Lexically Triggered Unbounded Discontinuities in English: An Indexed Phrase Structure Grammar Approach

Hee-Rahk Chae

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LEXICALLY TRIGGERED UNBOUNDED DISCONTINUITIES
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Hee-Rahk Chae, B.A., M.A.

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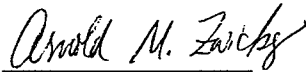

The Ohio State University

1992

Dissertation Committee: Approved by

David R. Dowty
Robert D. Levine
Arnold M. Zwicky   *Arnold M. Zwicky*
                                     —————————————————————
                                              Adviser
                                     Department of Linguistics

To My Mother

ACKNOWLEDGMENTS

VITA

September 9, 1959 .... Born - Kyungbuk, Korea.

1982 .... B.A., Department of English
Language and Literature,
Seoul National University (SNU),
Seoul, Korea.

1983 - 1986 .....:..............:.......... Research Assistant,
Language Research Institute, SNU.

1984 .... M.A., Department of English Language
and Literature, SNU.

1986 - 1987 .... Lecturer,
Language Research Institute, SNU.

1988 - 1992 .... Graduate Research/Teaching Associate,
Department of Linguistics,
Ohio State Univsersity
Columbus, Ohio.

FIELDS OF STUDY

Major Field: Linguistics

Studies in Syntax, Morphology and Semantics.

PUBLICATIONS

A Study of English Passives and Objectivity: With Reference to Scientific Writings, M.A. Thesis, Seoul National University, Jan 1984.

"Gap Licensing in *tough-* and Similar Constructions", in Aaron L. Halpern (ed.), *The Proceedings of the 9th West Coast Conference on Formal Linguistics (WCCFL 9)*, Stanford University, 1990.

-- An extended version appears in *Language Research* V. 26.4: 745-777, Language Research Institute, Seoul National University.

"Function-Argument Structure, Category Raising and Bracketing Paradoxes", in Yongkyoon No and Mark Libucha (eds.), *Proceedings of the 7th Eastern States Conference on Linguistics (ESCOL '90)*, Ohio State University, 1991.

"Right Node Raising and a LICENSOR Feature", to appear in Lise Dobrin, Lynn Nichols and Rosa M. Rodriguez (eds.), *CLS 27 I: Papers from the 27th Regional Meeting of the Chicago Linguistic Society*, Chicago Linguistic Society.

"The Morphological Status of Nominal 'Particles' in Korean", to appear in the *Proceedings of the Workshop for Korean Syntax and Semantics*, LSA 1991 Linguistic Institute, University of California at Santa Cruz, July 1991.

"English Comparatives and an Indexed Phrase Structure Grammar", to appear in the *Proceedings of the 18th Annual Meeting of the Berkeley Linguistic Society*.

(edited with German Westphal and Benjamin Ao) *Proceedings of the 8th Eastern States Conference on Linguistics (ESCOL '91)*, Ohio State University, 1992.

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Chapter I. INTRODUCTION

In this dissertation, we will provide a unified account of lexically triggered unbounded discontinuities in English under an Indexed Phrase Structure Grammar. These discontinuous constructions contain particular lexical items which characterize them and trigger the existence of other parts in them. The trigger and the target (i.e. the triggered element) can be separated from each other by other elements. Hence they are discontinuous. Furthermore, the trigger and (all or part of) the target might not be elements of the same clause. Hence they are unbounded, which presupposes discontinuity. There are two different types of constructions. The first type (Type A) comprises *tough-* and similar constructions. In these constructions, the target has a VP which contains a nominal gap. The other type (Type B) does not contain any nominal gap. Type A Constructions are a sub-type of traditional "Unbounded Dependency Constructions (UDCs)", and Type B Constructions are a sub-type of "Discontinuous Dependency Constructions (DDCs)."

A main motivation for a new analysis of these constructions comes from the inadequacies of previous analyses of Type A Constructions. The following sentences represent different kinds of Type A Constructions (Chae 1990, 1991a):

(1) This paper was *tough* for me to try to finish in a week.
    (*tough-*construction)
(2) The game was a *breeze* for Tom to convince her to win.
    (*breeze-*type construction)
(3) The house is *ready* for Tom to force Jim to buy.
    (*ready-*type construction)
(4) John is *too* nasty to ask Mary to make friends with.
    (*too* construction)

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(5) Tom is tall *enough* to imagine my little son could have seen.
    (*enough* construction)
(6) Kevin is a *tough* man to convince Mary to talk to.
    (*[easy person]*-type construction)
(7) The cake *took* Mary all day to bake. (*take*-type construction)

Even though not all of these constructions have exactly the same characteristics, one thing is common to them: unbounded dependency between the triggering element and a part of the target (i.e. an NP gap).

The rule-based approach of the framework in Gazdar et al. (1985) (GKPS) for (1) might be extended to account for (2), (3) and (7). However, a problem with this approach arises in describing sentences (4), (5) and (6). This is because the triggering element of the construction is not the head of the local structure concerned. In these cases, the idea that some particular set of lexical items is responsible for the construction cannot be effectively implemented within the rule because that idea is realized through the SUBCAT feature of the head. This point is related to another problem of the GKPS account:

(8) a. John is *tough* to argue with.
    b. John is a *tough* man to argue with.
(9) a. Jack is *too* kind to take advantage of.
    b. Jack is *too* kind a person to take advantage of.
    c. Jack is {*too* much of an unknown quantity / *enough* of a question mark} to trust.

It fails to express that the same lexical items in different constructions carry their gap-licensing properties with them.

I propose a new gap licensing mechanism, which introduces a FOOT feature [XP LICENSOR]. Each lexical item which triggers one of the A Type Constructions has a [VP//NP LICENSOR] (GVPL: Gapped VP LICENSOR) in a stack as a part of its syntactic information in the lexicon. The behavior of this feature is regulated by the following principle:

(10) [XP LICENSOR] in the stack of a node (pops out of the stack and) licenses one of this node's daughters when the specification of the LICENSOR's value (i.e. XP) is the same as that of this daughter node.

The key idea here is that GVPL is a property of the "top" node, which has a gapped VP node as its daughter. However, that property is due to some particular element which is located in various different parts of different constructions. With the above principle and GVPL, we can connect that element and the top node very effectively.

This theoretical framework is based on the mechanisms of GPSGs, especially those of GKPS. But we have introduced a stack, the characterizing feature of an Indexed Grammar, for the account of discontinuous dependencies. We will call the hybrid of these two grammar formalisms introduced in this dissertation an "Indexed Phrase Structure Grammar (IPSG)."

Under the present analysis, no separate rules are necessary to account for the constructions concerned. Most importantly, we can solve the problem posed by (8-9) very naturally. In addition, we can account for such recalcitrant data as the following without complicating the system:

(11) John is *too easy/easy enough* to make friends with.
(12) a. John is *too easy* for people to please *e* for anyone to take *e* seriously.
    b. Robin isn't *easy enough* to talk to *e* to approach *e* directly on this problem.

Sentences in (11) show the characteristics of the *tough*-construction rather than those of the *too/enough* constructions. In sentence (12a) the gap after *please* is licensed by *easy* and that after *take* is licensed by *too* (nested dependency). But in sentence (12b) the gap after *to* is licensed by *easy* and that after *approach* is licensed by *enough* (crossed dependency).

We will extend the present system to account for Right Node Raising Constructions (RNR). We can assume that the factor in RNR is the trigger (licensor) of the construction and the gap in the first conjunct is licensed by this factor (Chae 1991b). The system will also be extended and generalized to account for comparative constructions (Chae 1992) and result clause constructions (Type B Constructions):

(13) a. Jane is *more* beautiful *than* I thought she would be.
    b. Mary thinks that John has *more* money *than* he has.
(14) a. I told her that *so* many people attended last year's concert *that* I
        made Mary nervous.
    b. Mary believed that Harry is *so* crazy *that* he acted irrationally.

These constructions are also unbounded, as we will see later.

Under the IPSG framework, we can capture the constituency of neighboring elements via tree structure, and the dependency between discontinuous elements via mechanisms of indices:

(15) This fence is *so* much *too* much high*er* *than* that one *for* me to
      even consider climbing it *that* it's simply incomprehensible
      to me that Mary would try to get me to do it. (Gazdar 1988: 77)

In this sentence, the string *so much too much higher* forms a constituent, and the elements *so, too* and *-er* are related to a *that*-clause, a *for*-clause and a *than*-phrase, respectively.

The outline of the dissertation is as follows. In Ch. II, we will briefly look at some relevant basic concepts. In Ch. III, we will give a survey of UDCs and DDCs, which is necessary for a proper understanding of Type A and Type B Constructions. With background information about Indexed Grammars and Phrase Structure Grammars, we will develop the theoretical framework to be adopted here, i.e. an IPSG framework, in Ch. IV. Then, we will provide extensive IPSG analyses of Type A Constructions and Type B Constructions in Ch. V and Ch. VI, respectively. In Ch. VII, we will see that our analyses correctly predict the occurrence of nested dependency and crossed dependency sentences when more than one construction is involved in a sentence. In Ch. VIII, we will define the semantic role of LICENSOR features. Based on this, we will adopt a control theory for the interpretation of gaps and provide core semantic aspects of Type A and Type B Constructions.

Chapter II. BASIC ISSUES

In this chapter, we will briefly observe some of the basic linguistic concepts which are relevant for the purposes of this dissertation. These concepts might have complicated side issues, but we will disregard them and focus on the main points needed to set up a background for further discussion.

2.1. Constructions

The term construction is one of the most frequently used words in linguistic literature. It has been used in several different senses[1]. In this dissertation, we will use it as is defined in Filmore (1985), Zwicky (1987a, 1989a, 1989b) and Kuh (1990). A construction is a set of conditions that make up a unique meaningful syntactic pattern. As for the relation between a construction and a syntactic rule, each construction is described by a syntactic rule (and each syntactic rule describes one construction (Arnond Zwicky, p.c.)). The same conditions can be parts of different constructions. But each construction is associated with a set of conditions[2] and has its own properties. In this respect, constructions can be compared to 'molecules' and conditions to 'atoms' (Zwicky 1987a).

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[1] Kuh (1990) gives three different senses of construction in sec. 4.1 of Ch. IV.

[2] Two different constructions might have the same set of conditions because the same conditions could be matched with very different semantics or pragmatics (Arnold Zwicky, p.c.).

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Usually, a sentence exemplifies many distinct constructions. There are two different types of constructions: those corresponding to trees and those cutting across other constructions (Kuh 1990: sec. 4.3, Ch. IV)[3]. The former type of constructions describe what is represented by conventional trees. These constructions contain conditions about constituency, compatibility and linear precedence of the elements involved. For example, sentence (1a) contains two constructions, among others, represented by the two local trees in (1b):

(1) a. I like apples.

b.
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           S[FIN]                        VP[FIN]
          ╱      ╲                      ╱      ╲
    NP[SUBJ]    VP[FIN]          V[9; FIN]    NP[OBJ]
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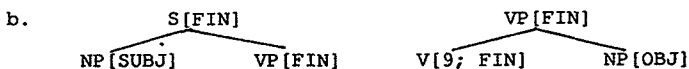
Some of the phenomena represented here (e.g. subject-verb agreement and feature sharing) will be described with general conditions or principles. But each of the constructions has its own conditions which cannot be subsumed by these general principles.

On the other hand, the latter type of construction does not involve conditions on constituency, compatibility and linear precedence. Rather, such constructions generalize over a number of patterns. As one way of characterizing these constructions we can use special syntactic features called "construction features" as Zwicky (1987b) used for the English passive construction. Employing BSLASH (\) for the passive gap and the construction feature PAS, he characterizes the passive construction as follows (pp. 662-3):

(2) Characteristics of PAS in universal grammar:
   a. PAS is a HEAD feature.
   b. [+PAS] occurs only with [+V, -N, -SUBJ] categories.
(3) The verbs *be* and *get* can govern VP[+PAS].

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[3] Actually Kuh (1990) distinguishes constructions (as rules) and syntactic patterns (as representation). But we will disregard this distinction because there is a one-to-one relation between them.

(4) Exponents of VP[+PAS] in English:
   a. If VP has [+PAS] then it has [\NP].
   b. VP[+PAS] can have PP[*by*] as a daughter.
   c. If VP has [+PAS] then it has [VFORM: PSP].

The construction feature PAS is introduced by principle (3) and has its own specific domain of VP as is specified in (2b). With reference to the construction feature, we can describe all the special properties of the passive construction.

In this dissertation we will focus on the second type of construction. All the constructions to be considered here have particular lexical items which characterize them. We will introduce construction features for these constructions (i.e. LICENSOR features). All the special syntactic properties of them will be described with reference to these features. Their special semantic properties will also be related to the features because a construction is the basic unit for the syntax-semantics match. That is, the semantics of a sentence will be provided in a rule-to-rule fashion as in early GPSG (e.g. Gazdar 1982) rather than in a universal mapping approach as in Gazdar et al. (1985) (GKPS).

2.2. Locality/Boundedness and Continuity

For any domain containing two (or more) related elements, the relations between these elements can be divided into two types. The relation is *local* when the elements stand in a sister relation or in a mother-daughter relation. This relation can be represented with a local tree, which has a mother node and its daughters. The relation is *non-local* when the elements stand in other relations and require a bigger domain than that which can be represented by a local tree. This local vs. non-local distinction has important theoretical consequences. If a phenomenon can be analyzed with reference to only local relations, the grammatical system would be simpler than other systems using

non-local relations in some respects. There would be fewer basic units[4] to be postulated (and the whole system would be more easily manageable). However, it is a different issue whether natural languages can be handled only with local relations or not.

Non-local relations are subdivided into two different types, depending on whether the relation can be extended without limit or stays within a designated domain. The relation is *bounded* if it cannot be extended outside of the domain of an S-node (an intra-clausal relation). Notice that S is a bounding node in English. For example, the relation between a head NP/N' and an extraposed relative clause is bounded (even though non-local) because the extraposed clause cannot cross a S-boundary (cf. sec. 3.2.1). The relation is *unbounded* when the two elements concerned can be separated from each other indefinitely (an inter-clausal relation). A typical example of an unbounded relation between a filler and its gap is that in wh-questions (cf. sec. 3.1). The treatment of unbounded constructions has been one of the most important issues for current syntactic frameworks.

The relation between two linguistic elements can be classified as *continuous* or *discontinuous* depending upon the existence of other elements inbetween them. This issue of continuity is closely related to that of locality. In particular, every non-local relation is discontinuous. But locality and continuity are two different concepts and are defined independently. Usually two elements in a local domain are continuous. But we can have discontinuous elements in a local domain when there are more than two daughters of a node. For example, there is a local but discontinuous relation between *looked* and *over* in *she looked the situation over*.

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[4] In many theories, only local trees or depth-1 rules (cf. No 1991) can be the basic units to be used for syntactic (and semantic) description. But in some theories like Tree Adjoining Grammar (cf. Joshi 1985), whole trees corresponding to simple clauses are basic units of grammatical description.

In this dissertation, we are interested in two differnt types constructions regarding the issues of locality and continuity: "Unbounded Dependency Constructions (UDCs)" and "Discontinuous Dependency Constructions (DDCs)". As we noticed just above, unboundedness presupposes discontinuity. But UDCs and DDCs have been used to refer to separate sets of constructions in the literature. UDCs are those constructions which have fillers and gaps (e.g. Topicalization, wh-questions, relative constructions). Notice that the two elements involved here are a "displaced" element and its original place. In this case, a whole unit in the original place is removed and nothing but an empty category remains in that place. On the other hand, DDCs are any constructions which have discontinuous elements, regardless of the locality. Here neither of the two elements are empty categories even though one of them might contain an empty category.

UDCs can be regarded as a subtype of unbounded DDCs. Schematically UDCs and unbounded DDCs can be represented as in (5) and (6), respectively:

(5) ... $[a, b]_P$ ... $(|_s)$ ... $[e]_P$ ...
(6) a. ... $[a, [e]_b]_P$ ... $(|_s)$ ... b ...
    b. ... $[a, b]_P$ ... $(|_s)$ ... $[c, d]_Q$ ...

In (5), the whole category P, which has two daughters (a and b), is displaced. In (6a), only a part of category P, i.e. category b, is displaced and categories a and b bear a discontinuous relation. In (6b), nothing is displaced and categories P and Q are discontinuously connected. Now we can see that what is represented in (5) is a special case of that in (6a). In (6a) only part of the category is displaced but in (5a) the whole category is displaced.

2.3. Lexical Triggering and Type A/B Constructions

In this section, we will extract a subset of constructions from UDCs and DDCs that share certain important properties. These constructions can be characterized as being lexically triggered and unboundedly discontinuous.

Most importantly, we must notice the difference between the sentences in (7) and those in (8):

(7) a. *Which book* do you like *e* most?
    b. John *talked,* of course, *about politics.*
(8) a. Susy is *too* tall *for* me to kiss e.
    b. Robin is a *more* beautiful woman *than* Sue is.

The constructions in (7) have nothing to do with any particular lexical items included. That is, they are characterized by non-lexical conditions. We can replace all the words with other words but they are still representations of the same constructions:

(9) a. Whose car did he stole *e* yesterday?
    b. Mary likes, as you know, economics.

But particular lexical itmes play an important role in the constructions in (8). These constructions are characterized by these lexical items. Hence they are ungrammatical without them:

(10) a. *Susy is *very* tall for me to kiss e.
    b. *Robin is a *rather* beautiful woman than Sue is.

Comparing the sentences in (8) and (10), we can see that the lexical items *too* and *more* are vital for the very existence of the constructions concerned.

Based on this difference, we will call constructions like (7) "structurally oriented" constructions. On the other hand, constructions like (8) will be called "lexically triggered" constructions. The former constructions do not contain lexical triggers, while the latter ones do. UDCs and DDCs comprise both structurally oriented and lexically triggered constructions. In this dissertation, we will focus on the analysis of lexically triggered constructions. All of these constructions contain triggers and what is triggered by them. We will call these triggered elements "targets" (of the triggers).

We will define lexically triggered UDCs as "Type A constructions" (cf. Ch. V) and lexically triggered unbounded DDCs as "Type B constructions" (cf. Ch.

VI). These Type A/B constructions can be characterized as discontinuous constructions as well. It is obvious that Type B constructions are discontinuous, but for Type A constructions, we need to explain why they are discontinuous. In the previous section, we observed that UDCs can be regarded as a subtype of unbounded DDCs. Even disregarding this point, we still have good reasons for calling them discontinuous. Notice that in typical UDCs like wh-questions, an unbounded relation holds between filler and gap. However, in Type A constructions like *tough-* and *too/enough* constructions, it is rather controversial whether there is a syntactic filler or not (cf. sec. 5.1.3.1). However, all the Type A constructions have their triggers and targets. Hence, these constructions can be better characterized by the trigger-target relation. Now the discontinuity of Type A constructions becomes evident because neither the trigger nor the target are empty categories themselves.

Summarizing, Type A constructions are a subtype of traditional UDCs and Type B constructions are a subtype of traditional DDCs. But Type A/B constructions form a homogeneous goup in the sense that they are lexically-triggered and show unbounded discontinuities between the trigger and (all or part of)the target. Of course, there are differences between Type A and Type B constructions. Type A constructions comprise *tough*-constructions, *breeze*-type constructions, *ready*-type constructions, *too/enough* constructions, [*easy person*]-type constructions, and *take*-type constructions. The target of these constructions is a VP which has an NP gap. In almost all the cases, this gap induces unbounded dependencies between the trigger and a part of the target. Type B constructions consist of comparative and result clause constructions. The target of these constructions is a designated phrase, and does not contain any NP gap, even though the target of the comparative constructions contains a degree/quantity phrase gap. Usually, this gap is responsible for the unboundedness of comparative constructions, but the trigger itself induces

unboundedness in the result clause constructions. Despite these differences[5], the similarities between Type A and B constructions are so significant that they deserve a unified account. The analysis of these lexically triggered constructions should be different from that of the structurally oriented constructions. In this sense, we do not agree with Chomsky (1977), who does not distinguish these two different types of constructions.

2.4. Backward vs. Forward Searching Constructions

Using figurative terms, we can distinguish two different types of "movement" constructions according to the direction of movement: leftward and rightward movement constructions. Typical examples of the former are wh-questions, relative clauses, and Topicalization. The examples of the latter are Heavy NP Shift, Extraposition and Right Node Raising (RNR). Under a monostratal tradition, these constructions may be called Filler-Gap and Gap-Filler constructions, respectively. However, these terms do not seem to be appropriate because not all constructions seem to have (syntactic) fillers, as in Type A constructions. We will call these constructions "backward searching" and "forward searching" constructions, respectively. When we meet a gap in interpreting a sentence, we need to look for its filler/binder in the sentence. When the binder precedes the gap, the search would proceed backward (i.e. right-to-left direction). On the other hand, when the binder follows the gap, the search would proceed forward.

After Chomsky (1973: 271-2), it is usually assumed that there is no left-right asymmetry for the extraction rules of the two types of constructions mentioned above. In other words, the two groups of rules show the same characteristics even though the directionality of movement is different. They

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[5] However, not all of these differences are directly related to the difference between Type A and Type B constructions, as we will see in sec. 6.3.

are assumed to be symmetrical and hence be subject to the same conditions. However, the difference between them seems to be far greater than is assumed. Then the rules and/or conditions for them would not be able to be unified into exactly the same format. In this section, we will briefly see that there are structural and behavioral differences between the two groups of constructions.

The characteristics of backward searching constructions can be summarized as follows. First, the extracted element (filler) is located outside of the source S (i.e., it is in a COMP position). Second, the filler/binder is always a constituent. Third, the distance between binder and gap can be unbounded. Fourth, these constructions are subject to "island constraints". Keeping these characteristics in mind, let us observe the characteristics of forward searching constructions.

First, Heavy NP Shift is responsible for putting a "heavy" element into the last position within the VP:

(11) a. John sent e to his mother the statue that he had spent the whole summer carving.
b. ?They continued e for several months to occupy the house.

As we can see in (b), elements other than an NP can also be moved. From the following data (cf. McCawley 1988: 98),

(12) a. John (both) gave e to his mother the statue that he had spent the whole summer carving and sold e to his aunt the book that he got from his girl friend.
b. A: John gave e to his mother the statue that he had spent the whole summer carving.
B: So did Tom.

we can see that the moved element forms a constituent with the matrix VP and it is within this VP. This VP-boundedness may be the real reason for the boundedness of Heavy NP Shift. These facts suggest that Heavy-NP Shift would be better analyzed as a rearrangement of VP-internal elements rather than assuming any movement/extraction, as argued in Pullum & Zwicky

(1988).

Second, let us consider Extraposition constructions. From the following examples, we can see that the extraposed S from the subject forms a syntactic unit with VP:

(13) a. It annoyed Bill [that Mary left].
 b. I thought that it would annoy Bill that Mary left, and *annoy Bill that Mary left* it did.
 c. It both surprised Alice that John quit his job and shocked her that he didn't seem concerned.

In (b) the unit concerned (the italicized expression) is topicalized (Jacobson 199x). In (c) it occurs as a conjunct of a focused coordination construction (McCawley 1988: 98). We know that the topicalized elements and the conjuncts of focused coordinations are always constituents. Thus, both of these examples show that the extraposed S is a daughter of VP rather than a daughter of S or a sister of S[6]. Then the extraposed S from a subject is VP-bound just as in Heavy NP Shift. We will examine Extraposition of relative clauses and noun complements in sec. 3.2.1. We will see that these extraposed clauses are S-bound rather than VP-bound. It will be shown that they can never be unbounded.

Third, the most significant differences between backward and forward searching constructions can be seen in Right Node Raising (RNR) constructions. As we will see in detail in sec. 5.2, there are pieces of evidence which show that the factor in RNR stays in its site of origin in the second conjunct and the gap in the first conjunct is licensed by this factor. First of all,

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[6] Extraposed S seems to be Chomsky-adjoined to the VP rather than being a daughter of the VP in a flat structure (McCawley 1988: 98):

(i) It both surprised Alice and shocked Susan that John quit his job.

However, Right Node Raising (cf. sec. 5.2) might be involved here.

the factor need not be a constituent unlike wh-extraction and Topicalization. Second, RNR does not obey island constraints for many English speakers. One of the most significant characteristics of backward searching constructions is that they obey island constraints. From these facts and others to be observed later, we can conclude that RNR is a very different construction from other constructions.

We have glanced at syntactic evidence which shows that forward searching constructions are different from backward searching constructions. From a processing point of view also, there seems to be an important difference between these two groups of constructions. Notice that the gap by nature occurs in its "original" place but the filler occurs outside of its original place. Thus, in the case of forward searching constructions, we can anticipate the exact nature (type and place) of a following filler/binder with reference to the missing element. But, in the case of backward searching constructions, we cannot be sure about the exact nature of the missing category just by looking at the filler, because the same phrase can be used differently depending on its position in a clause.

In addition, notice that there are two different types of displacement: those which do not preserve linear order and those which do preserve linear order. Backward searching constructions belong to the former and forward searching constructions belong to the latter. Island constraints are (fully) effective only in the backward searching constructions. When linear order is preserved, we cannot see the effect of island violations:

(14) a. I believe that John, as you know already, told us the truth.
b. I like a woman who has, as you know already, black hair and white teeth.

Even though an element in an island is linearly separated from the rest of the sentence in (14b), the sentence is still grammatical (cf. McCawley's (1982) analysis).

Due to the above-observed differences between the two types of constructions, the effect of displacement, if any, seems to be very weak in forward searching constructions. These differences are (partly) responsible for the peculiar characteristics of RNR.

Thus far, we have seen that forward searching constructions are different from backward searching constructions and that the former are not homogeneous. The latter are not homogeneous either, even though they are assumed to be exactly the same in Chomsky (1973, 1977). Let alone the well-established differences between typical backward searching constructions and *tough-* and similar constructions (cf. Hukari & Levine 1991a), we can see differences even among the typical examples (wh-extraction vs. Topicalization):

(15) a. *Going to what party are you?
    b. *Fond of whom are you?
(16) a. Losing at poker, Mary dislikes.
    b. Fond of Mary, I really am.

As we can in (15), wh-questions do not allow VPs or APs to be fronted. However, it is not the case with Topicalization, as we can see in (16). This difference is captured by the FOOT feature WH in GKPS (pp. 153-5). This feature is assumed to be incompatible with A^1 and VP.

Another difference is that category lifting is allowed in Topicalization (even though marginal) (Dowty & Jacobson 1989: 13):

(17) a. *His theory captures that grammars are learnable.
    b. ?That grammars are learnable, his theory captures.
(18) a. *I dislike to lose at poker.
    b. ?To lose at poker, I sure dislike.
(19) a. *I count on that you are trustworthy.
    b. That you are trustworthy, I really count on.

We do not have wh-examples corresponding to these examples because wh-elements are not compatible with VPs or Ss. From the following examples, however, we can infer that category lifting is not allowed in wh-constructions:

(20) a. I think John relies too much on his friends.
  b. On whom do you think John relies too much e?
  c. *Whom do you think John relies too much e?
(21) a. Mary solved that problem very easily.
  b. How easily did Mary solve that problem?
  c. *How easy did Mary solve that problem?

In this section, we have observed some characteristics of forward searching constructions. These constructions have different characteristics from those of backward searching constructions. Hence the two types of constructions cannot be handled with the same set of rules and/or principles. Furthermore, not all the constructions in the same group show the same characteristics. Based on these observations, we can argue that Chomsky's (1973) assumption of left-right symmetry cannot be maintained.

Chapter III. A SURVEY OF UDCs AND DDCs

In this dissertation, we will focus on analyzing Type A and Type B constructions as defined in sec. 2.3. These two groups of constructions are subtypes of UDCs and DDCs, respectively. To better understand the special properties of Type A/B constructions, it is necessary to examine UDCs and DDCs first. This observation will provide us with a clearer understanding of the similarities and differences between Type A/B constructions and the other UDCs/DDCs. In this respect, we will briefly observe different types of UDCs/DDCs and their properties in this chapter.

First, we will examine UDCs. These constructions will be classified according to whether they are backward searching or forward searching constructions. They will be further classified depending on whether they are structurally oriented or lexically triggered (cf. sec. 2.3), and whether they have syntactic fillers or not. Next, DDCs will be examined. These constructions will be classified according to whether they are bounded or unbounded, and whether they are lexically triggered or not.

3.1. UDCs

Typical UDCs such as wh-questions, wh-relatives and Topicalization have (syntactic) fillers and gaps. In wh-constructions, NPs, PPs, (APs) and AdvPs can be fillers:

(1) a. a teacher [[whom] I depend on e].
    b. a teacher [[on whom] I depnd e].
    c. the place [[where] John was born e].

(2) a. [Which town] do you live in e?
   b. [In which town] do you live e?
   c. [How busy] is John e?
   d. [Where] were you yesterday e?

It is well-known that there are constraints on the distribution of wh-fillers. When the filler is a wh-NP, a larger constituent containing this NP can be fronted (the "Pied Piping" phenomena) as we can see from the examples in (1-2b) (cf. (1-2a)). As these examples show, Pied Piping is allowed for PPs. But it is not allowed for all constituents:

(3) a. *the dog [fond of which] Tom is e.
   b. *the woman [love whom] John will e.

APs and VPs cannot be fronted even though they contain a wh-NP. There is another constraint on the distribution of wh-elements, which applies to such examples as the following:

(4) a. a book [[whose cover] Mary read e].
   b. [Whose story] do you believe e?
   c. [How tall] is Chris e?

In the fillers of these examples, the wh-word is the left-most element. In this case, the wh-word cannot be extracted alone, but rather the whole NP or AP must be fronted (the "Left Branch Condition").

Topicalization allows a wider range of categories to be fillers (Jacobson 199x: 198):

(5) a. [Apples], I like e.
   b. [In the garage], I put the car e.
   c. [Proud of her book], Sally is e.
   [Happy that Bill came], John is e.
   d. [Cook roast beef], John will e.
   e. [That Bill came], I hope e.
   [That John came], it seems e.

As these examples show almost any phrasal category can be fronted in Topicalization: NP, PP, AP, VP and S'. From the observations thus far, we can

realize that several different types of categories can be fillers in typical UDCs.

The distribution of gaps in UDCs is more interesting than that of fillers. As we just observed, NPs, PPs and AdvPs can be wh-fillers and almost all phrasal categories can be fillers in Topicalization. However, not all occurrences of gaps of these filler categories are allowed. The occurrence of gaps is subject to further constraints called "Island Constraints". Research on these constraints has been one of the major topics in syntactic theories since Ross (1967). In this section, we will just provide definitions and examples of some of these constraints[1] (cf. Jacobson 199x: 205-). The definitions will be given in non-transformational terms.

First, the "Complex NP Constraint" says that no gap is compatible with an NP containing a relative clause or a complement S':

 (6) a. *the man <u>who</u> I like [the woman [who saw e]]
  b. *<u>Who</u> does Mary believe [the claim [that Sue saw e]]?

The underlined phrases are assumed to be related to the gaps. Second, the "Coordinate Structure Constraint" disallows the occurrence of a gap only in one conjunct of a coordinate structure:

 (7) a. *<u>Who</u> did you see [Mary and e]?
  b. *<u>Who</u> did you see [e and Fred]?
 (8) *<u>What</u> did you [[break e] and [fix the stereo]]?

If a conjunct has a gap, the other conjunct should also have the same kind of gap (the "Across-the-Board" phenomenon).

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 [1] In some cases, islandhood is imposed by particular verbs rather than by structures (Chomsky 1973: 273):

 (i) a. *What did John complain [that he had to do e this evening].
  b. *What did John quip [that Mary wore e].

As these examples show *complain* and *quip* do not allow their sentential arguments to have gaps.

3.1.1. Backward Searching UDCs

We can classify backward searching constructions into two groups: structurally oriented and lexically triggered. We will first observe structurally oriented constructions. Some of these constructions have syntactic fillers:

(9) Topicalization
    a. <u>John</u>, Mary loves e.
    b. <u>John</u>, I think Bill said [Mary loves e].

(10) Wh-questions
    a. <u>Who</u> did Mary blame e?
    b. <u>Who</u> do you think Bill said [Mary blamed e]?

(11) Wh-relatives
    a. the woman [<u>who</u> [Mary hated e]].
    b. the woman [<u>who</u> I think Bill said [Mary hated e]].

(12) It-clefts
    a. It is John [<u>who</u> Mary criticized e].
    b. It is John [<u>who</u> I think Bill said [Mary criticized e]].

(13) Pseudo-clefts[2]
    a. [<u>What</u> Mary likes e] is apples.
    b. [<u>What</u> I think Bill said [Mary likes e]] is apples.

(14) Infinitival Relatives (with Pied Piping)
    a. This is an easy violin [<u>on which</u> to play sonatas e].
    b. This is an easy violin [<u>on which</u> to persuade John [to play sonatas e]].

The underlined expressions are (syntactic) fillers. It is not controversal that

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[2] The pronoun in the Pseudo-cleft construction has largely the same properties as that in free relatives:

(i) I will buy [<u>what</u> you like e].

The pronoun here has double functions. It is the head of the relative clause and, at the same time, is a relative pronoun. These two functions can be easily factored out by examining other relative clauses. The same is true with the pronoun in the Pseudo-cleft construction.

the constructions here have fillers. There is syntactic connectivity (cf. Jacobson 1984) between fillers and gaps in these constructions. The (b) sentences show unboundedness of the constructions.

There is one more construction which can be characterized as the same kind of UDC as in (9-14). Let us examine the following set of data (from David Dowty, p.c., unless indicated otherwise):

(15) *Though*-Attraction

    a. <u>Rich</u> [though John is e], he isn't happy.
    b. <u>Afraid of the dark</u> [though Mary may be e], she went anyway.
    c. <u>Hard to talk to</u> [though Mary is e], Max still loves her.
       (Berman 1973a: 274)
    d. <u>A saint</u> [though Bill definitely is e], he sometimes makes mistakes.
    e. <u>Under the weather</u> [though Susan could obviously be e],
       she came to class anyway.
    f. <u>Study for the exam</u> [though he may e], he still won't be able to pass.
       (Berman 1973a: 115)

As the underlined expressions indicate, almost all phrasal categories can be fillers just as in Topicalization: AP, NP, PP and VP. This construction shows unboundedness ((16), David Dowty, p.c.) and it is subject to island constraints (17):

    (16) a. Delicious though I suspect that fried duck feet may be e, I don't
          want any.
       b. Delicious though I have heard that Jim says that fried duck feet may
          be e, I think I'll put off trying them until some other occasion.
       c. Delicious though I have heard David claims that Jim assures him that
          fried duck feet are e, I don't think I'll have seconds just yet.
    (17) a. *Beautiful though Tom has [a girlfriend who is e], he sometimes
          feels lonely.
       b. *Beautiful though Kim is [e and gracious], she has no boyfriends.

From these observations, we can assume that the *though*-attraction construction is a UDC with a syntactic filler.

For some of the constructions observed in (9-15), there are related constructions that do not have syntactic fillers[3]:

(18) Wh-less Relatives

    a. the book [(that) Sandy likes e].
    b. the book [(that) I think John said Sandy likes e].

(19) Wh-less *It*-clefts
    a. It's apples [that Bill likes e].
    b. It's apples [that I think John said Bill likes e].

(20) Infinitival Relatives
    a. John found a book [(for him) to read e].
    b. John found a book [(for him) to ask Mary to read e].

Even though these constructions do not have syntactic fillers, they have binders of the gaps (i.e. *the book*, *apples* and *a book*, respectively). Notice that these binders occur in argument(A)-positions. On the other hand, the syntactic fillers in (9-15) occur in non-argument(A')-positions.

A few more generalizations can be drawn from the constructions observed thus far in (9-20). There are three different types of constructions depending on whether they have only fillers, both fillers and binders, or only binders. Topicalization, wh-question and *though*-attraction constructions only have fillers, even though these fillers are binders at the same time. Wh-relative, *it*-cleft and pied-piped infinitival relative constructions have separate fillers and binders. But wh-less relative, wh-less *it*-cleft and infinitival relative constructions only have binders. First, we can see that only the second group constructions have corresponding filler-less constructions in the third group. Second, the filler is positioned closer to the founder of the gap (Jacobson 1984) than the binder in the second group of constructions:

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[3] There is a controversy over the status of *that* in (18). It can be analyzed as a relative pronoun or as a complementizer. If it proves to be a relative pronoun, the assumption that there is no syntactic fillers in (18) might be wrong.

(21) a. *who the woman [Mary hated e].
   b. the woman who [Mary hated e].

In general, fillers seem to bear a closer relation to the founder of the gap than binders.

Thus far, we have looked at structurally oriented constructions. None of these constructions are characterized by particular lexical items. But there is a group of constructions that is characterized and triggered by lexical items. The analysis of these constructions, which are defined as Type A constructions, is one of the main topics in this dissertation:

(22) a. This paper was *tough* for me to try to finish in a week e.
   b. The game was a *breeze* for Tom to convince her to win e.
   c. The house is *ready* for Tom to force Jim to buy e.
   d. John is *too* nasty to ask Mary to make friends with e.
   e. Tom is tall *enough* to imagine my little son could have seen e.
   f. Kevin is a *tough* man to convince Mary to talk to e.
   g. The cake *took* Mary all day to bake e.

In these *tough-* and similar constructions, the occurrence of the italicized words is crucial for the very existence of the constructions.

The constructions in (22) have several peculiar properties which are not easily accounted for, as we will see in Ch. V. There are controversies on the analysis of these properties. For example, the underlined expressions in (22) are regarded as binders in some of the literature, under the assumption that there is no syntactic connectivity between them and the gaps. However, they are assumed to be fillers in other literature, under the assumption that there is syntactic connectivity. Here we will just point out that the underlined expressions all occur in A-positions rather than in A'-positions. In addition, they are separated from the founder of the gap by sentence internal elements.

3.1.2. Forward Searching UDCs

There are not many forward searching constructions which involve displacement. Possible candidates are Heavy NP Shift, Extraposition and Right Node Raising (RNR). We observed in sec. 2.4 that the heavy-NP-shifted element and the extraposed S from a subject are VP-bound. Hence Heavy NP Shift and Extraposition from a subject cannot be UDCs regardless of whether they involve extraction or not.

However, in RNR constructions, the relation between the gap in the first conjunct[4] and the filler (i.e. the factor) can be unbounded:

   (23) a. Harry cooked e, and Fred expects that Mary will eat without enjoying, some apples that they found lying around in the kitchen.
       (Mark Steedman, p.c.)
       b. John gave a briefcase e, and Harry knew someone who had given a set of steak knives, to Bill.

We will provide a detailed analysis of these constructions in sec. 5.2. (cf. sec. 2.4, as well). One relevant issue to be considered here is whether they are structurally oriented or lexically triggered. Strictly speaking, no special lexical properties are necessary to become factors in RNR. In this sense, RNR is structurally oriented. However, once an element acquires the status of a factor, it behaves like a (lexical) trigger in Type A constructions, as we will see in sec. 5.2.

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[4] There is a controversy over the issue whether there is a gap in the second conjunct or not. We will develop an analysis in which there is no gap there, in sec. 5.2.

3.2. DDCs

In this section, we will examine constructions that contain two elements which are separated from each other but are closely related[5]. These DDCs can be bounded or unbounded depending on the size of the domain where the two elements are located. In addition, some of them are structurally oriented and others are lexically triggered. Remember that Type B constructions are lexically triggered, unbounded DDCs.

3.2.1. Bounded DDCs

First, the simplest examples of discontinuities are those caused by parenthetical expressions:

(24) a. His father, <u>according to John</u>, is the richest man in this country.
   b. John talked, <u>of course</u>, about politics.

In these examples, some extra-sentential elements (or, sentential adverbs) are inserted in between two (major) constituents. Hence the discontituity between these two constituents can be assumed to be structurally oriented.

Second, there is a construction which involves a discontinuity between a verb and its particle:

(25) a. Please [[wake] [your friend] [up]].
   b. Finally John [[turned] [it] [down]].

Here a verb and its particle in the VP are separated from each other by an NP.

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[5] Discontinuities caused by accumulation of "subject-to-subject raising" verbs would not be considered here:

(i) Apples continue to appear to be certain to be stolen.

Here *apples* is the subject of *be stolen*. But this relation should be captured with reference to the properties of the raising verbs involved.

Usually, the three elements in the VP are assumed to be sisters. Hence the discontinuity doamin is local. But the construction can be characterized by the properties of the verb concerned, because not all verbs have separable particles.

Third, let us consider sentences involving Extraposition from complex NPs. Unlike Extraposition from a subject (cf. sec. 2.4), Extraposition of relative clauses and noun complements does not seem to be VP-bound, as we can see in (27):

(26) a. [Everyone e] came [who I liked].
   b. [The fact e] is undeniable [that the earth is round].
(27) a. *I thought [everyone came who I liked], and *came who I liked* everyone did.
   b. *[Everyone e] came here [who I liked] but went home [who I disliked].

If the extraposed clause is within the VP, the fronted VP in (27a) and the VP conjunction in (27b) would make grammatical sentences. Thus, we can assume that the extraposed S in (26) is a daughter of the matrix S. However, it is clear that it stays within the S boundary (Soames and Perlmutter 1979: 302-3):

(28) a. Tom always maintains [[a woman who was wearing a fur coat] entered the room] whenever he is asked about it.
   b. Tom always maintains [[a woman e] entered the room [who was wearing a fur coat]] whenever he is asked about it.
   c. *Tom always maintains [[a woman e] entered the room] whenever he is asked about it [who was wearing a fur coat].

The example in (c) is ungrammatical because the extraposed clause is outside of the relevant S-node. Hence, Extraposition of relative clauses and noun complements are not unbounded.

Extraposition of relative clauses, as in (26a), seems to be structurally oriented because the properties of the head NP seem to have nothing to do with the existence of the relative clause. But in the case of Extraposition of noun complements, as in (26b), the properties of the head NP seem to have an influence on licensing the noun complement. However, we will not go into this

issue in this dissertation because Extraposition is not unbounded.

3.2.2. Unbounded DDCs

Now we will consider unbounded DDCs. A typical unbounded DDC is the comparative construction:

(29) a. Jane is <u>more</u> beautiful <u>than</u> I thought she would be.
    b. Mary thinks that John has <u>more</u> money <u>than</u> he has.

Result clause constructions of the following type also belong to unbounded DDCs:

(30) a. I told her that <u>so</u> many people attended last year's
        concert <u>that</u> I made Mary nervous.
    b. Mary believed that Harry is <u>so</u> crazy <u>that</u> he acted irrationally.

All the examples in (29-30) show unbounded dependencies, as we will see in Ch. VI. In addition, in each sentence, the first underlined word characterizes the construction concerned and licenses the clause introduced by the second underlined word. Hence the constructions in (29) and (30) are lexically triggered. We can see that all the unbounded DDCs are lexically triggered rather than structurally oriented. The constructions observed in this section constitute Type B constructions, which will be discussed in Ch VI.

Chapter IV. THEORETICAL FRAMEWORK:
An Indexed Phrase Structure Grammar

4.1. Linear Indexed Grammars

It has been assumed that natural languages belong somewhere inbetween context free and context sensitive languages in their expressive capacity. In this sense, it is very important to determine how much more generative power beyond Context-Free Grammars (CFGs) is necessary to account for all the properties of natural languages. Among many different grammar formalisms introduced thus far, Indexed Grammars (IGs), which were introduded by Aho (1968), are one of the most extensively studied for the analysis of natural languages (as well as formal languaes) (cf. Gazdar 1988)[1]. An IG is different from a CFG in that "nonterminal symbols may carry a sequence of indices chosen from an initially specified finite set, and its productions (i.e. rules) allow for adding or removing these indices in the course of a derivation" (Partee et al. 1990: 536). CFLs are a proper subset of ILs. That is, an IG can generate any string set which can be generated by a CFG, but not vice versa.

I will present some properties of IGs that are relevant for our purpose, based primarily on Gazdar (1988). An IG can contain rules of three different types (p. 71):

(1) a. A[..] --> W[..]   b. A[..] --> B[i,..]   c. A[i,..] --> W[..]

A rule of the first type as in (a) simply copies the stack to all non-terminal

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[1] For a brief introduction of Indexed Grammars, refer to Hopcroft & Ullman (1979: 389-90), and Partee et al. (1990: 536-42).

daughters. A rule of the second type in (b) adds a new index to the top-most (i.e. left-most) part of the stack to be passed down to its single non-terminal daugher (an index-adding rule). A rule of the third type in (c) removes the top-most index off the stack and distributes what is left to its non-terminal daughters (an index-removing rule). We can see that stacks of indices are associated with non-terminals and are propagated by rules.

Inadequacies of CFGs for natural language analyses can be viewed from two different aspects: generability of relevant structures and generability of relevant strings. First, in some cases, CFGs cannot assign proper structures for strings of embedded dependency constructions. Even though they can generate these strings, they can assign only center-embedding structures. But a structure like (2) (a left-brancing structure) and its reflection (a right-branching structure) are necessary (Gazdar 1988: 75-9):

(2)
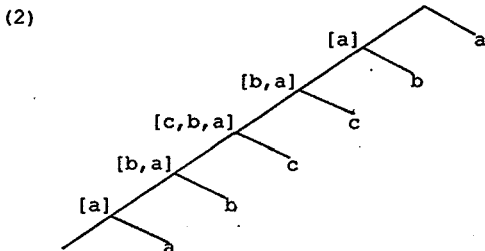
As indicated by the stack representations, an IG can generate a left-branching structure for a mirror image string. Notice that stacks of indices are used to record the information about one part of the tree and that information is used to build up the other part of the tree, hence the nested dependency can be represented without recourse to center-embedding structures. Center-embedded structures cannot capture the fact that the first part of the tree forms a constituent. But this can be captured in structure (2) (i.e., the string *abc* is a constituent). Gazdar (1988: 77-8) lists some evidence for this type of

structure[2]. We will see further evidence from English in Chs. V and VI.

Second, CFGs cannot generate string sets of the type $a^n b^n c^n$ ($n>=0$) and XX (i.e., string sets where the strings show crossed depencencies) while IGs can generate these string sets. Hence, arguments for the use of IGs will depend on whether we have examples of these types in natural languages or not. As is shown by Shieber (1985), Swiss German has clear examples of a crossed dependency construction:

(3) Jan sait das mer d'chind em Hans
    John said that we the children-Acc Hans-Dat
        es huus lond halfe aastriiche
        the house-Acc let help paint
    "John said that we let the children help Hans paint the house."

In the embedded clause of this sentence, Vs and their object NPs are cross-related. 'The children' is the object of 'let', 'Hans' is the object of 'help' and 'the house' is the object of 'paint'.

However, the fact that natural languages contain crossed dependency constructions does not necessarily mean that we need the full power of IGs. Actually, Gazdar (1988) considers a restriction of IGs to the effect that no more than one non-terminal daughter of a rule can inherit the stack from its mother. IGs restricted this way are called Linear Indexed Grammars (LIGs), which

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[2] Gazdar (1988: 77) shows that, with such a left-branching embedded structure as in (2), we can effectively account for the examples of the following sentence:

(i) This fence is | so much |$_c$ | too much |$_b$ high | er |$_a$ | than |$_a$
    that one | for |$_b$ me to even consider climbing it | that |$_c$
    it's simply incomprehensible to me that Mary would try
    to get me to do it.

Here *so (much)* is related to a *that*-clause, *too (much)* is related to a *for*-clause, and *-er* is related to a *than*-phrase. The structure with stacked indices captures not only these dependencies but also the fact that the string *so much too much higher* forms a constituent.

have rules of the following (p. 72):

(4) a. A[..] --> W$_1$[]B[..]W$_2$[]   b. A[..] --> W$_1$[]B[i,..]W$_2$[]
    c. A[i,..] --> W$_1$[]B[..]W$_2$[]

Notice that only one non-terminal daughter has a stack in these rules. For the discussion of LIGs, refer to Joshi, Vijay-Shanker & Weir (1990: sec. 4) and Vijay-Shanker & Weir (1990: sec. 2).

LIGs can also generate some crossed dependency constructions. Gazdar (1988: 80-3) says that two patterns of crossed dependency constructions are possible within their generative power:

(5) a.

