LOCATIVE MORPHEMES IN WORD-FORMATION: A COMPARISON BETWEEN ENGLISH AND JAPANESE

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1. Introduction

In the current generative literature on spatial PPs (Prepositional Phrases), two types of adpositions – functional and lexical adpositions – are distinguished (Cinque, 2010). Lexical adpositions are complex in form and meaning, each comprising a functional preposition and a specialized locative morpheme that translates roughly into words like "front", "under", "top", and so on (Baker, 2003: 303-311; Svenonius, 2006, 2010). Svenonius claims that the locative morpheme constitutes an independent head called AxPart (Axial Part). This head selects the ground DP of the lexical preposition as its complement, and the whole phrase is selected by an overt or covert functional preposition, as indicated below[1].

(1) a.$[_{PP}$ in/on $[_{AxPartP}$ front/top [of [the tree]]]
 b.$[_{PP}$ AT $[_{AxPartP}$ under/between [OF [the trees]]]

The composite structure of lexical adpositions is supported convincingly by Japanese data, where the functional postposition always occurs overtly. (1a/b) correspond to:

(2) $[_{PP}$ $[_{AxPartP}$ [ki] no mae/ue/shita/aida] ni/de/no]
  tree of front/top/under/between in/at/of

AxPart morphemes often originate from relational nouns referring to concrete parts of objects but differ from them in expressing spaces defined

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with reference to those parts. Compare the following sentences semantically (Huddleston & Pullum, 2002: 620):

(3) a. She was sitting in the *front* of the car.
    b. She was sitting in *front* of the car.

Morphosyntactically, AxPart morphemes behave similarly to nouns in some respects, but differently in other respects (Svenonius, 2006). For instance, unlike *front* in (3a), *front* in (3b) cannot take a determiner, be pluralized, or modified by an adjective. Japanese AxPart morphemes are noun-like in allowing demonstratives and case markers, but are unlike nouns in disallowing modification by adjectives. These peculiarities suggest that AxPart is a semi-lexical category (Corver & Riemsdijk, 2001)[2].

A question rarely addressed in the literature is about the occurrence of AxPart in the word domain: how are AxPart morphemes used in word-formation? This question provides a testing ground for the plausibility of the "word syntax" approach to word-formation. Many lexicalist researchers, while advocating for the autonomy of morphology from syntax, consider that morphology and syntax are parallel to a certain extent (e.g. Ackema & Neeleman, 2004). The aim of this paper is to examine how parallel morphology and syntax are when AxPart is involved, comparing data from English and Japanese.

2. PP-FORMING AxPART MORPHEMES USED IN WORDS

2.1. *English* front *and Japanese* mae

Let us start with observing how the free morphemes functioning as AxPart in lexical PPs participate in word-formation. To begin with *front* and *mae* 'front', the following data show that they can form attributive compounds, modifying a noun from the left, and subordinate compounds, projecting its complement to its left[3]:

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[2] Corver (2008) argues that the semi-lexical PERSON differs from nouns in disallowing pluralization and adjectival modification and allowing covert realization. In Japanese, *ue* "above" and *naka* "inside" allows zero realization (e.g. *tsukue no {ue/naka} ni* lit. 'desk of above/inside on/in' can be synonymous with *tsukue ni* lit. 'desk on/in; on/in the desk').

[3] For the classification of compounds, I follow Bisetto & Scalise (2005).

(4)   Modifier-Head   Argument-Head
    a.   [*front* leg]$_N$ b.   [ocean*front*]$_{N/A}$
                               "(place) in front of the ocean"

    a'.   [*mae*-ashi]$_N$ b'.   [eki-*mae*]$_N$
        front-leg   station-front "(place) in front of a station"

As the glosses in (4b/b') show, subordinate compounds by *front*/*mae* are semantically very close to lexical PPs; an OCEANFRONT *hotel* is *a hotel* IN FRONT OF THE OCEAN, and EKI-MAE(*-no*) *hoteru* lit. 'station-front(-of) hotel' is semantically equal to EKI-NO MAE-*no hoteru* lit. 'station-of front-of hotel', both expressing "a hotel in front of a station".

