

## COMPOUND FORMATION IN GENERATIVE GRAMMAR

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This article discusses the different theories that have been proposed within the framework of Generative Grammar to account for English compounds. Three groups of theories are distinguished and critically reviewed: Transformationalist Theories, Lexicalist Theories and Syntacticist Theories. The latter, which constitute the most recent account, have been developed under the theoretical assumptions of Government and Binding Theory throughout the 80s. Moderate Syntacticist Theories are claimed to provide the best current approach to English compounding.

## 1. Introduction

The main goal of this article is to provide a comprehensive overview of the different theories that have been proposed to explain compounds throughout the history of Generative Grammar, with a special emphasis on recent syntacticist theories. A second aim we have in mind is to reflect, in a very general sense, the state of linguistic theory (especially as regards the so-called syntax-morphology interface) at each of the three different stages we will distinguish in the study of compounding. All this will be done from a critical perspective, that is, we will attempt to provide a general assessment for each different theory and we will claim that moderate syntacticist accounts are to be preferred over the other theories, although we do not agree with some of the assumptions in the former.

Three great tendencies may be distinguished within the study of English compounds: Transformationalist Theories (TTs), developed within the general grammatical framework of the early 60s and within the framework of Generative Semantics in the case of Meys (1975) and Levi (1978); Lexicalist Theories (LTs), which arose in the late 70s under the influence of Chomsky's Lexicalist Hypothesis (LH); and finally, what we call Syntacticist Theories (STs), which appeared throughout the 80s and represent an attempt to apply the GB grammatical principles to morphological expressions.

Before we deal with TTs, we provide a list of English compounds which the reader may take as the empirical corpus that will constitute the basis of all our argumentation. Two types of compounds are distinguished in (1). Those in (a) are usually known as Verbal Compounds (VCs) and their characteristic property is that they contain a deverbal element in head position (on the right) so that the item on the left may be interpreted as an argument of that element (usually the Theme argument). The compounds in (b), on the other hand, are made up of two nouns and they are known as Primary Compounds (PCs). In this case, the first member is not an argument of the second: the semantic relation between the two elements may be quite heterogeneous and difficult to characterise from a grammatical point of view, depending, on many occasions, on pragmatic factors.

(1) (a) bus-driver meat-eating task-assignment steel-production (b) honey-bee car radio table-lamp corn field<sup>1</sup>

# 2. Transformationalist Theories of Compounds

TTs are represented by the works of Lees (1960), Meys (1975) and Levi (1978), who try to account for English compounds by providing a phrasal or sentential paraphrase which constitutes the underlying representation to which a (usually long) series of transformations applies, so that eventually the surface form of the compound is obtained. Lees (1960, 119) claims that "English nominal compounds incorporate the grammatical forms of many different sentence types". Accordingly, he provides a taxonomy of grammatical functions (subject-verb, object-

<sup>&</sup>lt;sup>1</sup> Of course, there are many other types of compound in English, but those in (a) and (b) represent the two most productive and regular types. For this reason, and for reasons of space, our exposition will concentrate mainly on these two clauses.

verb, etc.) that apparently exhaust the possible interpretations of compounds; for instance, the compound wading bird corresponds to the function subject-verb (the bird wades). Whereas Lees does not separate VCs and PCs, Levi does and she considers that PCs, which do not contain a predicate at the surface level, are to be interpreted by means of a set of Abstract Predicates including BE, CAUSE, DO, MAKE, etc.

The problem with the above approaches is that both grammatical functions and abstract predicates turn out to be inadequate mechanisms. In some cases, more than one function or predicate may be chosen for a given compound, even though there is no variation in meaning: steamboat in Lees may have at least two paraphrases, the boat uses steam and steam powers the boat, and the grammatical functions of the members of the compound vary depending on the paraphrase. We can conclude then that Lees' theory is not predictive since it is impossible to decide which verb governs the predicative relation and which grammatical function corresponds to each member in the deep representation. Something similar happens with Levi's predicates: the compound suspense film may correspond to more than one predicate, as the paraphrases show and Levi herself admits: film that HAS suspense, film that CAUSES suspense, etc.

