg \exists y(\text{likelihood}'(y) \ \& \ \text{attributed.with}'(y)(x) \ \& \ \forall z(z \neq x \rightarrow \neg \exists y(\text{likelihood}'(y) \ \& \ \text{attributed.with}'(y)(z))))))$

$\forall z(z \neq x \rightarrow \neg \exists y(\text{likelihood}'(y) \ \& \ \text{attributed.with}'(y)(z))))$

- b. pre-lifting negation with $\lambda T.T(\lambda x.\neg\text{sing}'(x))$ [negation narrow scope]

-sika_{raised}: $\lambda T\lambda P.(T(\lambda x.\neg P(x) \ \& \ \forall z(z \neq x \rightarrow P(z))))$

[N.B.: This is a functor that combines with a GQ and reruns a GQ with the addition of the NPI properties; *Polarity*(*P*) = 0]

dare-ka(-kare-ka)-sika: $\lambda P.\exists x(\text{person}'(x) \ \& \ \neg P(x) \ \& \ \forall z(z=x \rightarrow P(z)))$

intermediate step in derivation:

$\lambda P.\exists x(\text{person}'(x) \ \& \ \neg P(x) \ \& \ \forall y(y \neq x \rightarrow P(y)))(\lambda x.\neg \text{sing}'(x))$

[*Polarity*(*P*)=0 in accord with the property of *-siak*]

- $\exists x(\text{person}'(x) \ \& \ \neg \text{sing}'(x) \ \& \ \forall y(y \neq x \rightarrow \neg \text{sing}'(y)))$
- c. post-lifting negation with $\lambda T. \neg T(\lambda x. \text{sing}'(x))$ [negation wide scope]
 intermediate step in derivation:
 $\neg \lambda P. \exists x(\text{person}'(x) \ \& \ \neg P(x) \ \& \ \forall y(y \neq x \rightarrow P(y))) (\lambda x. \underline{\text{sing}'(x)})$
 $[Polarity(P) = 1 \text{ violating the property of } -\text{siak}]$

In contrast, the following is the reason why (9a) is unambiguous with its only translation being the final line of (14b). It is true that provided with the dynamic word-formation scenario (see (13)), negation in *utawa-nai* can be either narrow or wide scope as in the first lines of (14b,c), respectively. When the negative predicate combines with the subject GQ-*sika* in (9a), the translation employing (14b) comes out legitimate because the lexical condition $Polarity(P)=0$ is observed. However, the condition is violated by (14c) in the intermediate step—the underlined portion (i.e., the argument replacing the variable P) is not negative, i.e., $Polarity(P)=1$.

Summarizing the first case study, we note that the key is accurately identifying the relevant properties of different types of negation (compositional vs. attributive) as well as those of the NPI, and give them appropriate lexical definitions reflecting the differences. The meanings of lexical items and that of the sentence constructed with them are calculated as a by-product of simply putting the morphemes/words together in a straight compositional way. On the other hand, treating negation uniformly with a syntactic cartographic perspective employing NegP turns out to miss the generalizations arising from the lexical differences attributed to the opposition between compositional vs. attributive negation.

3.3.2 Case study 2: Sized inalienable possession

Let us move onto the next phenomenon in (15) called the sized inalienable possession (SIP) construction displaying yet a different type of bracketing paradox. (Fukushima (2004/2014/in progress) offers detailed empirical description and a compositional formal account for the construction.)

- (15) a. Taroo-ga $[_{NP} [_N \text{ ko-kubi}]-o]$ kasige-ta.
 Taroo-NOM small-neck-ACC tilt-PAST

(morphological bracketing)

‘Taroo tilted his neck slightly.’

≠ ‘Taroo tilted his small neck.’