[c]
[b,c]
[a,b,c]
a
b
c
[b,c]
[c]
a
b
c

b.

a
b
c
[b,a]
[a]
[a]
[b,a]
[c,b,a]
b
c
a
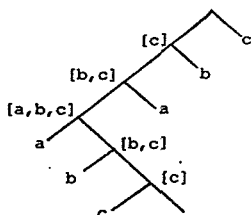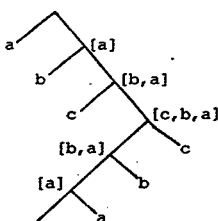
These structures are obtained when the stacking and unstacking of indices are associated with different branching directions. In (a) stacking occurs on the right-branch and unstacking on the left-branch of the tree. Among these two patterns, we will see an example of the second pattern (cf. Joshi, Vijay-Shanker & Weir (1990: sec. 4)):

(6) a. i. S[..] --> xA[x..]   ii. A[..] --> xA[x..]
       iii. A[..] --> xB[x..]   iv. B[x..] --> B[..]x
       v. B[ ] --> e

b. abab:

```
              S[ ]
          ____/\____
         a          A[a]
                ____/\____
               b          B[b,a]
                      ____/\____
                     B[a]       b
                  ___/\___
                 B[ ]      a
                   |
                   e
```
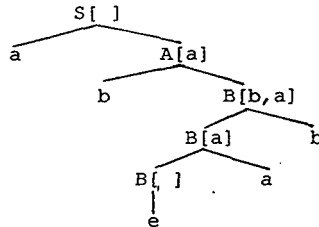
Since natural languages have these crossed dependency constructions, we can assume that we need a grammar formalism which has (at least) the power of LIGs.

Joshi (1985) proposes that the class of grammars that is necessary for describing natural languages can be characterized as "Mildly Context-Sensitive Grammars (MCSGs)", which have the following properties: i) context-free languages are properly contained in MCS languages (MCSLs), ii) MCSLs can be parsed in polynomial time, iii) MCSGs capture only certain kinds of dependencies, e.g., nested dependencies and certain limited kinds of crossing dependencies, and iv) MCSLs have the constant growth property. Joshi and his colleagues (e.g., Joshi, Vijay-Shanker & Weir 1990) have shown that LIGs, Head Grammars (Pollard 1984), Combinatory Categorial Grammars (Steedman 1987, 1988) and Tree Adjoining Grammars (Joshi 1985) all belong to MCSGs. Furthermore, these grammar formalisms are weakly equivalent even though they employ quite distinct formal objects and operations and they are motivated by different aspects of linguistic phenomena. This fact seems to be too significant to be disregarded. The convergence here strongly suggests that a formalism with the generative power of MCSGs is what we need for the analysis of natural languages. At least, we can assume that such power is the lower boundary that a natural language theory should have because we do not yet know all the properties of natural languages.

We want to keep the generative power of a grammar as restricted as possible. Hence, it is desirable to keep our grammar within the power of LIGs

until we find evidence to the contrary. One of the most likely counter-examples against a LIG analysis is a crossed dependency structure of the following type (Gazdar 1988: 84)[3]:

(7)
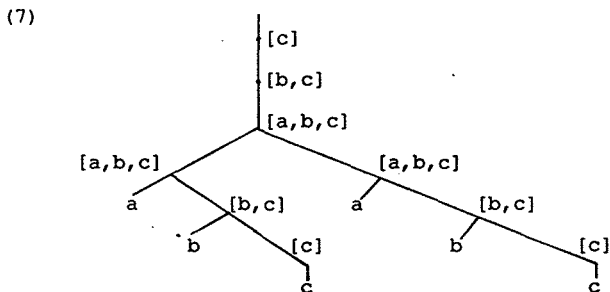
Stack [a,b,c] is copied into two daughters. This stack branching is a characteristic of an IG rather than a LIG. We need further research to see whether we must employ this kind of structure to analyze natural languages. I think we can safely assume that no natural language phenomena go beyond the purview of IGs. Gazdar (1988: 86) says that "we have no reason whatsoever for believing that natural language grammars are not (equivalent to) a proper subset of the indexed grammars"[4].

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[3] Gazdar (1988: 85) says that coordination forces the use of branching stacks. We should notice the special status of coordination. Even though coordination provides one case of stack sharing, this sharing is due to the properties of coordination itself rather than due to stack branching mechanisms.

[4] Gazdar & Pullum (1985: 11) also say, under the assumption that languages are being regarded as string sets, that "no phenomena are known which would lead one to believe that the natural languages fall outside the IL's purview. ... The indexed languages thus provide us, at least for the moment, with a kind of upper bound for syntactic phenomena". However, Miller (1991a) argues that IGs are not "strongly adequate" for characterizing some aspects of natural languages, based on Norwegian and Swedish extraction phenomena.

4.2. Extended Phrase Structure Grammars

The tradition of Phrase Structure Grammars (PSGs) began to revive in the early eighties under the rubric of Generalized Phrase Structure Grammars (GPSGs). This revival movement was initiated by Gerald Gazdar and his colleagues, as in Gazdar (1981), Gazdar (1982), Gazdar, Klein, Pullum & Sag (1982), etc. This series of works gave birth to a consistent theoretical framework in Gazdar, Klein, Pullum & Sag (1985) (henceforth, GKPS). This is one of the most explicit and extensive theories developed to date, which has only the generative power of CFGs.

Since the appearance of GKPS, there have been continuous modifications and extensions of the system. A substantial body of work has been done by Thomas Hukari and Robert Levine (cf. bibliography) for the analysis of English data which are not covered in GKPS. The framework has also been extended to analyze various other languages: for example, Gunji (1987) for Japanese and Uszkoreit (1987) for German.

There are other frameworks which brought about more fundamental changes to the GKPS/GPSG system. I will call these frameworks Extended Phrase Structure Grammars (EPSGs). The most notable and extensively studied one is the Head-Driven Phrase Structure Grammar (HPSG) of Pollard & Sag (1987) and Pollard & Sag (1992), which incorporates insights from other theories (like Categorial Grammars (CGs) and Government and Binding (GB) Theory) into a GPSG-type framework.

In this section, we will briefly examine some other EPSG frameworks developed recently: Kuh (1990), No (1991) and Miller (1991b). In Kuh's (1990) framework, which is based on Zwicky (1987a, 1989a and 1989b), the traditional notion construction (cf. sec. 2.1.) plays a prominent role (hence a Construction-based Phrase Structure Grammar: CPSG). There are three major differences between his CPSG and the GKPS frameworks (pp. 111-2). First, grammatical relations are considered as syntactic primitives in CPSG. Second, it employs

a set of rules expressing compatibility conditions between the heads and their dependents in phrasal and clausal domains. Third, it is construction-based in the sense that the basic units of syntactic description are not individual conditions on formal properties, but constructions (i.e. sets of such conditions).

No (1991) introduces "depth-n" PS rules to handle syntactic case alternation phenomena. These rules can have an extended domain of multiple depths contrary to the traditional "depth-1" only rules. Hence they can describe dependencies between any pair of nodes in a finite tree. The basic idea is the same as that in Tree Adjoining Grammars (cf. Joshi 1985, etc.) where the elementary unit of grammatical operations is a clausal-size tree. For example, he proposes a depth-2 rule (8b) to analyze [*the X-er, the X-er*] construction as in (8a) (pp. 141-3):

(8) a. The bigger they get, the harder they fall.
   b. S -->[[the S --> XP[CMPR], S I I·XP], [the S --> YP[CMPR], S I I YP]]

The features CMPR and I I XP can be disregarded for our purpose. With only depth-1 rules, an overgeneration problem would arise.

Miller (1991b) presents an EPSG framework to account for weak form function words (clitics) in French. Adopting innovations from HPSG into the GKPS framework, he assumes that subcategorization should be treated by a list-valued feature SUBCAT and that the subject argument of a verb should be subcategorized (p. 24). This strategy is also taken in Hukari (1990). Another major difference is that the Control Agreement Principle (CAP) is replaced by various other mechanisms (cf. Miller 1991b, sec. 2.2.5.2 (pp. 43-4)).

A real challenge to the GKPS framework came from an empirical front. As we have seen in sec. 4.1. with reference to the data in Shieber (1985), there are natural language phenomena which cannot be regarded as context-free (cf. Culy 1985; Kac, Manaster-Ramer & Rounds 1987, and Miller 1991a). The most typical example is structures with crossed dependencies. We need grammars which have more generative power than pure CFGs to handle these

phenomena. Simple modifications of the GKPS framework would not be helpful because the resulting framework would still remain in the realm of CFGs[5]. For a discussion of frameworks with the necessary power for our purposes, see in Joshi (1985) and Gazdar (1988). In this dissertation, we will take the line of Gazdar (1988) in extending the power of GKPS beyond that of CFGs, by introducing stacks of indices.

4.3. Lexical Triggering and LICENSOR Features

In the above two sections, we have observed that we need to employ some new mechanisms to enhance the power of GPSGs in order to handle non-context-free phenomena. We have seen that stacks of indices can be employed for this purpose. The grammar formalisms using these mechanisms are (Linear) Indexed Grammars. With these independently needed mechanisms, we can effectively account for a wide range of phenomena, especially discontinuity phenomena, which are not analyzed properly in previous frameworks.

Before we go into the extensions of the GPSG (especially, GKPS) frameworks, let us briefly sketch their basic assumptions which we will adopt without modifications (cf. Kuh 1990: 107-11). First, we adhere to a monostratal theory. We do not assume multiple levels of syntactic representation. Second, we assume that syntactic categories are sets of feature-value pairs. They are not unstructured atomic symbols. The propagation of features between mothers and daughters are regulated by the HEAD Feature Convention (HFC) and the FOOT Feature Principle (FFP). Third, we encode the valency sets of lexical items in syntax rather than in the

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[5] Even though we introduce stacked indices into a grammar formalism, the grammar will remain within the power of a CFG if we put constraints on the finite upper bounds on stack size (Gazdar 1988: 89).

lexicon. Some lexical items interact directly with syntactic mechanisms by way of LICENSOR features to be introduced shortly. Fourth, we separate Linear Precedence (LP) rules from Immediate Dominance (ID) rules. Fifth, we assume an autonomous syntax, which interacts with other components such as morphology and semantics in a limited but principled way. In regulating these interactions we will adhere to the "Lexicalist Hypothesis". Lastly, we do not represent semantic predicate-argument structure in syntax. We will allow mismatches between syntax and semantics if necessary.

Gazdar (1988) sketches how an LIG can be applied to handle certain (English) discontinuity phenomena. Under the inspiration of this work, I have been exploring a framework which uses a stacked FOOT feature LICENSOR within the general framework of GKPS. Chae (1990) deals with gap licensing in *tough-* and related constructions. Chae (1991b) and Chae (1992) show that the same system can be used to account for very complex phenomena in Right Node Raising constructions and comparative constructions, respectively. The main idea behind the present approach is that a particular lexical item (which we call a trigger) has the property of licensing another part (which we call a target) in the sentence. The target is usually separated from the trigger. Each lexical item which triggers a particular construction has a stacked [XP LICENSOR] as a part of its syntactic information in the lexicon[6]. The value of the feature (i.e. XP) is the same as the target.

LICENSOR is a kind of FOOT feature. Thus, its behavior is similar to that of other FOOT features. Its propagation in the middle of a tree is regulated by the same principle as that for others, i.e. the FOOT Feature Principle (FFP). But we can see a slight difference in the manner of stacking when more than one daugher of a mother has these features. With regular FOOT features

---

[6] All the particular properties of a lexical item should be listed in the lexicon. The list includes not only its pronunciation and meaning, but also its morphological, syntactic and pragmatic information which cannot be obtained from general principles.

the order of stacking (instantiation) on the mother is irrelevant because a category is a set of features. However, with LICENSOR features the order is important because they behave in a "last-in-first-out" manner. This special property of LICENSORs is due to the fact that they are stacked features (i.e. indices) and hence move around the tree only by way of stacks.

The behavior of LICENSORs at the top and bottom of a tree are somewhat different from that of regular FOOT features. As for the bottom, the former are introduced by lexical items while the latter are introduced by Slash Termination Metarules. As for the top, LICENSORs stop their upward propagation at the moment they pop out of the stack to license some element because they move around the tree only by way of a stack (cf. principle (9) below). On the other hand, syntactic rules stop the propagation of regular FOOT features.

The following principle is responsible for the discharging of LICENSORs, which results in licensing particular linguistic elements:

(9) [XP LICENSOR] in the stack of a node (pops out of the stack and) licenses one of this node's daughters when the specification of the LICENSOR's value (i.e. XP) is the same as[7] that of this daughter node.

The key idea here is that LICENSOR is a property of the node which licenses its daughter. However, that property is due to some particular element which is located in various different parts of different constructions. This is why the feature is a FOOT feature rather than a HEAD or other feature. With LICENSOR features and the above principle, we can connect that element and the top node very effectively.

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[7] As was pointed out to me by Robert Kasper (p.c.), we might need to formulate principle (9) with reference to "compatibility" rather than "sameness" of features. We need to refer to compatibility if a coordinate structure is the value of a LICENSOR feature but the two conjuncts involved do not have the same set of features.

We can see a related view in Zwicky (1987b). He introduces BSLASH and the construction feature PAS to describe English passives. The role of his PAS feature is similar to that of LICENSOR in some respect. Even though ordinary verbs do not have the feature in the syntactic part of their lexical entries, some exceptional verbs such as *resemble* and *rumor* contain [-PAS] or [+PAS] as a part of their syntactic information (p. 663).

Let me sketch how the licensing mechanisms work under the present framework. The following schema applies to all of the constructions analyzed in this dissertation:

(10)

```
            ΣP
              \
            XP!YP/WP L!
          /            \
   XP!YP/WP L!          YP/WP
   /        \             :
a!YP/WP L!    KP
           /    \
          LP     MP
```
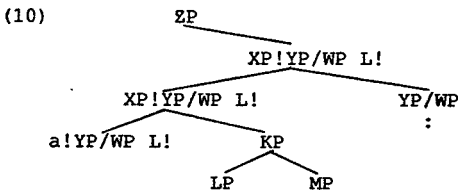
I use !...! to represent a stack. Principle (9) operates when !YP/WP L! is instantiated on the higher XP. According to the principle, the <YP/WP L(ICENSOR)> on this XP pops out of the stack to license its YP/WP daughter. Notice that the value of the LICENSOR feature (i.e. YP/WP) is the same as this daughter node. It is important to realize that the <YP/WP L> feature does not exist in the stack of the higher XP once the YP/WP daughter of this XP is licensed by the LICENSOR.

The upward propagation of the LICENSOR stops at the moment when it pops out of the stack because it propogates only through a stack. This is, as we know, a motivation for the feature being a stacked feature. Any downward propagation of !YP/WP L! would become problematic at the point of 'lexical insertion' by the fact that lexical items other than those which trigger the construction do not have that feature. In (10), if !YP/WP L! is instantiated on KP, the category LP and/or MP should have that feature according to the FFP.

However, the instantiation would not be allowed because none of the lexical items under the KP node would have the !YP/WP L! feature in the lexicon.

If /WP is instantiated on the higher XP in (10), it will be ruled out by a modified version of the FFP of GKPS because the licensed /WP on YP and the unlicensed /WP on the XP are different. The FFP as stated in GKPS says that only inheritance from an ID rule stops the upward flow of FOOT features. But we can easily modify the FFP to the effect that not only an inherited feature but also a feature which is required by a LICENSOR feature has a different function from a freely instantiated feature. Under this revised version of the FFP, a feature specification which is forced to appear on a category can also stop the upward propagation of FOOT features. That is, the /WP specification on YP is required by the LICENSOR on the higher XP (and/or by principle (9)) as opposed to free instantiation. Therefore, /WP instantiated above the higher XP will not terminate properly at the upper end.

We will see throughout this dissertation that the present system using the lexically oriented, stacked FOOT feature LICENSOR is superior to other approaches. Most importantly, the relation between a trigger and its target is captured naturally without positing any lexical operations or syntactic rules. Such operations and/or rules would be very complex because the same trigger can be located various parts of different constructions.

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[8] As was pointed out by Philip Miller (p.c.), the upward propagation of a feature should not be stoped even when it is "licensed" by another feature if this licensing feature is a regular feature (rather than a LICENSOR feature). For example, in Feature Cooccrrence Restriction 19 of GKPS,

(i) FCR 19: [+NULL]⊃[SLASH]

the existence of SLASH is licensed by [+NULL]. But the SLASH feature propagates upwards.

4.4. An Indexed Phrase Structure Grammar

The framework that I sketched in sec. 4.3 is based on GPSGs, especially on GKPS. But we have introduced stacked indices into our framework, which is the characterizing feature of IGs. I will call the hybrid of these two grammar formalisms an Indexed Phrase Structure Grammars (IPSG). As I mentioned before, the system here is based on Gazdar (1988). However, the tradition of introducing stacks into GPSG frameworks goes back to Maling & Zaenen (1982). In this work, as in Gazdar (1988), it is assumed that categories carrying stacks of SLASH features are necessary in GPSG frameworks (cf. Miller 1990, sec. 6). In addition, Pollard (1984) and early versions of HPSG (c. 1985) adopted stacked features into a GPSG-like framework[9].

As for the IG side of the IPSG framework, we should notice that the indices which are used here (i.e. LICENSORs) are different from those of regular IGs. First, the former are introduced by lexical items and removed by principle (9), while the latter are introduced and removed by rules. Second, the former are closely related to (actually, inseparable from) lexical items, while the latter are incompatible with lexical items because terminal symbols never bear indices. We will call the former type of indices "lexical indices" and the latter type "structural indices". We have seen that LIGs can handle those natural language phenomena which go beyond the realm of CFGs (e.g. crossed dependency constructions). Hence, I want to constrain the power of IPSG within that of an LIG. That is, in our framework at most one non-terminal daughter can copy the stack of its mother. We do not allow branching stacks.

As we will see later, more than one daugher of a node might have LICENSORs (i.e. lexical indices) in our framework. For example, expressions

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[9] In current HPSG, no stacked featues are used (cf. Pollard & Sag 1992). But some features have special values. They have (stacks), lists or sets as their values (i.e. (stack)/list/set-valued features).

too easy and *easy enough* are APs, but both of the two words in them have LICENSORs. However, I conjecture that the framework still remains within the power of a LIG rather than becoming an IG. Remember that structural indices and lexical indices are different in nature. They are regulated by different mechanisms. Even though both of the two daughters of a node have stacks in the examples above, what is involved here is very different from the branching stacks of (7):

```
(11) a.          AP!YP L!              b.          AP!YP L!
                   !XP L!                            !XP L!
              _____                   _____
         DP!XP L!        A!YP L!           A!YP L!        DP!XP L!
            |              |                  |              |
         too!XP L!      easy!YP L!         easy!YP L!    enough!XP L!
```
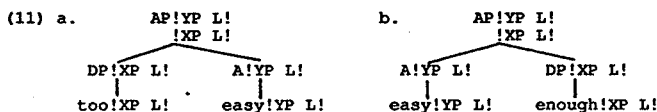
These examples portray an accumulation of indices into a stack (from daughters to their mother) rather than copying of stacked indices (from a mother to its daughters). Notice that the transmission of the stacks of lexical indicies from one node to another is regulated by the FFP rather than by syntactic rules. Depending on the order of accumulation[10] we can get a nested dependency as in (a) or a crossed dependency as in (b).

I think that we do not have the effect of branching stacks with lexical indices. We cannot license, for example, the structure in (7) within the power of the present framework:

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[10] We are assuming a last-in-first-out stack. For the order of stacking, we will assume a general rule of a "left-to-right" principle. That is, the index in the stack of the leftmost daughter is put first into the stack of its mother and that of the rightmost daughter is put last, when more than one daughter of a node has a stack. This general principle can be overridden by more specific principles such as the "obligatory-over-optional" principle to be introduced in Ch. V.

(12)

```
                              Z!a L!
                               !b L!
                               !c L!
                 _____|_____
            Y!a L!                                Y'
             !b L!                          _____|_____
             !c L!                         a             X'
        _____|_____                               ____|____
   a!a L!          X!c L!                           b         c
                    !b L!
               _____|_____
          b!b L!            c!c L!
```
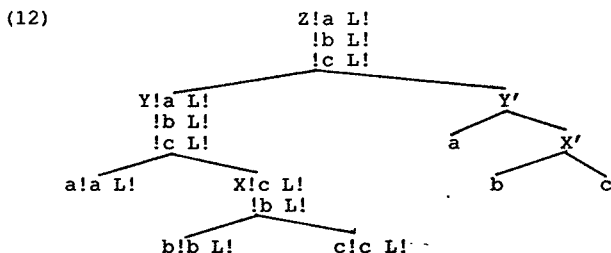
In whatever order we accumulate the LICENSORs, we cannot license any of the elements in the right-hand side of the tree (i.e. *a, b* or *c*) because none of these are daughters of node Z. Remember that only daughters of a node containing LICENSORs can be licensed according to principle (9). Then we can assume that IPSG is equivalent to the LIGs rather than the IGs in its generative power[11].

In sec. 4.1, we saw two cases where we need the power of LIGs: i) peripheral nested dependency constructions (cf. the structure in (2)), and ii) crossed dependency constructions. A natural way of handling structures of the first type is using lexical indices. Structures of the second type require structural indices. Hence, to see the interaction of lexical and structural indices, we need sentences which show (structurally oriented) crossed dependencies and which have lexical items with LICENSOR features. But we do not have relevant data in English because it does not have crossed dependencies which are truly structural as in Swiss German[12]. Depending

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[11] However, the statement here is just a conjecture because we could not provide any proof for it.

[12] Even though English does not have structural indices, we assume that still two different kinds of indices are necessary for the description of English: LICENSORs (i.e. lexical indices) and SLASH/GAPs (cf. sec. 7.2). I think that (the stacks of) these indices do not show interactions because they occur on different branches. If LICENSORs occur on a left-branch, then SLASH/GAPs occur on a right-branch, and vice versa.

on the existence of such data in other languages, we can set up principles for regulating the interactions of the two different types of indices. If there are no such data, we can say that no node can have a stack containing both of the two types of indices. If we can find such data, we need to examine their interactions carefully. We might need to assume two different stacks for them, one for the structural indices and the other for lexical indices. But these issues go far beyond the scope of this dissertation.

The IPSG framework presented thus far will not force us to choose any specific mechanism for the account of control and binding phenomena. We can adopt or develop appropriate mechanisms without theory internal restrictions. As for control phenomena, we will adopt the "Lexical Entailment Theory of Control" developed in Chierchia (1984), Dowty (1985) and others[13]. In GKPS the Control Agreement Principle (CAP) is responsible for the account not only of the control and binding phenomena but also agreement phenomena. In our framework, only agreement will be dealt with by this principle. In this sense the CAP should be reformulated as an Agreement Principle. The CAP is one of the most frequently and severely criticized principles in the GKPS framework. The problem is that this single mechanism is supposed to deal with several non-homogeneous phenomena. For criticisms of CAP, refer to Jacobson (1987a: 398-) and Miller (1991b: 43-4).

Now let us briefly discuss the relations between the IPSG framework and other frameworks introduced above. First, this framework is similar to HPSG and CGs in that some lexical items (those with LICENSORs) are more directly involved with syntactic mechanisms than in the GKPS framework. Second, it will use the semantic part of traditional CGs without major modifications, as we will see in Ch. VIII.

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[13] For a brief introduction of the Lexical Entailment Theory of Control, refer to Jacobson (1991: sec. 1).

Third, following the use of the extended locality domain of TAGs and No (1991), we will employ some depth-2 rules in this dissertation. They are allowed only when there is a token identity between a node and its adjacent niece:

(13) a. $_X$[A, B $_Y$[B, C]] (The higher and lower Bs are token-identical.)

b.
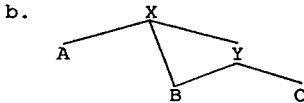
Here B is a daughter of X and at the same time a daughter of Y. The mechanisms of token-identity and structure-sharing" are extensively used in HPSG in dealing with raising, equi and anaphora constructions[14].

Fourth, we agree with Kuh's (1990) position that constructions are basic units of syntactic description (cf. sec. 2.1). A related view is that the interaction between syntax and semantics occurs in a rule-to-rule fashion as in Montague Grammar and early GPSG frameworks (e.g. Gazdar 1982). Fifth, we will remain uncommitted on the issue of whether we should have list-valued features for subcategorization, which is advocated in HPSG, Hukari (1989) and Miller (1991b). However, I assume that we need some such mechanisms to effectively capture the relation between a predicate and its arguments (e.g. compatibility conditions in Kuh (1990)).

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[14] Unlike in the case of (13), structure-sharing in HPSG does not lead to violations of "Single Mother Condition" (Robert Kasper, p.c.), which says that a node in a tree can have only one mother. Notice that structure-sharing in HPSG occurs among (SUBCAT) feature values rather than among nodes of phrase structures.

Chapter V. Type A Constructions

In this chapter, we will provide an IPSG analysis of Type A constructions (cf. sec. 2.3). I propose that these constructions can be dealt with by a single mechanism which employs a stacked FOOT feature LICENSOR (cf. Ch. IV). The basic idea behind this analysis is that each lexical item that triggers the construction has this feature as a part of its syntactic information. We will see that this lexically oriented approach is superior to other approaches (e.g., the rule-based approach of the GKPS framework (Gazdar et al. 1985)). Most importantly, we need not assume an arbitrary set of rules and accompanying structural manipulations (e.g. flattening).

In section 5.1, we will see how *tough-* and similar constructions can be analyzed in our framework. Then, we will extend this framework to handle Right Node Raising constructions in section 5.2. I think one of the primary advantages of the present approach comes from the analysis of these constructions.

5.1. *Tough-* and Similar Constructions[1]

In sec. 5.1.1, we will examine *tough-* and similar constructions. Even though not all of these constructions have exactly the same characteristics, they are similar in the sense that they show unbounded discontinuities

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[1] This section is based on Chae (1991a), which is an extended version of Chae (1990). There have been substantial modifications and extensions. Especially, sec. 5.1.3 was not included in the previous papers.

between an Adj/V trigger and the accusative NP gap which is included in its VP target. In sec. 5.1.2, we will provide an analysis of these constructions within GPSG frameworks (GKPS and its extensions), pointing out certain difficulties that arise in these analyses. In sec. 5.1.3, we will consider some important theoretical issues related to the analysis of them. In sec. 5.1.4, we will provide an IPSG analysis, which employs the [VP//NP LICENSOR] feature and a principle which defines its role. In this new approach, no separate rules are necessary to account for the constructions which are discussed in sec. 5.1.1. In the last section, we will briefly consider how the constructions are analyzed in other theoretical frameworks.

5.1.1. A Survey

5.1.1.1. *Tough*-Constructions

The following sentences represent typical examples of the *tough*-constructions:

(1) a. John is hard to convince e.
    b. Jack is easy to fool e.
    c. This paper was tough for me to finish e in a week.

These constructions have special properties which cannot be characterized in a simple way. First of all, they are like wh-constructions as is discussed in Chomsky (1977). The gap in the VP can be separated from the *tough*-Adj (or the binder) indefinitely[2]:

(2) a. This new kind of box was hard for me to persuade Harry
        to retool his factory to produce e. (Levine 1984b)
    b. Robin isn't easy for me to keep Dana from criticizing e.
    c. This paper was tough for me to try to finish e in a week.

---

[2] The gap bears an unboundedness relation with some element in the clause containing the *tough*-Adj. The issue of which element is supposed to bear that relation depends on one's theoretical assumptions as we will see in sec. 5.1.3.1.

    d. That book will be impossible for you to convince the
        class to try to finish e before Monday. (Berman 1973a: 263)

Parasitic gaps are also allowed in these constructions as is shown in (3a):

    (3) a. John is hard to talk to e [without getting mad at e].
       b. John is hard to talk to e [without getting mad at his brother].
       c. *John is hard to talk to his brother [without getting mad at e]

The gap in the square brackets is parasitic on the existence of the higher gap.
The real gap can occur alone (b) but the parasitic gap cannot (c).
Unboundedness between binder and gap, and allowance of a parasitic gap are
the most significant properties of UDCs.

    Tough-constructions are different from wh-constructions in that the binder
of the gap is in an argument (A) position (i.e. the subject position) rather than
in a non-argument (A') position. There is a case conflict between the gap and
the binder:

    (4) He/*Him is easy to please e.

The gap should have accusative case as the object of *please*, while the binder
has nominative case. In this respect, they are similar to control or raising
constructions. However, they seem to have properties of both of these two
constructions (Jacobson 1991), as will be discussed in sec. 5.1.3 and sec. 8.2.

    The *tough*-construction (5a) has a parallel construction with the expletive
it (b) or the infinitive clause (c) as its subject:

    (5) a. Bob is hard to convince.
       b. It is hard to convince Bob.
       c. To convince Bob is hard.

But we do not have a parallel left dislocation construction, which has a
resumptive pronoun in the place of the gap:

    (6) *Bob is hard to convince him.

As the sentences in (5b-c) indicate, there seems to be no thematic relationship

between the binder and the matrix predicate in this construction[3].

The following list contains Adjs which trigger *tough-* constructions. The list is based on Berman (1973a: 235), Lasnik & Fiengo (1974), Nanni (1978: 30-31), Quirk et al. (1985: 1229), etc.:

(7) a. difficult, easy, hard, simple, tough.
    b. amazing, amusing, annoying, awful, awkward, bad, beneficial, boring, convenient/inconvenient, dangerous, delightful, entertaining, evil, exciting, fun, good, gratifying, harmful, horrible, impossible, instructive, interesting, irresponsible, legal/illegal, loathsome, marvelous, nice, pleasant/unpleasant, reasonable/unreasonable, safe, stimulating, tolerable/intolerable, tricky, unhealthy, useful, useless.

(8) a. This sum is convenient to work with.
    b. The room was dangerous for Bill to stay in.
    c. Mozart is delightful to play on this violin.
    d. The backyard would be exciting for Koala bears to be in.
    e. The book is impossible for Tom to read.
    f. Vienna is nice for us to visit.
    g. The men is simple to fool.
    h. Those darts are tricky to use.
    i. That question is unreasonable for you to expect John
        to be able to answer.

Common properties of these Adjs can be characterized intuitively as "referring to degrees of ease or comfort" (Quirk et al. 1985: 1229). According to Nanni (1978), they "describe the relationship between an individual and an activity or event and ... describe the cost, value or benefit to the individual" (p. x). She

---

[3] However, the existence of the corresponding expletive *it* construction does not guarantee that there is no thematic relation between the binder and the matrix predicate:

  (i) (?)Robin is obnoxious to try to get to talk to e.
  (ii) It is obnoxious to try to get to talk to Robin.

The truth conditions for these two sentences are not the same (Robert Levine, p.c.). The subject in (i) has a theta-role. In this respect *obnoxious* has the properties of both regular *tough*-Adjs and *ready*-type Adjs to be observed shortly.

also observes that *tough*-Adjs can be separated into two groups: (7a) and (7b). The former describes the cost (work or effort) while the latter provides a measurement of the value or benefit involved in some activity (pp. 30-1).

However, it is clear that the above (informal) definitions cannot characterize all and only *tough*-Adjs. For example, we have both *pleasant* and *unpleasant* in the list. But ?**uninteresting**[4] is not a *tough*-Adj while *interesting* is one. We have both *tolerable* and *intolerable* in the list. But **possible*/*responsible* are not *tough*-Adjs while *impossible/irresponsible* are ones. Berman (1973a) observes that only those Adjs which have (explicit or implicit) [for-NP] complements can occur in *tough*-constructions (pp. 227-8, pp. 271-2):

   (9) a. It was beneficial to/for Mary to read that book.
       b. It was instructive to/for Mary to read that book.
       c. Reviewing that book was good of/for Mary.
       d. Watching the way Joe hit that ball was amazing to/for me.
   (10) a. That book was beneficial *to/for Mary to read e.
        b. That book was instrutive *to/for Mary to read e.
        c. That book was good *of/for Mary to review e.
        d. The way Joe hit that ball was amazing *to/for me to watch e.

The Adjs *beneficial, instructive, good* and *amazing* can occur in *tough*-constructions only when they take [for-NP] complements. But they are not compatible with *tough*-constructions when they have other PP complements. Even the Adj *tough* cannot occur in a *tough*-construction when its complement is [on-NP] (p. 248).

Based on this observation, Berman (1973a: 228) argues that "*tough*-movement is closely related to the existence of [for-NP] rather than on the

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[4] Some people might get a *tough*-construction with *uninteresting* (e.g. Lasnik & Fiengo 1974: 568). But we can see a clear contrast between this Adj and *boring*, which has the same meaning:

   (i) a. ?*This book is uninteresting for children to read e.
       b. This book is boring for children to read e.

lexical item itself". Under this assumption, however, we should posit abstract [*for*-NP] phrases for the examples with no explicit [*for*-NP] phrases. To avoid this problem, we can assume that particular lexical items themselves have the property of triggerring *tough*-constructions. But those examples with PPs other than the [*for*-NP] are not allowed to be *tough*-constructions because these constructions require only the [*for*-NP] as an optional element. Hence we can maintain that particular lexical items trigger the construction regardless of the existence of a [*for*-NP] phrase.

Now we will examine some other properties of *tough*-constructions[5]. First, only one [*for*-NP] phrase is allowed among two possible phrases, the experiencer phrase and the lower subject phrase. This single [*for*-NP] phrase does both of these functions (cf. Nanni 1978: 81):

(11) a. Susy is unpleasant for John to go out with e.
b. The story is amusing for Joe to think about e.
(12) a. *Susy is unpleasant for Mary for John to go out with e.
b. *The story is amusing for Joe for his children to think about e.

In (11a), for example, *for John* plays the roles of the experiencer of 'unpleasantness' and the subject of the lower infinitive clause. We will call the constraint here "No Double [*for*-NP] Condition". Even though the two phrases are separated from each other, the grammaticality does not improve when *for Mary* has an experiencer reading[6]:

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[5] There seems to be a semantic constraint on the subject NP. It must be definite/specific or generic according to Berman (1973a: 292) and Nanni (1978: 69).

[6] The sentences in (13) are grammatical when *for Mary* has a sentence adverbial reading rather than an experiencer reading (Robert Levine, p.c.). This point becomes evident in the following examples:

(i) a. For me, certain topics would be more pleasant for you to discuss than others.
b. For me, certain tipics would be more pleasant than others for you to discuss.

(13) a. *Susy is unpleasant for John to go out with, for Mary.
   b. *For Mary, Susy is unpleasant for John to go out with.

But two consecutive [for-NP] phrases do not cause any problem in the corresponding expletive *it* construction:

(14) a. It is unpleasant for Mary for John to go out with Susy.
   b. It is amusing for Joe for his children to think about the story.

From this observation, we can notice that the function of the [for-NP] phrase is not the same in a *tough*-construction as in a corresponding *it* construction. Nanni (1978: 32-44) shows that the following sentence has three interpretations (cf. Berman 1973a: 265-7)[7]:

(15) It is dangerous for the baby to smoke.

On one reading, the baby is experiencing the danger and is smoking cigarettes. The second reading is that the baby is experiencing the danger but is not smoking itself. On the third reading, the baby is smoking but is not experiencing the danger.

Arnold Zwicky (p.c.) has made a similar point for the construction:

(16) a. It's tough for Mary to eat peas with a knife.
   b. It's tough for Mary to have so many people visiting us.

The preferred, or perhaps only, reading for (a) is the one with *for Mary* as the lower subject (though there is an implicature that Mary is affected). The preferred reading for (b) is the one with *for Mary* as an experiencer. We will conclude from these observations that the behavior of [for-NP] in the *tough*-construction is different from that in the *it* construction.

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[7] David Dowty (p.c.) pointed out to me that the fact was observed by Otto Jespersen with reference to such examples as the following:

(i) It is good for a man not to touch a woman.

Second, it is usually assumed that the clause which contains the *tough*-gap must be non-finite (Berman 1973a: 304, Nanni 1978: 79, Hukari and Levine 1991a, etc.)[8]. This seems to be an absolute grammatical constraint when the gap is in the clause just below the *tough*-Adj (Jones 1990a: 323):

(17) *This will be easy [(that)[I (will) read e]].

But there seem to be dialectal variations when the gap occurs in a lower clause[9]:

(18) a. %Robin is tough for Sandy to think we can influence e.
  b. %Robin is tough for Sandy to think Kim could imagine
      we can influence e.
(19) a. %That house is pretty hard to imagine Bill thinking
      Mary could buy e.
  b. %John is hard for me to believe that Bill likes e.
  c. %The errors were hard for John to admit that he had made e.

Even though these sentences are ungrammatical for some English speakers, some people say that they are just fine. Others say that they are not perfect but still grammatical.

Third, all the examples of *tough*-constructions observed thus far have accusative NP gaps. There are other examples with non-NP gaps (Pauline Jacobson, p.c.):

(20) a. That shaving himself would bother Mary is hard for John
      to believe e.
  b. ?Proud of himself is hard for me to imagine John being e.
  c. To shave himself is hard for me to imagine John trying e.

Sentence (a) has a clausal gap, sentence (b) an AP gap, and sentence (c) an

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[8] Berman (1973a: 135) says that "the more 'sentential' the Adj complement looks, the worse the output seems to be" in *tough*-constructions.

[9] The sentences in (19a-b) are from Jacobson (1991) and are marked with two question marks. Nanni (1978: 114) says that a few speakers accept sentence (19c).

infinitival VP gap.

Fourth, sentences containing a gap in a passivized VP are not very natural in *tough*-constructions:

(21) a. It is unpleasant to be kissed by John.
  b. ??John is unpleasant to be kissed by e.
(22) a. It is easy to be accepted by that group. .
  b. ??That group is easy to be accepted by e.
(23) a. *The book was hard for Bill to be sent e by Alice.
  b. *The prize was hard for John to be given e.

In all of these examples, the lower VP is in a passive form. Sentences (21-2b) are assumed to be simply ungrammatical in Berman (1973a: 294-5), but they are not so bad even though they are not perfect. The sentences in (23) are really bad (Nanni 1978: 79, 92). There is an independent reason why they are worse than those in (21-2b). The subject is "displaced" from the structure of [V-NP-NP], which is another constraint operating on *tough*-constructions, as we see next.

Fifth, sentences with an NP gap out of the ditransitive structure of [V-NP-NP] are not very good[10]:

(24) a. It is impossible to buy presents for John.
  b. Presents are impossible to buy e for John.
  c. John is impossible to buy presents for e.
(25) a. It is impossible to buy John presents.
  b. ?*Presents are impossible to buy John e.
  c. ??John is impossible to buy e presents.
(26) a. ??This charity is really easy for us to give e money.
  b. ?This cheap item is easy for me to buy my parents e.

As we can see in (24), both the verbal and prepositional object NP can be missing. However, sentences with an object NP gap of [V-NP-NP] are not impeccable as we can see in (25). Berman (1973a: 293) maintains that

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[10] The constraint on the ditransitive structure is not a property of the *tough*-construction itself. We can see the same phenomenon in other constructions with "displacement".

sentences (25b-c) are simply ungrammatical, but the quality of such sentences can be improved as in (26).

Lastly, we note a similar situation when an NP "raised from subject to object" (the ojects of "raising" Vs) is absent in *tough*-constructions (Berman 1973a: 295-6, Nanni 1978: 79-80, Zwicky 1987b: 662):

(27) a. ?*John is impossible to expect e to understand that book.
b. ?*John is difficult to believe e to have made such a mistake.
c. ?*John was hard for us to believe e to be honest.
d. ?*Kelly is tough for us to believe e to be a spy.

However, it seems that the object NP of some raising Vs can be missing (Jacobson 1991: (56), Arnold Zwicky (p.c.))[11]:

(28) a. ?John is hard for me to imagine e ever being nice.
b. ?The children were easy for us to prove e to be innocent.

This awkwardness is a property of only raising Vs. The object NPs of "control" Vs can be missing:

(29) a. John is impossible to encourage e to attend the meeting.
b. John was hard for us to persuade e to go to leave.
c. Mary was hard for us to convince e to buy the car.

5.1.1.2. Related Constructions

In this section, we will examine some other constructions which are closely related to *tough*-constructions, what we will call *breeze*-type, *ready*-type, *too/enough*, [*easy person*]-type, and *take*-type constructions. These constructions have similar characteristics to those of *tough*-constructions. We will examine them focusing on the special properties of each of them.

First, there is a group of nouns and noun phrases which triggers largely the same type of construction as the *tough*- construction (Lasnik & Fiengo

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[11] The grammaticality difference between (27) and (28) suggests that the relevant constraint might be semantic rather than syntactic (David Dowty, p.c.).

1974):

    (30) a. The game was a breeze for her to win e.
        b. John is a pain to deal with e.
    (31) a. The game was a breeze for Tom to convince her to win e.
        b. John is a pain to try to deal with e.

This *breeze*-type construction shows the characteristics of unbounded dependency and other characteristics of the *tough*-construction:

    (32) a. The game was a cinch for her to win e.
        b. It was a cinch for her to win the game.
        c. For her to win the game was a cinch.
    (33) *The game was a cinch for her to win it.

There seems to be no thematic relationship between the binder and the matrix predicate.

    The following nouns and noun phrases also occur in the *breeze*-type construction (from Lasnik & Fiengo 1974: 568, etc.):

    (34) a. bear, bitch, blast, delight, fun, gas, joy, nuisance, pleasure, snap.
        b. pain in the ass/neck, piece of case, you know what, waste of time.
    (35) a. John is a bear to get along with.
        b. Lee is a bitch to make friends with.
        c. Tom is fun for us to give presents to.
        d. Mary is a pleasure to teach.
        e. Hebrew is a waste of time for us to learn.
        f. Mark is a piece of cake for me to beat.
        g. John is a pain in the neck to have to deal with.

    Second, there are *ready*-type constructions. Let us observe the following sentences:

    (36) a. The house is ready for Jim to buy.
        b. These books are available for visitors to borrow.
    (37) a. The house is ready for Tom to force Jim to buy.
        b. These books are available for the principal to allow
            visitors to borrow.

Sentences of this type also show the binder-gap relationship and this relationship can be unbounded (37).

This construction has different characteristics from those which we have observed thus far:

(38) a. The house is ready for Jim to buy.
    b. *It is ready for Jim to buy the house.
    c. *For Jim to buy the house is ready.
(39) The house is ready for Jim to buy it.

The matrix predicate does not allow *it* or the infinitive clause as its subject as we can see in (38b-c). This fact implies that there is a thematic relation between the binder subject and the matrix predicate. This type of construction has a parallel left dislocation construction.

Other adjectives inducing this type of construction are as follows (Berman 1973a: 262-3, Lasnik & Fiengo 1974: 566, Quirk et al 1985: 1229):

(40) a. fit, flimsy, free, sufficient.
    b. beautiful, cacophonous, delicious, fragrant, frosty, graceful, melodious, pretty, pungent, scratchy, slippery, soft, tasty.
(41) a. This picture is not fit to sell.
    b. This paper is terribly flimsy to write on.
    c. These books are free for visitors to borrow.
    d. The cloth is sufficient to make a dress out of.
(42) a. This stew is delicious (to eat).
    b. The air is frosty (to breathe).
    c. This floor is slippery (to dance on).
    d. Its fur is soft (to touch).

The Adjs in (40b) usually occur without their VP complements, as is indicated in (42) (cf. Quirk et al 1985: 1229)[12].

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[12] Hence, the constructions induced by the Adjs in (40b) might be different from the *ready*-type constructions. Another issue to be considered is that the gapped VP complements might be "subject-modifying purpose infinitives" (David Dowty, p.c.):

    (i) A calculator is available/here/accessible/obtainable/handy to compute costs with e.

We will not go into these issues further. Lasnik & Fiengo (1974: 566-7) list two groups of constructions which are similar to those which are induced by

Now let us examine the *too/enough* constructions. The phenomenon of unbounded binder-gap relationship can also be found in some of the *too ... to* sentences:

(43) a. John is too nasty to make friends with.
　　b. John is too nasty to ask Mary to make friends with.

From the following pair of ungrammatical sentences, we can see that the element which makes the above sentences have the characteristics of unbounded dependency is not the matrix Adj but *too* (Lasnik & Fiengo 1974: 536):

(44) a. *John is famous for you to meet.
　　b. *John is very famous for you to meet.
　　c. John is too famous for you to meet.

Sentences of this *too* construction have similar characteristics to those of the *ready*-type construction:

(45) a. John is too nasty for me to make friends with.
　　b. *It is too nasty for me to make friends with John.
　　c. *For me to make friends with John is too nasty.
(46) John is too nasty for me to make friends with him.

There is a thematic relationship between the binder subject and the matrix predicate, and the resumptive pronoun is allowed in this construction.

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the Adjs in (40b). First, some constructions are triggered by the preposition *like* (cf. sec. 7.3):

(ii) a. Robin is like a cat to get along with e.
　　b. Robin is like you know what to get along with e.

Second, nouns like *angel, bastard, marvel, pigsty, prince, tyrant, hornets' nest, loony bin*, etc. induce another group of constructions:

(iii) a. This room is a pigsty to behold e.
　　b. Nureyev is a marvel to watch e.

There seem to be no major differences between the *too* construction and the *enough* construction except the positions of *too* and *enough* with reference to the Adj concerned[13]:

(47) a. John is tall enough for us to see.
   b. John is tall enough to imagine my little son could have seen.
(48) a. *John is tall for us to see.
   b. *John is very tall for us to see.
(49) a. *It is tall enough for us to see John.
   b. *For us to see John is tall enough.
(50) John is tall enough for us to see him.

One important difference between the *too/enough* constructions and the other constructions observed thus far is that the former constructions do not obey the No Double [*for*-NP] Condition:

(51) a. Their pastrami was too greasy for me for them to be
        able to figure out if I enjoyed meat.
   b. Their pastrami was lean enough for me for them to
        consider letting me try their roast beef. (Jones 1991: 167).

These sentences have two *for*-strings just like in the expletive *it* construction (cf. (14)).

There is another unbounded binder-gap construction which is induced by the Adjs of the *tough*-construction[14]:

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[13] However, Baltin (1987: 12) notices that *too* requires only an infinitival complement but *enough* allows both infinitival and finite complements:

(i) a. John was too tall to fail to hit his head.
   b. *John was too tall that he failed to hit his head.
(ii) a. John was tall enough to hit his head.
   b. John was tall enough that he hit his head.

Hence we will treat *too/enough* constructions as two different constructions.

[14] Berman (1973a: 24) argues that there are a set of Adjs which trigger the [*easy person*]-type constructions but not the *tough*-constructions (*odd, idiotic, stupid, crazy, sensible*, etc.):

(52) a. John is a tough man to argue with e.
    b. (?) John is a tough man for me to stop Mary from arguing with e.
(53) a. That is an inappropriate book to require everyone to read e.
    b. Sam is a hard man to convince Mary to talk to e.
    (cf. Berman 1973a: 51, 346)

In this [*easy person*]-type construction, the NP in the matrix predicate consists of one of the *tough*-Adjs (cf. section 5.1.1.1) and a N. The denotation of this N is a set containing the denotation of the subject NP as its member.

It should be noticed, first of all, that the following sentences are ambiguous between an [*easy person*]-type reading and an infinitival relative reading:

(54) a. This is [a hard pillow to throw e].
    b. John met [a tough man to argue with e].
    c. I finally met [an easy guy to talk to e]. (Jones 1991: 168)

In sentence (a), the Adj *hard* can be predicated of 'throwing this pillow' or it can be used as an attributive Adj (in the sense of 'not soft') (Berman 1973a: 21). The former reading (i.e. the [*easy person*] reading) is more natural than the second reading in sentence (b) and (c).

(i) a. That was an odd gesture for him to make e.
    b. New York is a stupid place to live in e.

These sentences might be analyzed as infinitival relatives (cf. Berman 1973a: 236-8, 315-7, 337, 353). However, Robert Levine (p.c.) pointed out to me that they have interpretations parallel to that in the [*easy person*]-type constructions, which are different from the infinitival relative reading in such sentences as the following:

(ii) I met a brilliant mathematician for you to argue with e.

In the sentences of (i), the Adj can be predicated of the gapped VP (e.g. the reading of 'it is stupid to live in New York'). But it is not possible in (ii). Then we must assume that there is another group of Adjs which trigger the [*easy person*]-type constructions. But these Adjs license the gapped VP only when they are in a prenominal position unlike the *tough*-Adjs. That is, they trigger the construction only when they are used attributively.

The [*easy person*]-type construction is different from the following infinitival relative clause construction (cf. footnote 14):

(55) a. John has a doll for Mary to play with.
    b. ?John has a doll to tell Mary to play with.

