Noun incorporation and rule interaction in the lexicon

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Proceedings of the 10th International Conference on
Head-Driven Phrase Structure Grammar

Michigan State University

Stefan Müller (Editor)

2003

Stanford, CA: CSLI Publications

pages 359–379

Runner, Jeffrey T. & Raul Aranovich. 2003. Noun incorporation and rule interaction in the lexicon. In Stefan Müller (ed.), *Proceedings of the 10th International Conference on Head-Driven Phrase Structure Grammar, Michigan State University*, 359–379. Stanford, CA: CSLI Publications. DOI: 10.21248/hpsg.2003.20.

1. Introduction: Two types of rules

Wasow (1977) argues that linguistic theory should recognize two qualitatively distinct types of rules: lexical and transformational. His primary argument for this came from distinctions between verbal and adjectival passive participles in English, one type of which is illustrated below. The negative prefix *-un* is able to attach to adjectives but not verbs (1a,b). This prefix can also attach to adjectival passive participles (1c), suggesting they too are adjectives; verbal passive participles, however, appear to be verbs rather than adjectives, appearing in positions restricted to verbs (2).

(1) a. They were an unhappy couple
    b. *We unknow her whereabouts
    c. Her whereabouts may be unknown [adjectival passive participle]
(2) a. Mary was elected president [verbal passive participle]
    b. *Mary was happy president

Wasow's claim was that the grammar has two ways of deriving passive participles: one lexical, which creates adjectival passives; the other syntactic, deriving verbal passives. Based on the dichotomy observed in the two types of passive participles, as well as several other constructions, Wasow suggested that the two different rule types shared a cluster of properties, as Table 1 illustrates.

Table 1: Properties that distinguish the two rule types

Criteria	Lexical Rules	Transformations
structure-preserving?	yes	not necessarily
change POS?	possibly	not
local?	yes	not necessarily
fed by transformations?	no	possibly
idiosyncratic exceptions?	yes	little

For the purposes of this paper we will focus on one aspect of Wasow's dichotomy, developed especially in Anderson (1977) and Wasow (1981): syntactic rules affect more "superficial" grammatical function properties, while lexical rules affect deeper lexical semantic properties of lexical items. Wasow's analysis for these differences was that the particular characteristics of the rule type is determined by the domain of rule application. That is, since syntactic rules have access only to syntactic/phrasal informa-

tion, it is this information that they manipulate; and since lexical rules have access only to lexical information, that is what they manipulate. In a sense, the "vocabulary" of the domain of rule application constrains the characteristics of the rule. And given the architecture of the grammar Wasow assumed, with the output of the lexicon feeding the syntax, most of the properties of Table 1 are derived.

Since Bresnan (1982), however, lexicalist theories of grammar have replaced syntactic transformations with lexical rules. In the wake of this paradigm shift, it seems, Wasow's dichotomy is potentially left unexplained: if all rules are lexical, the differences between the properties of the two rule types cannot follow from the differences between the lexicon and the syntax. We believe that Wasow was fundamentally correct in recognizing two qualitatively different types of rules. Our goal in this paper is to recapture Wasow's insight within a lexicalist framework such as HPSG.

Our proposal builds on Sag & Wasow's (1999) distinction between *lexeme* and *word*. We claim that there is a contrast between lexical rules that relate lexemes to lexemes (L-to-L rules) and lexical rules that relate words to words (W-to-W rules) and that these differences follow from the architecture of the grammar. In particular, we will argue that syntactic function features (ARGST, VALENCE, etc.) are not defined for lexemes, while lexical semantic features (CONTENT) are. From this it follows that L-to-L rules can affect lexical semantic features, and not syntactic function features. In addition, since words are defined for syntactic function features, W-to-W rules can change them. L-to-L rules are Wasow's "lexical" rules, and W-to-W rules are his "syntactic" rules.

2. Background and Proposal

Our analysis, which we outline directly below, rests on three basic assumptions within current versions of HPSG. First, following Koenig (1999) and Riehemann (2001), we assume an approach to morphology in which affixes are associated with type schemata that introduce both phonological and SYNSEM information, and subcategorize for a morphological base. In this approach, the "input" to a lexical rule (i.e. the morphological base) is a feature of the output. We will follow Riehemann and call this Type-Based Derivational Morphology (TBDM). To illustrate the approach, Riehemann's analysis of *-able* adjectives is given in Figure 1. What is important to note here is that the input, labeled MORPH, is a verb with certain CONTENT features, and the entire "output" SYNSEM is an adjective, the phonology of which is made up of the input's phonology (tagged [1]) plus *-able*.

Second, we follow Sag and Wasow (1999), who suggested that nonphrasal signs are of two different types: lexeme and word. The lexeme car-

ries the information that is shared among all the elements in a paradigm, while all the different "surface" forms in a paradigm are each separate words. For example, the words *love, loves, loved, loving, lover,* are all related to a single lexeme *love.*

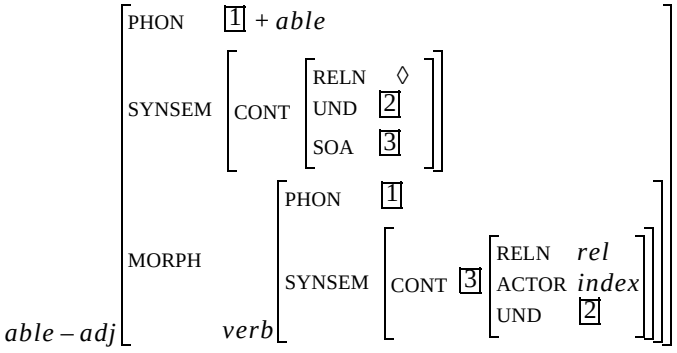

Figure (1): *-able* adjective type in TBDM

Third, we build on work by Davis and Koenig (Davis & Koenig 2000, Koenig & Davis 2001) which claims that the ARGST of a word is predictable from its CONTENT features. In particular, linking constraints are partial specifications of index sharing between members of ARGST and CONTENT; different event types determine different linking constraints. We extend the Davis/Koenig-style linking constraints to relate lexemes and their CONTENT features to words and the appropriate ARGST features in L-to-W types, as illustrated in Figure 2, above. The Actor is linked to the first NP in ARGST**.** The Undergoer is linked to the last NP in ARGST. What is different here is that the linking constraints are the licensing constraints for L-to-W types. That is, linking constraints need only be obeyed by words that have lexemes as the value of their morphology, not by words that have other words as their input (as in the feature structure for a passivized verb, for instance).[1]