- b. #Taroo-ga ookiku [NP [N ko-kubi]-o] kasige-ta.
 Taroo-NOM in.a.large.motion small-neck-ACC tilt-PAST
- c. [S Taroo-ga [VP ko [VP kubi-o kasige-ta.]]] (semantic bracketing)

Though the NP *ko-kubi* ‘small-neck’ in (15a) is a single word morphologically, the size-indicating prefix *ko-* modifies the verb *kasige-ta* ‘tilted’ outside the NP rather than the head noun *kubi*. Example (15b) is thus nonsense due to the semantic incompatibility between the two adverbial modifiers. In fact, (15a) does not at all entail that Taroo’s neck is small. Rather *ko-kubi* here simply refers to the neck of the inalienable possessor Taroo regardless of the size. The proper semantics for (15a) would be informally like (15c) contradicting the morphological combination. (Though it may be a bit misleading, I keep ‘small’ and ‘big’ as the glosses for the size-indicating morphemes *ko-* and *oo-*, respectively, for the ease of identification.)

Other items showing the same behavior are the following (non-exhaustive): *oo-guti-o ake-ru* ‘open one’s mouth widely’ but not ‘open one’s big mouth’, *oo-de-o hur-u* ‘swing one’s arms in a large motion’ but not ‘swing one’s big arms’ (complement SIP), *oo-asi-de aruk-u* ‘walk with a big motion of legs’ but not ‘walk with big legs’, *ko-waki-ni kaka-e-ru* ‘hold (something) under (one’s) arm lightly’ but not ‘hold (something) under (one’s) small arm’ (adjunct SIP), *ko-bara-ga suk-u* ‘get hungry slightly’ but not ‘someone’s small stomach becomes empty’, *ko-te-ga kik-u* ‘(someone’s) hand is dexterous to a small degree’ but not ‘(someone’s) small hand is dexterous’ (subject SIP).

In this second case study we first examine why we need a compositional approach to SIP data. After all, if SIP turns out to be idiomatic (‘illogical’ according to Kindaichi (1957), the first reference to the phenomenon in print), we need not worry about a general compositional characterization of it. Then an approach based on the tenets of direct compositionality and morphological integrity is outlined and compared with approaches based on syntax-semantics iconicity embodying indirect compositionality. Superiority of the former is demonstrated—it not only solves the bracketing paradox but also can accommodate problematic data for iconicity-based accounts.

To begin with disunity is observed between SIP and regular idioms in the following four respects. First of all, SIP expressions retain the core literal meaning of the head inalienable nominal. *Ko-kubi*, for example, retains its core meaning ‘neck’ but idioms do not.

Second, the interpretation of an SIP sentence is accomplished compositionally with the size indicating morpheme *ko-/oo-* participating (albeit unusually) as a semantically transparent predicate modifier.

Third, more significantly, the contrast between (16) on one hand and (17b) on the other hand renders the difference between SIP and idioms incontrovertible. We note that, for example in (16a), semantic relationship between *ko-waki* ‘small-under.arm’ and its verbal partner *kakae* ‘hold’ remains the same with or without coordination, i.e., *ko-* functions as adverbial in (16a) just as in (15) above. We note that, while the SIP expression is the second conjunct NP here, it exerts its unusual adverbial modification outside of the NP. However, the adverbial modification is limited to Taroo’s act of holding books under his arm proper, and does not extend over to his act of holding books in both hands (a very important point to which we will come back soon).

- (16) a. Taroo -ga [_{ADV} ryoo-te to ko-waki-ni] hon-o kakae-ta.
 -NOM both-hand and small-under.arm-at book-ACC hold-PAST
 ‘Taroo [held some books with both hands] and [held others under his arm lightly].’
 ≠ ‘Taroo [held some books with both hands lightly] and [held others under his arm lightly].’
- b. Hanako -ga [_{ADV} hadasi ka oo-mata-de] arui-ta.
 -NOM bare.foot or big-groin-by walk-PAST
 ‘Hanako [walked bare foot] or [walked with a big motion of legs].’
 ≠ ‘Hanako [walked with a big motion of bare feet] or [walked with a big motion of legs].’
- c. Ziroo -ga [_{NP} ryoo-me to oo-guti-o] ake-ta.
 -NOM both-eyes and big-mouth-ACC open-PAST
 ‘Taroo [opened his eyes] and [widely opened his mouth].’
 ≠ ‘Taroo [widely opened his eyes] and [widely opened his mouth].’