This parallelism, however, does not extend to the structure. Although lexical PPs are head-initial in English and head-final in Japanese, the compounds in (4b/b') are equally head-final. The head-finalness of (4b) proves the working of the structural principle of morphology known as the Righthand Head Rule (RHR) (Williams, 1981). Morphological compounding in English and Japanese follow this principle:

(5)   Modifier-Head   Argument-Head
    a.   [*killer* cell]$_N$ b.   [pain *killer*]$_N$
    a'.   [*kiri*-bana]$_N$ b'.   [niku-*kiri*]$_N$
        cut-flower "cut flowers"   meat-cut "cutting of meat"

English subordinate compounds provide the crucial evidence for the RHR. The head-finalness of Japanese subordinate compounds and English / Japanese attributive compounds could be viewed as reflexes of syntax. Japanese is head-final not only in morphology but also in syntax. English attributive modification is head-final not only in morphology but also in syntax; it violates the expected parametric word-order of English syntax (Emonds, 2009). Notice that right-headed subordinate compounds similar to (4b) are also produced by the AxPart *top* and *side*:

(6) a.   desk*top*$_{N/A}$,   lap*top*$_{N/A}$,   roof*top*$_{N/A}$,   table*top*$_{N/A}$
    b.   dock*side*$_{N/A}$,   harbor*side*$_{N/A}$,   plane*side*$_{N/A}$,   water*side*$_{N/A}$

2.2. *English* under *and Japanese* shita

Subordinate compounds containing *under* crucially differ from those containing *front* in exhibiting structural as well as semantic parallelism to the lexical PP:

(7)   Modifier-Head   Argument-Head   / Head-Argument
        a. [*under*belly]$_N$ b. *[floor*under*],   [*under*floor]$_{N, A}$
                                     "(place) under the floor"

        a'. [*shita*-bara]$_N$ b'. [yuka-*shita*]$_N$
            under-belly   floor-under "(place) under the floor"

Semantically, (7b) is equivalent to (4b) in expressing meanings paraphrased by the lexical PP. Structurally, however, they are quite different; *underfloor* follows the head-initial order of the lexical PP rather than the RHR. The other compounds in (7) are all head-final, similarly to (4a/a'/b').

One might argue that the contrast between (4b) and (7b) simply means that *front* is a noun while *under* is a preposition, a traditional recognition. Yet, genuine prepositions, functional prepositions, cannot participate in compounding at all (Moyna, 2011: 18); they cannot form compounds like **floorunder* (**school-to*, **physics-of*), nor compounds like *underfloor* (**to-school*, **of-physics*). To refer to (1b), this means that the compound-internal *under* in (7a/b) is not the realization of the AxPart conflated into the covert functional preposition AT; it is the AxPart head itself.

2.3. *English* between *and Japanese* aida

The AxPart morphemes *between* and *aida* exhibit the same patterns of compounding as *under* and *shita*, differing only in that *aida* almost always takes the suppletive bound form *kan* in compounds[4]:

(8)   Modifier-Head   Argument-Head   / Head-Argument
        a. [*between*brain]$_N$ b. *[class*between*],   [*between*-class]$_A$[5]
                                     "between classes"
        a'. [*kan*-noo]$_N$ b'. [kurasu-*kan*]$_N$
            between-brain   class-between "between classes"

The allomorphic relationship between *aida* and *kan* is clear from their synonymous semantics, complementary distribution, and orthography; they are written with the same *kanji* (間). *Kan* appears both word-initially (8a') and word-finally (8b'), so it is a bound morpheme but not an affix.

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[4] Attributive compounds such as AIDA-*gara* lit. 'between-pattern; relationship" are rare exceptions. There exist no compounds ending with *aida*.

[5] E.g. *the* BETWEEN-CLASS *homogeneity*.

3. Bound morphemes that function as AxPart

Section 2.3 has revealed that the word-internal AxPart can take a bound form that does not occur independently in syntax. In this section, we will observe the wealth of such morphology-specific AxPart morphemes both in English and in Japanese.