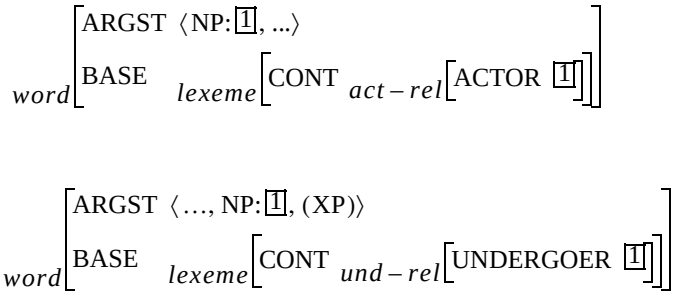

Figure (2): Linking Constraints

We are now ready to outline our proposal, which we call the SPLIT LEXICON HYPOTHESIS. As just mentioned, the Split Lexicon Hypothesis takes as background assumptions the lexeme vs. word distinction, Type-Based Derivational Morphology, and Davis & Koenig-style linking. In addition, we make the following novel claims: (1) lexemes have no ARGST, only words have ARGST; and (2) words are constrained to have the CONTENT features of their base. From the Split Lexicon Hypothesis it follows that L-to-L types (rules) will represent one type of alternation and that W-to-W types represent another. L-to-L types manipulate the lexical semantic features of CONTENT but not the grammatical function features of ARGST; W-to-W types manipulate grammatical function features of ARGST, but not the lexical semantic features of CONTENT.

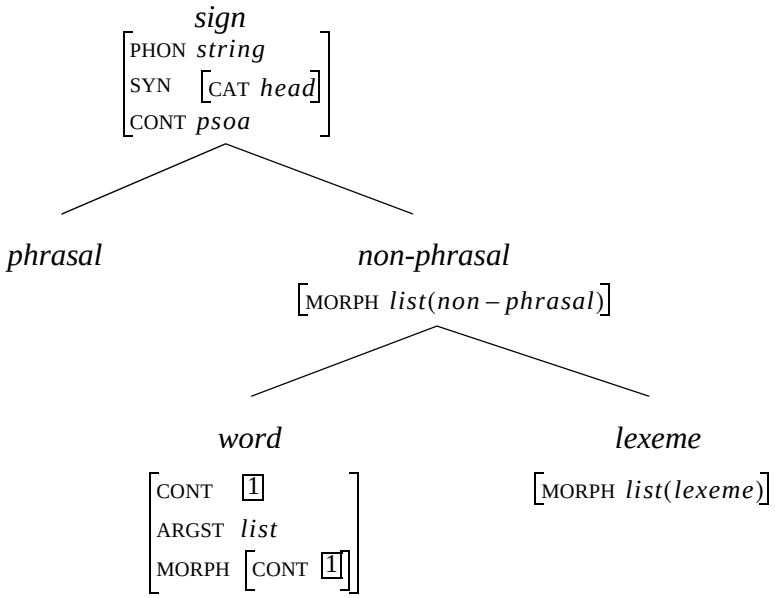

Figure (3): Type Hierarchy

The basic claims of the Split Lexicon Hypothesis are formalized as constraints on the type hierarchy. These are illustrated in Figure 3, above. In addition to the constraints that words but not lexemes have the ARGST feature and that the CONTENT value of the word is the CONTENT value its base, we add the constraint that lexemes have only lexemes as bases. This latter constraint is needed to insure that lexemes are inputs to words, but words are not inputs to lexemes, a constraint any approach assuming the

1. We should point out here that we also differ from Sag & Wasow (1999), who assume verbal inflection is "added" in L-to-W types. We assume, rather, that it is added after all W-to-W types, in an *inflected_word* type.

lexeme/word distinction needs.

The differences between rule types, then, follow in a principled way from constraints on the types of features that are appropriate for each input/output pair. L-to-L types may affect the CONTENT features of a lexical item (but not ARGST). W-to-W types may affect the ARGST features of a lexical item (but not CONT). And, any L-to-L type will be embedded within (will precede) any W-to-W type.

In Aranovich and Runner (2001), we argued that the Split Lexicon Hypothesis accounted for certain differences between the locative alternation and dative shift in English.[2] In this paper, we will use the Split Lexicon Hypothesis to examine certain differences between two types of Noun Incorporation construction, and their relation to other rules in the grammar. We will argue that Compounding Noun Incorporation is an L-to-L type and that Classifier Noun Incorporation is a W-to-W type; we will base our argument on data from the Paleo-Siberian language Chukchi and the isolate language Ainu. Our argument for the Split Lexicon Hypothesis is based on interaction of Noun Incorporation and Applicative Formation in the two languages.

3. Noun incorporation

In Noun Incorporation (NI), a verb and a dependent noun (normally the direct object) combine to form a complex verb. Several different types of NI have been acknowledged in the literature (Mithun 1984). We focus here on the two types discussed in Rosen (1989): Compounding NI and Classifier NI (see also Gerdts 1999 for an overview). Table 2 outlines some of the main differences that have lead researchers to divide these into two types of NI; some of the languages that have been classified as such are listed as well.