(16b) is another example to demonstrate the same point. As in (16a) *oo-* in the second disjunct retains its adverbial interpretation just as above which does not extend over to the combination of the verb and the first conjunct. As seen in (16c), an SIP complement can also be coordinated with a regular complement.

If an SIP expression were part of an idiom, then we would expect that other regular idioms to remain idiomatic within the context of coordination. This expectation is not supported. In (17a) is the expression *asi-o hippar* ‘pull (one’s) leg’ which can be construed either literally or idiomatically in the absence of coordination. However, as (17b) shows, the expression in question does not at all retain an idiomatic meaning within the context of coordination. SIP is not idiomatic.

- (17) a. Taroo -ga Ziroom -no asi-o hippat-ta.
 -NOM -GEN leg-ACC pull-PAST
 ‘(Lit.) Taroo pulled Ziroom’s leg.’
 ‘(Idiom) Taroo derailed Ziroom’s effort.’ (No body part is needed.)
- (b) Taroo -ga Ziroom -no [_{NP} te to asi-o] hippat-ta.
 -NOM Ziroom -GEN arm and leg-ACC pull-PAST
 ‘(Lit.) Taroo pulled Ziroom’s arm and leg.’
 ≠ ‘(Idiom) Taroo pulled Ziroom’s arm and derailed Ziroom’s effort.’

Fourth, passives offer further evidence to separate SIP from idioms. The SIP expression *ko-te-o kazas* ‘raise one’s hand slightly (in a sheltering motion)’ introduced above retains the same meaning in active and passive sentences as seen in (18a,a’). However, the idiomatic expression *te-o yaku* ‘struggle with’ loses its idiomatic meaning when appearing in a passive sentence shown by the contrast (18b) vs. (18b’).

- (18) a. Hanako-ga ko-te-o kazasi-ta.
 Hanako-NOM small-hand-ACC raise-PAST
 ‘Hanako raised her hand slightly (in a sheltering motion).’
- a’. Ko-te-ga kazas-are-ta.
 small-hand-NOM raise-PASS-PAST
 ‘(Her) hand was raised slightly (in a sheltering motion)’

- b. Ziroo-ga konro-de/syukudai-de te-o yai-ta.
 Ziroo-NOM stove-with/homework-with hand-ACC burn-PAST
 ‘(Lit.) Ziroo burned his hand with a stove.’ [i.e. selecting *konro-de*]
 ‘(Idiom) Ziroo struggled with homework.’ [i.e. selecting *syukudai-de*]
- b'. Te-ga konro-de/#syukudai-de yak-are-ta.
 hand-NOM stove-with/homework-with burn-PASS-PAST
 ‘(Lit.) (His) hand was burned with a stove.’
 ≠ ‘(Idiom) (He) struggled with homework.’

The contrasts (16) vs. (17b) and between (18a,a') and (18b,b') here highlight the disunity between SIP and idioms—the former participate productively in a regular syntactic process (e.g., coordination and passives). A proper account for the SIP construction needs to accommodate, among other things, at least the peculiar exocentric adverbial modification pattern (i.e., the instigator of morpho-semantic bracketing paradox) resulting in fairly literal, systematic, and compositional semantic interpretation.

Let us see the implications of such extraordinary adverbial modification for different methods of handling bracketing paradox. It may not come as a surprise that syntax-semantics iconicity permeates this domain as well. Among a few existing accounts for SIP, we count Kitagawa (1986) and Morita (2003) both of which is syntactically oriented.⁶

Kitagawa (1986) takes advantage of LF (i.e., invisible) movement of morphemes along the lines of Pesetsky (1985) according to which the size indicating morpheme *ko-in* (15a) is detached from the head noun and adjoined to a VP as described in (19).

(19) LF movement of *ko*-and adjunction to VP

[_S Taroo-ga [_{VP} ko_i [_{VP} [_{NP} [_N *t_i* -kubi-o]] kasige-ta]]]

This is a simple and attractive solution that apparently accommodates both

⁶ Bekki (2010b) is another possible account. As far as its semantic side is concerned, though limited in empirical scope, his idea is compatible with, and is a variant of, Fukushima (2004/2014) from which this section draws.

surface (PF) word-hood of SIP expressions at least superficially and the need for adverbial modification external to the expressions. However, there are problems. We focus on one crucial piece of evidence here, namely, (16) above where SIP participates in coordination (see Fukushima (2014/in progress) for an in-depth review of Kitagawa's account). We take (16c) involving an SIP complement as a representative example for the sake of simplicity of exposition which will have to be analyzed as indicated in (20), according to Kitagawa.