In (52), the gap is more naturally interpreted with *John* as its binder, which is separated from the infinitive clause, rather than with *man*. It is interpreted with *doll* as its binder in (55a), which comes just before the infinitival clause. However, we will see similarities between these two constructions as well.

The [*easy person*]-type construction shows its own characteristics:

(56) a. John is an easy person to please e.
    b. *It is an easy person to please John.
    c. *John is an easy person to please him.

Sentence (b) shows that this construction is similar to the *ready*-type and *too/enough* constructions which we have examined above, in the sense that there is a thematic relationship between the binder subject and the matrix predicate. Sentence (c) indicates that it is also similar to the *tough*- and *breeze*-type constructions in that it does not allow the resumptive pronoun.

Let us now observe similarities between the *tough*-construction and the [*easy person*]-type construction. First of all, all the *tough*-Adjs induce the latter construction. Second, the prenominal Adj in the latter is interpreted as being predicated of the proposition represened by the infinitive clause (Berman 1973a: 313). This is an important property of the former construction. Third, the No Double [*for*-NP] Condition and the tenseless condition hold for the latter construction as well (cf. Berman 1973a: 336, 30):

(57) a. It was tough for Joe for his student to fail that test.
    b. *a tough test for Joe for his student to fail.
(58) a. It was tough for Joe that he failed that test.
    b. *a tough test for Joe that he failed.
(59) a. %a hard man to believe that Mary would marry e.
    b. %an impossible book to require that everyone read e.

However, there is a significant difference between the two constructions. The infinitive complement can be a passive form in the [easy person]-type construction (Berman 1973a: 24, 368):

(60) a. Mary is a pleasant person to be kissed by e.
b. Joe would be a good person for Mary to be coached by e.

Notice, by the way, that the infinitival relative can also be a passive form.

The [easy person]-type construction is a nominal counterpart of the tough-construction. We also have parallel counterpart constructions of too/enough constructions:

(61) a. This is too heavy a ball to throw e.
b. This is too blunt a knife to cut the salami with e.
c. Joe is too short a man to make the basketball team.
(62) a. This is a light enough ball to throw.
b. %This is a sharp enough knife to cut the salami with e.
c. Joe is a tall enough man to make the basketball team.

A special property of these constructions and the [easy person]-type construction is that they allow Pied Piping (Berman 1973a: 33, 330, 366):

(63) a. This is an easy violin to play sonatas on e.
b. This is an easy violin on which to play sonatas e.
c. *This is an easy violin which to play sonatas on e.
(64) a. This is an easy violin for me to play sonatas on e.
b. *This is an easy violin for me on which to play sonatas e.
c. *This is an easy violin on which for me to play sonatas e.

From (63) we can see that only the "pied piped" version is allowed when a wh-word occurs. The data in (64) show that the [for-NP] phrase and the pied-piped PP are not compatible. Notice incidently that we can see the same phenomena in infinitival relatives (Berman 1973a: 328-9):

(65) a. a knife with which to cut the salimi e.
b. *a knife which to cut the salimi with e.
(66) a. Joe bought Mary a knife with which to carve the turkey e.
b. *Joe bought Mary a knife with which for her to carve the turkey e.

Here are some pied-piped examples of *too/enough* constructions (cf. Berman 1973a: 366):

(67) a. This is too blunt a knife to cut the salami with e.
   b. This is too blunt a knife with which to cut the salami e.
   c. *This is too blunt a knife which to cut the salami with e.
(68) a. %This is a sharp enough knife to cut the salami with e.
   b. ??This is a sharp enough knife with which to cut the salami e.
   c. *This is a sharp enough knife which to cut the salami with e.

We do not have Pied-Piping in the *tough-* and *too/enough* constructions (Jones 1990a: 324, 328. cf. Berman 1973a: 366):

(69) a. This will be easy to put pictures in e.
   b. *This will be easy in which to put pictures e.
(70) a. John's too old/old enough to depend on e.
   b. *John's too old/old enough on whom to depend e.

Thus far, we have examined several constructions which have unbounded binder-gap relationships. The last construction to be observed in this section (the *take*-type construction) is induced by Vs rather than Adjs or Advs (Degree Phrases) modifying Adjs (Chomsky 1981, Jones 1991: 226):

(71) a. New York took me eight hours to drive to e.
   b. The cake[15] took Mary all day to bake e.
(72) a. Minneapolis will cost me $300 to fly to e.
   b. The shirt cost John three dollars to buy e.
(73) a. (?) Dana took me exactly four minutes to talk Robin out of
      marrying e.
   b. (?) Minneapolis will cost me $300 to arrange for Mary to fly to e.

We can see that *take* and *cost* also trigger to some extent an unbounded binder-gap construction.

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[15] David Dowty (p.c.) pointed out to me that the most appropriate NP which can occur in this position is one which indicates the result of the process represented by the gapped VP. That is, *cake* is the result of *baking*. The other sentences in (71) and (72) are also acceptable.

This construction presents characteristics which are similar to those of the *tough*-construction:

(74) a. The shirt cost John three dollars to buy e.
b. It cost John three dollars to buy the shirt.
c. *The shirt cost John three dollars to but it.

There seems to be no thematic relationship between the binder subject and the matrix predicate, and the resumptive pronoun is not allowed.

5.1.2. GPSG Analyses

We have observed seven different types of constructions which can be regarded as *tough*-like constructions. We found that the *tough*-construction, the *breeze*-type construction and the *take*-type construction share the following characteristics: i) they have parallel constructions with the expletive *it* as their subjects, ii) they do not have parallel left dislocation constructions. The *ready*-type construction and the *too/enough* constructions group together in that they show the characteristics opposite to those of the first group. The *[easy person]*-type construction forms a separate group. However, all of the seven types deserve a unified account because they share one of the most significant characteristics of syntactic phenomena, i.e. unbounded dependency between a trigger (or the binder NP) and the accusative NP gap which is included in its VP target.

In this section, we will construct rules for the seven types of constructions under the GKPS and related GPSG frameworks. These rules will license the occurrence of the gap in them in cooperation with the FOOT Feature Principle (FFP). The Control Agreement Principle (CAP) is responsible for the account of the binder-gap association. These frameworks assume syntactic connectivity between binder and gap. Hence the binder is the syntactic filler of the gap.

GKPS (p. 150) has the following rule for the *tough-* construction:

(75) A¹ → H[42], V²[INF]/NP[-NOM]

This is the only rule which is provided in GKPS to analyze "Missing Object Constructions." Let us consider what kind of rules would be needed for the other types of constructions. I repeat the following sentences for convenience of reference:

(76) a. The game was a breeze for her to win (*breeze*-type).
 b. The house is ready for Jim to buy (*ready*-type).
 c. John is too short for you to see (*too*).
 d. John is tall enough for us to see (*enough*).
 e. John is a tough man to argue with ([*easy person*]-type).
 f. The cake took Mary all day to bake (*take*-type).

Sentence (b) can be handled with exactly the same kind of rule as (75) except that the rule would have a different SUBCAT value of the head. For the other five constructions, we need to formulate new rules.

Assuming the following tree for sentence (76a) (*breeze*-type construction)[16],
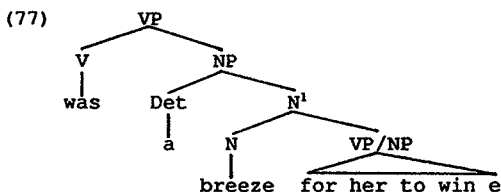
we can formulate the rule as follows:

(78) N¹ → H[101], V²[INF]/NP[-NOM]

A difficulty arises when the triggering element is a N¹ rather than a N, as in the case of *waste of time* or *piece of cake* (cf. (35e-g)). Since an N¹ cannot

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[16] The tree structures in this section are based on the assumptions of the GKPS system. Hence they are not necessarily the same as what I believe to be the right tree structures.

have a SUBCAT feature, it would be difficult to write a rule for these expressions. One might propose that we can reanalyze these N¹'s as N's in the lexicon. However, this is not a very good idea, especially for the *waste* examples, as Arnold Zwicky (p.c.) has pointed out. *Waste of time* is not a fully fixed expression:

(79) a. waste of (my/your/...) time/money/work/effort/...
    b. pain in the neck/ass/butt/you know what/...

Therefore, we cannot treat these expressions as lexicalized items.

Now let us look at sentence (76c) (*too* construction). There are three different ways to analyze it:

(80) a.

```
                AP
          ┌─────┴─────┐
        Adv           A¹
         │        ┌────┴────┐
        too       A       VP/NP
                  │     ┌───┴────┐
                short  for you to see e
```

b.

```
                AP
          ┌──────┼──────────┐
        Adv      A         VP/NP
         │       │      ┌────┴────┐
        too    short   for you to see e
```

c.

```
                AP
          ┌──────────┴──────────┐
         A¹                    VP/NP
       ┌──┴──┐             ┌─────┴─────┐
      Adv    A            for you to see e
       │     │
      too  short
```
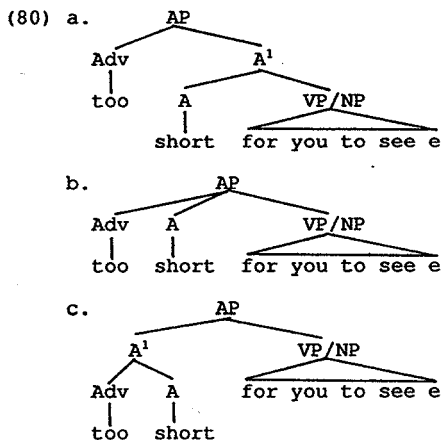
It would be difficult to write a rule for structure (c) within the GKPS system (but cf. Hukari & Levine 1987, 1991 below) because the trigger of the construction, i.e. *too*, and the constituent which contains the gap are not sister nodes. Such a rule would violate the locality principle of GPSG.

Let us consider structures (a) and (b). If we allow a lexical item which is not the head of a rule to have a SUBCAT feature, the rules for them would be

as (81). If we do not, we need another feature of AdvFORM, one of whose possible values is *too*. Then, we can write the rules as in (82):

(81) a. $A^2 \rightarrow Adv[102]$, $H^1/NP[-NOM]$
   b. $A^2 \rightarrow Adv[102]$, H[140], $V^2[INF]/NP[-NOM]$
(82) a. $A^2 \rightarrow Adv[too]$, $H^1/NP[-NOM]$
   b. $A^2 \rightarrow Adv[too]$, H[140], $V^2[INF]/NP[-NOM]$

Whichever type of rules we choose, we need one more mechanism in the grammar as a whole. That is, we must either allow non-head lexical items to have SUBCAT features or we need another feature of AdvFORM.

Furthermore, in the case of (81b) and (82b), the SUBCAT feature of the head has nothing to do with the characteristics of the construction. The Adjs which occur in these rules are not the elements which trigger the construction. From a different point of view, the problem is that the SUBCAT class 140 comprises all the Adjs which can occur in the predicate position in English. There is no motivation for using the SUBCAT feature. We will see the same problem in rule (98) below. The *enough* construction has similar problems (see Chae (1990, 1991a) for discussions).

Hukari & Levine (1987, 1991a) propose an analysis for the *too* and *enough* constructions which avoids the above-mentioned problems and captures that *too* and *enough* function in a somewhat parallel fashion. They introduce a head feature DEG(FORM), which takes either [*too*] or [*enough*] as its value (1987: 100, 1991a: 124). The rule for the construction is introduced by the following metarule:

(83) Degree Metarule

$A^1 \dashrightarrow W$
   $\Downarrow$
$A^1[DEG[@]] \dashrightarrow W$, $V^2[INF](//NP)$, where @ = *too, enough*

Based on these new mechanisms, they give the following structures for the two constructions:

(84) a.
```
                        AP[DEG: too, ...
                         |
                        A¹[DEG: too, ...
                    _____|_____
            A[DEG: too]          VP//NP[ACC]
             |                  _____
          too stubborn          to talk to e
```

b.
```
                        AP[DEG: enough, ...
                         |
                        A¹[DEG: enough, ...
                  _____|_____
          A[DEG: enough]          VP//NP[ACC]
             |                   _____
          stubborn enough        to talk to e
```
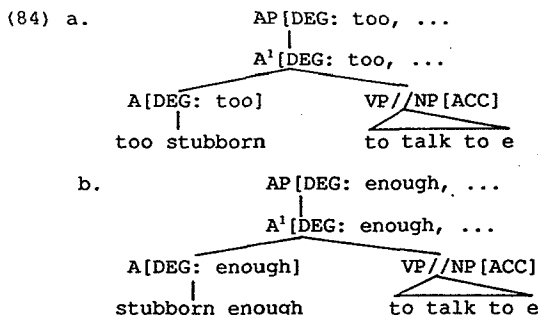
Notice that this system uses the structure in (80c) and does not have the problems caused by the rules in (81-2).

However, there are some metatheoretical issues to be considered. First, we need independent motivations for the DEG feature and the Degree Metarule. Second, it is too abstract in the sense that *too* and *enough* are regarded not as words but as feature values, at least at the syntactic level. We would need some independent criteria for determining which lexical items can be analyzed as features at the syntactic level. Third, a related abstractness issue is that A[DEG @], which dominates the [*too* + Adj] or [Adj + *enough*] expressions, is analyzed as a zero-bar category. We would expect that these expressions are phrasal categories if there is not enough evidence to the contrary. We would prefer frameworks which do not raise these questions if all other things are equal.

From an empirical point of view, we need to consider the following examples:

(85) a. John is [too worried about the exams] [for his parents
      to take ?e/him out for dinner].
   b. Mary is [angry enough with John] [to talk to e about him].
      (Hukari & Levine 1991a: 124)

We cannot apply the output of the Degree Metarule (83) to the sentences in (85) directly because the sister of the (gapped) VP is not a zero-bar category.

Hence the structure concerned should be flattened out:

   (86) a. [[too worried] [about the exams] [for his ...]].
      b. [[angry enough] [with John] [to talk to e about ...]]

Without independent motivations for this flattening/liberation, the analysis would be very "expensive". In addition, notice that the output rule of (83) applies only to these flattend structures.

   Now let us observe the following sentences, which require a different type of flattening:

   (87) He put [too much chlorine] in the pool [for us to swim
        in it without our eyes burning]. (Dowty 1991: (76b))
   (88) a. [Too many books] have been published recently [for me
         to be able to read them all]. (Gueron & Mary 1984: 1)
      b. [Too few guests] had arrived by noon [for John to start drinking].
        (cf. Jones 1990b: 580)
      c. [Enough ice cream] had been brought to the picnic [to keep
        the children happy]. (Baker 1989: 344)

The constructions involved here are not the same as the *too/enough* constructions observed thus far. For example, the VP licensed by *too/enough* cannot have a gap. In other important respects, however, the *too/enough* in (87-8) has the same characteristics as that in the *too/enough* constructions. It licenses the infnitival VP and this VP represents a negative result.

   One might propose the following structure and an extraposition rule for the analysis of the sentences in (87-8):

   (89) *... [[too much/many/few] [for ... to ...]] N ...

Under this assumption, we have an ungrammatical "source" sentence (i.e. (89)), which would never be realized as a real sentence. Then the extraposition rule assumed must be applied obligatorily. Under this type of analysis, we can posit any arbitrary string as a source sentence and apply a rule obligatorily to derive a sentence.

There is a more complex set of data to be considered in connection with the analysis of Hukari & Levine (1987, 1991a):

(90) a. For me, certain topics would be [more pleasant for you
           to discuss e than others].
     b. For me, certain topics would be [more pleasant than others
           for you to discuss e].

For sentence (a), we can assume the following structure:

(91) ... [more [pleasant [for you to ...]]] than others].

Here the gapped VP can be licensed by the regular *tough*-rule, but this analysis cannot capture the fact that *more pleasant* forms a constituent. The analysis of sentence (90b) would be more problematic. We can think of two possible ways of handling it. First, we can assume the following flattend structure for it:

(92) ... [[more pleasant] [than others] [for you to discuss]].

This string cannot be licensed by the regular *tough*-rule because this rule does not allow any extra element to follow the Adj:

(93) a. *John is tough [on me] to deal with e.
     b. *John is tough [for me] for Mary to deal with e.

The ungrammaticality of these examples is attributed to the existence of unlicensed material between the Adj and the gapped VP in the system of GKPS and Hukari & Levine (1987, 1991a). Then we need another metarule to analyze sentences like (92), which are just *tough*-sentences. Second, we might assume the following structure and extraposition for sentence (90b):

(94) *... [[more than others] [pleasant for you to discuss]].

But this string is not grammatical. That is, we need to posit an ungrammatical source sentence.

Before moving to the next filler-gap construction, let us consider which structures can be assigned for the *too* (and *enough*) constructions among those

given in (80). I propose that we should use structure (c), i.e. [[*too* Adj] VP] (and [[Adj *enough*] VP])[17], in view of examples like (90) and the following:

(95) This fence is [so much too much higher] than that one for me to even consider climbing it that it's simply incomprehensible to me that Mary would try to get me to do it. (Gazdar 1988: 77-8)

(96) a. John is [*either* very easy *or* too hard/clever] to deceive e.

b. Mary is [*neither* too hard/stubborn *nor* very easy] to get along with e.

In sentence (95), the Adj has multiple modifiers. By assuming the structures above, we can easily capture that the unit of the modifying phrases plus the Adj forms a constituent. The sentences in (96) show a good piece of evidence for the structures proposed. The conjuncts of a focused coordinate construction are always constituents (Arnold Zwicky, p.c.).

Next, let us observe sentence (76e) ([*easy person*]-type construction). The structure for this type of construction is as follows[18]:

---

[17] From a purely semantic point of view, [*too* + VP/NP[-NOM]] and [*enough* + VP/NP[-NOM]] seem to form constituents. In that case, we might need a special operation such as Right Wrapping in Categorial Grammar for the *too* construction. However, semantic constituency does not necessarily correlate with syntactic constituency.

[18] There are two more possible structures for this construction: [[Adj N] VP/NP] and [Adj [N VP/NP]]. However, these structures are not likely to be appropriate ones. The first structure says that the relation between *easy* and *person* is the same as an ordinary [Adj N] phrase such as *easy question*, where *easy* modifies *question*. But the *easy* in sentence (76e) and that here are different lexical items. The former has the gap-licencing property and the latter does not. Hence, if we do not have other mechanisms to distinguish these two lexical items (e.g. the LICENSOR feature to be introduced later), we cannot assume this structure. The second structure is the same as that for an infinitival relative. Under this structure, if (i) is ungrammatical, then (ii) should be as well because the infinitive relative is a modifier:

(i) *Robin is an easy man.

(ii) Robin is an easy man to argue with.

But sentence (ii) is perfect.

(97)

```
                        N¹
          ┌──────────┬──────────────┐
          A          N           VP/NP
          │          │        ┌─────────┐
        easy      person    to argue with e
```
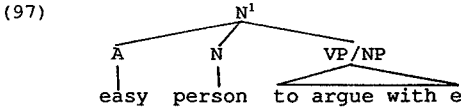
(98) $N^1 \rightarrow$ Adj[43], H[151], V^2/NP[-NOM]

Rule (98) has the same kind of problem as that for the *too* and *enough* construction rules. The construction which it is going to describe has nothing to do with the SUBCAT value of the H. The gap here is triggered by one of the Adjs in Adj[43], not by a N in H[151]. This is a serious problem since GKPS represents that a particular lexical item is the triggering element of the construction by the SUBCAT value of the head. Thus, the idea that some particular set of lexical items is responsible for the construction cannot be effectively implemented within the rule.

Finally, the tree structure of sentence (76f) (*take*-type construction) and the rule for it would be as follows:

(99)

```
                      VP
         ┌──────┬────────┬──────────────┐
         V      NP      NP            VP/NP
         │      │     ┌─────┐      ┌────────┐
       took   Mary  all day      to bake e
```
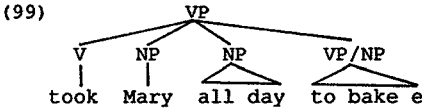
(100) $V^2 \rightarrow$ H[104], NP, NP, V^2/NP[-NOM]

There seem to be no special problems for this rule.

Thus far, we have seen that there are some difficulties with the formulation of rules for the constructions that we have observed in sec. 5.1.1 within the GKPS and related frameworks. The following set of data seems to raise a more difficult problem for these frameworks:

(101) a. John is too easy to make friends with.
     b. It is too easy to make friends with John.
     c. *John is too easy to make friends with him.
(102) a. John is easy enough to make friends with.
     b. It is easy enough to make friends with John.
     c. *John is easy enough to make friends with him.

There are two elements which trigger the unbounded filler-gap construction in both (101a) (*too* and *easy*) and (102a) (*easy* and *enough*).

In (101a), the *too* construction rules in (81) or (82) will apply under the GKPS analysis. That is, the sentence will be licensed by the *too* construction rule. However, it shows the characteristics of the *tough*-construction as we can see in (101b-c). Thus, I think, sentence (101a) should be characterized by the *tough*-construction rule (75). The situation is the same with sentence (102a). It can only be licensed by a *enough*-type construction rule because rule (75) cannot apply to it. Again, it shows the characteristics of the *tough*-construction.

Following the proposal made with reference to the sentences in (95-96), we will assume the structures below for the sentences in (101) and (102):

(103) a.

```
                    AP
        _____/ _____
       A¹                  VP/NP
      /  \          _____/|_____
    Adv   A       to make friends with e
     |    |
    too  easy
```

b.

```
                    AP
         _____/ _____
        A¹                 VP/NP
       /  \          _____/|_____
      A   Adv       to make friends with e
      |    |
    easy enough
```
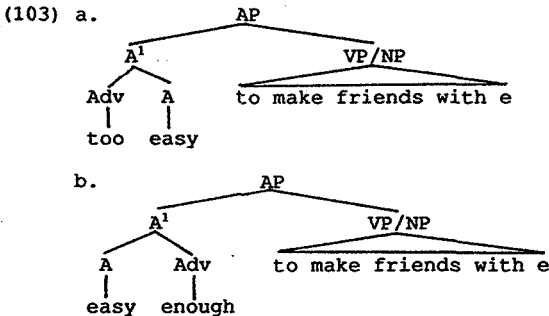
Here we are assuming the same structures as those for the *too/enough* constructions. Then, the issue is how we can account for the fact that the sentences here show the characteristics of the *tough*-constructions rather than the *too/enough* constructions. We will see in sec. 5.1.4 that our approach can handle this problem very naturally.

The most difficult problem with the rule-based approach of the GKPS framework is that it fails to express that the same lexical items in different constructions carry their gap-licensing properties with them. In sec. 5.1.1, we

have seen that the *tough*-construction and the [*easy person*]-type construction are licensed by the same Adjs:

(104) a. John is tough to argue with e.
b. John is a tough man to argue with e.

The lexical item *tough* is associated with both of these sentences, which are manifestations of different binder-gap constructions. It seems to be true that *tough* triggers both of these constructions. Otherwise, we cannot explain why the two constructions are related with the same Adjs. It would be very difficult for the GKPS framework to capture the relationship between the two constructions. Each· of the sentences in (104) is licensed by separate Immediate Dominance (ID) rules. Thus we would have to relate the two rules in some way or other. We can assume that sentences like (104b) can be handled by assuming extraposition:

(105) *John is [a [tough to argue with e] man].

However, this assumed source sentence is ungrammatical.

We have the following sets of sentences which show the same situation (Robert Levine, p.c.):

(106) a. Robin is too kind to take advantage of e.
b. Robin is too kind a person to take advantage of e.
c. Robin is too much of an unknown quantity to trust e.
(107) a. Robin is kind enough to take advantage of e.
b. Joe is a tall enough man to make the basketball team.
c. Robin is enough of a question mark to trust e.
(108) a. Robin isn't worth *(it) for you to talk to e.
b. Robin isn't worth (*it) talking to e.

Here we have eight distinct constructions, but the lexical item involved is the same and the gap is of the same kind in each set. Notice that all the occurrences of *too* in (106) induce exactly the same characteristics in all the three constructions: (i) a thematic relationship between the binder subject and the matrix predicate, (ii) allowance of a resumptive pronoun. The same is true

with *enough* in (107). The sentences in (108) are manifestations of two different constructions because we need the pleonastic *it* for the (a) construction but not for the (b) construction. Yet both have *worth* and both contain the same kind of gap, whose binder is the subject of *worth*.

5.1.3. Some Other Issues

In discussing the GPSG approaches in the previous section, we did not consider some of the important issues in *tough*-constructions. We will discuss three issues in this section. First, we will see whether or not there is syntactic connectivity between binder and gap (cf. Jacobson 1984). Second, we will consider the status of the {*for*-NP} string. In some approaches, it is assumed to be a higher PP, while in others, it is analyzed as a sequence of Comp and lower subject. The GPSG approaches assume syntactic connectivity between binder and gap, and analyze the {*for*-NP} string as Comp plus lower subject. Third, in many analyses, the [*for*-NP] phrase and the infinitival VP (with a gap) are assumed to be the complements of the *tough*-Adj. We have a more general way of analyzing these phrases in our approach. Notice that the last issue is separate from the second one because even though the {*for*-NP} string proves to be a higher PP, it can be regarded either as a complement or as something else.

When we criticize a particular option for each of the three issues, that criticism applies to all of the approaches which assume that option. A particular framework may not be subject to a certain criticism due to the role of other mechanisms employed, even though the framework assumes the criticized option. One thing that should be emphasized about the GPSG frameworks observed in the previous section is that the Control Agreement Principle (CAP) plays a central role. However, we do not adopt this principle, as we pointed out in sec. 4.4. The problem is that this single mechanism is supposed to account for several non-homogeneous phenomena: agreement,

control and binding (of gaps) (cf. Jacobson 1987a: 398-, and Miller 1991b: 43-4). We are assuming that only the agreement phenomena should be handled by such a principle.

5.1.3.1. The Binder-Gap Association

Analyses of the relation between the subject (i.e. the binder) and the gap in *tough*-constructions fall into two groups.

(109) This problem is easy to solve e.

The first group follows a "raising" tradition. These approaches, initiated by Postal (1971), give the same account for (109) as that for raising constructions. They are motivated by the observation that *tough*-Adjs do not seem to impose any semantic restrictions on the subject position. Bayer (1990) provides a categorial account using the mechanism of Function Composition, which gets the effect of raising without employing "movement." These raising approaches presuppose that there is syntactic connectivity between the subject and the gap. That is, the subject of the *tough*-construction is syntactically connected to the position of the gap.

However, it is not true that *tough*-Adjs have no semantic effect on its subjects, as we will see in sec. 8.2.1. In addition, there are other obvious problems of raising analyses, as far as the syntactic facts are concerned. Jacobson (1991: sec. 2.3.1) argues that the "Null Complement Anaphora" phenomena in *tough*-constructions constitutes strong counter-evidence to them:

(110) a. This rock is impossible for me to move, and that one
      is equally impossible e.
   b. This rock is hard for me to move, but that one is quite easy e.

The VP complement is deleted in each of the second conjucts. We can see the same phenomena in control constructions, but not in raising constructions:

(111) a. John is very eager to leave, but Bill is much less eager e.
   b. John is willing to serve on committees but Bill is not
      particularly willing e.

(112) a. *John is certain to win, but Mary is not certain e.
     b. *John is not likely to accept the offer, but Mary is most likely e.

Control Adjs as in (111) are subcategorized for the VP. Hence the deletion of this VP can be handled with an independently existing lexical process. We can posit a rule which derives a (output) lexical item with one or more fewer arguments than the input lexical item. However, we cannot posit this kind of lexical rule for raising Adjs as in (112). Here the VP itself is not an argument of the Adj, but the whole S containing the raised subject and the VP is (cf. Jacobson 1990, sec. 4). There is no indepently motivated rule for deleting a part of an argument. Under this circumstance, the fact that *tough*-Adjs undergo the argument dropping process is a strong argument for non-raising analyses of the constructions.

The second group of approaches for the treatment of the binder-gap relation can be characterized as non-raising analyses. These analyses assume that the *tough*-Adj subcategorizes for the infinitival VP with a gap. This group can be divided into two subgroups depending on whether syntactic connectivity is assumed or not between the binder and the gap. GKPS assumes connectivity, and Hukari & Levine (1987, 1991a) argue for this position. Jacobson (1991) argues that there is no syntactic connectivity, based on Jacobson (1984) and Dowty & Jacobson (1989). To account for the subject being the "understood" object of the infinitival VP, she adopts the "lexical entailment theory of control", developed in Chierchia (1984) and Dowty (1985) (cf. sec. 8.2.2).

The syntactic connectivity assumption presupposes that the syntactic specifications that are required in the gap position are the same as those in the subject position. The agreement facts in the following example seem to be an argument for this assumption (Jacobson 1991: (21)):

(113) That man is hard for me to persuade e to shave himself/*herself.

If we assume that agreement is a matter of syntax, we need some mechanisms

to ensure that the features of the reflexive match those of the gap, which in turn match those of the subject. Hence, we must assume that the subject and the gap are syntactically connected by way of feature matching. However, the agreement facts in (113) are not necessarily syntactic. Actually, Jacobson (1987a), and Dowty & Jacobson (1989) argue for semantic treatments of such agreement facts. If the agreement facts are semantic, we need not assume any feature matching mechanisms between the subject and gap in (113).

Another argument for syntactic connectivity comes from the fact that some idiom chunks can appear in *tough*-constructions (Berman 1973a: 261-2):

(114) a. Headway should be easy to make e in cases like this,
        but I've gotten nowhere.
    b. The hatchet is hard to bury e after long years of war.

We can get the idiomatic readings here, but these examples do not show that the relation should be syntactic. We can develop a semantic account (cf. Sag 1982; Wasow, Sag & Nunberg 1983), under the assumption, for example, that *headway* in (114a) has a special meaning which gives the idiomatic meaning of 'make headway' when it combines with the meaning of *make*.

Hukari & Levine (1991a) provide the following data as an argument for syntactic connectivity in *tough*- and similar constructions:

(115) a. I demand that you be/*are there on time.
    b. That you be/*are there on time is hard for me to demand e.

The requirement of the verb *demand* on its complement is preserved in the *tough*-construction (b). In response to this argument, Jacobson (1991: (59)) says that *demand* requiring a subjunctive complement is not a syntactic fact but a semantic one:

(116) I'm demanding something.
    It's that you be/*are there on time.

The requirement of *demand* is preserved across sentences, which is assumed to be a semantic phenomenon. However, the data in (116) does not necessarily

show that there is no syntactic connectivity between *demand* and its subjunctive complement, as is pointed out to me by Robert Levine (p.c.):

(117) a. The police charged Robin.
    I think it was [with breaking and entering].
  b. The police charged Robin.
    *I think it was [of breaking and entering].

There is a syntactic relation between the verb *charge* and its PP[*with*] complement, and thus the second sentence in (117b) is ungrammatical. The point is that both syntactic and semantic requirements carry over across sentences. What is relevant for our purpose is that (115) does not necessarily show that there is syntactic connectivity in the *tough*-construction.

Thus far we have looked at some possible arguments for syntactic connectivity between binder and gap in *tough*-constructions[19]. These arguments are not convincing because we have independently motivated semantic accounts for them. Now we will see difficulties with the syntactic

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[19] Hukari & Levine (1991a: 126-8) argue that the "Bordelois Paradigm" (cf. Lasnik & Fiengo 1974: 538) naturally follows from their system, which assumes syntactic connectivity:

(i) a. John$_i$ is too stubborn for us to argue with him$_i$/e$_i$.
  b. *John$_i$ is too stubborn to argue with him$_i$.
  c. John$_i$ is too stubborn to argue with e$_i$.

When there is a [*for*-NP] phrase as in (a), either a resumptive pronoun or a gap is allowed. A resumptive pronoun is not allowed when there is no [*for*-NP] phrase. Sentence (b) seems to be bad due to some pragmatic factors. Notice that its quality can be improved with emphatic material:

(ii) ??John is really/just too stubborn to argue with him.

To those who agree with the judgement in (ii), the ungrammaticality of (ib) would be pragmatic. For those who do not agree with it, we need a syntactic account of sentence (ib). As a syntactic account, we can assume that *too/enough* has [PP-VP(//NP) LICENSOR] or [VP//NP LICENSOR], under the approach we will develop in sec. 5.1.4. Notice that the NP gap is optional only when there is a PP as a part of the target.

connectivity assumption[20]. In sec. 3.1.1, we observed (backward searching) UDCs. If there is syntactic connectivity in the *tough*-construction between the subject and the gap in the VP, this construction should be classified as belonging to these UDCs. However, the *tough*-construction does not share important properties with them. Remember that there are three different types of the UDCs depending on whether they have only fillers, both fillers and binders, or only binders. Under the connectivity assumption, *tough*-constructions would belong to the first type because they have only fillers.

Now let us consider what would be peculiar about the *tough*- construction if we assumed syntactic connectivity. First, only binders occur in A-positions, while all the fillers occur in A'-positions in the three types of UDCs. Hence *tough*-constructions would be an exception to this generalization. Second, the

---

[20] It has been assumed that "major category mismatch" is one of the most important pieces of counter-evidence against syntactic connectivity (Dowty & Jacobson 1989, Jacobson 1991):

(i) a. *My theory captures that language is innate.
    b. ?*I dislike to win at poker.
    c. ?*I enjoy to swim in the pool.
(ii) a. That language is innate is hard for any theory to capture e.
    b. ?To win at poker is hard to imagine anyone disliking e.
    c. ?To swim in the pool is easy for me to enjoy e.

However, this phenomenon ("lifting") does not seem to be relevant for the issue of connectivity, as is argued in Hukari & Levine (1991a: 116-7). The same kind of category mismatch is observed in other cases when the complement concerned is separated from its head:

(iii) a. ?I count on, among other things, that you are trustworthy.
    b. ?My theory captures, and your theory proves, that language is innate.
    c. ?That language is innate, no theory can capture e.

In (a) a preposition can take a *that*-clause. Right Node Raising (cf. sec. 5.2.2) and Topicalization (cf. Dowty & Jacobson 1989) constructions show the same kind of mismatch. It does not seem to be reasonable to assume only a semantic relation between a head and its complement in these constructions.

UDCs of the first type allow several categories to be their fillers. This is not the case with *tough*-constructions. Notice that binders have fixed categories depending on the A-position where they are located. Third, we observed that fillers cannot be separated from the founder of the gap, but the "fillers" of *tough*-constructions are separated from it. Binders, on the other hand, can be separated from it. All these properties of *tough*-constructions tell us that their subjects are likely to be binders rather than fillers. Of course, it is possible to construct a rule without considering these special properties, as in GKPS. However, if we cannot provide independent reasons for these exceptions, the rule would simply be a stipulation. If we assume that there is no syntactic connectivity, everything becomes evident. All the properties are just what we expect because the subject is a binder rather than a filler under this assumption.

Let us consider some other issues pertaining to the connectivity assumption. First, we need to account for the fact that there is a case mismatch between the binder and the gap. Assuming connectivity, we must posit special mechanisms to tolerate this mismatch (cf. Hukari & Levine 1991a). Special mechanisms are necessary if they characterize the special properties of particular constructions. Remember that constructions are unique meaningful syntactic patterns (sec. 2.1). This uniqueness allows a construction to have a special mechanism. However, some special mechanisms are very "costly" if they are meant to account for a marginal property of a construction or to remedy a defect of some other mechanisms. The construction feature PAS in Zwicky (1987b) and the various LICENSOR features in this dissertation are introduced to characterize constructions.

Second, the binder can be chosen by pragmatic factors when there is no explit subject of the *tough*-Adj:

(118) a. Being easy to please e, I like Mary very much.
   b. Being so easy to please e, John's enemies are ready to
      take advantage of that.

In wh-constructions, which have syntactic connectivity, it is never the case that a gap is bound by an element outside of the clause. The gap is always bound by the "displaced" element from the gap. In *tough*-constructions, the gap is always bound by the controller of the Adj (when there is no subject) regardless of whether it is provided by pragmatic factors or by lexical items:

(119) a. John promised Mary to be easy to please e.
      b. John persuaded Mary to be easy to please e.

To account for the facts in (118) and (119), we need to employ some other mechanisms to use pragmatic information in syntax under the connectivity assumption.

The system of GKPS and Hukari & Levine (1987, 1991a) does not have this problem because the Control Agreement Principle (CAP) is constructed so that the binder of the gap becomes the same as the controller of the higher predicate. Here, connectivity is mediated through the AGR feature, which can take its value from pragmatics. However, without the CAP we would still have the problem. Remember that we do not adopt this principle because it deals with non-homogenious phenomena.

Third, *tough*-constructions do not show the weak crossover effect (Jones 1990a: 324, 328):

(120) a. $John_i$ should be easy for his_i mother [to talk to e_i].
      b. $John_i$'s too old/old enough (for us) [to talk to his_i mother about e_i].
(121) a. *This is a guy [for his_i mother to talk to e_i].
      b. *This is a guy [$whom_i$ [his_i mother cannot talk to e_i]]

In (120) there is a co-referentical pronoun in between an assumed filler and the gap. Such a pronoun is not allowed in sentences (121), which contain (implicit) fillers. Notice that the weak crossover effect is present in "movement" constructions, which show syntactic connectivity.

Fourth, it is a well-known fact that only categories of the same type can be conjoined. For example, if a conjunct contains a gap, the other conjunct should also have one to be a grammatical coordinate construction (GKPS, p. 177):

(122) a. The doctor who [Kim worked for e] and [Sandy relied on e] died.
b. *The doctor who [Kim worked for e] and Sandy [relied on Lee] died.

In (a) both conjuncts contain gaps, but only the first conjunct contains a gap in (b). This "Across-the-Board" phenomenon is not at work with *tough*- and similar constructions:

(123) a. John is [handsome] and [easy to understand e].
b. Mary is [beautiful] but [too arrogant to talk to e].
(Carl Pollard, p.c)

In the system of GKPS and Hukari & Levine (1987, 1991a), the two conjuncts in these examples have the same (syntactic) features because the AGR feature is used to deal with both subject-predicate agreement and binding of the gap. This is achieved by the CAP.

However, if we assume that agreement and binding should be handled with different mechanisms, there would be a problem with the connectivity assumption. In the sentences of (123), the first conjunct is an AP with no feature related to the gap. Hence, the second conjunct should not have such a feature, either. This means that the feature responsible for the interpretation of the gap in the second conjunct must be "discharged" before it combines with the first conjunct. However, the discharge at this stage is impossible if we assume syntactic connectivity. The feature can only be discharged when the [be + coordinate AP] combines with the subject to ensure syntactic connectivity. We cannot escape from this problem by assuming a special gap for the *tough*-constructions. What induces the Across-the-Board constraint is the existence of a gap rather than a special property of a subset of gaps.

From the observations in this section, we can conclude, first, that a non-raising approach is necessary for the syntactic analysis of *tough*- and similar constructions. We have seen problems of raising analyses. Second, there seems to be no syntactic connectivity between the binder and the gap. We

have discussed seven issues to be considered to determine whether there is syntactic connectivity or not. All these issues require special explanations under the connectivity assumption, but all of them follow naturally if we assume that there is no syntactic connectivity. The subject of the *tough*-construction does not behave like a (syntactic) filler. Merely constructing rules to avoid all these issues would not be acceptable. Such rules would simply be arbitrary stipulations. Until we find sufficient evidence to overcome the difficulties of the connectivity assumption, we will assume that there is no syntactic connectivity. Therefore, we need to develop a non-raising approach which assumes only a semantic connection between binder and gap.

5.1.3.2. The Status of {*for* NP}: PP or Comp+Subj?

Now, let us examine the status of the underlined string in sentences of the following:

(124) This book is easy <u>for Kim</u> to understand e.

This string has been assumed to be a PP of the matrix predicate since Bresnan (1971) (Berman 1973a, Lasnik & Fiengo 1974, Nanni 1978, Jacobson 1991). However, GKPS and Hukari & Levine (1991b) argue that *for* is a Comp and the following NP is the subject of the lower clause. In this section, we will examine arguments for each of these positions and will conclude that both/neither of these two approaches are correct.

Let us examine arguments for the PP analysis. First, the {*for*-NP} string can also appear in S-initial position and S-final position (Chomsky 1973):

(125) a. For Kim, this book is easy to understand e.
b. This book is easy to understand e, for Kim.

Before we go on, notice that these sentences are ambiguous depending on the role of the {*for*-NP} string. The string can have the function of a sentence adverbial. In this case, it represents, among other things, the point of view of the NP in it. It can also have the meaning of an expreiencer of the *tough*-Adj.

Only the second reading is relevant for the discussion here. The issue is to identify the status of the string with the experiencer reading not with the sentence adverbial reading.

Robert Levine (p.c.) pointed out to me that the paradigm containing the sentences in (124-5) is not complete. We should consider the following sentences as well:

(126) a. This book, for Kim, is easy to understand e.
b. This book is, for Kim, easy to understand e.

Then the distribution of {*for*-NP} is the same as that of sentence adverbials rather than that of topicalized elements. This distribution is exactly what is expected for the sentence adverbial reading of the string. The data in (126) would be problematic for the PP analysis under the experiencer reading because pure complements do not show the mobility shown in (125-6). However, the data are troublesome only with a PP analysis which assumes that this PP is a complement of the *tough*-Adj. They do not pose any problem for a PP analysis which assumes that this PP is a modifier of an Adj(P), as we do (cf. sec. 5.1.3.3). Notice that other PP modifiers of Adjs show the same pattern of distribution as {*for*-NP} in (124-6) (Arnold Zwicky, p.c.):

(127) a. Chris is known in Chicago for her cooking.
b. In Chicago, Chris is known for her cooking.
c. Chris, in Chicago, is known for her cooking.
d. Chris is, in Chicago, known for her cooking.
e. Chris is known for her cooking, in Chicago.

The PP modifier *in Chicago* is not a sentence adverbial but an Adj modifier. Notice that all the other sentences except sentence (a) require a special prosody just as all the sentences in (125-6) require a special prodosy. Thus, the distribution represented in (126) is not a unique property of sentence adverbials.

Turing to the main point, if we assume that the {*for*-NP} string is Comp plus subject, the mobility represented in (125) would be impossible because it

is not a constituent. Based on this fact, Hukari & Levine (1991b: (25)) argue that the S-initial and S-final *for Kim* are actually PPs but they are different from the string in (124)[21]. They are assumed to be sentence adverbials. Then the task is to account for the fact that the PP in the sentences of (125) has the experiencer reading of the *tough*-Adj. Robert Levine (p.c.) said that the adverbial reading is more salient than the experiencer reading in these sentences and that the latter reading can be derived from the former reading by pragmatic factors. His argument is based on the fact that the PP in sentences like the following has the reading of the speaker's judgment, which is "derived" from the viewpoint reading:

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[21] According to Robert Levine (p.c.), French and Caribbean English Creole "*tough*-constructions" provide evidence for the assumption:

(i) a. *Ce livre est facile *pour Jean-Jacques* a lire.
   'This book is easy for Jean-Jacques to read.'
   b. *Pour Jean-Jacques*, ce levre est facile a lire.
(ii) a. Savi haad *fu i (*am)* fuul. (Winford 1992: 342)
   'Savi's hard for her/him to fool.'
   b. i iizi *fu am (*i)* fu fiks di kyar. (Winford 1992: 335)
   'It's easy for him to fix the car.'

First, as we can see from the French data in (i) (Kayne 1975: 340), the PP *pour Jean-Jacques* cannot occur after the *tough*-Adj while it can occur in sentence-initial position. The Caribbean English Creole example in (iia) shows that *(fu) i* in the *tough*-construction is the subject of the lower clause, unlike in the pleonastic construction in (iib). Notice that *i* is a nominative form and *am* is an accusative form of a third person pronoun.

However, we must carefully examine whether the *pour Jean-Jacaues* in (ia) and the *fu i* in (iia) (are supposed to) have the experiencer reading of the *tough*-Adj or not. If these phrases (are supposed to) have only the lower subject reading, the ungrammaticality of (ia) and the case selection in (iia) are just what is expected. Sentence (ia) would be ungrammatical because *pour* is not a Comp in French. In (iia) a nominative pronoun would be required after *fu* because it is a subject. More importantly, even though the phrases have an experiencer reading as well as a lower subject reading, the facts in these languages are not necessarily the same as those in English.

(128) Someone in your situation could benefit from approaching Leslie,
      but for ROBIN, Leslie wouldn't be worth bothering with.

This shows, according to Levine, that "the sentence adverb (i.e. *for Robin*)[22] can serve to fix the value of one of the terms in the relation denoted by the Adj which does not correspond to a constituent of the AP itself".

I agree with Robert Levine that the speaker's judgment reading can be derived from the viewpoint reading by pragmatic factors. However, I do not think the experiencer reading can be derived from the viewpoint reading by pragmatic factors, at least in English (cf. footnote 21). First, the experiencer reading is far more salient than the viewpoint reading in the following sentence:

(129) For whom is this book easy to understand e?

The viewpoint reading seems to become salient when a specific name is mentioned sentence-initially in declarative sentences. Second, when an element is topicalized, the element is most likely to be associated with extra implications according to general pragmatic principles. It does not seem to be very common that a reading as specific as the experiencer reading can be derivable from other readings.

Third, if the experiencer reading is derived from the sentence adverbial reading, it is unclear why the reading should always be an experiencer reading rather than some other readings (e.g. a benefective reading). The experiencer reading can only be guaranteed when the *tough*-Adj has an (implicit)

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[22] Hukari & Levine (1991b: (25)) argue that *for John* in the following sentences is a sentence adverbial:

(i) a. For John, Mary isn't worth talking to (about himself).
   b. Mary isn't worth talking to, for John.
   c. *Mary isn't worth for John talking to (about himself).

If we assumed that *for John* in (c) is a higher PP there would be no reason for the sentence to be ungrammatical. But cf. Jacobson (1991: 8).

experiencer argument, as is assumed in the approach of Hukari & Levine (1991b). The question is to discover what kind of argument this is. If it is a syntactic argument, it is never realized phonetically. That is, it does not have any syntactic correlation at all. Even though it may be necessary to posit a semantics-only argument, it does not have its own meaning of experiencer. Its meaning is always filled in by pragmatics. I am not sure we can posit a pragmatic argument for a predicate. In view of the *"tough-*constructions" in other languages such as French and Caribbean English Creole (cf. footnote 21), we might need to assume an argument like the one in Hukari & Levine (1991b). However, it is clear that we do not have many cases, if any, which require positing such arguments.

As for the second argument in favor of the PP analysis, there are some semantic constraints on {*for*-NP} (Bresnan 1971). Roughly speaking, the NP here must be "animate" just like a normal dative NP (Nanni 1978: 21-2) or "something with certain abilities" (Jacobson 1991: 9). Hence, dummies or inanimate elements cannot occur in the NP position[23]:

(130) a. *This park would be easy for there to be a riot in e.
　　　b. *Bill would be easy for it to bother e that Mary left.
　　　c. *John would be interesting for that story to frighten e.

These selectional restrictions on the phrase seem to be imposed by the *tough-*Adjs.

The restrictions in (130) can be easily stated if the string concerned is a higher PP, but we need special mechanisms to ensure this fact if the string is Comp plus subject. As a possible option, we can argue that the NP is the subject of the lower clause syntactically but it also functions as the semantic

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[23] Robert Levine (p.c.) pointed out to me that the grammaticality judgments in such sentences as (130a) are not universal.

argument of the Adj[24]. A difficulty with this approach is that we need information about the internal structure of a lower clause. Jacobson (1991: 9) argues that it is impossible to construct a meaning postulate to make the lower subject to be interpreted as the argument of the Adj:

(131) a. John is easy for Mary to show that picture to e.
      b. ?* John is easy for that picture to be shown to e by Mary.

The Adj *easy* takes as one argument the denotation of *for Mary to show that picture to* under the Comp plus subject assumption. The constituent *for that picture to be shown to by Mary* has the same denotation. This means that we need the information about the syntactic structure of an argument when we write the relevant meaning postulate. However, this is impossible because meaning potulates can only impose constraints on the set of denotations of the arguments concerned. One might argue that (131b) is ungrammatical because the gap is in a passive VP (cf. sec. 5.1.1.1). This fact does not lead to ungrammatical sentences, as we can see in (21-2b). Notice that another source of ungrammaticality is the occurrence of *for that picture*, which cannot be a legitimate experiencer. There is no way to tell that this phrase is the experiencer argument of the higher clause, which would make it possible to rule out sentence (131b), without referring to the syntactic structure.

In a later version of Hukari & Levine (1991b), they provide a pragmatic account of how the experiencer reading is obtained based on the subject of the lower clause:

(132) a. [For Robin to do something like that] would be incredibly rude.
      b. Robin was easy [for Leslie to please e].

