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## To What Extent Are Compounds Morphological? A Review of Problems in Linguistic Theories

### 1. Introduction

The aim of the present paper is to study the theoretical problems of compounding, mostly in English, since the major theoretical work on compounding has been done in that language (see Spencer 1991: 309), and in the generative framework. Some attention will be given to Finnish as well. Compounding will be examined in respect to lexicon, morphology, and syntax, and some phonological criteria will also be included. Although compounding is obviously not a question of phonological formation, phonology will not be a leitmotif here.

The main issue will concern the extent to which compounding has been regarded as a subsystem of morphology. Traditionally, most of the major morphological theories have presented compounding, as well as inflection and derivation, as a subfield of morphology, either in total or in part, with some concessions to syntax. However, to a growing extent theories with other emphases have emerged. Of course, the very same question could be expressed in regard to compounding as a subsystem of syntax. In this essay the main issues of the theoretical discussion will be considered.

Theories reviewed here include structuralist, briefly, and in greater detail the early and late generativist approaches. One rejected theory that could have been selected because of its relatively notable importance in present-day linguistics, is natural morphology<sup>1</sup>. It does, in particular,

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<sup>1</sup> In the 70s a group of European linguists started to devote much of their work to morphology. In the beginning, they worked quite independently of each other, but later they found a mutual basis and principles for their research, which came to be known as natural morphology. Among the most notable founders were Wolfgang Dressler, Willi Mayerthaler, Oswald Panagl and Wolfgang U. Wurzel, and the common theoretical foundation was published by the very same authors in *Leitmotifs in Natural Morphology* (1987). It should be remembered, however, that, Mayerthaler already in 1981 used the term

practically exclude compounding outside morphology, and only include inflection and derivation (see Mayerthaler 1988: 6 ff.; Dressler 1987: 20 n.) Compounding is not handled straightforwardly, because it is not a part of the 'core morphology', and several statements reveal that compounding is considered to benefit from syntax, for instance, in the analysis of the following examples:

- (1) The two developing countries have thus decided to introduce containers. *This decision* involves ...
- (2) The campaign against tuition fees proposals... *Tuition fees campaigning*...

Descriptive techniques of morphology (in addition to serving morphological motivation) can be used for predication, although this is done by syntactic means in a more transparent and informative way. Take for example the competition between a nominalization and a sentence in (1), between compounds and a sentence as in (2), above, as well as between -able/-ible formations (e.g. read-able) and passive sentences, between agentives and relative clauses etc. Yet, the use of such WFRs must be fitted into syntactic strategies. Thus, this is an example of a practical result of the semiotic primacy of syntax over WF.... (Dressler et al. 1987: 100)

This section will undoubtedly continue to confront the problem of defining the concepts of morphology, syntax and lexicon. Since the issue of defining them is a major subject on its own, and beyond the possibilities of analysis here, only a brief outline will follow.

Traditionally and throughout the century, morphology and syntax have been divided by the concept of word, or the idea that morphology deals with the inner structure of words, whereas syntax deals with combining them with other words. As we can see, the notion of word is at the very center of the description. The generative framework has *de facto* never challenged this, since the grammar of phrase and sentence formation by rules was at the core, and the concept of morpheme became more important than word, and word-formation was marginal in the first place. At the same time the distinction between morphology and syntax disappeared (see, for instance, McCarthy 1991). Later on, as will be shown, lexicalism changed the situation.

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*morphological naturalness* based on the idea of markedness, in his book *Morphologische Natürlichkeit*.

Aronoff (1994), among others, has tried to draw a clear line between morphology and syntax. In short, he regards the core of morphology to be the rules concerning bound forms. This will be reconsidered in respect of compounds in Chapter 5.

## 2. Structuralism: compounds in morphology

It is revealing that in the structuralist tradition, almost without exception, compounds of some syntactic formation or processing are considered to be special cases. In American structuralism Leonard Bloomfield (1933: 183, 207) proposes the organization of grammar into two parts: morphology, for the construction of words, and syntax, for the construction of phrases. Nevertheless, the border between the two remains obscure, because *per definitionem* it depends on the notion of word.

..., we may say that morphology includes the constructions of words and parts of words, while syntax includes the constructions of phrases. As a border region we have phrase-words (*jack-in-the-pulpit*) and some compound words (*blackbird*), which contain no bound forms among their immediate constituents, and yet in some ways exhibit morphologic rather than syntactic types of construction. (Bloomfield 1933: 207)

As a result, compounds form a grey area between morphology and syntax, ranging from “syntactic to semisyntactic to asyntactic,” as he puts it with the examples *black bird* > *blackbird*, *keep house* > *housekeep*, and *knob in the door* > *door-knob*, respectively (ibid)<sup>2</sup>. Marchand (1960: 11) uses the term “syntactical compounds” for such English constructions that are lexicalizations from free syntax and do not have a head as their rightmost constituent, for example *father-in-law*.

Andrew Spencer (1991: 47—57) has summarized the major problems and criticism that structuralist approaches confront in morphological description. The three models or theories, particularly of American structuralism are Item-and-Arrangement (hereinafter IA), Item-and-Process (IP), products of the early structuralism in the 1920's and 1930's and mainly based on Charles F. Hockett (1958), and Word-and-Paradigm (WP), which mainly concerns inflectional morphology.

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<sup>2</sup> Since the issue of inner syntax in compounds is still controversial (see Ch. 4 below), there is no reason to overlook the insights of Bloomfield, in any of the types. We do not as yet have a proper, or satisfying, classification for the various types of constituent relationships.

One of the generalizations of IA is that “word formation came to be viewed as the disposition of morphemes in a word”, and that “morphology came to be dominated by the metaphor of word analysis rather than word formation”, as linguists were seeking to provide techniques for decomposing words into their component morphemes. Since IA is fundamentally word analysis, it means that there is no distinction between underlying forms and surface forms, and that all morphology is essentially agglutinative. The IP is an agglutinating theory, as well, but it has a distinction between underlying and surface form, since it presumes a process or a transformation between two levels. For example, the English past tense *took* is formed from *take* plus the ablaut process (Spencer 1991: 47—57).