Another problem that arises is that sometimes no adequate correlate is found for a given interpretation of a compound: apart from its conventional meaning, honeybee may also refer to a bee that eats honey, but the predicate EAT is not found within Levi's restricted set. Other predicates, such as MAKE, cover a rather arbitrary grouping of semantic types: "to produce", as in honeybee, "to be made up of", as in student committee. A strict definition of each predicate should be given so that each one could correspond to a coherent semantic content.

As the paraphrases constitute the input for the derivation of compounds, we can assume that the derivational mechanism is spoilt from its very beginning, but apart from this, that process shows other weaknesses, the major one being that it is quite unrestricted since it is made up of a series of "ad hoc" transformations that operate freely. The derivation Lees (1960, 135) proposes for wading bird may serve as an example:

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... bird wading ——>(T63)
... wading bírd ——>(stress shift)
... wáding bìrd²
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It is surprising that Meys (1975), who published his book five years later than Chomsky (1970), should criticize Chomsky on the grounds that he confines idiosyncrasies to the lexicon and forgets (in Meys' opinion) about the partial regularity that many compounds exhibit. What happens is that Meys identifies regularity with transformation and does not seem to be acquainted with the regular, productive dimension of the lexical component as it was developed by the defendants of the LH.

# 3. Lexicalist compounding

In this section we will examine the theories of Roeper and Siegel (1978) (RS), Selkirk (1982), Lieber (1983), and Di Sciullo and Williams (1987) (DSW).<sup>3</sup> All these works were written under the lexicalist program initiated by Chomsky (1970) which gave place to the so-called Lexicalist Hypothesis (LH), according to which complex and compound words must be derived by means of lexical rules, not transformational rules, as in the TTs. The existence of an independent, generative Word Formation component is therefore proclaimed. Many different variants of lexicalism have been proposed since the early 70s, but DSW's work probably constitutes the most recent relatively comprehensive treatment.

RS's theory may be conceived as a pseudo-lexicalist approach in the sense that they still use the transformational metaphor: they propose a lexical transformation which operates on subcategorization frames (SFs, henceforth) in order to generate VCs. SFs in RS are strings of structural frames which follow the verb and stand for both the arguments and adjuncts that a predicate may take (see line one in (3)). RS's Compound Rule takes an element from postverbal position and moves it to the left of the verb. This operation is constrained by the First

<sup>&</sup>lt;sup>2</sup> The brackets in 2 refer to the transformation which applies to the preceding sequence and which originates the string that follows. The sign 'indicates primary stress and 'secondary stress.

<sup>&</sup>lt;sup>3</sup> Botha (1984) constitutes an interesting critical appraisal of Lexicalist Theories of compounding. Some of his arguments show up in our exposition.

e. [[empty]+initiated] [NGovern.]—> [[Government] initiated]

Sister Principle, which determines that the element that is moved must be adjacent to the predicate before movement. For the Compound Rule to apply, a series of operations must apply before, which prepare the context for the former. Botha (1984) criticises these preparatory operations on the grounds that they have obscure or unacceptable properties. Below we reproduce RS's (1978, 224) derivation for the compound Government-initiated and then comment on some of those properties.

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(3) initiate [NP] ([NP]) ([NP]) (by [NP]) [NP]) [NP] ([NP]) (
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As regards the Affix Rule in (3), one of its major defects is that it duplicates the function of the rule of affixation for non-compounds. RS (1978, 210) claim that "the distinction is necessary because not all compounding verbs can undergo the non-compound rule. We hear *churchgoer* but not & a goer". This means that the output of lexical rules must be constrained by the notion "existing word". We agree with Botha (1984) that this distinction is not compatible with the idea of a productive lexical component and conclude that having two different rules for the same affix implies a considerable loss of generalization.

Another serious problem arises in relation to the rule of Subcategorization Adjustment in (3). This is needed for the case of compounds such as the one above, because the moved element is never the direct object of the verb: it is the agent, instrument, etc. The point is that the rule deletes the object, but then in an expression like [Government-initiated] projects the head noun corresponds precisely to that element. The question is then, is it possible to retrieve that element once it has

been erased? It does not seem so, and therefore RS cannot explain how *projects* is related to the predicate *initiate*.

