

# Priscianic Formation in Compounding and Upgrading as Stem-Formation\*

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## 1. Introduction

In this paper, we are concerned with how a grammatical word form is involved in a process of word formation, especially in compounding. A grammatical word-form is an inflected word consisting of a root and morphophonological realizations of functional features such as number, gender, and case. Compounding is a process of deriving a word through merging more than one word to build hierarchical structures. We will focus on the phenomenon in which grammatical word-forms occur in compounds. The English and German N-N compounds in (1) and (2) are typical examples of compounds containing grammatical word-forms:<sup>1</sup>

- (1) a. oars-man, frontiersman, sportsman, suggestions box, parks department (Lieber (2009:369), Bauer (2009:347))
- b. I can give you a *thumbs up* to show that everything's OK.  
(David Crystal, *A Little Book of Language*)
- (2) German
  - a. *Wochenende* (lit.) week.PL end 'weekend'
  - b. *Professorengattin* (lit.) professor.PL wife 'wife of a professor'  
(Neef (2009:391))

For example, the compound *suggestions box* in (1a) is attested alongside *suggestion box*, exhibiting the first constituent formally identical to the plural word-form of *suggestion*. *Wochen* and *Professoren* in (2) are also identical to the nominative plural forms of the basic lexemes. (1) and (2) thus appear to indicate that plural word-forms can occur in compounds.

Occurrence of word-forms in compounds is observed cross-linguistically and

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<sup>1</sup> ABL = ablative, ACC = accusative, ADV = adverbial form, ATTRIB = attributive form, ERG = ergative, DAT = dative, GEN = genitive, IMP = imperative, LOC = locative, NOM = nominative, PART = partitive, PAST = past tense, PL = plural, POLITE = polite form, POSS = possessive, SG = singular, SUB = subessive, SUBL = sublative, SUPER = superessive, 2 = 2nd person

cross-categorially. In Hebrew and Italian as well as in English, for example, number markers can attach to nominal constituents inside compounds. (3) and (4) give examples from Hebrew and Italian, respectively:

(3) Hebrew

- a. N-N compounds: *beyt-safarim* (lit.) house books ‘library’
- b. V-N compounds: *netilat-yadayim* (lit.) wash hands ‘hand-washing’  
(Borer (1988:56))

(4) Italian

- a. portafoglio (lit.) carry.2SGIMP money.SG ‘wallet’
- b. portafogli (lit.) carry.2SGIMP money.PL ‘wallet’
- c. marciapiede (lit.) march.2SGIMP foot.SG ‘sidewalk’
- d. marciapiedi (lit.) march.2SGIMP foot.PL ‘sidewalk’  
(Montermini (2010:88))

(3a) is an N-N compound and (3b) is a V-N compound. The affix *-im* is a plural marker and occurs in the rightmost position. Since Hebrew is head-initial in compounding, *-im* is attached to the non-head of the compound in (3a, b). Italian compounds can also contain number markers. The italicized vowels in (4a) and (4c) are singular markers, while *-i* appearing in (4b) and (4d) is a plural marker. Turning to the non-heads in (4), underlined constituents assume the imperative form of verbal inflection, as Montermini (2010) observes. This indicates that verbal inflection can also occur inside compounds.<sup>2</sup>

Case inflection or case particles are also found in compounds in a variety of languages. Genitive or possessive forms are particularly versatile in this respect, as indicated below:

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<sup>2</sup> Verbal constituents in V-N compounds in French and Danish also assume inflected forms. The first constituents of the French compounds in (i) are formally identical to the verbs’ 2nd singular imperative and 3rd singular present forms and that of the Danish compound in (ii) assumes an infinitival form:

- (i) a. *porte*-drapeau (lit.) bear standard ‘standard bearer’  
b. *abat*-jour (lit.) weaken light ‘lampshade’  
(Fradin (2009:422))
- (ii) *drikke*vand (lit.) drink water ‘drinking water’  
(Bauer (2009:347))

- (5) English<sup>3</sup>
- a. children's hour (Lieber (2009:369))
  - b. woman's magazine (Mukai (2008:190))
- (6) German
- a. Boot-*s* bau (lit.) boat-GEN building 'building of boats'
  - b. Jahr-*es* begin (lit.) year-GEN beginning 'beginning of a year'
- (Neef (2009:390))
- (7) Swedish
- arbet-*s* lön (lit.) work- GEN salary 'wage' (McClellan (1969:229))
- (8) Finnish
- käde-*n* sija (lit.) hand-GEN place 'handle' (Niemi (2009:244-245))
- (9) Japanese
- ama-*no* gawa (lit.) heaven-GEN river 'milky way' (Mukai (2008:189))

The non-heads in (5)-(9) are identical to genitive forms of the host nouns. Turkish tells us that even compounding heads can carry possessive markers:

- (10) Turkish
- a. resim ders-*i* (lit.) painting lesson-POSS 'painting lesson, art class'
  - b. hanım el-*i* (lit.) lady hand-POSS 'honeysuckle'
- (Göksel (2009:216-219))

The morpheme *-i* is a possessive marker attached to the head. We will return to this construction in section 5.1.

The languages cited below show that not only genitive but also other case forms can appear within compounds:

- (11) Czech
- a. pomst-*y* chtivý (lit.) revenge-GEN wanting 'revenge wanting'

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<sup>3</sup> *Children's book* is ambiguous in two ways. Mukai (2008:190) shows that *the small children's book* has the following two representations, one as a phrase and the other as a compound:

- (i) a. [[the small children's] book] → phrase
- b. the [(small) [children's book]] → compound

The same ambiguity is true of *woman's magazine*. The expression shows anaphoric island effects in some cases, but not in other cases, as pointed out by Taylor (1996:29):

- (ii) a. \*I found those [woman<sub>i</sub>'s magazines], but as far as I know she<sub>i</sub> has not read them.
- b. I found [that woman<sub>i</sub>]'s magazines, but as far as I know she<sub>i</sub> has not read them.

- b. pravd-ě podobný (lit.) truth-DAT similar ‘probable’  
(Štichauer (2009:310))

(12) Finnish

- a. työ-*n* tek-o (lit.) work-GEN do-ing ‘working’  
b. silmä-*llä* pito (lit.) eye-LOC holding ‘supervision’  
c. vet-*tä* pitävä (lit.) water-PART holding ‘waterproof’  
(Niemi (2009:244-245))

(13) Hungarian

- a. fej-*en* állás (lit.) head-SUPER standing ‘head-stand’  
b. nagy-*ra* becsülés (lit.) high-SUBL esteem ‘high esteem’  
(Kiefer (2009:539))

(14) Warlpiri

- a. ngulya-*ngka*-nyina-ngu (lit.) burrow-LOC-sit-er ‘hole-dwellers’  
b. ngaju-wiri-manu (lit.) I.NOM-big-cause-er ‘one grown up by me’  
(Simpson (2009:614-615))

Many of the compounds in (11) to (14) are headed by deverbal nouns or adjectives, with their non-heads corresponding to complements of the basic verbs. Yet, it is not always the case that the case markers on the non-heads correspond to the ones selected by the underlying verbs in syntax. Thus, the case selection in the compounds in (13) is identical to that in corresponding VPs in Hungarian (Kiefer (2009:539)), but the same does not apply to Warlpiri. According to Simpson (2009:614-615), the non-head nouns in (14) bear different case markers from the ones that the verbs take in main clauses. Word forms with Case information are thus proved to be widely utilized as constituents in compounds.