They argue that "the problem of ensuring identity between the subject of the embedded clause in sentence (b) and the NP argument of the adjectival functor

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[24] The position here is actually proposed by Hukari & Levine (1991b). They discarded this position and proposed a pragmatic account in a later version of the paper, as we will see shortly.

easy" is the same as that of ensuring that Robin is predicated of rudeness in sentence (a). Notice that the semantic constraints on the {*for*-NP} string (cf. (130)) can be stated with reference to the NP argument of the *tough*-Adj assumed here. As mentioned above, however, this argument has no syntactic correlation and gets its value only from pragmatics. We would not have this problem if we assumed that it is the syntactic complement of the Adj. Notice that in the following sentence, *for Mary* is the complement of the higher Adj:

(133) a. It is unpleasant *for Mary* for John to go out with Susy.
b. This book is easy *for Mary*.

It is true that *unpleasant* in (a) is not a *tough*-Adj. However, we need to account for the relation between the *unpleasant* here and that in a *tough*-construction. The *easy* in (b) has largely the same properties as that in a *tough*-construction. Then the two *easy*'s would have very different complement structures regarding the status of *for Mary* under the Comp plus subject approach.

Furthermore, there are important differences between (132a) and (132b). First, the Adj *rude* can have an explicit PP argument[25]:

(134) a. ??For Robin to do something like that would be incredibly rude of her.
b. ?For Robin to do something like that would be incredibly rude of her mother.
c. ?To do something like that would be extraordinarily rude of Robin.
d. It would be incredibly rude of Robin to do something like that.

Hence, in sentence (132a), what we can get from pragmatic factors fills in the role that is required by the PP[*of*] complement. There is no case where the experiencer argument of the *tough*-Adj is syntactically realized under the Comp plus subject analysis. Second, in sentence (132b), the experiencer of easiness

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[25] Sentence (134a) is a little awkward because a redundant element (i.e. *of her*) is added. To interpret sentence (b), we need a special context such as will be given just below. Sentence (c) involves a backward control.

and the lower subject must be the same, as we observed in sec. 5.1.1.1. However, the rudeness can be predicated of someone else even in sentence (132a), for some people. For example, in a society where a mother is blamed for whatever "wrong-doings" of her children and only rude mothers let their children do what is described in the sentence, we can use this sentence to blame the rudeness on Robin's mother. This difference shows that pragmatic factors are responsible for the identity in (132a) but some syntactic/semantic factors are responsible for the identity in (132b).

Thus far, we have observed some arguments for the higher PP analysis of the {for-NP} string. However, there are important pieces of evidence which show that the string is an element of the lower clause. This seems to be an argument for the Comp analyses[26]. First, there are some *tough*-sentences where the string does not bear any (thematic) relation to the Adj:

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[26] First, Jacobson (1991: 16) notices a contrast between sentences in (i) and those in (ii):

(i) a. ?This rock is impossible for me to move, and that one is
        impossible for John.
   b. ?This rock is hard for me to move, but that one is easy for John.
(ii) a. This rock is impossible for me to move, and that one is
        equally impossible.
    b. This rock is hard for me to move, but that one is quite easy.

In (i) only VP//NP is deleted in the second conjunct. But in (ii) both PP and VP//NP are deleted. The fact that the sentences in (ii) are more natural than those in (i) implies that PP-VP//NP is a unit of some sort.

Second, the following example can be used to argue for the subject analysis of the {for-NP} string, depending on one's theory of conditions on reflexivization:

(iii) That little mirror will be hard for Mary$_i$ to get a good
     look at herself$_i$ in e. (Jones 1991: 225)

(135) a. The Titanic is impossible/easy/hard/tough for any
iceberg to sink e. (Berman 1973a: 305)
   b. This boulder would be difficult for even a bulldozer to move.
(David Dowty, p.c.)
(136) a. ??The slick surface was really hard for the paste to stick to e.
   b. ??That amount of liquid was tough for the pitcher to hold e.

Usually the string cannot be inanimate, but the sentences in (135) seem to be perfect. The sentences in (136) are not very bad either even though they are assumed to be ungrammatical in Nanni (1978: 21). The fact that the string has only the function of the lower subject in these sentences can be accounted for more readily in a lower subject analysis than a higher PP analysis.

Second, there are examples where a parasitic gap occurs in the NP of the phrase concerned (Jones 1990a, Hukari & Levine 1991b: (41)):

(137) a. ??These books are hard for reviewers of e to praise e sincerely.
   b. ??These books were tough for critics of e to praise e sincerely.
   c. ??John would be hard for friends of e to admire e.
   d. ??This should be easy for advocates of e to build a case for e.
   e. ??John's too old/old enough for friends of e to trust e.

Even though grammaticality judgments on these examples are not consistent (from OK to ??/*)[27], I think they are grammatical but a little awkward. There is an independent reason for this awkwardness as Arnold Zwicky (p.c.) pointed out to me. They are not perfect because the parasitic gap precedes the real gap. When the real gap occurs before the parasitic gap, the sentence becomes perfect:

(138) a. John is hard to talk to e without getting mad at e.
   b. John is too stubborn to talk to e without getting mad at e.

The advocates of the higher PP analysis might argue that the awkwardness

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[27] Sentence (137a) is marked with ??/* in Hukari & Levine (1986: 243). Sentences (137b) and (137c) are assumed to be OK in Hukari & Levine (1991b: (41)) and Jacobson (1991: fn. 5), respectively. Sentences (137d-e) are marked with double question marks (??) in Jones (1990a).

arises because the parasitic gap is in the element of a higher clause. However, this argument does not hold because we can see the same awkwardness in infinitival relatives (Jones 1990a: 323):

(139) ??This is a law for advocates of e to build a case for e.

The *for*-phrase here is definitely an element of the lower clause subject. Ironically, Jones (1990a) also wants to use the awkwardness of such examples as (137) as evidence for his position that there is no syntactic subject in the gapped VP of *tough-* and similar constructions. However, his argument is not valid due to the infinitival relative examples and the independent reason for the awkwardness.

The grammaticality of the sentences in (137) is a serious problem for the higher PP analysis because the PP is outside the "gap domain" (cf. Jacobson 1991, fn. 5). That is, a parasitic gap cannot be licensed when it is outside of the "founder" of the (real) gap. The founder of the gap is the highest node which has a gap licensed by some grammatical mechanisms. (Jacobson 1984). There is no problem with the Comp analysis because the parasitic gap is within the founder of the gap, i.e. within the lower clause which has a gap licensed by the Adj. However, this does not necessarily mean that the parasitic gap examples support the Comp analysis. They only show that the {*for*-NP} is an element of a lower clause. This string can still be a PP even though it is an element of the lower clause. I will argue that the parasitic gap examples do not show that *for* is a Comp and the NP is the lower subject. It simply shows that [*for*-NP] should be a phrase of the lower clause.

Now the issue is whether the {*for*-NP} string in *tough*-constructions functions as a lower subject PP or a Comp plus lower subject NP. In general, the {*for*-NP} in a subordinate clause has the properties of both a PP and a Comp + subject in infinitival clauses:

(140) a. They intend [for him to be put on probation].
　　　 b. There is a book [for me to read e].

As properties of PP, we can, first, notice that the NP has an accusative case marker. The subject of a clause that occurs after a typical Comp has nominative case. One can assume that the nominative case of the subject is due to the finiteness of the clause. This assumption requires an explanation. But it is undeniable that Ps take accusative NPs.

Second, sentential adverbs may intervene a Comp and its sister S (Emonds 1985: (42)):

(141) a. I realized that obviously/soon John would rob the bank.
b. They suggest that initially he be put on probation.

However, we can never put these adverbs after *for*:

(142) a. *There is a book for soon me to read e.
b. *They intend for initially him to be put on probation.

This seems to be a property of a PP rather than a Comp + subject[28]. If we assume that *for* is a P, the reason for the ungrammaticality of the sentences in (142) becomes obvious. No sentence adverbials can intervene between a P and its NP complement.

The *for* in (140) has also the properties of a Comp, at least in infinitival relatives (Emonds 1985: (46-47)):

(143) a. They should list the topics (for students) to write on e
in the syllabus.
b. They should list the topics about which to write e in
the syllabus.
(144) *They should list the topics about which for Mary to write e.

The ungrammaticality of (144) can be easily accounted for by a "Doubly-filled Comp" Constraint if we assume that *for* is a Comp. Observe the following examples (Joyce Powers, p.c.):

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[28] What is relevant for the restriction in (142) might be that infinitive clauses in general do not support pre-subject adverbials (Robert Levine, p.c.). Under this assumption, we need to provide an answer for the question why pre-subject adverbials are not allowed in infinitives.

(145) a. topics that I have written about e.
   b. *topics about which that I have written e.
   c. *topics which that I have written about e.

Turning to our main concern, the {for-NP} string in *tough*-constructions has the PP properties observed above. The NP has an accusative case marker, and sentential adverbs cannot be inserted between *for* and the following NP:

(146) a. *The bank is easy for obviously/soon John to rob e.
   b. *This bank is impossible for initially John to choose e.

We do not have any evidence for the Comp-hood of *for*. The "Doubly-filled Comp" fact in (144) does not appear here because no wh-phrases, including pied-piped phrases (cf. (69-70)), are allowed to occur before *for*. Hence, we will assume that the {for-NP} string in *tough*-constructions is a simple subject PP[29]. Remember that we argued above that the string is a higher PP, which presupposes that it is a constituent.

In this section, we have observed that {for-NP} behaves as a higher PP in some respects but it behaves as a lower subject PP in other respects. Hence, neither the higher PP analysis nor the Comp analysis can account for all the properties of the phrase. Moreover, there are other phenomena which cause problems for both accounts. First, *tough*-constructions do not allow double *for*-phrases (No Double [*for*-NP] Condition), unlike corresponding constructions

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[29] We have some evidence for the PP-hood of the {for-NP} string, though it is not conclusive:

(i) a. John is hard for his mother to reason with e, but he is
      rather easy for his father.
   b. ??The principal is eager for me to graduate, but he is not for Mary.
(ii) a. This book is easy for me.
   b. *The principal is eager for me.

The (a) sentences are grammatical but the (b) sentences are not perfect. These data show that the {for-NP} in *tough*-constructions are different from that in other constructions.

with expletive *it*, as we observed in sec. 5.1.1.1:

(147) It is unpleasant for Mary for John to go out with Susy.
(148) a. *Susy is unpleasant for Mary for John to go out with.
      b. *Susy is unpleasant for John to go out with, for Mary.
      c. *For Mary, Susy is unpleasant for John to go out with.

To account for the fact in (148), the higher PP analysis must posit an extra constraint. We might say that the VP complement of the *tough*-Adj cannot have a subject. This constraint would not work due to the following examples (repeated from (135)):

(149) a. The Titanic is impossible [for any iceberg to sink e].
      b. This boulder would be difficult [for even a bulldozer to move].

In these sentences, the [*for*-NP] phrase functions as the subject of the lower clause rather than the experiencer of the higher clause. One might argue that a semantic constraint, which says that the experiencer should be the same as the lower subject, will block the sentences in (148). We still need to account for the ungrammaticality of the following expressions:

(150) a. *Susy is unpleasant for Mary$_i$ for her$_i$ to go out with.
      b. *For Mary$_i$, Susy is unpleasant for her$_i$ to go out with.
      c. *Susy is unpleasant for her$_i$ to go out with, for Mary$_i$.

Even though there is such a semantic constraint, we still need a syntactic constraint.

To account for (148), a Comp analysis must posit a constraint that there cannot be an experiencer PP in the higher clause when there is a subject in the lower clause. A constraint of this sort would not be possible to construct because we need information about the internal structure of the VP to regulate the existence of the higher experiencer PP. Of course, this kind of constraint would not be necessary if the following assumptions (of GKPS and Hukari & Levine 1987, 1991a) are correct. First, there is no syntactic PP complement of the *tough*-Adj. Second, the experiencer reading of the Adj is provided by the lower subject or by the sentence adverbial based on pragmatic factors. Under this

approach, sentence (148a) is ungrammatical because it has an unlicensed PP by the *tough*-rule (i.e. *for Mary*). The sentences in (148b-c) are ungrammatical because the experiencer role of the Adj is given to two different phrases (i.e. *John* and *Mary*). The very fact that two different mechanisms (one syntactic and one pragmatic) must be used to rule out what seems to be a homogeneous phenomenon weakens the credibility of the theory. Furthermore, we observed above that the assumptions involved are not well-motivated.

Second, even with the syntactic constraint needed for the data in (148), we still need a semantic or pragmatic constraint to account for the fact that the [*for*-NP] phrase is an experiencer and at the same time the subject of the lower clause. In other words, when a [*for*-NP] appears, the complement subject cannot receive an unspecified reading (Nanni 1978: 81):

(151) This book is easy for me to read e.

Here *for me* is the experiencer of 'easiness' and the subject of *read*.

With the higher PP analysis, we need to assume that the PP is always interpreted as the subject of the lower VP semantically. This is done by lexical entailments of the *tough*-Adj in Jacobson's (1991) system, which turns out to be wrong (cf. sec. 8.2). With the Comp analysis, we need to stipulate that the lower subject is always interpreted as the experiencer of the higher clause. This would be very difficult to do with semantic mechanisms because we need to refer to the syntactic subject of the lower clause, just as the case of imposing a semantic constraint on the PP. We can resort to pragmatic mechanisms as in a later version of Hukari & Levine (1991b). In this system, as we observed before, the *tough*-Adj has different syntactic and semantic argument structures. The semantic argument structure has a variable for the experiencer, but the value of this variable can only be provided by pragmatic information. Then the questions are, first, whether there can be any semantic argument which has no syntactic correlation at all. Second, whether there can be any semantic argument whose value is always fixed by pragmatic factors.

We might need such a system, as was suggested with reference to French and Caribbean English Creole "*tough*-constructions". However, if alternative approaches are possible which do not confront these questions, they would be preferred.

Based on the observations in this section, we will assume that the [*for*-NP] is a higher PP and at the same time is the subject of the lower clause.

5.1.3.3. [*for*-NP] and [VP//NP]: Complements or Not?

In the previous sections we came to the conclusion, first, that the *tough*-Adj is not a raising predicate. It is not subcategorized for a whole clause containing the "displaced" subject NP. The gapped VP (which is represented as VP//NP here, cf. sec. 5.1.4) bears a direct relation with the Adj, and there is no syntactic connectivity between binder and gap. Second, the [*for*-NP] should be (partly) an element of the higher clause. That is, this phrase and VP//NP are sisters. The last issue to be considered is whether or not these phrases are arguments/complements of the Adj.

In the tradition of non-raising analyses, the PP and VP//NP are treated as the complements of the *tough*-Adj (Bresnan 1971, Lasnik & Fiengo 1974, Chomsky 1977, Fodor 1983, Jacobson 1984, Jacobson 1991, Pollard and Sag 1992). Under this subcategorization approach, the relevant structure would be:

(152)

```
              AP
         ___/ |  \___
       A     PP     VP//NP
```
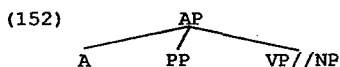
In this structure the *tough*-Adj together with its two complements forms a constituent.

However, Nanni (1978, 1980) and Jones (1991) argue for a non-subcategorizational approach. Nanni's basic idea is that there are some differences between [*for*-NP] and VP//NP in the *tough*-constructions, and

standard examples of subcategorized elements in other constructions[30]. First, the following sentences,

(153) a. ?[How easy for the kids to tease e] was that fellow with a red hat?
    b. ?[How hard to let Bill wear e] was the coat which were
        found near the garbage can?

are not as natural as those involving standard complements (Nanni 1978: 10; 1980: 573):

(154) a. The teacher was [concerned about her student].
    b. John is [suspicious of his wife].
    c. The tourists were [eager to examine the ruins].
(155) a. [How concerned about her student] was the teacher?
    b. [How suspicious of his wife] is John?
    c. [How eager to examine the ruins] were the tourists?

The sentences in (155) are perfect even though the displaced elements are rather "heavy". There is no awkwardness as in (153).

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[30] One of Nanni's (1978, 1980) arguments for a non-subcategorizational approach is based on the assumption that the Adj + VP//NP sequence does not behave as a constituent when a [for-NP] intervenes or the Adj is followed by more than one VP//NP (1980: 572-3):

(i) a. *How easy [for the children to tease e] is John?
    b. *How difficult [to persuade Bill to wear e] was the coat?

We do not agree with the grammaticality judgments here. Those sentences are not ungrammatical (some people say (ia) is just fine) and their quality can be improved, as we can see in (153). We can assume that some pragmatic/processing factors are responsible for the awkwardness of the sentences in (i) (cf. Jones 1991: 157, fn. 9). Furthermore, as we can see in the following examples,

(ii) a. [Hard for the children to tease e] though John was,
        they followed him wherever he went.
    b. [Hard to convince e to leave] though she probably will be, Robin should
        still be invited to the party. (Robert Levine, p.c.)

The unit of the Adj plus multiple VP//NPs and the unit of the Adj plus [for-NP]-VP//NP form constituents.

Second, we can see the same kind of contrast when a modifier is added[31]:

(156) a. ??How easy to quickly clean was the room?
      b. ?[How easy to clean with only a dust mop] was the room?
(157) a. [How concerned about her lazy students] was the teacher?
      b. [How eager to thoroughly examine the ruins] were the tourists?

The sentences in (157) are natural, but those in (156) are not perfect even though they are not ungrammatical.

Third, the [for-NP] phrase in *tough*-constructions is more easily displaced from its source than a standard complement (Nanni 1978: 25)[32]:

(158) a. For Brando, the part was easy.
      b. For me, the puzzle was difficult.
(159) a. For me, this book is easy to understand e.
      b. This book is easy to understand e, for me.
(160) a. ?About her student, the teacher was concerned.
      b. ?Of his wife, John is suspicious.

All these examples indicate that the unit of a *tough*-Adj with the [for-NP] and/or VP//NP is less tightly bound than standard head-complement units. Remember that we reject the assumption that the [for-NP] phrase in (158-9) is a sentence adverbial even when it has an experiencer reading.

Jones (1991: 156-7) argues for the non-subcategorization approach in terms of a generalization with other *tough*-like constructions. In the *breeze*-type constructions (cf. sec. 5.1.1.2), the Ns concerned must occur in indefinite NPs:

(161) a. John is a bitch [to work for e].
      b. *John is that bitch [to work for e].
      c. Those guys are bitches [to work for e].
      d. *Those guys are the bitches [to work for e].

His argument is that "if the possibility of the *tough* construction (i.e. the

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[31] Sentence (156a) is regarded as ungrammatical in Nanni (1980: 577), but it does not seem to be totally ungrammatical as we can see in (156b).

[32] The structure in (158) and regular *tough*-constructions have the same characteristics except that the latter has a gapped VP (Nanni 1978: 69).

breeze-type construction here) depends on the definiteness of the NP, then the *tough* construction cannot be simply subcategorized by its N". What is relevant for the construction is the whole NP rather than the N itself. If this were a general property, what is relevant for *tough*-constructions would be *tough*-APs rather than *tough*-As.

We have other pieces of evidence for the non-complementhood of the [*for*-NP] and VP//NP phrases. First, observe the following sentences:

(162) John is [too hard to deceive e].
(163) a. John is [*either* very easy *or* too hard] to deceive e.
　　　b. Mary is [*neither* too hard *nor* very easy] to get along with e.

Sentence (162) has the characteristics of the *tough*-construction rather than those of the *too* construction (cf. sec. 5.1.2). The sentences in (163) show that *too hard* forms a constituent (cf. (96)). In addition, the degree modifier *too* has the property of closing an AP just as a determiner has the property of closing an NP (cf. GKPS, p. 122). From these observations, we can conclude that a *tough*-Adj with its modifier *too(/enough)* forms an Adj phrase rather than simply a zero-bar Adj. This fact is not compatible with the subcategorization hypothesis because only a zero-bar category is subcategorized for its complements.

Second, the subcategorization approach cannot be easily extended to the constructions observed in sec. 5.1.1.2, especially to the *too/enough* constructions[33]:

(164) a. John is [too nasty] to make friends with e.
　　　b. Dana is [tall enough] for us to recognize e.

The constructions here require a VP//NP because of the presence of *too/enough*

---

[33] The system in Hukari & Levine (1987, 1991a), which is based on the subcategorization assumption, does not have the problem here. However, we will not consider this framework here because we have suspicions about the system (cf. sec. 5.1.2).

rather than that of the Adj itself or other modifiers, as noted earlier:

(165) a. *John is nasty to make friends with e.
　　　 b. *Dana is tall for us to recognize e.
(166) a. *John is very nasty to make friends with e.
　　　 b. *Dana is very tall for us to recognize e.

Then the subcategorization approach must assume that *too/enough* is subcategorized for an Adj, *[for*-NP], and VP//NP. On the other hand, these Advs have the same function as other modifiers. Their existence depends on the existence of their adjectival hosts:

(167) a. John is very/too nasty.
　　　 b. John is nasty.
　　　 c. *John is very/too.

An Adj is necessary not because it is a complement of the Adv but because it is a predicate. The existence of an Adj is a precondition on the existence of its modifier. If we assume that the Adj is an argument, we would expect that it can be "deleted" by some argument deletion process just like the VP//NP in the *too* construction in (167a), but the Adj can never be deleted (167c).

　　Third, the subcategorization approach encounters more difficult problems with the following examples:

(168) a. Robin is [too naive a person] to take advantage of e.
　　　 b. This is [a light enough ball] for my baby to throw e.
(169) a. He put too much chlorine in the pool for us to swim in
　　　　　 it without our eyes burning.
　　　 b. Too much wine, possibly, to permit a reliable judgment
　　　　　 was consumed on that occasion.
　　　 (Dowty 1991: (76b), (78f))

In (168) *too/enough* would have to be analyzed as having four complements. Remember that what is relevant for subcategorization is not a phrase but a lexical item. In (169a) the relevant lexical item *too* occurs in a complement position. What is licensed by it (i.e. the VP) occurs outside the head-complement unit (i.e. *put NP PP*). Hence the object complement containing *too*

cannot be subcategorized for the VP. In (169b) we need to assume that *too* takes *much*, an NP and a VP as its complements under the subcategorization approach. Notice that no predicates are involved in the examples of (169).

From the observations in this section we can argue that the [*for*-NP] and VP//NP phrases are not complements in *tough*- and similar constructions, but they are not simple adjuncts, either. The existence of these elements depends on that of the *tough*-Adjs. We need some mechanisms to capture this relationship. Nanni (1978, 1980) does not provide any mechanisms for this purpose even though she proposes a non-subcategorizational approach.

5.1.4. An IPSG Approach

Besides the need to overcome the difficulties which we have observed in the previous two sections, there are other motivations for a new analysis of *tough*- and similar constructions. One of the most important characteristics of the seven constructions observed in sec. 5.1.1 is that they are lexically governed. The number of the lexical items which can trigger these constructions is very small. In the cases of the *too* and *enough* constructions, there is only one such lexical item in each construction. There are only two such items in the *take*-type construction, as far as I know. Therefore, the rules in section 5.1.2 must be different from the following rules in GKPS, which are not lexically governed but structurally governed:

(170) a. $S \rightarrow X^2, H/X^2$
    b. $VP[+it] \rightarrow H[44], X^2, S[FIN]/X^2$ (be)

These rules are different from the *tough*-construction rules in the sense that the former contain both the filler and the gap in the same rule while the latter contain only the gap in the rule (cf. linked gap vs. free gap (Jacobson 1984)).

Before we go into a new approach for the analysis of *tough*- and similar constructions, we need to provide appropriate structures for them. In sec.

5.1.3. we considered two issues directly related to the assignment of structures. We saw, first, that the [*for*-NP] phrase is a higher PP and at the same time a lower PP subject. In English, there is a good reason for the possibility of this double function of the [*for*-NP] phrase. The *tough*-Adj can take only the [*for*-NP] "complement" (cf. sec. 5.1.1.1) and infinitival clauses can have only the [*for*-NP] subject.   Second, the [*for*-NP] and ˙VP//NP phrases are not complements of the *tough*-Adj. Based on these observations, I will propose the following structures for the constructions[34]:

---

[34] I propose structure (ib) for sentence (ia), which can be regarded as "derived" from (ic) by the deletion of the higher VP//NP:

(i) a The role was easy for Brando.

b.
```
        VP
       /  \
      V    AP
          /  \
        AP    PP
```

c.
```
        VP
       /  \
      V    AP
          /  \
        AP    (VP//NP)
        |
       PP    (VP//NP)
```
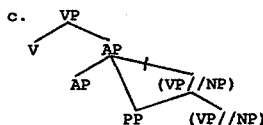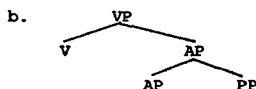
(ii) How easy for Brando was the role?

Sentence (ii) is grammatical, contrary to Nanni's (1978: 23) judgment.
    The structure for sentence (iiia) is (iiib):

(iii) a. It is easy for me to tease John.

b.
```
             VP
          /   |   \
         V    AP    VP
             /  \
           AP    PP
```
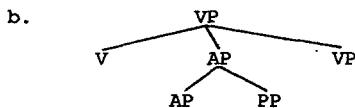
(iv) a. [How tough for Ann] is it to publicize his failure
     b. [How hard for Brando] was it to learn the part?
 (v) a. *[How easy to tease John] is it? (Nanni 78: 17, 26(56))
     b. *[How hard for Brando to learn the part] was it?

Sentences in (iv) and (v) show that [AP-PP] forms a constituent but [AP-PP-VP] does not. A piece of evidence for the structure in (iiib) comes from the

(171) a.

```
              AP
         ┌────┴──────┐
       AP          VP//NP
        |        ┌────┴────┐
      easy       PP      VP//NP
                ┌─┴─┐    ┌──┴──┐
              for me   to please e
```

b.

```
            AP
       ┌────┴────┐
      AP       VP//NP
       |       ┌──┴──┐
     easy    to please e
```
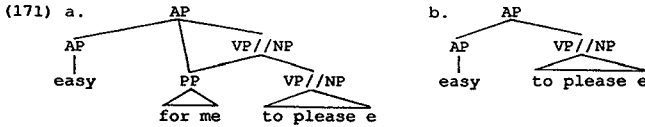
As we observed in sec. 4.4, there are two innovations involved in structure (171). First, we employ a depth-2 rule (cf. No 1991). Second, a PP is shared by two categories of different levels, one by the higher AP and the other by the higher VP//NP. Notice that this VP//NP is a daughter of the AP. There are two "tokens" of PP, but these two tokens are identical. "Structural sharing" and "token-identity" are innovations of McCawley (1982, 1987), Ojeda (1987) and HPSG (Pollard & Sag 1987, 1992). We are assuming that only two adjacent categories can share another category unlike these previous works. In this respect, the present approach is far more restrictive than others. Structure (171a) correctly represents that the *[for-NP]* is a higher PP and at the same time a lower subject. In addition, the *tough*-Adj is not subcategorized for the PP and VP//NP. When the *[for-NP]* is not present, the structure would be as in (171b). This phrase is optional because both the infinitival subject and the experiencer phrase are optional. One remaining task is to connect the Adj with these phrases, which will be discussed shortly.

We can write the rule for the structure in (171) as follows:

(172) $[AP, PP_{ti} [PP_{ti}, VP//NP]_{VP//NP}]_{AP}$ (ti: token-identity)

The token-identity between the higher PP and the lower PP imposes a natural

---

following data (cf. Nanni 1978):

(vi) a. It is easy to sing.
    b. How easy to sing was it?

Sentence (via) is ambiguous between a *tough*-reading (where *it* is interpreted as the object of *sing*) and a *it...easy* reading (where *it* is interpreted as *to sing*). Sentence (vib) has only the former reading. This fact follows from the proposed structures of the constructions concerned.

ordering constraint between this PP and the lower VP//NP. The higher PP comes before the higher VP//NP by a Linear Precedence Statement. Then the lower VP//NP must come after the lower PP because this lower PP is the same as the higher PP. This order is compatible with the general order between a subject and its predicate. Now let us consider the following sentences:

(173) a. For me, John is easy to please e.
b. John is easy to please e, for me.

We can generate these sentences by applying the same mechanisms needed for Topicalization, as follows:

(174) a.

```
                    S
         ┌──────────┴──────────┐
        PP                    S/PP
      ┌───┐          ┌─────────┴─────────┐
     for me         NP                 VP/PP
                     |           ┌───────┴───────┐
                   John          V             AP/PP
                                 |        ┌──────┴──────┐
                                 is      AP          VP//NP
                                         |        ┌─────┴─────┐
                                       easy     PP/NP      VP//NP
                                                  |        ┌───┴───┐
                                                  e      to please e
```

b.

```
                    S
          ┌─────────┴─────────┐
         NP                   VP
          |            ┌───────┴───────┐
        John           V              AP
                       |      ┌────────┴────────┐
                       is   AP/PP              PP
                         ┌────┼────┐         ┌──┴──┐
                        AP  VP//NP          for me
                         |   ┌──┴──┐
                       easy PP/NP VP//NP
                             |   ┌──┴──┐
                             e  to please e
```
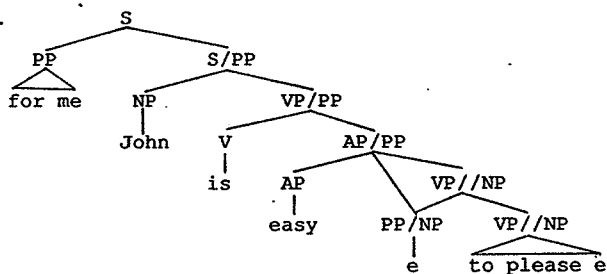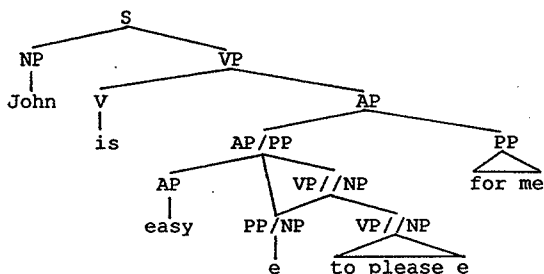
Here we will disregard the mechanisms for licensing the gapped VP (i.e. VP//NP), which will be discussed shortly.

In the trees in (174), according to the FFP in GKPS, the higher VP//NP node is supposed to have /PP because its daughter had one. This linkage is

blocked because there is an independent constraint which blocks extraction of the subject of a clause (175a), which is PP here:

(175) a. *[For whom] do they intend e to be put on probation?
     b. [How foten] does the baby sleep e?

This PP is allowed to be extracted as a sister of AP just like the extraction of VP adjuncts should be allowed as in (b) (cf. Hukari & Levine 1992). Notice that the PP is an AP ajunct in our approach. The analysis in (174b) is based on the following data:

(176) a. John is [easy to please, for me] but [difficult to please, for Mary].
     b. [Hard to please, for me] though John is e, he is very friendly.

The PP forms a constituent with the gapped VP. In sentence (a), this unit is a conjunct, and it is extracted in (b).

Since the [for-NP] and VP//NP are contiguous in rule (172), there is a special consequence. This linear sequence provides subjecthood to the [for-NP] phrase. Notice that there is no syntactic subject PP of the VP//NP in the sentences of (173):

(177) a. The Titanic is impossible for any iceberg to sink e.
     b. *For any iceberg, the Titanic is impossible to sink e.
     c. *The Titanic is impossible to sink e, for any iceberg.
(178) a. ??John is easy [for friends of e] to admire e.
     b. *[For friends of e], John is easy to admire e.
     c. *John is easy to admire e, [for friends of e].

We noticed before that *for any iceberg* in (177a) has (only) the function of the lower VP subject. Sentences (b-c) are ungrammatical because the displaced PP cannot serve as the (syntactic) subject of the gapped VP anymore. Hence the displaced PP has no role at all. The sentences in (178b-c) show the same phenomenon. From these examples, we can see that the [for-NP] phrase has the function of the lower subject only when it is contiguous with the VP//NP. This is reasonable because the extraction of the PP is allowed only as the daughter of the AP, and not as a daughter of the higher VP//NP (cf. (174-5)).

In sentence (178c) the fact that the real gap comes before the parasitic gap does not improve its grammaticality.

Now we will consider the nature of the gap in *tough*- and similar constructions. A typical gap is what is represented by SLASH (/), which is used for wh-gaps. There are a few works which argue that we need more than one SLASH-like feature in GPSG. Zwicky (1987b) introduces BSLASH (\) to account for passives, and Hukari and Levine (1987) introduce GAP (//) to analyze "Missing Object Constructions", which comprise *tough*-constructions, *too/enough* constructions, and (object-gapped) purpose clauses. Hukari & Levine (1987, 1989a, 1991a) point out the following differences between the wh-gaps and the *tough*-gaps:

(179) a. Free linkage through finite clauses (yes for wh, no for many speakers for *tough*),
　　b. Case connectivity (yes for wh, no for *tough*),
　　c. Ability to tolerate wh-gaps as sisters (no for wh, yes for *tough*),
　　d. Ability to sustain gaps in the binder category itself (no for wh, yes for *tough*).

We can see each of these differences in each of the following sets of examples:

(180) a. Who do you think John likes e?
　　b. *John is easy that I like e.
　　　%Robin is tough for Sandy to think we can influence e.
(181) a. Whom do you like e?
　　b. He/*Him is easy to please e.
(182) a. *Which violins do you wonder which sonatas [you can play e on e]?
　　b. Which violins are these sonatas easy [to play e on e].
(183) a. *Whom do you wonder [which pictures of e] to include e?
　　b. Napoleon is boring to make up [stories about e] to amuse my friends with e.

Based on these differences, we will assume that *tough*- and similar constructions have GAP (//) gaps rather than SLASH (/) gaps, following Hukari & Levine (1987). Hence, the present analysis captures that the gap in *tough*-constructions shows characteristics different from those in structural UDCs, not only by positing a different SLASH-like feature but also by eliminating all

the rules for *tough*-constructions, as we will see below.

Based on the observations thus far, I here introduce a LICENSOR feature, <VP//NP[ACC[35]] LICENSOR>[36] (GVPL: Gapped VP Licensor) for *tough-* and similar constructions. Each lexical item that triggers one of these constructions has a GVPL in a stack as a part of its syntactic information in the lexicon. As we observed in sec. 4.3, GVPL is a kind of FOOT feature. Its behavior is similar to that of other FOOT features in its spreading throughout the tree. However, it is different from ordinary FOOT features in the sense that it is a stacked feature. It moves around the tree by way of a stack. Its behavior is regulated by the following principle (repeated from sec. 4.3):

> (184) [XP LICENSOR] in the stack of a node (pops out of the stack and) licenses one of this node's daughters when the specification of the LICENSOR's value (i.e. XP) is the same as that of this daughter node.

The XP in this principle is VP//NP[ACC] for *tough-* and similar constructions.

---

[35] As in Hukari & Levine (1987), we will use [ACC] rather than [-NOM]. Then we can exclude the following examples of *tough*-constructions:

(i) a. *Yesterday was easy for John to go e.
   b. *Here is hard for trains to travel e.

The expressions *yesterday* and *here* are [-NOM] but are not [ACC]. However, the use of [ACC] is not perfect, either, as is pointed out to me by Arnold Zwicky. First, [ACC] is a default case for NPs in English. Second, we cannot formally distinguish direct (verbal and prepositional) objects from indirect/oblique objects. In this respect, we must introduce grammatical functions (subject, direct/indirect object, etc.) into the framework.

[36] LICENSOR is a feature and VP//NP[ACC] is its value. Thus, <LICENSOR VP//NP[ACC]> would be the representation required by the GKPS system. However, LICENSOR features are different from other features.

Strictly speaking, it would be (PP)-VP//NP[ACC][37] because these constructions have an optional PP.

To see how GVPL and principle (178) operate, let us consider the following sentence of the *easy*-type construction (for a more detailed account of how the system works, see sec. 4.3):

(185) a. John is easy for me to please e.

b.
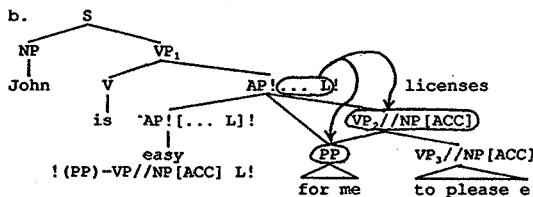
Principle (184) operates when !GVPL! is instantiated on the higher AP, and when //NP is instantiated on VP$_2$. Then, PP and its sister VP$_2$//NP[ACC] will be licensed by the principle. Notice that the higher AP does not have the LICENSOR feature after these categories are licensed. If //NP[ACC] is instantiated on the higher AP, it will be ruled out by a modified version of the FFP (cf. sec. 4.3) because the licensed //NP[ACC] on VP$_2$ and the unlicensed //NP[ACC] on the higher AP are different. In other words, the //NP[ACC] specification on VP$_2$ is required by the !GVPL! on the higher AP (and/or by principle (184)) as opposed to free instantiation. So, //NP[ACC] instantiated above VP$_2$ will not terminate properly at the upper end. Now turning to the behavior of !GVPL! feature, its upward propagation stops at the moment when it comes out of the stack because it propagates only through a stack. Any downward propagation would become problematic at the point of 'lexical insertion' because lexical items other than those which trigger the construction

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[37] LICENSOR featues can have a list value, which is a tradition in HPSG. But, for the moment, I want to restrict the use of list values only in those cases where the elements in the list are sisters.

do not have that feature.

Now with the introduction of licensing mechanisms, we have three different types of relations between head-like elements and their dependents. First, we have head-complement (argument) relations. In these cases, the head is subcategorized for its complements, and the head must be a lexical item. Second, we have modified-modifier relations. Neither of these two categories can be lexical items. Modifiers are not obligatorily required. Third, we have licensor-target relations, as introduced in this dissertation. Licensors can be both lexical items and phrases (in the case of idiomatic expressions). However, all of these must be listed in the lexicon. Each of these licensors specifies the categories of the targets to be licensed. As for the connection between head-like elements and their dependents, the head-complement unit is the most tightly bound, the modified-modifier unit is the most loosely bound, and the licensor-target unit comes in between. In the previous section, we argued that subcategorized elements are different from licensed elements (i.e. targets) even in the case of tough-constructions. This difference provides a good piece of evidence for the reality of LICENSOR features.

In discussing the seven different types of binder-gap constructions, we saw that some constructions do not allow resumptive pronouns while others do allow them. Therefore, there seems to be more than one kind of GVPL involved:

(186) a. John is easy for you to please.
     b. *John is easy for you to please him.
     c. *John is easy for you to please his dog.
(187) a. John is too short for you to see.
     b. John is too short for you to see him.
     c. John is too short for you to see his eyes.

In the *tough*-construction the gap is obligatory, while in the *too* construction it is not. Furthermore, in the case of *too/enough* constructions, the whole VP//NP is also optional:

(188) a. It's too hot.
   b. It's hot enough.

Hence, the feature for *too/enough* is doubly optional, !(VP(//NP)) LICENSOR![38].

Accordingly, we can distinguish two different types of GVPL: GVPL$_1$ (which is obligatory and has an obligatory GAP) and GVPL$_2$ (which is optional and has an optional GAP). The problem is how to implement the idea of obligatoriness and optionality formally. The easiest way would be to use parentheses to indicate optionality. Then we can say that *too* has !(VP(//NP)) L! and *easy* has !VP//NP L! in the lexicon as parts of their syntactic information.

However, there is perhaps a more principled way of expressing the optionality because there seems to be a close relationship between the binder, the gap and the trigger of the construction. Let us observe the data in (187). We can see that a gap exists when there is a binder that has the same information or specification as the gap, as in sentence (a), but there is no gap when there is no such binder. Based on this observation, one might propose

---

   [38] Degree words *too/enough* can license three different types of constructions:

   (i) a. John is too nasty to talk to e.
       b. John is too tall for us to see his eyes.
       c. It's too hot.

The second conjunct in sentence (iia) is ambiguous between the readings corresponding to (ia) and (ic):

   (ii) a. This rock is too heavy for me to move e, but that rock
          is light enough for Mary.
       b. This rock is hard for me to move e, but that rock is easy for John.

Behind the first reading there is a lexical rule involved (cf. Ch. VIII), which deletes VP//NP from !VP//NP LICENSOR! of *enough*. In this case, even though we do not have an explicit VP//NP, we need one in interpretation. The second reading does not have even this implicit VP//NP meaning. Sentence (iib) is not ambiguous because there is no reading corresponding to (ic).

that the node which has [VP//NP L_1] *requires* VP//NP among its daughters. And the node which has [VP//NP L_2] requires //NP in its daughter VP *only when* this //NP can be bound properly. However, this kind of mechanism violates the locality principle. It needs information from outside of the local tree. A better analysis can be found within a framework which directly connects the subject NP (i.e. a potential binder) and the predicate (which contains the trigger) of the construction as a kind of a compatibility rule as was suggested by Arnold Zwicky (p.c.) (cf. Kuh 1990). Here I do not want to pursue this issue further. We will simply follow the tradition of using parentheses to indicate optionality.

Under the present mechanisms, we can analyze *tough-* and similar constructions without any special rules for them. Since no separate rules are necessary, we can overcome all the difficulties which are caused by the formulation of the rules (cf. sec. 5.1.2). First of all, let us see how basic sentences of each of the seven constructions can be handled. Since we have already seen how the mechanisms work with the *tough* construction, we will proceed to the other six constructions:

(189) *breeze*-type construction
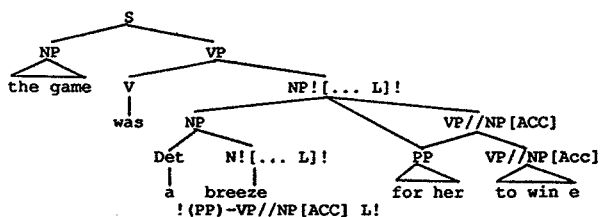
(190) a. [(A) breeze (for us) to win e] though the game was, ...
   b. ?*[(A) breeze for her] though the game was to win e, ...
   c. ??[(A) breeze] though the game was for her to win e, ...
   d. *[For whom to win e] was the game a breeze?
   e. [For whom] was the game a breeze to win e?
   f. ?*[Who] was the game a breeze for to win e?

The structure in (189) captures that we need to refer to a whole NP (*a breeze*) rather than only the N (*breeze*) within it to describe the indefiniteness condition (cf. (161) sec. 5.1.3.3). The data in (190) correspond to the predictions from the tree structure in (189). The string *a breeze (for us) to win e* is a constituent, but *a breeze for her* and *for her to win e* are not constituents. Even though the latter is exhaustively dominated by the higher VP//NP, it is not by the higher NP. The expressions *a breeze, for us* and *us* are constituents. Sentence (c) is somewhat awkward probably because of an "A-over-A" violation. Sentence (f) is not good because *us* is a part of the lower subject.

(191) *ready*-type construction
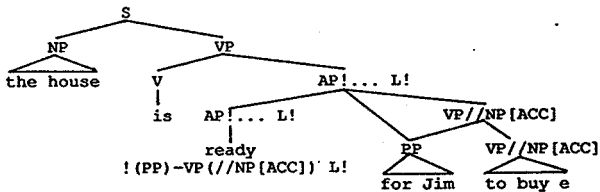
(192) a. [Ready (for Jim) to buy e] though the house is, ...
      b. ?*[Ready for Jim] though the house is to but e, ...
      c. [Ready] though the house is for Jim to buy e, ...
      d. *[For whom to buy e] was the house ready?
      e. [For whom] was the house ready to buy e?
      f. ?*[Whom] was the house ready for to buy e?

(193) *too* construction
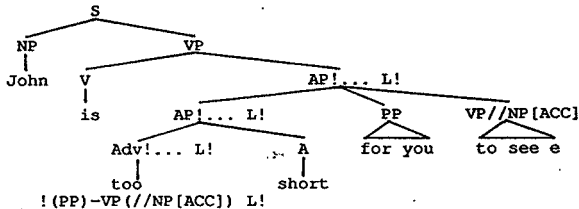
(194) a. [Too short (for you) to see e] though John is, ...
     b. *[Too short for you] though John is to see e, ...
     c. ?*[Too short] though John is for you to see e, ...
     d. *[For whom to see e] was John too short?
     e. [For whom] was John too short to see e?
     f. *[Whom] was John too short for to see e?

We expect that sentence (c) would not be so bad according to the structure in (193). There might be some other factors involved in its awkwardness.

(195) *enough* construction
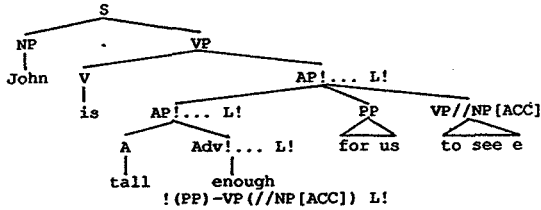
(196) a. [Tall enough (for us) to see e] though John is, ...
     b. *[Tall enough for us] though John is to see e, ...
     c. ?*[Tall enough] though John is for us to see e, ...
     d. *[For whom to see e] was John tall enough?
     e. [For whom] was John tall enough to see e?
     f. *[Whom] was John tall enough for to see e?

As we observed in sec. 5.1.1.2, the *too/enough* constructions do not obey the No Double [*for*-NP] Condition. There can be two separate [*for*-NP] phrases: one as the experiencer of the Adj and the other as the subject of the lower clause. Hence, no depth-2 rules, which represent structure-sharing, are necessary in the analysis of the constructions, as we can see from the trees in (193) and (195). There are two issues to be considered with reference to these analysis trees.

First, there must be some way to ensure a proper structure for each trigger. The triggers of all the constructions except the *too/enough* constructions require their PP target to be shared by AP and VP//NP. Those

of the *too/enough* constructions require their PP target to be a regular daughter of AP. Remember that we have the following rule for the former constructions (repeated from above):

(172) $[AP, PP_{ti} [PP_{ti}, VP//NP]_{VP//NP}]_{AP}$ (<u>ti</u>: token identity)

We can use the PP_{ti} in this rule to ensure a proper match between a trigger and a structure. Let us assume that the triggers of the former constructions have a token-identical PP as a part of their LICENSOR value. That is, they have a <(PP_{ti})-VP//NP LICENSOR>. On the other hand, the triggers of the *too/enough* constructions have a regular PP in their value (i.e. <(PP)-VP(//NP) LICENSOR>).

Second, *too/enough* sentences are three-way ambiguous when there is only one [*for*-NP] phrase, just as in the *it...tough* sentences (cf. (15-6) in sec. 5.1.1.1):

(197) This cake is too sweet/sweet enough for my mother to buy e.

On the first reading, my mother is the experiencer of what is represented by the AP ('too sweet' or 'sweet enough') and the controller of the VP (i.e. the buyer of the cake). We can get this reading when the [*for*-NP] phrase is a higher PP and the lower subject is controlled by this PP. On the second reading, my mother is the experiencer but someone else (e.g. me) is the buyer. This reading is obtained when the [*for*-NP] phrase is in the higher clause and the lower subject is controlled arbitrarily. On the third reading someone else is the experiencer but my mother is the buyer. We can get this reading when the phrase is the lower subject and the higher PP is controlled arbitrarily.

Not all *too/enough* sentences would have these three readings. One or two readings can be ruled out by some pragmatic factors. For example, in the following sentence, *for us* has only the subject reading of the lower clause (Robert Levine, p.c.):

(198) Robin is too comitted to this position for us to agree with e.

Here the higher subject (i.e. Robin) is the experiencer of the 'too-comittedness'.

Hence *for us* can only be the subject of the lower clause. Notice that the experiencer role of a predicate cannot be assigned to two different entities.

(199) [*easy person*]-type construction
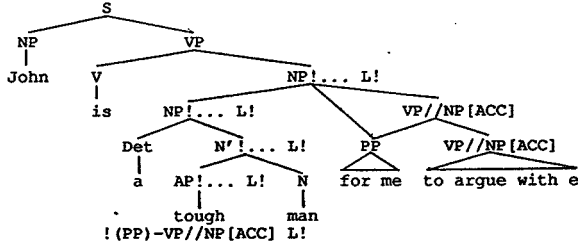
(200)[39] a. [(A) tough man (for us) to argue with e] though John is, ...
 b. ?*[(A) tough man for us] though John is to argue with e, ...
 c. [(A) tough man] though John is for us to argue with e, ...
 d. *[For whom to argue with e] is John a tough man?
 e. [For whom] is John a tough man to argue with e?
 f. *[Whom] is John a tough man for to argue with e?