Selkirk (1982) and Lieber (1983) are the lexicalist accounts which have been more widely accepted. They attempt to provide an exhaustive characterization of English compounds and their theories have two clear parts, a structural one and a semantic one. Selkirk devices an X-Bar grammar to account for the structural properties of compounds, so that all the categorial combinations are captured by particular context-free rewriting rules (for example, N---> N N, for table lamp, A---> P A, for underripe, etc.). Lieber, in turn, proposes several structural conventions (her well-known Conventions) for the construction of binary-branching trees: there are no expansion rules in her system, she generates the trees by direct aplication of the conventions. For this reason, we can claim that she gains in generality with respect to Selkirk, as she does not need a set of word-structure rules.<sup>4</sup>

Selkirk and Lieber develop the interpretive dimension of their theories to account for the semantics of VCs, since they accept that the interpretation of PCs is not really subject to grammatical constraints but depends rather on extralinguistic factors. Selkirk adopts the framework of Lexical Functional Grammar (LFG). In LFG each predicate has a "lexical form", ie, a lexical representation reflecting the association between  $\theta$ -roles and grammatical functions, that must be satisfied when the predicate is realized in a syntactic or lexical expression. The lexical form for the verb see, for example, is that in (4):<sup>5</sup>

(4) see: SUBJ OBJ
Agent Theme

The point is that Selkirk assigns grammatical functions to the first members of VCs, thus accounting for the thematic interpretation those elements have (in *sight-seeing*, for example, *sight* is the object and there-

<sup>&</sup>lt;sup>4</sup> Compounds are generated by Lieber's conventions in the following way: a binary tree without labels is produced and two lexical items (the ones which make up the compound) are inserted each under one branch. Finally, the categories of the items are percolated up the tree so that the nodes receive labels and the tree is complete.

<sup>&</sup>lt;sup>5</sup> In *John saw the cat*, for instance, *John* is the subject and also the Agent of the action, whereas *cat* is the object and the Theme (or Patient) which undergoes the action, i.e. which is seen.

fore the Theme of the second member). She completes her model with two empirical conditions on VCs: the No-Subject Condition (NSC) and the First Order Projection Condition (FOPC). The former predicts that the non-head of a compound cannot be associated with the function of subject. In this way she explains the ungrammaticality of expressions like those in (5a), in which the first member is the subject. The FOPC ensures that all non-subjects arguments must be sisters of the head of the compound and therefore explains why the compunds in (5b) are wrong.

- (5) (a) \*girl-swimming \*kid eating
- (b) \*baby toy handing \*table boot putting

The main drawback in Selkirk's account is that the two conditions actually make wrong empirical predictions, as a consequence of their being formulated in terms of grammatical functions. For reasons of space we will only refer to the NSC here: the forms in (5a) are not really excluded, as they should, since the Agents may be realized by means of the function BY OBJECT (cf. swimming by girls), and this function is not excluded from compounds, it is actually assigned to the first member of compounds such as man-made, etc.

Lieber's interpretive mechanism is given by her Argument Linking Principle (ALP), whose part a) we reproduce below:

(6) In the configuration  $[]_{V/P}$   $[]_{\hat{a}}$  or  $[]_{\hat{a}}$   $[]_{V/P}$ , where  $\hat{a}$  ranges over all categories, V/P must be able to link all internal arguments.

Part b) of the ALP stipulates that in VCs the non-head may also be interpreted as a "semantic argument", ie, a locative, manner, instrumental element, ie, an adjunct, in short (as in *homemade*, for example, where *home* is a locative).

Several criticisms have been levelled against the ALP. Botha claims that this principle is redundant because it is needed independently for the syntax, ie, it is a version of the Projection Principle. We may add that from an empirical point of view, the ALP is not adequate either since it predicts that only internal arguments (ie, non-subject arguments) may be realised in compounds, thus being unable to explain the cases of (7a) —in which the head nouns are not internal arguments— and it also predicts that those arguments

must be adjacent to the verbal stem, which is disconfirmed by the cases of (7b) due to the intervention of the suffix -ing.