(20) [_S Taroo-ga [_{VP} oo_i [_{VP} [_{NP} ryoo-me to *t_i* -guti]-o ake-ta]]]]

Given such an analysis, first, we note that an unavailable reading will be ascribed to the data like (16c) in such a way that the size-indicating prefix *oo-* would end up taking scope over both conjuncts (plus the verb). This erroneously predicts that not just Taroo's mouth but also his eyes were opened widely as well.

Second, such LF movement would violate the Coordinate Structure Constraint (CSC) that is to hold in LF, too.

This means that one of the following two situations holds for Kitagawa's theory. (i) When the CSC is adhered to, no adverbial interpretation will be available. Or (ii) with the CSC being irrelevant, the unavailable reading is predicted to arise for (16) —a paradox.

Next, let us have a look at yet another syntactic account without movement, namely, that of Morita (2003). Morita considers that the size-indicating morphemes are an 'aspectual delimiter' which renders a host predicate in the SIP construction telic with a help of a base-generated 'restrictive (atelic → telic) operator (*Op*)'. Her analysis for a simple case like (15) is formulated along the lines of (21a) where *Op* is co-indexed with the prefix *ko-*. The interpretation obtained would be something like: 'Taroo performed an aspectually delimited act of tilting his head', though the equation between 'aspectual delimitation' and manner adverbial modification is neither perspicuous nor convincing.

- (21) a. [_S Taroo-ga [_{VP} [_{NP} [_N ko_r-kubi-o]] [_{Op_i} kasige-ta]]]
 b. [_S Taroo-ga [_{VP} [_{NP} ryoo-me to oo_i-guti]-o [_{Op_i} ake-ta]]]]

Just as for the movement approach above, there are problems for this

co-indexation account (again see Fukushima (2014/in progress) for a detailed review of Morita's approach). First, examples like (16) are problematic for Morita as well due to the fact that *Op* ends up restricting the verbs *kakae-ta*, *arui-ta*, and *ake-ta* once and for all just as in (21a) above. (21b) is a Morita-style analysis for (16c). Since the verb is delimited, the analysis incorrectly predicts that the size-indicating prefix indirectly exerts its adverbial modification not only over the act of opening his mouth (correctly) but also over the act of opening his eyes (incorrectly).

Second, the alleged telic reading for a host verb is epiphenomenal. This is shown in (22) with an activity verb where—despite the fact that the unusual adverbial modification obtains—the event described is not telic/delimited.

- (22) Taroo-ga san-pun-kan ko-waki-ni hon-o
 Taroo-NOM three-minute-duration small-under.arm-at book-ACC
 kakae-ta.
 hold-PAST
 'Taroo lightly held a book under his arm FOR THREE MINUTES.'

Now I demonstrate a directly compositional account of SIP that avoids the pitfalls experienced by the syntactic accounts. Due to the fact that the syntax of SIP is relevant only for assembling words together reflecting the surface word order and no significant syntactic innovation is intended here, I forgo a detailed explanation of it. It suffices to point out that the local dependency/compatibility between an SIP expression and its host verb is guaranteed by a mechanism to regulate feature co-occurrence (see Fukushima (2014/in progress)). Instead, the semantic (albeit simplified) of SIP is the main focus here.