Internally-inflected compounds raise a question of how they are derived. Assume that inflectional morphemes are realized at PF after morphosyntactic operations are completed. Realization of inflectional morphemes must occur following all derivational and compounding operations. However, the word-internal occurrence of the inflectional morpheme *-s* in (1), for example, would suggest that the inflectional realization can precede the process of compounding.<sup>4</sup> Addressing the question raised by internally-inflected compounds, we will explore the possibility of capturing the relationship between inflectional morphology and compounding from a lexeme-based morphology perspective. Specifically, based on the separation hypothesis (Beard (1995)), we will propose that a grammatical word-form can be reanalyzed as a stem for compounding in the stem formation

<sup>4</sup> We are grateful to Raúl Aranovich for clarifying the issue raised by internally-inflected compounds.

component. This means that while compounding is a process of producing a new lexeme by merging two lexemes, it involves the process of selecting a stem (Aronoff (1994)), just like inflectional and derivational morphology, for its output to be phonologically realized.

This paper is organized as follows. First, we present key notions of a lexeme-based theory relevant to our discussion in section 2. Then, in section 3, we present our proposals, according to which internally-inflected compounds should be seen as cases of Priscianic formation, and word forms in compounds should be seen as stems derived via a stem-forming process of *upgrading*. The upgrading process deprives the inflectional element involved of the ability to agree with and work in concert with other elements in the sentence. After we show the synchronic validity of assuming Priscianic formation uniformly in inflection, derivation, and compounding through Japanese data, section 4 discusses the concept from a diachronic point of view. In section 5, we compare our analysis with Ralli's (2013) bifurcation of compounds into morphologically-based and phrasal compounds. The relationship between case inflection and compounding is the issue of section 6, where it is to be revealed that morphological word-forms and periphrastic word-forms are equally subject to upgrading. Section 7 concludes the paper.

## 2. Theoretical Framework

### 2.1. A Lexeme-Based Theory as a Separationist Theory

Lexeme-based morphological theory takes the position that morphology “is not a matter of concatenation of morphemes [...] but rather the complex process by which abstract morphosyntactic representations are realized morphophonologically” (Aronoff (1994:9)) and “the mapping from morphosyntax to morphophonological realization is not direct but rather passes through an intermediate level” (Aronoff (1994:25)). According to this view, a morphosyntactic structure and its phonologically-realized form are not directly connected like the two sides of a Saussurean sign. Rather, they are essentially independent and indirectly connected to each other through the autonomous working of morphology. Aronoff (1994:25) calls the sound-meaning mediating function of morphology *morphomic* and calls each token of it a *morphome*.

As Aronoff (1994:sec.1.2) discusses, the notion of morphome is based on the separation hypothesis developed by Beard (1995), stated roughly as follows:

(15) *The separation hypothesis*

Syntactico-semantics and phonological realization are separate in morphology.

Under the separation hypothesis, it is natural that one surface form is linked to more than one meaning and that one meaning is expressed with different phonological forms. For example, the form *-ed* expresses past tense, passive voice, or adjectivization in English. In contrast, plurality is expressed by the form *-s* in some cases but by *-en* in other cases. The many-to-many mapping between forms and meanings is considered to be a purely morphological, or morphomic, property.

## 2.2. *Lexemes and Stems*

The separationist nature of Aronoff's theory is manifested in its division between lexemes and stems. *Lexemes* are lexical items as abstract units (Matthews (1991)), units which bind together their word forms, lexical meanings, and syntactic properties such as lexical categories (N, V, or A) and argument structures. This level is close to the set of paradigms of each lexical item. In Aronoff's (1994:10) words, a lexeme represents "form, syntax, and meaning bound together."

*Stems*, on the other hand, concerns how lexemes are phonologically pronounced (or realized) in each morphosyntactic context. Aronoff (1994:39) defines stem as "the phonological domain of a realization rule: that sound form to which a given affix is attached or upon which a given nonaffixal realization rule operates." Stems in themselves are independent of syntactico-semantics. For example, the English noun lexeme WIFE has two stems, *wife* (used in e.g. *John's wife*) and *wive* (used in e.g. *these men's wives*); the choice from these two forms does not affect the lexeme's semantic contribution to the output word forms.

Aronoff's view that a lexeme can have more than one stem can be confirmed by derivational morphology, too. It is well known that derivational suffixation in the native and non-native strata of English often involves different stems of base lexemes (Kastovsky (2006), Carstairs-McCarthy (2002:ch.3), Booij (2010:ch.10)). In the following examples, the derivatives in (i) use a free stem, while those in (ii) use a bound stem:

- |      |    |           |                         |                               |
|------|----|-----------|-------------------------|-------------------------------|
| (16) | a. | APPLY:    | (i) apply-ing, appli-er | (ii) applic-ation, applic-ant |
|      | b. | CLEAR:    | (i) clear-ness          | (ii) clar-ity                 |
|      | c. | NOMINATE: | (i) nominat-or          | (ii) nomin-ee                 |
|      | d. | RENDER:   | (i) render-ing          | (ii) rend-ition               |

There is no semantic motivation for this stem alternation, either. The lack of semantic motivation can also be observed in adverbial *-ment* suffixation in French. According to Montermmini (2010:87-88), participating in this derivation, adjective lexemes take the same form as their feminine word form, with no semantic nor

phonological justification:

- (17) a. Base adjective: *fort* ‘strong’ [fɔr]<sub>masc</sub> ~ [fɔrt]<sub>fem</sub>  
 b. Derived adverb: *fortement* [fɔrt(ə)mã]

### 2.3. Compounding

Compounding differs from inflection and derivation in not involving any functional bound morphology. Yet, the distinction between lexeme and stem is also relevant for this process; the process of compounding merges two lexemes (e.g. MAIL and BOX) into a new lexeme (e.g. MAIL BOX), which is then phonologically realized by selecting particular stems of the combined lexemes. The step of lexeme-merge ensures that the semantic and syntactic properties of the constituents are properly inherited into compounds (Roeper and Siegel (1978), Selkirk (1982), Lieber (1992), among others) (e.g., *{bird-watching/\*bird-singing} always depresses John*), whereas the morphophonological realization process accounts for a-semantic formal variation that lexemes exhibit inside compounds. Recall the Italian V-N compounds exemplified in (4). In these compounds, the selection of the second singular imperative form for the V constituent has no syntactico-semantic motivation, in exactly the same way as the selection of the feminine word form for the adjectival base in (17b) is unmotivated syntactically nor semantically.