In any theoretical framework of linguistics there is a distinction between lexicon and grammar. In the Bloomfieldian framework lexicon only contains completely idiosyncratic information. (In the generative framework this is opposed to the system of word formation rules that produce any (polymorphemic) word that may be interpreted regularly, on the basis of the meanings of the morphemes. In American structuralism there was no such system.) In regard to compounds, since their meaning is not always predictable, they largely have to be listed in the lexicon. The problem is, however, that we might be unable to conceive of any lexicon being so huge and having no internal structure or rule-like system. Thus, the lexicon is forced to have some property of grammar-like rules. This has also been the argumentation of the generative framework, as will become evident in the following.

### **3. Early generativism: compounds in syntax**

All in all, generative linguistics has presented compounds in various theoretical frameworks as lexicon, morphology and syntax. The shift has been, as might be expected from more general perspectives, from viewpoints where syntactic phenomena were the focus of the formal description to those of lexicon and morphology in the era of lexicalist morphology. A survey of these perspectives and their argumentation will be presented below.

In Chomsky's Standard Theory (hence ST) of generativism morphology as such hardly existed. One of the main ideas of ST, in respect to the relation between lexicon and syntax, was that word forms, including inflection, derivation, and compounding, were part of syntax rather than

lexicon when grammar is “describing the morphemic structure of sentences. ... Hence the grammar cannot simply be a list of all morpheme (or word) sequences, since there are infinitely many of these.” (Chomsky 1957: 18.) The theory was crystallized in *Aspects of the Theory of Syntax* (1965), where compounding was definitely seen as an issue of syntax.

It is briefly worth noting that even before *Aspects*, Robert Lees in *The Grammar of English Nominalizations* (1968 [1963], originally 1960) stated that compounds are formed through transformations from underlying sentences—which is the most specifying feature of ST.<sup>3</sup> Thus, compounds are classified in terms of subject, predicate, and object, so that we have compound types 'subject-predicate', e.g. *girl+friend* from the sentence *The friend is a girl*, and 'subject-middle object', e.g. *horse+tail* from the sentence *The horse has a tail* (Lees 1968: 124—134). However, this principle makes compound formation extremely exhaustive, as Scalise (1984: 9—10) puts it, since even a simple procedure, for example, the two-constituent compound *manservant*, is extremely complicated, not to mention compounds with more constituents. The most important defense for such heavy treatment is that it can explain the ambiguity of compounds in grammatical terms, for instance, various meanings of the compound *snake poison* by referring to different meanings in deep structures:

X extracts poison from the snake  
The snake has the poison  
The poison is for the snake

However, there were two major theoretical problems in Lees's treatment. First, as Katz & Fodor (1964) and Chomsky (1965) pointed out, there were no restrictions on the lexical deletions necessary to achieve the simple structure of the compound *snake poison*, and, hence, no explanatory power in Lees's proposal. Second, there was no way to differentiate one paraphrase (or underlying sentence) of a compound from the others that are also possible (according to Scalise 1984: 9—12). Later on, such ambiguity rules were proven in the lexicon, as will be demonstrated.

In general, since there is no morphological component in ST, inflection was merely seen as a subcomponent of phonology, and its only

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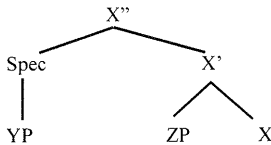
<sup>3</sup> Pauli Saukkonen (1973) has tentatively adjusted this kind of transformationally oriented description in Finnish compounding and explicitly gives 16 nominal and 3 deverbal types of underlying sentences.

task is to separate the phonology from the syntactic features. Furthermore, not much effort is expended on compound description in ST and thus before moving on to lexicalism (in Ch. 4.) a brief look at nominalizations is necessary.

In "Remarks on Nominalization" Chomsky (1970) began a modification of ST, which had major consequences on morphology in generative theory. He noted that a model separate from syntactic transformations is needed when describing derivation, for example, nominalization. At the same time he posited that lexicon is a collection of idiosyncratic information from linguistic units. According to this modification of ST, the best way to describe the structure of words, in addition to phrases and sentences, is still phrase structure grammar.

The major argument for the modification of ST was that when a verb is nominalized through derivation all of the major relations are included, as in case (a), where the subject of the verb *give* is transformed into a possessor when the verb is nominalized.

- (a) Tom gave a book to Harriet.
- (b) Tom s giving a book (to Harriet).
- (c) Tom s gift of a book (to Harriet).



**Figure 1.** The structure of a lexical head.

This gives Chomsky cause to posit that the relevant information on the relations must be presented in the lexicon, as lexicon redundancy rules. In the model (see Figure 1), the (lexical) head of the phrase is category X, which stands for any major category (N, V, A, P) and in turn may have modifiers (YP, ZP). So-called projections exist from the lexical head, here X and X', of which the intermediate projection X' is necessary, for it allows us to draw a parallel between (1) a verb heading a verb phrase with complements and (2) a noun heading a noun phrase with complements; the maximal projection X'' stands for XP (NP, VP, AP, PP, or S). Spec is, of

course, a specifier, for example, for a verb (in example a *Tom* for the S category and *Tom's* for the NP). It was impossible for word structure to have transformations, according to the lexicalist hypothesis. This means that derivatives cannot be described through transformations.

#### 4. Compounds in lexicon

##### 4.1. Root compounds in phrase structure grammar

One criteria for distinguishing the early generative description of compounds from later ones is the principal dissociation between root and synthetic compounding that arose in late seventies, especially after the work and article of Roeper & Siegel (1978). Their main ideas, now well-known, are that there are compounds in which the underlying verb of the head governs the relationship between the constituents, and that it is necessary to incorporate features of the syntactic behavior of the verb into these compounds at the lexical level. Their model will be described in detail below (Ch. 4.3.).

The description of the problems in synthetic compounds will be preceded by a review of theories of root compound generation, in generative grammar after Chomsky. The reason for is chiefly because description in phrase structure grammar is based heavily on the syntactic categories of the constituents and Grimshaw (1990), for example, has pointed out there are several compound types, some deverbal nominals and gerunds, that have an ambivalent status in respect to having an argument structure, i.e. whether the head of a compound is a noun or a verb. The phenomenon itself, the ambiguity of some deverbal nominal compounds, has, of course, been known in the literature and description of Finnish compounding (see e.g. Penttilä 1963: 267), for some time.