Table 2: Two kinds of Noun Incorporation

Compounding NI	**Classifier NI**
reduces valence	no effect on valence
no doubling	may or may not allow doubling
Chukchi, Polynesian (Samoan, Tongan, Nieuen), Micronesian (Mokilese, Ponapean, Kusaiean)	Ainu, Northern Iroquoian (Mohawk, Seneca, Oneida, Onondaga, Cayuga, Tuscarora), Caddo, Rembarnga, Southern Tiwa, Gunwinggu

2. Driven by somewhat different concerns, Ackerman (1992) and Briscoe & Copestake (1999) also make proposals for two classes of lexical rule types.

Noun Incorporation in Chukchi is of the Compounding type. The main evidence for this is that NI changes the transitivity of the predicate. Chukchi has ergative/absolutive marking, and it shows a complex system of subject/object agreement based on an animacy hierarchy. When the object *mətqəmət* incorporates in (3b), the subject receives absolutive marking, and the agreement marker on the verb (*gʔe*) is the one found in intransitive sentences.

(3) a. *ətləg-e* *mətqəmət* *kawkaw-ək* *kili-ɣin* [CHUKCHI]
father-ERG butter.ABS bread-LOC spread.on-3SG.S/3SG.O
b. *ətləg-ən* *kawkaw-ək* *mətqə=rkele-gʔe*
father-ABS bread-LOC butter=spread.on-3SG.S
'The father spread butter on the bread.'

Noun Incorporation in Ainu, on the other hand, is of the Classifier type. In this language, NI does not change the transitivity of the predicate. Ainu is also an ergative/absolutive language. When the object incorporates, the agreement marking on the Ainu verb is still ergative (A for Agent), as in (4b) (in one dialect of Ainu, however, the marking changes to absolutive). NI in Ainu does not reduce the verb's valence, which is typical of Classifier NI languages. Ainu does not allow doubling.

(4) a. *mukcar-aha* *a-tuye*. [AINU]
chest-poss 1s.A-cut
b. *a-mukcar-tuye*.
1s.A-chest-cut
'I cut his chest.'

Following Rosen (1989) and Spencer (1995), we analyze NI as a lexical alternation. To account for the contrast between Classifier NI and Compounding NI we rely on the distinction between word and lexeme. We argue that Compounding NI involves the formation of a new lexeme; Classifier NI involves the formation of a new word. Chukchi NI (i.e. Compounding NI) is the result of a Lexeme-to-Lexeme type; Ainu NI (i.e. Classifier NI) is the result of a Word-to-Word type.

4. An HPSG analysis of NI

A formal account of Noun Incorporation in the HPSG formalism is presented in Malouf (1999). He proposes a binary lexical rule, i.e. a lexical rule that takes two signs as its input, to account for NI in West-Greenlandic. We also adopt the idea of the binary rule, but we couch our analysis in terms of

TBDM instead of the lexical rule approach. In our approach, incorporating verbs are represented as a type that combines two signs in the input. The morphological base, then, is a list of two nonphrasal signs, a verb and a noun. The phonology of the incorporating verb is the concatenation of the phonology of the incorporated noun and the phonology of the base verb. A general type constraint for incorporating verbs is presented in Figure 4.

$$verb\left[\begin{array}{l}\text{PHON} \quad \boxed{1}+\boxed{2} \\ \text{MORPH} \ \langle verb\left[\text{PHON} \ \boxed{2}\right], noun\left[\text{PHON} \ \boxed{1}\right]\rangle\end{array}\right]$$

Figure (4): Noun Incorporation type constraint

There is no specification in the type constraint in Figure 4 as to the nonphrasal subsort of the input and the output types. They could be words or lexemes. In Classifier NI (e.g. Ainu) input and output are words, while in Compounding NI (e.g. Chukchi) input and output are lexemes. Other features of the incorporating verbs (argument structure, semantics, etc.) are determined in accordance with the constraints on their input-output types.

Classifier NI, the type Ainu NI belongs to, builds a new word out of two base words, the base verb and the incorporated noun. The function of the incorporated noun is to identify a missing syntactic phrase, the complement that is not going to be realized as a canonical syntactic constituent (it could be absent--as in Ainu--or doubled, or partially realized as a remnant, as in other Classifier NI languages). In Classifier NI (Figure 5) the output is of type *word,* and the morphological base (the input) is a list of *words.* The incorporated noun's HEAD value is shared with the HEAD value of one of the members of ARGST in the base verb. Sharing of HEAD features, as opposed to structure-sharing of the whole SYNSEM, is necessary since the incorporated noun is not a phrasal object, but the member of ARGST to which the incorporated noun corresponds is phrasal. In the incorporating verb's ARGST there is a non-canonical NP, corresponding to the missing syntactic constituent left by the incorporated nominal.

$$verb-word\left[\begin{array}{l}\text{ARG-ST} \ \langle \boxed{1}, \text{NP}_{\text{non-canon}}:\boxed{2}\rangle \oplus \boxed{3} \\ \text{MORPH} \ \langle \ verb-word\left[\text{ARG-ST} \ \langle \boxed{1}\text{NP}, \text{NP}\left[\text{HEAD} \ \boxed{5}\right]:\boxed{2}\rangle \oplus \boxed{3}L\right], \ \rangle \\ \qquad\qquad\qquad\qquad noun-word\left[\text{SYN}|\text{HEAD} \ \boxed{5}\right]\end{array}\right]$$

Figure (5): Classifier NI type constraint

The insight we are basing our analysis on is that Classifier NI is similar to cliticization in Romance. Like a Romance clitic, the incorporated noun is the expression of a verbal argument that is suppressed from the syntactic tree, but not from the argument structure of the predicate. Following Miller and Sag's (1997) treatment of French clitics, we analyze such suppressed complements as noncanonical NPs in ARGST. Also, like cliticization, the suppression of the complement does not affect the transitivity of the predicate. This is the main reason to leave a noncanonical NP in ARGST. Note, however, that as in the case of Romance clitics, NI languages may vary on whether and to what extent they allow "doubling" (and/or "stranding") of the incorporated nominal, as discussed in Mithun (1984) and Rosen (1989). More work needs to be carried out to determine the formal nature of such doubling and stranding.