In fact, Aronoff (1994:44-45), along with Bloomfield (1933:229-232), speaks of the notion of *compounding stem* in order to deal with bound forms found only in compounding such as *Sino-* in *Sino-Japanese* and *Anglo-* in *Anglo-Saxon*.<sup>5</sup> Expanding on this view, the next section will argue that what appear as word forms in compounds in (1) to (14) are stems that the constituent lexemes take in the morphosyntactic context of compounding and that such inter-level sharing of phonological forms speaks for the working of a stem-formation process that we term *upgrading* in the component of morphology.

## 3. Priscianic Formation and the Stem-Formation Process of Upgrading

### 3.1. Priscianic Formation in Inflectional and Derivational Morphology

In our view, the data in (1) to (14) should be seen as compound cases of what has been traditionally called Priscianic formation in inflectional morphology (Matthews (1972), Haspelmath (2002:132)). Priscianic formation stands for cases in which one member of an inflectional paradigm can be analyzed as being formed from another member, rather than both being formed from a third more abstract form.

<sup>5</sup> Spencer (2001:309) also observes that compounds are formally distinct from phrasal combinations in many languages, involving special stem forms.

Witness the following partial paradigm of Latin verb inflection taken from Aronoff (1994:32):

(18)

Present active infinitive	Perfect participle	Future participle	Gloss
laudā-re	laudāt-	laudāt-ūr-	‘praise’
monē-re	monit-	monit-ūr-	‘warn’
duce-re	duct-	duct-ūr-	‘lead’
cape-re	capt-	capt-ūr-	‘take’
vehe-re	vect-	vect-ūr-	‘carry’
loqu-ī	locut-	locut-ūr-	‘speak’
experī-rī	expert-	expert-ūr-	‘try’

A Priscianic formation can be detected in the formal relationship between the perfect participle and the future participle; that is, the future participle is formed based not on the form of the verb root, which is the part without *-re* of the present active infinitive, but rather on the perfect participle form. The perfect participle itself is formed based on the verb root with *t*-suffixation, which triggers certain irregular root alternation (or ‘stem’ alternation in the present terminology) in the output phonological forms. Yet, the future participle is formed quite regularly based on the perfect participle form, so much so as to inherit the irregular stem alternation of the latter, if any. The idea of Priscianic formation gives priority to formal relatedness over semantic relatedness; crucially, the future participle cannot be seen semantically based on the perfect participle because while the latter is usually passive, the former is always active (Aronoff (1994:32)).

Faced with a-semantic formal regularities like this, Aronoff (1994) has developed the concept of stem as the phonological domain of a realization rule (section 2.2) and proposed that in (18), the perfect participle functions as the stem for the *-ūr* suffixation of the future participle formation. Then, Stump (2001:36-37) has formalized this analysis by introducing the *rule of referral* in order to guarantee such intra-paradigmatic formal dependency. In (18), for example, the *-ūr* suffixation is accompanied by the rule of referral that refers to the perfect participle slot of the base lexeme.

Priscianic formation can be detected in derivational morphology also. Witness the following paradigms of toponymic derivations in Dutch discussed by Bauer (1997:254) and also by Booij (1997):



(19)

Toponym	Inhabitant	Adjective	Female inhabitant
Finland	Fin	Fin-s	Fin-s-e
Noorwegen	Noor	Noor-s	Noor-s-e
Belgié	Belg	Belg-isch	Belg-isch-e
Rusland	Rus	Russ-isch	Russ-isch-e

Semantically most transparent dependency is the one between a toponym and its adjectival form and the one between an inhabitant name and its female counterpart. However, the data in (19) make it clear that the formal dependency is established independently of the semantic dependency, in such a way that the inhabitant form constitutes the stem for the toponymic adjective form, which then constitutes the stem for the female inhabitant form. Considering that (19) represents paradigms of the left-most toponym lexemes (Booij (1997)), the formal dependency shows that the adjectivizing rules need a rule of referral that refers to the inhabitant form for stem selection, and the feminine *-e* suffixation rule needs a rule of referral that refers to the adjectival form (see also Stump (2001:254)).<sup>6</sup>

### 3.2. *Priscianic Formation in Compounding*

We have seen that Priscianic formation is characterized by formal dependency independent of semantic dependency. The recourse to the level of stem is indispensable in order to capture this property with maximum efficiency. However, what has not been addressed seriously is the cross-level dynamics of the stem formation process, i.e. the question of how what has been produced as a grammatical word-form by one realization rule can function as a stem for another realization rule. To put it differently, what is the internal mechanism of the rule of referral? How can a rule of referral select a word-form, the perfect participle form in (18) for example, and return it as a stem, a unit belonging to a distinct level?

This issue can be fruitfully examined by our data of apparently internally-inflected compounds in (1) to (14). First of all, let us point out that these

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<sup>6</sup> According to Stump (1989:272-273), Breton *-où* and *-ed* plural forms can be used as bases of denominal verb formation:

- |     |                     |                        |                                     |
|-----|---------------------|------------------------|-------------------------------------|
| (i) | Singular:           | Simple plural:         | Verbal derivative by <i>-a</i> :    |
| a.  | <i>aval</i> ‘apple’ | <i>avaloù</i> ‘apples’ | <i>avalaoù</i> ‘to look for apples’ |
| b.  | <i>evn</i> ‘bird’   | <i>evned</i> ‘birds’   | <i>evneta</i> ‘to hunt for birds’   |

The verb derivation here is a candidate for another Priscianic formation in derivation, though in this case it seems difficult to prove that the plural forms inside derivatives are free from the plural semantics.

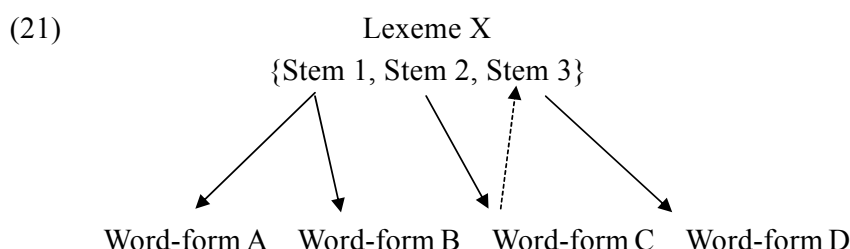
data show that Priscianic formation is possible not only in inflectional and derivational morphology but also in compounding. Crucially, inside these compounds, the apparent word forms do not express their respective grammatical meanings; their semantic contributions are purely lexical. Consider the examples in (1) and (2). Lieber (2009:369) observes that the denotation of *oars-man* does not semantically motivate the use of a plural form of *oar*, and in *frontiersman* “neither a plural nor a possessive interpretation makes sense.” Referring to *sportsman*, Bauer (2009:347) speaks against semantic explanation for the use of an *s*-form in compounds. The semantic emptiness of certain compound-internal *s*’s can be clearly detected in (1b), where only one thumb is to be raised to signal that everything is all right. Similarly, Neef (2009:391) states that although the forms of the first constituents of the compounds in (2a, b) suggest a plural reading, the semantic interpretation forces their singular interpretation.