First, however, the issue of compound stress and its distinction from phrasal structures will be considered since it is not governed by morphology or syntax, which are the subjects here. Since Chomsky & Halle (1968) the standard assumption has been that according to the Compound Stress Rule a true compound of two constituents is stressed on the first, whereas a lexically respective phrase has two separate stresses, for example *bläckbird* vs. *bläck bird*. It is equally certain that there are several lexical and lexico-semantic exceptions to this, for instance, street names and certain names of wars (see, for instance, Marchand 1960: 14—20). It must be noted that the rule is highly language specific. For example,

Finnish is a language that has no exceptions in compound stress. The stress in Finnish is automatic word level stress, and strongly indicates word boundaries (see Wiik 1981: 107). In cases where there is no denotative distinction between a phrase and a compound, but only a contextual one, the stress differentiates the cases; for example, *in kiel+ten+opetta+ja* [language+GENpl+teach+DN] 'language teacher', the first constituent refers specifically to languages.

In phrase structure grammar, Elizabeth Selkirk (1982: 14) has proposed simple rules to generate root compounds:

$$\begin{aligned} N &> \{N, A, V, P\} N \\ A &> \{N, A, P\} A \\ V &> P V \end{aligned}$$

These rules are supposed to generate the structures directly. Prepositions may also take part in root compounding, as Selkirk (1982: 14—15) points out, for example *overdose*, *overwide*, *overdo*, but they cannot occupy the position of the head.

Still some problems remain. For example, there is the compound *bird-brained* in English, as Spencer (1991: 323) points out, that cannot be derived from the verb *to brain* as the rule  $A > N A$  states, since there is none, but seems to be derived from  $N N$  compound *bird brain*. The very case belongs to what is called bracketing paradoxes ( $*[[bird][[brain][ed]]]$ ). In Finnish, however, some deverbal adjectives, for example *syvä+jäädyte+tty* or *betoni+raudoite+ttu*, that are past participle forms, may very well morphologically have a verb as a stem for derivation, although diachronically the adjectives were created first (see Vesikansa 1989: 257—258):

*betoni+raudoite+ttu*  
[concrete+rivet with iron+PASS PAST PART]  
'concrete riveted with iron'

*betoni+raudoittaa*  
[concrete+rivet with iron]  
'to rivet concrete with iron'

Selkirk is resting on Williams (1981: 261) here and proposes the case to be a case of lexical relatedness. Williams suggests the following principle: 'X can be related to Y if X and Y differ only in the head position or in the



nonhead position', where the nonhead is the highest left branch of a word. In this way either the left or right constituent of a compound remains; the formation of *macroeconomist* on the basis of *macroeconomic* is an readily available example. However, as Hoeksema (1986 according to Spencer 1991: 404) points out, Williams's principle of lexical relatedness is dangerously liberal: it also accounts for cases that are not related, and carried to an extreme makes it possible to regard, for instance, all stems of regular plurals as lexically related!

In the Finnish example we have a case of back-formation from an (apparently derived) noun *betoni+raudoit+us* [concrete+rivet with iron+DN], 'concrete riveting'. Scalise (1984: 189), Spencer (1991: 413—417) and others have criticized generative theory of its lack of consideration towards the distinction between regular and productive word-formation and lexicalized expressions. Theories rarely make any use of analogy, which explains much of lexicalized forms. Spencer (1991: 413—417) proposes a solution of his own to various kinds of bracketing paradoxes, including those in compounding. He employs of two notions that are not common in generative morphology: a lexico-semantic subclass, here 'personal nouns', and a process of proportional analogy, that is based on lexicalized expressions. For example, when a lexicon has the expressions *grammar*, *grammarian* and *transformational grammar*, the principle of proportional analogy allows a fourth member to be formed (see Table 1).

grammar	grammarian
transformational grammar	X

**Table 1.** The principle of proportional analogy.

The absolute condition is that the three members of the analogy truly exist in the lexicon, that is at the same level of grammatical description. Furthermore, the meaning of the individual expressions have to be identical. All in all, this seems to work in particular for personal nouns, nouns that "refer to people who bear some sort of relationship to the source nominal expression" (Spencer 1991: 414).

Spencer (1991: 323) points out that generativism has shown surprisingly little interest in questions that should be resolved before

rushing into details. Some of these questions include (1) variation in compounding strategies, taking into account the many ways (combining roots, derivation from compounds, back formation) compounds are made; (2) the true status of inflection inside compounds, which involves the division between inflection and derivation, in general; and (3) the issue of productivity: what governs it and is it necessary in the description of compounding.

Aronoff, one of the most prominent morphologists within generative framework, has conveniently—in (1976) and (1994)—outlined compounds outside morphology and inside syntax. In lexeme-based morphology his division between morphology and syntax is such that “the core of morphology ... is the arbitrary relation between the signified and signifier of bound forms,” what he has called phonological operations, and that “it is entirely possible for a grammatical construction to be simultaneously morphological and syntactic ... [m]orphology deals with forms. Syntax deals with grammatical constructions and categories.” (Aronoff 1994: 12—13.) In such a framework the scope of morphology is narrow. “Compounding is a type of lexeme formation that operates primarily at the level of syntactic categories, without reference to the morphological content of the construction” (Aronoff 1994: 16).