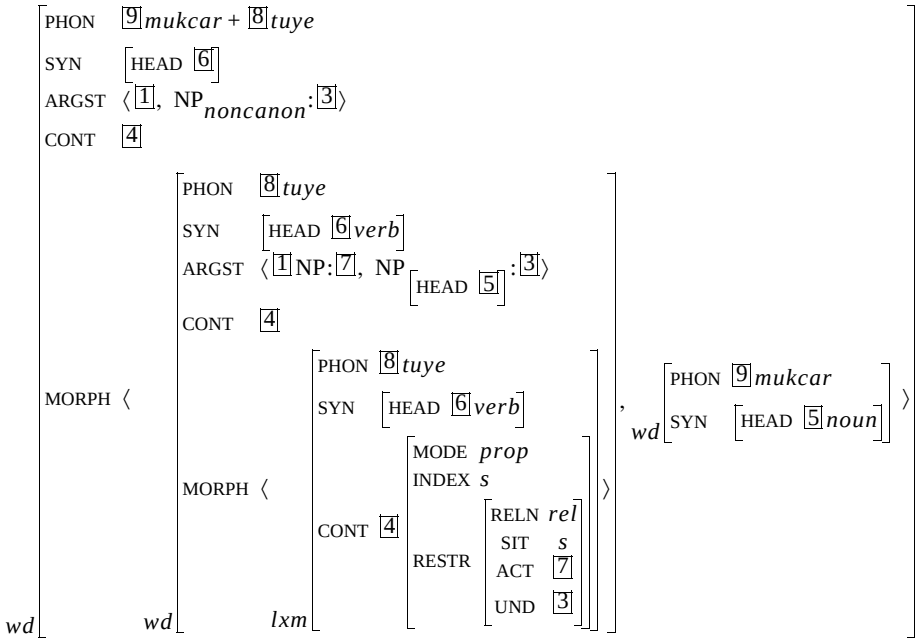

Figure (6): A Classifier NI verb in Ainu

Above, in Figure 6, is a feature description for the Ainu incorporating verb *mukcar=tuye* 'chest=cut', as it appears in sentence (4b). The MORPH value of the outermost word is a list that contains two words: the base verb and the incorporated noun. The base verb contains a lexeme, the arguments of which are linked to ARGST according to the linking principles in Figure 3, above. The outermost ARGST, however, is not identical to the ARGST of the innermost verb. In particular, the object (i.e. the second NP) is of type noncanonical, which means it will not be realized as a valence

feature. Its presence in ARGST, however, ensures that the verb remains transitive (this accounts for the presence of the A-type agreement marker on the verb in (4b)). The index assigned to this noncanonical NP ([3]) corresponds to that of the incorporated noun. The incorporated noun shares its head features (tagged [5]) with the object of the base verb (i.e. the NP that corresponds to the noncanonical NP in the outermost ARGST). Notice that the CONTENT of the incorporating verb (tagged [4]) is identical to that of the base verb.

Compounding NI, of the kind found in Chukchi, reduces the number of semantic arguments of the verb that are available to project to ARGST. The change in transitivity in the incorporating verb indicates that one of the semantic arguments of the base verb is saturated in the lexicon, by being assigned a denotation (i.e. an index) before the syntax gets a chance to do so. This argument, then, must not be represented in ARGST. Since this kind of argument saturation amounts to a change in meaning between the base verb and the incorporating verb, we claim the word-formation type for Compounding NI cannot have *words* as input or output, but rather *lexemes*. This is shown in Figure 7. Since lexemes do not have ARGST features, incorporation consists of the saturation of one of the semantic arguments of the incorporating verb by the incorporated nominal.[3] To achieve this, we specify that the restriction of the verbal compound is the concatenation of the restrictions of the morphological roots. This is analogous to the way in which the meaning of a VP is compositionally determined by the meanings of the head verb and its complements in HPSG (Sag and Wasow 1999). Semantically, then, an incorporating verb is as complex as a VP, but from a syntactic point of view it is still a lexical, not a phrasal, object.

$$vb\text{–}lxm\left[\begin{array}{ll}\text{CONT} & \left[\text{RESTR}\ \langle \boxed{3}, \boxed{5} \rangle\right] \\ \text{MORPH} & \langle\ vb\text{–}lxm\left[\text{CONT|RESTR}\ \boxed{3}\left[\begin{array}{ll}\text{RELN} & rel \\ \text{UND} & \boxed{4}\end{array}\right]\right],\ n-lxm\left[\text{CONT|RESTR}\ \boxed{5}\left[\begin{array}{ll}\text{RELN} & rel \\ \text{ARG} & \boxed{4}\end{array}\right]\right] \rangle\end{array}\right]$$

Figure (7): Compounding NI type constraint

In Compounding NI there is a mismatch between the number of unrestricted indeces of the base verb and those of the compound verb. This difference correlates with the difference in valence between the incorporating verb and the base verb when it does not incorporate a noun. To account for

3. A matter of continued research is whether this is indeed a case of "saturation" vs. "merger" in the sense of Chung & Ladusaw (to appear).

this correlation we introduce convention that blocks linking of the restricted incorporated argument to ARGST.

> **Argument Saturation Convention**: The set of indices linked to ARGST is the set of unsaturated indices in the CONTENT of the verb. An index is saturated if it is linked to a nominal index.

