Argument Structure and the Interpretation of Deverbal Compounds

by

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Abstract

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This thesis presents a new analysis of deverbal compounding. In a compound such as clown-painting, the native speaker of English knows that the clown is being painted and cannot be doing the painting. On the other hand, in clown-painted, the clown is the one who did the painting and cannot be the one who was painted. It is argued that this and other facts about compounding follow both from natural assumptions about the argument structure of lexical items and from independently motivated principles of grammar. The central claim of this thesis is that the distinction between internal and external arguments proposed in Williams (1981a) must be reformulated as a three-way distinction in order to account for the facts of deverbal compounding. It is also proposed that compounds are subject to the Theta-criterion, which requires that obligatory arguments of a lexical head be satisfied. This requirement accounts for the absence of noun-verb compounds such as *fish-eat, as well as for a class of compounds derived from verbs that require more than one non-subject argument.

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Resumé

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Cette thèse présente une nouvelle analyse du composé déverbal. Dans un composé tel que clown-painting, tout locuteur natif de l'anglais comprend que c'est le clown qui a été peint et non celui qui a fait la peinture. Par contre, l'interpretation du composé clown-painted est la suivante: le clown est celui qui a fait la peinture et il ne peut pas être celui qui a été peint. Il sera démontré que ces faits et autres phénomènes reliés aux composés déverbaux découlent à la fois de la structure argumentale des items lexicaux et de principes de la grammaire indépendamment motivés. La thèse centrale défendue ici est la suivante: la distinction entre arguments internes et arguments externes proposée dans Williams (1981a) doit être reformulée sous forme d'une distinction tripartite de façon à rendre compte des propriétés des composés déverbaux. Il sera aussi proposé que les composés sont soumis au critère-thêta qui exige que les arguments obligatoires d'un item lexical soient réalisés. Ce principe explique l'absence de composés du type 'nom-verbe' tel que *fish-eat de même que de composés dérivés de verbes qui exigent plusieurs arguments non-sujet.

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Chapter 1

Introduction

1.1 Statement of the problem.

The literature tends to distinguish two general classes of compounds. One class of is referred to as "root" compounds. The other is referred to as "deverbal" or "synthetic" compounds. Examples of the former class are given in (1), examples of the latter in (2).

(1) mailman greenhouse
textbook armchair
truckbook flywidget

(2) a. beer-drinker
fire-stealer
wood-chopper

b. beer-drinking
fire-stealing
wood-chopping

c. capitalist-infiltrated
expert-tested
senate-approved

d. user-serviceable
machine-readable

The difference between the words in (1) and (2) is that the meanings of the latter are transparently derived from the constituents of the word, whereas the meanings of the former are largely arbitrary. Thus for instance we know that a beer-drinker is someone who drinks beer. However, the meaning of mailman is not so obvious, no matter how well known. The term mailman refers to the person who delivers mail to the door or perhaps drives the truck which transports sacks of mail to and from mailboxes. However, the term mailman cannot refer to a person who, in Canada at least, is called an 'inside postal worker': a mailman is not the person who sells stamps in a post office.

This difference can be viewed in another way. Suppose we consider the phrase which is the 'gloss' for a given compound. The gloss for mailman is shown in (3), and the one for beer-drinker is shown in (4).

(3) mailman — someone who delivers mail
(4) beer-drinker — someone who drinks beer

In the case of the deverbal compound (4), everything in the phrase exists explicitly in the compound. This is not the case of the root compound (3). Specifically, the notion 'deliver' is nowhere to be seen.

There are a number of properties of deverbal compounds that are closely related to this semantic transparency. The first of these is that the function of the non-head[1] of a compound can not be duplicated elsewhere in the sentence. Thus, while the (a) and (b) sentences in (5) and (6) are grammatical, the (c) sentences are not.

(5) a. John is a beer-drinker.
b. John is a drinker of beer.
c. *John is a beer-drinker of Fresno lite.

(6) a. This bill was senate-approved.
b. This bill was approved by the senate.
c. *This bill was senate-approved by Inoue.

Sentences (5c) and (6c) correspond to violations of the Theta Criterion in sentences (see section 1.4 for details). Verbs, nouns and other categories regulate the number and function of other items (called arguments) that appear in phrases with them. For instance the verb approve requires that there be an approver and something approved. The Theta Criterion bars sentences in which there is more than one approver or thing approved (not counting the case of a phrase including conjunctions). Examples of sentences which violate this principle are given in (7). In (7a) the senate and Inoue cannot both be construed as the approvers of the measure.[2] In (7b) the law and the bill cannot both be

1. Throughout this thesis I will use the terms head and non-head in an informal, intuitive sense. In a compound like beer-drinker the non-head is beer and the head is either drink or drinker, depending on the context.

2. A grammatical reading of this sentence exists if it is the measure (introduced) by Inoue.

construed as being approved by the senate, and because one or the other does not have a function in the sentence, the sentence is ungrammatical. The ungrammaticality of (5c) and (6c) seems to be a similar violation.

(7) a. *The senate approved the measure by Inoue.
b. *The bill was approved the law by the senate.

Another property that deverbal compounds have is a limitation on the function that the non-head may fill with respect to the head. In the compound robot-building, robot is the thing being built, not the thing doing the building. On the other hand, in the compound robot-built, robot is the thing that did the building, and can not be the thing that was built. This difference between subtypes of deverbal compounds (e.g. -ing vs. -ed) is systematic. The types of arguments that the non-heads can take on in the compounds that are shown in (2a-b) are not the same as those for the compounds shown in (2c-d). This property also has a phrasal correlate. The argument that a non-head can take on is the same as the one that appears immediately after the head in a phrase, as shown in (8) and (9).

(8) robot-built
a. X was built by a robot
b. *a robot was built by X

(9) robot-building
a. X's building of robots
b. *the robot's building of X

The facts so far lead to the suspicion that both phrases and compounds are constrained by the arguments that the head takes plus conditions on how those arguments may be expressed. Another property that arguments of a phrasal head may show is the optionality or obligatoriness of their presence. For instance, eating may or may not be followed by a specification of the thing eaten, as shown in (10). However devouring requires that the thing being devoured be made explicit either inside or outside a compound, as shown in (11).

(10) a. Bill's eating of paperclips disturbed the librarian.
b. Bill's paperclip-eating disturbed the librarian.
c. Bill's eating disturbed the librarian.

(11) a. Bill's devouring of paperclips disturbed the librarian.
b. Bill's paperclip-devouring disturbed the librarian.
c. *Bill's devouring disturbed the librarian.

The formation of compounds is affected by the obligatoriness or optionality of arguments in another way. It is the case that, if there is a choice of arguments that may serve as the non-head in a compound, then the non-head must be filled by the obligatory argument. Thus giving, for which the receiver of the gift is optionally present but the gift itself is obligatory (as shown in (12)), can only have the gift itself as the non-head (as shown in (13)).

(12) a. the giving of gifts
b. the giving of gifts to students
c. *the giving to students

(13) a. gift-giving (to students)
b. *student-giving of gifts

Another related example is shown in (14) and (15). As can be seen in (14), putter requires the existence of both a thing put and the place where it ends up. In (15) we see that neither can appear within the compound.

(14) a. a putter of marbles in shoes
b. *a putter of marbles
c. *a putter in shoes

(15) a. *marble-putter in shoes
b. *shoe-putter of marbles

Finally it is interesting to observe that, while deverbal compounding is quite productive, compounds which have the form NV do not arise with any regularity. The examples in (16) are all ungrammatical and sentences containing them sound quite odd (e.g. 'We plan to compound-derive for several hours tomorrow.')

(16) a. *fish-eat
b. *beer-drink
c. *government-infiltrate
d. *compound-derive
e. *book-read

There are some examples of verbs that appear to have the structure NV, for instance bartend and babysit. However, note that these have meanings that are not entirely transparent: babysit does not mean to sit a baby.

We turn briefly to apparently problematic examples. In (17), we see some compounds which seem to contradict the observation that NV compounds are not productively formed in English.

(17) hand-make
machine-slice

Note that while the non-heads here have an instrumental flavor to them, it seems to be the case that, in general, NV compounds cannot be formed with instruments as the non-head, as is shown in (18).

(18) *pencil-write
*fork-eat
*knife-stab
*mower-cut

It may be the case that the words in (17) are not real compounds, and that hand and machine are prefixes of a kind. As shown in (19), hand and machine attach relatively freely to the verbs in (18).

(19) machine-cut
hand-write
hand-stab
?machine-eat

Another possible means of demonstrating that there is a difference between hand and machine on the one hand, and instrumentals on the other can be seen from how they

appear in phrases. Instrumentals require the preposition with and an article, hand and machine take by and no article. This is shown in (20).

(20) write with a pencil
?write by pencil
write by hand
?write with a hand
cut with a mower
?cut by mower
cut by machine
cut with a machine

The rather unusual properties of the prepositional phrases containing hand and machine indicate that something special is going on here. I do not have any revealing insights into this phenomenon, but it indicates that the words in (17) do not represent the general case.

As for instrumentals in deverbal compounds, it appears that whether or not these are arguments in the same sense that themes and goals are, their behavior in compounding does not contradict anything said so far. Thus they cannot be a non-head of a compound if the head requires an obligatory argument, as shown in (21) and (22).

(21) eating of paperclips with a fork
paperclip-eating with a fork
?fork-eating of paperclips

(22) devouring of paperclips with a fork
?paperclip-devouring with a fork
*fork-devouring of paperclips

In this thesis we will not deal with instrumentals further on the assumption that they are either optional arguments or adjuncts.

These argument structure constraints on deverbal compounding have become central concerns of the literature that deals with these compounds. In chapter 2, this literature is discussed and problems that each account has with respect to the properties listed above are pointed out. In chapter 3, a new proposal is made which accounts fairly neatly for the properties, while avoiding pitfalls previously encountered.

1.2 A Model of Grammar

The present study assumes the theory of grammar (Government-Binding or GB theory) proposed in Chomsky (1981). Chomsky assumes that the grammar is composed of several subcomponents: a lexicon, the syntax, which in turn is composed of a categorial component and a transformational component, a PF (phonetic form) component and a LF (logical form) component (Chomsky (1981:5)).

The rule systems that exist in GB theory aspire to maximal simplicity. For instance, it is assumed that there is only one rule which derives syntactic surface structure from deep structure. This rule, referred to as Move-α, is capable of generating vast numbers of ungrammatical strings. Thus GB theory also assumes a number of subtheories which have the effect of constraining the power of rules such as Move-α. Examples of the subtheories are binding theory, government theory, bounding theory, Case theory and Theta-(Θ-)theory.

1.3 X-Bar Theory

In the 'Standard' theory of syntax (pre Chomsky 1972), the structure of phrases was generated by rules such as those in (23).

(23) a. S -> NP AUX VP
b. VP -> V (NP)
c. NP -> Det N (PP)

In Chomsky (1972) the conception of what these rules look like changed. Chomsky proposed that generalizations about phrase structure similarities could be captured through the use of rules which did not specify their category. Thus the fact that the phrasal categories NP, VP and AP all rewrite as a head (N,V or A, respectively) followed by a complement can be captured as shown in (24).

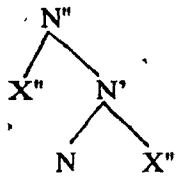
(24) X' -> X ...

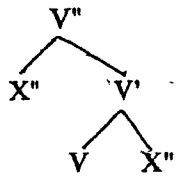
[Where ... is a range of complements. J.M.]

This theory, called X-Bar theory, has since been studied and developed in such works as Jackendoff (1977) and Stowell (1981). X-Bar Theory predicts that differences in the apparent structures between different categories (and within the categories) arise from other factors e.g. the Case- or Θ-assigning properties of the lexical items themselves. The rules for English are something like those given in (25). Note that X^n dominates X^{n-1} and some other maximal projection (i.e. a Y^n where n=2).

(25) i. X" -> Y" X'
ii. X' -> X Z"

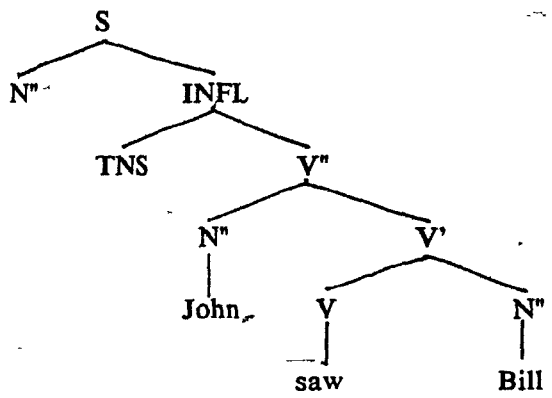
There is one prediction of the theory which is relevant to our purposes. If we assume the rules for English given in (25), then, because we should be able to replace the X's with V's or N's, the two structures in (26) should be possible.

(26) a. 

b. 

The structure in (26a) is quite familiar and is assumed to be the structure of phrases such as the city's destruction of the cereal boxes. On the other hand, structure (26b) is less familiar. However, such a structure is assumed in recent work by Sportiche (1986), Fukui and Speas (1986), Kitagawa (1986) and Kuroda (1986). In such a theory, a sentence such as John saw Bill has (approximately) the underlying structure in (27).

(27)



The verb saw assigns a Θ-role to John. However, because John is not in a position to be assigned Case, it must move. The position it moves to is the empty N" dominated by S. Here it can be assigned Case by the TNS element of INFL.

We will assume in this thesis, that this particular view of syntax is correct. It will be shown that the phenomenon of deverbal compounding provides further, indirect support for this view.

1.4 Theta Theory

1.4.1 Chomsky's (1981) 'Theta Criterion'

Another component of the theory of grammar which is important to this thesis is Theta-theory (Θ-theory). Theta-theory deals with the relationship between items that take arguments (=assign Θ-roles) and the items that serve as arguments (=are assigned Θ-roles). It is generally assumed that there is a limited number of these Θ-roles (thematic relations), e.g. ACTOR (or A: 'performer of action'), THEME (Th: 'person/thing affected by action'), Location (Loc: 'site of action'), etc. The basic principle constraining the relationship between assigners and their arguments is the Θ-criterion (28).

(28) Theta (Θ-)criterion
Each argument bears one and only one Θ-role, and each Θ-role is assigned to one and only one argument. Chomsky (1981:36)

Some of the consequences of the Θ-criterion are shown in (29).

(29) a. John hit Fred.
A Th

b. *John hit.
A Th

c. *John hit Fred by Mary.
A Th A

The verb hit assigns two Θ-roles, ACTOR and THEME. These are appropriately assigned in (29a). In (29b), the Θ-roles of hit have both been assigned to John, violating the first part of the Θ-criterion. In (29c), both John and Mary have been assigned the same Θ-role (ACTOR) in violation of the second part of the Θ-criterion. A similar case has already been shown for the passive participle in (6b) and (7b), above.

1.4.2 Williams' (1981a) theory of argument structure[3]

The specific theory of argument structure that will form the basis of most of the discussion in this thesis is that proposed in Williams (1981a).[4] This theory of argument structure can be thought of as an enhanced version of Θ-theory as proposed in Chomsky (1981). Like Chomsky's Θ-theory, Williams' theory assumes that a lexical entry may include information about the arguments that that entry may take. Both theories assume that nouns, verbs, adjectives and prepositions may take arguments. The Θ-theory of Chomsky (1981) is not explicit with respect to the lexical representation of argument structure. In Williams' framework, the argument structure of hit would be as in (30).

3. This section is adapted from Mead and Hagiwara (1983)

4 Williams (1981a) does not assume that verbs have the structure as in (26b) and this section is presented in his terms.

(30) hit: [Actor, Theme]

A concept central to Williams' system not found (at least explicitly) in Chomsky (1981) is the distinction between external and internal arguments. An internal argument is one which is located inside the maximal projection of a head. An external argument (of which there may be only one) is located outside the maximal projection of the head. The notation that distinguishes an external argument is an underline, as in (30).

An example of a sentence in which hit could be such an argument-bearing head is (31a). Here, the internal argument is assigned to Bill. Fred is assigned the external argument of hit under predication (Williams 1980). This requirement on where the arguments are assigned means that (31b) can not be a paraphrase of (31a).

(31) a. Fred [hit Bill]$_{VP}$.
b. Bill hit Fred.

The notion 'external' cannot, however, be thought of as meaning "in subject position" (i.e. [NP,S]), since internal arguments of, for example, a VP may end up in such a position as a result of the application of the syntactic rule "Move-α". Example (32) shows such a case. Here, Bill is an internal argument by virtue of the location of its trace, even though it is in [NP,S] position.