#### 4.2. Level ordering in Lexical Phonology

Dorothy Siegel's dissertation (Topics in English morphology, 1974) presented a promising way of tying together certain morphological conditions of phonological patterns. In English these patterns involve a group of affixes of Latin origin, for example *-ion*, *-ity*, *-ive* and *sub-*, *in-*, that are associated with a change in stress in the base to which it is attached, for instance *cúrious* > *curiós+ity*. When attached to other affixes, generally Germanic in origin, for example *-ly*, *-like*, *-ful*, *-ness* and *un-*, no change in stress occurs, for instance *cúrious#ness*. In order to account for these phenomena, it has been proposed that in the former case a morpheme boundary “+” and in the latter a word boundary “#” be introduced. The morphological conditions and stress patterns may be described as ordered rules, and Siegel's model is well-known as the Ordering Hypothesis:

- Level I    + affixation
- Cyclic phonological rules
- Level II    # affixation

In respect to compounds it is significant that the hypothesis was later extended by Allen in his dissertation (1978) to include compounding and inflection in this ordering as new levels. Here, Compounding Rules generate structures with a strong word boundary “# #” that blocks semantic and phonological processes of amalgamation between the constituents. The model became known as the Extended Ordering Hypothesis:

Level I	+ affixation	<i>nativ+ity</i>
Stress rules		
Level II	# affixation	<i>nation#al</i>
Level III	compounding	<i>nation##wide</i>
Level IV	regular inflection	

In generative morphology the model of level ordering has certainly been one of the most debated issues during the past two decades. There are cases that on the surface seem to violate the ordering of the levels, for instance *un#grammatical+ity* (for this and other restrictions, see Fabb 1988); however, the independence of the levels has never been challenged, although there are of course various interfaces between them. In respect to compounding, the interface may take place between derivation and compounding as well as compounding and inflection. These interfaces will be dealt in the following.

In respect to the interface between derivation and compounding, the Extended Level Ordering Hypothesis (hereinafter, EOH) predicts that there should be no words that have first undergone the rules of compounding and then derivation. Here, in addition to some classic examples of controversial cases in English, some examples in Finnish will also be examined. The interface between level II affixation and compounding is controversial in English. Examples (a) are unproblematic in respect to level ordering, but examples (b) seem on the surface to violate level ordering, since the rule of affixation cannot precede the rule of compounding.

- |     |                      |                              |
|-----|----------------------|------------------------------|
| (a) | de-forest            | *de-pine-forest < pineforest |
|     | de-mast              | *de-fore-mast < foremast     |
| (b) | to re-air-condition  | < air condition              |
|     | to pre-air-condition | < air condition              |

The only possible structure of examples (b) is that of [[pre[[air]<sub>N</sub>][condition]<sub>V</sub>]<sub>V</sub>] and not [[pre[air]<sub>N</sub>][condition]<sub>V</sub>]<sub>V</sub>; the former, however, should be impossible according to EOH. The solution, however,

is that after careful consideration the meaning of the verb *air condition* is 'to use an air conditioner' not 'to condition air.' This means that the verb is a back formation of the lexicalized noun *air conditioner* and not an application of productive compounding rules:  $[\text{air}]_N[\text{condition}]_V > [[\text{air}]_N[\text{condition}]_V]_V$ . Moreover, Allen points out that counterexamples to back formations from lexicalized nouns do not appear. Hence, the counterexamples are not actually examples of productive level ordering at all.

Second, like counterexamples of ordering between derivation and compounding, there are examples that seem to violate the ordering of compounding and inflection in EOH. Normally, even in the cases of *pluralia tantum* words, the plural suffix otherwise required drops out, as in *trousers*, but *trouser-leg*, or in *scissors*, but *scissor-handle*. In examples (c), however, there seems to be an inflectional suffix between the constituent words.

- (c) craftsman  
swordsman

Allen argues that in these cases the constituent *man* is not actually a word at all. Since the vowel is unstressed and reduced  $[\text{m}^{\text{a}}\text{n}]$  precisely in those cases where there is a linking *s* between the constituents and as there is no genuine plural meaning in these compounds, these words are actually forms with a word boundary suffix. There are also true compounds with *man* as the second constituent, for example *doorman*, *oarman*, where the vowel is stressed  $[\text{m}\text{æ}\text{n}]$  and not reduced and where the linking *s* is impossible. Furthermore, there are still derivative pairs for true compounds (*doorsman*, *oarsman*) with a lexicalized meaning and an unstressed and reduced vowel and linking *s*. Thus, Allen (1978: 112) concludes that the *s* is a derivational linking element, and proposes a universal constraint that any true, i.e. productive, inflection is impossible inside morphologically complex words, or here, inside compounds.

Scalise (1984: 124—126) argues simply on syllogistic grounds and using some Italian counterexamples that this allegedly universal constraint does not hold. He states that not all compounds in all languages are morphological formations and, hence, the constraint cannot be universal, and he shows through his examples in Italian that at least where the leftmost element is the head of the compound, compound internal inflection is possible and required, for instance *capi+stazione* [master+PL+station]

'station masters' (see also Scalise 1992: 189—190). Selkirk (1982: 52) argues the same based on some English examples. Some Finnish examples will be considered here.

Finnish typically has root compounds (for synthetic compounds, see Ch. 4.3 below) containing productive genitive formation where constituents have a firm whole-part relationship, for instance

aallo+n+harja  
[wave+GEN+surf/brush]  
'surf of a wave'

The relationship could as often be functional, for instance

koira+n+koppi  
[dog+GEN+hut/shed]  
'doghouse'

rota+n+myrkky  
[rat+GEN+poison]  
'rat poison'

where the shed is 'for' the dog and the poison is 'for' the rat (note, however, that the corresponding phrases have distinct meanings; *koira+n koppi* is 'house for dog', whereas *\*rota+n myrkky* would be 'poison from rat'). There are also, of course, lexicalized cases with metaphorical meanings, such as

kissa+n+kello  
[cat+GEN+bell]  
'(a flower of) cat's bell'

(where the corresponding phrase *kissa+n kello* means 'bell on cat's collar'). Here the genitive case is productive, there are no lexical constraints on the constituents, and in Finnish there is no phonological reduction that would be special to these constructions alone. The compound stress (*kissan+kèllo*) here is distinctive from the phrasal stress (*kissan kèllo*), where the first constituent cannot have a generic reading and the genitive has a possessive function.