In observing the properties of the [*easy person*]-type construction in sec. 5.1.1.2, we noticed that this construction has similarities with the infinitival relative construction. First, their VP//NP complements can be in a passive form. Second, they show the same characteristics with reference to the Pied-Piping phenomena. Third, their structural configurations are also the same. These similarities suggest that the [*easy person*]-type construction has the

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[39] Some people find sentence (200b) not very bad. However, Berman (1973a: 312) assumes that such sentences are ungrammatical:

(i) *[Easy man for Mary] though Joe may be to get along with e, ...

In addition, a major break seems to come in between *easy man* and *for Mary* rather than in between *for Mary* and *to get along with* (Berman 1973a: 311):

(ii) a. Joe is an easy man, don't you think, for Mary to get along with e.
 b. *Joe is an easy man for Mary, don't you think, to get along with e.

properties of both the *tough*-construction and the infinitival relative construction. Based on these observations, we propose a more detailed analysis of the following tree for the [*easy person*]-type construction (cf. (199)):

```
(201)                    NP!... L!
              _____/      _____
         NP!... L!                       VP//NP/(NP//NP)
        /      \                           |
     Det      N'!... L!    PP          VP//NP/(NP//NP)
      |      /      \    /   \             |
      a    AP!... L!  N  for me  V      VP//NP/(NP//NP)
            |         |          |      /      \
          tough      man        to    V       PP//NP/(NP//NP)
      !(PP)-VP//NP[ACC] L!             |      /      \
                                     argue   P      NP//NP/(NP//NP)
                                             |          |
                                           with         e
```
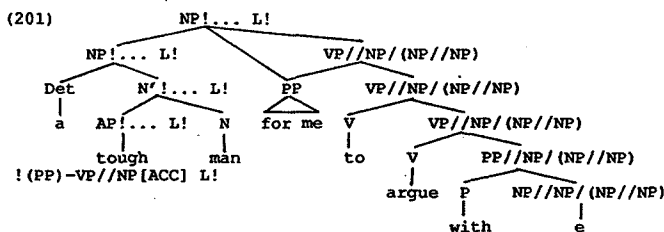
The highest VP has two gaps, //NP and /(NP//NP). The former is licensed by the LICENSOR, but the latter is licensed structurally (hence a SLASH) just as in the infinitival relative VP of the following sentence:

(202) I met a man [to talk about this issue with e].

The difference is that just an NP is missing here but a gap (NP//NP) is missing in (201). The importance of the analysis in (201) is that the gapped VP is licensed both by the LICENSOR and by the infinitival relative mechanisms. Hence the [*easy person*]-type construction, as a whole, shows the characteristics of the two constructions concerned (i.e. a *tough*-type construction and the infinitival relative construction). However, the gapped VP shows the characteristics of only the infinitival relative VP because VP//NP/(NP//NP) is the same as VP/NP, and NP//NP(NP//NP) is the same as NP/NP. This fact accounts for the above-mentioned similarities between the [*easy person*]-type construction and the infinitival relative construction.

(203) *take*-type construction

```
                         S
              _____/  _____
            NP                      VP!.. L!
           /  \              _____/  |  _____
      the cake  V!.. L!    NP      NP      VP//NP[ACC]
                 |                         /    \
           took!VP//NP[ACC] L!  Mary  all day  to bake
```
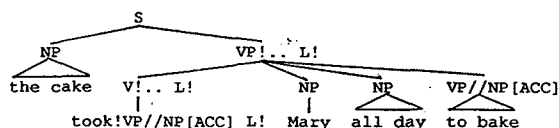
(204) a. [Who] did the cake took all day to beke e?
  b. [How long] did the cake took Mary to bake?

The tree structure for this construction would be as follows if it has the same pattern as those for the other constructions observed thus far:

(205)
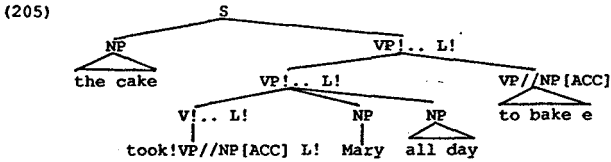
The *take*-type construction seems to be different from the others as far as the tree structure is concerned. First, the licensor is a V rather than an (part of) Adj. Second, we have positive evidence for the flat structure in (203):

(206) a. The cake took [[Mary all day] but [John just an hour]] to bake e.
  b. The cake took Mary [[all day to bake e] and [all night to ice e]].

Neither of *Mary all day* and *all day to bake e* seem to form constituents. Notice that non-constituents can also be conjoined (cf. Dowty 1988)[40].

Thus far, we have provided analyses for all the other six constructions related to the *tough*-construction. There seem to be no apparent problems in accounting for them within our framework.

Now let us consider how other problems for the GKPS-style treatments discussed in sec. 5.1.2 can be solved in our framework. First, we have seen that expressions like *waste of time* (cf. (79)) cause a problem for the *breeze*-type construction rule (78). Under our approach, we can simply assume that these expressions themselves have the !GVPL! feature as a property of idiomatic expressions. Then they need not be reanalyzed as zero-bar categories:

---

[40] There is one more factor to be considered to determine the correct structure. Right Node Raising might be involved in (206a).

(207)

```
                              NP!... L!
            _____|_____
         NP!... L!                           VP//NP[ACC]
      ____|____                              __|__
    Det      N'!VP//NP[ACC] L!              to learn e
     |        __|__
     a      N      PP
            waste  of my time
```
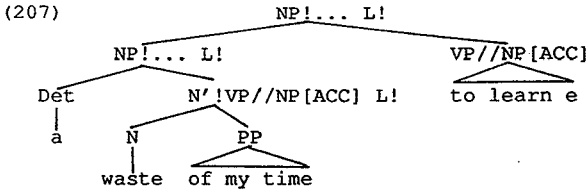
As we have seen in (79a), the *waste of* ... expression is somewhat productive. We cannot treat such expressions as zero-bar lexical items. But these expressions should be listed in the lexicon because they have the characteristics of triggering a binder-gap construction.

Second, the problems which occur in sentences with *too easy* (101a) and *easy enough* (102a) can also be solved under the present approach (repeated here):

(101a) John is too easy to make friends with e.
(102a) John is easy enough to make friends with e.

In each of these sentences there are two lexical items which have the !GVPL! feature. However, they show the characteristics of the *tough*-construction rather than the *too/enough* constructions. This means that the gapped VP is licensed by the GVPL which originates from *easy* rather than that from *too/enough*. Notice that the VP and gap are obligatory in the *tough*-construction and they are optional in the *too/enough* constructions. In other words, the LICENSOR feature of *easy* must license a gapped VP to derive a grammatical sentence. That is, it is a feature with an obligatorily gapped VP, !VP//NP L!. The VP and gap of LICENSOR in *too/enough* need not be obligatorily present, i.e., it is a feature with optional VP and gap, !(VP(//NP)) L!.

We can implement this fact by positing a principle of the following sort:

(208) When there is more than one LICENSOR feature among the daughers of a node, a LICENSOR feature with an obligatory value goes into the stack later than one with an optional value.

Features which are put into the stack later come out of it earlier. This arrangement uses the stack to capture the precedence of obligatory elements of grammar over optional ones. Obligatory-over-optional precedence ensures that no obligatory features are left unused (cf. Koutsoudas 1972; Ringen 1972a, 1972b; and Hastings 1976).

We can analyze the sentences in (101a) and (102a) as follows:

(209) a.
```
                 AP!VP//NP  L   !
                   !(VP(//NP))  L!
          _____
   AP!VP//NP  L   !                    VP//NP
     !(VP(//NP))  L!                _____
    _____                to please e
   Adv!(VP(//NP))  L!   A!VP//NP L!
      |                    |
   too!(VP(//NP))  L!   easy!VP//NP L!
```

b.
```
                 AP!VP//NP  L   !
                   !(VP(//NP))  L!
          _____
   AP!VP//NP  L   !                    VP//NP
     !(VP(//NP))  L!                _____
    _____                to please e
   A!VP//NP  L!        Adv!(VP(//NP))  L!
      |                   |
   easy!VP//NP L!      enough!(VP(//NP))  L!
```
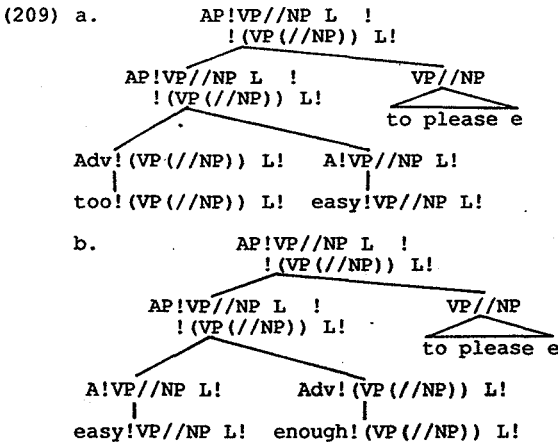
In these structures, the stack of the AP node has two LICENSOR features. The obligatory feature, which originates from *easy*, is always put on the top of the stack due to principle (208). The VP//NP can be licensed only by this obligatory feature, and the optional LICENSOR feature will not be used here. Thus, we can provide a natural account for the fact that sentences (101a) and (102a) have the characteristics of the *easy*-type construction rather than the *too/enough* constructions.

One might argue against the present analysis on the basis of the following data:

(210) a. Chess is too hard for me to enjoy it.
    b. Chess is easy enough for me to enjoy it.

In these sentences, a resumptive pronoun is allowed just as in the *too/enough* constructions. We will see that these sentences are really instances of these constructions rather than of the *tough*-constructions. The basic difference between the sentences in (101-102a) and those in (210) is that the subject in the former does not have a thematic role but that in the latter has one. Now let us compare the following sentences:

(211) a. John is too easy to make friends with e. (= (101a))
    b. Chess is too hard for me to enjoy e. (cf. (210a))

The important thing to be noticed is that sentence (b) is ambiguous while sentence (a) is not. Sentence (b) is ambiguous between a "*tough*-reading" and a "*too*-reading". In the former reading the difficulty lies in my enjoying chess. In the latter, the cause of difficulty is the nature of chess itself. Hence, there are two lexical items involved: a *tough*-Adj and a regular Adj as in *that question is hard*, respectively. In this sense, the Adjs in (210) are not *tough*-Adjs because they induce only the second reading. Notice that the sentences in (210) are not ambiguous. Therefore, they are examples of the *too/enough* constructions. The following sentences show the characteristics of the *tough*-constructions even though the subject is *chess*:

(212) a. Chess is hard for me to enjoy e/*it.
    b. Chess is too hard for me to enjoy e/*it for my wife
        to recommend playing e before dinner.

Sentence (a) does not contain *too*. In sentence (b) the first VP (i.e. *for me to enjoy*) has nothing to do with *too*.

In sec. 5.1.2, we noticed that one of the most serious problems with the rule-based approach of GKPS is that it fails to capture that the same lexical items induce the same kind of gapping in different constructions (cf. (104-8)). The strongest argument for the present GVPL approach lies in dealing with

these data. Our approach is based on the idea that each lexical item is the source of gap-licensing property in an A-position binder-gap construction. We need not worry about accounting for the relationship between different constructions which have the same gap-licensing lexical item. They show the same gapping characteristics simply because they have the same lexical item, which triggers the constructions concerned.

Further support for our approach comes from the analysis of the following examples:

(213) a. *Robin and Pat are too anxious for everyone to like *e*
       to be comfortable around *e*.
    b. Robin and Pat are too anxious for everyone to like them
       to be comfortable around *e*.
(214) a. John is too easy for people to please *e* for anyone to take *e* seriously.
    b. *John is too easy for people to please him for anyone to take *e* seriously.

In (213) we need an object NP for *like* because *anxious* is not a gap-licensing lexical item. But there must be a gap NP after *please* in (214) because *easy* is such a lexical item. Notice that sentence (214a) does not have a parasitic gap. If one of the two gaps is a parasitic gap, the following sentence should be grammatical:

(215) *John is very easy for people to please e for anyone to take e seriously.

Let us consider how we can license each of the two gaps in sentence (214a). The structure for it is as follows[41]:

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[41] The structure in (216) constitutes one of the strongest evidence for our Chomsky-adjunction of the target. The string *too easy for people to please* cannot be A' or A.

(216)

```
                                        AP!(PP)-VP(..) L!
          AP!(PP)-VP//.. L!                    PP      VP//NP[ACC]
              !(   )!                        for anyone  to take e
      AP!  !                    VP//NP[ACC]              seriously
       !()!
   Adv!()!        A! !        PP      VP//NP[Acc]
     |            |       for people  to please e
    too          easy
 !(PP)-VP(//NP) L! !(PP)-VP//NP L!
```
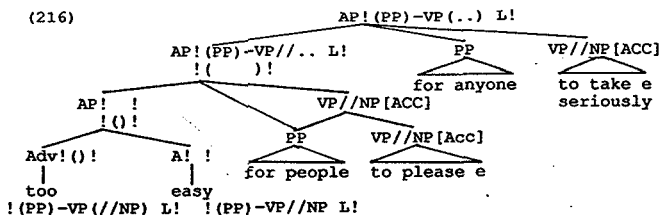
The gap after *please* is licensed by the obligatory LICENSOR from *easy* and the gap after *take* by the optional LICENSOR from *too*.

Under this analysis, we can account for the following sentence without any extra cost:

(217) Robin isn't easy enough to talk to e_1 to approach e_2 directly
      on this problem.

This sentence shows a kind of crossed dependency. The first gap (e_1) is licensed by *easy* and the second one (e_2) by *enough*. Under the approach here, we need not assume expensive mechanisms like 'flattening' or 'liberation'. The structure for this sentence is the same as (216) except for the following part:

(218)

```
            AP!VP//.. L !
             !VP(//.. L!
     A!VP//.. L!        Adv!VP(//.. L!
        |                    |
    easy!VP//.. L!      enough!VP(//.. L!
```
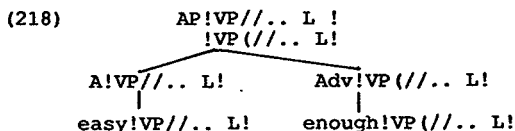
Principle (208) ensures that the obligatory GVPL comes on the top of the stack on AP regardless of the linear order of its daughters (cf. (209)).

Thus far, we have provided analyses for all of the major syntactic properties of *tough-* and similar constructions within our IPSG framework. There are some other important properties to discuss. First, we noticed that the clause which contains the *tough*-gap is non-finite when the clause is just below the *tough*-Adj (cf. (17), sec. 5.1.1.1). This can be ensured by specifying

the VFORM value of the VP target in the value of LICENSOR features. For example, Adj *easy* has !VP[-FIN]//NP LICENSOR!. Notice that the VP specified in this feature is the highest VP. There is dialectal variation when the gap is in a lower clause (cf. (17-19)). For the dialect in which finite clauses are not allowed, we need the following Feature Cooccurrence Restriction (FCR):

   (219) ~(FIN & GAP)

This FCR says that GAP is not compatible with finite clauses. For the dialect in which the gap can be missing from a finite clause, we would not need FCR (219).

   Second, some examples have non-NP gaps as we observed in (20): S-, AP- and VP-gaps. This can also be easily accounted for by specifying the value of the GAP in the value of LICENSOR features. For example, Adj *hard* can have !VP//S LICENSOR!.

   Third, sentences with a gap from a passived VP are not perfect as we observed in (21-2). Nanni (1978: 94-) argues that we need to put a restriction on the type of verb of the VP containing the gap. She says that "only verbs which can be understood as specifying the agents' intentions can appear in the VP complement". I think this intentionality requirement is responsible for the awkwardness of *tough*-sentences with a gap in a passive VP[42]. Hence, the

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[42] Jones (1990a: 323, 327) notices that *tough*-sentences and purpose clauses do not combine easily with "non-intentional auxiliary *be*". Rather, they occur naturally with "intentional *be*":

(i) a. ??That article will be tough [to be proud of e].
   b. That mask will be easy [to be obnoxious with e].
(ii) a. ??I bought it [to be proud of e].
   b. I bought it [to be obnoxious with e].

This intentionality requirement is not in effect in *too/enough* constructions:

(iii) John's too naughty/well-behaved enough [to be proud of e].

We might need different intentionality requirements for each of the

relevant constraint is semantic rather than syntactic. However, the [*easy person*]-type construction is not subject to this constraint (from (60)):

(220) Mary is a pleasant person [to be kissed by e].

This is exactly what would be expected if the analysis of the [*easy person*]-type construction in (201) were correct. There we noticed that the gapped VP here has the same properties as those of the infinitival relative VP. Notice that infinitival relatives allow a passive VP.

Fourth, we also observed that an NP of [V-NP-NP] and an NP "raised from subject to object" cannot be easily missing in *tough*-constructions and other gap-containing constructions (cf. (25-8)):

(221) a. It is impossible to [buy John presents].
    b. ?*Presents are impossible to buy John e.
    c. ??John is impossible to buy e presents.
(222) a. ?*John is impossible to expect e to understand that book.
    b. ?*John is difficult to believe e to have made such a mistake.
    c. ?John is hard for me to imagine e ever being nice.
    d. ?The children were easy for us to prove e to be innocent.

There seems to be a common property of the NPs in [V-NP-NP] and the raised object NPs. That is, these NPs do not seem to be accusative NPs but dative or oblique NPs. But English does not have any formal distinctions between accusative and dative forms. Hence we must use grammatical functions to tell the difference (cf. footnote 35). In the following sentence,

(223) It is impossible to [buy presents for John].

both *presents* and *John* are direct objects. The former is a direct object of V *buy*, and the latter of P *for*. In (221a), the prepositional host of *John* is not present and *presents* is separated from its host by another element. These NPs might be an indirect object and an oblique object, respectively. Raised object NPs are not directly affected by the higher predicate, unlike the objects of control Vs. Hence these might also be indirect objects rather than direct

———————————————

constructions observed.

objects. If our characterizations of the objects here are correct, then we can generalize that only direct objects can be missing in constructions with gaps.

Fifth, Pied-Piping is allowed in [*easy person*]-type constructions (cf. (63)):

(224) a. This is an easy violin [on which to play sonatas e].
   b. This is too blunt a knife [with which to cut the salami e].

Our system predicts that the material in the square brackets is licensed by the relevant lexical item, but has the property of an infinitival relative (cf. the analysis in (201)). Let us consider sentence (224a):

```
(225)                    NP!VP//NP L!
              _____|_____
          NP!.. L!                    VP//NP
        ___|___              _____|_____
      Det      N'!.. L!      PP           VP//NP/(PP//NP)
       |      ___|___      __|__           ____|____
       an   Adj      N   on which  V      VP//NP/(PP//NP)
            |        |             |      ____|____
          easy    violin          to    V    NP   PP//NP/(PP//NP)
        !VP//NP L!                 L.    |    |         |
                                play sonatas  e
```
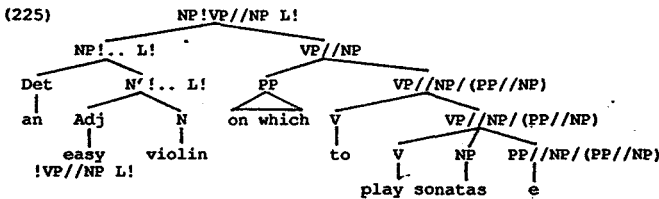
The highest VP//NP is licensed by *easy*. The string *on which to play sonatas on e* has the characteristics of an infinitival relative clause because category VP//NP/(PP//NP) is the same as VP/PP (and PP//NP/(PP//NP) is the same as PP/PP). These categories are exactly the same as those in Pied-Piped infinitival relatives[43].

We further noticed that Pied-Piping is not allowed in pure *tough*- and *too/enough* constructions (cf. (69-70)), and that the pied-piped PP is not

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[43] An alternative way to account for the phenomena in ~~(213a)~~ 224a) is to say that the string *on which to play sonatas e* does not have any direct relation with *easy* but it is a pure infinitival relative clause. In this case, the VP//NP meaning which is required by *easy* is picked up by pragmatic factors (i.e. by the given context). In Ch. VIII, we will see that we have variants of *tough*-Adjs which do not require VP//NP, as the *easy* in the second conjunct:

(i) This rock is hard for me to move e, but that one is quite easy.

Here *easy* gets its VP//NP meaning from pragmatics.

compatible with a [*for*-NP] phrase (cf. (64)):

(226) a. *This will be easy [in which to put pictures e].
     b. *John's too old/old enough [on whom to depend e].
(227) a. *This is an easy violin <u>for me</u> [on which to play sonatas e].
     b. *This is an easy violin [on which <u>for me</u> to play sonatas e.

According to the analysis in (225), the material in the square brackets in (226) would have the properties of infinitival relatives. However, it is not in an environment for a infinitival relative to occur. There is no head NP to be modified by a relative clause. The sentences in (227) violate two constraints, one on the [*easy person*]-type construction and the other on infinitival relatives. The former is related to the function of [*for*-NP] phrase. It must be an experiencer of the higher predicate and the subject of the lower clause. None of the sentences in (227) satisfies this condition due to the intervening material *on which*. The latter is the "Doubly-filled Comp" constraint on infinitival relatives (cf. (144-5), sec. 5.1.3.2).

Lastly, in some *tough*-sentences the [*for*-NP] phrase does not bear any (thematic) relation to the Adj (cf. (135-6)):

(228) a. The Titanic is impossible/easy/hard/tough for any iceberg to sink e.
     b. ??That amount of liquid was tough for the pitcher to hold e.

We can assume that some *tough*-Adjs (e.g. *impossible, easy, hard, tough*, etc.) allow their PP target to be inanimate (but do not allow it to be a dummy). When it is inanimate, the Adj imposes no theta role (i.e. no experiencer role) to it. These can be easily implemented in our framework by way of lexical entailments because the PP is a part of the lexical item concerned. Notice that it is a part of the LICENSOR value. The following sentence is ungrammatical because it violates the intentionality requirement:

(229) *This bed is impossible for your letter to be under e.

The VP *be under* is not an expression of intention. A pure lower subject analysis of the PP would predict that the following sentences are grammatical

because inanimate NPs should be allowed in the [*for*-NP] phrase as in (228) (cf. (130)):

(230) a. *This park would be easy for there to be a riot in e.
    b. *Bill would be easy for it to bother e that Mary left.

As mentioned above, not all *tough*-Adjs allow inanimate PPs:

(231) a. *The Titanic is illegal for any iceberg to sink e.
    b. *John would be interesting for that story to frighten e.

Notice that the gapped VPs here do not violate the intentionality constraint. The (dis)allowance of an inanimate PP is a property of the *tough*-Adj concerned.

5.1.5. Other Approaches

In this section, we will consider how the data we analyzed in previous sections might be handled in such frameworks as Categorial Grammar (CG), Head-driven Phrase Structure Grammar (HPSG) and Government and Binding Theory (GB). There does not seem to be CG or HPSG literature which deals not only with *tough*-constructions but also with the related constructions observed in sec. 5.1.1.2, even though it is assumed that the system for the *tough*-construction can be extended to other constructions. Our discussions on these theories will be based on Jacobson (1991) and Pollard & Sag (1992), respectively, which deal with only *tough*-constructions. There is some GB literature dealing with non-*tough* constructions as well (e.g. Browning 1987, Jones 1990a, etc.).

The major innovations of our IPSG framework is the treatment of [*for*-NP] phrase and the introduction of stacked indices. Hence, those linguistic phenomena which can best be analyzed by these will be problematic to other theories. These theories provide no natural account that the [*for*-NP] phrase simultaneously behaves as a higher PP and the subject of the lower VP in

tough- and similar constructions. They cannot account for those phenomena in which two contiguous elements form a constituent but license different parts of a sentence (cf. (214), (217)):

(232) a. John is [too easy] for people to please *e* for anyone to take *e* seriously.
b. Robin isn't [easy enough] to talk to *e* to approach *e* directly on this problem.

In these examples, *too easy* and *easy enough* are constituents, but *too/enough* and *easy* are connected with different parts of the sentence.

One of the common properties of modern syntactic theories is that the role of lexical items became more important than before. In this respect, CG and HPSG are more lexically oriented than GB. But even in CG and HPSG, the use of lexical information is somewhat restricted because the information in lexical items is fully accessible only when they are head-like elements. We have seen several cases where non-head lexical items are relevant for the *tough-* and related constructions (cf. (85), (106-8), (168-9)):

(233) a. Robin is [too kind] to take advantage of e.
b. Robin is [kind enough] to take advantage of e.
(234) a. John is an [easy person] to talk to e.
b. Robin is [too kind a person] to take advantage of e.
c. This is [a light enough ball] for my baby to throw e.
(235) a. Robin is [too much of an unknown quantity] to trust e.
b. Robin is [enough of a question mark] to trust e.
(236) a. He [put too much chlorine in the pool] for us to swim in it without our eyes burning.
b. [Too much wine], possibly, to permit a reliable judgment was consumed on that occasion.

In none of these constructions is the licensor of the (gapped) VP the head of the string concerned. Constructions which have the same lexical item have the same licensing properties regardless of its status/source. We need to employ a lexically oriented FOOT feature to capture this fact.

Bayer (1990) and Jacobson (1991) provide CG analyses for *tough-* constructions. We have already rejected Bayer's analysis in sec. 5.1.3.1 with

reference to the issue of syntactic connectivity. Criticisms on (the semantic aspects of) Jacobson's analysis will be provided in sec. 8.2.2. There are just a few pages on *tough*- (and *take*-type) constructions in Pollard & Sag (1992). Hence we do not have any specific details of the HPSG analyses to discuss.

We will briefly consider the GB analyses of *tough*- and similar constructions in Browning (1987). She provides an account of "Null Operator Constructions," which comprise not only lexically triggered constructions but also structurally oriented constructions such as relatives and clefts. Null operators play an important role in accounting for these constructions. Three types of constraints are proposed to regulate their behavior: "constraints governing the licensing of the null operator itself, the licensing of the variable created by null operator movement and the licensing of the null operator chain as a whole (p. 2)." The most important motivations for the null operator movement approach are that these constructions obey Subjacency and license parasitic gaps.

However, there are several problems which cannot be easily solved in this framework. First, in Browning's approach, the ultimate source of gap licensing in a *tough*-construction is a special thematic role assignment pattern of the *tough*-Adj. In this respect, this approach is more indirect than CG and HPSG in using lexical information. She assumes that this Adj has only an internal theta-role to assign and hence the matrix subject is not licensed by theta-role assignment (p. 147). However, this approach predicts that the following sentence would be grammatical:

(237) *John is possible to talk to.

The Adj *possible* cannot occur in a *tough*-construction even though *impossible* can (cf. sec. 5.1.1.1). But *possible* seems to have the same theta-role assignment pattern as other *tough*-Adjs:

(238) a. To talk to John is possible.
     b. It is possible to talk to John.

From these data, we can see that there is no thematic relation between *possible* and the matrix subject.

Second, let us consider the data in (104-8) in sec. 5.1.2. These data show that the same lexical items in different constructions carry their gapped VP licensing properties with them. There do not seem to be straightforward ways of capturing similarities among these constructions. For example, in the following set of sentences,

(239) a. John is tough to argue with e.
b. John is a tough man to argue with e.

Adj *tough* in (b) is not even a theta-role assigner because it is a prenominal Adj, while it is crucial in (a) that the Adj is a theta-role assigner.

From the discussions of the data in (101)-(102), we have seen that the following sentences,

(240) a. John is too easy to make friends with e.
b. John is easy enough to make friends with e.

show the characteristics of *tough*-constructions rather than *too/enough* constructions. However, under Browning's approach, these sentences can only be analyzed as *too/enough* constructions because the Deg(ree) words *too* and *enough* are the (obligatory) cue words for assigning special structures for these constructions.

Lastly, consider the sentences in (232), which contain two (gapped VP) licensing elements and two gapped VPs. Each of the two gapped VPs is licensed by one of the two licensing lexical items. The problem here is how to combine the structure for *tough*-constructions and that for *too* constructions to get the structures for them. It seems to be almost impossible to get such a structure for sentence (232b) because the dependencies between triggers and gapped VPs are crossed rather than nested. The only possible structure for sentence (232a) would be as follows:

(241) ... [too [easy for people to please e] for anyone to take
        e seriously]

However, this structure cannot capture the fact that *too easy* forms a
constituent (cf. (103)). Another problem for this structure is that we need to
revise the mechanisms to license the "agreement chain" to ensure the
connection between the inner gap (i.e. the gap after *please*) and the matrix
subject. Notice that the clause which contains this gap is separated from the
matrix subject by another clause (i.e. the *too* clause).

5.1.6. Conclusion

In this chapter, we have observed seven different constructions which show
unbounded discontinuities between the trigger and a part of the target. If we
are going to account for all of these constructions within the GKPS-like
frameworks, we would need several additional mechanisms, which cannot be
always independently motivated. One of the problems of this approach is that
the triggering element of the construction concerned is not always the head of
the local structure. In cases where it is not the head of the structure, the idea
that some particular set of lexical items is related to the construction cannot
be effectively implemented within the rule, because that fact is represented
through the SUBCAT feature value of the head. A more serious problem is
that it fails to express that the same lexical items in different constructions
carry their gap-licensing properties with them.

Based on new observations on some aspects of *tough-* and related
constructions, we have proposed a new gap licensing mechanism that
introduces a stacked FOOT feature [VP//NP[ACC] LICENSOR]. Under this
framework, we can effectively account for the data that are problematic for a
rule-based analysis. Even though the source of the LICENSOR feature is a
particular lexical item, the unbounded discontinuity between a trigger and
gapped VP target is accounted for by the characteristics of the FOOT features

GAP and LICENSOR, and by syntactic mechanisms like the FFP and the licensing principle (184). This system provides a unified account for all the varieties of lexically triggered discontinuity constructions which do not necessarily have structural similarities. The lexical origin of the LICENSOR feature is the main innovation for an effective account of the data which are problematic for a rule-based approach like GKPS and others.

5.2. An Extension: Right Node Raising Constructions

In sec 5.1. we have provided analyses for *tough-* and similar constructions under an IPSG framework. Some other constructions can be accounted for with the same set of mechanims. Right Node Raising Constructions have been one of the most difficult constructions to analyze. They have peculiar properties which cannot be easily accounted for with standard mechanisms. We can provide a reasonable analysis of them by slightly modifying some of the mechanisms for *tough-* and similar constructions, as will be shown below. Our analysis is based on new observations about these constructions.

There are works which analyze (object-gapped) purpose clause constructions under the same mechanisms as those for *tough-* and *too / enough* constructions. Hukari & Levine (1987) assume, partly based on Bach (1982), that the purpose clauses are complements of the verbs concerned. That is, the purpose clauses are licensed by lexical items. However, it is not clear whether they are really verbal complements or just adverbial adjuncts, despite that they are very similar to *tough-*constructions in their properties of VP target and the gap in it (cf. Jones 1990a). We will leave this issue for further research. For the moment, however, we will assume that purpose clauses are not lexically governed, but rather that they are pure adjuncts, following Green (1992) and Jones (1991: 64-8). Remember that our framework only applies to lexically triggered constructions.

Traditionally, Right Node Raising (henceforth, RNR) constructions[44] have been regarded as involving "movement". Hence the "factor" in RNR has been assumed to be "moved/displaced" from the conjuncts. Gazdar (1981) provides an analysis of RNR under this assumption. However, RNR shows several characteristics which we cannot expect from a displacement construction, as we will see in sec. 5.2.1. Based on these characteristics, McCawley (1982) and Steedman (1985) provide analyses which do not assume displacement. However, they do not seem to provide satisfactory accounts for all the special characteristics of RNR, as we will see in sec. 5.2.2. I will propose a new approach for RNR in the spirit of the approach for *tough-* and similar constructions in sec. 5.2.3. The basic idea behind this approach is that the factor remains in the second conjunct and the gap in the first conjunct is licensed by this factor.

5.2.1. Basic Facts

RNR is realized in a coordinate structure. It applies to conjoined Ss, VPs or NPs ending in identical (sequences of) constituents[45]:

(1) a. Alice composes, and John performs, *Philadelphia-style punk rock music.*
   b. In these days, few people learn or indeed see any point in learning, *the languages of Homor and Virgil.* (Quirk et al. 1985: 977)
   c. John's affection for and admiration of *his parents* is remarkable.

The italicized expressions in these examples are called the factor of RNR.

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[44] Sec. 5.2 is a slightly shortened version of Chae (1991b).

[45] The conjuncts in RNR may not be connected with a conjunction as was pointed out to me by Paul Deane (p.c.):

i) Don't actually hate, just be willing, to swim in the pool.

Now let us examine some special characteristics of RNR, which differ from the behavior we expect from displacement constructions. First, the factor in RNR need not be a constituent (contra Gazdar 1981, McCawley 1988), as was observed in Abbot (1976):

(2) a. Smith loaned, and his widow later donated, a valuable
       collection of manuscripts to the library.
   b. I borrowed, and my sisters stole, large sums of money
       from the Chase Manhattan Bank.

The factors in these examples are not constituents. In this sense, RNR cannot be used as a sufficient condition for constituency.

Second, the factor in RNR can be a 0/1-bar expression even though the distribution is limited:

(3) a. John wants just any, but I want the very best, portrait of Elvis.
   b. *Ted has always wanted a, so I've given him my, coffee grinder.

McCawley (1988: 529) gives two question marks about the grammaticality of sentence (a), but native speakers around me agree that it is acceptible. For sentences like (b), the unacceptability seems to be due to phonological restrictions rather than syntactic ones, as is argued by McCawley. The indefinite article a is a bound word and hence may not be separated from its host.

Third, the factor in RNR does not have syntactic "prominence" over the conjuncts. We can see this from the facts of antecedent-anaphor relations (Levine 1985):

(4) a. Mary$_i$ said, and I happen to agree, that she$_i$ needs a new car.
   b. *She$_i$ said, and I happen to agree, that Mary$_i$ needs a new car.

If the factor is displaced from the conjuncts and hence "c-commands" them, sentence (b) would be grammatical.

Fourth, RNR does not obey island constraints for most English speakers (cf. Wexler & Culicover 1980):

(5) a. John gave a briefcase, and Harry knew someone who had
         given a set of steak knives, to Bill.
    b. John knew a man who wanted to take, but everybody who was
         in the concert already owned, a picture of John Lennon.
    c. Anyone who likes, or anyone who thinks their family would
         like, a vacation is welcome to this club.

We cannot *wh*-extract (a part of) the factor when one of the positions from
which the factor was "displaced" is in the configuration of an island ((6a)
compared with (6b)):

(6) a. *To whom did John give a briefcase and Harry know someone
         who had given a set of steak knives? (cf. (5a))
    b. Which book did Kim believe, and Sandy eventually prove,
         that Chris had stolen from the British museum?

Sentence (6a) would be grammatical if the factor were displaced from its
"original" position, because the factor would not be in the configuration of an
island anymore.

   All of the characteristics observed thus far indicate that the factor is not
displaced from the conjuncts, but rather stays in its site of origin in the second
conjunct. In this respect, we need to pay attention to Wexler and Culicover's
(1980: 301) observation that the factor in RNR "always behaves, vis-a-vis all
constraints on analyzability, just as it would if it were in its original position".

5.2.2. Previous Analyses

   In sec. 3 of Chae (1991b) I summarize problems of some previous
approaches. Gazdar's (1981) displacement approach cannot account for the
characteristics of RNR observed in the previous section. Steedman (1985) and
Dowty (1988) provide a categorial analysis of RNR constructions, but the
displacement implicit in this analysis also causes some problems.

   McCawley (1982, 1988) provides an analysis which overcomes many of the
problems of these approaches. In his analysis, the factor is connected with

each of the conjuncts:

(15)
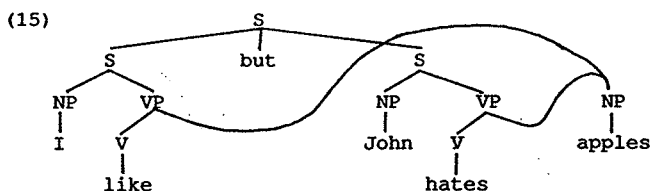
The factor has a special status in the sense that it has two mothers. It is a part of the first and second conjuncts at the same time, which implies that each unit of a conjunct plus the factor has its own identity as a clause. However, the factor stays in the "original" position in the second conjunct. There is no displacement involved explicitly or implicitly.

However, there are some problems with McCawley's approach. First, he assumes that the factor in RNR is a constituent. But we have seen that non-constituent factors are also possible (cf. (2)). In this case, the analysis tree would be a bit more complex because there are two two-mother constituents. Aside from this metatheoretical consideration, we have some counter-examples to McCawley's analysis. Remember that each conjunct and the factor is analyzed as being a grammatical unit. There are cases where this unit is not grammatical by itself, even though it is OK in a RNR construction:

(16) a. ?*I was yesterday unhappy.
     cf. ?I was yesterday, and Tom is today, unhappy.
   b. ??I gave to the old lady a ring.
     cf. I gave to the old lady, and John presented to Mary, a ring.

These examples indicate that the conjunct plus factor unit in RNR has a special status, which is different from those cases where it is out of RNR. If we assume that the unit has the same status as an independent clause, we cannot account for the data in (16).

Next, there are cases where the two conjuncts, rather than the unit of conjunct plus factor, should be considered as a unit (at least semantically)

(Gazdar 1981: 180):

(17) a. John hummed, and Mary sang, the same tune.
b. John hummed, and Mary sang, at equal volumes.
c. John gave Mary, and Joan presented to Fred, books which
looked remarkably similar.
d. The Red Sox beat, and the Giants were beaten by different teams.

At the moment when we interpret the factor, we need information about both of the conjuncts. Each unit of conjunct plus factor is not a possible (semantic) expression. That is, the unit cannot have an independent meaning. The factor should be analyzed as being directly related to the whole conjunction. We can see a similar phenomena in the following examples:

(18) a. A man just came in and a woman went out who were similar
in all kinds of ways.
b. A man just came in and a woman went out who hate each
other like poison. (Gazdar 1981: 178-9)
(19) Tom bought a can-opener and Alice bought a dictionary that
were once owned by Leonard Bloomfield. (McCawley 1982: 100)

Even though we can analyze these sentences as extraposed relative clause constructions (with split heads) (cf. Gazdar 1981: 178), we can also analyze these as manifestations of RNR constructions (cf. McCawley 1982: 100).

Under McCawley's analysis, we must be able to provide an explanation of why the sentences in (17-9) are good but the followings are bad:

(20) a. ??John hummed at equal volumes. (cf. (17b))
b. *Tom bought a can-opener that were once owned
by Leonard Bloomfield. (cf. (19))

The oddity of these sentences may not be due to syntactic factors, but we must admit that they are, at least, semantically bad.

Before looking at one more problem, notice that only the right-most element in a clause can be the factor in RNR, as was pointed out to me by

Arnold Zwicky (p.c.)[46]. The right-most element can be the result of Heavy-NP Shift or Extraposition (from the subject/object). Hence, RNR obeys the same constraints as these constructions:

(21) a. *I gave money the volunteers of America.
     b. *I gave money, and John gave rare books, the volunteers of America.

Sentence (21b) is ungrammatical because the direct object of a ditransitive verb cannot be Heavy-NP-shifted, as we can see in sentence (21a).

Based on this observation, let us consider the fact that non-constituents can also be factors in RNR. But when non-constituents are involved, the Heavy-NP Shifted version is not a good "input" to RNR:

(22) a. My older brother sells to insurance executives those
        cars which are the most luxurious in the world.
     b. My younger brother rents to insurance executives those
        cars which are the most luxurious in the world.
     c. ?*My older brother sells, and my younger brother rents, [to insurance
        executives] [those cars which are the most luxurious in the world].
     cf. My older brother sells, and my younger brother rents,
        [luxury sedans] [to insurance executives].

There is a constraint on non-constituent factors. When the Heavy-NP-Shifted element is a part of the factor, the resulting RNR sentence is not grammatical. It seems that only the unmarked ordering is allowed in RNR when the factor is not a constituent. It is not clear how we can account for this fact in McCawley's system. Under his assumption that each conjunct plus the factor is a unit, we would expect that (22c) would be OK because the two input expressions are grammatical, as we can see in (22a-b).

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[46] The generalization here needs to be modified. We have seen that the following sentence is ungrammatical (cf. (16)):

i) ?*I was yesterday happy.

If the generalization is correct, then we must assume that an ungrammatical sentence can be an "input" to RNR.

Before leaving this section, I want to point out that we can see a major category mismatch ("lifting") when a functor category and its argument are not adjacent:

(23) a. *I count on that you are trustworthy.
  b. ?I count on, among other things, that you are trustworthy.
  c. ?You can count on John, and that he will be on time.
  d. ?That he will be on time, you can count on.

Usually a preposition does not take a *that*-clause as its object, but it is allowed to when the preposition is separated from the clause as we can see in (23b-d).

We can see the same phenomenon of lifting in RNR constructions:

(24) a. ?I count on, but Mary does not believe, that you are trustworthy.
  b. ??Mary does not believe, but I am willing to count on,
    that you are trustworthy.
(25) a. ?My theory captures, and your theory proves, that language is innate.
  b. ??My theory shows, but your theory can only capture,
    that language is innate.
  cf. *My theory captures that language is innate.
(26) a. I dislike, but most people like, to win at poker.
  b. ?I like, but most people dislike, to lose at poker.
  cf. ?*I dislike to win at poker.
(27) a. I enjoy, but Mary hates, to swim in the pool.
  b. ?I hate, but Mary enjoys, to swim in the pool.
  cf. ?*I enjoy to swim in the pool.

These data also indicate that the relation between each conjunct and the factor in RNR is not the same as the corresponding unit out of RNR.

5.2.3. An IPSG Approach

In this section, I will propose an alternative account for RNR constructions. As a preliminary observation, we can see that the special characteristics of RNR that we observed in sec. 5.2.1 are a compound effect of the following special structural/constructional characteristics of RNR:

(28) a. the parallelism between conjuncts (coordination).
   b. the forward-searching nature of the construction.
   c. the special prosody on the factor.
   d. the preservation of the linear precedence relation.

First, it seems to be easier to identify the "missing" element when there are two parallel clauses involved than when there is only one clause[47]. Second, in the case of a forward-searching construction, we can anticipate the exact place and type of the "filler" (i.e. the factor) with reference to the missing element in the first conjunct. This is not the case with a backward-searching construction (leftward extraction construction). Third, the special prosody on the factor (an intonation break before the factor) acts as a cue for indicating that the factor is exactly the element which is missing.

As for (28d), notice that there are two different types of displacement (cf. sec. 2.4): those which do not preserve linear order and those which do preserve linear order. Backward searching constructions belong to the former and forward searching constructions, if any, belong to the latter. Island constraints are (fully) effective only in the backward searching constructions. When linear order is preserved, we cannot see the effect of island violations:

(29) a. I believe that John, as you know already, told us the truth.
   b. I like a woman who has, as you know already, black hair
      and white teeth.

Even though an element in an island is linearly separated from the rest of the sentence in (29b), the sentence is still grammatical (cf. McCawley's (1982) analysis).

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[47] Strictly speaking, there seems to be only phonological parallelism between the two conjuncts in RNR. The factor is separated from the conjuncts by an intonational break and hence the two conjuncts seem to be parallel. However, the factor stays in the second conjunct in the syntactic structure, as we will see later. Thus, there is no syntactic parallelism because the first conjunct has a missing element but the second conjunct does not.

I think the special structural characteristics of RNR in (28) are enough motivation for a new SLASH-like feature for RNR. This feature will play an important role in accounting for the special characteristics of RNR (especially, the non-adherence to island constraints and the possibility of 0/1-bar factors). This feature will be exempt from all the constraints imposed on the regular SLASH (and GAP) to account for its behavior with respect to island constraints.

Based on the observations above we can provide a new framework for the analysis of RNR. My assumption is that we can extend the theoretical mechanisms used for the analysis of *tough-* and similar constructions. The basic idea behind the new approach for RNR is that the factor stays in the second conjunct and the gap in the first conjunct is licensed by this factor. First, I introduce a new SLASH-like feature (say, Double Back SLASH (DBS): \\) for the gap in the first conjunct of RNR. This is justified because the RNR gap is different from other gaps as we have seen above. Second, I introduce another LICENSOR feature [<DBS X> LICENSOR], which originates from the factor and propagates through the tree by way of a stack. This feature licenses the gap in the first conjunct (which is represented as <DBS X>), and is realized as the special prosody of RNR. That is, it is a syntactic cue for the special prosody.

The factor is associated with a stack which has a [<DBS X> LICENSOR] feature. As we have seen before, only the right-most constituent(s) (of the last conjunct) can have !\\X L! (stacked [<DBS X> LICENSOR]). The value of DBS (i.e. X) can be a whole constituent or a sequence of constituents[48], on

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[48] Philip Miller (p.c.) pointed out to me that the present approach would be problematic if an adjunct can be a part of the factor. Then, the value of DBS (i.e. X, the factor) would consist of elements from two different levels. However, a sentence of the following sort seems to be ungrammatical:

which the special prosody will be realized. For example, in the following sentence,

(30) ?I was yesterday, and Tom is today, <u>unhappy</u>!\\AP L!.

the factor *unhappy* has the !\\AP L! feature. Now we can see why the unit of conjunct plus factor is ungrammatical even though it can occur in a RNR construction:

(31) a. ?*I was yesterday unhappy.
     b. ??I was yesterday <u>unhappy</u>!\\AP L!

Expression (31a) is not a case of Heavy-NP Shift but (31b) can be regarded as one because of the LICENSOR feature, which makes the AP "heavy"[49].

I propose the following principle to regulate the behavior of the LICENSOR feature[50]:

(32) [<DBS X> LICENSOR] in the stack of a XP[CONJ α] node (pops out of the stack and) licenses the FOOT feature <DBS X> on the node's XP sister.

---

i) ?*I like, but Mary hates, apples very much.

The problem here is not semantic and/or pragmatic. People agree that this sentence sounds terrible even though they understand it.

[49] But our approach predicts that sentence (31b) might not be as good as the corresponding unit in the RNR construction. The special prosody on the factor is not the only element which makes the unit so perfect in RNR, as we observed in (28).

[50] Notice that there are some RNR constructions which have more than two conjuncts:

i) a. I like, (and) Mary loves, but John hates, this dog.
   b. Ted is interested in, Alice has done some research on, and you are probably aware that Jenny is a recognized authority on, the circulatory system of flatworms. (McCawley 1988: 528)

These sentences would not be problematic to principle (32) if we can properly incorporate the function of the conjunction rule into the system.

The XP node which bears a CONJ feature is usually a clause (S). But it can also be other categories as in (1c).

Let me illustrate how the system works with reference to the following example:

(33) Mary loves, but John hates, this dog.
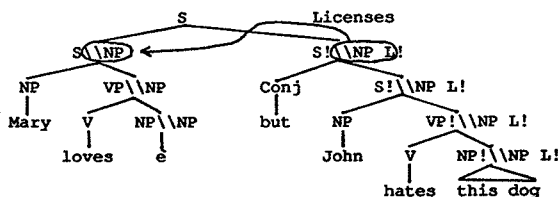
The \\NP (i.e. <DBS NP>) specification on the S node of the first conjunct is required by principle (32) as opposed to free instantiation. Hence the \\NP feature would not propagate onto the highest S node. The propagation of the [\\NP L] feature (i.e. [<DBS NP> LICENSOR]) can be controlled as follows: its upward propagation stops at the moment when it comes out of the stack to license \\NP because it propagates only through a stack. Any downward propagation of it would be blocked due to the fact that only the factor can carry it and the factor always comes at the end of the second conjunct.

Now let us consider how we can account for the special characteristics of RNR and solve the problems of the previous approaches. First, the non-constituent factor does not pose any difficulties because the value of DBS, which is represented as X, can be a string of non-constituents as long as it appears clause-finally. Second, the possibility of 0/1-bar factors and the non-adherence to island constraints are ascribed to the special structural characteristics of RNR. These characteristics are implemented in the system by introducing a new SLASH-like feature, i.e. the Double Back SLASH. Third, the factor does not have any syntactic "prominence" over the conjuncts because it stays in its site of origin in the second conjunct.