Let us begin with (15a) whose constituents and their translations are given in (23a). The verb *kasige* translates as a two-place predicate with two GQ arguments. *Taroo* is a GQ. Importantly, *ko-kubi* is translated as a special GQ which already internalizes the unusual adverbial modifier *ko-* lexically. (See Fukushima's (2004) description for how this happens compositionally from the combination of *ko-* and *kubi* along with the truth conditions for key example.) The type of the morpheme is that of a one-place predicate modifier (more specifically, a VP meaning modifier). In this way, *ko-kubi* does not mean 'small neck' since *ko-* is not a nominal modifier. In (23b) is a step by step translation for the entire sentence. SIP adverbs seen in

(16a,b) are treated basically the same way as far as the semantics of the size-indicating morphemes goes. (The exposition here eschews a more complex characterization of inalienable body parts. See Fukushima (2004))

- (23) a. Translations for the constituents of (15a)

kasige-ta ‘tilted’: $\lambda T_1 \lambda T_2. T_2(\lambda y. T_1(\lambda x. \mathbf{kasigeta}'(x)(y)))$

ko-kubi-o ‘small-neck’: $\lambda Q. \mathbf{ko}'Q(kubi)$

Taroo-ga: $\lambda P. P(taroo)$

- b. Translation for (15a)

ko-kubi-o kasige-ta:

$\lambda T_1 \lambda T_2. T_2(\lambda y. T_1(\lambda x. \mathbf{kasigeta}'(x)(y)))(\lambda Q. \mathbf{ko}'Q(kubi))$

reduction:

$\lambda T_2. T_2(\lambda y. \mathbf{ko}'\mathbf{kasigeta}'(kubi)(y))$

Taroo-ga ko-kubi-o kasige-ta:

$\lambda T_2. T_2(\lambda y. \mathbf{ko}'\mathbf{kasigeta}'(kubi)(y))(\lambda P. P(taroo))$

reduction:

$\mathbf{ko}'\mathbf{kasigeta}'(kubi)(taroo)$

[N.B.: $\text{TYPE}(\mathbf{ko}') = \langle\langle e, t \rangle, \langle e, t \rangle\rangle$; $\text{TYPE}(\mathbf{kasigeta}') = \langle e, \langle e, t \rangle \rangle$.]

We are ready to deal with the coordination examples (16) taking here (16c) with a conjoined SIP complement as our example. The constituents of (16c) are listed in (24a). As in (24b), coordination of the complements takes place first. Second, the verb *ake-ta* takes the conjoined complement. Finally, with the subject *Ziroo* combined in, the interpretation for the entire sentence is obtained.

- (24) a. Translations for the constituents of (16c)

ake-ta ‘opened’: $\lambda T_1 \lambda T_2. T_2(\lambda y. T_1(\lambda x. \mathbf{aketa}'(x)(y)))$

ryoo-me ‘both-eyes’: $\lambda Q. Q(ryoome)$

oo-guti ‘big-mouth’: $\lambda Q. \mathbf{oo}'Q(kuti)$ [*kuti* $\rightarrow$ *guti* with sequential voicing]

Taroo-ga: $\lambda P. P(taroo)$

- b. Translation for (16c)

ryoo-me to oo-guti-o (coordination of two NPs):

$\lambda Q.Q(ryoome) \ \& \ oo'Q(kuti)$

ryoo-me to oo-guti-o ake-ta:

$\lambda T_1 \lambda T_2.T_2(\lambda y.T_1(\lambda x.(aketa'(x))(y)))(\lambda Q.Q(ryoome) \ \& \ oo'Q(kuti))$

reduction:

$\lambda T_2.T_2(\lambda y.(aketa'(ryoome)(y) \ \& \ oo'aketa'(kuti)(y)))$

Taroo-ga ryoo-me to oo-guti-o ake-ta:

$\lambda T_2.T_2(\lambda y.(aketa'(ryoome)(y) \ \& \ oo'aketa'(kuti)(y)))(\lambda P.P(taroo))$

reduction:

aketa'(ryoome)(taroo) & **oo'aketa'**(kuti)(taroo)

[N.B.: TYPE(**oo'**) = $\langle\langle e,t \rangle, \langle e,t \rangle \rangle$; TYPE(**aketa'**) = $\langle e, \langle e,t \rangle \rangle$.]