Given the semantic emptiness, these and many other authors analyze what seem to be grammatical formatives in compounds as belonging to compound-specific formatives called *linking elements (LEs)*. The definitional property of LEs does not lie in their formal (or etymological) properties but in their semantic emptiness. Thus, Bauer (2009:346) states that “[m]any languages have some kind of linking element between the two parts of a compound. Typically, whatever its etymological source, this element is semantically empty.” The semantic emptiness of LEs is empirically confirmed by the fact that a compound with an LE often exhibits an LE-less counterpart with no clear semantic differentiation between them, as shown below:

- (20) a. suggestions box vs. suggestion box  
       b. drugs money vs. drug money (Morita (2006:413))  
       c. weapons purchase vs. weapon purchase (Morita (2006:413))

It is now clear that the compounds in (1) to (14) are instances of Priscianic formation in which the compound realization rule uses a particular word-form of the relevant lexeme as its stem. The constituent with an LE (e.g. *suggestions* in (20a)) represents an overtly inflected word-form that has turned into a stem. The question is, as mentioned above, how such a qualitative change is guaranteed in the system of morphology. We propose here that the stem formation component of morphology (Spencer (2012)) is endowed not only with the stem-level-internal process of default inheritance (see e.g. Aronoff and Fuhrhop (2002), Tribout (2012)) but also with a cross-level operation that can be termed *upgrading*, a reanalysis or conversion process that brings a grammatical word form, which is itself produced on the basis

of a stem, back onto the level of the stem. This process can be schematized as follows:



This schema represents that Lexeme X has a *stem space* that consists of three stems, referred to as Stem 1, Stem 2 and Stem 3, respectively (see Tribout (2012) for stem space). The solid downward arrows indicate morphophonological realization processes, which give sounds to functional features carried by the lexeme. Thus, Lexeme X is mapped into its Word-forms A and B through the phonological form called Stem 1. Similarly, it is mapped into the Word-forms C and D through Stem 2 and Stem 3, respectively. Now suppose that Word-form D is a Priscianic formation based on Word-form C; that is, Stem 3 has the same phonological form as Word-form C. Then, this purely phonological identity suggests that there should be a process indicated by the dotted upward arrow heading from Word-form C to Stem 3, a process that “upgrades” a member of the word-form level to the stem level. For example, the formation of *oars-man* in (1a) involves upgrading OAR’s plural word form *oars* to the stem level and using the upgraded stem as the basis for morphophonological realization of the lexeme OAR MAN.

Notice that upgrading is equal to a kind of semantic bleaching because stems are purely phonological units; the upgrading process deprives a word-form of whatever grammatical meaning it has. Since a word-form is definitionally a form-meaning pair, the semantic bleaching automatically converts an original word-form into a stem. The empirical plausibility of upgrading can be found in the fact that there exist synchronic and diachronic phenomena in which functional semantics is deleted or bleached. Synchronically, we have constructional alternations due to the presence and absence of a particular functional category. Thus, Grimshaw (1982) analyzes anticausativization (or inchoativization) via a process that deletes the CAUSE operator from the semantic representation of the predicate. Diachronically, semantic changes in grammaticalization involve bleaching of the original physical or concrete meaning (Hopper and Traugott (2003)). Our point is that deletion of semantic information is widely observed in natural languages and the upgrading process can be seen another instantiation of it

belonging to the stem formation component.<sup>7</sup>

Summarizing so far, we have discussed that compounds with LEs are instances of Priscianic formation and that such instances involve an upgrading process from word form to stem, a cross-level shifting process triggered by semantic deletion. If this view is on the right track, Aronoff's (1994) and Stump's (2001) analyses of the paradigms in (18) and (19) can be enriched by the process of upgrading; that is, Aronoff's stem is formed by this process, while Stump's rules of referral involve it as their sub-process.<sup>8</sup>

In this section, we have focused on compounds with number inflection such as (1) to (4). We will return to those with case inflection such as (5) to (14) in section 6, where it will be shown that they have periphrastic counterparts due to the process of upgrading.

### 3.3. *A Case Study: Adverbial Form in Japanese*

Priscianic formation via the process of upgrading occurs not only internally to inflection, derivation, and compounding, as suggested in sections 3.1 and 3.2, but also crisscrossing the three morphological types. This is clearly demonstrated by the adverbial form ("renyoo" form) of a Japanese verb; this form provides a stem not only for several inflectional categories but also for nominalization and verbal compounding.

As succinctly surveyed by Shibatani (1990:221-235), Modern Japanese verb roots inflect for seven inflectional classes: Irrealis, Adverbial, Conclusive, Attributive, Hypothetical, Imperative, and Cohortative. Shown in (22) below is the inflectional paradigm of the verb YOM(U) 'read.' The bracketed terminology is the one used in traditional Japanese linguistics.<sup>9</sup>

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<sup>7</sup> Thus, our present claim is consistent with Haspelmath's (2004) claim that diachronic changes from functional formatives to LEs (his "stem-extendors") or vice versa cannot be regarded as cases of grammaticalization. He calls such changes as "changes internal to morphology," supporting our proposal that the process of upgrading belongs to the stem formation component.

<sup>8</sup> In order to capture the widely attested uses of word forms as stems, Stump (2001:sec.4.5) also proposes the concept of a *word-to-stem rule*. However, his proposal differs from ours in that he regards the concept not as an independent operation in the stem formation component but as an inherent property of a specific morphophonological realization rule. For instance, the diminutive *-ig* suffixation rule in Breton is of a word-to-stem type, while the diminutive *-aka* suffixation rule in Southern Barasano is not. First, it is unclear how a morphophonological realization rule can change a word form into a stem. Second, it is unclear how his proposal can deal with compounding data.

<sup>9</sup> Japanese verbs are divided into two types, consonant and vowel verbs. A consonant verb has a stem that ends with a consonant like *yom-u*. Vowel verbs are characterized by a vowel-ending stem and subdivided into two types: (i) the type whose stem ends with *i* like *mi-ru* 'see' and (ii) the type whose stem ends with *e* like *tabe-ru* 'eat.' Our discussion does not hinge on this classification.

(22)

inflectional categories	suffixes	word-forms of the verb YOM- 'read'
Irrealis (Mizen)	-a	<i>yom-a</i>
Adverbial (Renyoo)	-i	<i>yom-i</i>
Conclusive (Syuusi)	-u	<i>yom-u</i>
Attributive (Rentai)	-u	<i>yom-u</i>
Hypothetical (Katee)	-e	<i>yom-e</i>
Imperative (Meirei)	-e	<i>yom-e</i>
Cohortative (Sikoo)	-o	<i>yom-o</i>

Verb roots occur in one of the seven word forms depending on grammatical contexts. For example, the conclusive form and the attributive form take the identical suffix, the former occurring when a sentence is concluded and the latter occurring when the verb modifies a noun. The irrealis form is selected by the negative morpheme *-nai*, for example, while the hypothetical form is selected by the conditional particle *-ba*. We pay attention to the adverbial form, which occurs in grammatically quite diverse environments.