We have seen in (6) that a part of the factor cannot be extracted when the conjunct(s) contain islands. We can handle such examples as follows:

(34) a. *Which pop singer did Mary take, and John know a man who wanted to buy, a picture of?

b.
```
                                    [NP/NP]
        *N'/NP!\\NP L!
    N'          S/NP!\\NP L!
    |
   man    NP          VP/NP!\\NP L!
          |
         who    V          VP/NP!\\NP L!
                |
             wanted    V          VP/NP!\\NP L!
                       |
                       to    V          NP/NP!\\NP L!
                             |
                            buy     NP          PP/NP
                                    |
                              a picture    P      NP/NP·
                                           |       |
                                           of      e
```
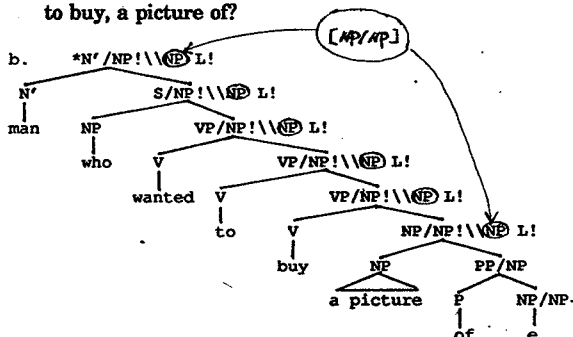
The analysis in (b) shows that a *wh*-extraction out of the factor in an island is ungrammatical just like other extractions out of islands. Notice that we have an independently motivated constraint to prevent inheriting the SLASH from the relative clause onto the top N' node (i.e. the Complex NP constraint).

When neither of the two conjuncts contain islands, the extraction is allowed:

(35) a. Which pop singer did Mary take, and does John want to buy, a picture of?

b.
```
                        S
    NP                      S/NP
    which
    pop singer  S/NP\\[NP/NP]        S/NP!\\[NP/NP] L!
            V   NP  VP/NP\\[NP/NP]  Conj      S/NP!... L!
            did Mary  V  NP\\NP    and    V   NP    VP/NP!... L!
                     take  e          does John  V      VP/NP!... L!
                                                want  V      VP/NP!... L!
                                                      to  V    NP/NP!\\[NP/NP] L!
                                                        buy  NP        PP/NP
                                                           a picture  P   NP/NP
                                                                      |    |
                                                                      of   e
```
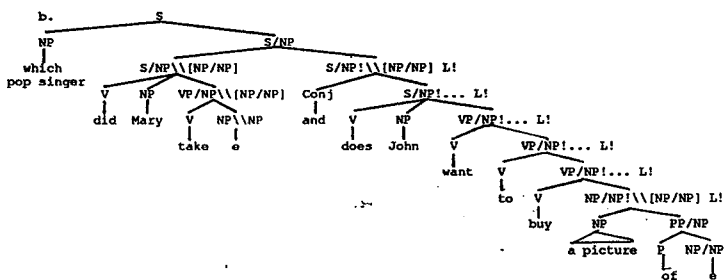
The VP node which dominates *take* has two category-valued features /NP and \\[NP/NP], but this node (VP/NP$_i$\\[NP/NP$_j$]) is the same as VP\\NP (cf. A-B-[C-B] = A-C).

Let us consider the difficulties with McCawley's analysis. First of all, we do not employ non-standard trees, as in (15)[51]. Hence non-constituent factors do not make the analysis tree more complex. Secondly, as we have already observed in (30-31), we do not assume that each conjunct and the factor forms an independent unit[52]. Because the factor in RNR has a special feature (i.e. the [<DBS X> LICENSOR]), the unit in RNR is not the same as the corresponding unit outside of RNR.

As for the semantic facts observed in (18-20), we can use the (inherited) LICENSOR feature on the factor as a marker for preventing direct semantic combination of the factor and its sister. The basic idea is that the factor is syntactically licensed in its site of origin but it is semantically licensed "later"

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[51] We allow structure-sharing only when a shared category is inbetween the two sharing structures as in the analysis of the [*for*-NP] phrase in *tough-* and similar constructions.

[52] Carl Pollard (p.c.) pointed out to me that the badness of sentence (i) naturally follows from the ungrammaticality of sentence (ii) under McCawley's theory:

i) *John gave her$_i$, and I sold Fred, a picture of Mary$_i$.
ii) *John gave her$_i$ a picture of Mary$_i$.

Sentence (ii) violates one of the principles of Binding Theory. However, the ungrammaticality of sentence (i) might follow from other factors. Let us consider sentences of the following:

iii) *I gave her$_i$ a book and a friend of Mary$_i$ gave me a notebook.

Sentences (i) and (iii) are instances of coordinate constructions. The ungrammaticality of sentence (i) may be due to the same factors as those which are responsible for the ungrammaticality of sentence (iii), whatever they may be.

when the LICENSOR feature licenses the DBS feature (cf. sec. 8.3.3).

The problematic case where the factor contains a Heavy-NP-Shifted element as a part (cf. (22c)) can also be analyzed as follows in our system:

(22) c. ?*My older brother sells, and my younger brother rents,
to insurance executives those cars which are the most
luxurious in the world.

(36)
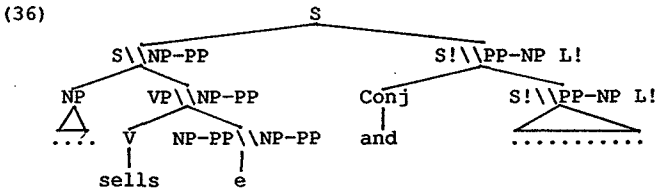
As we can see in (36), there is a mismatch between the value of the \\ in the first conjunct and that of the \\ in the second conjunct. The former is [NP-PP], which is determined by the unmarked ordering of the arguments of the verb, but the latter is [PP-NP], which represents the constituent order in the factor. Hence, the LICENSOR feature cannot license the \\ in the first conjunct.

In this section, we have provided an IPSG approach for RNR constructions. The factor of RNR is assumed to be the trigger of the construction, and the target is the gap in the first conjunct. There are some differences between the mechanisms for RNR and those for the other constructions observed in this chapter. First, the LICENSOR feature licenses only a part of a category (i.e. only a gap) rather than the whole category. Second, strictly speaking, the source of the LICENSOR feature (i.e. the factor of RNR) is not lexical items. Third, syntactic connectivity is established between the gap in the first conjunct and the factor in the second conjunct. This is done due to the fact that the value of the DBS (\\) in the LICENSOR feature is the same as the factor, but this connectivity is only syntactic. We have seen before that the

factor is directly combined with the whole conjunction semantically. Finally, we employed a special version of the principle which regulates the behavior of the LICENSOR feature. However, I do not think these differences make the present analysis less attractive than without them. RNR requires a speical treatment because it has peculiar properties, which separate it from other constructions.

<Appendix> Grammar Fragment

We have the following rules, trees and principles for the analysis of *tough*- and related constructions in sec. 5.1:

(1) (cf. (172))

$[AP, PP_{ti} [PP_{ti}, VP//NP]_{VP//NP}]_{AP}$ (ti: token-identity)

(2) (cf. (171), (185))
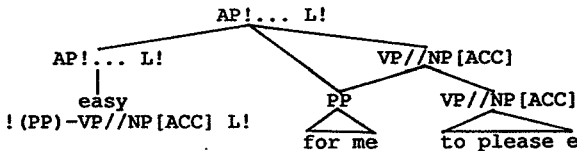
(3) (cf. (184))

> [XP LICENSOR] in the stack of a node (pops out of the stack and) licenses one of this node's daughters when the specification of the LICENSOR's value (i.e. XP) is the same as that of this daughter node.

The structure in (2) is based on the rule in (1). In the structure, the PP and the higher VP//NP[ACC] are licensed by the LICENSOR feature in the stack of the higher AP, according to the principle in (3).

The relevant mechanisms for the RNR constructions which were observed in sec. 5.2 are as follows: .

(4) (cf. (33))
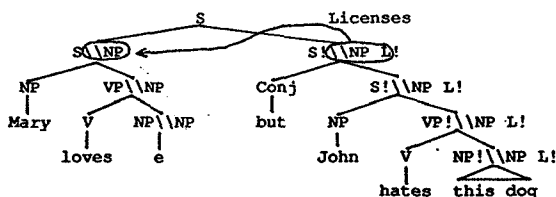
(5) (cf. (32))

[<DBS X> LICENSOR] in the stack of a XP[CONJ α] node (pops out of the stack and) licenses the FOOT feature <DBS X> on the node's XP sister.

The DBS gap on the node of S in the first conjuct (i.e. \\NP) is licensed by the <\\NP LICENSOR> in the stack of the higher S node in the second conjunct, according to the principle in (5).

Chapter VI. TYPE B CONSTRUCTIONS

In this chapter, we will provide an IPSG analysis of Type B Constructions (cf. sec. 2.3). These constructions have the same properties as Type A Constructions observed in Ch. V in that both types are lexically triggered and show unbounded dependencies. There are differences between these two types of constructions as well. The characterizing feature of Type A Costructions is that their targets (infinitive VPs) contain major gaps (represented by GAP (//)), which are due to absent arguments/complements. On the contrary, the targets of Type B constructions do not have major gaps. These constructions will be characterized by other properties.

In sec. 6.1, we will provide an extensive analysis of comparative constructions. Even though these constructions contain gaps, these gaps are not from arguments but from degree or quantity words and have different characteristics from Type A gaps and wh-gaps in many respects. Result clause constructions will be discussed in sec. 6.2. In all of the previously considered constructions, gaps (both argument and non-argument gaps) are responsible for unbounded dependencies. In contrast, the result clause constructions do not have any gaps. Here, what induces unboundedness is the behavior of the LICENSOR feature (originated from the trigger). In sec 6.3, we will observe some common properties of the structures and principles operating in the configuration where the target is licensed in Type A/B constructions.

A common property of Type B Constructions is that their triggers are degree (or quantity) Advs. There are several different types of degree Advs (cf. Baker 1989: 313-6): i) *very, extremely, unusually*, etc., ii) *this, that*, etc., iii) *how*, iv) comparative elements (*-er, as, more, less*), and v) *too / enough, so / such*.

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Among these five groups of degree Advs, we will focus on the Advs in group (iv) and (v). These two groups fall together into a class because these Advs are associated with some particular phrases/clauses. Group (iv) Advs are related to phrases which provide a relative standard in comparatives (i.e. *than/as* phrases). Group (v) Advs are associated with result clauses. We have already observed result clause constructions containg *too/enough* (i.e. *too/enough* constructions) in Ch. V. Remember that these constructions have infinitival VP result clauses. Constructions with *so/such*, which will be dealt here, have result clauses introduced by *that*.

We will assume the following structures for phrases with degree Advs in both comparative and result clause constructions:

a.   AP   b.   AdvP   c.   NP
   DegP   A'   DegP   Adv'   QP   N'
                                          DegP   Q
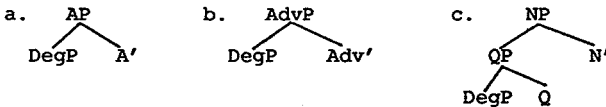
Notice that *more/less* function not only as pure DegPs (e.g. *more/less beautiful*) but also as QPs (e.g. *more/less money/books*), just like *enough* (cf. Baker 1989: 320-2).

6.1. Comparative Constructions[1]

In this section, I propose a new analysis of English comparative constructions, based on a few observations including a new classification of "Comparative Deletion (CD) and Comparative Ellipsis (CE)" and other related

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[1] Sec. 6.1 is an extended version of Chae (1992), which will appear in the proceedings of BLS 18. I acknowledge the benefit I got from Carl Pollard's manuscripts on comparatives: "Notes- on the Syntax and Semantics of Comparatives" and "A Survey of Comparatives in HPNL". Our approaches share the basic idea that comparative elements license the compared phrase. However, there are significant differences in the classification of comparatives and the specific mechanisms of the analyses.

issues. The basic idea behind the present IPSG approach is that comparative elements (*-er, more, as* etc.) themselves have the property of licensing the compared phrases (*than/as*-phrases).

6.1.1. Comparative Deletion and Subdeletion

A wide variety of ellipses are involved in comparatives. First, we can see some independently existing ones[2]:

(1) a. Mary wrote more books than John did.
    b. Mary wrote more books than you think.
    c. Mary loves John more than Sue, Tom.
    d. John would lie to Sue sooner than Bill would to Jane.
    e. I organized more than I actually ran her life.

We have VP Ellipsis in (a), Null Complement Anaphora in (b), Gapping in (c), Pseudo-gapping in (d), and Right Node Raising in (e) (Napoli 1983, sec. 1). Second, there are (obligatory) comparative-particular deletions:

(2) a. Mary is taller than Joan is (*x tall*).
    b. John eats more apples than Mary eats (*x-many apples*).
(3) a. Mary is taller than Joan is (*x*) thin.
       Mary is shorter than John is (*x*) tall.
    b. John has more books than Mary has (*x-many*) records.

The deletion of the elements in these parentheses has been the center of study in comparatives, which are handled by the so-called CD (Comparative Deletion) rules. Third, there is another group of ellipses which are dealt under the name of CE (Comparative Ellipsis) rules:

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[2] However, we cannot say that being a comparative has no effect on these ellipses. It is a well-known fact that Pseudo-Gapping is far more productive in comparatives than in other constructions (cf. footnote 11).

(4) a. John is taller than Mary.
    b. Mary was fatter at 15 than at 21.
    c. John eats more apples than oranges.
    d. John is more tall than thin.

The "ellipses" in this group seem to be motivated neither by independently motivated ellipses nor by comparative-particular deletions.

The ellipsis phenomena in the first group and third group (if any) can be characterized as "omission under identity of a non-contrastive phrase". In this paper, we will focus on the analyses of comparatives containing the second and third group ellipses. For the second group, we will explore the idea that CD is responsible for the omission of only $x(-many)$ in (2-3). For the third group, we will pursue the idea of "base generation" in line with most Phrase Structure Grammar approaches, which implies that our accout would have far fewer ellipses than in traditional approaches.

As for the second group of comparative-particular deletions, it has been assumed in the literature that there are two different kinds of obligatory deletion rules involved (Bresnan 1973, Chomsky 1977, etc.): a CD rule for the data in (2) and a Comparative Subdeletion (CSubD) rule for (3). Even though Bresnan (1977) posits a single rule for these two cases by using a variable, the deletion of Adj/Avd (and N) is still a part of the CD rule. However, I will argue that CD is responsible only for the omission of a Degree Phrase (DP) (x in (2-3a)) or a Quantity Phrase (QP)(x-$many$ in (2-3b)). In addition, I posit that the deletion of Adj $tall$ in (2a) is motivated by its distributional characteristics and hence the resulting gap is not due to CD itself. By factoring out this independently existing deletion, we can provide a unified account of CD phenomena, without positing separate CD rules for (2) and (3).

To begin with, we see a contrast in the acceptability of the following sentences:

(5) a. *Mary is taller than Joan is tall.
    b. ?John eats more apples than Mary eats apples.

First of all, both of these sentences violate a general (semantic?, cf. Gazdar 1980: 166) constraint against repetition of non-contrastive phrases. But sentence (b) is not so bad, especially with a contrastive stress on *John* and *Mary*, while sentence (a) is still bad. To see the difference here, notice that Adj *tall* has a "neutral meaning" rather than the normal "polar meaning" and that the neutral meaning arises only when an Adj (or Adv) occurs as the head of comparative elements and other degree expressions such as *this/that* and *how* (cf. Bresnan 1973: 323).

It is true that both *tall*'s in (5a) occur with degree elements, *-er* in the former and empty DP x in the latter. This empty DP gives a neutral meaning to Adj *thin* in (3a). However, the effect of the empty DP is not as strong as that of explicit comparative elements in providing neutral meaning to its head. Its effect can be nullified in special contexts (Chomsky 1977: 122, Gazdar 1980):

(6) What is more, this desk is higher than that one is HIGH.

In this sentence the height of the desk in the compared phrase is 'high' in its polar sense. With a special intonation we can cancel out the effect of the omitted degree word.

Then we can see why the repetition of *tall* in (5a) is worse than that of *apples* in (5b). What is required in the compared phrase is 'tall' in its neutral sense. But the empty DP is not strong enough to keep this neutral meaning salient. Hence, the Adj is likely to be associated with its regular polar meaning. This conflict can be easily resolved by avoiding repetition in the compared phrase when Adj (or Adv) is the head of empty DP/QP. Notice that there is no polar vs. neutral distinction when the head of a comparative word is an N as in (5b). As a piece of evidence for our position, we can refer to the following sentence:

(7) Henry is taller than 6 feet (tall). (Rusiecki 1985: 48)

Here the repetition of *tall* is natural. The reason here is that we have an explicit QP *6 feet*, which gives the neutral meaning of the Adj without any

interference from the polar meaning, unlike the case where there is an implicit QP. This constitutes an independent motivation for the distributional deletion of As (Adjs and Advs) in comparatives.

This distributional fact leads to a natural account of the almost-obligatory deletion of Adj in (2a), and of the difference berween (2a) and (6). It also means that we cannot account for the deletion of A as a part of CD itself. CD seems to be responsible, at most, for the omission of DP and QP. We can see that the omission of these phrases is comparative-particular (cf. Gazdar 1980: 80, 176; Baker 1989: 341):

(8) a. *higher than that one is *very/so/that* wide.
   b. *less fussy than Fido is *very/so/that* greedy.
   c. *as erudite as he is *very/so/that* creative.
(9) a. *more corn than dogs eat *much* hay.
   b. *More pigs eat corn than *many* dogs eat hay.
   c. *more bones than *the* biscuits.
   d. *more of the bones than *many* of the biscuits.

These data show that the compared phrase in comparatives inherently lacks DP or QP. That is, the omission of these phrases has nothing to do with the repetition of identical items. But notice that repetition is a precondition for the omission of A (compare (2a) with (3a)). Based on these examples and the above arguments for the distributionally motivated deletion of A, we can argue that CD is responsible only for the omission of DP and QP.

One potential problem of the present approach is that the omission of Adj in the compared phrase seems to be obligatory when the Adj is used attributively, as was pointed out to me by Carl Pollard (p.c.):

(10) a. John has smarter friends than Bill has [x (*smart/*stupid)] enemies.
   b. We have more intelligent consultants than they have
      [x (*intelligent/*competent)] engineers.

But not all attributive Adjs are omitted. On the contrary, the following construction requires one:

(11) a. *John doesn't have such a kind brother as Mary has a sister.
    b. John doesn't have such a kind brother as Mary has a nice sister.

We can account for the phenomena in (10) with reference to the distributional difference between *-er / more* and the DP/QP gap (what is represented as *x* and *x-many / much*):

(12) a. i) a smarter boy, *smarter a boy.
        ii) a very/more pleasant boy, *very/??more pleasant a boy.
     b. i) *a this/so/such big boy, this/so/as big a boy.
        ii) *a such kind friend, such a kind friend.
                        (as

The data in (a) show that *-er, more* and *very* have the same pattern of distribution (i.e. [Det - [[DP-Adj] - N']]). But *this/so/as* and *such* have different patterns (i.e. [[DP-Adj] - [Det - N']] and [DP - Det - Adj - N'], respectively), as we can see from the data in (b)[3]. Based on this difference, we can assume that the DP/QP gap belongs to the second group in its distribution[4]. Then the sentences in (10) are ungrammatical with Adjs because the order required by the head of comparison (i.e. the first pattern) is different from that which is required by the DP gap (i.e. one of the second

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[3] We have an alternative ordering imposed by *more* (i.e. [[DP - Adj] - [Det - N']]) in (ia):

(i) a. Dan is [more competent a manager] than Derek.
    b. Dan is [a more competent manager] than Derek.

If this order is in effect in (10b), the sentence with an Adj in the compared phrase should be OK under our analysis. However, we can maintain our approach because the order in (ib) is far more natural than that in (ia). Notice that sentence (a) is rather archaic in its style.

[4] Among the two patterns in (12b), we can assume that the first one is a default order for DP/QP gap, and the second one is required only when the head of comparasion is *such*.

patterns)[5]. Sentence (11a) is ungrammatical because it contains [x a e sister].
Two gaps (DP gap and Adj gap) are separated from each other by a Det, which
seems to cause difficulties in processing.

One might argue that sentence (13a) (cf. (10a)) is a counter-example to the
present account:

(13) a. John has smarter friends than Bill has e enemies.
b. *Paul has a longer table than Sue has a desk. (Ryan 86: 41)

But sentence (13b) is ungrammatical as is expected[6]. This contrast is due to
the fact that the order difference of relevant elements (i.e. Det, DP and Adj)
is neutralized in (a) because all of these elements are empty. Note that e
represents a string of omitted categories. But in (b) there is still an order
conflict owing to the existence of the Det in the compared phrase. We have
further evidence for our approach:

(14) a. John has as kind a friend as Mary has x vicious an enemy.
b. *Paul has a longer table than Sue has a wide desk.

In sentence (a) the order that is imposed by DP as is the same as that imposed

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[5] Sentence (10b) is ambiguous. The relevant reading for our purpose, in
which *more* modifies *intelligent*, is more difficult to get than the other reading,
where *more* is a modifier of the following N. For this latter reading, Adjs
might not be deleted (Bresnan 1973: 312):

(i) Sally will give me more helpful advice than destructive criticism.

[6] One of the major arguments against a "deletion" analysis and for an
"interpretive" account in Pinkham (1982: 1) is based on the following set of
data:

(i) a. *Joe's parents bought him a larger table than he has a kitchen.
b. Joe's parents bought him a larger table than he needed.

But we know that sentence (a) is ungrammatical for an independent reason.
It is ungrammatical due to an order conflict. But sentence (b) does not have
any conflict because all the relevant items are deleted.

by the DP gap in the compared phrase[7], but there is an order conflict in sentence (b) (i.e. <u>a x wide</u> vs. <u>x wide a</u>).

this is imposed by -er.   → *this is required by the DP gap.*

6.1.2. The Status of the Compared (*than-*) Phrase

Now, focusing on comparatives involving the third group of ellipses (cf. (4)), I will argue that *than* has three different functions in comparatives, contrary to traditional two-way distinctions (Hankamer 1973, Napoli 1983, and Ryan 1986): P(reposition), Comp(lementizer) and (Coordinating) Conj(unction). The three-way distinction here is similar to Pinkham's (1982) classification: "clausal" and "base-generated" comparatives, the latter of which is further classified into "parallel" and "prepositional" comparatives[8].

The compared phrase is a PP when only an NP follows *than*, regardless of this NP's interpretation as subject or object:

(15) a. Jean gave Mary more books *than Alice*.
     b. Jean gave Mary the most books.
(16) a. Mary is as pretty as a picture. (Berman 1973: 53-4)
     b. Mary eats faster than a tornado.
     c. The town produced men who were more annoying than its tax rate.
       (Ryan 1986: 19).

As was pointed out by Mark Gawron (p.c.), the superlative sentence in (15b) has an ambiguity analogous to that in (15a). Thus, the proper place to capture

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[7] We will need to account for the contrast in the following set of data (cf. Berman 1973a: 101):

(i) a. Helen is as good a doctor as Mary is (*x good*) a lawyer.
    b. *Helen is as good a doctor as Mary is (*x*) bad e.

Sentence (b) seems to be bad because a modifier (i.e. *bad*) remains but its head (i.e. an NP) is deleted.

[8] Pinkham (1982) does not assign category Conj to *than* for her parallel comparatives.

the similarity between these sentences is in the semantics because we cannot assign two different structures for the ambiguity in (15b). For the comparatives containing "figurative NPs" as in (16)[9], it is not clear what would be the "sources" if we assume ellipses.

There are several pieces of evidence for the PP analysis. First, we have expressions of the following:

> (17) a. different from/than NP
> b. superior/inferior to NP
> c. taller than me/*I.

In (a) *than* alternates with a P. In (b) words which have comparative meaning have PP complements (cf. Hankamer 1973). In (c) the accusative form of a pronoun occurs after *than* for many speakers of English.

Second, the NP within the PP can be fronted as is observed in Hankamer (1973):

> (18) a. Mary is taller *than Joan.*
> b. (?)*Who* is Mary taller *than?*

But the NP can be extracted even when the subject of a transitive verb is the focus of comparison, contrary to his "ergative constraint":

> (19) Who do I drink beer more than? (Ryan 1986: 160)

The natural reading for (19) is the one in which *who* is interpreted as the subject of the verb.

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[9] The metaphoric comparatives in (16) have different characteristics from those of regular NP comparatives as in (15a) (Berman 1973a: 53-4):

> (i) a. *Mary is as pretty as a picture is.
> b. *Mary isn't as pretty as a picture.

Sentence (16a) does not have a corresponding construction as in (ia), and it cannot be readily negated as indicated in (ib).

Third, the NP in the compared phrase behaves like an element in the same clause as the head of comparison (Napoli 1983: 164-5):

(20) John thinks [Mary$_i$ is taller than herself$_i$/*her$_i$].

Lastly, there are comparatives for which the NP in the compared phrase is an explicit DP or QP ("measure phrase NPs")[10]:

(21) a. The car was travelling faster than 90 mph.
     b. Mary bought more records than ten.
     c. Max is older than the forty years they reported him to be.
        (Berman 1973a: 98)

The underlined DP/QPs here can combine with Ps (e.g. *at ten, over 90 mph,* etc.) but never with Comps or Conjs (if the other conjunct is not a DP/QP). In addition, we cannot assume that any other DP/QP element is omitted from the compared phrase, which is most clear in (c). Notice that a QP cannot cooccur with article *the*. This is different from those cases where the compared phrase is introduced by Comp or Conj *than* as we can see later.

There seem to be no differences in the status of *than NP* when the head of comparison is the subject:

_____

[10] There is a difference between comparatives with regular NPs and measure phrase NPs as was pointed out by Carl Pollard (p.c.):

(i) a. taller manager than Derek.
    b. *taller consultants than 6 feet.

In the measure phrase comparatives, the compared phrase must be right-adjacent to the comparative element. Based on this fact he argues that the comparative element is subcategorized for the compared measure phrase complements. However, there seems to be a problem with this approach:

(ii) ?Derek is [(much) more intelligent] than 900 milliLampings.

Here the compared phrase is not a sister of *more* but a sister of *more intelligent*. Hence, we need to assume non-local subcategorization.

(22) a. More people play soccer [than water polo].
b. ?What do more people play soccer than?
(23) a. More dentists recommend Oral B [than any other toothbrush].
b. More dentists recommend these toothbrushes than them/*they.

The NP can be extracted as in (22b), and an accusative form of a pronoun occurs after *than* as in (23b).

Than is a Comp when a clause (which has at least a subject and a predicate) follows, as in the examples in (1-3). There is evidence for this assumption:

(24) a. *Who is Mary taller than t is?
b. Mary is [taller than Joan is].

From (24a) we can see that *than* is not a P. In (b) *taller than Joan is* forms a constituent as we will see later. Hence *Mary is taller* cannot be a constituent, which means that *than* is not a Conj either. Consider the following data:

(25) a. Is Mary taller *than* Joan is thin?
b. *Is Mary taller than is Joan thin?
(26) a. Did you buy more apples than John bought oranges?
b. *Did you buy more apples than John buy oranges?
c. *Did you buy more apples than did John buy oranges?
(27) a. *Is Mary very tall *and* Joan is very thin?
b. Is Mary very tall and is Joan very thin?
c. *Did you buy some apples and John bought some oranges?
d. Did you buy some apples and John buy some oranges?
e. Did you buy some apples and did John buy some oranges?

As we can see in (25-6), *than* here shows different properties from those of Conj *and* (cf. (27)). It shows exactly the same set of properties as other Comps. The compared phrase is not affected by "operations" on the higher clause.

The following sentences also have Comp *than*, even though there is no explicit subject in the compared phrase;.

(28) a. More people [than e were invited] came to the party.
b. More people from Connecticut lived in frame houses [than e lived in stone houses]. (Baker 1989: 338)

Note that the omitted subject in these sentences has a special status. Its omission is triggered by the head of comparison. In sentence (28a), the compared phrase is a part of the head of comparison (here, the subject of the higher clause), and does not bear any relation to the rest of the sentence. It is subordinate only to the subject NP. Introducing a subordinate clause is a characteristic function of Comp. We can set up similar arguments for the Comp-hood of *than* in (28b) as those in (25-7):

> (29) a. Did more people from Connecticut live in frame houses
> than lived/*live in stone houses?
> b. Did more people buy apples than bought/*buy oranges?
> cf. More people bought apples than bought oranges.

We have additional evidence which shows that the Comp-hood of *than* is maintained when the head of the comparison is the subject of the main clause:

> (30) a. ?What did more men buy apples than women bought t?
> cf. More men bought apples than women bought oranges.
> b. ?What do more pigs eat t than dogs eat hay?
> cf. More pigs eat corn than dogs eat hay.

We can extract an element from only one clause as in (30), which is not allowed in coordinate structures.

Thus far, we have observed that comparative *than* functions as a P when an NP follows and as a Comp when a clause follows. But there are many other comparative sentences which do not fit into these two categories. I will now argue that it functions as a Conj in these sentences. Typical examples of Conj *than* are those in which the focus of comparison itself is the head of comparison:

> (31) a. John eats [more apples] than [(x-many) oranges].
> b. The company needs [more trucks] than [(x-many) cars].
> c. John bakes [better cakes] than [(x-good) pies].
> (32) a. John is more tall than thin.
> b. This car runs more fast than smoothly.

(More) apples in (31a) is the focus and, at the same time, head of comparison. The examples in (32), which are called "meta-comparatives", have the same characteristics as those in (31) in the sense that they also induce a coordinate structure. But they have different characteristics in other respects and will be discussed in sec. 6.1.3.

Comparatives with Conj *than* show a strong parallemism between the two conjuncts[11]. Napoli (1983, sec. 2.1.) lists some pieces of evidence for Conj-hood of *than*. First of all, this construction obeys the "Coordinate Structure Constraint"[12]:

(33) a. Nancy Reagan, I've seen [more pictures of] than [books about].
b. *Who did you see more pictures of than books about Ronald?
c. *Who did you see more pictures of Nancy than books about?

Second, *than* can introduce elements of any major syntactic category. This will become evident when we discuss other examples, especially meta-comparatives. Third, items which have limited distribution can appear in the compared phrase when the conditioning context is present in the sentence:

(34) The team made/*liked [more noise] than [(x-much) headway].

Notice that *headway* is a part of the idiom chunk *make headway*. But *like headway* is not a possible expression.

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[11] Comparatives with Comp *than* also seem to show a parallelism between the two conjuncts even though it is not as strong as that in comparatives with Conj *than*. The productivity of Pseudo-Gapping in comparatives seem to be a combined effect of this parallelism and of the fact that *than* is a Comp in Pseudo-Gapping comparatives (cf. (1d)).

[12] Carl Pollard (p.c.) told me that the data in (33) do not show that *than* is a Conj. They show only that whatever factors are at work in coordinate constructions that give rise to the so-called Coordinate Structure Constraints are also at work in that construction. But I think we need Conj *than* to account for other data to be discussed shortly.

Apart from those cases where the focus of comparison is the same as the head of comparison, there are other cases for which we must assume that *than* is Conj:

(35) a. I bought [a bigger car today] than [e yesterday].
     b. Mary was [fatter at 15] than [e at 21]. (Ryan 1986)
     c. John listens [to folk music more often] than [to jazz e].
     d. John gave [more books to Shirley] than [e to Fred].

There seem to be three different ways of analyzing these examples. First, we can assume that the compared phrase is a full sentence with Comp *than*. This kind of analysis is not accepted nowadays due to many apparent problems. We have two possibilities of non-sentential analyses. If we assume that only constituents can be conjoined, the first conjunct would be the smallest constituent which contains both the head and focus of comparison. For example, in (35a) the first conjunct would be *bought a bigger car today*. If we assume that non-constituents can also be conjoined (cf. Dowty 1988), the first conjunct would be a string which contains only the head and the focus of comparison. For example, that of (35a) would be *a bigger car today*. I favor this second analysis because we would need to posit sentence (36) as the source of (35a), which is ungrammatical, under the first analysis:

(36) *I bought a bigger car today than bought e yesterday.

Whichever of these two possible analyses we choose, we need a Conj *than* rather than a Comp *than* because Comp introduces only clausal units. We will see further evidence for the Conj analysis when we discuss meta-comparatives.

The phenomenon is a little more complex when the head of comparison is in the subject position:

(37) a. [More boxes were stored in the attic] than [e in the basement].
       (Ryan 1986: 43)
     b. *Which attic were more boxes stored in t than in the basement.
     c. *Which basement were more boxes stored in the attic than in t.
(38) More doctors debate doctors than lawyers. (Ryan 1986: 35)
     a. 'More doctors debate doctors than lawyers debate doctors'.
     b. 'More doctors debate doctors than doctors debate lawyers'.

From the examples in (37b-c) we can see that *than* is not a Comp but a Conj. These are bad because an element is extracted from only one conjunct, violating the Coordinate Structure Constraint. Thus, a reasonable way of analyzing sentence (37a) would be a coordinate structure with sentence-like conjuncts (cf. (98'a)). The second conjunct contains a string of omitted elements (corresponding to *x-many boxes*), which are due to CD and other ellipses. Sentence (38) is ambiguous. For the (a) reading *lawyers* is a N' with an omitted QP, but for the (b) reading it is an NP and hence the compared phrase is a PP. For the sentence with the former reading, we can assume a coordinate structure with an extraposition of *than lawyers* from *more doctors than lawyers*. There is no problem in extraposing a whole conjunct from a coordinate structure if the conjunct is extracted together with the conjunction:

(39) a. Neither John nor Mary attended the class.
  b. Neither John attended the class nor Mary.

Notice that *neither...nor* is a typical example of (split) Conj.

Incorporating what we have observed thus far, we can summarize comparative constructions schematically as in (40):

(40) L). A + -er; *more*$_1$ + A ⎱   ⎰ P). *than*$_P$ + NP
  M). *more*$_2$ (+ N^1) ⎰   ⎱ Q). *than*$_{COMP}$ + clause
                  ⎰ R). *than*$_{CONJ}$ + X

There are six constructions represented here (cf. (42)). Both *-er/more*$_1$ and *more*$_2$ can be associated with three different types of *than*-phrases. The parentheses in (M) indicate that *more*$_2$ can also be used as an NP or as an Adv (Bresnan 1973: 280-1):

(41) a. He offers more than we had hoped for.
  b. Sally eats caviar more than I had expected.

These additional functions of *more*$_2$ arise simply because it is a QP. The symbol X in (R) represents the assumption that it might not be a constituent.

From schema (40), we can first observe that there are six interrelated constructions:

(42) LP: John is taller than Mary.
    LQ: John is taller than [Mary is (x *tall*)].
    LR: John has [smarter friends] than [(x *smart*) enemies].
        Mary was [fatter at 15] than [(x *fat*) at 21].
    MP: John eats more apples than Mary.
    MQ: Mary eats more apples than [Mary eats (*x-many apples*)].
    MR: John eats [more apples] than [(*x-many*) oranges].
        John gave [more books to Shirley] than [(*x-many books*) to Fred].

Notice that the italicized elements in the parentheses are not explicit expressions. Second, there are 2 *more*'s observed thus far. The one in (40L), *more*$_1$, which is a morphophonologically conditioned variant of *-er*, is a DP. It induces degree comparatives (the same with the *as...as* construction). The *more* in (40M) is a QP and induces quantity comparatives. DPs can modify Adjs, Advs and Qs, but QPs can modify only N'-s. DPs can only modify N'-s by way of a QP as in *as many / much N' as ...* (cf. **as N' as ...*). We have one more motivation for the distinction between DPs and QPs:

(43) a. The car was travelling faster than [90 mph]/*[90 miles].
    b. Mary bought more records than [ten]/*[three per week].
       (cf. Ryan 1986: 17)

In (a) the DP *-er* combines with another degree expression in the compared phrase, but in (b) the QP *more* combines with a quantity expression.

We will see that the DP vs. QP distinction is responsible for the contrast among the following sentences (cf. Bresnan 1973: 322-7):

(44) a. *John is taller than thin.
     *John is as tall as thin.
    b. John has more apples than oranges.
(45) a. John is taller than he is thin.
     John is as tall as he is thin.
    b. John is as much tall as (he is) thin.
(46) John is more tall than (he is) thin.

In a "single-scale comparative" as in, for example, *John is taller than Mary*, we

are comparing the heights of John and Mary on a single scale of 'tallness'. When there is only one scale involved, we can compare what is represented by two points of degree because the comparison is done within the same scale. We can see the relative positions of these points by just looking at them on the given scale. However, when there are two different scales involved as in (44a), the comparison of two degrees would be logically impossible because we cannot compare 'tallness' and 'thinness' directly without referring to their quantities. In (44b), however, we are comparing two quantities rather than two degrees. Notice that *more* here is a QP rather than a DP.

The sentences in (45a) do not have quantity expressions even though two scales are involved, but they are grammatical unlike those sentences in (44a). There is a difference between these two groups of sentences, which is related to the issue of providing quantities. In (45a) we can get the quantity of 'thinness' by referring to a specific entity 'he', which is in the scope of comparison (the constituent containing both the head and the compared phrase). In this case we know how much 'thinness' we are talking about. The 'tallness' and 'thinness' are compared on the scale of 'tallness' by referring to the quantity of 'thinness' indirectly provided. In (45b), we can get the quantities of both 'tallness' and 'thinness' directly because we have an explicit quantity expression *much*. The expressions in (46) have nothing to do with degree or quantity. These meta-comparatives will be handled in the following section.

6.1.3. Meta-comparatives

It has been pointed out that the comparatives in (32) and (46) have different characteristics from the others we have observed thus far (Pinkham 1982, Napoli 1983 and Ryan 1986, among others). The focus of study thus far has been on semantic differences. In this section, I will show similarities and differences between the two groups from a syntactic point of view. These

properties will be described with reference to the syntactic properties of *more* and *than*.

Before we go into syntactic characteristics, let us consider a semantic difference between regular comparatives and meta-comparatives:

(47) a. Mary is more tall than thin.
　　b. This car runs more fast than smoothly.

Sentence (a) has the meaning of 'Mary is more aptly described as tall rather than thin', rather than that of 'the degree to which Mary is tall exceeds the degree to which she is thin'.

As for syntactic characteristics, any (phrasal) categories of the same type can be connected by *(more)...than* in meta-comparatives:

(48) a. Mary is [more very tall than very thin].
　　b. Mary served a [more tasty than elegant] dinner.
　　c. It was a [more social than intellectual] affair. (Pinkham 1982: 152).
(49) a. This car runs more very fast than very smoothly.
　　b. He played more passably than extremely well. (Ryan 86: 91)
　　c. I stood more outside than inside.
(50) a. John is more a reactionary than a conservative.
　　　Mary is more a linguist than a sociologist.
　　b. She more than he understands how to proceed. (Napoli 83: 681)
(51) John is more trying to win acceptance than (he is) trying to get rich.
(52) a. The airport is located more to the east than to the north.
　　b. I did it more in jest than in anger.
　　c. John took his cue more from the director than from the script[13].

These data show that several different categories can occur here: AdjP, AdvP, NP, VP and PP. This is a characteristic of a coordinate structure[14]. Actually

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[13] Actually sentence (52c) is ambiguous between a meta-comparative reading and a reading where *more* has the meaing of 'more often'.

[14] Consider the following examples of Right Node Raising (RNR) constructions (cf. sec. 5.2.2):

(i) Teresa surprised more than scared John. (Ryan 1986: 54)
(ii) a. Did Teresa surprise more than *scared/scare John?

this construction shows the same characteristics as those of the construction in (31) and (33) as far as the behavior of *than* is concerned (cf. the MR construction in (40)).

A real difference between the MR construction in (40) and the meta-comparative construction lies in the behavior of *more* rather than *than*. We argued above that there are two *more*'s: DP and QP, but *more* in a meta-comparative is neither DP nor QP because it has nothing to do with degree or quantity. I will argue that it is a Conj. Strictly speaking, it is the first part of a split Conj *more ... than*. We can say that it has the same function as *neither ... nor, either ... or, both ... and*, etc.

There are some other pieces of evidence for this assumption besides the semantic fact that the Adjs in a meta-comparative have polar meanings. First, as was pointed out by Pinkham (1982: 150-1), meta-comparative *more* cannot be modified:

(53) a. Mary was <u>even</u> more angry than she was sad.
    b. Mary was <u>three times</u> more angry than she was sad.
    c. Mary was <u>much</u> more angry than she was sad.

These sentences have only the literal meaning, i.e. only the DP/QP reading of *more*. She used [+metacomparative] and [+numerical] to account for this fact in (53). Meta-comparative *more* cannot be modified for the simple reason that it is a Conj in the present analysis. No stipulation is necessary.

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    b. Who did Teresa suprrise more than *scared/acare t?
(iii) I organized more than I actually ran her life. (Napoli 1983: 676)
(iv) a. Did you organize more than you actually ran/*run her life?
    b. Whose life did you organize more than you actually ran/*run t?

As we can see in (ii), sentence (i) has Conj *than*. But sentence (iii) seems to have Comp *than* rather than Conj *than*, considering the data in (iv). However, such examples as in (iii) are not a conclusive evidence for a Comp-hood of *than*. Typical Conjs can have a clausal second conjunct even though the first conjunct is not a clause, as we can see in (56-7).

Second, the compared phrase in meta-comparatives does not have any DP/QP gap, either semantically or syntactically:

(54) a. Mary is more very tall than very thin.
　　 b. *John is more tall than I think he is thin.

If we assume that *more* in meta-comparatives is a Deg word, we cannot account for the fact that two Deg words occur in (54a). Notice that a DP has the characteristic of closing an AP (cf. Gazdar et al. 1985 (GKPS): 122). Since meta-comparatives do not have any gaps, there are no unbounded examples of meta-comparatives. This is apparent as we can see from sentence (54b). Regular comparatives with sentential compared phrases can be unbounded as we will see later.

Under the present analysis, we can easily capture the relation between meta-comparative *more...than*[15] and a related expression (split Conj) *rather...than*:

(55) a. Mary is tall rather than thin.
　　 b. Dan would rather admit Frank fired no engineers than
　　　　 Derek hired no engineers.

These two expressions seem to have similar syntactic and semantic characteristics.

One might argue against the split Conj analysis on the basis of the following data in (56), where only the second conjuncts have clauses:

(56) a. John is more tall than he is thin.
　　 b. Mary is more bored than she is hungry.
　　 cf. *John is more tall than Mary is thin.

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[15] We have some *more...than* examples which are used rather figuratively:

(i) I earn more than money at UPS. I earn respect.
　　 (Lantern, Ohio S. Univ. newspaper, advertisement)

Here the expression seems to have the meaning of 'not only'.

(57) Mary is neither tall nor is she short.
    cf. *Mary is neither tall nor is John short.

First, notice that there is a semantic restriction on the clause in the compared phrase. The subject of the clause must be the same as the higher subject (cf. Pinkham 1982: 152). Second, a standard split Conj can also have a clausal second conjunct under the same semantic constraint, as we can see in (57).

    To account for the observations in this section, we can revise the schema in (40) as follows:

(58) L). $A + \text{-}er;\ more_1 + A$ ⎱   ⎰ P). $than_P + NP$
     M). $more_2\ (+ N^1)$ ⎰ ── ⎱ Q). $than_{COMP} + $ clause
                                   R). $than_{CONJ} + X$
     N). $more_{CONJ} + XP$ ──────── R'). $than_{CONJ} + XP$

Now, there are seven interrelated comparative constructions. We can divide these into two groups: N-R' vs. the others. The major difference between these two groups of constructions is due to the functional difference of *more*: Conj vs. DP/QP. This difference is responsible for the syntactic and semantic differences between regular comparatives and meta-comparatives.

    Before we leave this section, let us summarize the two types of ellipses we assumed for comparatives. Excluding the independently motivated ellipses in (1), there are two different kinds of ellipses. First, there are comparative-particular deletions (CD), which are responsible only for the deletion of Degree Phrases (DP) or Quantity Phrases (QP). Second, there is a group of ellipses which is motivated by "identity with a non-contrastive phrase":

(59) a. Mary is taller [than Joan is ($\underline{x}$) thin].
    b. Mary is taller [than Joan is ($\underline{x}$ *tall*)].
    c. John has [smarter friends] than [($\underline{x}$ *smart*) enemies].
    d. Mary was [fatter at 15] than [($\underline{x}$ *fat*) at 21].
(60) a. John has more books [than Mary has ($\underline{x\text{-many}}$) records].
    b. John eats more apples [than Mary eats ($\underline{x\text{-many}}$ *apples*)].
    c. John gave [more books to Shirley] than [($\underline{x\text{-many}}$ *books*) to Fred].
(61) a. More students ate apples than [($\underline{x\text{-many}}$ *students*) ate oranges].
    b. [More boxes were stored in the attic] than [($\underline{x\text{-many}}$ *boxes*)
        in the basement].

The deletion of all and only the underlined parts is due to CD. The ellipsis of the italicized elements is motivated by "identity" with the material in the head of comparison. Basically this ellipsis is optional, but other factors such as distributional properties of As and restrictions on word order are responsible for the obligatory deletion of As in (59b-d). On the other hand, the following comparatives do not have any ellipses:

(62) a. John is taller [than Mary].
    b. John eats more apples [than Mary].
    c. More people play soccer [than water polo].
    d. John is more [tall] than [thin].

Sentences (a-c) have prepositional *than*, and sentence (d) is an example of a meta-comparative.

In this paper, we will not go into the issues related to the following data. Let us look at them briefly[16]:

(63) a. More people arrived than I met yesterday.
       Jones wrote a better story than we expected him to write.
    b. More people arrived than I expected.
       Her speech was more insightful than I had expected.
(64) a. Mary wrote more books than (was/??were) necessary.
       (cf. Napoli 1983: 678).
    b. They arrived sooner than (was/*were) necessary.
       (cf. Hankamer 1973: 189)
    c. These boxes are bigger than (is/??are) required.
(65) %John is taller than what (Mary told us that) Bill is.
       (Chomsky 1977: 871)

As is discussed by Chomsky (1981: 81-8) and Gueron & May (1984: 26), there

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[16] Examples of the following seem to be very difficult to analyze:

(i) Pat comes to class more often than not.

Napoli (1983: 681) tries to account for this sentence by assuming that *not* is a pro-S and that *than* is a P taking this pro-S as its argument.

are differnces between the sentences in (63a) and those in (63b). There seem to be no DP/QP gaps in the latter. Notice that these are examples of Null Complement Anaphora (cf. (1b)). The compared phrase here is treated as a PP in Napoli (1983: 685) (cf. *than ever before*). We can see similar examples in (64). The compared phrases in these examples seem to be somewhat idiomaticized. First, the V in them does not have a direct syntactic and semantic relation to any outer element. It does not show agreement and is semantically independent. Second, the V can be omitted. This is not possible in regular comparatives. If sentence (65) is grammatical, it also seems to be an example of gapless comparatives. Whatever follows *than* has a nominal function, as we can see in (66a):

(66) a. I know what (Mary told us that) Bill is.
    b. *John is taller than what Bill is thin.

The gap after *is* in (65) is related to *what* rather than to the head of comparison. This gap is not a DP/QP gap as we can see in (66b). If the gap were a DP gap, sentence (66b) would be grammatical because sentences (65) and (66b) would induce the same type of gap, i.e. the DP gap.

6.1.4. An IPSG Approach

Thus far we have observed that the comparative word *more* has three different functions: DP, QP and Conj. Also, *than* has three functions: P, Comp and Conj. We have noticed that DP and QP *more* induce gaps in compared phrases that are introduced by Comp and Conj *than*. We have not looked at the nature of the gaps induced by DPs and QPs. There is evidence showing that these gaps are different from NP (and other) gaps (represented by SLASH (/), GAP (//) or DBSLASH (\\) in this dissertation). The force of DP or QP gaps is far weaker than that of other gaps in the sense that their existence is not as significant as others either syntactically or semantically. In (6), we

have already seen one case where the effect of a DP gap is cancelled out.

First, DP/QP gaps do not obey the Generalized Left Branch Constraint (Carl Pollard, p.c.):

(67) a. John is taller than Mary is [x thin].
   b. *How is John [t tall]? cf. [How tall] is John t?

In wh-questions, which involve SLASHes, the whole constituent should be extracted when the left-most element of the constituent is a wh-word.

Second, the Empty DP/QP has no ECP effect as is observed by Gueron & May (1984: 20):

(68) a. ?As much/More caviar was eaten at the party as/than I
         thought that [(x-much) smoked salmon] would be.
   b. *As much/More caviar was eaten at the party as/than I ·
         thought that [e] would be[17].

We can see the ECP effect only when other elements are deleted together with the DP as in (b).