(32) Bill$_i$ [was hit t_i]]$_{VP}$

In fact, a verb need not have an external argument at all. An example of such a verb is seem. However, Williams (1981a:187) claims that it is a universally true that if Actor is an argument of a given verb, then it is external.

There are two operations that can affect argument structure: externalization and internalization. Williams defines externalization as in (33).

(33) Externalization

E<X>: Erase the underline on the external argument, if there is one, and underline X. If X=∅, then underline nothing.

Williams assumes that there can be only one external argument, and that therefore the act of making argument X external in (34) will also have the effect of making Y an internal argument.

(34) E<X>:[Y,X] => [Y,X]

Externalization (or internalization) may be a feature of any lexical rule, as is the addition, deletion, etc. of phonological material. To use Williams' example, the rule that adds -able to verbs to form adjectives involves the externalization of the Theme (35).

(35) E<Th>: V [A,Th] => V+able [A,Th]
e.g. read [A,Th] => readable [A,Th]

The other type of lexical rule proposed by Williams, internalization, is defined as in (36).

(36) Internalization
I<∅>: Add a new external argument (the appropriate one for the category created; R for nominals, A for verbs, etc.).[5]

The example Williams uses to demonstrate the operation of this rule is the English lexical rule that turns adjectives into verbs by suffixing -ize, shown in (37).

(37) I<Th>: A [Th] => A+ize [A,Th=Th]
e.g. marginal [Th] =>
marginalize [A,Th=Th]

What I<Th> does in (37) is add a new external argument, Actor, and indicate that the Theme of the output word is realized as the same item that was the Theme of the input word.

In the derivation of a noun from a verb, the operation of the rule in (36) on an argument structure such as [A,Th] gives rise to [R,A,Th]. An example of such an operation is given in (38). (39) shows the effect of the rule. Note particularly that in (39a) Bill is outside

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5 "R", an argument peculiar to nouns, is meant to imply "referential" in some sense See Williams (1981a:86) for details

the VP and is the external argument. On the other hand, in (39b) Bill is inside the maximal projection of the NP headed by devouring.

(38) I<∅>:devour[A,Th] => devouring[R,A,Th]

(39) a. Bill devoured the jellybeans.
b. We witnessed the devouring of the jellybeans by Bill.

We end the discussion with two assumptions that we will make about the theory of argument structure as proposed by Williams. The first is that the θ-criterion (28) proposed in Chomsky (1981) holds for Williams' theory also. The second is that, given the θ-criterion, it must be the case that the argument structure of a lexical item contains information as to whether realization of a given argument is optional or obligatory. The reason for this is fairly obvious: given the output of the rule shown in (38), we expect the phrase to be well-formed in (40a). However in (40b) the Actor argument of devouring is not assigned and the phrase should be ill-formed according to the θ-criterion. We assume that (40b) is not ill-formed because arguments can be optional and the θ-criterion does not force the assignment of optional arguments.

(40) a. John's devouring of pickles
b. The devouring of pickles

Thus, the argument structure of devouring is actually [R,(A),Th], where the parentheses indicate that the assignment of the enclosed argument is optional.

1.5 Projection Principle

The Projection Principle is defined in Chomsky (1981) initially as in (41). Subsequent additions to the principle are given in (42) and (43).[6] The word *select* in (42ii) means that α θ-marks β, either directly or indirectly (i.e. to a subject position).

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6. See Borer (1984) for a version of the Projection Principle extended to cover other lexical properties.

(41) Projection Principle
Representations at each syntactic level (i.e. LF, S- and D-structure) are projected from the lexicon in that they observe subcategorization properties of lexical items. (Chomsky (1981:29))

(42) Projection Principle
i. if β is an immediate constituent of γ in the structures

$[_\gamma \ldots \alpha \ldots \beta \ldots]$ or
$[_\gamma \ldots \alpha \ldots \alpha \ldots]$

at L_i, and $\gamma = \alpha'$ then α Θ-marks β in γ

ii. if α selects β in γ as a lexical property, then α selects β in γ at L_i

iii. if α selects β in γ at L_i, then α selects β in γ at L_j
(Chomsky (1981:38))

(43) (Extended) Projection Principle
i. Θ-marking properties of each lexical item must be represented categorially at each syntactic level.

ii. Clauses have subjects. (Chomsky (1982:8,10))

The Projection Principle is closely linked to two other areas of the grammar. The first is trace theory. If some X selects some Y at D-structure and Y is displaced by the rule of Move-α, how will X select it at S-structure? If Y leaves behind an indexed trace, we can claim that this is an acceptable substitute. Note that the Projection Principle also constrains the possible places Y may move to. Specifically, Y can not move to any place that is selected at S-structure since the new position must have contained something different at D-structure and hence the Projection Principle is violated. The second component linked to the Projection Principle is, of course, the Θ-criterion. It is the Θ-criterion which holds at each level.

This completes the discussion of the theoretical framework this thesis assumes. In chapter 3, we will motivate modifications to Williams' definition of internal argument. We will also extend the domain of application of the Θ-criterion. These changes will allow us to account for the properties of compounds.

Chapter 2

Literature Review

2.1 Introduction

The purpose of this chapter is to give an overview of the literature that treats the phenomenon of deverbal compounding. Over the past twenty-five years, explanations proposed have been based on one of two basic hypotheses. The first is that deverbal compounds are derived transformationally, either from actual syntactic phrase markers or from the strict subcategorization frames of verbs contained in them. This approach we might refer to as the Transformational Hypothesis. Both Lees (1960) and Roeper and Siegel (1978) present models that incorporate this hypothesis.

The second approach, which we might term the Argument Structure Hypothesis proposes that the relationship between deverbal compounds and apparently related syntactic phrases springs from lexical properties that the constructions have in common. Specifically, it is the thematic properties of the heads of the two types of constructions that are important. Thus the reason that meat-eater is similar in meaning to eater of meat is that meat in both cases bears the same thematic relationship to eater (or, alternatively, the verb eat from which the noun eater is derived). The proposals (other than those of Lees or Roeper and Siegel) discussed in this chapter--Selkirk (1982), Lieber (1983), Mead and Hagiwara (1983), Walsh (1985), Fabb (1984) and Sproat (1985)--assume some version of the Argument Structure Hypothesis.

2.2 Lees (1960)

The first generative description of compounding appeared as part of Lees' (1960) study of English nominalizations. Lees proposed complex transformational rules which derived compounds from whole sentences or phrases. This was in keeping with the standard approach to how relationships between semantically synonymous strings were accounted for. For instance, passive/active pairs were similar in meaning because they were both derived from the same deep structure phrase markers, the main difference being that the ultimately passive sentence has an extra transformation during the process of its derivation. Since syntactic transformations do not affect the meaning of a string, surface structures derived from the same source will be identical in meaning.

The conception of the form and functioning of the lexicon that prevailed at that time was rather limited. In fact, contemporary generative theory (Chomsky (1957)) assumed that the lexicon was a listing of all the morphemes of the language. There was no word-formation component per se. Thus, Lees had little option but to derive nominals and compounds transformationally. An example is shown in (1). The actual transformations whose labels appear in parentheses are not shown here; only the outputs of each of them appear.

(1) a. John teaches science ---> (T47)
b. John is a teacher of science ---> (GT9)
c. ...teacher of science... ---> (NPN)
d. ...science-teacher...

(Lees (1960:p.152))

Chomsky (1972) points out some difficulties with Lees' general theory of nominalizations. It is Chomsky's position that the distinctions between gerundive nominals (e.g. destroying and derived nominals (e.g. destruction) provide the basis for an argument against using transformations to relate basic lexical entries (e.g. destroy) to both types of derivative forms. Chomsky views transformations as having completely regular, i.e. predictable, outputs and notes some distinctions between derived and gerundive nominals with respect to the degree to which the form and meaning are predictable in the two types of nominals.

The phonetic output of the rule forming gerundive nominals always adds -ing. On the other hand, the rule forming derived nominals has to account somehow for why destruction but not *destroyment, is derived from destroy, while employment, but not *empluction, is derived from employ[1]. Another difference is that the meanings of gerundives are transparently related to their bases, but those of derived nominals are not. An example of such a derived nominal is trial which can be related to try as in Judge Smith tried the case but not as in John tried the smoked sausages.

Chomsky's proposal for the case of derived nominals (the Lexicalist Hypothesis) is that lexical items which may surface as either nouns or verbs do so because there is a common entry which is not fixed with respect to category, although it may be fixed with respect to strict subcategorization features, semantic content, etc. Those features of a nominalization which are idiosyncratic (e.g. phonetic form, possible semantic forms) will be due to the application of equally idiosyncratic morphological rules (Chomsky(1972:p21)). Gerundives, being predictable, are still to be derived by a transformational rule.

The conclusion we draw from Chomsky (1972) (although he does not mention it) is that deverbal compounding, being predictable, is still a phenomenon generated by transformational rules. On the other hand, compounds like mailman or birdhouse are generated in the lexicon (although the precise way in which this would come about is not clear).

2.3 Roeper and Siegel (1978)

In what can only be referred to as a landmark among papers on compounding, Roeper and Siegel (1978) (henceforth, RS) propose a new type of device, the lexical transformation, as

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1. Whether or not this is a legitimate criticism is not clear. Lees' rule for nominalization followed by affix-hopping would give rise to destroy+nml (=nominal). Morphophonemic (MP) rules would then act upon this string. Not all the output of MP rules is necessarily predictable. For instance, though the past tense form of destroy is regular (destroyed), the past tense form of take is not (took). Therefore a special MP rule, take+PAST-->took, appears before the general past tense rule. It is not clear why a similar strategy could not be adopted for destroy+nml. In fact Sproat (1985) suggests such an analysis.

well as a constraint called the First Sister Principle which limits the output of the new device. This type of transformation is different from those proposed by Lees (1960) because it takes as its structural description the strict subcategorization frame of a verb instead of a post-deep structure syntactic string.

RS state the First Sister Principle (henceforth, FSP) as in (2).

(2) First Sister Principle All verbal compounds are formed by incorporation of a word in first sister position of the verb.

The justification for positing the FSP is based on evidence of the type shown in (3). RS claim that only elements which can appear to the immediate right of a verb may form part of a compound. Hence, wash which is subcategorized by a following NP (i.e. [+___NP]), can form a compound (3a), while die, which does not allow an NP to appear to its right (i.e. [-___NP]), may not (3b). In (3c) slow may not be incorporated because it is not in first sister position. However, radish may be incorporated (3d) and if radish is not present slow may be incorporated (3e). (It is not to be inferred from (3) that the (i) examples are derived in some way from the (ii) ones. The latter are provided to demonstrate the properties of the complements of the verbs in question.)

(3) ai. elephant-washing
aii. wash elephants

bi. *elephant-dying
bii. *die elephants

ci. *slow-growing of radishes
(as in "growing radishes slowly")
cii. grow radishes slowly

di. radish-growing slowly
dii. grow radishes slowly

ei. slow(ly)-growing
eii. grow slowly

Examples of the lexical transformations may be provided by the rules for generating verbal compounds in -ed proposed by RS. These are listed in (4) and appear in order of

application. Rule (4a) adds an affix to the end of a verb and creates an empty slot into which another lexical item will later be inserted.

(4) a. Affixation
[verb] W => [[empty]+verb+aff] W

b. Subcategorization Deletion
[[empty] verb+ed] $[_{NP}]$ $\{[^{NP}_{Adj}]\}$ X =>
[[empty] verb+ed] X

c. Subcategorization Insertion
(P^*) $[_{X^n}$ empty] => (P^*) $[_X$ word]

d. Variable Deletion
verb X [+word] Y => verb [+word] Y

e. Compound Rule
[[empty]+verb+aff] [+word] Y =>
[[+word]+verb+aff] Y

(Roeper and Siegel (1978:243-244))

Not all of the rules given in (4) are necessary for the derivation of all verbal compounds. For instance, (4b) does not enter into the generation of compounds in -er or -ing. The existence of (4b) is crucial to the derivation of compounds in -ed, though. This is clearly shown in the derivation in (8). Before discussing these derivations it should be noted that RS assume that the structures to which the rules apply are supplied by redundancy rules. The subcategorization frame relevant to house-building that these rules would supply is given in (5).

(5) [build] $[_{NP}]$ ...

RS claim that "the verb build allows at least four different subcategorization frames to be involved in compound formation: adverb, agent, instrument and locative" (p.212). The context of this claim is a discussion of compounds of the form X-built.[2] Thus, the subcategorization frame relevant to the derivation of slave-built near Cairo would be as in (6).

2. The basis for this claim arises in an odd manner. RS provide a listing of examples of compounding in X-built (e.g. well-built, slave-built, *slave-built well, etc.) in order to justify the existence of the agent frame, because such a frame is not found after the non-derived build. However, it does leave RS open to accusations of manipulating the input on the basis of output data in order to guarantee the correct output.

(6) [build] $[_{NP}]$ $[_{Adv}]$ $[_{Inst}]$ $[_{Agent}]$ $[_{Loc}]$

The derivation of house-building proceeds as shown in (7). The verb build, which is subcategorized by an N", undergoes the rule of Affixation (4b), which serves to (a) add the affix -ing and (b) add an empty slot into which the N will eventually be moved. Next the rule of Subcategorization Insertion (4c) fills the empty NP slot with house. Note that this rule also changes the category features of the N" to N. Finally, the Compound Rule (4e) moves house into the empty position to the left of build.

(7)

[build] [$]_{N"}$ $[[empty]+build+ing]_A$ [$]_{N"}$	=>	(4a)
$[[empty]+build+ing\ ]_A$ [empty $]_{N"}$ $[[empty]+build+ing\ ]_A$ [house $]_N$	=>	(4c)
$[[empty]+build+ing\ ]_A$ [house $]_N$ $[[house]+build+ing\ ]_A$	=>	(4e)

In the derivation of compounds of the form X-built, the derivation proceeds as in (8). First Affixation adds the empty frame and affix. Next, Subcategorization Deletion deletes the $[_{NP}]$. This is followed by the insertion of lexical material into an empty frame (by Subcategorization Insertion). Variable Deletion removes material intervening between the compound and the filled frame. Finally, the Compound Rule inserts slave into the empty slot to the left of build. The remaining [loc] slot may be filled in the syntax at a later stage of the grammar and thus slave-built in a factory can be derived.

(8) a. [build] [NP] [Adv] [Inst] [Agent] [Loc] => (4a)
[[empty]+build+ed]A [NP] ...

b. [[empty]+build+ed] [NP] [Adv] [Inst] [Agent] [Loc]
=>
[[empty]+build+ed] [adv] ... (4b)

c. [[empty]+build+ed] X by [empty] Y => (4c)
[[empty]+build+ed] X by [slave] Y

d. [[empty]+build+ed] [adv] [inst] by [slave] [loc]
=>
[[empty]+build+ed] [slave] [loc] (4d)

e. [[empty]+build+ed] [slave] [loc] => (4e)
[[slave]+build+ed] [loc]

Notice that despite RS's claims to the contrary, rules (4b) and (4c) must be extrinsically ordered. Suppose that it were not the case that such ordering exists. Then it should be possible for Subcategorization Insertion to fill the [NP] frame in the output of (8a). Given the principle of "deletion up to recoverability" Subcategorization Deletion will not be permissible. But if Subcategorization Deletion does not take place, it would be possible to derive the ungrammatical *house-built well.

The approach to supplying subcategorization frames connected with examples (5)-(6) is not exactly that of the Standard Theory as proposed in Chomsky (1965). Given that theory and RS's claims, we might suppose that the subcategorization frames for build are at least as in (9).[3]

(9) a. [+___NP ADV INSTR LOC]
b. [+___ADV. INSTR AGENT LOC]

If (9) contains the correct description of the subcategorization rules for build then it is possible to generate a sentence such as *Fred built by Louise with both Fred and Louise interpreted as doing the building and nothing being built. This problem appears to be unavoidable--there is no obvious way to restrict the appearance of the frames to only

3. Actually, INSTR and LOC would not be part of a strict subcategorization frame because they are not categories (although they might appear in a selectional restriction).

those cases where they give rise to the correct results. We might propose that subcategorization frame (9b) ought to look something like (10).

(10) {+[[empty] ___ ed]$_A$ [+adv] [instr] [agent] [loc]}

Such a frame is quite unusual to say the least. In fact, given the rule schema for strict subcategorization as proposed in Chomsky (1965:96), shown here as (11), (10) is not possible either.