First, as an independent word-form, it is used as the verb form of the coordinate conjunctive clause or phrase. For example, in (23), *yom-I*, the adverbial form of the verb YOM(U) 'read,' appears in a conjunctive clause:

- (23) Taroo-ga hon-o *yomi*, Hanako-ga e-o kaku.  
 Taro-NOM book-ACC read Hanako-NOM picture-ACC draw  
 'Taro reads a book and Hanako draws a picture.'

If we use the conclusive form instead of the adverbial form, the sentence is completed, as the following example shows:

- (24) Taroo-ga hon-o *yomu*.  
 Taro-NOM book-ACC read  
 'Taro reads a book.'

Hence, the adverbial form takes its name from the function as a marker of conjunctive or adverbial function of the sentence.

However, the adverbial form occurs in diverse contexts whose semantic or functional connection with it is much less clear. First, in the realm of inflection,

the adverbial form is used as the stem for inflectional suffixes including the following ones:

- (25) a. Past *-ta*: Taroo-ga    hon-o       yon-da [*< yomi+ta*].  
                  Taroo-NOM   book-ACC   read-PAST  
                  ‘Taro read a book.’
- b. Imperative *-nasai*: Hon-o       *yomi-nasai*.  
                  book-ACC   read-IMP  
                  ‘Read books.’
- c. Polite *-masu*: Taroo-ga    hon-o       *yomi-masu*.  
                  Taroo-NOM   book-ACC   read-POLITE  
                  ‘Taro reads a book.’
- d. Other major suffixes: *-tai* (Desiderative), *-uru* (Possibility),  
                  *-soo(da)* (Conjectural)

Similarly to the relationship between the perfect participle and future participle forms in (18), the relationship between the adverbial form and the past, imperative, and polite forms in (25) is purely morphological; synchronically, it is very difficult to motivate the use of the adverbial form as the basis of these forms from a semantic point of view. In (25a), due to the historical sound change known as *onbin* (‘euphony’), the adverbial form assimilates to the suffix-initial consonant, eliding the inflectional suffix *-i* (see Frellesvig (1995) for details). In verbs like MI(RU) ‘look at’ and KAS(U) ‘lend,’ the adverbial form is kept intact in the past form: *mi-ta* (lit. look.ADV-PAST, ‘looked’), *kasi-ta* (lit. lend.ADV-PAST, ‘lent’).

Next, the adverbial form is used as a stem of Verb-to-Noun derivation. When the derivational suffixes in (26) below derive noun lexemes expressing Agent or Manner from verbs, they select the adverbial form as their stem:

- (26) a. Agentive *-te* ‘-er’: *yomi-te* ‘reader,’ *mi-te* ‘looker,’ *kasi-te* ‘lender’  
       b. Manner *-kata* ‘the way’: *yomi-kata* ‘how to read,’ *mi-kata* ‘the way of looking,’ *kasi-kata* ‘the way of lending’

In addition, the adverbial form is used as the stem of Verb-to-Noun conversion. The following instances are all noun lexemes with concrete meanings:

- (27) a. *yomi* (lit.) read.ADV ‘a reading, judgment, prediction’  
       b. *kasi* (lit.) lend.ADV ‘what one lends, a loan, a debt, an obligation’

- c. *kanji* (lit.) feel.ADV ‘a feeling, one’s impression’

Lastly, the adverbial form is used as a realization of the first verb constituent of nominal and verbal compounds, as illustrated below:

- (28) a. *yomi-mono* (lit.) read.ADV thing ‘books, stories’  
 a’. *yomu mono* (lit.) read.ATTRIB thing ‘something to read’  
 b. *yomi-goe* (lit.) read.ADV voice ‘reading voice’  
 b’. *yomu koe* (lit.) read.ATTRIB voice ‘voice of reading something’  
 (29) a. *yomi-hazimeru* (lit.) read.ADV begin ‘begin to read’  
 b. *yomi-kiru* (lit.) read.ADV complete ‘complete reading’

(28a, b) illustrate nominal compounds and (29a, b) verbal compounds, often called V-V compounds in the literature (see Kageyama (2009) for details). The former is particularly interesting for the present discussion because the adverbial form rather than the attributive form combines with the nominal head. This stem selection is not found in noun phrases. Thus, when the verb syntactically modifies the head noun, it takes the attributive form, as shown by (28a’, b’). The compound vs. phrase status distinction between the combinations in (28a, b) and (28a’, b’) is clear from stress difference and the fact that *koe* in (28b) but not the one in (28b’) has undergone the sequential voicing (see section 5.1). Also, the combination in (28b) projects the verb’s internal argument in genitive case, while the combination in (28b’) does so in accusative case, as illustrated below. This fact means that *yomu* in (28b’) modifies the head noun as a relative clause:

- (30) a. *okyoo*-{no/\*o} *yomi* *goe*  
 sutra-{GEN/ACC} read.ADV voice  
 ‘reading voices of a sutra’  
 b. *okyoo*-{o/\*no} *yomu* *koe*  
 sutra-ACC read.ATTRIB voice  
 ‘voice of someone reading a sutra’

The coexistence with the semantically logical combination of the attributive form and the noun head makes evident the purely morphological nature of the adverbial-form use in nominal compounds.

In sum, we have seen that the adverbial form recurs across inflection, derivation, and compounding without any semantic or functional motivation. Although this fact has not received any satisfactory explanation in the literature, our

discussions in sections 3.1 and 3.2 make it possible to view the data in (25), (26), (27), (28a, b), and (29) as instances of Priscianic formation. The adverbial form can function as a stem because it undergoes the upgrading process in the stem formation component, being deprived of its semantic function as a marker of conjunctive or adverbial function of a sentence. Without such a process, the distribution of the adverbial form in Japanese morphology would be very difficult to deal with.<sup>10</sup>

#### 4. Upgrading from a Diachronic Point of View

We have proposed the process of upgrading as a stem-formation process. Since the form *oars* in English and the form *yomi* in Japanese, for example, retain their usage as a plural word form and an adverbial form, respectively, we view the upgrading process primarily as a synchronic process. Yet, there are cases which suggest the validity of this process as a diachronic change as well (cf. Stump (2001:207)).

First, Haspelmath (2004) discusses diachronic changes in which a meaning-bearing affix changes into a semantically empty “stem-extender,” i.e. an LE. For example, he says that the Latin derivational inchoative suffix *-ēsc(ō)* somehow became the Romance stem-extender *-isc(o)* (as in Italian *finisco* “I finish”), claiming that this is a change internal to the morphology which is unrelated to grammaticalization. Although Haspelmath leaves the exact nature of the “change internal to the morphology” unclear, we can pinpoint it as a change caused by the upgrading process.