There are two theoretical possibilities available in generative grammar for coping with the compound internal genitive in Finnish. First, the case inflection is not truly regular and productive. This, however, is the easier one to reject since the case fulfills all the marks of regularity and

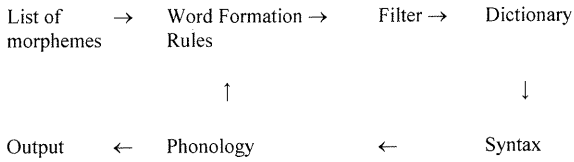
productivity (see e.g. Dressler 1997). Second, the structure is not truly a compound. This is not as easy to refute. The recursiveness of compound rules and the productivity of the meaning specific structure, as well as the compound stress and distinctiveness from the respective phrasal structure, make it very hard to regard it as anything other than a compound. In Dutch, similar cases of plural inflection are handled as compounds (Booij 1992: 36—39). Furthermore, if the weakening through language specificity requires further amplification, there are well-known cases of exceptions to compound-internal inflection, in English as well, for example *arm+s+race* (of which in details, see Selkirk 1984).<sup>4</sup>

These examples of compound internal inflection quite clearly diminish the strong, universal version of EOH. There is still a weaker, English specific version of EOH, although even that requires further inspection, as Scalise (1984) has pointed out. Outside the generative framework, Booij (1994) has suggested a distinction between semantic and contextual inflection in word-formation. The idea is that the former could feed word-formation, including compounding, whereas the latter could not. This seems to work at least in Finnish; for instance, *maa+sta+pako* [country+ELA+flight] 'exile' is possible, whereas *\*maa+sta+välit+ys* [country+ELA+care+DN] ("< *välittää maa+sta* [care country+ELA] 'care of one's country'") with a syntactic case marking is not.

In the framework of early generative linguistics, a rather advanced and fully descriptive model of the lexical component of English grammar was developed by Halle (1973):

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<sup>4</sup> Although a paper by Fabb (1988: 538), concluding that "level-ordering of suffixes is less powerful than may have been assumed" concerns the suffixation of level ordering and not compounding, it is relevant to the internal inconsistency of OH, parallel to the issue in compounding. With actual pairs of suffixation the basis of ordering levels 1 and 2, it can be shown that "level-ordering does no extra work in ruling out suffix pairs beyond that done by independently needed selectional restrictions", e.g. by the English Stress Rule. Furthermore, the Bracketing Erasure Convention by Kiparsky (1982), stating that all internal brackets in a word are erased at the end of the level, raises further problems, since "if any suffixation at level 1 was rendered invisible by bracketing erasure, then one of these level 2 suffixes would not be able to distinguish between a word containing no suffix and a word containing a level 1 suffix", and many of the level 2 suffixes would only be attached to unsuffixed words.



**Figure 2.** The relative position of Word Formation Rules in grammar (Halle 1973).

The lexical component consists of the dictionary and the Word Formation Rules, i.e. representations of words and stems and Compounding Rules and Derivation Rules. After the use of these Word Formation Rules, three kinds of rules will be applied to give the output of the morphological component, that is Inflection Rules, Readjustment Rules and the Boundary Insertion Convention.

The blocks or levels of the model are independent and unidirectional, that is totally serial as a process. In the dictionary words do not have internal structure, and following the application of the morphological component the inner structure of the words is once again impenetrable to the syntactic component. One admission, however, has often coincided with the model, namely that the inner structure of Derivation Rules is language specific. There have been attempts to universalize the existence and ordering of the levels through external evidence, for instance, evidence from language acquisition (see Clahsen et al. 1992, Clahsen & Hong 1995), but this has been rigidly challenged (Lardiere 1995) both at the level of interpreting the evidence and at the level of the theorization itself.

### 4.3. Later generativism back and forth: the problem with synthetic compounds

When we examine the second major group of compounds, where we address the question of the inner syntax of compounds, we confront at the same time the tacit assumptions each theory has in its relations between morphology and syntax.

Spencer (1991: 319) claims that most researchers, until recently, have agreed with the following idea:

Compounds may be either primary (root) or synthetic (verbal). Primary compounds are simply concatenated words (e.g. *houseboat*), synthetic compounds are formed from deverbal heads and the non-head fulfills the

function of the argument of the verb from which the head is derived (e.g. *truck driver* 'one who drives a truck').

The need to distinguish synthetic compounds from the root compounds may, of course, be found in Finnish, even within the same meaning, for instance *auto+kuski* [car+driver] 'chauffeur' vs. *auto+n+kuljetta+ja* [car+GEN+drive+DN] 'chauffeur'. According to Spencer (1991: 324—325) at least one major question immediately arises when we assume the independent status of synthetic compounds: where should we draw the line between root and synthetic compounds? The answers vary in theoretical literature.

According to Spencer (1991: 325) there are several theoretical issues in English concerning synthetic compounds to be explained. First, the range of syntactic categories or structural types of synthetic compounds does not vary from that of root compounds. As a result, many linguists would like to see both groups either lexically or syntactically formed. Second, the head of such a compound, the deverbal N or A, inherits the argument structure of the verb itself. Third, as a counter-effect to the second point, the non-head mainly satisfies the internal argument of the deverbal head. There are, however, cases where a word appearing immediately after the verb in a verb phrase is not valid for a non-head in the corresponding compound, for example *fry quickly* > *quick-fried*, but *drive quickly* > *\*quick-driver*. Fourth, and as a special case of point three, there is a need to explain why it is impossible for the non-head to function as the subject of the verb, for example *\*child driver* 'child who drives', not 'one who drives for children', which is a possible reading.

It seems to me that a generatively oriented theory, namely a description, of synthetic compounding cannot "explain" the fourth issue, for it is only a fact that must be accounted for in theory, i.e. a stipulation, since it does not explain anything. The first and second properties appear to be issues that are best explained empirically, possibly experimentally, and where the explanation includes somewhat more general cognitive or psychological backgrounding. Furthermore, the issue of whether syntactic categories are the primary determinants of compound formation at all is rather questionable *per se*. The third property is an issue that can be explained through the description of grammar.

Spencer (1991: 325—326) points out quite rightly that our determination of compounding being either essentially lexical or syntactic has certain consequences. In a lexicalist theory *truck driver* is simply a



concatenation, and we have to account for argument inheritance by *driver* in the case of a compound as well as in the case of *driver of trucks*. In a syntactic theory, it is assumed that the verb stem can govern its complement in a compound, and the fact that the non-head serves as an argument can be explained by pre-existing syntactic principles. The theory has to, of course, explain how the argument structure of the verb stem can also be satisfied outside the deverbal nominal in phrases like *driver of trucks*.