(11) V-> CS/___x where x is a string such that Vx is a VP

This is because the V in (10) does not head a VP at all, at least assuming X'-theory. Instead the phrase that dominates build will be an AP by virtue of the category feature of the -ed affix.

One objection that has been raised with respect to the Affixation rule (4a) is that it almost identical to the rule that affixes -ed (or -ing or -er) to verbs to form passive participles that do not enter into compounding. This means that house-building and the building of houses are related only in that they are both derived from build. The two instances of building are just that: two items that share a common root and not two instances of the same item. RS defend this as being a necessity in any case "because not all compounding verbs can undergo the noncompound rule" (e.g. church-goer but &goer)[4] (Roeper & Siegel (1978:210)).

2.4 Mead and Hagiwara (1983)

Mead and Hagiwara's (1983) (henceforth MH) account of how compounds are formed is based on the theory of morphology as presented in Walsh (1981) and the theory of argument structure of Williams (1981a). Their rule for forming compounds (in English) is given in (12) (MH (1983:133)).

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4. The symbol "&" indicates that goer is possible but nonexistent.

(12) Compound Formation

$[Y]_N$
$[X]_{\{\hat{N}\}}$ =>$[[Y]_N \#\# [X]_{\{\hat{N}\}}]_{\{\hat{N}\}}$

Assign an internal argument of $[X]_{\{\hat{N}\}}$ to $[Y]_N$.

Williams' theory does not allow arguments to be deleted. Forming a noun from a verb adds a new external argument (R) and internalizes the previously external A. MH thus have to provide an account for why it is that this internal A is not assigned to Y in the rule of Compound Formation. This they do with some success, but, as we will see, there is a major problem with their analysis.

A well known property of -er nominals is the fact that they do not assign the actor Θ-role. Thus, phrases like *drinker of beer by Bill are ungrammatical. MH show how this fact can be made to follow from Williams theory and the fact that the argument structure of drinker is [R,Th,∅=A] where (they claim) ∅=A should be taken to mean that the A Θ-role is unassignable. However it is to be dealt with, the fact that the A argument is not an available internal argument means that MH's account correctly predicts that compounds like *student-drinker and *postman-opener will be ill-formed (or at least bizarre) deverbal compounds.

Their rule of compound formation also makes the correct prediction in the case of -ed compounds. They note that a crucial distinction must be made between "adjectival" and "verbal" passives. That such a distinction exists has been noted by Wasow (1977) and others. The important difference between the two for MH is their argument structure. Williams claims that the verbal passives are derived using E<∅>, while adjectival passives are derived using E<Th>. Example (13) shows the case of the verb send (13a), and the verbal and adjectival passives derived from it, (13b) and (13c), respectively.

(13) a. send [A,Th,(G)]
b. sent [A,Th,(G)]
c. sent [Th,A,(G)]

(14) They sent the money to us.

(15) a. The money$_i$ was sent t_i to us by them.
b. We$_i$ were sent t_i the money by them.

(16) a. The money was unsent.
b. *We were unsent (the money).
c. The money was readily sent.
d. *The school was readily sent (the money).

The examples in (15) show that, for verbal passives, either the Th or G may be realized outside the VP (although the argument is assigned to a position marked by a trace inside the VP). The examples in (16) show that, for adjectival passives only the Th argument may appear in the "subject" position. These facts are consistent with (13).

Consider now the simple case of the verb test with the argument structure [A,Th]. The two possible types of compounds are shown in (17). If tested in these compounds is adjectival, then the difference between (17a) and (17b) follows from (12). If it is verbal, then (12) makes the wrong prediction. Note also that we may potentially be able to generate the sentence in (18) where it is the dummy subject.

(17) a. *shaver-tested[5]
b. technician-tested

(18) *It was shaver-tested by the technicians.

Another adjectival compounding type, mentioned only in passing in MH, is compounding in V-able. Such forms are clearly adjectives since they undergo un- prefixing, appear in adjectival positions, and may be modified by very. Their argument structure is [Th,A] (Williams (1981a:93)). Compounds that are well-formed, involving the assignment of an internal argument to the non-head, are given in (19). Ill-formed ones involving the assignment of External arguments are given in (20).[6]

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5. The reading in which shavers are tested.

6. Walsh (1985) assumes that the compounds in (19) are ungrammatical. Note, however, that the relative judgments are fairly clear--the compounds in (19) are much better than those in (20).

(19) machine-readable
user-serviceable
human-parsable
pet-openable

(20) *text-readable
*refrigerator-serviceable
*sentence-parsable
*door-openable

The final type of compounding in English that MH discuss is compounds in which the head is an -ing nominal (e.g. beer-drinking). The rule which derives these nominals adds a new external argument R and makes the A internal. An example is given in (21). Well-formed phrases based on the output of (21) are shown in (22).

(21) give [A,Th,G] => giving [R,Th,(G),(A)]

(22) a. the giving of gifts
b. the giving of gifts to students
c. the giving of gifts by teachers
d. the giving of gifts to students by teachers

The compounds that can be formed from -ing nominals are reminiscent in part of the compounds in -er. The non-head cannot be assigned the external argument R although it can be an internal argument such as Th, as shown in (23).

(23) a. gift-giving (to students by teachers)
b. *student-giving (of gifts by teachers)
c. *teacher-giving (of gifts to students)

Note, however, that several other potentially well-formed compounds (given (12)) are not possible in English, e.g. (23b-c). This is due to interference of the obligatory/optional argument distinction. MH show that obligatory internal arguments 'take precedence' over optional ones. Consider (22) and (23) in light of the data in (24).

(24) a. *the giving
b. *the giving to students
c. *the giving by teachers
d. *the giving to students by teachers

It is clear from the union of (22) and (24) that, of the three internal arguments of the nominal giving, only the Th is obligatory. To capture this fact MH prpose the somewhat inelegantly stated Argument Realization Principle (ARP) (25). A better statement of this principle (suggested to me by Mark Baker) is given in (26).

(25) Argument Realization Principle
In compounds, an obligatory argument of the head must not be left unrealized within the compound.

MH (1983:128)

(26) If X is a compound with head Y, and ϕ is an obligatory argument of Y, ϕ must be realized as the non-head of X.

MH note that the ARP accounts for the data of (23) in an obvious fashion. Since Th is an obligatory argument of giving, it must be satisfied as the non-head of a compound formed with giving as a head. Three other predictions are also made. First, if some other argument of giving was obligatory, e.g. Goal instead of Theme, then the non-head would have to be interpreted differently (e.g. as an indirect object). The second prediction is that if there are several internal arguments, none of which are obligatory, then the non-head of a compound may be interpreted as any of them. The third prediction is that if a lexical item has more than one obligatory internal argument, then no compound can be formed from it.

MH give an example showing that the third prediction is borne out. Compounding is impossible when the head has more than one obligatory internal argument in English as is shown in (28). The data in (27) show that putting has two obligatory internal arguments--Theme and Location (or perhaps Goal).

(27) a. the putting of marbles in shoes
b. *the putting of marbles
c. *the putting in shoes

(28) a. *marble-putting (in shoes)
b. *shoe-putting (of marbles)

MH give examples showing that all three predictions are borne out in Japanese. These data are included in an appendix to this chapter.

There is a problem with MH's analysis, especially with respect to -ing compounding. This problem is noted by Selkirk (1982:35).[7] In the case of -er compounds, there is good reason to think that the Agent argument is unassignable. Similar arguments cannot be made in the case of -ing compounds, as (22d) shows. The fact that A cannot be assigned to the non-head of the compound in *teacher-giving may be solely due to the ARP. A V-ing form whose internal arguments are all optional or whose sole internal argument is A will be a counter-example to (12). Such a case is swimming, whose argument structure is [R,(A)]. By the rule in (12), a compound such as *girl-swimming should be well formed. As this is not the case, this proves to be a major fault in MH's analysis.

2.5 Lieber (1983)

Lieber's theory of compounding is based on her (Lieber (1980)) theory of the lexicon and a theory of argument structure. This section will discuss only briefly the former (as found in Lieber (1983)) and concentrate on the latter.

Lieber's model of morphology includes a lexicon (a list of morphemes) and Feature Percolation Conventions (FPCs) which determine how nodes of binary branching trees--the sole source of structure--are labeled. The lexicon includes the idiosyncratic information about each morpheme, e.g. category, semantic representation, argument structure, and subcategorization (what the morpheme may/must attach to) if the item in question is an affix (Lieber (1983:252)). FPCs are needed because the trees into which morphemes are inserted are unlabeled. The four FPCs are given in (29) (Lieber (1980)).

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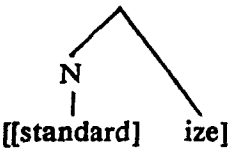
7. Selkirk notes the problem as a problem for any analysis of compounds which uses Williams' theory. She does not refer to Mead and Hagiwara (1983) since her precede's than of MH.

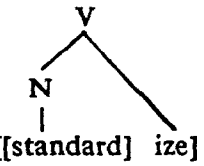
(29) a. Convention I
All features of a stem morpheme, including category features, percolate to the first node dominating that morpheme.

For example:



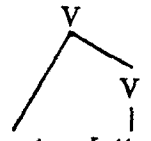
b. Convention II
All features of an affix, including category features, percolate to the first branching node dominating that morpheme.

For example:



c. Convention III
If a branching node fails to obtain features by Convention II, features from the next lowest node automatically percolate up to the unlabeled branching node.

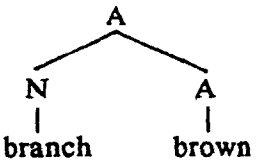
For example:



[counter [attack]$_V$]$_V$
(where counter- lacks a category feature)

d. Convention IV
If two stems are sisters (i.e. they form a compound), features from the right-hand stem percolate up to the branching node dominating the stems.

For example:



Lieber's theory of morphology as described thus far allows for the complete spectrum of category combinations in compounding. We will not go into all of them, but among the types of compounds allowed for are Verb + Noun (e.g. drawbridge), Adjective + Verb (e.g. sweet-talk), Preposition + Preposition (e.g. onto) and Noun + Noun (e.g. mailman). As is well known, in English, some of the types of combinations are less productive than others. For instance, compounds of the type Verb + Preposition and Preposition + Adjective seem not to exist, while those of the type that this thesis concentrates on (e.g bird-watcher, kite-flying) abound. Lieber proposes that variations in productivity can be accounted for, in part, by appealing to a theory of argument structure and a principle of interpretation of arguments that may appear in compounds. It is her contention that given a sufficiently restrictive theory, which is in any case needed elsewhere in the grammar, the massive overgeneration that her approach entails can be dealt with.

In the discussion of her general approach to compounding, Lieber does not opt for any specific theory of argument structure (neither Marantz's (1981), Bresnan's (1982a) nor Chomsky's (1981)), but claims that "the same analysis of compounds is likely to follow from any reasonable statement of argument-linking within a syntactic theory" (Lieber (1983:p.257)). However, assuming that the various theories mentioned by Lieber are not notational variants of each other, it is reasonable to assume that one or more of them will not be able deal with the data she seeks to account for. For instance, Selkirk (1982:p.35) claims that the argument structure theory proposed in Williams (1981a) is incapable of making the distinctions necessary for proper coverage of the deverbal compounding data.

The crucial part of Lieber's version of the Argument Structure Hypothesis is her Argument-linking Principle. This principle is given in (30).

(30) Argument-linking Principle

a. In the configuration $[\ ]_{\{\substack{P\\V}\}}\ [\ ]_\alpha$ or $[\ ]_\alpha\ [\ ]_{\{\substack{P\\V}\}}$, where α ranges over all categories, $\{\substack{P\\V}\}$ must be able to link all internal arguments.

b. If a stem $[\ ]_\alpha$ is free in a compound which also contains an argument-taking stem, α must be interpretable as a semantic argument of the argument-taking stem, i.e. as a Locative, Manner, Agentive, Instrumental, or Benefactive argument.

(Lieber (1983:258))

For Lieber, internal arguments (a notion derived from Williams (1981a)) are defined as "...all obligatory (i.e. lexically specified) arguments with the exception of subject..."(Lieber (1983:p.257)).[8] Free stems are those "left unlinked by an argument-taking lexical item". Semantic arguments are defined as Manner phrases, Benefactives, Agentives, etc." (Lieber (1983:257)). Argument-taking lexical items are verbs and prepositions. On the other hand, nouns and adjectives are not argument-taking. As we will see, this last assumption is crucial to the analysis that Lieber presents. Interestingly enough, this assumption is inconsistent with the theories of argument structure of Chomsky (1981), Bresnan (1982a) and Williams (1981a).

In the interaction between the feature percolation conventions of (29) and the principle in (30), the former have a kind of precedence of application. Thus in a structure like (31a), Lieber assumes that the argument structure of weave percolates and is satisfied outside the compound entirely. Here hand must have a semantic argument interpretation. On the other hand, in (31b) if α is of the category N or A the argument structure of the verb (or preposition) cannot percolate and hence α must satisfy an argument of this verb. An example of this type of compound given by Lieber is drawbridge.

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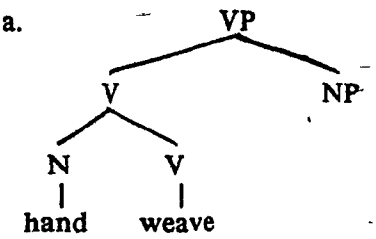
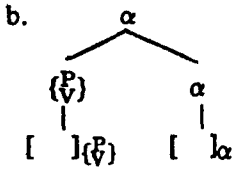
8. This definition is not precisely the same as Williams'--"the external argument of a lexical item is located outside of the maximal projection of that item" (Williams (1981a: p.84)).

(31) a.



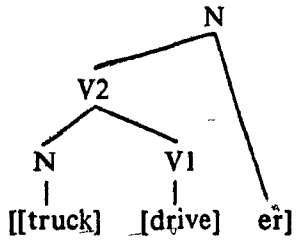
b.



The fact that argument structure percolates in preference to being satisfied accounts for the fact that verbs like fish-eat (meaning to eat fish) does not appear in English: the non-head will not get assigned the internal argument of the verb. On the other hand, given the discussion of (31b), the noun *eat-fish ought to be a comprehensible and coinable compound. In fact, compounds like (31b) are not productive in English.

We now turn to the type of compounds that this thesis is primarily interested in. Consider one possible structure for the compound truck-driver, shown in (32). Here the argument structure can percolate as high as V2 but no higher because nouns cannot have an argument structure.

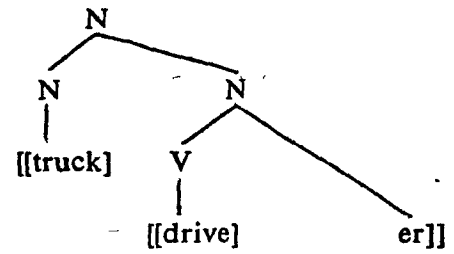
(32)



Because the argument structure of drive must be satisfied in this configuration, the noun truck is assigned the internal argument, and the reading for this instance of truck-driver is 'driver of trucks'.

Lieber's model of morphology allows another structure to underlie the surface string truck-driver. This structure, given in (33), does not require the argument structure of drive to be met, because (33) does not meet the structural description of (30), given that one of the compounded items is a verb or a preposition; instead we have the noun driver.

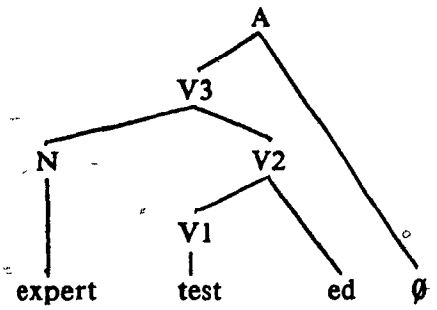
(33)



Because (33) does not meet the structural description of (30a) truck need not be linked to an internal argument of drive. Therefore it does not mean 'driver of trucks'. Nor can truck be interpreted as a semantic argument. Instead Lieber suggests that the compound may take on an ideosyncratic reading such as 'driver owning a truck' or 'driver wearing a shirt with a truck' (although she notes that these are farfetched (Lieber (1983:p.268))).