As a more systematic instance of change, it is worthwhile reconsidering the typological change of English from a language with stem-based morphology into a language with word-based morphology in the present framework. According to Kastovsky (2006), one important parameter of morphological typology concerns the morphological status of the input to the morphological process: word, stem, or root. Word-based morphology refers to the system of morphology in which inflectional and derivational processes operate on a free word form (e.g. *cheat* → *cheat-s*, *cheat-ed*, *cheat-ing*), while stem-based morphology refers to the one in which morphological processes operate on a bound stem (e.g. *scient-(-ist)*, *dramat-(-ic)*,

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<sup>10</sup> Tsukamoto (2012:339-359) compares the distribution of the adverbial form between Japanese and Korean and shows that the Korean adverbial form occurs in the same contexts as (23) and (29) but cannot occur in the contexts in (25), (26), (27), and (28a, b). This suggests that the Korean adverbial form does not undergo the upgrading process, occurring only in the semantico-functionally selected contexts. Indeed, Tsukamoto makes a conclusion to the effect that Priscianic formation is much more restricted in Korean morphology than in Japanese morphology.



-ist)). Notice that if we translate Kastovsky's distinction into the present terminology, word-based morphology should be called word-form-based morphology while stem-based morphology bound-stem-based morphology. Kastovsky's main claims are that English morphology historically changed from stem-based type to word-based type and that this change was triggered by the reanalysis of inflectional word-forms as stems.

Kastovsky (2006:165-166) illustrates this change by instances of nominal case inflection. Due to the loss of the nominative/accusative singular endings with strong masculine and neuter nouns, Old English already had ending-less nominative forms such as *cyning* 'king' and *stān* 'stone' beside overtly inflected nominative forms such as *luf-u* 'love,' *end-e* 'end,' and *gum-a* 'man.' And because the former, word-based type was numerically dominant, it caused a reinterpretation of the latter type in such a way that the inflectional ending was reanalyzed as part of the inflectional base. Thus, the form *end-e* was reanalyzed as *ende*; here, "-e must have been reinterpreted as part of the stem [...], losing its inflectional function" (Kastovsky (2006:166)). Kastovsky concludes that this kind of reanalysis, together with the levelling of unstressed vowels, rendered both nominal inflection and denominal derivation word-based throughout.

It is evident that Kastovsky's reanalysis is equal to what we call upgrading from the word-form level to the stem level. English morphology developed into the word-based type by upgrading its word-forms into the set of stems and replacing older bound stems with the upgraded ones.<sup>11</sup>

## 5. Two Types of Stems in Cross-Linguistic Comparison of Compounding

Interestingly, Kastovsky's distinction between word-based and stem-based morphology manifests itself also in compounding, which supports our basic claim that not only inflection and derivation but also compounding involves morphophonological realization. Reflecting Kastovsky's claim that the distinction constitutes a parameter in morphological typology, cases abound in which it plays a crucial role in cross-linguistic comparison of compounding. Below, we will focus on two such cases and further confirm the validity of the notion of upgrading.

### 5.1. Greek Compounding vs. Turkish Compounding

Ralli (2013) compares Greek and Turkish compounds in order to demonstrate her view that morphology and syntax are distinct structure-building modules and

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<sup>11</sup> Instances of stem-based morphology existent in Present-day English, such as *scientist* and *dramatist*, are due to lexical borrowing from French and Latin in Late Middle English (Kastovsky (2006:166-167)).

compounding cuts across them. When compounding occurs in the module of morphology, driven by a morphological rule or template, the resulting *morphologically-based compounds* should involve units specific to morphology and share properties with other morphological objects such as derived words. This type should be distinguished from *phrasal compounds*, “which may be semi-visible to syntax, their semantics may be non-compositional, but their structure is derived in syntax, in that it is not based on morphologically-proper units and it is not the product of morphological rules or templates” (Ralli (2013:183)).

Greek compounds are morphologically-based compounds because they involve bound stems which are not used in corresponding phrases. Compare the following two combinations of the lexemes expressing ‘table’ and ‘cloth’ in Greek:

- (31) a. *Free forms of the constituents*  
           trapézi           mandíli  
           table.NOM.SG   cloth.NOM.SG  
           ‘table’           ‘cloth’
- b. *Compound*  
           trapez-o-mándil-o  
           table<sub>[stem]</sub>-CM-cloth<sub>[stem]</sub>-NOM.SG

(Ralli (2013:185))

As indicated by the gloss, in compounds the two lexemes take bound stem forms and they are connected by the compound-specific element *o*, which is an instance of LE (section 3.2) but Ralli calls compounding marker (CM). These properties are absent in the corresponding phrase shown in (31a).

Ralli contrasts Greek compounds with one type of formations that are usually regarded as compounds in Turkish, i.e. N(ominal)N(ominal)-(s)I(n) compounds, which are illustrated below:<sup>12</sup>

- (32) a. ev      çati-si  
           house roof-(s)I(n)  
           ‘house roof’
- b. kitap sayfa-si  
           book page-(s)I(n)  
           ‘book page’

(Ralli (2013:188))

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<sup>12</sup> The genitive/possessive marker *-(s)I(n)* retains *-s* when it attaches to a vowel-ending stem and retains the final *-n* when followed by a suffix.

Following the standard view, Ralli considers that this type of compound derives from the 3SG GEN-POSS referential phrase exemplified in (33) below, dropping the genitive marker *-sIn* attached to the non-head:

- (33) Cem-in                      araba-si  
       Cem-3SG.GEN    car-3SG.POSS  
       ‘Cem’s car’

(Ralli (2013:188))

In this noun phrase, the marker *-(s)I(n)* is attached both to the modifier and the head. When it is omitted from the modifier, the corresponding compound results. In other words, unlike the contrast in (31a, b), the Turkish NN-*-(s)I(n)* compound is exclusively constituted of units identical to the ones in the corresponding phrase.

A crucial difference between (32) and (33) is that in (33) *-(s)I(n)* attached to the head is a possessive marker visible to syntax, but in (32) it has lost its syntactic function and has become a semantically empty string (Göksel (2009)). This difference leads Ralli to claim that the *-(s)I(n)* marker in the Turkish N-N compound functions as a compounding marker, i.e. an LE. And she stresses that whereas LEs used in Greek compounds are specific to morphology, originating from purely morphological segments, Turkish uses an LE that originates from a functional element employed in syntax.

Ralli’s distinction between morphologically-based compounds and phrasal compounds fits into Kastovsky’s morphological typology between stem-based morphology and word-based morphology. In our framework, phrasal compounds are analyzed as consisting of compounding stems derived via upgrading from word-forms. In the Turkish phrasal compound in (32a), for example, *çati-si* is a compounding stem derived through the upgrading of the inflected word with a possessive marker. Since upgrading deletes functional semantics, the marker *-si* becomes semantically empty; it turns into an LE. On the other hand, morphologically-based compounds consist of compounding stems originally listed in the stem space (Aronoff and Fuhrhop (2002), Tribout (2012)). Upgrading is not involved in this case, so that the constituent units are exclusively specific to morphology. Thus, the difference between phrasal compounds and morphologically-based compounds can be viewed as a strong piece of evidence for our proposal that the process of upgrading should be added to the stem-formation component.<sup>13</sup>

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<sup>13</sup> Okubo (2014) attempts to distinguish two types of compounds in the framework of

We have shown that Ralli's (2013) insights and observations can be captured in a natural way in our framework. Let us add that our analysis is superior to Ralli's in some respects. First, we can avoid potential problems Ralli (2013) faces. She leaves it unclear how functional elements lose their functional semantics to be reused as LEs in phrasal compounds. In her analysis, the formal recycling property and the semantic emptiness of LEs appear to be entirely accidental phenomena. In contrast, in our framework, these properties are natural consequences of the upgrading process.