3.1. *English* pre *and Japanese* zen

The bound morpheme *pre* is semantically very close to *front*, and *zen* is a bound allomorph of *mae*, which instantiates the same suppletive allomorphy as we saw between *kan* and *aida* in section 2.3[6]. These morphemes can be viewed as morphology-specific AxPart morphemes because they produce complex words that embrace semantic relationships very similar to those exhibited by the compounds in (4). (9a/a') below are *attributive* complex words, while (9b/b') are *subordinate* complex words:

(9)   Modifier-Head   Head-Argument   / Argument-Head
       a. [*pre*modifier]$_N$ b. [[*pre*-ax]-ial]$_A$
          "front modifier"   "in front of an ax"
       a'.[*zen*-rin]$_N$ b'.[jiku-*zen*]$_N$
          front-wheel   ax-front "(place) in front of an ax"

(9b) is especially interesting in that it is closer to the lexical PP by *front* than (4b) is[7]. Like *front* in *ocean*FRONT, *pre* in PRE*axial* functions as an argument-taking head but differs from *front* in projecting its argument to its right word-internally; it forms the same head-initial structure as the lexical PP. Although we cannot go into details, (9b) is also closer to the lexical PP in the syntactic category. According to Baker (2003: 311-325), PP is a subtype of adjective[8].

In (6), we saw that *top* and *side* form subordinate compounds in a similar manner to *front*. These two, however, do not have a bound counterpart like *pre*-.

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[6] Both *zen* and *mae* are written as 前 in *kanji*.

[7] In *preaxial*, *pre* does not modify *axial* but rather takes *ax* as its complement. Therefore, semantically, the structure of *preaxial* is as indicated in (9b) rather than [*pre*-[*ax-ial*]]. The fact that *pre* does not attach to adjectives in general suggests that the former structure is also valid morphologically.

[8] Baker analyzes P, or functional adpositions like *in* in (1a), as an NP-to-AP category-shifting functional category. This analysis makes it possible to view the adjectival suffix of [[*pre-ax*]-*ial*] as a bound realization of the *in* in [*in* [*front of an ax*]].

Exhibiting the head-final structure, (9a/a'/b') have the same semantic and structural constitution as (4a/a'/b').

3.2. *English* inter *and Japanese* kan

In section 2.3, we observed that *aida* "between" always takes the bound form *kan* in words. *Between* also has a bound, morphology-specific counterpart, *inter*. Unlike *aida*, *between* can occur in compounds (see 8a/b), but in morphology, *inter* is used much more frequently, producing complex words that are semantically and structurally similar to (8a/b):

(10)   Modifier-Head   Head-Argument   / Argument-Head
    a. [*inter*brain]$_N$ b. [[*inter*-cultur]-al]$_A$
       "betweenbrain"   "between cultures"
    a'. [*kan*-noo]$_N$ (= (8a'))   b'. [bunka-*kan*]$_N$
       between-brain   culture-between "(domain) between cultures"

Unlike *front*, *between* forms a head-first subordinate compound. Thus, both (8b) and (10b) are semantically and structurally parallel to the lexical PP starting with *between*[9].

3.3. *Japanese* kan *and* zen*: Development of new usage*

The Japanese words we have discussed so far are consistently head-final, exhibiting no structural conflict either with the parametric word-order of Japanese syntax or with the RHR. Certain Japanese bound morphemes, however, function as the AxPart head in the word-initial position and take the complement to their right. Puzzlingly enough, *kan* and *zen*, along with other bound morphemes, are now acquiring this usage in addition to their traditional usage discussed above. That is, when these morphemes form subordinate complex words which are semantically close to lexical PPs, they normally do so in the right-headed order, as in (8-10b'), but recently they are beginning to do so also in the left-headed order, as in:

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[9] The parallelism holds of the syntactic category also; (8b) and (10b) are both adjectives (Note 8).

(11) a. [[*kan*-shukan]-sei]$_N$
      between-subject- NOMINALIZER   "intersubjectivity"
  b. [[*kan*-bunka]-teki]$_{AN}$
      between-culture-ADJECTIVIZER   "intercultural"
  c. [[*kan*-medeia]-teki]$_{AN}$
      between-media- ADJECTIVIZER   "inter-media"
  d. [*zen*-genteishi]$_N$
      front-determiner   "element in front of a determiner"

(11b) is especially interesting in its co-existence with the right-headed counterpart in (10b'). In my native judgment, the adjectivized form of (10b'), *bunka*-kan-*teki* lit. '[[culture-*between*]-ADJECTIVIZER]; intercultural', is acceptable as a synonym of (11b). (11d) can also be paraphrased by forms in which *zen* takes its complement to its left, such as *genteishi*-zen-*yooso* lit. '[[determiner-*front*]-element]; element in front of a determiner'[10].