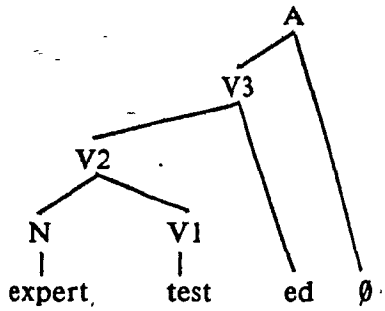
Turning to compounds in -ed (e.g. expert-tested, Lieber claims that these, too, may have two possible underlying structures, as shown in (34) and (35). Affixing -ed to a verb modifies the verbs argument structure such that the verbs internal argument becomes external, while the external argument disappears. Thus, in (34) the argument structure of test is [A,Th]. The argument structure at V2 is [Th] and this argument structure also projects to V3. It can project no higher because adjectives do not have argument structures. Now since tested has no internal arguments (because it is a participle), expert will have to be interpretable as a semantic argument (e.g. agent) and the compound will mean 'tested by experts'.

(34)



In the case of the structure in (35), Lieber claims that the final result will be the same as in (34), that expert will be interpreted as a semantic argument. This is because the argument structure of test will be projected to V2 as is, modified by -ed and projected to V3. Since it cannot be projected any farther and since the structural description in (30) is found, expert will have to link to an internal argument. Since there are none, it will have to be a semantic argument.

(35)



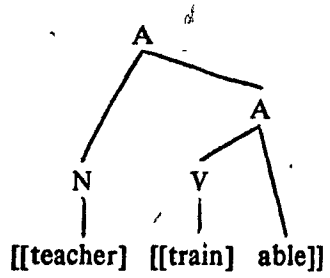
We might question Lieber's interpretation of how (30) applies in structure (35). Note that in each of the other structures presented so far ((32), (33) and (34)) the argument that the non-head satisfies can be thought of as belonging to a sister node. Thus in (32) truck is an internal argument of drive, in (33) truck's sister is an item with no argument structure, driver, and in (34) expert is sister to a node with no internal arguments, tested. This view is not possible in the case of (35). Here, expert's role must crucially not be considered to have anything to do with its sister, test. The reason for this is obvious: if expert is

considered an internal argument of test then the compound ought to mean that experts were tested.

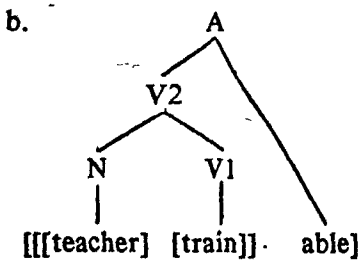
We are forced to conclude that expert must be an internal argument of something that dominates it (V3). This sort of assignment of Θ-roles would be impossible in the syntax where Θ-roles are assigned under government. Of course, this does not preclude arguments being linked in such a fashion in the word-formation component. Furthermore, there is a sense in which the linking that is necessary in (35) is at odds with (30). The most obvious interpretation of "$\{^{P}_{V}\}$ must be able to link all internal arguments" is that the $\{^{P}_{V}\}$ in question is the one in [ ]$_{\alpha}$ [ ]$_{\{^{P}_{V}\}}$. This, of course, gives the wrong result in (35). To get the correct one we must say that the discontinuous object test]-ed actually takes arguments. We say discontinuous since in (35) -ed attaches to expert-test not test. In fact, Lieber says just this (Lieber (1983:279)).

There are also some compounds which are not accounted for by Lieber's analysis. Such a case is compounding with a deverbal adjective in -able. For instance, consider compounds such as teacher-trainable, 'trainable by teachers' or user-serviceable, 'serviceable by users'. The possible underlying structures for these compounds are given in (36).

(36)a.



b.



In (36a), the argument structure of train cannot project to the A node. As train is not an item in the structure [ ]$_{\alpha}$ [ ]$_{\{P\}}$, by (30a) its argument structure need not be satisfied. Furthermore, by (30b) teacher will not be interpretable as a semantic argument in this position, because trainable is not argument-taking; hence, teacher cannot be interpreted as an Actor. In (36b) the argument structure of train can percolate as high as V2 but no higher. Thus the internal argument of train must be satisfied by teacher. This leads to the reading 'able to train teachers'--the wrong interpretation.

2.6 Selkirk (1982)

Like the analyses in Lieber (1983) and Mead and Hagiwara (1983), Selkirk (1982) assumes that argument structure plays a role in the interpretation of compounds. Unlike Lieber, Selkirk proposes that word structure rules do not overgenerate, but that there is one rule for each type of compound. The rules she proposes to concatenate lexical items to form compounds are similar in form to phrase structure rules. These rules are listed in (37).

(37)

$$N \rightarrow \begin{Bmatrix} N \\ A \\ V \\ P \end{Bmatrix} N$$

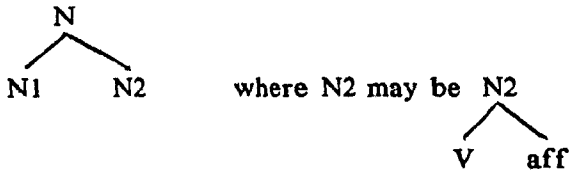
$$A \rightarrow \begin{Bmatrix} N \\ A \\ P \end{Bmatrix} A$$

$$V \rightarrow P \quad V$$

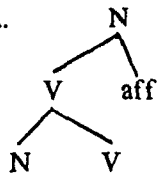
We will not discuss these rules in detail except to note that they directly encode the gaps that exist with respect to what might be possible compounds in English but in fact are not (e.g. Noun-Verb, Adj-Verb, Noun-Prep). The fact that there is no rule V -> NV accounts simply if perhaps unrevealingly, for why compounds such as *fish-eat do not exist in English. The fact that there is no rule V -> NV also means that there is only one possible representation for any given deverbal compound. Thus (38) is the representation

for compounds such as mailman, beer-drinking and book-burner, while the two structures in (39) are not possible. (The structures in (39) are not relevant for NN compounds like mailman.)

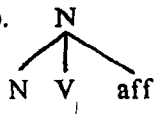
(38)



(39) a.



b.



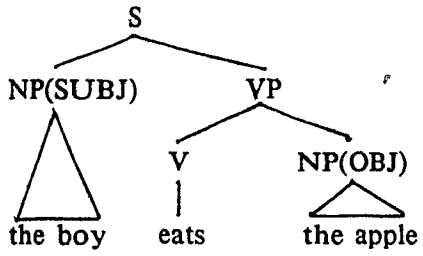
The ternary branching structure in (39b) is assumed not to be allowed by the grammar (Selkirk (1982:29)). Because (38) is the only representation of compounds such as mailman and book-burning, Selkirk's system must differentiate between these by appealing to a device other than that which generates word tree-structures. Her theory must also allow for the two readings that Selkirk claims a compound like tree-eating has: one in which tree is an argument of eating ('eating of trees') and another in which it is not ('eating in trees').

The analysis that Selkirk proposes is based on a theory of grammar, called Lexical Functional Grammar (LFG), developed in Bresnan (1982b) (and elsewhere). This theory assumes that a lexical item may have an argument structure. Associated with the argument structure are grammatical functions whose job is to link the arguments of the lexical item with positions in a syntactic tree. For example, in (40) the verb eat has the argument structure <ACTOR, THEME>. These arguments are linked to a grammatical function e.g. SUBJ (or subject) and OBJ (or object). Where an argument need not be satisfied, optionality is represented by allowing linkage to a null position, ∅.

(40) eat <ACTOR, THEME>
| |
SUBJ OBJ/∅

Example (41) shows a possible syntactic structure. The labels SUBJ and OBJ are associated with specific nodes on a tree. In this way, grammatical functions mediate the assignment of an argument to a syntactic position.

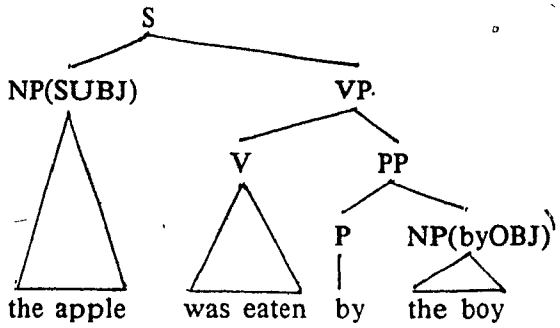
(41)



Examples (42) and (43) show the lexical and syntactic representations, respectively, of the passive construction.

(42) eaten <ACTOR, THEME>
byOBJ/∅ SUBJ

(43)



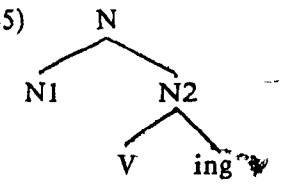
The lexical representation in (42) is derived from that in (40) by means of a rule that changes the OBJ of the former into the SUBJ of the latter while also changing the SUBJ into a byOBJ. Because there are no transformational rules in LFG, (43) is the result of phrase structure rules just as (41) is. Selkirk's proposal for interpreting compounds is given in (44).

(44) Grammatical Functions in Compounds

Optionally, in compounds, (i) a non-head noun may be assigned any of the grammatical functions assigned to nominal constituents in syntactic structure, and (ii) a non-head adjective may be assigned any of the grammatical functions assigned to adjectival constituents in syntactic structure. (Selkirk (1982:32))

Returning to a compound such as tree-eating, recall that Selkirk claims that there is only one word structure representation, (45), underlying its two readings. For Selkirk, the difference in meanings arises because eating has the lexical representation shown in (46). In the case where N1 is an argument of N2 (it bears the THEME argument) the compound means 'the eating of trees'. Because the argument THEME is only optionally realized, N1 can bear some other (non-argument) relationship to N2, and thus the compound can mean 'eating in trees'.

(45)



(46) eating <AGENT, THEME>
SUBJ/Ø OBJ/Ø

If the OBJ argument of eating were not optional, then (45) would not be ambiguous. An example of a verb with an obligatory OBJ is devour. Selkirk notes that we know that the OBJ of devour is obligatory because strings such as John is devouring are ill-formed. In compounds formed from this verb, e.g. tree-devouring, the non-head can only be understood as the THEME, 'devouring of trees', and not as some non-argument, 'devouring in trees'.

Now as it stands, (44) allows for the generation of ill-formed compounds such as those found in (47), where the non-head satisfies the SUBJ argument. For instance, (47a), with the reading as given, is not possible in English, although it would be if it had the

somewhat bizarre reading 'drinking of students'. It is crucially assumed that the stress pattern of this example is what is generally referred to as compound stress, as opposed to phrasal stress.[9] If (47a) is pronounced with phrasal stress, then it would be acceptable with the reading 'drinking by students'. We thus assume that government-spending (47b), as it is normally used ('spending by the government') is not derived by a compounding process, noting that if given compound stress, it has the meaning 'spending of the government'.

(47) a. *student-drinking 'drinking by students'
b. *government-spending 'spending by the government'

Selkirk deals with this by proposing the generalization found in (48).

(48) The SUBJ argument of a lexical item may not be satisfied in the compound structure.

Thus, given that the argument structure of swimming is as in (49), the only possible reading for *?girl-swimming is one in which girl is a non-argument (e.g. 'swimming in a style characteristic of girls').

(49) swimming <ACTOR>
|
SUBJ

Another type of overgeneration allowed by (44) is illustrated in (50).

(50) a. *tree-eating of pasta 'eating of pasta in trees'
b. *book-handing to children
c. *children-handing of books

In (50a), pasta is the OBJ of eating while the non-head, tree, is a non-argument. On the other hand, both book and children satisfy arguments of handing (the OBJ and toOBJ, respectively) in (50b-c). To deal with these, Selkirk proposes a second generalization, given here in (51) (Selkirk (1982:37).

---

9. Compound stress emphasizes the non-head, i.e. STUdent-drinking, whereas phrasal stress emphasizes the nonhead and head more or less equally, i.e. STUdent DRINKing.

(51) The First Order Projection Condition (FOPC)

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

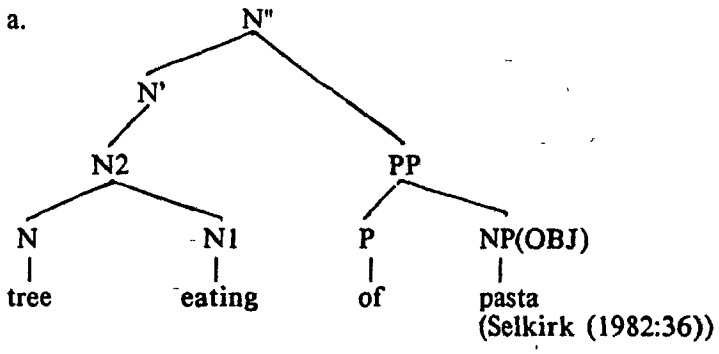
The notion of first order projection is defined as in (52).

(52) The first order projection (FOP) of a category X_i^n is the category X_j^m that immediately dominates X^n in the syntactic representation.

[Where syntactic means the tree structure both above and below the X° node. J.M.]

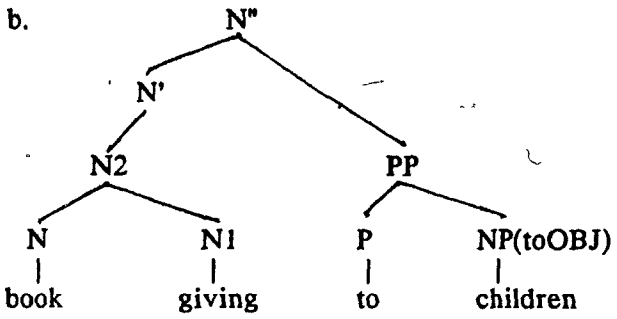
The FOPC accounts for the data in (50), as is clear from the representations given in (53). In (53a), pasta, which satisfies the OBJ of eating, is nevertheless satisfied outside its FOP (N2). Similarly, in (53b), one non-SUBJ argument is satisfied within the FOP of giving (by book). However, children remains outside the FOP and hence the phrase is ill-formed.

(53) a.



(Selkirk (1982:36))

b.



A number of criticisms have been leveled against the theory of compounding proposed by Selkirk. One noted by Mead and Walsh (1984) is that while compounds such as *girl-swimming are indeed ill-formed if girl is to be interpreted as an argument, there seem to

be instances of well-formed strings that require an argument structure for swimming different than that found in (49). Such an instance is given in (54).

(54) Everyone agreed that the swimming by the girls was more graceful than that by the boys.

In such a sentence, girls and boys are not SUBJs. To prevent *girl-swimming it will now be necessary to change Selkirk's generalization (48) to exclude whatever grammatical function girls and boys bear. The grammatical function borne by girls and boys cannot be simply byOBJ, because boy-eaten is a possible compound derived from the lexical representation in (42). Indeed, it will be difficult to assign a suitable grammatical function in this case and not appear to be making an ad hoc move. This problem is also noted in Williams (1984), who points out that Selkirk's other examples *weather-changing and *kids'-eating can be generated from the same deverbal nominals that underlie changing of the weather and eating by kids, respectively.[10]

A second criticism, from Williams (1984), concerns the nature of the SUBJ/non-SUBJ dichotomy in LFG. He notes that because all grammatical function types are supposed to be equal, no special status can be attributed to the fact that there is a distinction between SUBJ and all other GFs in any given situation, e.g. (48). It should, therefore, not be surprising to find a language which makes special reference to, e.g. toOBJ, in compounding or a similar rule.

A final problem with Selkirk's analysis is that the FOPC makes the wrong predictions in the case of NPs with optional arguments. For instance, the phrases in (55) ought to have the same structure as is given in (53b), and hence should be ruled out by the FOPC. Nevertheless, they do not seem to be nearly as bad as e.g. *book-handing to kids.[11]

---

10. Williams suggests that *girl-swimming and similar forms are, in fact, acceptable. Few others I have spoken to, however, agree or know anyone who agrees with his judgments.

11. Note that these grammaticality judgments are my own and that Selkirk assigns a star to (55a).

(55) a. gift-giving to children
b. French-teaching to senators
c. book-selling to illiterates

2.7 Walsh (1985)

Walsh assumes a theory of morphology based on that proposed in Selkirk (1982), but with some modifications. The first change Walsh makes (that we are interested in) is a reduction in the number of types of compounds assumed to exist in English. The reason for this decrease is the fact that many of the types of compounds assumed in Selkirk (e.g. PV) are of limited productivity. Thus, the eight compound types proposed by Selkirk are reduced to three in Walsh's model as shown in (56).

(56) $N^0 \rightarrow N^0\ N$
$A^0 \rightarrow N^0\ A$
$A^0 \rightarrow A^0\ A$

Walsh proposes that compounds are interpreted on the basis of the argument structure of the head items, and that the head may assign an argument to a non-head it governs. Government in morphology is defined in terms of mutual c-command. The definition of c-command Walsh assumes is given in (57).