Second, Ralli's discussion implies that languages divide into those that produce compounds in morphology and those that produce compounds in syntax. However, there are languages like Japanese that have both morphologically-based and phrasal compounds. Thus, in section 3.3, we saw instances of what Ralli calls phrasal compounds in Japanese, i.e. those involving the adverbial form in their first constituent such as (28a, b) and (29). On the other hand, what Ralli calls morphologically-based compounds are instantiated by Japanese N-N compounds with sequential voicing (Labrune (1999, 2013), Itô and Mester (2003)). As illustrated below, the second constituent of Japanese native N-N compounds canonically undergoes assimilatory voicing at its first segment:

- (34) a. YAMA + SAKURA → yama-zakura  
           mountain cherry tree 'wild cherry tree'  
       b. KAWA + KISHI → kawa-gishi  
           river side 'river side'

What is important for us is that this morphological realization pattern cannot be reduced to phonology. Sequential voicing occurs when N-N compounds are semantico-syntactically of the modifier+head type, as in (34), but it does not occur in coordinate N-N compounds, as shown below.

- (35) YAMA + KAWA → yama-kawa (cf. \*yama-gawa)  
       mountain river mountain and river

Because voiced forms such as *zakura* and *gishi* in (34) occur inside compounds only, they count as what Ralli calls units specific to morphology and thus should be listed

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Distributed Morphology. In this framework, there are two patterns of morpheme attachment, inner attachment and outer attachment. Okubo claims that phrasal compounds involve outer derivation, whereas morphologically-based compounds involve inner derivation. The comparison between his analysis and ours is beyond the scope of this paper.

in the stem space along with their non-voiced counterparts. The realization rule of modificational N-N compounding selects the voiced stem, while the realization rule of coordinate N-N compounding selects the non-voiced stem.

The coexistence of both phrasal compounds and morphologically-based compounds in Japanese speaks for the view that whether the merge of two lexemes occurs in morphology or syntax, morphophonological realization of the resulting compounds uniformly makes access to the stem formation component.<sup>14</sup> In Ralli's analysis, Japanese compounds with an adverbial form should be derived in syntax, excluding morphology-specific properties. However, when occurring as the head noun of a modificational compound, the adverbial-form stem also undergoes sequential voicing (e.g. TE 'hand'+KAK(U) 'write' → *te-gaki* 'handwriting') (Ito and Sugioka (2002:125-128)). This is possible if, as we are proposing, syntactically originated stems belong to the same level or component as purely morphological stems as a result of upgrading.

In short, compounds are classified into two types depending on whether upgrading is involved or not.

## 5.2. *Attributive Compounding in Dutch and German*

The proposed analysis enables us to take a fresh look at an apparently puzzling contrast between Dutch and German Adjective+Noun attributive compounds. Hüning (2010) claims that when German makes what Booij (2010:175-190) calls A+N naming units (units that function as names for unitary concepts) via compounding, Dutch does so via syntax. This claim is based on the fact that Dutch apparently inflects the adjective in A+N naming units, while German does not. In the following instances, the same naming unit is realized differently between the two languages, exhibiting adjectival agreement only in Dutch:

- (36) A+N naming units in Dutch
  - a. mobiele telefoon 'mobile phone'
  - b. nieuwe auto 'new car'
- (37) A+N naming units in German
  - a. Mobil-telefon 'mobile phone'
  - b. Neu-auto 'new car'

(Booij (2010:176))

Although Hüning (2010) views the presence and absence of the adjectival

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<sup>14</sup> Kageyama (2009) shows that verbal compounds also consist of the morphologically-based and syntactically-based types in Japanese.

agreement formative in (36) and (37) as the definitive symptoms of the combinations' different status as phrase and compound, it is problematic to take Dutch naming units as phrases. Beside the semantic property as names, they exhibit various properties that speak for the word status of the entire combination, as discussed by Booij (2010:183-188). For example, Dutch A+N naming units can be embedded in compounding and derivation, which should be impossible from the viewpoint of atomicity if they are really phrasal:

- (38) a. [namaak [mobiele telefoon] 'imitation mobile phone'  
 b. [[jonge mensen]-achtig] 'young people-like'  
 (Booij (2010:184-185))

Also, as the following examples show, Dutch naming units can be coordinated with compounds, and the common constituent can be gapped, as in (39a). In contrast, this is impossible between naming units and descriptive phrases, as in (39b):

- (39) a. *naming unit + compound*  
 Amerikaanse (talen) en Papoeatalen  
 'American (languages) and Papua-languages'  
 b. *naming unit + descriptive phrase*  
 \*Amerikaanse (talen) en moeilijke talen  
 'American languages and difficult languages'  
 (Booij (2010:185))

These data strongly suggest that naming units in Dutch, like those in German, should be analyzed as compounds. Booij (2010:187) proposes a construction-based account for the form-meaning discrepancy of the Dutch A+N naming unit, leaving it unclear why such form-meaning pair can arise in the first place. In our framework, the agreement marker *-e* in the Dutch examples can be analyzed as part of stems derived from word forms through upgrading. Thus, the constituent *mobile* in *mobile telefoon* is a compounding stem formed via upgrading. German, on the other hand, selects a stem not involved in upgrading.

## 6. Periphrastic Word Forms in Upgrading

The active working of the process of upgrading can be revealed by data that suggest that even periphrastic word forms can be upgraded to compounding stems.

Let us start with Beard's (1995) theory of nominal case inflection. Through an in-depth investigation of how various case functions, not only structural cases but



(41) *French N+PP constructions*

- a. heure de pointe (lit.) hour of peak ‘rush hour’
- b. course de côte (lit.) race of hill ‘hill climb’
- c. fil de fer (lit.) wire of iron ‘iron wire’
- d. moulin à vent (lit.) mill to wind ‘windmill’

(Fradin (2003:199))

(42) *Spanish N+PP constructions*

- a. dulce de leche (lit.) sweet of milk ‘caramel paste’
- b. traje de baño (lit.) suit of bath ‘swimsuit’
- c. diente de león (lit.) tooth of lion ‘dandelion’
- d. hombre de paja (lit.) man of straw ‘straw man’

(Moyna (2011:39))

(43) *Italian N+PP constructions*

- a. casa di cura (lit.) home of treatment ‘nursing home’
- b. camera a gas (lit.) room at gas ‘gas chamber’
- c. hockey su prato (lit.) hockey on meadow ‘field hockey’
- d. ferro da stiro (lit.) iron from iron ‘iron’

(Masini (2009:259))

Benveniste (1966), Di Sciullo and Williams (1987), Nicoladis (2002), and ten Hacken (2013) analyze these constructions as compounds, while Booij (2010:171-173) call them phrasal naming units. Of particular importance for us is the fact that the constituent [P+N] has lost a phrasal status and behaves as an incorporated head. Referring to Italian data, Masini (2009:260) shows that the [P+N] constituents exhibit the following characteristics of what Dahl (2004:ch.10) calls incorporating patterns: i) they cannot be expanded by adding a modifier to the N, ii) they denote unitary concepts, or stereotypical or permanent properties, and iii) the N may be wholly or partially deprived of the morphological marking that would be expected in similar syntactic constructions. Thus, unlike the complement of a PP, the post-prepositional nouns in (41), (42), and (43) lack number inflection and determiners. Additionally, the following data concerning lexical atomicity speak for the compound status of the entire construction:

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Maori, exhibiting the preposition *-ā-* ‘of’:

- (i) waiata-ā-ringa (lit.) song-of-hand ‘action song’

(Bauer 1997: 309)



## (44) Spanish data

*La habitación tiene un ojo (\*grande) de buey.*  
 the room has an eye big of bull  
 ‘The room has a porthole.’