By virtue of the Argument Saturation Convention, the saturated argument in Compounding NI will not be linked to any element of ARGST, resulting in the desired reduction in valence. Figure 8 shows the linking in the lexeme-to-word type that takes place in Compounding NI.

$$
\textit{verb-word}\left[\begin{array}{l}\text{ARG-ST}\ \langle \text{NP:}\boxed{1}\rangle \\ \text{MORPH}\quad \textit{verb-lexeme}\left[\begin{array}{l}\text{CONT}\left[\begin{array}{l}\text{MODE}\ \textit{prop} \\ \text{INDEX}\ s \\ \text{RESTR}\ \langle \left[\begin{array}{ll}\text{RELN} & \textit{rel} \\ \text{SIT} & s \\ \text{ACTOR} & \boxed{1} \\ \text{UND} & \boxed{2}\end{array}\right], \left[\begin{array}{ll}\text{RELN} & \textit{rel} \\ \text{ARG} & \boxed{2}\end{array}\right]\rangle\end{array}\right]\end{array}\right]\end{array}\right]
$$

Figure (8): Linking to ARGST in Compounding NI

Below, in Figure 9, is the feature structure corresponding to the compound verb *mətqə=rkele-* 'butter=spread.on', as it was used in sentence (3b). Notice the innermost MORPH feature, which has a list of lexemes as its value (a verb lexeme, and a noun lexeme). These lexemes combine to yield another lexeme, the compound verb. This lexeme must appear as the MORPH value of a word, since it is in the transition from the lexeme to the word that linking takes place. The Actor is linked to the first (subject) member of ARGST, while the Location is linked to a locative NP (by a linking constraint we do not spell out here). Notice that the Undergoer is not linked to any member of ARGST, because it is bound to the restriction of the incorporated noun in the restriction of the compound verb. The Argument Saturation Convention prevents this argument from being linked. The ARGST of this feature structure, then, corresponds to that of an intransitive verb, since there is no direct object. This account for the reduction in transitivity that can be observed in (3b).

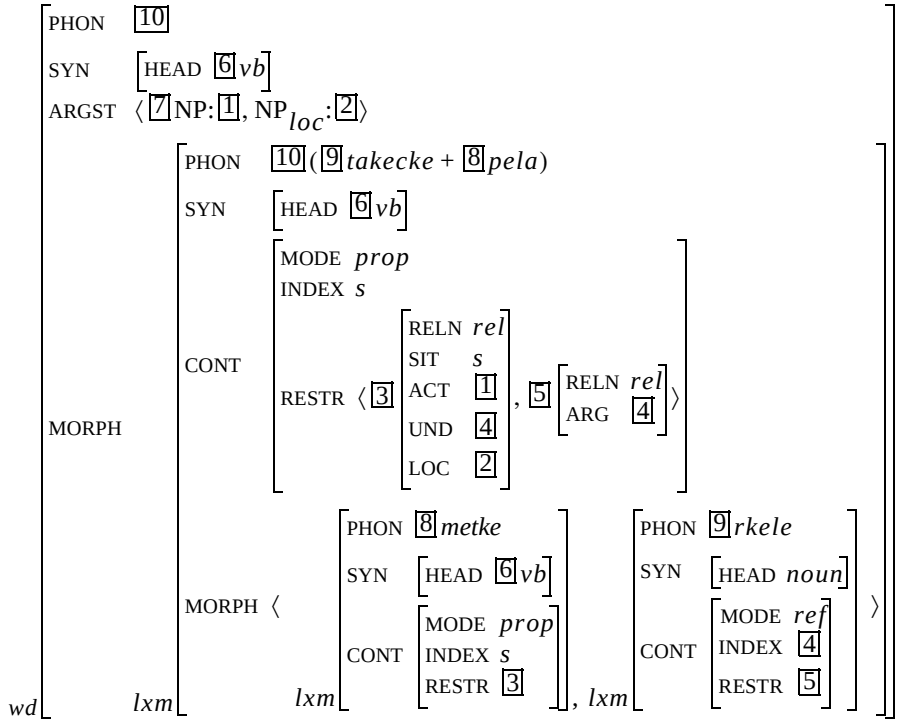

Figure (9): A verb with an incorporated noun in Chukchi

5. Noun incorporation and the applicative construction

Applicative Formation (AF) in Chukchi and Ainu is a productive construction in which a non-object is "promoted" to object. AF affects the grammatical functions of a predicate, not its lexical semantics. As Figure 10 shows we treat AF as a W-to-W type. The input is a word with an ARGST containing a non-object; the output is a word with an ARGST containing a direct object.

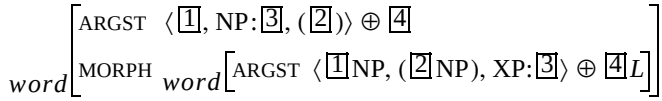

Figure (10): Applicative Formation type constraint

Our account of AF in these languages makes the following predictions. Classifier NI should be able to feed AF. The input to AF is of type *word*, and the output of Classifier NI is also a word. This is shown in the schematic feature structure in Figure (11). Also, AF should be able to feed Classifier NI since the input to Classifier NI is a word with an ARGST containing

a direct object NP. This is shown in the schematic feature structure in Figure (12).