There is some disagreement in the question of the actual domain of synthetic compounds: what types of structure constitute a synthetic compound—and in this case are valid in English. Table 2 presents general perspectives of the main generative theories of the 1980s.

In the following, a short review of the main issues of the lexical and syntactic viewpoints concerning synthetic compounds will be presented (for a more detailed review, see Spencer 1991: 309–344). Moreover, consideration will be given to Grimshaw (1990) and her theory of argument structure, which has certain repercussions for the description of compounds and the basis of the relationship between lexicon and grammar.

Primary	Type of structure	Synthetic
-	<i>truck driver</i>	All theorists.
-	<i>truck driving</i> (-ing; nominalization by gerunds and participles)	All theorists.
-	<i>hand-made</i> (pass. part.)	Most theorists.
Fabb (1984)	<i>slum clearance</i> (further nominalization)	Selkirk (1982) Sproat (1985)
	<i>machine-readable</i> (adjectives)	Selkirk (1982) Roeper (1987)

**Table 2.** Perspectives of generative theories in various cases of synthetic compounds.

Roeper and Siegel (1978) were the first, after Chomsky's *Remarks on Nominalization* to account for synthetic compounds in grammatical framework. In their opinion some aspects of the syntactic structure in a verb phrase should be incorporated directly into the lexical representation of the corresponding compound.

They believe that transformations essentially became lexical in nature because the synthetic compounding rule applies in the lexicon. As a result, they launched a completely new device for generative grammar. The central generalization was known as the First Sister Principle:

All verbal compounds are formed by the incorporation of a word in the first sister position of the verb.

A synthetic compound, for example *pan-fried*, is formed through the (1) Affix Rule, through which the *-en* affix to the verb creates a slot to the left of the verb; (2) Subcategorization Insertion, in which a word is inserted into the subcategorization slot, here PP; and the (3) Compound Rule, which states that the argument moves into the non-head position. The three phases are represented in the following as:

fry [...[...NP]PP > [...] + fry + en] [...[...NP]PP  
 [...] + fry + en] [...[pan]N]  
 [...] + fry + ed] [pan]N > [[pan]N + fry + ed]

Roeper and Siegel's (1978) lexical transformations were considered dubious by the lexicalists standpoint (for a good summary of the criticism levelled at Roeper and Siegel at that time, see Botha's review in his *Morphological mechanisms* (1983), or Spencer 1991: 327). First, it has a great deal of redundancy in rules, for instance, why are there two different kinds of rules for forming a single type of structure, for example N-N. Second, there are no constraints to explain why we have no compound *\*good-looking* from the verb *look* in types Adj+V and Adv+V since we have a compound *good-looking*. It is worth considering whether the reason is semantic.

In Selkirk's (1982) theory morphological structure is explained by phrase structure rules, which means that the structures for both root and synthetic compounds are generated by the same source, phrase structure rules. Thus, the lexical device of Roeper & Siegel (see above) for generating synthetic compounds is unnecessary.

Selkirk sets narrower limits on synthetic compounds than Roeper and Siegel. She posits a case for synthetic compounding only when the non-head satisfies the argument structure of the head. This means that cases like (d) (her examples), with the noun affixes *-ance*, *-ion*, *-ment*, and *-al* and adjective affixes *-ent*, *-ive*, *-able*, and *-ory* are synthetic compounds.

- |     |                  |                    |
|-----|------------------|--------------------|
| (d) | slum clearance   | water-repellent    |
|     | self-deception   | self-destructive   |
|     | troop deployment | machine-readable   |
|     | trash removal    | disease-inhibitory |

For Selkirk the very case *pan-fried* (Roeper & Siegel 1978) is not a synthetic but a root compound, because *pan* serves an adjunct, not a necessary fulfillment of the argument of the verb. She gives this general rule for grammatical functions in compounds:

Optionally, in compounds, a non-head noun/adjective may be assigned any of the grammatical functions assigned to nominal/adjectival constituents in syntactic structure.

But she then rules out the possibility of a subject, for example, being a non-head, by simply giving the following inelegant rule, not some description or explanation:

The subject argument of a lexical item may not be satisfied in compound structure.

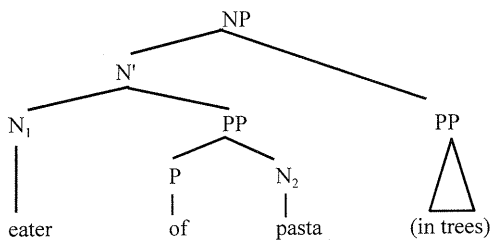
Where Roeper and Siegel offered the First Sister Principle, Selkirk provides the First Order Projection Condition:

All non-SUBJ arguments of a lexical category Xi must be satisfied within the first order projection of Xi.

This is a solution to the inheritance problem of a argument of the verb. Selkirk uses an ambiguous example, *tree eater*, which has two possible interpretations, 'one who eats trees' and 'one who eats in a tree'. She believes, however, that only the former is a synthetic compound, as previously noted. The following examples are ungrammatical. Why?

- \*tree eater of pasta
- \*pasta eater in trees

Roeper and Siegel's First Sister Principle regards the former example as ungrammatical because *pasta* as an object has a first sister position for the verb *eat*, not the PP-adjunct *tree*. This criteria means that the latter example should be possible. Selkirk's First Order Projection Condition, however, states that the first order projection of a category is simply the category that immediately dominates it, whether in word structure or in syntactic structure proper, and as a result the latter example is ungrammatical as well because of the grammatical structure of the following Figure 3:



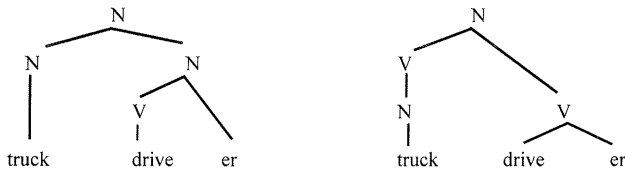
**Figure 3.** The grammatical structure of *eater of pasta in trees*.