(Kornfeld (2009:446))

## (45) Italian data

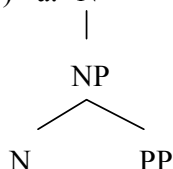
*une casa (\*accogliente) di cura*  
 a home cosy of cure  
 ‘a nursing cosy home’

(Masini (2009:260))

The fact that an additional modifier cannot be inserted between the head noun and the [P+N] modifier speaks for the wordhood of the entire combination, supporting the compound analysis.

Given that N+P+N constructions are compounds, we have to consider how they are derived. Assuming that “French (and no doubt Spanish) lacks compounding altogether” (p.83), Di Sciullo and Williams (1987:ch.4) argue that Romance compounds like (41), (42), and (43) are produced as PP-modified noun phrases in syntax and reanalyzed as words, providing them with the following structure in (46a):

(46) a. N

b.  $N \rightarrow XP$ 

(Di Sciullo and Williams (1987:84))

(46a) is derived by the rule in (46b), which the authors claim to derive Romance V+N compounds such as (4) also. Notice that in this analysis, phrase-to-word conversion targets at the NP, that is, the entire combination of N and PP.

Our proposal, in contrast, is that as a periphrastic case word form, a PP can be upgraded to a stem in the stem formation component and chosen by a realization rule of modificational compounds. PPs are periphrastic word forms of case inflection, as discussed above, and as such can undergo the upgrading into stems in our framework. There is no a priori reason that morphological word forms can undergo upgrading but periphrastic word forms cannot. Let us focus on the French preposition *de* ‘of.’ According to ten Hacken (2013:103), in French, morphological case was lost around the 13th century and the genitive is expressed by means of this

preposition. He (2013:106) explicitly states that “the function of *de* can be seen as parallel to morphological case in Polish and *’s* in English,” a view that confirms Beard’s case theory. Thus, a PP headed by *de* is a periphrastic realization of genitive function. Compounds like (41), (42), and (43) belong to “phrasal compounds” by Ralli (2013) in which a compound realization rule uses an upgraded stem. Notice that the same analysis applies to the English genitive compounds we saw in (5). In fact, our analysis can deal with Romance N+P+N compounds and cross-linguistic occurrences of compounds with case inflection in (5) to (14) in a uniform manner; these two types represent the upgrading of periphrastic and morphological word-forms of case functions, respectively.

Our analysis is superior to Di Sciullo and Williams’s analysis in that Romance languages actually have a compounding process in the morphological component. For example, Moyna (2011:38-39) provides the following examples of A+N and N+A modificational compounds in Spanish:

- (47) [A+N]<sub>N</sub>  
 a. vanagloria (lit.) vain-glory ‘vainglory’  
 b. gentilhombre (lit.) gentle-man ‘gentleman’
- (48) [N+A]<sub>N</sub>  
 a. olla podrida (lit.) pot rotten ‘stew’  
 b. hielo seco (lit.) ice dry ‘dry ice’

Moyna regards these types of expressions as compounds because they also have structural fixity and resist the modification of adjectives by adverbs, as in *hielo* (\**muy*) *seco* ‘(lit.) ice very dry.’ If we pursue Beard’s claim that PPs are functionally identical to denominal adjectives (see above; also Baker (2003) for a similar view), the N+P+N compounds should be seen as realized by the same realization rule as the compounds in (47) and (48); that is, the N+P+N compound is in an allomorphic relation to the N+A compound. Given this analysis and the word-order variation in (47) and (48), one might wonder why the upgraded [P+N] modifier always occurs after the head noun. Although it is unclear whether the ultimate reason is syntactic or semantic, our analysis can account for the fact by noting that the [P+N] modifier follows the head noun for the same reason that an denominal adjectival modifier follows it, as indicated below:

- (49) a. French  
 tuberculose *osseuse* (lit.) tuberculosis of.bone ‘bone tuberculosis’  
 carte *routière* (lit.) map of.road ‘road map’

(Fradin (2008:2, 7))

b. Spanish

el agua *mineral* (lit.) water mineral ‘the mineral water’

tren *eléctrico* (lit.) train electric ‘electric train’

(Ticio (2010:132-133))

c. Italian

sforzo *muscolare* (lit.) effort of.muscle ‘muscle effort’

scatola *cranica* (lit.) box cranial ‘cranial box’

(Bisetto (2010:65))

In sum, this section has revealed that the process of upgrading gives rise to both compounds with apparent case inflections inside such as (5) to (14) and compounds with apparent PPs inside such as (41) to (43). Their coexistence is a natural consequence of our analysis and Beard’s case theory, according to which case functions are realized either as inflections or as PPs.

## 7. Conclusion

Based on the data of so-called internally inflected compounds, this paper has made the following empirical and theoretical findings. We will summarize them in this order.

The notion of Priscianic formation, i.e. the use of a word-form as the base of another morphological process, has a very long tradition in morphological research. Traditional grammarians detected this type of formation in inflectional morphology, based on which Aronoff (1994) established the lexeme-based theory which crucially uses the notion of stem. Bauer (1997), Booij (1997), and Stump (2001) revealed that derivational morphology also exhibit Priscianic formation. Then, in this paper, it has been revealed that this notion is very useful in compounding, too. Specifically, we have shown that so-called phrasal compounds or internally inflected compounds, attested widely in languages of the world, can be seen as compound versions of Priscianic formation.

Theoretically, we have proposed that the process of upgrading should be added to the stem formation component. This process converts a word-form into a stem by depriving it of functional semantics. Such a process is necessary in order to deal with the level difference between word forms and stems. While we view the process primarily as a synchronic process, we have shown that it is useful for dealing with diachronic change, particularly the diachronic shift of a language with “stem-based” morphology into the one with “word-based” morphology.

Our view that the upgrading process enables Priscianic formation not only in

inflection and derivation but also in compounding has been supported by the fact that the Japanese adverbial form is used in the Priscianic manner across-the-board. The stem space can contain (i) non-upgraded or listed stems and (ii) upgraded stems, the latter of which divide into (a) those from morphological word-forms and (b) those from periphrastic word-forms. We have shown that these three types of stems participate in the realization of compounds, giving rise to typological cross-linguistic variation of compounding.

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