Third, Gazdar (1980: 177) points out that in some dialects there is a contrast between (69) and (70)[18]:

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[17] We can see a difference in the behavior of Comp *than* and Comp *that* with reference to the ECP effect:

(i) More students ate apples than e ate oranges.

Comp *than* is not subject to ECP even though a full NP is omitted when this NP gap is licensed by the head of comparison.

[18] Bresnan (1973: 323) gives different judgments to the sentences containing only DP/QP gaps:

(i) *The table is longer than the door's wide.
   cf. The table is long, and the door's wide.

This set of data is used by Bresnan to show that there is a gap in the compared phrase. But the very fact that the grammaticality judgments are not consistent with these examples indicates that the force of DP/QP gaps is not

(69) a. Fido is more cowardly than Rover is e nowadays.
    b. *Fido is more cowardly than Rover's e nowadays.
(70) a. Fido is more cowardly than Rover is x careful nowadays.
    b. Fido is more cowardly than Rover's x careful nowadays.

It is well-known that contraction of the tensed auxiliary is not allowed when a (real) gap follows. Sentence (70b) indicates that the DP gap does not obey this constraint. From these observations, we can argue that DP/QP gaps are different from other gaps.

Finally, sentences with DP/QP gaps are less acceptable in unbounded sentences than those sentences with other gaps[19] (cf. Chomsky 1977: 119):

(71) a. The desk is higher than they believe that it is x wide.
    b. ?The desk is higher than they believe that Bill claims
        that it is x wide.
    c. The desk is higher than they believe that Bill claims that it is e.

In sentence (c) an Adj together with a DP is omitted.

From the above observations, we can clearly see that DP/QP gaps show different characteristics when they are alone vs. when they are combined with other gaps. Only in the latter case, the (string of) gaps involved behave like normal gaps (cf. Pinkham 1982: 2). Now we can understand why Chomsky (1977) uses only the type of example with multiple gaps to argue for the wh-treatment of comparatives. He tries to argue that CSubD comparatives are different from CD comparatives in nature (pp. 118-20). We know that the difference between these two groups of comparatives is simply due to the special characteristics of DP/QP gaps, but we should keep in mind that DP/QP gaps are still gaps and hence they show gap properties to some degree. First,

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very strong.

[19] Berman (1973a: 55-6) assumes that unbounded "subdeletion" comparatives are ungrammatical:

(i) a. *Mary is as clever as Joe believes Sally to be x stupid.
    b. *Mary is as good a lawyer as Joe believes Sally to be e a doctor.

we have some (limited) examples of unbounded dependency comparatives as in (71a-b). Second, they obey Complex NP Constraints despite Chomsky's (1977) arduous counter-arguments:

(72) a. The desk is higher than they believe that it is x wide.
   b. *The desk is higher than they believe the claim that it is x wide.

Before we go into the theoretical framework, we need to consider the issue of constituency. It has been implicitly assumed that the compared phrase and the head of comparison form a constituent even when the compared phrase is a PP or a clause. We will see evidence for this assumption:

(73) a. Mary is taller than John.
   b. Mary is as tall as John.
(74) a. [Taller than John] though Mary is, she is slower than him.
       [As tall as John] though Mary is, she is slower than him.
   b. [Taller than which of your friends] is Mary?
       [As tall as which of your friends] is Mary?
   c. [[Just how much] taller] than John] is Mary?
       [[Just how close to] as tall] as John] is Mary?
(75) a. How tall is Mary? — [Taller than John].
   b. Just how tall is May? — [As tall as John].

From the data in (74), we can see that the underlined parts in (73) can be extracted, which is strong evidence for constituency. The data in (75) show that they can stand alone as answers to questions.

When the compared phrase is a clause, the result of the extraction tests is not clear, but we have evidence for the constituency in other respects:

(76) a. Mary is taller than John is.
   b. Mary is as tall as John is.
(77) a. How tall is Mary? — [Taller than John is].
   b. Just how tall is Mary? — [As tall as John is].
(78) a. Mary is [taller than Joan is] and [richer than Sandy is].
   b. Mary is [as tall as Joan is] and [as rich as Sandy is].
       (cf. Napoli 1983: 689)
(79) [As pretty as Mary is], nobody likes her. (Berman 73: 135).

In (77) the underlined parts can stand alone as answers. In (78) they can be

conjoined, which can be used as evidence for constituency in default cases. In (79) the unit concerned has the function of an independent clause. In addition, we can see that the unit has an internal structure rather than a flat one:

(80) a. [More beautiful] though Mary is [e [than that woman over there]], ...
b. [(A) more beautiful woman] though Sue is [e [than the owner of this building]], ...

Now we have established enough background to give a formal account of the relationship between the comparative element and the compared phrase in comparatives. The basic idea is that the comparative element has a (lexical) property of licensing the compared phrase. This relation between particular lexical items and what is licensed by these items can be easily captured within the IPSG framework sketched in Ch. IV. We will use USLASH (Upright SLASH: |) rather than SLASH or other representations to represent the DP/QP gaps. We have seen before that these gaps are different from other gaps. Then, under the present framework, we can say that *-er* and *more₁* have the property of licensing PP[PFORM *than*], S[COMP *than*]|DP or X[CONJ *than*]|DP. *More₂* licenses PP[PFORM *than*], S[COMP *than*]|QP or X[CONJ *than*]|QP. Conj *more* licenses XP[CONJ *than*]. The idea here can be easily formalized by using a LICENSOR feature, which is a stacked FOOT feature. For example, *-er* has <PP[PFORM *than*], S[COMP *than*]|DP, or X[CONJ *than*]|DP LICENSOR> in the lexicon as a part of its syntactic information. The LICENSOR for comparatives is an obligatory feature because there must always be a compared phrase, but there are alternatives for its value. The feature propagates through the tree by way of a stack and pops out of the stack when it licenses PP[PFORM *than*], etc.

Let us see how the present system accounts for the following example:

(81) Jane is more beautiful than I thought she would be.

```
                    S
          ┌─────────┴──────────┐
         NP                    VP
          │          ┌──────────┴────────────────────────────┐
        Jane         V              AP!<S[COMP than]|DP L>!  ⌒
                     │          ┌────┴──────┐            ⌒
                    is        AP!.. L!     S[COMP than]|DP
                          ┌────┴────┐     ┌───┴────┐
                        DP!.. L!    A'   COMP     S|DP
                          │         │     │    ┌───┴────┐
                        more    beautiful than  NP      VP|DP
                  !<S[COMP than]|DP                │   ┌───┴─────┐
                      LICENSOR>!                    I   V        S|DP
                                                    │   │     ┌───┴────┐
                                                  thought she would be
                                                          (x beautiful)
```
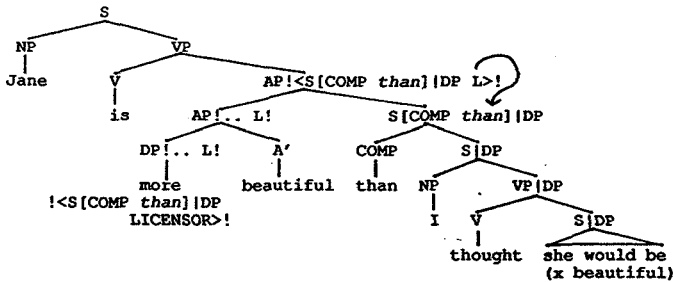
The LICENSOR feature on the node of the higher AP pops out of the stack and licenses the S[COMP *than*]|DP node according to the following: the LICENSOR feature of a node licenses one of its daughters when the feature's value specification is the same as that of this daugher node (cf. sec. 4.3 (9)). The upward propagation of the LICENSOR feature stops at the moment when it pops out of the stack because it propogates only through a stack. The |DP on the node of S[COMP *than*] cannot propagate upward because it is licensed by the LICENSOR feature. Licensed features are different from freely instantiated features. Notice that USLASH in |DP is responsible only for the omission of x in the lowest clause. The Adj *beautiful* is omitted due to other factors as noted above, and the USLASH is a mechanism for the account of unbounded dependencies in comparatives.

The present system predicts that the compared phrase (i.e. the target) can be licensed when it is a sister of the head of comparison. The head is defined as the largest constituent the left-most element of which is a comparative element (i.e. the trigger). Notice the "Chomsky-adjunction" in the local structure where the licensing mechanisms operate. We have seen above in (73-79) that the string containing the head and the compared phrase really forms a constituent when the comparative element is in a non-subject position. Now, let us observe some data in which the head of comparison is in the subject position (repeated from above):

(22) [More people play soccer] [than water polo].
(23) [More dentists recommend Oral B] [than any other toothbrush]
(29) [More people bought apples] [than bought oranges].
(30) [More pigs eat corn] [than dogs eat hay].
(37) [More boxes were stored in the attic] [than in the basement].

The *than* in the compared phrase in (22-3) is a P, that in (29-30) is a Comp and that in (37) is a Conj. Our framework predicts that the compared phrase is a sister of the whole preceding phrase regardless of its status because it can be licensed only at the top node of the sentence. I think the prediction is correct. The compared phrase does not belong to any constituent which is smaller than the whole sentence from both the syntactic and the semantic points of view:

(82) More people think that she$_i$ is beautiful than e realize
     that Mary$_i$ is warm-hearted.

The anaphoric relation here shows that *than*-clause is not subordinate to the main clause.

In most cases, the compared phrase is licensed when it is the sister of the head of comparison, as we have observed. This is only the lowest possible position for the compared phrase to be licensed. The compared phrase might be licensed at a higher position because the LICENSOR feature, as a FOOT feature, can pass up through the tree if no restrictions are added. Let us consider the following sentences:

(83) Mary thinks John has more money than he has.

This sentence is ambiguous (Jones 1990b: 579) between narrow and wide scope readings of the degree word. A narrow scope reading is that Mary believes a contradiction, and a wide scope reading is that Mary's mistaken belief about the amount of John's money exceeds his actual amount of money. For the first reading, the compared phrase is licensed as a sister of the head of comparison, but, for the second reading, the compared phrase is licensed at a higher position. We can analyze the sentence with this reading as follows:

(84)

```
                              S!.. L!
         S!.. L!                              S[COMP than]
    NP        VP!.. L!                         than he has
   Mary    V         S[COMP that]!.. L!
        thinks   COMP        S!.. L!
                  that    John has more
                             money
```
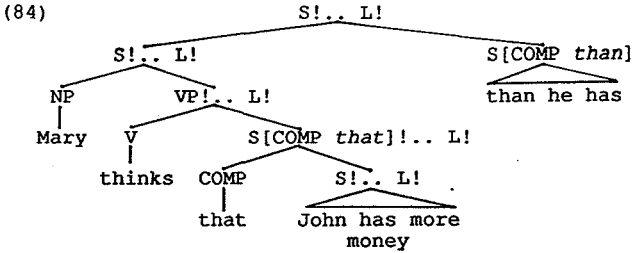
In this structure, the licensing takes place at the highest S node. What is special about this tree is that the LICENSOR feature crossed the boundary of a S' node. This fact indicates that unboundedness in comparatives can be induced not only by DP/QP gaps but also by LICENSOR features.

We need to assume that licensing mechanisms in comparatives can operate in two different places: at the node containing both the head of comparison and the compared phrase, and at an S node[20]. Notice that both of these places have the configuration of "Chomsky-adjunction".

There are a few more issues to be considered to correctly define the role of LICENSOR features in comparatives. First, we have examples of nested comparison as (Zwicky 1989c: 159, footnote 15):

(85) This sauce is much more tastier than the last sauce than
      we could have expected.

There are two comparative elements (*more* and *-er*) and two *than*-phrases. The following data show that the relations here are nested:

(86) a. How much tastier than the last sauce is this sauce?
          ---> Much more than we could have expected.
      b. #How much tastier than we could have expected is this
          sauce? ---> Much more than the last sauce.

---

[20] The licensing at an S node would be possible only when *than* in the compared phrase is a P or COMP. If CONJ *than* is extracted out of its lowest position, it would violate the coordinate structure constraint.

Based on sentence (85), we can construct a question-answer set as in (86a) but not as in (86b). Notice that the conversation in (86b) is plausible only when the relations between triggers and targets in (85) are crossed rather than nested.

Second, in some cases one comparative element is related to more than one compared phrase (Napoli 1983: 690-1, cf. Ryan 1986: 166):

(87) But now she's much more aggressive than he is than she was before.

None of the constructions observed in Ch. V have this property of one-to-many relations[21]. Hence, this property should be understood as a special property of comparative LICENSORs[22]. Based on the following structure for sentence (87),

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[21] Actually, we have comparative sentences of many-to-one relations as well:

(i) a. More silly lectures have been given by more boring
professors than I would have expected.
b. *More silly lectures have been given by more boring
professors than I met yesterday.

However, this kind of examples are limited to such comparatives as in (a) (Chomsky 1981: 81, Gueron & May 1984: 26), which we looked at (63b) but we will not consider them in this dissertation.

[22] Alternatively, we can assume that the one-to-many relation is due to a structural property of comparatives:

(i)
```
                         AP
        ┌────────────────┴────────────────┐
       AP                           S[COMP than]
      ╱  ╲                    ┌───────────┴───────────┐
 much more            S[COMP than]              S[COMP than]
 agressive              ╱    ╲                    ╱    ╲
                     than ...                  than ...
```
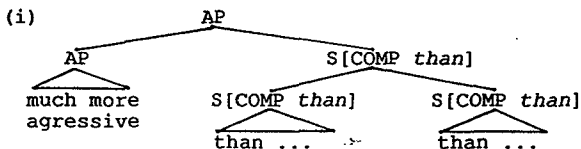
Here we are assuming a kind of "serial S" structure for the S daughter of AP. However, a correct analysis will depend on whether the two *than*-phrases form a constituent or not.

(88)

```
                              AP
                        ___/‾‾_____
              AP              S[COMP than]   S[COMP than]
          __/‾‾\___        __/‾‾\___        __/‾‾\___
          much more        than ...         than ...
          agressive
```
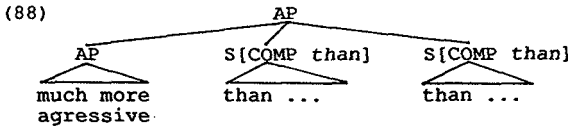
we will assume that comparative LICENSORs can be duplicated when there is more than one target as a sister. This assumption fits with the semantic fact that the head of comparison here bears a separate relation with each of the two compared phrases.

We need some more constraints, which are not necessarily syntactic, to account for other aspects of comparatives. First, there is a strong parallelism requirement between the head of comparison and the corresponding syntactic and/or semantic unit in the compared phrase. The standards upon which we can measure the parallelism are the site of DP/QP in the head and the site of omitted DP/QP (if there is one) in the compared phrase. Notice that the information about these two sites is provided by comparative elements and what is licensed by them, which are connected by way of LICENSOR features in our framework.

A corollary of the parallelism is that the head of comparison should be a part of the compared phrase (at least in its interpretation) when the corresponding unit is not present in the compared phrase:

(89) a. I've never seen a man [[taller] than my mother].
b. *I've never seen [[a taller man] than my mother].
(90) a. Joe is a man who is [[more intelligent] than Mary is].
b. *Joe is [[more intelligent a man] than Mary is]. (Berman 1973a: 2, 37)

In (89) a semantic unit that should be provided in the compared phrase is 'x tall' in (a) and 'x tall a man' in (b). The latter meaning is incompatible with *my mother*, which is a female. In (90), what is missing is *x intelligent* in (a) and *x intelligent a man* in (b), the second of which is incompatible with *Mary is*.

In (91) (Bresnan 1973: 320), what we can recover from the deleted VP is *found x good a solution* in (a) and *found a solution x good* in (b):

(91) a. John wants to find [[a better solution]
        than Christine did]/than Christine's].
     b. John wants to find a solution [[better]
        than *Christine did]/Christine's.

In sentence (a), *x good a solution*[23] is recovered from the head of comparison, while, in sentence (b), *x good* is recovered from the head. In the latter case, we can see a clash between the role of the head in the higher clause and that of the corresponding clause in the compared phrase. In the main clause, the head together with the compared phrase (i.e. *better than Christine did*) is a modifier of *a solution*. In the compared phrase, only *x good* is a modifier. The problem is that the former can be a post-modifier but the latter cannot (cf. (104-5)). The nullifying effects of empty categories (cf. footnote 23) would not be operative here because the information for *x good* comes from the parallelism requirement, but the information for *a solution* does not. In the case of *than Christine's*, what is missing is a N' in both examples. The only candidate for this is *x good solution* in (a) and *solution* in (b).

We can provide a similar account for the ungrammaticality of sentence (92d) (Bresnan 1973: 320):

(92) a. Jack eats caviar [[more] than he eats mush (x-much)].
     b. Jack eats [[more caviar] than he eats (x-much) mush].
     c. Jack eats caviar [[more] than he sleeps (x-much)].
     d. *Jack eats [[more caviar] than he sleeps (x-much caviar)].

In (d) we expect that the phrase corresponding to the whole head *more caviar* (i.e. *x-much caviar*) is omitted from the compared phrase. However, this expected phrase cannot play an appropriate role in it. Let us consider one

---

[23] The ordering here does not match the ordering required by degree element *-er*. But this ordering conflict does not matter because all the relevant elements are empty.

more example:

> (93) *John ate more apples than ate oranges. (Ryan 1986: 29)
>   a. *John ate more apples than e ate (x-many) oranges.
>   cf. More students ate apples than ate oranges.
>   b. *John ate more apples than (x-many apples) ate oranges.
>   cf. The cat ate more rats than ate oranges.

There are two possibilities for analyzing example (93), as in (a) and (b). In (a) a QP is deleted from the object NP of the compared phrase. The string represented by this analysis is ungrammatical because the string ... *than e ate...* is bad if the gap is not licensed by the head of comparison itself. In (b) a QP is omitted from the subject NP of the compared phrase. This string is also ungrammatical for semantic reasons. 'Apples' cannot eat 'oranges'. The two sentences in (93b) have exactly the same syntactic structure.

Second, we need a constraint on the relative linear order of constrastive phrases, i.e. the focus of comparasion and the corresponding contrastive phrase in the compared phrase. I will argue that the latter should be to the right-hand side of the former when the compared phrase is introduced by Conj *than*. This is an absolute grammatical constraint when the contrastive phrases are complements rather than adjuncts:

> (94) a. John stored bigger boxes in the basement than in the attic.
>   b. *John stored bigger boxes than in the attic in the basement.
>   (Ryan 1986: 105)

The PP *in the basement* is an argument/complement of V *store*. In (a) the contrastive phrase in the compared phrase (i.e. *in the attic*) comes to the right of this PP. But it is not the case in (b).

The phenomenon is more complicated when the contrastive phrases are adjuncts. In these cases, the sentences are not ungrammatical even though they violate the above-posited constraint. Here the reversed order just seems to add difficulties in processing:

(95) a. John saw newer micros at this year's fair than at last year's fair.
    b. ??John saw newer micros than at last year's fair at this year's fair.
(96) a. More boxes mildewed in the basement than in the attic.
    b. *More boxes than in the attic mildewed in the basement.
       *More boxes mildewed than in the attic in the basement.

The contrast between (94b) and (95b) is due to the difference of the nature of the order constraints: it is a grammatical constraint for complements and a processing constraint for adjuncts. Then the question is why the sentences in (96b) are bad. Notice that *in the attic* here is an adjunct. We can get an answer by observing the following data:

(97) a. John saw more boxes in the basement than in the attic.
    b. ??John saw more boxes than in the attic in the basement.
(98) a. More people saw new micros at this year's fair than at last years fair.
    b. *More people than at last year's fair saw new micros
        at this year's fair.
      *More people saw new micros than at last year's fair
        at this year's fair.

The only difference between (95) and (97) vs. (96) and (98) is that the head of comparison occurs in the predicate position in the former but it occurs in the subject position in the latter. We have seen before that this difference brings about the difference of the position of the compared phrase.

Let us compare the sentences in (97) and (98) with reference to their tree structures:

(97′) a.

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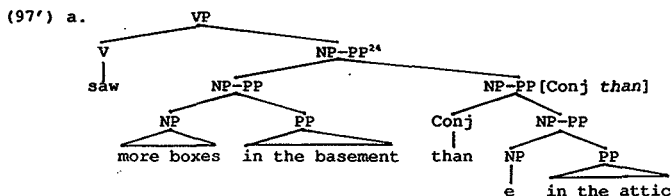
[24] I use NP-PP to indicate a string which consists of an NP and a PP. This string is not a constituent in itself, but it behaves like a constituent for the purpose of coordination.

b.
```
                              VP
        ┌──────────┬────────────────────────┬──────────────┐
        V        NP        NP-PP[Conj than]              PP
        │      ┌────┐      ┌─────┐         ┌─────┐
       saw   more boxes  Conj    NP-PP    in the basement
                         │      ┌───┐
                        than   NP   PP
                         │     ┌───┐
                         e   in the attic
```
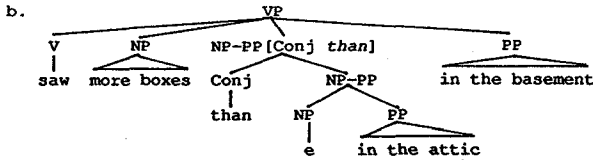
In (a), the configuration permits the licensing mechanisms to work, i.e., it is a "Chomsky-adjoined" structure, and the compared phrase comes after the focus phrase. In (b), the order of the two contrastive phrases is reversed, violating the processing constraint. This reversed order also destroys the optimal configuration for the licensing mechanisms to work. These factors are responsible for the awkwardness of sentence (b).

Now let us consider what kind of structures we can assign for sentences like (98):

(98') a. More people came to this year's fair than to last year's fair.

```
                              S
            ┌─────────────────┴──────────────────────┐
            S                              NP-PP[Conj than]²⁵
       ┌────┴────┐                        ┌────┬──────────┐
      NP         VP                      Conj    NP-PP
   ┌──────┐   ┌──┴───┐                   │     ┌──┬────┐
 more people  V      PP                 than   NP       PP
              │    ┌─┴──┐                │     ┌──┴──────┐
            came  to this year's         e    to last year's fair
                    fair
```

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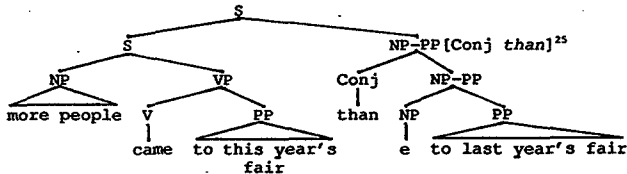
²⁵ There are other ways of analysing the compared phrase in (98). For example, it can be analyzed as S[CONJ than] or PP[CONJ than]. I have chosen the NP-PP analysis because I think the information about the omitted NP (the head of comparison) should be provided by syntax but information about the omitted V can be provided by semantics or pragmatics:

(i) More people eat vegetables than herbs.
   a. ... than (x-many people) (eat) herbs.
   b. ... than (x-many horses) (eat) herbs.
   c. ... than (x-many people) (smells) herbs.

The natural reading for sentence (i) is (a), but I think we can get reading (c) in appropriate contexts even though it would be impossible to get reading (b).

bi. *More people than to ~~this~~ *last* year's fair came to ~~last~~ *this* year's fair.

```
                        S
          ┌─────────────┼──────────────┐
    NP        NP-PP [Conj than]         VP
  ┌──┴──┐    ┌──┴──┐              ┌──────┴──────┐
more people Conj   NP-PP          V            PP
            │     ┌─┴─┐          came  to this year's fair
           than  NP   PP
                 │   ┌─┴─┐
                 e  to last
                   year's fair
```
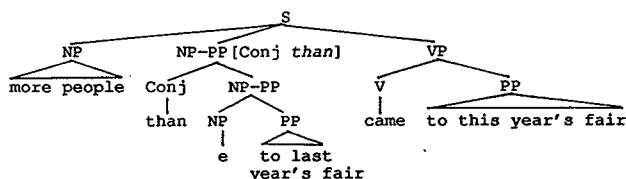
bii. *More people came than to last year's fair to this year's fair.

```
                        S
        ┌────────┬────────┴────────┬──────────────┐
       NP        V         NP-PP [Conj than]      PP
   ┌───┴───┐    │        ┌──────┴──────┐    ┌──────┴──────┐
more people   came      than e to last    to this year's fair
                              year's fair
```
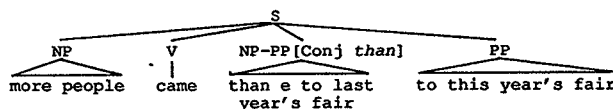
The examples in (98'bi-ii) violate the ordering constraint. The difference between (97'b) and (98'bi) is that in the former the focus of comparison (i.e. *in the basement*) is a sister of the compared phrase, which contains the constrastive phrase. In the latter, it (i.e. *to this year's fair*) is on a lower position than the compared phrase. The focus of comparison should be on an equal (or higher) position than that of the compared phrase when the order of the constrastive phrases is reversed. We can see a similar requirement in binding of pronouns. In example (98'bii), no VP node can be assigned.

Notice that the above-mentioned syntactic and processing constraints operate only with those comparatives containing Conj *than*[26]:

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[26] The following examples seem to be exceptions to the generalization that the syntactic and processing constraints do not apply to the comparatives with Comp *than*:

(i) a. More pigs eat corn than dogs eat hay.
    b. *More pigs than dogs eat hay eat corn. (Baker 1989: 345)
(ii) a. More doctors see clients here than lawyers play golf on Tuesday.
     b. *More doctors than lawyers play golf on Tuesday see clients here
        (Ryan 1986: 38)

(99) John gave [more books than he gave to Fred] to Shirley.
(100) a. John saw [newer micros than were shown at last years
        fair] at this year's fair. (cf. (95b))
     b. [More students than studied for the exam] skipped the lab.
        (Ryan 1986: 27)
(101) Jack told Irene [how much richer than he was now] he
     wanted to become in the future.
(102) [More books than Pete will be able to read] appeared on
        the history reading list.

These examples contain Comp *than* rather than Conj *than* because a clause
follows. A common characteristic of the data in (99-102) is that the head of
comparison and the clausal compared phrase forms a constituent. Comparing
sentence (99) with the following sentences,

(103) a. John gave [more books to Shirley] than [e to Fred].
     b. *John gave more books than to Fred to Shirley.

we can clearly see that the constraints are closely related to coordinate
structures. In (100) we have examples in which the subject is omitted by the
head of comparison. In sentence (102) there seems to be no set of contrastive
phrases. This does not seem to be possible in comparatives with Conj *than*.

    In dealing with comparatives, people have assumed that Extraposition is
involved for the (a) sentences in (94-98). The problem with this assumption is
that the "source sentences", which are represented by the corresponding (b)
sentences, are not grammatical. In this approach, the source sentences are
ruled out by independent principles. For these examples, it is better not to

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However, notice that there are more than one pair of contrastive phrases
involved in these sentences. In (i) contrastive pairs are *pigs* vs. *dogs*, and *(eat)
hay* vs. *(eat) corn*. I think sentences (i-iib) have severe processing difficulties.
When we interpret the compared phrase, we need to refer to what is preceding
for one of the contrastive phrases and to what is following for the other
contrastive phrase. These split reference directions for contrast is enough to
make a sentence uninterpretable regardless of whether the compared phrase
is introduced by a Comp or Conj.

assume any kind of Extraposition than to assume ungrammatical source
sentences and obligatory application of the rule. We can assume Extraposition
only when the source sentence does not violate any of the constraints posited
above as those in (99-102):

(99') John gave [more books e] to Shirley [than he gave to Fred].
(100') a. John saw [newer micros e] at this year's fair [than
            were shown at last years fair].
        b. [More students e] skipped the lab [than studied for the exam].
(101') Jack told Irene [how much richer e] he wanted to become
            in the future [than he was now].
(102') [More books e] appeared on the history reading list [than
            Pete will be able to read].

We need to consider more data with reference to the above-posited
constraints and Extraposition:

(104) a. *[[More intelligent than John] managers] work at H-P.
        a'. [More intelligent managers than John] work at H-P.
        a". [More intelligent managers e] work at H-P [than John].
        b. [Managers [more intelligent than John]] work at H-P.
        b'. *[Managers [more intelligent e]] work at H-P [than John].
(105) a. *Fred introduced [[taller than Mary] women] to Ed.
        a'. Fred introduced [taller women than Mary] to Ed.
        a". Fred introduced [taller women e] to Ed [than Mary].
        b. Fred introduced [women [taller than Mary]] to Ed.
        b'. *Fred introduced [women [taller e]] to Ed [than Mary].
        (Carl Pollard, p.c.)

The (a) sentences in (104-5) are bad even though they do not violate any of the
constraints. And the (b') sentences are bad despite the fact that the source
sentences (i.e. the (b) sentences) are grammatical. However, we have
independent factors for the ungrammaticality of these sentences. The (a)
sentences are bad because prenominal modifiers must be head-final (Arnold
Zwicky, p.c.). Notice that the assumed prenominal modifiers *more intelligent
than Derek* and *taller than Mary* end in non-head elements (i.e. the compared
phrases). On the other hand, the prenominal modifiers in (a') and (a") end in
head elements (i.e. Adjs). The (b') sentences are bad because *more intelligent*

and *taller* cannot be postmodifiers without their "complements" (the targets in our term) (cf. Zwicky 1992). Notice that the postmodifiers in the (b) sentences contain the complements.

Let us summarize those issues related to determining constituency. First, we are assuming that non-constituents can be conjuncts. Second, our licensing mechanisms require that the compared phrase cannot be lower than the unit containing the head of comparison. Third, this unit and the compared phrase form a constituent.

Combining these assumptions, we can provide the following analyses for complicated sentences:

(106) a. Martin makes Jack do [[more laundry] [than Fred does e]].
    b. Barbara [[donated more money to the church] [than Joe
        donated e to the school]].

Sentence (106a) is ambiguous: '... than Fred makes Jack do x-much laundry' and '... than Fred does x-much laundry.' For both of these readings *more laundry than Fred does* constitutes a constituent. For sentence (106b), we have two more possible ways of analyses:

(107) a. [Barbara donated more money to the church] [than Joe
        donated e to the school].
    b. Barbara [donated [[more money to the church] [than Joe
        donated e to the school]]].

I think the analysis in (106b) is correct because the biggest break in the sentence comes in between *Barbara* and *donated* unlike what is predicted by (107a) (i.e. in between *church* and *than*). The next biggest break comes in between *church* and *than*. However, (107b) predicts that it would come in between *donated* and *more*. We can test our intuitions by inserting parenthetical remarks in the relevant places.

(108) a. The company [[sent more refrigerators to Siberia] [than
        it sent (x-many) heaters to Kuwait]].

b. The company sent [more refrigerators to Siberia] than
[(x-many) heaters to Kuwait].

The difference between the two sentencs in (108) is that sentence (a) has Comp *than* while sentence (b) has Conj *than*. Notice that only the latter sentence involves non-constituents.

In this section, we have considered both *-er/more...than* constructions and *as...as* constructions together. These constructions have largely the same characteristics. However, the latter constructions, called "factor comparatives", have their own properties as well. First, the comparative word *as* can combine with one-bar Adjs as well as zero-bar Adjs:

(109) a. Max is [as [willing to leave]] as his wife is reluctant to stay.
b. Joe is [as [eager to go]] as Max is reluctant to stay.
(Berman 1973a:71, 101)

Only meta-comparatives seem to allow phrases to be modified by comparative elememts *-er/more*.

Second, there are some constructions related to factor comparative constructions (cf. Chomsky 1977: 87-8):

(110) a. Mary isn't the same as she was five years ago.
b. Mary isn't the same as John believes that Bill claimed
that she was five years ago.
(111) a. Mary is (more or less) as she was five years ago.
b. Mary isn't as John believes that Bill claimed that she
was five years ago.
c. Mary isn't (the same) as what she was five years ago.

The sentences in (111) seem to have no triggers to license the *as*-phrase. Thus, these data are problematic to our analysis because there must be some element to license the compared phrase. However, the construction in (111) is a variant of that in (110). As we can see in (111c), the existence of *the same*, the trigger of the construction, is optional. In addition, the two sentences with or without this trigger have the same meaning. Thus, we can assume that the

construction in (111) is an idiomatized version of the construction in (110).

Third, we can see alternations between *as...as* and *so/such...as* in negative environments (Bresnan 1973: 300):

(112) a. It was as/*so awful a picture as it first seemed.
      b. It wasn't as/so awful a picture as it first seemed.
(113) a. *It was such an awful picture as it first seemed.
      b. It wasn't such an awful picture as it first seemed.

To account for the facts here, we can assume that lexical items *so* and *such* have <S[COMP *as*] LICENSOR>. These words are only allowed to occur in negative environments.

The following constructions, which are related to the regular and factor comparatives, have their own special properties (Berman 1973a: 1):

(114) a. Joe is [[more intelligent a man] than Harry is].
      b. The kitchen is [[as big a mess] as the bathroom is].

First, these are predicate constructions. That is, the material in the square bracket is restricted to occur in predicate position (Berman 1973a: 3):

(115) a. *Joe met [as pretty a girl as Mary is].
      b. *[As pretty a girl as Mary is] visited me this morning.

Second, the head noun must be an indefinite, singular, count noun (p.42):

(116) a. *Max is [the stronger man than Joe is].
         *Lucy is [as pretty the girl as Sally is].
      b. *Mary and Sue are [more intelligent girls than Sally is].
         *Joe and Max are [as strong men as Pete and Sam are].
      c. *This is [as strong coffee as Espresso is].

These two distributional properties of the constructions in (114) will be handled independently of the licensing properties induced by the comparative elements.

6.1.5. Conclusion

In sec. 6.1 we have seen that new observations about the deletion of A (Adj and Adv), and about *more* and *than* lead to a reanalysis of a messy group of comparatives into separate (but closely related) well-defined constructions. First, we have shown that the deletion of A is distributionally motivated rather than an integral part of CD itself. Second, comparative word *more* has three different functions. This distinction is shown to be responsible for the contrast among *taller than thin*, *taller than he is thin* and *more tall than (he is) thin*. Third, *than* also has three functions. These three-way distinctions led to a good analysis of the whole range of comparatives including meta-comparatives. We were able to capture the similarities and differences between regular comparatives and meta-comparatives with the same set of mechanisms.

We have provided a framework to formally represent the relationship between a comparative element and what is licensed by it (i.e. the compared phrase). We have seen that this framework provides correct predictions about constituency in complicated sentences.

6.2. Result Clause Constructions

There are several different constructions which have result clauses (cf. Gueron & May 1984: 1). In Ch. V, we discussed two constructions which are triggered by degree Advs *too* and *enough*. In this section, we will focus on the constructions which are triggered by *so* (and *such*) and have result clauses introduced by *that*:

(1) a. Sue is so beautiful that everybody loves her.
   b. Mary is so nice a woman that everybody loves her.
   c. Jane is such a wonderful woman that everybody loves her.

We will see that all the (special) properties of these constructions can be accounted for in our IPSG framework.

Degree Advs *so* and *such* play largely the same role in result clause constructions[27]. A major difference between these two words lies in their distributions. The former combines with Adjs, Advs or quantity words while the latter cooccurs with nominals:

(2) a. so lovely   b. such a girl
     so lovely a girl   such girls
     so fast   such a lovely girl
     so much/many   such lovely girls

Result clause constructions consist of one of these expressions and a *that*-clause.

Before we look at the characteristics of result clause constructions, I want to argue that there are two different *so*'s and *such*'s involved in the following set of data[28], following Arnold Zwicky (1992):

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[27] Bresnan (1973: 303-4) argues that *so* and *such* are ambiguous between 'degree or extent' reading and 'character or kind' reading. The former reading is related to a *that*-clause while the latter is related to a *as*-clause:

(i) a. You have presented so elegant a solution that we can only admire it.
     b. [So elegant a solution as you have presented us with] can elicit
         only admiration.

In addition, the former seems to be predicative while the latter is non-predicative:

(ii) a. Her mother wants Mary to be (such an eminent woman that
         everyone will respect her).
     b. ?Her mother wants Mary to be [such an eminent woman as Sappho].
(iii) a. ?[Such a scholar that people are impressed] is here.
       ?[Such a scholar e] is here [that people are impressed].
     b. [Such a scholar as you were speaking of just now] is here.

[28] Gueron & May (1984: 27) assume that the following sentence is an example of result clause construction:

(i) So many articles have been published recently which he
     hasn't been able to understand.

(3) a. Sue is so beautiful.
    b. Sue is so beautiful that everybody loves her.
(4) a. ?Mary is so nice a woman[29].
    b. Mary is so nice a woman that everybody loves her.
(5) a. Jane is such a wonderful woman.
    b. Jane is such a wonderful woman that everybody loves her.

We can see intonation and meaning differences between the degree words in (a) sentences and those in (b) sentences. We will call the former "exclamatory" *so/such* and the latter "resultative" *so/such*. The exclamatory *so* does not happily cooccur with a result-*that* clause:

(6) a. So very many people came in yesterday morning.
    b. ?*So very many people came that I didn't know what to do.

One might argue that there is only one *so* (and *such*), but this word can optionally license a *that*-result clause just like *too/enough* optionally modifies a (gapped) VP:

(7) a. It's too hot/hot enough.
    b. It's too hot/hot enough for me to swim in this pool.

Remember that we assumed an optional VP LICENSOR for these degree

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According to them, this type of "result clause is syntactically nondistinct from an extraposed relative construction". However, in our approach, sentence (i) is simply a relative construction, which has an "exclamatory" *so* rather than a "resultative" *so*, to be distinguished shortly.

[29] Sentence (4a) is somewhat awkward. There seem to be at least two factors which are responsible for this unnaturalness. First, there is a style conflict between "exclamatory" *so* and the structure [[so Adj] [a N]], as was pointed out to me by Arnold Zwicky (p.c.). The former is a word with an informal nature but it occurs in a formal structure of the latter. Second, in sentences (3a) and (5a), the exclamatory words *so* and *such* modify their heads and these heads are the head of the whole structure concerned. That is, *so* modifies *beautiful* in (3a) and *such* modifies *a (wonderful) woman* in (5a). But what is modified by *so* in (4a) (i.e. *nice*) is not the head of the whold structure. This head is NP *a woman* which is modified by *so nice*. The exclamatory phrase (containing the exclamatory word) does not seem to stand naturally in a modifier position.

words. However, there is a clear (semantic) difference between the sentences in (3-5a) and sentence (7a). The latter has an implicit result meaning even though there is no explicit result phrase, but the former ones do not have any implied sense of result.

Based on this observation, we will assume that resultative *so* and *such* have obligatory <S[COMP *that*] LICENSOR> as a part of their lexical information under our IPSG framework.

In comparative constructions, the head of comparison and the compared phrase form a constituent, as we observed in sec. 6.1.4. However, there is no evidence which shows that the unit of degree word *so* and its head form a constituent with the result clause:

(8) a. *[So beautiful that everybody loves her] though she is, ...
 b. How beautiful is she?
  ---> [So beautiful that everybody loves her].
 c. *[How much so beautiful that everybody loves her] is the
  woman over there?

We have an independent reason for the ungrammaticality of sentence (c). Notice that *so* cannot be modified by other quantifiers (e. g. *that much so beautiful*). Hence sentence (c) does not say anything about the constituency of the string concerned. The ungrammaticality of sentence (a) implies that the string is not a constituent. The question-answer set in (b) seems to constitute an argument for its constituency. However, the answer sentence seems to involve "zero-anaphora" because we can get the same pattern of answer when *so* is a part of the subject (Arnold Zwicky, p.c):

(9) How many people came?
  ---> [So many that they couldn't fit into the room].

In this regard, it would be reasonable to assume that the answers in (8b) and in (9) have zero anaphora:

(10) a. [... so beautiful that everybody loves her].
 b. [So many ... that they couldn't fit into the room].

Then, the fact that they can stand alone is not evidence for the constituency of the string concerned.

Result clause constructions have some other special properties. The observations here are mainly from Gueron & May (1984)[30]. First of all, we have an unexpected pattern of antecedent-anaphor relations (if we assume that the result clause is a regular subordinate clause) (p. 10):

(11) a. She$_i$ told so many people about the concert that Mary$_i$ made Bill nervous.
     b. *She$_i$ told many people about the concert who Mary$_i$ made nervous.

In sentence (a) (a result clause sentence), a pronoun in the main clause can have its antecedent in the result clause. This kind of coreference is not allowed in sentence (b) (an extraposed sentence), which seems·to have a similar configuration.

The fact in (11) implies that the result-*that* clause is outside the domain of the main clause, as is argued in Gueron & May (1984) and Dowty (1991). Under this assumption, we can give a natural account of the following set of data (Willims 1974):

(12) a. [Everybody e] is so strange [whom I like] [that I can't go out in public with them].

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[30] Gueron & May (1984: 1) assume that degree words *so / such* are the heads of result clauses, following some previous studies. However, I cannot find any evidence which shows that they are heads. In addition, they assume that the result clause is extraposed from the *so/such* phrase. Under this assumption, the result clause can be moved out of some syntactic islands (p. 2):

(i) a. Plots by so many conspirators have been hatched that the government had jailed them.
    b. *Plots by many conspirators have been hatched who the government has jailed.

However, there seems to be no displacement involved. Notice that there are no possible source sentences.

b. *[Everybody e] is so strange [that I can't go out with them]
[whom I like].

An extraposed relatve clause cannot be displaced out of the clause from which
it originates (cf. sec. 3.2.1). The result clause lies outside of the clause that
contains the *so*-phrase. Hence the only possible order is that in (12a). In
addition, we can have the same kind of antecedent-anphor relation as in (11)
when a subordinate clause precedes its main clause (Dowty 1991: 38):

(13) a. Because I told her$_i$ that so many people attended the concert,
    I made Mary$_i$ nervous.
    b. *I made her$_i$ nervous because I told Mary$_i$ that so many people
    attended the concert.

In sentence (a), the first clause is subordinate to the second clause, which gives
the same configuration as that for result clause constructions under our
assumption.

The fact that the result clause is "superordinate" to the clause containg
degree word *so* follows naturally (without any stipulations in syntactic or other
rules) from the mechanisms of the IPSG framework, under the assumption
that the influence of the degree word ranges over the whole clause. We have
evidence for this assumption[31]:

(14) John ate so much caviar in 10 minutes that he got sick.

Dowty (1991: (102)) observes that this sentence expresses a causal relation, not
between the host NP (i.e. *(so) much cavier*) and the event described by the

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[31] In the following example, the domain of *so* seems to be smaller than the
clause containing it:

(i) Joe is angry, but not so much that he can't think straight.
    (Berman 1973a: 74)

However, some other factors are involved here: conjunction and (sentential)
negation. The second conjunct means that 'it is not the case that he is so
(much) angry that he can't think straight'.

result clause, but between the extent of something obtained in the event described in the first clause and the event described in the second clause. That is, the cause of John's sickness is not that he ate too much cavier but that he ate too much cavier in ten minutes. Hence we can assume that the domain of degree word *so* is not smaller than the clause which contains the word. Translating into IPSG terms, the lowest possible place for the operation of the licensing of the result clause is on the level of S, unlike in comparative sentences.

Now we can provide the following analysis for sentence (11a) within our framework:

(15) a. She$_i$ told so many people about the concert that Mary$_i$ made
        Bill nervous

b.
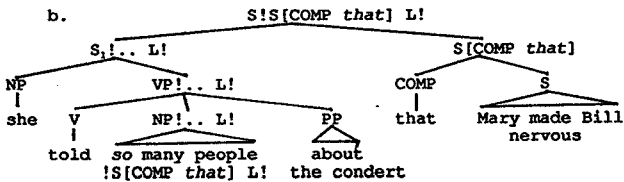
This is the only possible analysis because licensing must take place somewhere above the S_1 node due to the domain property, and because the target must be a daughter of some node with the LICENSOR feature. This analysis fits with all the properties of result clauses observed thus far. The result clause is outside of the boundary of the main clause and degree word *so* has its scope over the whole main clause. The analysis is the same as Dowty's (1991) analysis in its nature even though the frameworks are different[32].

Turning to the second property of result clause constructions, it has long been observed that (only) result clauses can have multiple antecedent *so-*

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[32] Baker (1989: 343-4) provides the same type of structure for result clause constructions (and comparative constructions).

phrases in the main clause:

(16) a. [So many people] liked [so many pictures] at the gallery
that the exhibition was held over for two weeks.
   b. The investigators said that [so many people] knew [so many mistakes]
were made in construction that it was surprising that there wasn't
a major accident much earlier. (Gueron & May 1984: 24)
   c. [So many football fans] brought [so much beer] and [so much popcorn]
in [so many knapsacks] with [so many rips] in them in [such
drunken stupors] that a bulldozer had to be brought in to clear
the parking lot. (Dowty 1991: (101))

As we can see from these examples, result clause constructions allow many-to-one relations.

Third, we noticed in sec. 6.1.4 that comparative constructions allow both nested dependencies (85) and one-to-many relations (87). We have nested result clause sentences as well:

(17) ?So many mothers complained that their children ate so much of the
candy that they got sick that the manufacturers took it off the market.

Even though this sentence might not be perfect, it is assumed to be grammatical in Dowty (1991: (106)). However, one-to-many relations are not allowed in result clause constructions:

(18) *So many books have been published by (so many authors) recently
[that I haven't been able to read them all] [that I've run out of
meney to buy them].

This sentence shows that one so cannot license more than one that clause (Gueron & May 1984: 27). Notice that both of the that-clauses are related to the so in the subject. The nested dependency sentence (17) can be handled easily in the present framework because this dependency naturally follows from the licensing mechanisms, as we will see in sec. 7.1.

Allowing many-to-one relations and forbidding one-to-many relations are special properties of the result clause constructions[33]. Notice that these constructions are characterized by the properties of their triggers, and these triggers have the relevant LICENSORs. Hence the special properties of the constructions can be accounted for with reference to the behavior of these LICENSORs. For the many-to-one relations in (16), two approaches are possible. First, we can assume that a <S[COMP *that*] LICENSOR> can license what is already licensed by the same kind of LICENSOR. Then the same result clause can be licensed by more than one *so* phrase. Second, we can assume that multiple <S[COMP *that*] LICENSOR>'s in the stack of a node can be "fused/unified" into one. This unified LICENSOR will license the result clause. Each of these two approaches has different semantic effect. The former approach implies that each of the *so* phrases concerned has a separate causal relation with the result clause. The latter implies that the unit which comprises all the *so*-phrases has a single causal relation with the result clause. The semantic fact in multiple-*so* result clauses fits with the implications of the

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[33] In a subclass of comparatives, many-to-one relations are allowed, as we observed in footnote 21 in this chapter:

(i) More silly lectures have been given by more boring professors
      than I would have expected.

As was pointed out by Chomsky (1981: 81), this special type of comparative and result clause constructions share some properties, including allowance of multiple triggers. Multiple triggers seem to be allowed because targets are clauses with no gaps. Remember that we are not assuming any DP/QP gaps in sentence (i) (cf. (63) in sec. 6.1). My hunch is that if a target clause contains a gap, we need a specific trigger related to the gap. Then the meaning of the target would not be general enough to be compatible with more than one triggers. Another factor for multiple triggers might be that the target is outside the boundary of the main clause. Notice that the target bears a relation directly with the whole main clause. In result clause constructions, this property is attributed to the characteristics of lexical item *so* itself. In comparatives like (i), it is attributed to the position of the first *more*-phrase.

second approach. For example, in sentence (16a), what caused the exhibition to be held over is neither the number of people nor the number of pictures. It is the "combined extents x and y such that x people liked y pictures" that caused the extension (Dowty 1991: 36). Hence we will adopt the second approach. We can account for (18) by disallowing duplication of result clause LICENSORS, which is allowed in the case of comparatives (cf. sec. 6.1.4).

Next, there are several different types of examples which show unboundedness in result clause constructions. First, let us observe the following data (Gueron & May 1984: 2, 14):

(19) a. I told her$_i$ that [so many people attended last year's
   concert] that I made Mary$_i$ nervous.
   b. I told her$_i$ that the concert was attended by so many
   people last year that I made Mary$_i$ nervous.

We have noticed above that result element *so* has the property of making the result clause have a "higher" position than the main clause, with reference to the coreference examples (cf. (11), (15)). The coreference phenomena in (19) show a more dramatic property of *so*. The sentences here would be grammatical only if the result clause has a higher position than the whole main clause. That is, the effect of *so* should go over the boundary of S'-nodes. This is a property of unboundedness. The result element *so* and the result clause can be separated from each other unboundedly. We can capture this fact by imposing no restrictions on the behavior of <S[COMP *that*] LICENSOR>'s.