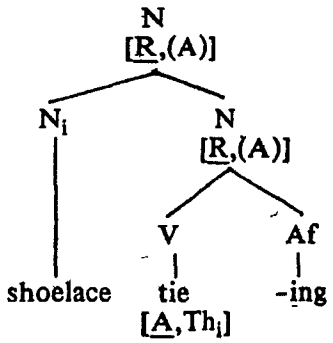
(57) C-command
A node A c-commands B iff the first branching node α_1 dominating A either dominates B or is immediately dominated by a node α_2 which dominates B and α_1 is of the same category as α_2. (from Reinhart (1976:148))

Walsh assumes that argument structures of lexical items may percolate and that affixation may modify these argument structures. She also proposes the Argument Percolation Principle (henceforth APP), shown in (58) which constrains the extent to which arguments may percolate.

(58) Argument Percolation Principle
The internal arguments of a word percolate iff none of them can be realized. (Walsh (1985:295))

The effect of the APP can be seen as follows. In (59), tie governs shoelace and assigns the Th argument to it. The A argument, which is external, percolates to the next level (where it is modified by -ing). However, Th can no longer percolate since it is realizable. Thus, *shoelace-tieing of ribbons is ill-formed since ribbons can receive no argument. If tie did not assign its Th argument, this argument still would not be able to percolate because of being realizable. Thus we still could not have *shoelace-tieing of ribbons.

(59)



Walsh proposes that the assignment of the Th argument of tie to shoelace is forced by the Θ-criterion, which requires that all obligatory arguments be assigned.[12] The combination of the APP and the Θ-criterion also guarantees that compounds with double object verbs will be severely restricted. Specifically, verbs that have two obligatory internal arguments will be able to assign only one of them inside the compound. The second argument will not be able to percolate and thus the structure will be ruled out by the Θ-criterion. Verbs that have only one obligatory internal argument, however, will be able to assign that one to the non-head of the compound. However, the other arguments will not be able to percolate and be assigned in the syntax. A structure of the type shown in (60) is not possible since here the V will not c-command (and hence will not govern) the N2 position, thus preventing the assignment of the other argument.

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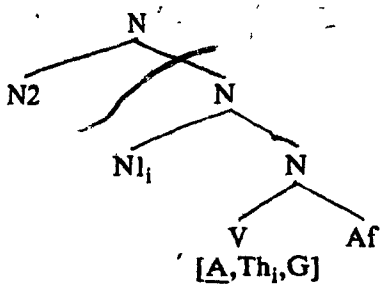
12. For further details see Walsh (1985:286).

(60)



The fact that percolation of other (optional) internal arguments is not possible means that (61) and much of the data from Japanese demonstrating the same phenomenon will be ruled out. We take this to be a problem for Walsh's analysis.

(61) gift-giving to students

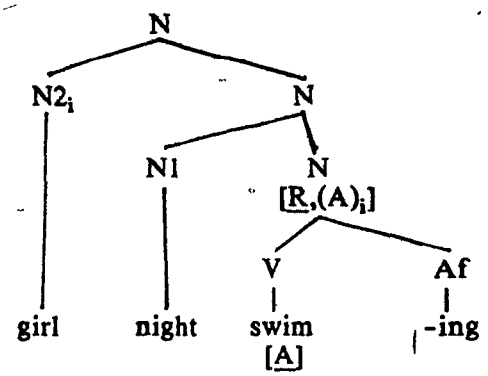
Note that so far, compounds like *girl-swimming are not ruled out. Girl cannot be assigned an internal argument of swim, because swim does not have one. However, swimming does have an internal argument (A). Why can this argument not be assigned to girl? To prevent such an assignment, Walsh proposes the Theta-Role Assignment Principle (henceforth TAP) (62). Thus, because the verb swim governs the noun girl, swimming cannot assign the noun an argument. Because this argument cannot be assigned, it can percolate. This means that phrases like swimming by girls or shoelace-tying by kids will be well formed.

(62) Theta-Role Assignment Principle
X may assign a theta-role to Y iff X governs Y and there is no constituent Z dominated by X which also governs Y.

Under Walsh's analysis, non-arguments may appear as non-heads of compounds, (e.g. night-swimming (by girls)). In fact, because non-arguments may appear in this position, compounds like *girl-night-swimming appear to be possible. Consider the structure in (63). Swim has no internal arguments to assign, and A percolates to the next node, at which point affixation of -ing causes it to be internal. This internal argument cannot be

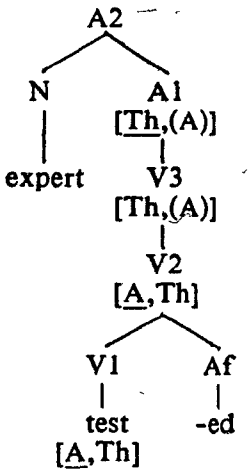
assigned to N1 by the TAP because swim also governs N1. However, A can be assigned to N2 because swim does not govern this positio, while swimming does.

(63)



Compounding in -ed gives rise to structures such as that in (64).

(64)



The affix -ed turns a verb into its perfect participle form (V2). V3 is the verbal passive, while A1 is the adjectival passive form. Note that under the current definition of c-command, V2, V3 and A1 all govern the N expert. By the TAP, the lowest in the tree of these, i.e. V2, should assign its internal argument to expert. This, however, would yield 'experts were tested', the wrong reading for this compound. Therefore, Walsh proposes the modification of c-command given in (65).

(65) C-command
A node A c-commands B iff the first node α_1 dominating A is a branching node which either dominates B or is immediately dominated by a node α_2 which dominates B and α_1 is of the same category as α_2.
Walsh(1985:315)

Thus, in (64) A1 is the only node that governs the N, because A1 has only one child node. Walsh notes that this redefinition does not appear to affect how things work in the syntax. However, there seems to be something odd about the fact that a node must have a branching parent in order to be able to c-command some other node.

2.8 Fabb (1984)

Fabb (1984) marks a return to the idea of compounding as a syntactic phenomenon. Because his account of deverbal compounds is tied so closely to his view of syntax, and his view of syntax is at least superficially non-standard,[13] it is difficult to do justice to his analysis in a short space. I will try to present the bare bones of his theory as it applies to compounding.

Fabb proposes the following visibility requirements.

(66) Visibility Requirements
1. Every node on a theta-indexed path must be visible.
2. A predicate must have a visible subject.

A node X is visible if

(i) it is Case-matched
(ii) it is PRO
(iii) a projection of X is visible

Fabb (1984:96)

In Fabb's system, Case must be assigned to verbs as well as nouns.

Visibility requirements dictate the choice between structures (67i) and (67ii).

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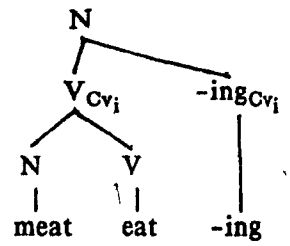
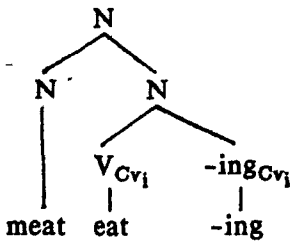
13. "Superficially" because his thesis discusses explicitly a number of topics (e.g. the mechanics of Case assignment), which the literature tends to leave underdiscussed.

(67) i.



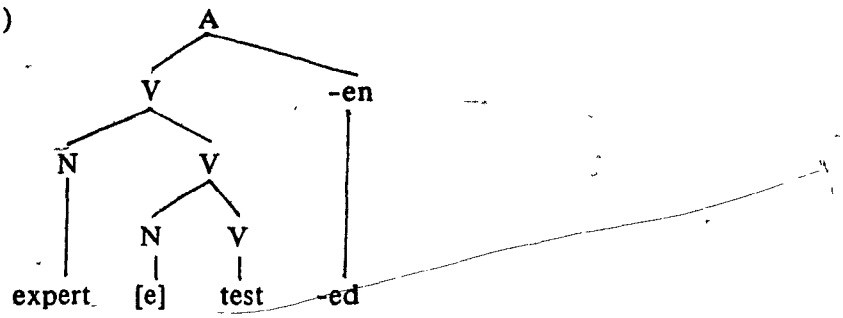
ii.



In (67), eat assigns a theta-role to meat. Hence, every node on the path between the two must be visible. In (67i), the highest projection of eat is assigned Case by the affix -ing, and thus this node is visible. The projection of meat is case-marked by eat (not shown in this example), and thus is visible, too. On the other hand, the N node dominating eating in (67ii) is not assigned (and does not assign) Case and is therefore not visible. The path between eat and meat is therefore broken and (67ii) is ruled out.

Compounds in -ed have an interesting structure, containing an empty element, as shown in (68). This empty element gets bound by some external item, e.g. radios in the expert-tested radios.

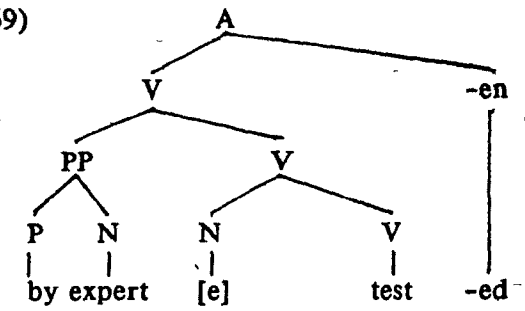
(68)



How does expert get Case? This question turns out to be intimately linked to the problem of ruling out compounds like *girl-swimming. Expert needs Case so that it can be visible. Test cannot assign it Case as its Case feature is absorbed by the -ed affix. Note that this turns out to be unproblematic in the case of *girl-swimming: in a structure like (67i), if swim cannot assign Case to girl then the compound will be out because the N dominating girl will not be visible and swim will not be able to assign a theta-role to girl. Fabb proposes that expert gets assigned Case because it is actually contained in a

prepositional phrase headed by by, as shown in (69). This preposition is subsequently deleted at PF.

(69)

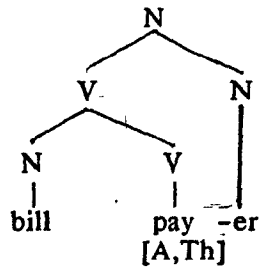


We may now legitimately wonder why a structure like that in (69) cannot underlie *girl-swimming. To avoid this possibility, Fabb stipulates that nouns may not contain PPs. This explanation is not particularly revealing and is a major problem for his theory.

2.9 Sproat (1985)

Sproat, like Fabb, argues that compound formation occurs in the syntax. The structures for compounding that he proposes are quite similar to those proposed in Lieber (1983). For instance, the structure for bill-payer is as in (70).

(70)



As in Lieber's analysis, pay is claimed to be in a position which requires that its Th role be satisfied[14]. What forces the Th argument to be assigned is a condition on the

14. The interactions of the arguments of the various items in a compound such as (70) can be ignored for the present purposes. So too can Sproat's definition of the external argument as being, the "last argument assigned/discharged in any syntactic structure" (p. 170).

projection principle (stated in (71)). The version of the projection principle that Sproat assumes is given in (72).

(71) Constraint on the Projection Principle
The Projection Principle applies to α in a structure $[_{\gamma}...\alpha...]$ where γ directly dominates α and γ is of the same category as α.
(Sproat (1985:198))

(72) Projection Principle
Representations at each syntactic level (i.e. LF, S- and D-structure) are projected from the lexicon in that they observe subcategorization properties of lexical items. (Chomsky (1981:29))

This condition applies in (70) because there is a V that dominates both the noun, bill, and the verb, pay, which is immediately dominated by an N. Unlike Lieber, Sproat assumes that argument structures may percolate to categories with different labels, although not in this particular case. Thus, if (70) were not a compound structure (i.e. if pay were dominated by the N projected by -er), then pay's argument structure would not need to be satisfied but would instead percolate. This accounts for the similarity of meanings between bill-payer and payer of bills, although note that this similarity is indirect; in the former bill is an argument of pay, while in the latter it is an argument of payer.

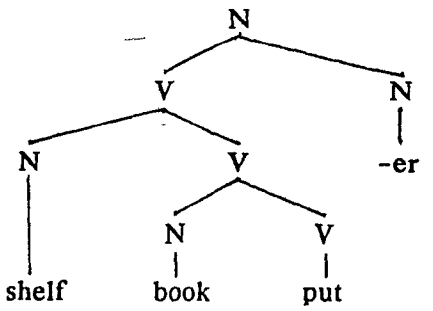
Note that the version of the projection principle that Sproat chooses is the least extensive of the three versions discussed in Section 1.5. The reason for this is clear. The other two versions make reference to the argument structure of lexical items, which includes the external argument. Were we to include the external argument in the case of (70), then the structure would be ruled out since the external argument cannot be assigned in the structure given in (71).

Because all the arguments (excluding the external one) must be discharged in the structure in (71), phrases such as *book-putter on shelves are ruled out since the G argument will not be assigned within the compound. However, given the data from Mead and Hagiwara

(1983) motivating the ARP, the current analysis will incorrectly rule out apparently acceptable structures, such as book-stacking on shelves.

The analysis so far does not prevent a structure such as that given in (73). In this structure, the domain of condition (71)'s application is the highest V; thus the projection principle is satisfied and the resulting compound *shelf-book-putter should be well-formed. In fact the structure is ill-formed.

(73)



To rule out the structure in (73), Sproat proposes that not only does V assign a Θ-role to the N in a compound but it also assigns it Case. Thus, the reason why (73) is ill-formed is that shelf is not assigned Case. This assumption allows Sproat to account for why unaccusative (ergative) verbs do not compound. An unaccusative verb is a verb which assigns a Θ-role to its complement, but not Case. To get Case the complement of such a verb must move to the [NP,S] position. Examples of unaccusative verbs are arrive, rise and sink (as in the ship sinks). Because these verbs cannot assign Case to the N in a compound, compounds like *man-arriving and *sun-rising are correctly ruled out.

It is not clear whether the Case-assignment claim can be made to hold up, though. The theoretical status of unaccusative verbs is fluid and any account of them must take into consideration one of their best-known characteristics, shown in (74).

(74) a. There arrived three men from France.
b. There rose an orange planet in the west.

Note that in these two sentences, NPs are found where none should be--in the object position. It is suggested in Belletti (1988) that the verbs do in fact assign Case (partitive Case) to their objects. If this is true, then they should also be able to do so to the Ns in compounds. Hence, *angel-existing should be grammatical.

Another problem with the Case-assignment claim is that there are verbs which seem to assign Case to two objects, e.g. give. If give can indeed assign Case to both its objects in a sentence such as that in (75a), then Sproat will have to provide a reason for why a structure such as that in (73) cannot underlie a compound like that in (75b).

(75) a. Mary gave the kid some candy.
b. *candy-kid-giver

In (70) we have represented the noun bill as an N^0. In fact, Sproat claims that this position is actually N'. His arguments are, to my mind, not as convincing as they might be. The first and strongest argument (attributed to Fabb (1984)) comes from such forms as The Bronx and The Hague which can appear in compounds only without the The as in Bronx-hater or Hague-visitor. His second argument is based on the fact that some phrase-like objects can appear in the head position. The examples he gives are shown in (76).

(76) a. Attila the Hun hater
b. Jack the Ripper chaser
c. Jack-in-the-box admirer

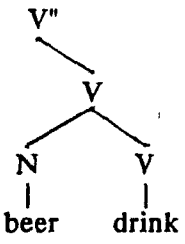
Note that the non-heads in (76a-b) are names and therefore ought to be considered to be NPs not N's. In any case, as Sproat admits, they do appear to be lexicalized items and it is therefore possible that they do not have N' structure. Sproat notes further that the examples given in (77), which can be argued to be real N's, are also odd. The '??' judgments are those that Sproat gives. They seem somewhat optimistic to me, and lead to a rather paradoxical situation in which complements are predicted to be possible but are not.

(77) a. ??dog in a hat catcher
b. ??mice with lice chaser

The third example that Sproat claims provides evidence for N' non-heads is of the type [American History] teacher. He cites Stowell (1981) as providing arguments against this proposal.(i.e. teacher of American History) gives American History a stress pattern commonly associated with compounds as opposed to phrases.) Sproat also argues against the possibility that the non-head is an N".