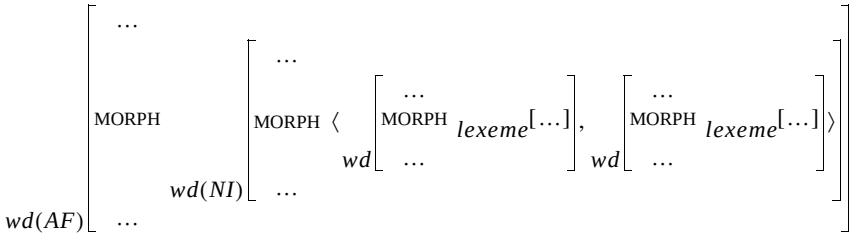

Figure (11): Classifier Noun Incorporation feeds Applicative Formation

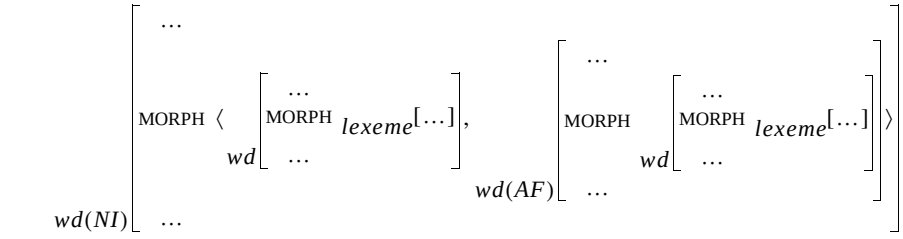

Figure (12): Applicative Formation feeds Classifier Noun Incorporation

Compounding NI should be able to feed AF too, since the output of Compounding NI is a word (even though Compounding NI creates a new lexeme). The schematic feature structure in Figure 13 shows this.

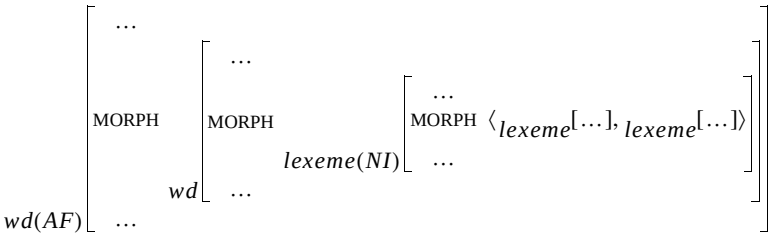

Figure (13): Compounding NI feeds Applicative Formation

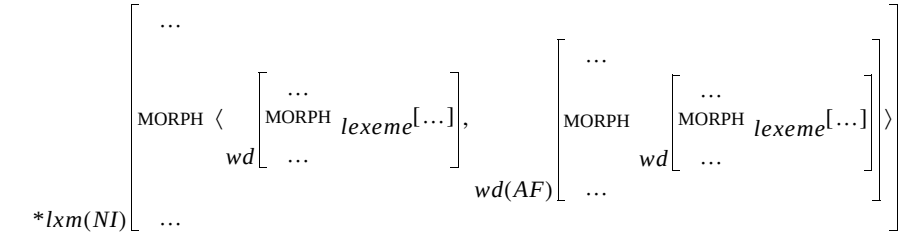

Figure (14): Applicative Formation cannot feed Compounding NI

But AF should not feed Compounding NI since the input to Compounding NI is a lexeme, not a word. This is shown in the schematic feature structure in Figure (14). We now show that these predictions are fulfilled in Ainu and Chukchi, respectively.

Beginning with Ainu, Applicative Formation (Shibatani, 1990, Kaiser 1998) is indicated by one of three prefixes: *e-*, *ko-*, or *o-*, the choice of the applicative prefix being determined by the grammatical function of the oblique. A range of non-objects can be promoted to object (5b).

(5) a. *a-kor kotan ta sirepa-an*.[AINU]
1sA-have village to arrive-1sg.S
b. *a-kor kotan a-e-sirepa.*
1sA-have village 1sA-appl-arrive
'I arrived at my village.'

In Chukchi Applicative Formation (Spencer 1995) an oblique can become an object when an original object is demoted. Object demotion may be the result of Antipassive (AP) (6b) or of Noun Incorporation. The oblique NP bears one of several non-nuclear cases rather than being in a PP. No applicative affix appears in the verb after AF takes place (6b) (note that *ena-* is the antipassive marker).

(6) a. *ətləg-e təkeč?-ən utkuč?-ək pela-ɴen*[CHUKCHI]
father-erg bait-abs trap-loc leave-3sgS/3sgO
b. *ətləg-e təkeč?-a utkuč?-ən ena-pela-ɴen*
father-erg bait-instr trap-abs ap-leave-3sgS/3sgO
'The father left the bait at the trap.'

(7) a. *Tam-kurpoki a-ko-tam-etaye*.[AINU]
sword-bottom 1s.A-appl-sword-draw.out
'I drew the sword out from the bottom of the (other) sword.'
b. *Ratki apa a-sapa-e-puni*.
hung door 1s.A-head-appl-lift
'I lifted the suspended door with my head.'

(8) a. *ətləg-e utkuč?-ən təkeč?ə=pela-ɴen* [CHUKCHI]
father-erg trap-abs bait=leave-3sgS/3sgO
b. **ətləg-ən təkeč?-a utkuč?ə=pela-g?e*
father-abs bait-instr trap=leave-3sgS
'The father left the bait at the trap.'

In Ainu (7a) as well as in Chukchi (8a) underlying objects can incorporate, and then AF may promote an oblique to object. However, AF can feed NI in Ainu (7b), but AF cannot feed NI in Chukchi (8b).

The example in (7b) shows that a nominal promoted to object in Ainu as a result of AF can subsequently be incorporated. This is reflected in the order between the IN and the applicative prefix (*ratki apa* 'hung door' is a secondary object). Example (8b) shows that a locative cannot be incorporated in Chukchi, not even after Antipassive and AF promote the oblique to object (note that the antipassive affix does not cooccur with the incorporated noun, cf. Kozinski et al. 1988).

Figure 15 illustrates Applicative Formation and Noun Incorporation in Ainu, as in the verb complex *-sapa-e-puni* 'head-appl-lift', from (7b). In this language AF "feeds" NI, since the input for the NI type is a word. What is important to notice is that in the most deeply embedded MORPH we find a base word (a verb) whose ARGST contains an XP indexed [3]; this index is shared with the NP in the output ARGST of AF. That ARGST is part of the input to NI. The head value ([5]) of the NP indexed [3] is shared with the incorporated noun. The output ARGST now indicates that the NP indexed [3] is non-canonical and thus will not license a NP in the phrase structure.