(7) (a) search party (b) eating apple scrub woman chewing gum

We will finish this section with a brief look at DSW (1987). DSW claim that compounds are coined as freely as phrases in running speech. This means that compounds (at least some types) are completely productive and therefore they are worth studying from a grammatical point of view. These authors do not develop a full theory of compounding but they do stress the fact that in VCs the head relates to the non-head by  $\theta$ -role assignment and they insist that, due to the fact that they are words, compounds are atomic with respect to syntactic operations (roughly, no syntactic rule can relate a member of a compound with an element outside the compound). This explains the ungrammaticality of \*the [destruction story] of the city, where of the city would be an argument (in the syntax) of the first member of the compound, destruction.

DSW consider that the fact that words are syntactically atomic and have their own rules of formation (in which the head, for example, is on the right and not on the left, as in syntax) implies that they must be dealt with in an independent Word-Formation Component. They actually adopt an extreme lexicalist position which we do not accept. It will be critically examined in the next section.

# 4. Going Back to the Syntax

There are two tendencies within the syntacticist treatment of compounds. We will refer to them as Moderate Syntacticism (MS) and Strong Syntacticism (SS). The former is represented by authors such as Fabb (1984) and Sproat (1985), and is based on the idea that compounding (as well as derivation) is a syntactic phenomenon. These authors provide structural representations for compounds which belong to the base of the syntactic component and are constrained by the modular principles in GB theory (Case, Theta-Theory, Binding Theory, etc.). In MS no transformation applies to compounds.

ss, on the other hand, is practised by Pesetsky (1985) and Roeper (1988), among others. These authors use movement operations in their acconunts of English compounding. We review the two positions below and explain our preference for Ms.

## 4.1. Strong Syntacticism (SS)

Pesetsky claims that VCs have two levels of representation, S-structure and Logical Form (LF), which are related by a transformation that adjoins the suffix in the second member of the compound to the whole compound as reflected in (8):

In Pesetsky's view, by postulating such an operation we can account for two things about English VCs. First, we can explain the non-existence of forms such as \*weather changing or \*heart beating, and second, we can preserve sisterhood (at LF, see above) between the verb stem and the argument on the left: he assumes that  $\theta$ -assignment applies under government from the verb, and this requires sisterhood.

We think that the two assumptions above are flawed. As for the first one, Pesetsky considers that the **t** in (8) is subject to principle A of Binding Theory (BT) (ie, it counts as an anaphor with respect to this theory) and therefore it must be bound within the domain of the nearest subject. Furthermore, Pesetsky assumes that weather, in \*weather changing, acts as the subject. The ungrammaticality of this compound is then due to the fact that the trace in [[weather change t] -ing] has its antecedent (-ing) outside the domain specified by principle A above.

This argumentation presents a serious shortcoming: the type of movement Pesetsky adopts is an adjunction, ie, movement to a non-argument position which creates a node that did not exist before movement. Now, in GB theory it is not the trace resulting from this movement the one which is subject to principle A of BT, but that resulting from NP-movement (ie, movement to an argument position).

<sup>&</sup>lt;sup>6</sup> According to Pesetsky, the trace in (8) does not interrupt sisterhood between *meat* and *eat*: he assumes that these two are immediately dominated by the same node in a tree representation.

As regards Pesetsky's second assumption, we agree with him in that the argument on the left must be a sister to the verb in order to be q-marked by the latter, but we think this is achieved without any transformation if the initial representation for VCs in one in which argument and verb form a constituent to which the suffix attaches (ie, we think that the base representation should be the one that results from movement in Pesetsky's account): [[meat eat] -ing]. This is the representation which the defendants of MS adopt and we agree with them. Besides, in Pesetsky's proposal the base structure in (8) does not respect the subcategorization of the verb since the argument is not immediately adjacent to the verb stem, which constitutes a violation of the Projection Principle, as Pesetsky (1985, 236) himself admits. We therefore reject Pesetsky's account on the grounds that it is not properly constrained.