The first order projection of  $N_1$  is  $N'$ , and the generalization implies that the verb's argument is always satisfied inside rather than outside the compound.

To briefly summarize the main points of Selkirk's theoretical work on synthetic compounding, she attempts to describe the linking of the argument in compounding without Roeper and Siegel's assignment of lexical transformations; she prefers to preserve them in syntax.

Lieber's (1983) theory of synthetic compounding makes use of the argument structure of the verb. She distinguishes between root and synthetic compounding simply on the basis of the difference in constituent structure. Hence, the structure associated with a synthetic compounding should be available to any compound formed by adding a suffix to a verb.

For Lieber a verb's argument structure is a feature capable of percolating. Percolation, however, is not possible for a dominating node of a different syntactic category. Therefore, in *truck driver* the verb's argument structure is unable to percolate to the N node, and the structure of *truck driver* cannot be the one on the left in Figure 4, which presents the structure of a root compound, but the one on the right.



**Figure 4.** The two possible grammatical structures of the compound *truck driver*.

It is worth noting that Lieber argues for the second constituent structure of Figure (4) for synthetic compounds, regardless of whether a corresponding verb compound (here *\*truck drive*) exists or not.<sup>5</sup> Somewhat marginally, Lieber states that *truck driver* could be interpreted as a root compound, but a nonce root compound, with the meaning '(taxi) driver who owns a truck'. Spencer (1991: 473, fn. 4) in turn states that the point is that in this case the verb *drive* is intransitive, and that "a compound formed from an obligatorily transitive verb such as *make*, however, can only be read as a synthetic compound", which is exemplified by *coffee maker* 'person or thing that makes coffee'.

Lieber's theory includes a principle she calls the Argument Linking Principle. First, it states that, as sister to its potential complement, the verb assigns all its internal arguments. Second, as non-head such a complement must be a semantic argument, for example, locative or instrumental. The restriction to internal arguments makes it possible to rule out subjects as non-heads.

Sproat (1985) presents a noteworthy argument to differentiate between root and synthetic compounds. In English there are cases where a nominalization, say *cooking*, has a morphological and a lexicalized reading, that is an eventive and a resultive meaning. The theta grid of a verb may be inherited in the eventive meaning and a compound may be attached to a possessive, for instance, *Harriet's lasagne cooking took 30 minutes*, whereas the same is impossible in the resultive meaning, for instance, *\*Harriet's lasagne cooking is tasty*.

<sup>5</sup> Spencer (1991: 330) points out that this very case is a good example of a bracketing paradox, since "the morphophonological constituent structure is [[truck][driver]] while the morphosyntactic constituent structure is [[truck drive][er]]."

Grimshaw (1990) has developed - originally from Hale (1983) - the idea of giving a more structured description for the structure of the verb's argument. In respect to general syntactic theory, it states that the structure of a verb's argument is straight-forwardly derived from its lexico-semantic representation (or, in Jackendoff's (1990, 1997) terms, a lexical conceptual structure), and includes knowledge of the participants that take a part in verb's activity or state. It is then this syntactic representation, i.e. the argument structure, of the verb that together with the d-structure determines its syntactic behavior.<sup>6</sup> Moreover, in Grimshaw's extension the argument structure is not a set of features or elements, but rather a structured representation with prominence relations among the arguments.

There are two kinds of arguments in the theory, which follows its predecessors (Williams 1981, Levin & Rappaport 1986, DiSciullo & Williams 1987) in this respect, namely external and internal. External argument has traditionally been the subject and has been defined as that part of the argument structure which is external to the maximal projection of the verb, and thus the rest of the arguments are internal (see e.g. van Riemsdijk & Williams 1986: 240-242). Grimshaw (1990: 33-37) emphasizes that the prominence theory contains one additional motivation for the notion of external argument, since "every argument in an a[rgument]-structure has a certain prominence in each dimension relative to every other argument."

Prominence relations reflect thematic information only in respect to the relative position, whether lower or higher than another, of a given argument on the thematic hierarchy. This is crucial to synthetic compounds in the very respect of theta-marking; in this way the argument structure also governs theta-marking in compounds.

For example, the verb *give* is assigned an argument structure (Agent (Goal (Theme) ) ) where the first element (Agent) is external as the most prominent and the other elements are internal. The phrases *Gift-giving to children* and *\*Child-giving to gifts*, where the Theme but not the Goal is possible inside a compound, testify to a structured argument structure. This indicates that because of position the Agent is the last element to be realized as a non-head member of a synthetic compound, but not at all

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<sup>6</sup> The very same system of grammar has been adjusted in most contemporary descriptions of syntactic theory, see for instance Van Valin & La Polla 1997.

impossible in principle. Selkirk's principle that "the subject argument of a lexical item may not be satisfied in compound structure" (see above) receives a more detailed and relativized description—and explanation—here.

Grimshaw (1990: 68—70), however, deals with the borderline between root and synthetic compounds: explaining cases like *dog-bite* or *bee sting* which apparently do have an Agent as a non-head member. The solution is—somewhat disappointingly—that in this case the structure of the verb's argument does not govern the relationship between the constituents and, hence, these examples are not synthetic but root compounds. Similarly, cases with an apparent subject of an unaccusative predicate, like *rainfall* and *bus stop*, are root compounds. In her argumentation Grimshaw rests on Roeper (1987), who argues that since the following compounds differ in interpretation, with (e) involving a control relationship and (f) not, the former has an argument structure and the latter not.

(e) John enjoys *clam baking*.

(f) John enjoys *clam bakings*.

Grimshaw (1990: 70) points out that "the characteristic morphology of the two types of nouns is replicated within the compound system in exactly the expected way." Namely, *-ing-nominals* typically act as synthetic compounds, and zero-derived forms, e.g. *bus stop*, typically act as root compounds.

In Finnish, the Agent is possible as the satisfaction of an argument structure, for example, *linnu+n+laul+u* [bird+GEN+sing+DN] 'bird's singing' with an eventive reading, when it is marked with genitive case inflection. Furthermore, the same genitive appears in the object position as well, for example, *palka+n+maks+u* [salary+GEN+pay+DN] 'salary paying'. The genitive marking does not make any difference on the thematic roles of an argument.