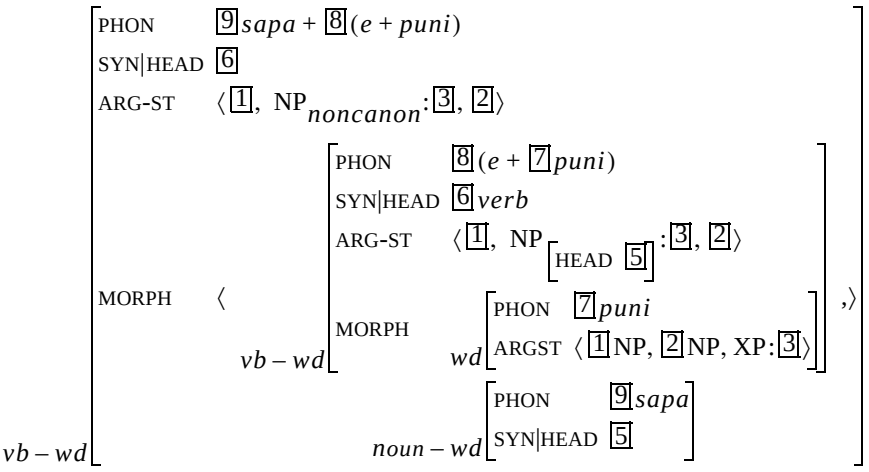

Figure (15): Incorporation of AF-derived object in Ainu

NI can also feed applicative formation in Ainu, since both types are words. Figure 16 illustrates the verb complex *-ko-tam-etaye* 'appl-sword-draw.out', from (7a). The MORPH value of the feature structure in Figure 16 is the feature structure for a verb + incorporated noun, similar to the one in Figure 6. The inner verb's ARGST contains a non-canonical NP (the gap left by the incorporated noun, indexed [3]) and also a PP (indexed [2]). That PP is the phrase targeted by AF, so that the outer ARGST now has a direct object

NP sharing the same index as the input oblique PP ([2]).

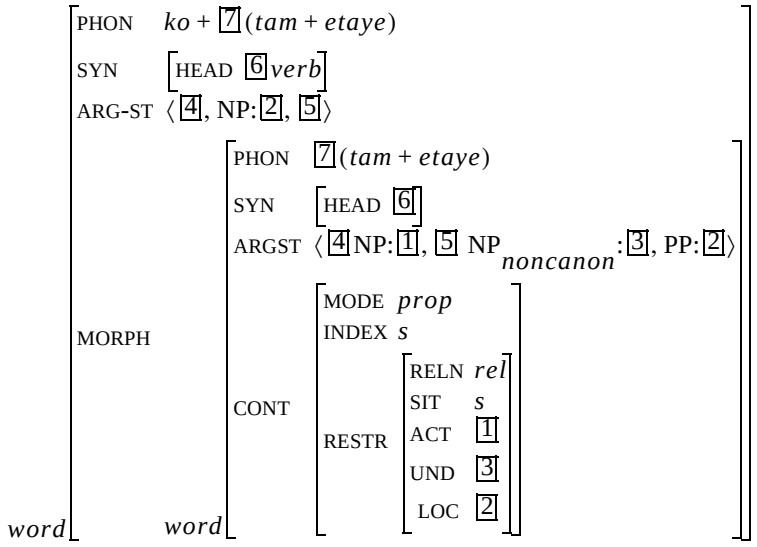

Figure (16): Applicative formation following NI in Ainu

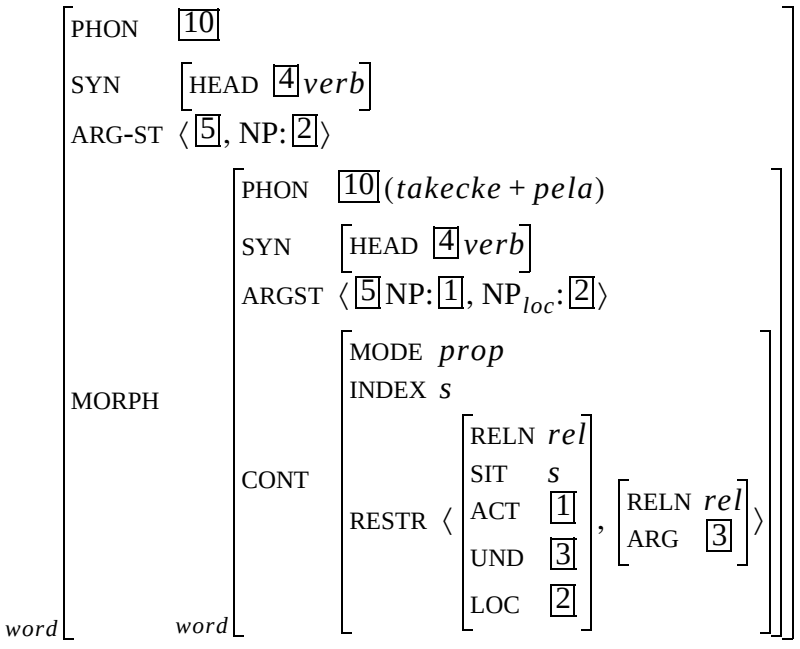

Figure (17): Applicative verb with incorporated noun in Chukchi

In Chukchi, NI can feed AF, because lexemes can be part of words. Figure 17 illustrates the verb complex *təkeč?ə=pela-* 'bait=leave', from

(8a). Here the inner word type is a verb with an incorporated noun, as in Figure 9. In that feature structrure there were two lexemes that combined to create a new NI lexeme. That lexeme was then associated with an ARGST which contained a locative NP. This NP, indexed [2] in Figure 17, provides the input for Applicative Formation; the original locative NP ends up a direct object NP in the output ARGST.