Roeper (1988) deals mainly with compounds in -ing and he claims that they have two syntactic properties (which are reflected in the expression in (9)): a) they appear in control contexts (ie, they have a non-realized subject which is controlled by some other argument —John in (9)— in the sentence), and b) they express progressive aspect:

## (9) John enjoyed [clam-baking] for hours

In relation to control, in one interpretation at least it is true that John is the one who bakes the clams and who enjoys doing it. As regards progressive aspect, we completely disagree with Roeper. We think there is no real basis for holding that compounds show syntactic progressivity. Before explaining our reasons, we will present Roeper's transformational mechanism.

The idea that compounds show progressivity leads this author to consider -ing as an inflectional affix which bears that feature (progressivity) and that originates under the sentential node INFL. The basic tenet in this model is then that compounds are based on syntactic underlying structures, in particular, INFL phrases (sentential structures or IPs). We will not go into Roeper's derivational mechanism in detail as it is quite complicated; we will just say that compounds are originated by two movement operations, one which lowers the suffix from the INFL position and puts it to the right of the verb, and another (a case of Head-to-Head Movement) that takes the head noun of the complement which is on the right of the verb and places it

on the left of the verb. On the whole, this author assumes that a compound such as clam-baking comes from the expression baking [+progr.] clams. In addition to these two transformations, Roeper claims that there is a rule of Category Change (CC) that turns the original IP into an NP or AP (notice that he does not treat compounds as words —X°s—, as most authors do, but as phrases). The operation of CC is well-attested at the word level (most affixes in English are category-changing), but Roeper applies it to phrases without really providing supporting evidence in favour of this innovation. If Roeper had considered -ing as a derivational suffix carring a nominal or adjectival category (this suffix is ambiguous in this sense, as many authors have noted), he would have been able to claim that this element is responsible for the change in category and he would not need to postulate such an ad hoc operation of syntactic Category Change.

In our view, one of the weakest aspects in this theory is the idea that the fact that the sentence in (9) expresses a certain degree of progressivity must mean that compounds come from IPs and that the suffix is inflectional. Roeper takes the PP in (9) (for hours) as evidence for the progressivity of compounds without apparently realising that this temporal modifier may indicate progressivity-duration by itself, ie, it does not need an inflectional morpheme in the verb (so that we do not need to assume that -ing is inflectional), as the following examples prove: he can talk for hours, there was silence for a few minutes. Furthermore, if compounds are used in contexts other than that provided by Roeper, no progressivity is implicit: meat-eating usually annoys me, bird-watching is one of my favourite activities...

To sum up, we consider that Pesetsky's and Roeper's accounts present a number of shortcomings which considerably weaken the hypothesis that transformations are involved in the formation of compounds.

# 4.2. Moderate Syntacticism (MS)

We explained in section 3 that Di Sciullo and Williams (1987) defend an extreme version of lexicalism which leads them to claim that morphology and syntax are different sciences about different objects and that morphological expressions belong to a separate morphological component. We do not agree with this strong position. Instead, we follow Ms, in particular Sproat's position, in considering that no separate Word-Formation Component is needed if we apply GB grammatical principles to compounds. The result is that we do not need to formulate extra rules or principles for compounding and the independently needed syntactic principles have a wider empirical coverage, so that the grammar gains in generality and simplicity. In short, we can talk about a single grammatical component in which both phrases and words (at least, compounds) are generated. These two types of expressions are naturally distinct, but their differences (among others, head position, and atomicity for words vs transparency for phrases) may be derived from the fact that phrases are maximal projections ( $X^{max}$ ) whereas words are "submaximal projections" ( $X^{\circ}$ ), as Sproat calls them.

Both Fabb and Sproat provide a Deep Structure representation for vcs in which the left member and the verb form a constituent to which the suffix attaches (ie, [[N V]-suf]]). Both the compound as a whole and its members are of level zero (note the contrast with Roeper, who treats vcs as phrases). Fabb and Sproat use trees which include not only syntactic features (ie, labels such as N, V, etc.) but also diacritic features. Fabb uses these features to indicate Case-assignment and Sproat to indicate q-role assignment, although both claim that these two principles —Case and q-theory— apply in compounds. We of course agree that the latter holds in compounding but we disagree as regards Case: this principle applies only to maximal projections. We explain our reasons below.