The embedded complex words in (11) thus violate both the RHR and the parametric syntactic word-order, but they cannot be put aside as minor exceptions. In fact, the following underlined bound morphemes always produce semantically PP-like complex words in such a left-headed structure:

(12) a. CYOO-*jiga*   lit. 'go.over-ego; superego',
     CYOO-*bunsetsuon*   lit. 'go.over-segment; suprasegmental'
  b. TSUU-*gengo*   lit. 'pass-language; cross-linguistic',
     TSUU-*bunka-teki*   lit. 'pass-culture-adjectivizer; cross-cultural'
  c. KAN-*Taiheiyoo*   lit. 'surround-Pacific; circum-Pacific'
  d. TAI-*Amerika*   lit. 'confront-America; anti-American',
     TAI-*sensha*   lit. 'confront-tank; antitank'

These bound morphemes differ from *kan* and *zen* in not producing complex words with a right-headed structure such as (8-10b'), and also in not having corresponding lexical PPs such as (2). While *aida* and *mae* are originally nouns, the free allomorphs of the bound locative morphemes in (12) are verbs. Given the verbal category and Sino-Japanese status of the underlined parts, the compounds in (12) can be seen as a type of the Sino-Japanese two-morpheme compound with the structure [verb + complement]:

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[10] Zen produces the left-headed subordinate compound more actively when expressing the precedence in time: e.g. ZEN-*gan* lit. 'before-cancer, pre-cancerous', ZEN-*kindai* lit. 'before-modern. period; period before the modern period', ZEN-*utsu* lit. 'before-depression; prone to depression', ZEN-*seijin* lit. 'before-adult; preadult', ZEN-*sokuratesu* lit. 'before-Socrates; pre-Socrates'. ZEN-*masui* lit. 'before-anesthesia; preanesthetic' co-occurs with a right-headed synonym, *masui*-ZEN.

(13)   DOKU-*syo*   lit. '*read*-book; book-reading'

As noted in Kageyama (2009: 514), compounding in Japanese allows a left-headed structure only in this type[11].

To pursue this conjecture, the production and establishment of compounds like (12) could provide one of the grounds for the development of the new, left-headed usage of *kan* and *zen* in (11). This is an analogy-based change motivated by semantic similarity; the bound morphemes in (12) express spatial relations which are translated via AxPart morphemes such as *supra* and *trans*.

4. DISCUSSION

Let us discuss our observations in light of the morphology-syntax parallelism.

First, the fact that the free AxPart morphemes used in lexical PPs consistently produce attributive compounds confirms the modifier nature of this type of morpheme discussed in Cinque (2010) and Terzi (2010). They argue that AxPart morphemes in lexical PPs modify a phonetically null noun PLACE, which is a type of semi-lexical category. For example, *in front of* is analyzed as *in front-PLACE of*, and the Japanese AxPart *mae* has the composite structure *mae-PLACE*. If so, all the compounds in (4a/a'), (7a/a'), and (8a) can be formed based on this composite structure, overtly realizing the head PLACE by specific nouns. This is a clear instance of word-formation based on syntactic structure. The effect of syntactic structure on word-formation, or the idea of morphology making reference to syntax, is confirmed by the fact that even morphology-specific AxPart morphemes consistently produce attributive complex words with the same structure, such as (8a'), (9a/a'), and (10a/a').

The morphology-syntax interaction is much more complex in the subordinate type. The following schema summarizes our data based on the structure and the free/bound distinction of the AxPart morpheme. (14) classifies English data, while (15) classifies Japanese data. In column (I), we have left-headed words, while column (II) cites right-headed words. X stands for the complement of the AxPart head. AxPart morphemes that are used in syntax are underlined.

Structurally, the complex words in the bold boxes are parallel to the semantically corresponding lexical PPs. Formally, the underlined morphemes straddle the morphology-syntax divide.

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[11] Thus, native synonyms are compounded in the reverse, right-headed order. Compare (13) with the native compound *hon-yomi* "book-reading".