What is crucial to our argument is that there is no possible type which has Applicative Formation inside Compounding NI, because word types cannot be the value of a lexeme's morph attribute. Thus, it follows from our analysis that such constructions do not exist in Chukchi (cf., *(8b)).

To summarize our argument, we began with the observation, which we suggest may be an important generalization, that the kind of NI that reduces the valence of the verb is the kind that *cannot* be fed by AF. We derived this with our type-inclusion solution (analogous to a level-ordering solution): Word formation constraints (WFCs) are assigned different types. WFCs of type *word* cannot be part of WFCs of type *lexeme.* Thus, this model can capture the correlation between type inclusion (i.e. rule ordering) and the linguistic properties of those types. WFCs that change lexical semantics are always included in (i.e. precede) WFCs that preserve lexical semantics because the type that can have mismatches in lexical semantics (the *lexeme*) is strictly included in the type that may not have mismatches in lexical semantics (the *word*)

Our observation/generalization about the contrasting properties of NI in Chukchi and Ainu offers evidence for different types of WFCs, and for the Split Lexicon Hypothesis. Recasting Wasow's distinction between lexical and syntactic rules in terms of L-to-L or W-to-W type constraints allows us to account for systematic differences between otherwise superficially similar constructions (Dative Shift and the Locative Alternation, as discussed in Aranovich and Runner (2001), and here Compounding NI and Classifier NI)

6. Consequences

The main argument presented above focuses on the different constraints on lexemes and words, and that words contain lexemes but not vice versa. The model we propose also illuminates the notion of "transitivity". In particular, if our approach is correct, the level of Argument Structure is the only level at which the notion of the transitivity of a predicate is represented.

To clarify this, let us consider the various ways in which the syntactic and semantic features of a predicate effect its transitivity in HPSG. Gapped (wh-extracted) arguments appear on ARGST as noncanonical phrases; these phrases do not license valence features, so no overt syntactic constituent is

projected (in the VP). Such gapping/extraction, though, is not generally assumed to affect the transitivity of the predicate. Likewise, cliticized arguments, which appear on ARGST as noncanonical elements, do not license valence features; this also does not affect transitivity. And in our analysis, Classifier NI incorporated nominals, which appear on ARGST as noncanonical elements, do not license valence features nor project syntactic structure; and these arguments do not affect the overall transitivity of the predicate. On the other hand, Compounding NI incorporated nominals, which appear in CONTENT but not in ARGST, do affect transitivity.

Thus, operations that affect valency (wh-extraction, Classifier NI) do not affect ARGST, and do not affect transitivity. Operations that do affect ARGST (e.g., Compounding NI) do affect transitivity. It appears, then, that the ARGST level is the locus of the notion transitivity. If correct, this observation makes predictions about the analysis of other transitivity-affecting operations in the grammar.

Several important questions are left open by our analysis thus far and will require further research to determine the appropriate answers. Our claim that lexemes are not defined for ARGST makes several predictions. First, if there are verbs which obligatorily take subject expletives (e.g., weather verbs), do these lexemes need ARGST in order to ensure the appearance of the expletive subject? An approach to this might claim that rather than giving in and requiring ARGST on every lexeme (no matter how predictable its form), for the few idiosyncratic verb types that appear to require such information, a subtype of lexeme (e.g., *expl-vb-lexeme*) can easily be defined that will map onto a word containing an expletive in its ARGST.

Second, in languages with "quirky" case, do these verbal lexemes need ARGST in order to ensure that the idiosyncratic case shows up on their subject? Again rather than giving up the claim that lexemes lack ARGST it may be possible that what is idiosyncratic in these languages is the linking to ARGST from CONTENT; that certain verb types trigger a special linking between particular CONTENT features and particular ARGST positions.

Third, it is a fact that many languages with Classifier NI, including Ainu, allow the incorporation of unaccusative subjects: if Classifier NI is insensitive to CONTENT features how can it pick out an unaccusative subject from an unergative subject? A possible approach to this problem is argued for in Manning (1996) (and has been developed elsewhere, see in particular Williams 1980), where it is argued that the ARGST list includes an indication of the notion "internal" vs. "external" argument. If this could be worked out, then Classifier NI picks out the most prominent (leftmost) internal argument nominal. This would require no reference to the actual underlying thematic relations within CONTENT (in addition, it is clear that the unaccusativity/unergativity of a predicate is more likely due to a complex

interaction of thematic role and aspectual information).

Finally, a question that needs to be addressed is the analysis of doubling in Classifier NI. Ainu does not allow doubling of the incorporated nominal, allowing us to provide an analysis parallel to French cliticization. However, Classifier NI languages vary on whether and to what extent doubling is allowed. We see this as the same problem as the question of clitic-doubling across Romance and other language families. While French does not allow clitic-doubling, Spanish does under certain circumstances. We look to analyses of e.g., Spanish clitic-doubling for insights into the analysis of Classifier NI doubling (and at present, we know of no such analyses).

This paper is one part of an on-going project exploring the Split Lexicon Hypothesis presented here. In Aranovich and Runner (2001) we used the Split Lexicon Hypothesis to provide an analysis of certain distinctions between the locative alternation and dative shift in English. In this paper we use the Split Lexicon Hypothesis to explain differences between Compounding and Classifier Noun Incorporation. Many other phenomena have been argued to divide into qualitatively distinct classes of alternations, such as different types of causatives (Zubizarreta 1987, Kuroda 1993), adjective vs verbal passives (Wasow 1977), native vs. latinate compounds in English (Selkirk 1984), and certainly others. It is our hope to investigate some of these phenomena through the lense of the Split Lexicon Hypothesis in order to shed light on their properties.

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