Case Theory plays a basic role in Fabb's model. He (1984, 89) claims that Case is a "constraint on head-complement relations" that applies both to phrases and words. By means of Case he tries to account for the distributional properties of morphological realizations of verbs and so he claims that inflectional and derivational affixes which subcategorize verbs also mark them with a Case feature. We can conclude that Case in Fabb duplicates the function of category selection, which independently constrains head-complement relations. It turns out to be a largely redundant mechanism therefore. But it is also empirically inadequate: Fabb claims that an expression such as \*the run man is wrong because the verb is caseless since there is no affix that can assign it Case (and nouns cannot assign Case to verbs); but the point is that there is a type of compounds in English (see (10) below) whose structure is parallel to the above expression and nevertheless they are perfectly grammatical:

(10) pushbutton watchdog

Fabb would probably send those to the lexicon claiming that they are irregular but the fact is that they are productive (Lees 1960) and exhibit  $\theta$ -relations, and these two properties demand a syntactic account in Fabb's theory, but if they are to be dealt with in the syntax, those compounds cannot be explained in this theory.

Sproat equally applies Case Theory to compounding and claims that the ungrammaticality of \*table boot putting is due to the fact that Case assignment requires adjacency between the Case-assigner and the element which receives Case, and in this expression the argument table is not adjacent to the verb, only boot is adjacent, given that the structure is binary.

Two arguments of an empirical nature can be levelled against Sproat's theory of Case. First, he claims that compounds such as \*man- arriving are ungrammatical because verbs such as arrive are ergative (ie, they only take an internal argument) and therefore they cannot assign Case. However, there is a group of compounds (those in (11a)) which take ergative verbs and whose members do not present any type of ungrammaticality:

- (11) (a) heartbeat, sound change, daybreak ...
  - (b) church-goer, wall-sitter, city-dweller...

Similarly, the compounds in (11b) contain intransitive verbs, which cannot assign Case either, and nevertheless they are equally grammatical. So the compounds in (11) constitute serious counterexamples to any account which claims that Case Theory holds in morphological expressions.

As we said above, we claim that Case can only be assigned to  $X^{max}$ , ie, to referential expressions (this is the position adopted by Roeper 1988): the members of a compound are not referential, they can only have a generic meaning (accordingly, they do not take articles, cf. \*a [the opera lover], vs an opera lover).

Sproat considers —on the grounds of expressions with *self*, such as *self-destruction*— that Binding Theory applies in compounds. Although there are some problematic cases which we will not be able to review here, in general we agree with his position and think that the fact that compounds may contain some anaphors is a good demonstration that they share a number of properties with syntactic expressions and they may be accounted for by independently needed syntactic principles.

## 5. Conclusion

In this article we have sketched the basic lines in the three great groups of theories of compounding that exist within the field of Generative Grammar. We are aware that many important ideas have been left out and this is why we encourage those readers who are interested in this topic to go through the bibliography if they want further details about English compounding. We have provided a critical appraisal of the available literature and have argued that Transformationalist Theories failed because they tried to impose an order on the multiple interpretability of RCs and because they used a totally unconstrained derivational mechanism. Lexicalist Theories are more heterogeneous and have in general been successful for a long time but they also present empirical and theorical drawbacks. As regards Syntacticist Theories, we have plainly rejected Strong Syntacticism on the basis that transformations are not a good mechanism to account for compounds: many ad hoc devices must be postulated, as in the case of Roeper, or many theoretical shortcomings arise, as in the case of Pesetsky. We have taken Moderate Syntacticism as the best current account of English compounding, although we do not agree with the application of Case Theory to these expressions, but we do agree with the generation of compounds at the level of Deep Structure and with the idea that the differences between phrases and compounds must be put down to the fact that the former are maximal projections and the latter minimal (or maybe submaximal) projections.

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