One of the goals of Sproat's thesis is to show that there is no such thing as a word-formation component. There is, of course, a lexicon, but this contains only underivable information. On the face of it this is an attractive idea. The less machinery imputed to the grammar and the more phenomena that fall within the scope of independently motivated principles the better. Such a research strategy succeeds or fails to the extent that things morphological end up looking like things syntactic. With respect to compounding at least, I do not think Sproat makes a good case. The reason for this, I believe, is that there are a number of things that are odd about compound formation which, if attributed to the fact that compounding is part of some separate module, are at least localized mysteries; whereas if compounding is part of syntax, they bring our understanding of the latter into question. So, for instance, if the non-head of a compound is an N' (which I have disputed), then we must explain why X-bar syntax is violated in structures dominated by X^0. This problem extends further. Why the argument structure of the V cannot be satisfied by the N in the structure in (78), is unexplained.

(78)



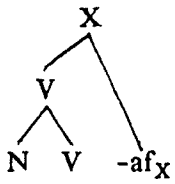
By the condition on the projection principle in (71) this should be possible. Even if (71) is changed such that it applies to the maximal projection of α, this does not preclude beer being an argument of drink.

2.10 Conclusions

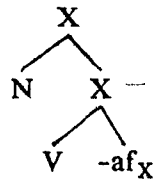
As can be seen, there is a great deal of agreement as to why deverbal compounds mean what they mean. The fact that Selkirk (1982), Mead & Hagiwara (1983), Lieber (1983), Walsh (1985) and Sproat (1985) quickly begin to get repetitive (with regard to compounding), is probably a good sign.

What is interesting about the analyses reviewed is that they can be partitioned into two sets. The dividing line is not the syntax/lexicon barrier. Instead, it is drawn from the perspective of the affix involved in the compounds. Both Selkirk (1982) and Mead and Hagiwara (1983) assume that affixation precedes compounding (structure (79b)). The rest assume the opposite (structure (79a)).[15]

(79) a.



b.



Analyses that assume the structure in (79b), put the burden of accounting for the differences between, e.g. beer-drinking and government-infiltrated on the theory of argument structure. It happens that LFG as it stands does not make exactly the argument structure distinction that Selkirk's analysis requires. A similar rationalization can be made with respect to Williams' (1981a) argument structure theory and Mead and Hagiwara's analysis--the external/internal distinction as defined simply does not work as it stands.

---

15. Actually, Lieber (1983) assumes both, but the structure that underlies deverbal compounds in her analysis is the compound first, affix second structure.

The situation is much different for adherents to the structure given in (79a). In these analyses, the burden of accounting for the two types of compounds is placed on the theory of morphological structure and feature percolation. Difficulties arising in these accounts always seem to revolve around compounds in -ed. The reason for this is clear: the argument structures of -er and -ing compounds are largely similar to those of the verb they are derived from. However, in the case of -ed compounds, the argument structures of the underlying verbs are wrong. There are ways to get around this problem. However, the 'fixes' required to make the analyses of -ed compounds work do not seem entirely natural. Therefore, in the next chapter I will propose a theory of argument structure which allows the selection of (79b) as the basis of deverbal compounds.

2.11 APPENDIX: Japanese Data from Mead and Hagiwara (1983)[16]

In this appendix, we present the data adduced in Mead and Hagiwara (1983) that support the predictions of their Argument Realization Principle (ARP). These predictions are repeated in (80).

(80) 1. If a head has only one obligatory argument, that argument must be satisfied by the non-head.
2. If a head has only optional arguments, then any of these may be satisfied by the head.
3. If a head has more than one obligatory argument, then no compound can be formed.

In Japanese we get the same kind of compounding facts for lexical items with one internal argument as we do in English. This is illustrated in (81).

---

16 This section is adapted from Mead and Hagiwara (1983).

(81) a. atume-ru [A,Th] 'to collect'

kitte-atume	'stamp-collecting'
shiryoo-atume	'date-collecting'
shikin-atume	'capital-collecting'

b. sagas-u [A,Th] 'to find, to search'

hito-sagashi	'person-searching'
ara-sagashi	'fault-finding'
takara-sagashi	'treasure-finding'
yome-sagashi	'bride-searching'

c. yom-u [A,Th] 'to read'

hon-yomi	'book-reading'
ronbun-yomi	'article-reading'
shinbun-yomi	'newspaper-reading'

d. kak-u [A,Th] 'to write'

hon-kaki	'book-writing'
syoosetu-kaki	'novel-writing'
ronbun-kaki	'paper-writing'

e. war-u [A,Th] 'to chop'

kurumi-wari	'walnut-chopping'
suika-wari	'watermelon-chopping'
maki-wari	'wood-chopping'

Japanese is also similar to English with respect to the compounding of heads that have the argument structure [R,Th,(G)]. For instance, (82) shows that the Japanese verb yuzuru 'to leave X to Y' has among its internal arguments an optional Goal and an obligatory Theme. Thus we should expect that in compounds derived from this verb, the non-head will only be interpretable as a Theme, as is shown to be the case in (83).

(82) a. Titi-wa musuko-ni zaisan-o yuzu-tta.
father-top. son-dat. property-acc. leave past
'Father left his property to his son.'

b. Titi-wa zaisan-o yuzu-tta.
father-top. property-acc. leave past
'Father left his property.'

c. *Titi-wa musuko-ni yuzu-tta.
Father-top. son-dat. leave past
'Father left to his son.'

d. *Titi-wa yuzu-tta.
Father-top. leave past
'Father left'

(83) a. zaisan-yuzuri 'property-leaving'
b. *musuko-yuzuri 'son-leaving'
c. musuko-ni zaisan-yuzuri
'property-leaving to son'
d. *zaisan-o musuko-yuzuri
'son-leaving of property'

Japanese also has verbs that have the argument structure [A,G,(Th)]. An example of this is makaseru 'to entrust with'. That this verb has an obligatory Goal and an optional Theme is shown in (84). Facts corresponding to the first prediction of the ARP given in (80) are shown in (85).

(84) a. John-wa ziken-o bengoshi-ni makase-ta.
-top. case-acc. lawyer-dat. entrust-past
'John entrusted his case to the lawyer'

b. John-wa bengoshi-ni makas-e-ta
-top. lawyer-dat. entrust past
'John entrusted to his lawyer'

c. *John-wa ziken-o makas-e-ta
-top. case-acc. entrust past
'John entrusted his case'

d. *John-wa makas-e-ta
-top. entrust-past
'John entrusted'

(85) a. *ziken-makase 'case-entrusting'
b. bengoshi-makase 'lawyer-entrusting'
c. *bengoshi-ni ziken-makase 'case-entrusting to the lawyer'
d. ziken-o bengoshi-makase 'lawyer-entrusting of the case'

The Japanese verb tanomu 'to ask for' exemplifies the second prediction of the ARP--that if no internal argument is obligatory the interpretation of the non-head can correspond to any internal argument. The examples in (86) demonstrate that both Theme and Goal are optional for this verb, while (87) shows that the compounds we expect to be produced are in fact well-formed.

(86) a. John-wa oya-ni kane-o tanom-da
-top. parent-dat. money-acc. ask-past
'John asked for money from his parents'

b. John-wa oya-ni tanom-da
-top. parent-dat. ask-past
'John asked of his parents'

c. John-wa okane-o tanom-da
-top. money-acc. ask-past
'John asked for money'

(87) a. oya-danomi 'parent-asking'
b. kane-danomi 'money-asking'
c. kane-o oya-danomi 'parent-asking for money'
d. oya-ni kane-danomi 'money-asking of parents'

Similar facts obtain from the compounding of verbs which have undergone causativization. The rule that adds -sase to verbs involves the internalization of either Theme or Goal (we will henceforth assume, somewhat arbitrarily, that only I<G> is involved; nothing hangs on this choice, cf. Williams (1981a:100)). This rule is shown in (88).

(88) I<G>: V [A] => V-sase [A,G=A]

Applying rule (88) to the intransitive verbs naku 'to cry', oyogu 'to swim' and aruku 'to walk' allows the compounds shown in (89) to be formed.

(89) a. oya-nakase 'parents-crymake'
b. sensei-nakase 'teacher-crymake'
c. inu-oyogase 'dog-swimmake'
d. neko-oyogase 'cat-swimmake'
e. kodomo-arukase 'child-walkmake'

Note that while kodomo-arukase is somewhat dubious, the addition of the suffix -ki 'machine' yields kodomo-arukase-ki 'machine for making (i.e. helping) a child walk' which is well-formed.

The output of the causativization rule provides an example of the third prediction made by the ARP--that lexical items with more than one obligatory internal argument cannot undergo compounding. When yomu 'to read' and nomu 'to drink' undergo causativization to become yomaseru and nomaseru, respectively, their argument structures contain both an

internal Goal and Theme, which are both obligatory, as is shown in (90). As expected, neither of these two verbs can undergo compounding (91).

(90) a. Watashi-wa kodomo-ni hon-o yom-ase-ru.
I -top. child-dat. book-acc. read-make-pres.
'I make the child read the book.'

b. *Watashi-wa kodomo-ni yom-ase-ru.
I -top. child-dat. read-make-pres.
'I make child read'

c. *Watashi-wa hon-o yom-ase-ru
I -top. book-acc. read-make-pres.
'I make read the book'

d. Watashi-wa byoonin-ni mizu-o nom-ase-ru
I -top. sick person-dat. water-acc. drink-make-pres.
'I make the sick person drink the water'

e. *Watashi-wa mizu-o nom-ase-ru
I -top. water-acc. drink-make-pres.
'I make drink water'

f. *Watashi-wa byoonin-ni nom-ase-ru
I -top. sick person-dat. drink-make-pres.
'I make the sick person drink'

(91) a. hon-yomi 'book-reading'
b. *hon-yomase 'book-readmake'
c. *kodomo-yomase 'child-readmake'
d. mizu-nomi 'water-drinking'
e. *mizu-nomase 'water-drinkmake'
f. *byoonin-nomase 'sick person-drinkmake'

Chapter 3

An Analysis of Deverbal Compounds

In this chapter, a new proposal for dealing with deverbal compounds will be made. This proposal will provide an explanation for the various properties of this type of compounding. These properties are, as shown in the last chapter, fairly well understood in that few would deny that an account of them must be based on a theory of argument structure. Nevertheless, the details of this account have proved difficult to pin down. These properties include:

(1) a. The non-head is an argument of the head.*

b. This argument is an internal argument of the head.

c. The argument of the head is not available for assignment in the syntax. (i.e. the Θ-criterion holds).

d. An obligatory argument must be assigned in preference to an optional one.

e. If there is more than one obligatory argument, neither/none of them may be assigned.

f. There are no NV compounds (in English).

g. Compounding may be done recursively (in English).

It is clear that several of these properties are related to each other, and those that are closely related will be dealt with more-or-less simultaneously.

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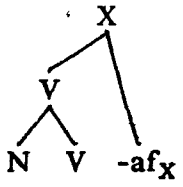
* Readers concerned with the possibility that this claim is too strong especially in the case of instrumentals are referred to the discussion in chapter 1.1.

3.1 The Basic Structure of a Deverbal Compound

We have seen in chapter 2 that there are several approaches to generating the constituent structure of compounds. On the one hand we have the rewrite rules that Selkirk (1982) proposes. On the other we have rules that simply generate structure without regard to the categories involved like those proposed in Lieber (1983). One of the crucial factors that might allow us to decide between these two types of rules is the question of how we deal with the gaps in compounding that are found in English. Is the fact that English does not productively generate compounds of the type NV merely a peculiar fact about English (as is predicted by Selkirk's proposal) or due to other factors (as is predicted by Lieber's proposal)? The standard strategy to this is to choose the latter approach. We will opt for the most general rules for compound-generation and then look for principles which will account for why some forms are grammatical and others are not. We therefore assume that rules such as those presented in Lieber (1983) generate word structure and that compounds of the form NV can be ruled out independently. As we will see in a later section this choice is justified.

Another issue in constituent structure is what compounds look like. This issue, too, is driven in part by the type of rule system we choose: if we choose phrase structure rules we can generate a narrow range of structures; if we choose rules that allow for the arbitrary generation of structure we must provide ways of reducing their power. Whichever rule system we choose, the choices for the structure of compounds are as shown in (2).

(2) i.



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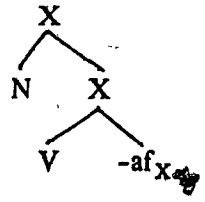
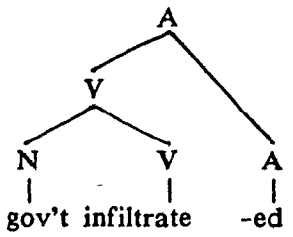
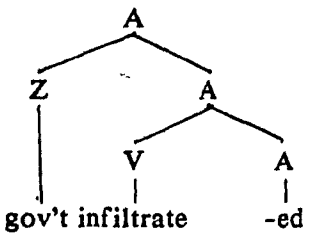


In the case of -ed-based compounds (e.g. government-infiltrated) the choice of (2ii) is fairly easy to make (see (3)). Were we to assume that the NV compound was formed first we would have no explanation for why government has the agentive role, because the argument structure of infiltrate is [A,Th]. Assuming that there is any substance to the idea that external arguments (or SUBJ GFs) cannot be assigned to the non-heads in compounds, this will produce the wrong results. Furthermore, we would not explain compounds whose head is not transparently derived from the verb + ed. For instance, the reason that manager-bought is well-formed but *manager-buyed is not is more readily apparent if we assume a structure like (2ii) underlies the compound. If we were to posit (2i) as the underlying structure we would have to explain why a new verb has an exceptional passive participle form.[1]

(3) i.



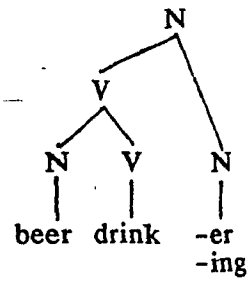
ii.



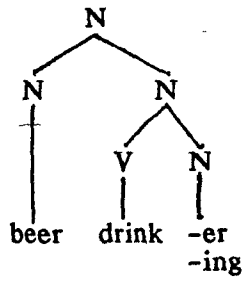
In the case of -ing and -er compounds, the choice between (4i) and (4ii) is somewhat more difficult to justify. Lieber (1983) assumes that both structures are possible, with (4i) underlying the compound which means 'drinker(ing) of beer' and (4ii) underlying a compound whose meaning has the same status as a compound like mailman, i.e. the meaning is relatively arbitrary. Selkirk's analysis admits only the structure in (4ii), because she assumes that there is no rule that would give rise to an NV compound.

1. We gingerly sidestep that section of the literature that treats the so-called "bracketing paradoxes" which might defend structure (2i) from this objection. See Pesetsky (1985), Williams (1981b), Sproat (1985), and Walsh (1981).

(4) i.



ii.



A potential argument based on the Θ-role structure of the head of the compound can be made in favor of (4i), at least for -ing compounds. The verb drink has the argument structure [A,Th] and only the internal argument can be assigned to the non-head, hence beer-drinking is well formed but *student-drinking is not. On the other hand drinking has the argument structure [R,A,Th] and if we assume Williams' (1981a) definition of internal argument, we predict that both beer-drinking ('drinking of beer') and *student-drinking ('drinking by students') are well formed. (This argument cannot be extended to -er compounds because the Agent argument is not available (perhaps having been assigned to the -er)). Nevertheless, we will present a theory of argument structure below which supports the structure in (4ii).

There is a strong prediction made given one's choice between (2i) and (2ii). Suppose there were a language with nominalizing prefixes. A theory assuming (2i) would predict that compounds that involved this prefix would be of the form [pre [N V]]. A theory assuming (2ii) would predict that compounds would be of the form [N [pre V]]. I don't have any data that bears on this prediction.[2]

In arguing that (4ii) is the correct structure we note that there do not appear to be any arguments based on phonologically exceptional forms (as there are in the case of -ed compounds).[3] There may, however, be arguments based on semantically exceptional forms. The phenomenon referred to as blocking 'discourages' the formation of words if words

2. I am grateful to Mark Baker for pointing this prediction out to me.

3. Mark Baker has pointed out to me that such cases exist for other nominalized forms. Thus we have photon-emissions and not ?*photon-emittings.

with identical meaning already exist. An example of this is wiseness which is blocked by the word wisdom. Sometimes only one of a range of meanings is blocked. An example of this is cooker. The meaning 'person who cooks' is blocked by the word cook. However, cooker can still mean 'device for cooking'.

The prediction that the structures in (4) make are as follows. If structure (4i) is correct then broccoli-cooker should be either a person or a device for cooking broccoli. This is because there is no existing broccoli-cook to block any meaning of the compound. On the other hand, (4ii) predicts that only the reading 'device for cooking broccoli' is available since the 'person who cooks' reading has already been blocked for the word cooker. My intuition is that the device reading is strongly preferred over the human reading. Note that it cannot be claimed that the 'person who...' reading is impossible. Neither, for that matter, is wiseness completely unacceptable; nevertheless wisdom is strongly preferred.