To start with (14), morphology-specific morphemes always head the word on the left, while free AxPart morphemes do so on the left or the right depending on their "lexicality". If AxPart morphemes are semi-lexical (section 1), it is conceivable that some of them are more lexical than others. *Top*, *side*, and *front* are more lexical, closer to nouns, than *between* and *under* in requiring *of* in lexical PPs. Based on this difference, we could make sense of the configuration in (14) by saying that AxPart morphemes of stronger lexicality follow the RHR in word-formation, while those of weaker lexicality are governed by syntax even in word-formation. This view makes it possible to account for the prefixal distribution of *pre* and *inter* as a result of their functionality. That is, these are among those AxPart morphemes of weaker lexicality.

TABLE 1. Subordinate word formation with AxPart

	I. Left-headed structure	II. Right-headed structure
(14) a.		X-*top*, X-*side*
b.	pre-X	X-*front*
c.	inter-X / *between*-X	
d.	*under*-X	
(15) a.		X-ka / X-*shita*
b.	zen-X	X-zen / X-*mae*
c.	kan-X	X-kan
d.	tsuu-X, choo-X, tai-X	

Under this analysis, *front* and *pre* represent more lexical and more functional versions of the same spatial relation[12]. On the other hand, the relationship between *between* and *inter* is allomorphy, which is empirically confirmed by the fact that *inter* is now replacing *between* in word-formation (section 3.2).

Next, consider the data configuration in (15). Section 1 discussed the fact that Japanese free AxPart morphemes, including *shita*, *mae*, and *aida*, behave like nouns morphosyntactically. The present analysis explains that their strong lexicality makes them follow the RHR in word-formation. *Ka* and *zen* occur on

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[12] A similar relationship can be found between the semi-lexical *person* (Corver, 2008) and the suffix -*er*. Even the same morpheme can change in its lexicality, as often discussed as a facet of grammaticalization.

the right for the same reason because they are suppletive allomorphs of *shita* and *mae*, respectively. Interestingly, *aida* has been totally replaced by *kan* in word-formation, which resonates with the replacement of *between* by *inter* in English word-formation.

Our analysis of the words in (15II) as morphological has two pieces of evidence independent of the structure. The first one is consistency with English. The right-headedness of similar words in English, those headed by strongly lexical AxPart morphemes in (14II), is unambiguously due to the RHR.

The second evidence concerns phonology. Although the majority of Japanese compounds are pronounced with compound accent, certain compounds exhibit phrasal accent[13]. According to Kageyama (2009), they divide into two types, morphological compounds with certain grammatical peculiarities, and compounds derived syntactically.

Crucially, all the types in (15II) exhibit compound accent, whereas all the types in (15I) are pronounced like phrases, with a short pause between the locative morpheme and X. This confirms our analysis, showing that (15II) are default compounds in Japanese morphology, while (15I) are structurally deviant; their structure is deviant for both Japanese morphology and syntax.

Before closing, let us mention the issue of syntactic category. As noted in sections 3.1 and 3.2, the adjectival category of the words in (14I) support their status as PP-based word-formations. The nominal category of the words in (14II) and (15II), on the other hand, confirms our claim that they are driven by the RHR[14].

5. CONCLUSIONS

AxPart morphemes are prevalent in word-formation both in English and in Japanese. We have examined in what ways this word-formation exhibits parallelism to syntax. Semantically, complex words involving this type of morpheme are parallel either to the attributive modification between AxPart and the phonetically null head PLACE or to the lexical PPs in which AxPart (+ PLACE) takes a complement. This parallelism is observed both in English and Japanese. Structurally, however, unambiguous parallelism can be discerned only in English left-headed subordinate types in (14I). We have also found that the structure of an AxPart word can be deviant both morphologically and syntactically, as in (15I). Notice also that the structural parallelism, if any, does

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[13] They qualify as full-fledged words in exhibiting lexical integrity (Kageyama, *ibidem*).

[14] (14II) can be used also as adjectives. This is intriguing given the category A of (14I), but we cannot discuss the implications in this paper.

not align with the morphological free-bound distinction; word-formations with morphology-specific morphemes can be more parallel to phrases than those with free counterparts[15].

A very general conclusion from our discussion therefore is that AxPart morphemes speak for the Parallel Architecture view of the morphology-syntax interface (Ackema & Neeleman, 2004), showing that morphology makes semantic and structural reference to syntax but works independently. Our discussion also shows that the syntax-morphology interaction should be carefully examined on the individual morpheme level. The next task, therefore, is to extend the examination to other locative morphemes in various languages.

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[15] "Prefix" is a cover term for this type of bound morpheme.

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