It is worth noting that the genitive case is in some contexts of free syntax specifically the case of subject and object in nominalizations as well (*Jaana+n hiihtä+m+inen* [Jaana+GEN ski+INF3+DN] 'skiing of Jaana', *auto+n osta+m+inen* [car+GEN buy+INF3+DN] 'buying a car'). The question is whether the case marking of the verb's arguments in free syntax has any effect on internal case marking in synthetic compounds, unless the latter somehow takes place in syntax?

A significant issue concerning synthetic compounds is the recursiveness of compounding in respect to argument structure. First, when

forming a new, that is a three-constituent, compound using a recursive rule, the inner structure of the two-constituent head is impenetrable; in fact, even a synthetic two-constituent compound is considered a root compound. In Finnish, if we seek a further compound in the compound *työ+n+teki+jä* [work+GEN+do+DN] 'worker, employee', its lexicalized reading is rather open in regard to its morphologically parsed reading, and we find, for example, the following cases in Laine & Virtanen (1996): *hoito+työn+tekijä* [ward+work+GEN+do+DN] 'nurse; healthcare employee', *etä+työn+tekijä* [far+work+GEN+do+DN] 'tele worker', which have a structure of [[[x][y]][z]], and *avain+työn+tekijä* [key+work+GEN+do+DN] 'key employee', *apteekki+työn+tekijä* [pharmacy+work+GEN+do+DN] 'drugstore employee; pharmacy clerk', which have the structure of [[x][y][z]]. In the former cases we have the compound *hoito+työ* and *etä+työ*, whereas in the latter we do not have the compounds *apteekki+työ* and *avain+työ*. Thus, we may infer that the former are synthetic compounds and the latter root compounds. Generally, this means that a left-branched three- (or more) constituent compound could never be anything but a root compound. However, a right-branched three-constituent compound may be synthetic.

Second, as Grimshaw (see above) points out and which might be predicted from the first point, more than one argument cannot be satisfied in one cycling; otherwise a two-constituent synthetic compound would not be impenetrable. It is obviously impossible to fulfill both the external and internal argument in one compound, even in Finnish, where an external argument may be satisfied. Thus, an expression like *Jaana+n+auto+n+ost+o* [Jaana+GEN car+GEN+buy+DN] 'Jaana's buying a car' necessarily has a phrasal structure and a phrasal stress. Furthermore, an interpretation paraphrase of the neologistic Finnish compound *yhdistys+kirja+lahjoit+us* [society+book+donate+DN] is 'donation of a society book' and cannot be 'society's book donation' or 'book donation for a society', because in the latter cases two arguments would be satisfied at the same time. This underlines the similarity in respect to subconstituency structure between root and synthetic compounds.

## 5. Concluding discussion

If we briefly try to summarize the developmental path of compound description in generative grammar, we might make two statements. First, as Scalise (1984), Botha (1984), and finally Spencer (1991) show, there has



been a shift of a pendulum in the issue of lexicon or syntax. In the early days of generative theory, Lees's dissertation argued for compounds as nominalizations and that syntactic transformations lay behind compounds; as a result, compound formation was placed in syntax. Thereafter, nominal and deverbal compounding were separated. It was stated that the rules—which were no longer transformations—for compound generation were to be found in the lexicon. In root compounds, the deep structure behind compounds was forgotten and the rules involved combining syntactic categories. In deverbal compounds, the problem of describing all the possible verb effects was given priority.

The problem in the early transformational means for generating compounds was that no restrictions existed on constructing specific deep structures and differentiating the most correct deep structure.

Later, especially in respect to deverbal compounding, the problems have pertained to detailing the relationship between lexicon and syntax, although they could as well be problems caused by descriptive principles. In syntax-oriented compound description, lexicon is mainly attached to the idiosyncratic knowledge of words. The scope of the lexicon, then, is extremely narrow. Anderson (1992), for instance, rejects such a view of lexicon. He ignores most of the discussion concerning it, since it is only nominal and terminological. In contrast, lexicon to him is an intensional form of knowledge governance, although he declines to give it a definition. Such a view of lexical word-formation would approach Ryder's (1994) analogy-based model of compounding.

Aronoff, one of the most prominent morphologists within the generative framework, has twice — in (1976) and (1994) — outlined compounds external to morphology and inside syntax, and thus, outside his work. In lexeme-based morphology his division between morphology and syntax is such that “the core of morphology ... is the arbitrary relation between the signified and signifier of bound forms,” what he calls phonological operations. A grammatical construction may be morphological and syntactic at the same time since morphology involves forms while syntax is concerned with grammatical constructions and categories (Aronoff 1994: 12-13). In such a framework the scope of morphology is narrow. “Compounding is a type of lexeme formation that operates primarily at the level of syntactic categories, without reference to the morphological content of the construction“ (Aronoff 1994: 16).

Baker (1998) sums up four principles of syntax that can be applied to compounding. First and foremost, according to the Theta Criterion the

structure of a verb's argument is reflected in deverbal (or synthetic) compounding, and follows some of the same restrictions as it does in syntax. For example, a patient argument cannot be expressed inside and outside the compound, and thus *\*John is a truck-driver of 14-wheelers* is ungrammatical. Second, there is a distinction among arguments between internal and external arguments, since the former can appear inside the compound, whereas the latter cannot. For instance in English, the compound *shark-eating* in the meaning 'eating by sharks' is impossible.<sup>7</sup> Third, there is no compound to satisfy two obligatory internal arguments, for instance, *\*table-putting of boots*. Finally, the so-called directionality parameters are also valid in compound formation, at least in endocentric compounding. The distinction between head-initial and head-final languages in syntactic constructions seems to be restated in the order of constituents. As a result, it is assumed here that research on the relationship between the syntactic and semantic features of verb representations will require increased investigation in the near future.

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<sup>7</sup> Jussi Niemi (personal communication) gives an example using an occasional compound that seems to be an exception: "There were many people singing in the pub: professors, students and their friends. The *student singing* was really off key."

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