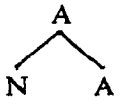
The other prediction stemming from the acceptance of (4i) and (3i) (as we have already noted) is that NV compounds are freely generated in English and are well-formed so long as they are subsequently subject to affixation by -ed, -er or -ing. Assuming the structures (3ii) and (4ii), we are in a position to reject the existence of NV compounds out of hand, which seems natural. Again, we will return to the question of NV compounds below.

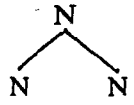
One final remark about structure is perhaps in order. (2i) is a compound which subsequently undergoes affixation. (2ii) is a compound whose head is an affixed item. If (2ii) is the correct structure then the meaning of a compound can be derived solely from the properties of the non-head and head and the compounding process itself. On the other hand, if (2i) is correct, then the meaning of the compound is not calculable from the compound rule (or compound representation) itself. Instead, the argument that the non-head satisfies is determined by a node that dominates it. This is clear especially in the case of -ed compounds. In (3i), Government is not an internal argument of infiltrate. Instead, it is the argument of the argument structure projected to the node dominating

government-infiltrate. There is something odd about such a claim. For this and the other reasons we have cited we will assume that (2ii) is the structure of deverbal compounds.

3.2 On the meaning of deverbal compounds

In the last section we presented arguments to the effect that the structure of deverbal compounds is (2ii) and not (2i). Thus, what we are really claiming is that the structure of the compounds such as rat-infested and spaghetti-twirling are as given in (5i) and (5ii), respectively. We may, therefore, legitimately ask what the difference is between, e.g. program-reader and compatibility-box.[4] The structure of both of these compounds would appear to be that in (5ii).

(5) i.


ii.


What we claim here is that the crucial (and perhaps sole) difference between the two types of compounds is in the relationship between the head and the non-head. In deverbal compounds, the non-head is an argument of the head. In 'root' compounds, the non-head is not an argument of the head.

The claim that non-heads are arguments of heads of deverbal compounds is not at all new, as was seen in chapter 2. In fact, as was seen in that chapter, we must be more specific about the type of argument that the non-head can be. We turn to this question in the next section. We will not, however, delve further into the semantics of root compounds in this thesis.

4. This is a real word which refers to the ability of a particular computer operating system to run programs intended for another operating system.

3.3 Compounds and the definition of "internal argument"

In this section, we will explore a new proposal for the definition of the notion "internal argument". To do this, we will consider what a theory of argument structure "ought" to look like in order to account for the facts. We will propose a definition to fit the facts and examine how the resulting theory can be justified independently. Note that it is possible that the notion the redefinition we will propose is not relevant to the syntax, only to compounding. This is not a conclusion that we would like to draw, because it would weaken the argument that θ-role assignment happens in compounds.

We have just pointed out that deverbal compounds require the assignment of an argument of the head to the non-head. We also noted above, (1b), that one of the properties of compounding is that the non-head of a deverbal compound satisfies an internal argument of the head. However, it was shown in the discussion of Mead and Hagiwara's (1983) proposal (section 2.4) that such a claim is not tenable, if we employ Williams' (1981a) definition of internal argument. This is unfortunate since the account in Mead and Hagiwara (1983) comes very close to being correct. What we would like is a slightly more refined notion which will divide up the set of arguments of a lexical item as shown in the table in (6). We will call the arguments that can be satisfied in the non-head of a compound *immediate* arguments. In the table in (6), internal refers to those arguments that would be internal arguments as defined in Williams (1981a). Non-immediate arguments include external arguments and internal arguments.

(6)

head type	immediate	internal	non-immediate
V-$\underline{ing}_N$	Th,G	Th,G,A	A,R
V-$\underline{ed}_A$	A,G	A,G	Th
V-$\underline{er}_N$	Th,G	Th,G	A,R

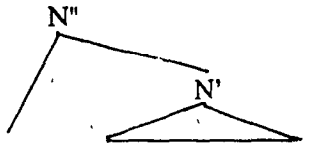
(7)

drinking	Th	Th,A	A,R
swimming	____	A	A,R

As we saw in the discussion of MH, compounding in both -er and -ed can be dealt with under Williams' original definition of internal argument, although in the case of -er nominals this is due to the "unavailability" of the Actor argument (possibly due to some involvement with -er). The change from internal to immediate arguments thus does not affect compounding with either of these. It does make a difference to -ing and other derived nominals;[5] *girl-swimming will not be well-formed assuming that only immediate arguments are available for compounding. This follows from the fact that swimming has no immediate arguments, as shown above in (7).

If A is not a immediate argument of drinking, then it is the case that student is not a immediate argument in the phrase shown in (8), although it would still be an internal argument. Thus it seems natural to say that the difference between internal and immediate is a matter of which bar-level projection of the head an argument appears in. Let us say that an internal argument is defined as an argument satisfied within the X" projection of the head (Williams (1981a)). We then define an immediate argument as one which is satisfied within the X' projection of the head. The argument structure of drinking is now the following: an immediate Th, an internal A and an external R. The notation we will use for this is [R,A,{Th}].

(8)



the student's drinking of beer

How are arguments assigned? In Williams (1981a) a number of realization rules are proposed. An example of one of these rules is given in (9). Considering how finely we've divided the phrase-structure turf among the various argument types, we might consider accepting these rules overkill. Instead something simpler is in order.

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5. For instance destruction yields city-destruction but not enemy-destruction where enemy is an Agent.

(9) Theme:(NP) hit Bill

The simplest thing we could say would be "assign arguments freely within the constraints of the immediate/internal/external definitions".[6] Suppose we say the same thing about the assignment of arguments within compounds. It cannot be denied that something that appears inside a word must be within that word's syntactic single-bar projection. So if we take the constraints on syntactic arguments literally, it must be the case that non-heads can only be immediate arguments.

The redefinition of argument levels has a number of major consequences. The two major issues we will address are listed in (10).

(10) 1. What is the effect of this redefinition on other categories (i.e. V,P,A)?
2. The argument student satisfies in (8) can also be satisfied by the PP by the student. Where does this hang from?

3.3.1 The syntax of NPs and the definition of immediate arguments.

We have claimed that in the structure in (8), student is not an immediate argument. However, student need not be in the 'subject' of N" position. It may also appear in a prepositional phrase as shown in (11). Is it still possible to claim that student is not immediate? Clearly we need the answer to be yes. In this section we will outline some evidence which if not overwhelming is at least suggestive.

(11) the drinking of beer by students

Perhaps the most obvious evidence that can be adduced is the relative order of the PPs themselves. If the by prepositional phrase is at a higher level than the of phrase, then while (11) is what we expect with such phrases, (12) should be marked. While this does

6. Of course, something will have to be said about double object verbs and the role of prepositions

seem to be the case, note that (13) is also not as good as (11), though it seems better than (12).

(12) ??the drinking by students of beer.

(13) a. the giving of gifts to students
b. ?the giving to students of gifts

The example in (12) doesn't conclusively argue that the position that the by-phrase is above the N' level. Even in verb phrases the object can appear in a non-verb-adjacent position, as a result of "heavy XP shift" as shown in (14). It is possible that a similar process is at work in (12) and (13b).

(14) Bill gave $[e_i]$ to Mary [the least expensive BMW]$_i$.

Another way to demonstrate that the by phrase is at a level higher than that of immediate arguments is by using the binding theory. The binding theory is stated in (15), the definition of bound is given in (16), the definition of governing category is given in (17) and c-command is defined in (18).[7]

(15) Binding Theory
Principle A : An anaphor is bound in it governing category.
Principle B : A pronominal is free in its governing category.
Principle C : An R-expression is free.

(16) α binds β iff
a) α is co-indexed with β
b) α c-commands β

(17) The Governing Category for β is the smallest NP or S containing β and a governor of β.

(18) A c-commands B iff the first branching node dominating A also dominates B, and A does not itself dominate B.

---

7. These definitions are taken from Sells (1985).

Consider the sentences in (19).

(19) a. *John$_i$ saw him$_i$.
b. John$_i$ saw himself$_i$.
c. *He$_i$ saw John$_i$.
d. John$_i$ asked Mary to marry him$_i$.

In (19a), him's governing category is the whole S and it is c-commanded by John. Thus it is a Condition B violation when coindexed with John. In the exact same position, himself must be bound under Condition A and (19b) is grammatical. An example of a Condition C violation is given in (19c). Here, John is c-commanded by and coindexed with he and thus the sentence is ungrammatical. In (19d) we see the effect of the governing category. Even though John binds him, because him's governing category is the subordinate S, Condition B is not violated.

We now examine the structure of NP complements in light of the binding theory. What we will show is that the relationship between bound items among immediate argument positions is different than between an immediate argument position and the object of a by phrase.

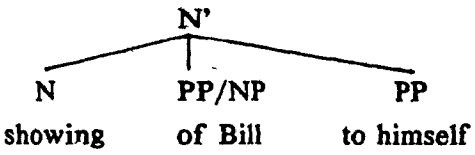
In the case of immediate argument positions, (20) shows that (i) the object of an of phrase c-commands the object of the to phrase, but (ii) not vice-versa. (i) must be true since otherwise there would be a condition A violation, while (ii) is true or there would be a condition C violation.This then accounts for the ungrammaticality of (21).

(20) the showing of Bill$_i$ to himself$_i$

(21) *the showing of himself$_i$ to Bill$_i$

We can thus conclude that the structure of this NP is as shown in (22).

(22)

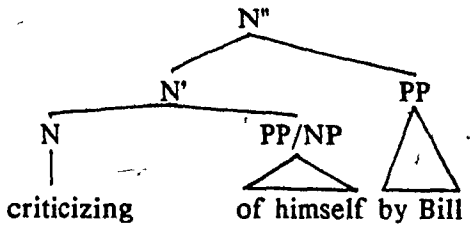


The case of by phrases is a different story as shown in (23). From this example we conclude either (i) that himself c-commands Bill or (ii) that Bill does not c-command himself or (iii) both. The fact that (24) is good (at least in comparison to (23) and (21)) indicates that (i) is correct. If (ii) were correct we would expect the sentence to be bad since it would be a condition C violation. We thus conclude that the structure of (24) is (25).

(23) *This constant criticizing of $Bill_i$ by $himself_i$

(24) This constant criticizing of $himself_i$ by $Bill_i$

(25)



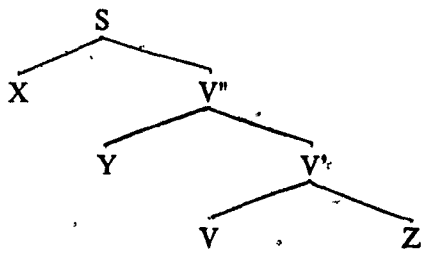
We can even go one step further and show that the by phrase is at a higher level than any other argument in a double object verb. This is demonstrated by the fact that (26a) is preferable to (26b).

(26) a. the giving of raises to each other by politicians
b. the giving of raises to politicians by each other

3.3.2 Categories besides N and the definition of immediate arguments.

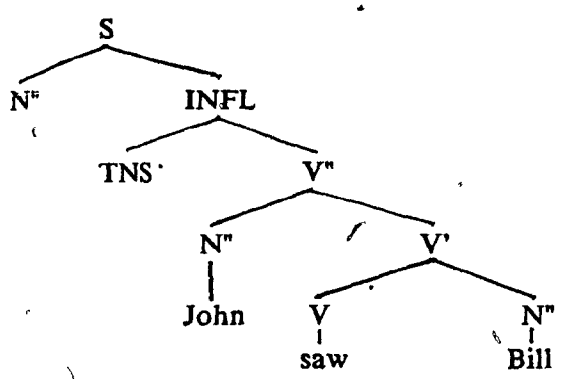
We now examine the consequences of re-defining internal at the X' level. The first category we will consider is V. X-bar theory predicts that there is a position in a VP corresponding to the subject of an NP. This position is marked Y in (27). In the past, little status has been attributed to this position. The addition of the notion immediate argument does not necessarily change the status of this position. Given a verb with an argument structure along the lines of [A,T,G] we may still claim that Actor is external i.e. outside V" and that position Y is empty. Note, however, that what have been called internal arguments of verbs are also immediate arguments. We might assume that Actor is not immediate, but that it is also not external. In other words, the argument structure of a V is [A,{T,G}]. The raises the possibility that either of two positions may be assigned the Actor argument of a V, depending on whether we think that A is not internal or merely not immediate.

(27)



Note that the possibility that the A argument is assigned to the position marked by Y is exactly what we would want given the assumption about the theory of syntax made in chapter 1. Recall that (27) roughly underlies (28) in theories presented in Sportiche (1986), Fukui and Speas (1986), Kitagawa (1986) and Kuroda (1986).

(28)



The verb saw assigns the A argument to John. However, because John is not in a position to be assigned Case, it must move. The position it moves to is the empty N" dominated by S. Here it can be assigned Case by the TNS element of INFL. Thus we can see that the notion of 'immediate argument' is consistent with at least one independently proposed version of syntactic theory.

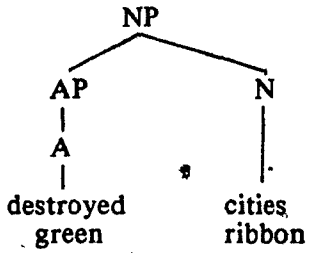
Does a V have an external argument? An argument corresponding to R has been proposed for verbs (Davidson (1966), Higginbotham (1985)). This argument, E, suggesting 'Event' is bound by INFL. Assuming such an argument gives us a measure of parallelism between the argument structures of nouns and verbs. In fact, they will be almost identical except for their external arguments and the obligatoriness of the non-immediate internal argument as is shown in (29).

(29) devour [E,A,{Th}]
devouring [R,(A),{Th}]

The other major category that we must worry about in this regard is the adjective. The adjective appears not to have an argument position corresponding to Y in (27).[8] It clearly has an external argument as shown in (30). Thus, destroyed has as its argument structure either [Th,{(A)}] or [Th,(A)].

8. Thus, wherever very goes in, e.g., very green we would not claim that it is an argument.

(30)



We need to determine whether the by-phrase of these adjectives occurs at a level which makes it an immediate argument or not. One way we might approach this question is to consider extraction out of such phrases, especially in contrast with similar extractions from -ing phrases. In general we expect that subcategorized phrases are more likely to allow extraction than non-subcategorized one. This is clearly shown in (31), where (31a) is much better than (31b).

(31) a. Which sonata$_i$ did you talk about t_i ?
b. ??Which sonata$_i$ did you talk during t_i ?

There does appear to be a difference between extraction from the by-phrase in an AP and from that of an NP. The sentences in (32) are better than those in (33).[1]

(32) a. Who$_i$ does your book remain ignored by$_i$?
b. What/who$_i$ has this island become inhabited by$_i$?

(33) a. ?Who$_i$ did you witness torturing of prisoners by t_i ?
b. *?Who$_i$ did the pope outlaw eating of bacon sandwiched by t_i?
c. *Who$_i$ did you witness swimming by t_i ?

We thus conclude that there is some reason from the syntactic point of view, to think that the by-phrase is an immediate argument.

---

1. These judgements were borne out by several other native speakers of English.

3.3.3 Argument Structure Effects of Affixation

We conclude with a summary of the assumptions about the changes in argument structure which result from the affixation of -er, -ing and -ed made (and hopefully justified) in the previous sections. I have used the a slight variation of the format found in Williams (1981a). In each case, {X,Y,Z} are immediate arguments, which may or may not be optional and may or may not be present for any given verb. The properties of the derived words hold regardless of whether they appear in syntactic phrases or in compounds.

-ed Attachment
V[E,A,Th,{X,Y,Z}] => V+ed [Th,{(A),X,Y,Z}]

-er Attachment
V[E,A,Th,{X,Y,Z}] => V+ed [Th,{(A),X,Y,Z}]

-ing Attachment
V[E,A,{X,Y,Z}] => V+ing [R,(A),{X,Y,Z}]

3.4 Optional/Obligatory Arguments, NV Compounds and the Theta Criterion

We now turn to two seemingly unrelated phenomena: the case of compounding with a head which has obligatory immediate arguments, and the non-existence of NV compounds. It will be seen that constraints on both of these follow from the extension of the Θ-Criterion to the word-formation component.

3.4.1 Compounding and Obligatory Arguments

Compounding with heads which take two immediate arguments is restricted in well-defined ways. Relevant data are given in (34) and in the appendix to chapter 2 containing data from Japanese.