The important aspect of the analyses above is that the unusual adverbial modification is *localized* to an SIP lexical item and do not ‘spill’ out of it. This is made possible due to the standard assumption in semantics that an NP is a GQ that is a functor looking for a VP meaning as an argument. (Or, in the case of adverbial SIP like *ko-waki-ni* or *oo-mata-de*, they are an endocentric modifier, again, a functor that combines with a VP meaning and returns a new VP meaning.) Since the scope of the size-indicating prefixes is not affected one way or another, the semantic analyses do not suffer from shortcomings experienced by Kitagawa and Morita with respect to coordination in particular. Just as in case study 1 above, we witness the importance of explicit lexical specification of the key properties of SIP. The specification, then, is reflected in the meaning of lexical items and eventually in the compositional interpretation of the whole sentence.

4 Implications, discussion, and concluding remarks

It has been shown that the two types of morpho-semantic bracketing paradoxes can be resolved based on their surface morphological structures *as is*. They do not constitute an obstacle for direct compositionality at all, provided that we think creatively and appeal to diverse resources/tools independently available in linguistics.

Moreover, the direct compositional approaches are arguably superior to syntactic ones as far as the domains of the two case studies are concerned.

Though the current claim is not that every aspect of morpho-semantic mapping can be handled strictly compositionally (see Hoeksema & Janda (1988), Bach (2005), and Stump (2001/2007/2009) for non-concatenative morphology and their implications for compositional approaches), there is a lesson to be learned from this. When faced with scope phenomena of any sort, there seems to be a stereotypical reaction amongst some (particularly syntacto-centric) linguists to uncritically appeal to the notion of syntax-semantic iconicity or surface-to-LF strategies. This trend penetrates the domain of morphology as well and, when there is a slight hint of structural complexity concerning a simple or complex word, an analysis is formulated in syntactic terms. This situation is called ‘syntax-all-the-way-down’ by Spencer (2005). Followers of this line of thought frame bracketing paradox or, more generally, the debate regarding lexicalism as merely the matter of opposition between simple minded morphology (lexicon) on one hand and syntax on the other (e.g., Kuroda 2003), concluding prematurely that a lexicalist approach to morpho-syntax inevitably suffers from unresolvable bracketing paradoxes.

This is too simplistic and hardly a well-balanced conception of the issue. Where did semantics go, for instance? Though there is no denying that syntactic structure is the basis for semantic composition (the position upheld by the current paper as well), semantics is not a mere byproduct of syntax—it has life of its own. After all, alleged structural complexities are detected in terms of semantic interpretation, hinting at a possible semantic origin of such complexities. Unfortunately, (formal) semantically oriented approaches to bracketing paradox are often overlooked by the advocates of syntactic (or even lexicalist) approaches. As noted by Spencer (2005), if morphological phenomena (including bracketing paradox) do not command full linguistic (not just syntactic) attention, independent morphological principles will never be hypothesized, seriously impeding progress in the field. In the current context, this means that the semantically-oriented generalizations regarding the morpho-semantic bracketing paradoxes seen above and the related empirical and conceptual issues could have been overlooked. According to this paper, one way to avoid such an unfavorable state of affairs is critically scrutinizing the validity of syntax-semantics iconicity employed for problems in a morphological domain. The concept has been shown to be neither a necessary nor sufficient condition for

compositional semantic interpretation.

Finally, the exposition in section 3.3 is relevant to an influential attempts to capture flexibility in accessing the internal information of a lexical item. To this end, Kageyama (1993/2009) introduces a new word category ‘W+’, encompassing full-fledged words that show neither intrusion of phrasal and functional categories nor syntactic deformation. Unlike more conservative regular word-level elements, however, words belonging to this category allow syntactic ‘visibility’ into their internal makeup. Actually, as pointed above, the effect of this transparency is manifested not simply via syntax but rather reflected and detected in semantics ultimately. Though the possibility of dividing lexical words into two different categories—lexical-level and W+-level—is worthy of investigation, the factors and mechanisms that give rise to the latter remain unclear at the moment. According to this paper, possible candidates for such factors/mechanisms are the standard formal semantic apparatus (e.g., the properties of GQs and endocentric modification) and semantic rules (e.g., type-sifting operations) that collectively and systematically generate (what we might call) ‘super lexical words’ like *ko-kubi* which seem to comfortably fit the profile of W+ supposed by Kageyama.

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