(34) a. ?gift-giving to children
b. *children-giving of gifts
c. *book-putting on tables
d. *table-putting of books
e. *tree-devouring of pasta
f. ?tree-eating of pasta

The data in (34) has been accounted for to various extents and in various ways in the literature. Lieber's (1983) proposal provides two underlying structures for each of the compounds. One of these structures assigns to these compounds the same status assigned to root compounds. Thus (34a-f) are all possible but their meaning is not entirely predictable. The other structure assigned to the compounds in (34) rules out (34b-f) because the argument structure of the verb will not be satisfied. Whether (34a) or (34f) will be ruled out depends on how Lieber's proposal deals with optional arguments: if they exist then these two may be well-formed; if they do not then (34a) and (34f) are ill-formed.

As was noted in section 2.6, Selkirk's proposed FOPC (First Order Projection Condition) rules out all of (34a-f). It was pointed out that the FOPC may be too strong because it rules out any structure in which one (non-SUBJ) argument of the compound is realized within the compound and another is realized inside a phrase headed by the compound. The phrases in (35), if grammatical, are inconsistent with the FOPC.

(35) a. book-stacking onto shelves
b. French-teacher to senators
c. senator-teacher (*of French)
d. book-selling to illiterates
e. (The tigers appeared) broccoli-fed by cowards
f. story-reading to kids
g. (The pillows appeared) feather-stuffed by distracted workers.
h. deal-offering to unwary customers
i. hay-loading onto trucks
j. truck-loading of hay

Mead and Hagiwara's (1983) approach to the data in (34) and (35) was to propose the ARP (Argument Realization Principle) which requires that any (and every) obligatory (internal) argument must appear in a compound, if a compound is to be formed. Justification for the argument structures of some of these compounds is given in (36). For more on this class of verb see, Levin and Rappaport (1986).

(36) a. the stacking *(of books) (onto shelves)
b. the stacking *(of shelves) *(with books)
c. teacher *(of French) to senators
d. teacher of senators (* (of) French)
e. selling *(of books) (to illiterates)

The proposal that will be made here is that the ARP is essentially correct but that it is subsumed under the Θ-criterion if the latter's influence is extended to the lexicon. The Θ-Criterion as stated in (37) is a slightly modified version of that which appears in Chomsky (1981), the modification being the addition of the word obligatory.

(37) Theta (Θ-)criterion
Each argument bears one and only one Θ-role, and each obligatory Θ-role is assigned to one and only one argument. (Chomsky (1981:36))

The justification of this addition is fairly clear, though not entirely uncontroversial. Verbs which may be followed by two or more different complements (e.g. give) may be dealt with in two ways. We may assume that there are two verbs give, one that takes a Th argument and another that takes both a Th and a G argument. Alternatively, we may assume that there is one verb, whose G argument is specified as being optionally assigned. The latter assumption allows us to account for optional/obligatory argument phenomena in compounds in a straightforward manner. Under the two verb hypothesis, however, the phenomenon becomes mysterious. For example, the data in (38) and (39) show compounds derived from give and a compound derived from hand which has an obligatory Th and G, respectively.

(38) a. gift-giving
b. gift-giving to politicians

(39) *gift-handing to politicians

Assuming a condition like the ARP the optional argument hypothesis allows us to differentiate between compounds with giving and compounds with handing, thus allowing for the difference between (38b) and (39). The two verb hypothesis predicts that there is no difference between hand and the form of give which takes both a Th and G. Thus this hypothesis predicts that both (38b) and (39) should be ungrammatical whereas only the latter is.

Presumably we could patch the two verb hypothesis to allow for the distinction by adding an indication in the lexical entries of these verbs as to which argument may or may not be compounded. Note, however, that any generalization concerning the relationship between compoundable arguments and "optional" arguments would be lost.

This generalization was stipulated in the ARP. Why should there be a connection between obligatoriness and compoundable arguments? Suppose the Θ-criterion applies to compounds (the domain of application will be made more precise). Then all the

obligatory internal arguments of the head must be assigned. This means that for a compound like *shelf-putter, whose head has the argument structure [R,(A),{Th,Loc}], the argument that might subsequently be assigned to book (i.e. Th) is not assigned and the structure is ruled out. For a compound like book-stacking, whose head has the argument structure [R,(A),{Th,(Loc)}], the fact that one of the two immediate arguments is optional (i.e. Loc) means that during compound-formation all the obligatory arguments are assigned. Thus the ARP follows from the Θ-criterion.

3.4.2 Compounding with Verbs

The application of the Θ-criterion to compounds leads to an explanation of another fact about compounding in English, that NV compounds of the type shown in (40) are ill formed.

(40) a. *beer-drink
b. *tea-taste
c. *hay-load
d. *truck-load
e. *shelf-puts
f. *spaghetti-eat

The non-existence of the compounds in (40) has had to be stipulated in most accounts. For instance, Selkirk (1982) simply does not provide a rule, V -> N V.

If the Θ criterion is applied to compounds, then the non-existence of NV compounds follows immediately.[10] Consider the verb drink, whose argument structure is [E,A,{(Th)}]. When the compound *beer-drink is formed, beer is assigned the Th role. However, the A role is not assigned, and hence the structure is ruled out. Of course, the A role may not be assigned to beer because it is not an immediate argument. Contrast this with beer-drinking whose head crucially has an optional Agent role ([R,(A),{(Th)}]). This can be

10. The non-existence of NV compounds also follows from the ARP, something that Mead and Hagiwara (1983) were unaware of.

demonstrated by the fact that the drinking of beer is well-formed, but *It drinks beer (expletive it) is not. Thus we have some justification for the choice of Lieber's category-neutral lexical structure rules; NV compounds can be ruled out without resorting to stating explicitly rules that do not generate them.

Note that NV compounding does exist in some languages, e.g. Mohawk. There are proposals suggesting that these are cases of noun-incorporation in syntax. e.g. Baker (1987). If this is indeed the case, then the even if the Θ-criterion applies, as no doubt it would, the NV structure will not be ruled out since any obligatory argument will be assignable.

3.4.3 Where the Θ-Criterion Applies

In this section we investigate just where and how the Θ-criterion applies to derive these results. This has to be approached somewhat delicately if we are to derive its full benefits while not upsetting other aspects of word-formation. Several important issues must be addressed in this matter. First, the Θ-criterion cannot apply to every word in the word-formation component: we cannot throw out normal verbs while ruling out compound ones. After all, normal verbs appear in sentences. Nor do we want to rule out any other non-compounded head which has obligatory arguments (e.g. putting).

The simplest thing we could say about the application of the Θ-criterion with respect to compounds is that the point at which compounds are formed is a level similar to DS, SS or LF, i.e. a level of 'Compound-structure'. Of course, it is not quite so simple. The syntactic levels are all obligatory in some sense; none of them may be skipped. But compounding is not obligatory, and the vast majority of lexical items do not undergo it.

In what way is Compound-structure a level like DS, SS and LF? The level of Compound-structure is in the same class as the syntactic levels in that direct reference to the content

of the argument structure of lexical items must be made in order to relate the arguments to the lexical items that satisfy them, i.e. Θ-role assignment occurs. We clearly need to do this, because phrases like that in (41) are ungrammatical. In (41) the Th argument is assigned to beer and thus should not be subsequently assigned to ale.

(41) *the beer-drinking of ale

Examples such as (41) suggest that the projection principle (specifically clause (42i)) is operative here.

(42) (Extended) Projection Principle
i. Θ-marking properties of each lexical item must be represented categorially at each syntactic level.
ii. Clauses have subjects. (Chomsky (1982:8,10))

However, it must be operative at a level that precedes D-structure, because otherwise we lose our explanation of the general non-existence of NV compounds: if the Θ-criterion holds only at D-structure then the Actor argument will be assignable to the syntactic subject.

Do any other morphological processes merit the application of the Θ-criterion? The data in (43) show that the argument structure of lexical items is modified by affixation. The attachment of un- appears to modify the argument structure of an adjective such as readable from [Th,{(A)}] to [Th]. The output of this rule provides an argument structure which is a function of the input word's argument structure. We can claim that the actual content of the argument structure is not referred to, because no assignment takes place. Hence, the Θ-criterion need not be brought to bear here.

(43) a. This book is readable by five year olds.
b. *This book is unreadable by five year olds.
c. This mountain is climbable by experts.
d. *This mountain is unclimbable by experts.

Finally, we have differentiated three different types of arguments, immediate, internal and external. If the Θ-criterion applies to all of these, then any compound it applies to must be ruled out since there is no way that R, for example, can be satisfied inside the lexicon (i.e. pre-syntactically).[11]

The exclusion of external arguments makes sense, given the widely different function that they play in the grammar as opposed to non-external arguments. Consider a sentence such as that given in (44).

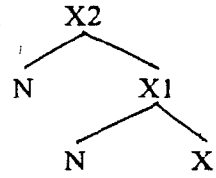
(44) The destruction of the city worried Bill.

The noun destruction can be seen in two different ways. At one level it is an argument-taking item. In this case its argument is city. At another level it heads the phrase that is an argument of worried. In the former case, destruction's non-external arguments are relevant. In the latter, its external argument is relevant. Thus, the external argument enters into the Θ-criterion only to the extent that the lexical item to whose grid it belongs is an argument of some other item.

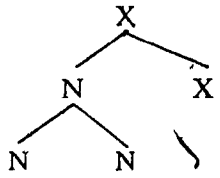
3.5 A Note on Recursive Compounding

We turn now briefly to the case of compounds that appear within other compounds. There are two possibilities here. A compound can either be a head (45i) or a non-head (45ii) of another compound. The latter type of compound is relatively easy to create and examples are given in (46).

(45) i.



ii.



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11 This has also been noted in Walsh (1985) who points out that root compounds would be ungrammatical if their R arguments were required to be satisfied

(46) a. [coffee-maker]-fixer
b. [fly-swatting]-prohibiting
c. [computer-user]-tested

The case where a compound is the head of yet another compound is rather less productive. In fact, most compounds of this kind seem to be marginal. Note that a structure like (45i) cannot be used to "save" a compound based on an item with two obligatory arguments. The Θ-criterion will apply to compound X1 on its own without regard for subsequent projections. In the case of heads with one obligatory argument, this will not work. So a compound like *?child-[candy-giving] should be fine. This is not the case, although this compound seems to be somewhat better than a compound like *candy-[child-giving] where the Θ-criterion is violated at the level of the lower compound. Similarly, *?shelf-[book-stacking] is somewhat better than *book-[shelf-stacking].

Chapter 4

Conclusion

4.1 Summary of claims of the thesis.

The major proposal of this thesis is that the argument structure of a lexical items is divided three ways, not two as originally proposed in Williams (1981a). We assume (with Williams) that arguments may be either *External* or *Internal* appearing outside or inside the X" level, respectively. However, we claim here that internal arguments may further divided between those that appear outside the X' level and those that appear within it. These latter arguments we refer to as *Immediate* arguments. For example, the argument structure of the ing noun, devouring, is [R,(A),{Th}], where R is external, A and Th are internal, and Th is also immediate. Note also that A is optional.

We claim that only immediate arguments may be assigned to the non-head of a compound. This follows, not from a special principle, but from what we take to be a reasonable condition on the assignment of arguments--that the various levels discussed in the previous paragraph are absolute. An argument that is of a given X-bar level can only be assigned at that level. Thus the fact that non-heads can only be immediate arguments follows from the fact that non-immediate arguments must be deployed at a level higher than X'.

We have also claimed that the θ-criterion applies to compounding structures. This has several good effects. The first is that compounds of the type NV are ruled out, since such compounds will have an obligatory A argument which can not be assigned. The second

effect is that the data that motivates Mead and Hagiwara's (1983) ARP is also covered. If a head of a compound has one obligatory argument, that argument must be assigned to the non-head. If a item has more than one obligatory argument, then any compound it heads will be ill-formed because one of the arguments will not be assigned.

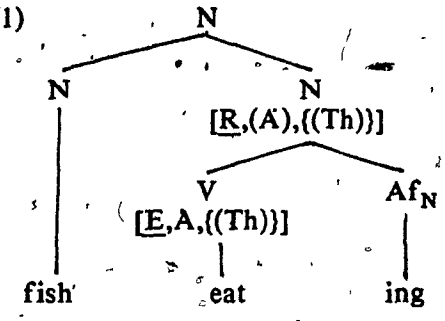
Finally, the analysis presented here gives support to the claim that compounds are formed from rules of the type proposed in Lieber (1983). Nothing in these rules prevents compounds of the form NV from being generated. As we have shown nothing needs to, because of condition on the argument structures involved.

4.2 Examples

The following are some examples of the how the theory deals with some key cases.

The compound shown in (1), fish-eating is the canonical case. Here fish is the immediate argument of eating. Notice that Th is optional here. This means that the Θ-criterion does not require that it be assigned to the non-head, hence it is possible that the compound will have a root compound interpretation. The meaning of fish-eating as a root compound is not clear to me, which is not surprising. We predict that a head that does has an obligatory argument won't have a possible root compound interpretation. Thus it should be impossible (harder) to interpret fish-devouring as anything but a deverbal compound. I think this is true although the comparison here is between possible but non-existent meanings vs. impossible and non-existent meanings. Note however that the possibility that eating may head a root compound underlies Selkirk's examples shown in (2).

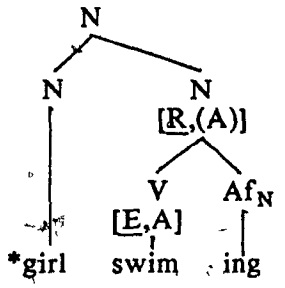
(1)



(2) a. tree-eating of pasta
b. *tree-devouring of pasta

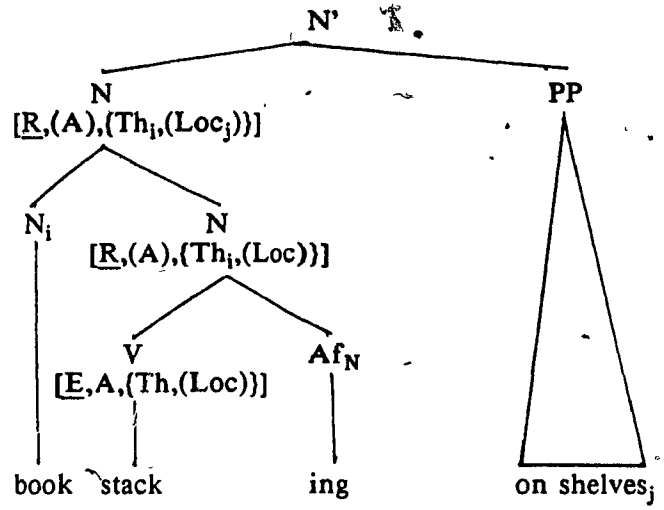
In *girl-swimming, (3), there is no immediate argument that can be assigned to the non-head. Thus a reading such as 'swimming by girls' is unavailable.

(3)



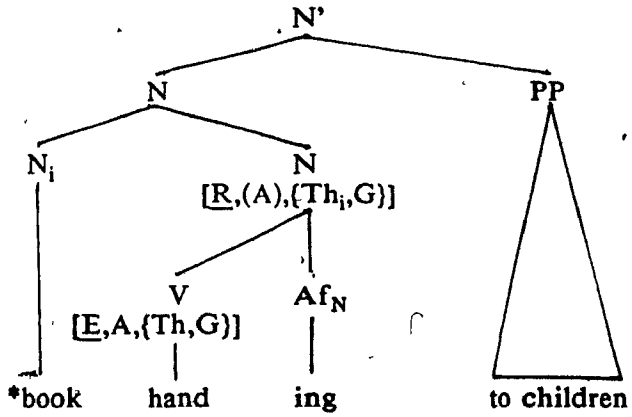
In the example in (4), we see the case of an argument structure containing one obligatory and one optional argument. The obligatory argument must be assigned to book in the compound, otherwise the Θ-criterion is violated. The optional argument percolates and can be assigned at a later point in the derivation.

(4)



The example in (5) shows the case in which the argument structure of the head of a compound contains two obligatory arguments. While the Th is assigned, G is not, violating the Θ-criterion. Diagram (5) is somewhat misleading in that it shows the syntactic environment of the compound. The compound can not be 'saved' through the assignment of the G argument to the prepositional phrase. To try to do so would be the equivalent trying to save an illformed DS by adding an argument at LF. The projection principle rules out such a move.

(5)



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