Second, the following examples also show the unbounded relation between trigger and target:

(18) a. The investigators said that [so many people] knew [so many mistakes]
   were made in construction that it was surprising that there wasn't
   a major accident much earlier. (repeated from (16b))
   b. Critics who have reviewed so many books were at the party that I
   didn't have time to speak with them all. (Gueron & May 1984: 18)

Sentence (a) is an example of many-to-one relation, where a unit which

contains all the occurrences of *so* bears a causal relation with the result clause. This sentence contains two *so*'s which are in different clauses. Hence the relation between, at least, the second *so* and the result clause is unbounded. In sentence (b), the effect of *so* goes over the boundary of a relative clause. Notice that *them* in the result clause refers to *critics* rather than *(many) books*[34].

Third, result clause sentences are ambiguous when the main clause contains a complement clause and the result element *so* occurs in this complement:

(21) Mary believed that Harry is so crazy that he acted irrationally.
    (Lieberman 1974)

In one reading, there is a causal relation Harry's craziness and his irrational behavior. In the other reading, the causal relation is between Mary's belief about Harry's craziness and his irrational behavior. These two readings can be represented with the following analyses:

(22) a.

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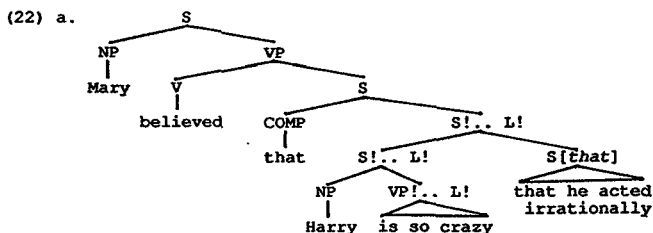
[34] The following sentence where *them* in the result clause refers to *(many books)* is ungrammatical (Gueron & May 1984: 18, footnote 22):

(i) *Critics who have reviewed so many books were at the party
    that I didn't have time to read them all.

This fact implies that the result clause is likely to bear an anaphoric relation with the "nearest" possible antecedent in the tree structure.

```
b.                              S!.. L!
                _____|_____
           S!.. L!                                S[that]
         ____|____                              that he acted
        NP        VP!.. L!                       irrationally
        |      ____|____
       Mary   V         S!.. L!
             believed  COMP    S!.. L!
                        |     ___|___
                       that   NP      VP!.. L!.
                              |      __|__
                            Harry   is so crazy
```
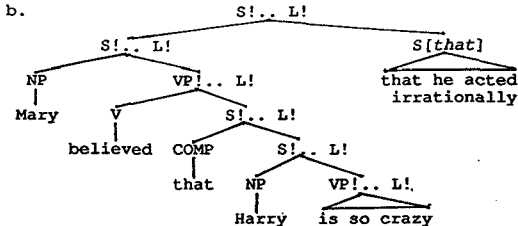
In analysis (a) the result clause is licensed by the complement clause of the
main clause, but in analysis (b) it is licensed by the main clause. These
licensing relations correctly represent appropriate readings. Actually the
sentences in (19) have the same pattern as that in sentence (21). However,
they are not ambiguous because the readings corresponding to that
represented by analysis (a) are blocked because of the coreference requirement.
The analysis in (b) involves an unbounded relation between *so* and the result
clauses.

Thus far, we have observed some examples of unboundedness in result
clause sentences. Unlike the constructions observed in Ch. V, the
unboundedness is caused by a special behavior of the LICENSOR feature from
degree word *so*. In other constructions, the existence of a gap triggers
unboundedness.

Before we leave this section, let us observe one more set of data, which
seem to have two different triggers but has only one result phrase:

(23) a. So many people liked too many pictures at the gallery that the
        exhibition was held over for two weeks. (Gauron & May 1984: 25)
     b. So many people liked too many pictures at the gallery
        for the director to close it at five.

In sentence (a), the *that*-result clause is licensed by *so* and in sentence (b), the
for-result phrase is licensed by *too*. The question is about the relation between
too and the result clause in (a), and the relation between *so* and the result
phrase in (b). As we discussed in Ch. V, *too* has an optional VP//NP

LICENSOR. Hence there need not be an overt VP in (a). An implicit result meaning can be picked up from the context, which would be the same as the result meaning represented in the *that*-result clause. However, the resultative *so* has an obligatory LICENSOR. On the other hand, not all occurrences of *so* are resultative as we observed above. There are exclamatory *so*'s as well. I think that the *so* in (b) is an exclamatory one. This *so* does not have any implicit result meaning associated. Notice that the *for*-result phrase has a negative implication, but the *so*-phrase does not impose any negative meaning to the result.

In this section, we have observed the special properties of *so(/such)* result clause constructions. We have shown that all these properties can be accounted for with the licensing mechanisms of the IPSG framework.

6.3 General Properties of Licensing Mechanisms

In Chs. V and VI, we analyzed Type A constructions (*tough-* and related constructions, and RNR constructions) and Type B constructions (comparative and result clause constructions). Each of these constructions has its own specific value of the LICENSOR feature even though some generalizations are possible (e.g., (gapped) VP for Type A constructions except RNR). However, we have a general principle for the regulation of LICENSOR features, and the structures where the licensing takes place have common configuration as well.

First, we have the following general licensing principle, which is in charge of discharging LICENSOR features from stacks (repeated from sec. 4.3):

(1) [XP LICENSOR] in the stack of a node (pops out of the stack and)
   licenses one of this node's daughters when the specification of the
   LICENSOR's value (i.e. XP) is the same as that of this daughter node.

According to this principle, a whole node rather than a part of a node is licensed by a LICENSOR. There is one case where this principle does not work as is. We posited a slightly different principle for RNR constructions

(from sec. 5.2.2):

(2) [<DBS X> LICENSOR] in the stack of a XP[CONJ] node (pops out of the
stack and) licenses the FOOT feature <DBS X> on the node's XP sister.

This principle licenses a part of a node and the value of the LICENSOR has
a specified gap. We observed that RNR has peculiar properties which are not
shared by other constructions. Due to these properties, we need a particular
licensing principle. However, the principles in (1) and (2) are not different
kinds of principles. Principle (2) is a special case of principle (1) in some
respects.

Second, the structures where the licensing mechanisms operate share
important configurational similarities as well. Remember that LICENSOR
features are discharged at the following structures:

(3) a.
```
        AP
       /  \
      AP   VP//NP
```
b.
```
        XP
       /  \
      XP   PP
           (S' or X)
```
c.
```
       S
      / \
     S   S'
```
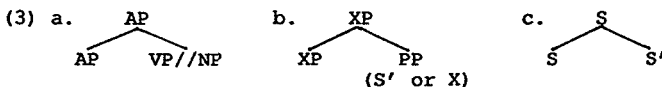
Structure (a) is for *tough-* and similar constructions, structure (b) is for
comparative constructions, and structure (c) is for result clause constructions.
A common property of all these structures is that the target is "Chomsky-
adjoined" to the phrase containing the trigger. This target position is a typical
place for an adjunct. We can portray the common properties of the structures
in (3) as follows:

(4)
```
              XP!YP LICENSOR!
             /              \
   XP!YP LICENSOR!           YP
          |
 ... ZP!YP LICENSOR! ...
```
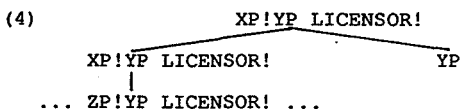
This configuration can effectively represent that the target has some
characteristics of adjuncts even though it is required by some other element
in the sentence (i.e. by the trigger).

There are some exceptions which do not have the structural pattern in (4): *take*-type constructions (cf. sec. 5.1.1.2), RNR constructions, and some comparative examples like (95b) and (97b) in sec. 6.1.4. We have already noticed that RNR constructions are special in several respects. We have a reason for the exceptional configuration in sentences (95b) and (97b). Let us observe the following (repeated from (97b) and (97'b)):

(5) a. ??John saw more boxes than in the attic in the basement.

b.
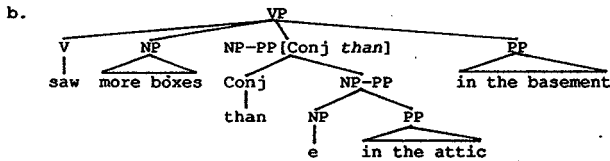
Sentence (5a) is not perfect even though it is not ungrammatical. Hence the fact that structure (5b) does not have the same pattern as in (4) is evidence for our analysis of comparatives becuase this fact provides a reason for the awkwardness of sentence (5a).

We need to pay special attention to *take*-type constructions. We proposed the following tree structure for a *take*-type sentence (repeated from (193) in sec. 5.1.4):

(6)
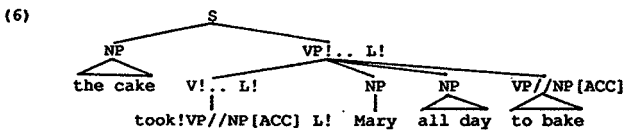
We observed in sec. 5.1.4 that this construction has different characteristics from other *tough*- and similar constructions. In particular, the licensor is a V rather than (part of) an Adj. I suspect that the gapped VP in (6) is more complement-like than that in other *tough*- and similar constructions. If so, we would have an argument for the reality of the structure in (6).

Third, we will briefly consider unboundedness. There are two different mechanisms which are responsible for the unbounded dependency. One is the existence of a gap in the target as in *tough-* and similar constructions, and comparative constructions. The other source of unboundedness is the behavior of the LICENSOR feature itself as in (some examples of) comparative constructions (cf. (83) in sec. 6.1.4) and result clause constructions. Notice that comparative constructions have two different mechanisms for inducing unbounded dependencies.

Only Type B constructions seem to have LICENSORs which can induce unboundedness. However, *too/enough* constructions can also have unbounded relations caused by the behavior of LICENSORs:

(7) a. John believes that chess is too hard for him to be able to enjoy it.
 b. John believes that chess is easy enough for him to enjoy it.

As we argued in sec. 5.1.4, these sentences exemplify *too/enough* constructions rather than *tough*-constructions. Jones (1990b: 584-5), based on Dresher (1977), argues that the sentences in (7) are ambiguous: a narrow scope reading and a wide scope reading of *too/enough*. For example, on the narrow scope reading of sentence (7a), the complement of *believes* expresses the content of John's belief. On the wide scope reading, the target expresses "an independent characterization of the content of John's belief". That is, John cannot enjoy chess just because he believes that chess is too difficult not necessarily because chess is actually difficult. This second reading is possible only when the LICENSOR from *too* can move unboundedly and when the target is licensed at the highest S node.

The correct generalization about what kind of LICENSORs can be unbounded should be based on the existence of expressions like *too/enough*, comparative elements (-*er, more, as*, etc), and *so/such*. These are degree expressions. Hence we will propose that only those LICENSORs from degree expressions can be unbounded. We have a piece of evidence for this

assumption:

> (8) a. John believes that chess is easy for him to enjoy.
> b. John believes that chess is hard for him to be able to enjoy.

In these *tough*-sentences, only the narrow scope reading is possible. Under our assumption, this is just because these sentences do not have any unbounded LICENSORs.

To capture the behavior differences between bounded LICENSORs and unbounded LICENSORs, we would need the following Feature Cooccurrence Restriction:

> (9) ~ (<XP LICENSOR> & S([COMP *that*]))

This FCR will apply to the Type A constructions other than *too/enough* constructions to block the spreading of LICENSOR features across an S/S' boundary. Hence the XP represents the LICENSOR values of these constructions. However, the LICENSORs from degree expressions are not subject to the FCR.

Now we understand that there are some factors which blur the distinction between Type A and Type B constructions. First, degree elements, which induce one kind of unboundedness, occur both in *too/enough* constructions (Type A constructions) and Type B constructions. Second, the other type of unboundedness is caused by gaps (represented by SLASH-like features) in the targets. Both Type A constructions and comparative constructions (Type B constructions) have these gaps. When the unboundedness is induced by these gaps, the unboundedness relation holds between the trigger and a part of the target rather than the whole target. These factors imply that the distinction between Type A and Type B constructions might not be as clear as generally assumed.

Lastly, we have assumed and posited several different SLASH-like features throughout this dissertation. We are assuming SLASH (/) for structural UDCs, and BSLASH (Back SLASH: \) for passives (cf. Zwicky 1987b). We adopted

GAP[35] (Double SLASH: //) for Type A constructions (cf. Hukari & Levine 1987). In addition, we posited DBSLASH (Double Back SLASH: \\) for RNR constructions (cf. sec. 5.2.3), and USLASH (Upright SLASH: |) for comparative constructions (cf. sec. 6.1.4). We might need one more feature for Extraposition from complex NPs. Let us assume DUSLASH (Double Upright SLASH: | |) for this Extraposition. Then, there are six different SLASH-like features including SLASH itself.

We have used separate names for the SLASH-like features, but this does not mean that they are unanalyzable atoms. We can classify them according to some factors which characterize their properties. The first factor is whether they are bounded or unbounded. Only unbounded features can "cross" the boundary of a clause. BSLASH (\) and DUSHASH (| |) are bounded features. And SLASH (/), GAP (//), DBSLASH (\\) and USLASH (|) are unbounded features. The second factor is whether they are associated with backward searching constructions or with forward searching constructions. SLASH (/), GAP (//), USLASH (|) and BSLASH (\) belong to the former. DBSLASH (\\) and DUSLASH (| |) belong to the latter. The third factor is whether they are gaps of major categories (mainly, NP gaps) or gaps of minor categories (e.g. DP/QP gaps). We will call the former "(real) gaps" and the latter "pseudo-gaps". The only pseudo-gap recognized in this work is USALSH (|).

We can schematically represent the result of the observations made in the preceding paragraph as follows schematically:

(10)		Backward	Forward
Unbounded	(Real) Gaps	/, //	\\
	Pseudo-gaps			
Bounded	(Real) Gaps	\			

---

[35] There is no significance in the name itself. In the present system, DSLASH would be a better term than GAP. We are just following Hukari & Levine (1987) for the name of the feature.

SLASH (/) and GAP (//) share the same set of factors involved, hence they are the closest among the six features in their properties. One remaining question about the distribution of SLASH-like features in (10) is about the existence of other possible features. Among eight possible types (due to three factors), we have only five types of features. The missing types are the unbounded forward peudo-gaps, bounded backward pseudo-gaps, and bounded forward pseudo-gaps. We need further research not only in English but also in other languages to see whether these types of features actually exist or not.

Chapter VII. MULTIPLE DEPENDENCY AND NESTING/CROSSING

In this chapter, we will examime sentences which have more than one trigger-target relation. These sentences have the same number of triggers and targets. We will not consider parasitic gap constructions, which have only one instance of a trigger-gap dependency. The one-to-many relation here is simply due to a special relation between a real gap and a parasitic gap. We will not consider multiple dependency sentences which are caused by conjunction or disjunction, either. This multiple dependency should be captured with reference to the characteristics of conjunction or disjunction.

When there is more than one relation between trigger and target, we need to restrict possible arrangements of these relations because not all arrangements are allowed. For example, when there are two trigger-target dependencies (A-A' and B-B'), four arrangements are possible:

(1) a. [... A ... A' ... B ... B' ...]
    b. [... B ... B' ... A ... A' ...]
    c. [... A ... B ... B' ... A' ...]
    d. [... A ... B ... A' ... B' ...]

The two arragements in (a-b) do not seem to pose any problems because there are no interactions between the two dependencies. However, when they interact with each other as in (c-d), one of the two arrangements is not usually allowed (depending on the construction concerned). In English, pattern (c) (i.e. "nested" dependency) seems to be the only pattern that is allowed. To prevent the occurrence of pattern (d) (i.e. "crossed" dependency), it has been assumed that we need a "Nested Dependency Constraint" (cf. Ades & Steedman 1982, Fodor 1983). However, this kind of constraint does not follow from any other

mechanisms.

The stack mechanisms assumed in our IPSG framework make strong predictions about the interaction of multiple dependencies. We assumed a "last-in-first-out" stack (cf. sec. 4.4). In addition, when more than one daughter of a node has a stack, the element in the stack of the leftmost daughter is pushed onto the stack of its mother first and that of the rightmost daughter is pushed last (the left-to-right principle). These stack mechanisms generate only the nested dependency pattern in (1c). Hence, if this prediction is correct, we need not stipulate a nested dependency constraint as a separate filter. It follows naturally from the independently motivated stack mechanisms.

In our framework, the triggers of all the Type A and Type B constructions have stacked LICENSOR features. Hence it is predicted that the interactions among Type A/B constructions should be nested rather than crossed if the left-to-right principle is not overridden by some other principles. In sec. 7.1 we will examine sentences which show interactions among Type A and/or Type B constructions to see whether our prediction is correct. Then, in sec. 7.2, we will consider interactions between Type A constructions and structural UDCs, and between Type B constructions and structural UDCs. We will see that these two types of interactions have different characteristics. In sec. 7.3 we will evaluate the validity of a nested dependency constraint with reference to some counter-examples. We will realize that we cannot posit a single nested dependency constraint as a general filter, but rather that the constraint should be couched in two different mechanisms.

7.1. Interactions among Type A/B Constructions

We predict that interactions among any two or more Type A and/or B constructions would be nested if the two or more LICENSOR features concerned pile up in the stack of one or more nodes, as in the following example:

(2) a. Joe is as much taller than Sam as Max is.

b.
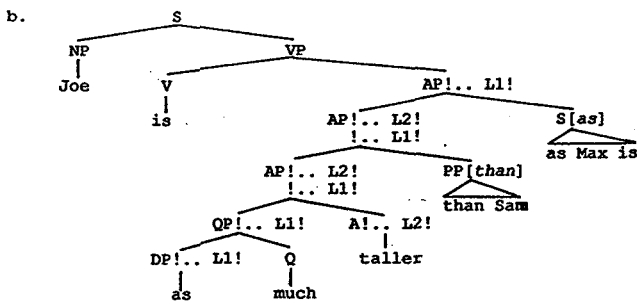
The manner of the stacking of two LICENSOR features on the lowest AP node guarantees a nested dependency. Notice, however, that not all LICENSOR features stack up in a node even though more than one Type A/B constructions is involved.

First, let us consider some examples showing interactions among Type A constructions:

(3) a. The wood is too rough for these nails to be easy for me
      to hammer e into e.
  b. *The nails are too blunt for this rough wood to be easy
      for me to hammer e into e.

Even though Hukari & Levine (1991c: (18-19)) assume that sentences like (3a) are ungrammatical, some people accept them, for instance, Ades & Steedman (1982: 519). However, no English speakers accept (3b), which has a crossed dependency. Strictly speaking, the nested dependency in (3a) is not guaranteed by the interaction of the two LICENSORs themselves, because they do not stack up on the same node. The LICENSOR from *easy* is not passed to the higher AP, where it can meet the LICENSOR from *too*. But notice that these two LICENSORs license two different GAPs as parts of their targets. These two GAPs interact on the node dominating *to hammer e into e*. On this node, the two GAPs are arranged so that the GAP after *hammer* can be

licensed by the LICENSOR from *easy* (and bound by the inner binder). We have independent motivation for this kind of mechanism (cf. sec. 7.2).

The following sentences show a nested dependency and a crossed dependency, respectively:

(4) a. John is too easy for people to please e for anyone to take e seriously.
    b. Robin isn't easy enough to talk to e to approach e directly
       on this problem.

The two LICENSORs from *easy* and *too/enough* pile up on one node. In these cases, however, the order of LICENSOR stacking is not decided by the general left-to-right principle because this principle is overridden by the obligatory-over-optional principle, as we observed in sec. 5.1.4. According to this latter principle, the LICENSOR from *easy* goes into the stack later than that from *too/enough* regardless of the linear order involved.

Second, some sentences show interactions between Type B constructions. As we observed in Ch. VI, two comparative or resultative trigger-target relations are possible only in a nested manner:

(5) This sauce is much more tastier than the last sauce
      than we could have expected. (from sec. 6.1.4)
(6) a. Mary swam as many more laps than Joan (swam) as Linda (swam).
    b. *Mary swam as many more laps as Linda (swam) than Joan (Swam).
    c. Max is as much taller a man than Sam as Harry is than John.
    d. Horowitz is as much more of a pianist than Rubinstein as Richter is.
       (Berman 1973a: 340, 111, 90)

In sentence (5) the node dominating *much more tastier* has two LICENSORs, which guarantees a nested dependency. As we can see from the analysis in (2), the sentences in (6) also have a node containing two LICENSORs.

Sentence (7a) does not have any node with two LICENSORs, as we can see in tree (8):

(7) a. ?So many mothers complained that their children ate so much of
       the candy that they got sick that the manufacturers took it off
       the market. (from sec. 6.2)

b. *So many mothers complained that their children ate so much of
the candy that the manufacturers took it off the market
that they got sick.

(8)
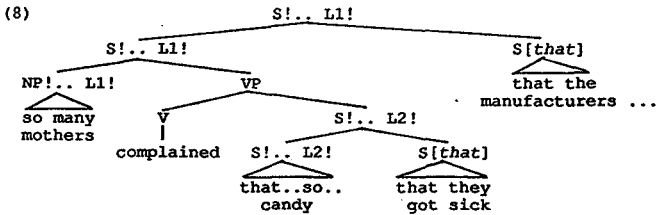
Here the LICENSOR from the second *so* (L2) licenses the inner *that*-clause and
that from the first *so* (L1) licenses the outer *that*-clause. Even though there
is no node with two LICENSORs, a nested dependency is guaranted because
the other order in (7b) is blocked by the stack mechanisms. In the structure
for this sentence, the two LICENSORs from two *so*'s would stack up on the
lower S̲ node because the inner *that*-clause in (8) occurs outside of the outer
that-clause. However, the result is a nested dependency, which leads to an
incorrect interpretation.

Let us observe one more example of Type B interactions from Gueron &
May (1984: 29):

(9) a. So many people ate more hush puppies at the country fair
    than we expected that we ran out of them early.
   b. *So many people ate more hush puppies at the country fair
    that we ran out of them early than we expected.

In sentence (a), the *that*-clause occurs outside of the main clause, but the *than*-
clause is "Chomsky-adjoined" to the VP. Hence the two LICENSORs do not
interact with each other on a single node. The other order in sentence (b) is
blocked due to the stack mechanisms. Notice that *more* cannot license a *that*-
clause and *so* cannot license a *than*-clause.

Third, a Type A construction can also interact with a Type B construction
(cf. Berman 1973a: 90):

(10) a. Joe is as hard a man (for me) to get along with as Max is.
    b. ?*Joe is as hard a man as Max is (for me) to get along with.
(11) a. Sally is more pleasant a boss to work for than Sam is.
    b. This event is more difficult for him to just accept than
        anyone would have imagined.

In these sentences, the two LICENSORs occur in the same node and show a nested dependency[1]. However, when two LICENSORs occur in a single word, both the nested and crossed interactions are grammatical:

(12) a. This event is harder right now than anyone would have
        imagined for him to just accept e.
    b. This event is harder right now for him to just accept e
        than anyone would have imagined. (Dowty 1991: (95))

According to the principle of Morphology-Free-Syntax (Pullum & Zwicky 1988), the left-to-right principle does not work for word-internal elements. LICENSORs provided by word-internal elements have the same status for syntactic operations.

    As we saw before, there are sentences with triple trigger-target relations. Let us observe an example of Type B-A-B interaction (Gazdar 1988: 77):

(13) This fence is | so much |$_c$ | too much |$_b$ high | er |$_a$ | than |$_a$ that one
    | for |$_b$ me to even consider climbing it | that |$_c$ it's simply
    incomprehensible to me that Mary would try to get me to do it.

In this sentence *so (much)* is related to a *that*-clause, *too (much)* is related to

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[1] For some people, sentence (10b) and the following sentences (cf. (11)) might not be bad:

(i) a. Sally is more pleasant a boss than Sam is to work for.
    b. This event is more difficult than anyone would have imagined
        for him to just accept.

A common property of all these sentences is that the two LICENSOR-carrying lexical items are contiguous and one is a modifier of the other. We might need to assume that the left-to-right principle does not operate in this particular environment.

a *for*-clause, and *-er* is related to a *than*-phrase. In addition, *so much too much higher* forms a constituent. Hence the three LICENSORs will be in a single node, which forces nested dependencies.

From the examples discussed in this section, we can conclude that interactions of Type A and B constructions are nested rather than crossed. This nested dependency is guaranteed by the behavior of LICENSOR stacking. Even though the LICENSORs from different triggers do not stack up on a single node, nesting is obtained indirectly because the other possible order is blocked by the stack mechanisms (cf. (7) and (9)).

7.2. Interactions between Type A/B and Other Constructions

In the previous section, we observed that one source of nested dependencies is the manner of LICENSOR stacking that is involved in Type A/B constructions. We suggested as another source of nested dependency mechanism that multiple GAPs are arranged so that the leftmost GAP is licensed by the rightmost LICENSOR, and the next GAP by the second rightmost LICENSOR, etc., with reference to the data in (3). We will see in this section that this second source for nested dependencies is necessary not only for the GAP (//) in Type A constructions but also for the SLASH (/) of structural Unbounded Dependency constructions (UDCs). Remember that the gap in comparatives (USLASH: |) is very different from these gaps (cf. sec. 6.1.4).

Before we look at the interactions between Type A/B and other constructions, let us consider why we need to regulate the manner of gap piling in Type A constructions and other UDCs. Traditionally, extraction from a wh-clause is assumed to produce an ungrammatical sentence (cf. the "wh-island constraint"). However, many of the examples cited for discussion are ungrammatical for other reasons. For example, some have crossed dependencies:

(14) a. *Which toy did you decide [who to give e to e]?
    b. *That toy is hard for me to decide [who to give e to e]?

However, when we consider the corresponding nested examples, they become so much better that some people accept them as grammatical:

(15) a. ??Who did you decide [which toy to give e to e]?.
    b. ??John is hard for me to decide [which toy to give e to e].

Even though not all people accept the sentences in (15), we can see a clear contrast between (14) and (15)[2]. To account for this contrast, we must resort to the crossed vs. nested difference. For those who do not accept the sentences in (15), we need a wh-island constraint as well.

Notice that positing different SLASHes for the two gaps in the sentences of (15) (as in Hukari & Levine (1991c)) is not helpful in accounting for the contrast between (14) and (15) becuase they are unordered features. Furthermore, we have examples which have exactly the same kind of gaps:

(16) Euthanasia is definitely not a topic to go looking for people
    to argue with e about e.

Both of the gaps here are from infinitival relatives. Based on this kind of example, Hukari & Levine (1991c: 8) argue that extraction must make reference to list-valued features in English as well as in Scandinavian languages (cf. Maling & Zaenen 1982).

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[2] According to Hukari & Levine (1991c), there is a contrast depending on the finiteness of the clause just below the displaced wh-phrase (their (14) and (46)):

(i) a. *We just didn't know which issues to tell Martha [who to consult
        with e on e].
   b. *We just didn't know which instrument to tell Felix
        [which piece to play e on e].
(ii) I've been able to determine which problems Kim knows [who to talk
        to e about e].

It is assumed that sentences like (15b) are ungrammatical (their (17)).

However, we need to make reference to the relative order of different occurrences of SLASH to distinguish nested dependencies from crossed dependencies. In addition, GAPs behave the same way as SLASHes in this regard. There are two GAPs in the sentences of (3) and two SLASHes in (14-15a). Even when GAPs and SLASHes interact, the result is the same:

(17) a. Which violin are these sonatas easy to play e on e?
 b. *Which sonata are these violins easy to play e on e?

Notice that the gap after *play* is a GAP (*//*) and that after *on* is a SLASH (*/*). Only sentence (a), which shows a nested dependency, is grammatical.

There might be several ways of implementing the fact that only nested dependencies are allowed when more than one SLASH and/or GAP is involved in a sentence. In this section, we will assume, without going into details, that when more than one daughter of a node has a SLASH or a GAP, these FOOT features should be stored in a stack, say {...}, on that node. That is, we can assume that these features are also indices, as assumed in Maling & Zaenen (1982), and Gazdar (1988) (cf. Miller 1990: 23). Let me illustrate the idea with reference to sentence (17a):

(18)
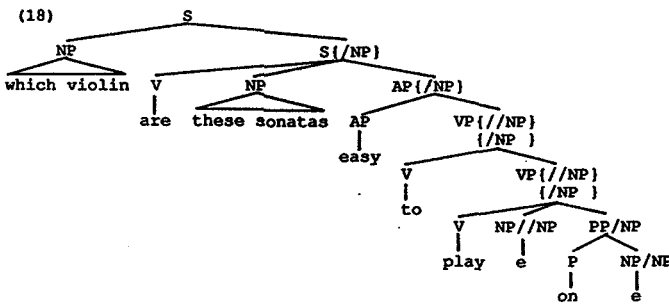
The stack here has nothing to do with lexical items (cf. LICENSORs) or specific rules/structures. It is introduced in a local tree because of the number

of daughters carrying SLASH/GAP features[3]. Once a stack is introduced, it will propagate through the tree until it becomes empty. We can assume that stacked FOOT features are subject to the same principles as unstacked FOOT features. However, there are some differences between stacked and unstacked SLASH/GAPs. First, when a stack is introduced on a node, the FOOT features of its daughters will be piled up in the stack in a specific order. Second, the stacked features behave as a unit that is subject to the FOOT Feature Principle as a whole. Third, only the topmost FOOT feature of a stack is available for the "operations" of syntactic mechanisms.

In tree (18) it is assumed that the FOOT feature on the rightmost daughter goes into the stack first, and that of the leftmost daughter goes into it last. This is opposite to the order assumed for the LICENSOR features. We will call this a "right-to-left" principle. This principle makes the leftmost feature be the first available for reference, which guarantees nested dependencies. Notice that the mirror-image behavior of stacking orders for LICENSORs and SLASH/GAPs comes from the nested dependency constraint required for the interactions among Type A constructions.

Now we have two different mechanisms for creating nested dependencies: stacked LICENSORs and stacked SLASH/GAPs. Type B constructions are regulated by the former mechanism and structural UDCs containing gaps by the latter mechanism. Type A constructions are subject to both of the mechanisms, because these have both LICENSORs and GAPs. Based on these observations, we can predict the manner of interaction of Type A constructions with other UDCs. We generate nested dependencies because GAPs and SLASHes go into the same kind of stack. On the other hand, we predict that there are no restrictions on the manner of interaction when Type B

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[3] From an empirical point of view, we expect that only one daughter of a node would have a stack because we need at least four SLASH/GAPs to have two daughters of a node have stacks.

constructions and structural UDCs are involved. Notice that Type B constructions have only LICENSOR features but UDCs have only SLASH features. There are no common features which go into the same stack for these two types of constructions. Hence we would expect crossed dependencies when Type B constructions interact with UDCs.

I think our predictions are correct. First, let us observe interactions between Type A constructions and other UDCs. We have already examined two sets of data in (14-5b) and in (17), which confirm our prediction. Here are some more examples:

(19) a. We didn't know which topics to expect Robin to be easy
[to talk to e about e].
 b. *We didn't know which person to expect these topics [to be easy
[to talk to e about e].
(cf. Hukari & Levine 1991c: (13))
(20) [This new vacuum flask]$_1$, I want you to work out [what size test tubes]$_2$
[the acid]$_3$ will be easiest [to pour e_3 into e_2 from e_1]. (Fodor 1983: 208)

Sentence (20) shows an interaction of Topicalization, wh-question and a *tough*-construction. Only nested dependencies are allowed because all the SLASH/GAPs are put into one stack on one node.

Type B constructions and structural UDCs also interact with each other in some sentences (Jones 1990b: 583):

(21) a. Who does Mary think more people will vote for e than actually will?
 b. Who did Mary believe so many people liked e that he became
arrogant?

In each of these sentences, the two dependencies concerned are crossed ([*who - e*, and *more - than*] and [*who - e*, and *so - that*], respectively). These crossed dependencies are allowed because none of the restrictions posited for Type A/B constructions and UDCs force these sentences to have nested dependencies.

In this section, we have observed sentences which show interactions between Type A/B constructions and UDCs. We have seen that we need two different mechanisms to enforce nested dependencies. Confirming our

predictions, sentences with Type A constructions and other UDCs show only nested dependencies, but sentences with Type B constructions and UDCs are not constrained in their manner of interaction.

7.3. Crossed Dependency Sentences

One might assume that we need only one (surface) constraint to prevent crossed dependencies in English. However, we have already looked at some counter-examples to this position in (21). Then, one might argue that such a constraint applies only to those sentences with multiple relations involving gaps. In this section, we will see that even this restricted version of a nested dependency constraint does not work, because there are many crossed dependency sentences with gaps. Our stack mechanisms predict that we would have crossed dependency sentences as long as they do not have nodes with stacks of multiple LICENSORs or SLASH/GAPs.

First, some sentences show crossed dependencies because the left-to-right principle is overridden by other principles (cf. (4) in sec. 7.1):

(22) a. Robin isn't easy enough to talk to e to approach e directly
on this problem.
b. John is too easy for people to please e for anyone to take e seriously.

Sentence (a) has crossed dependencies ([easy - to talk to e], and [enough - to approach e]), while sentence (b) has nested ones. In the former sentence, the LICENSOR from easy goes into the stack later than that from enough due to the obligatory-over-optional principle.

Second, the following sentences do not show any interaction of features in the LICENSOR stack or in the SLASH/GAP stack:

(23) a. [For whom] is Mary easy e to talk to e.
b. [For whom] is this violin hard e to play sonatas on e?
(24) a. [How easy to please e] is John e?
b. This actor, [the best book about e] is tough to find e.

In the sentences in (23), *for whom* and the first gap, and *easy/hard* and the second gap are cross-related. The sentences in (24) involve rather complicated relations. The binder of a gap contains another gap (cf. Hukari & Levine 1989a). We can analyze sentence (23a) and (24a) as follows:

(25) a.

```
                          S
           ┌──────────────┴──────────────┐
          PP                           VP/PP
        ┌──┴──┐              ┌──────────┼──────────────┐
      for whom            V    NP              AP/PP!.. L!
                          │    │          ┌──────────┴──────┐
                          is  Mary     AP!.. L!         VP⁴//NP
                                          │          ┌──────┴──────┐
                                        easy       PP/PP         VP//NP
                                        !.. L!       │        ┌─────┴─────┐
                                                     e        V        VP//NP
                                                              │     ┌─────┴─────┐
                                                              to    V         PP//NP
                                                                    │      ┌────┴────┐
                                                                   talk    P      NP//NP
                                                                           │        │
                                                                           to       e
```

b.

```
                              S
              ┌───────────────┴────────────────┐
           AP!.. L!                          S/AP
        ┌─────┴──────┐                 ┌───────┼───────┐
    AP!.. L!      VP//NP              V      NP      AP/AP
    ┌──┴──┐     ┌───┴────┐            │      │        │
   how easy    V       VP//NP        is    John       e
               │    ┌────┴────┐
               to   V       NP//NP
                    │          │
                  please       e
```
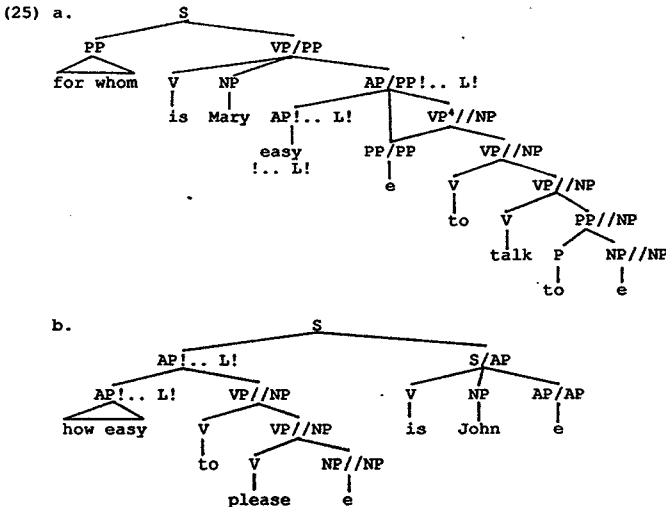
As we can see in these analysis trees, the SLASHes and/or GAPs do not stack up in a single node.

If one assumes that *for whom* in (23) is a sentential adverb, the sentences there would not show crossed dependencies because there is only one discontinuous relation. But there is a clear case where sentences with multiple gap-relations exhibit crossed dependencies:

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[4] According to the FFP, this node are supposed to have /PP because its daughter has one. However, this linkage is blocked because we have an independent constraint which blocks extraction of the subject of a clause, which is a PP here (cf. **For whom do they intend e to be put on probation?*). On the other hand, this PP should be allowed to be extracted as a sister of AP (cf. VP adjunct extraction: *How often does the baby sleep?*).

(26) a. You know what Robin is like e to talk to e.
  b. Do you know what Robin is like e to talk to e?

The first gap is related to the question word *what*, but the second gap is licensed by/related to the lexical item *like*, as we can see from the following data (cf. Lasnik & Fiengo 1974: 567):

(27) a. Robin is like a cat to get along with e.
  b. *Robin is a cat to get along with e.

Hence the two gaps involved seem to be a SLASH and a GAP. Furthermore, both of these gaps induce unboundedness (Robert Levine, p.c.):

(28) a. You know what I think Robin is like e to talk to e.
  b. You know what I've said Leslie thinks Robin is like e to talk to e.
(29) a. You know what Robin is like e to try to talk to e.
  b. You know what Robin is like e to try to persuade e to talk
     about herself.

Judging from the observations here, it is clear that the sentences in (26) contain two gaps (a SLASH and a GAP), but they are cross-related.

From the grammaticality of the sentences in (26), we can expect that they do not have any node which has more than one SLASH/GAP in the stack. Let us examine sentence (26a):
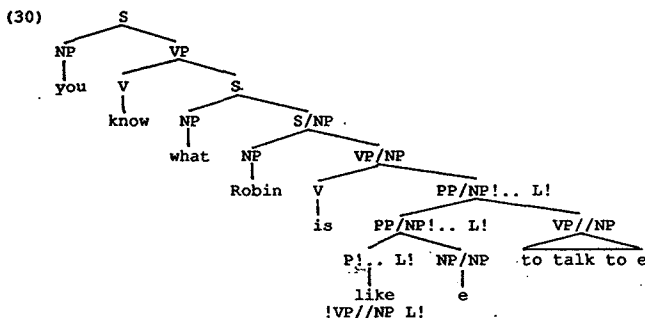
As expected, the two gap features (i.e. SLASH and GAP) do not interact each

other in one node. Therefore, the sentence is grammatical even though the two dependencies involved are crossed.

Third, some sentences with interactions between backward searching and forward searching constructions show crossed dependencies:

(31) a. [To whom] did Mary give a picture e e during yesterday's recess [of BILLY]?
   b. [These points] I doubt the fellow e made e [who talked about KANT]. (cf. Huck and Na 1990: 68)
   c. [Which people] did you mention a problem e to e [that no one has ever solved].

These sentences have interactions between wh-constructions/Topicalization and Extraposition. Here a SLASH cooccurs with the gap caused by Extraposition on a single node. This does not enforce a nested dependency because the latter gap does not cooccur with the former gap in the (same) stack. Notice that Extraposition gaps have nothing to do with a stack. As we noticed in secs. 2.4, 3.2.1 and 6.3, Extraposition gaps (DUSLASH: | |) have very different properties from those of SLASH/GAPs. Most importantly, Extraposition gaps are clause-bound and associated with forward searching constructions. We have some other examples:

(32) a. [To which woman] [did Harry offer e, and will Mary actually give] [an autographed copy of *Syntactic Structures* e]?.
   b. [This woman], Harry offered e, and Mary actually gave, [e an autographed copy of *Syntactic Structures*]. (Steedman 1985: 542)

These sentences involve wh-extraction/Topicalization and RNR constructions. In these sentences, the sentence-initial phrase is displaced from the factor and the first conjunct is missing this factor. Again, the crossed dependencies here do not make the sentences ungrammatical, because only SLASHes and/or GAPs are relevant for stacking. Remember that the RNR gap is DBSLASH (\\).

All the abvove-listed crossed dependency sentences are allowed because they do not involve feature piling in any of the two stacks posited in this chapter. The crossed dependencies in these sentences are accidental results of interactions among different constructions. However, there is a construction which requires crossed dependencies among elements in the sentence as a property of the construction itself:

(33) a. John, Peter, and Robert play football, basketball, and baseball, *respectively*.
 b. Robinson and his son were *respectively* the greatest educator and the greatest critic of the Victorian age. (Quirk et al. 1985: 957)
 c. George and Martha respectively denounced and were denounced by the governor.
 d. George and Martha are respectively easy for me to fool and hard for anyone to take advantage of. (McCawley 1988: 536)

There is only one construction involved here and the crossed dependency is induced by the trigger *respectively* (cf. McCawley 1988: 536-).

Considering the examples in this section, it is clear that we cannot posit an all-purpose constraint to prohibit crossed dependencies. Such a constraint would rule out all the grammatical sentences in this section as well as the ungrammatical sentences observed in previous sections. We posited some specific constraints which apply to those categories which have more than one stackable feature. By regulating the order of stacking of relevant features, we can get the effect of a nested dependency constraint for precisely those cases where the crossed dependency is not allowed.

Chapter VIII. The Semantics of Type A and B Constructions

As in GKPS (i.e. Gazdar et al. 1985), we will assume the basic premises of Montagovian model-theoretical semantics (cf. Dowty et al. 1981). Items in the lexicon have their own translations, and lexical nodes in the tree are assigned the same translations as the lexical items they dominate. Unlike GKPS's type-driven translations, however, we will maintain the rule-to-rule hypothesis of Montague Grammar (Montague 1970), following early GPSGs (e.g Gazdar 1982), Kuh (1990), Miller (1991b), etc[1]. Hence, the translation of a non-lexical node is compositionally derived from the translations of its daughters based on the semantic rule corresponding to the syntactic rule which licenses the local tree concerned. Notice that syntactic categories and corresponding semantic types are allowed to be non-homogeneous in this approach. In addition, we will assume that a syntactic category can have more than one semantic type (cf. Partee 1987, Miller 1991b: 51). We will also assume that the same syntactic structure can be associated with multiple constructions.

8.1. The Semantic Role of LICENSORs

LICENSOR features are *semantical* features because they make a contribution to the semantic interpretation of the structure in which they occur (GKPS, p. 224). Unlike other semantical features, they have both a general semantic effect and specific semantic effects on the interpretation. The specific

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[1] For the discussion of some problems of the type-driven translation, see Miller (1991b: 48-50, fn. 32).

effects are different construction by construction, depending on the nature of the lexical items carrying the features (i.e. the triggers). In this section, we will focus on the general semantic effect of the features.

Not all the occurrences of semantical features make their contribution to the semantic interpretation. In GKPS (p. 224) they are assumed to be *semantically potent* only at the highest point of occurrence in the tree (Carlson 1983: 305)[2]. In this respect, LICENSOR features have the same characteristics as other semantical features. Their general semantic effect can be stated as a principle of the "Argumentization of the Target" (AT). The point of this principle is that the highest node which bears a LICENSOR feature becomes a semantic functor. The argument of this functor is the value of the LICENSOR feature, namely the target[3]:

(1) Argumentization of the Target (AT)

    a. Syntactic tree: b. Semantic tree:

$$XP!\ ! \qquad\qquad xp$$
$$XP!YP\ L! \qquad YP \qquad xp/yp \qquad yp$$
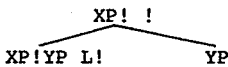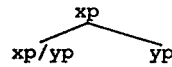
As we observed in Chs. V and VI, licensing mechanisms operate on a local structure as in (1a). The LICENSOR feature on the higher XP popped out of the stack to license the YP node. Thus the LICENSOR feature which is at the highest point of occurrence is that one on the lower XP. It is semantically potent. Hence, according to the AT principle, it becomes a functor which takes YP as its argument as in (1b).

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[2] According to Miller (1991b: 56), that is the case only for semantical HEAD and FOOT features. Other semantical features have semantic effects on all the nodes on which they appear.

[3] The principle can be interpreted as a kind of what David Dowty (p.c.) calls the "reanalysis of adjuncts as arguments as a significant mode of type enrichment".

I think the AT principle posited above is not arbitrary. It has a kind of reality which cannot be found in other semantical features. In the case of other features, there is no clear reason why only the highest occurrence of a feature has a semantic effect. On the other hand, a node with the highest occurrence of a LICENSOR has exerted some influence on what has become its argument. That is, this argument is licensed by it, though indirectly via its mother. Notice that a node which becomes a functor and its mother have the same syntactic category. Even though the source of the LICENSOR feature is a lexical item whose position is somewhere below, the target of the feature becomes the argument of a sister node bearing the feature[4].

8.2. The Interpretation of Gaps and *tough*-Constructions

Before going into the construction-particular semantic effects of LICENSOR features, which will be discussed in sec. 8.3, we will provide a control system for the interpretation of the gap (in *tough*- and related constructions), which is based on Jacobson (1991). In Ch. V, we observed that there is no syntactic relation between the subject of the Adj and the object gap in *tough*-constructions. The binder[5] in these constructions occurs in an A-position rather than in an A'-position. They are syntactically analyzed as being control-like constructions because the gapped VP following the Adj behaves like a complement-like element rather than like a part of the lower clause (cf. "raising" analyses). Based on these characteristics, Jacobson (1991) argues that they are control constructions both syntactically and semantically.

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[4] The fact here will be used crucially in capturing generalizations when the trigger itself is not a predicate but a part of it.

[5] In Ch. V, we used the term (semantic) binder to refer to the A-position "provider" of the meaning of a gap in *tough*- and related constructions (cf. (syntactic) filler). However, this does not mean that only a binding mechanism can provide the meaning of the gap.

8.2.1. Semantic Properties of *tough*-Constructions

There are several semantic characteristics of *tough*-constructions to be described. One of the most important issues regarding them is how we can fix the meaning of the gap. In a sentence like,

(2) John is easy to please e.

the gap is interpreted as meaning 'John'. That is, *John* is the "understood object" of the embedded clause.

Second, we need to capture that this understood object is the subject/controller of the *tough*-Adj:

(3) a. I always try to be easy to please.
    b. I promised Robin to be easy to deal with.
    b. I persuaded Robin to be easy to deal with.
(4) a. Being easy to please, I like Robin most of all.
    b. Being easy to please is a prerequisite for being a member of this club.

From these examples, we can see that the controller of the Adj is always the underderstood object. The information about the controller can either be provided by the lexical properties of the higher predicate as in (3) (cf. the Lexical Entailment Theory of Control: Chierchia 1984, Dowty 1985), or by pragmatic considerations as in (4).

There are some other semantic properties to be noticed. First, it was once widely assumed that the *tough*-Adj does not impose any semantic effect on its subject position (cf. raising analyses)[6]. However, this does not seem to be

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[6] The following data show that the subject position of the VP containing a *tough*-Adj has some selectional restrictions (Lasnik & Fiengo 1974):

(i) a. John is being easy to please.
    b. *To please John is being easy.
    c. *It is being easy to please John.
(ii) a. Kim was intentionally/purposely hard to deal with.

true. We can clearly see the semantic effect of *tough*-subjects from the following examples[7]:

(5) It is difficult (for John) to play this sonata on that violin.
(6) a. This sonata is difficult (for John) to play e on that violin.
   b. That violin is difficult (for John) to play this sonata on e.

We know that sentence (5) is different from the sentences in (6), but sentence (6a) is also different from sentence (6b). Sentence (6a) involves an implicit comparison of 'this sonata' with other pieces of music that one might 'play on that violin'. On the other hand, sentence (6b) entails a comparison of 'that violin' with other musical instruments that one might 'play this sonata on'. Hence, the two sentences could differ in truth conditions (David Dowty, p.c.). 'This sonata' might be such a challenging piece of music that it would be difficult to play on this violin or on other instruments. It could be true at the same time that 'that violin' is such a fine instrument that it would be rather easy to play difficult pieces of music on it. In this situation, what is represented by sentence (6b) would be false even though sentence (6a) would be true.

The semantic difference between (6a) and (6b) becomes more explicit in comparative sentences of *tough*-Adjs (David Dowty, p.c.):

(7) a. This sonata is harder to play e on that violin than this etude is.
   b. *This sonata is harder to play e on that violin than this piccolo is.
   c. That violin is harder to play this sonata on e than this piccolo is.

There is a close semantic correlation between the subject of the main clause

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   b. *It was intentionally/purposely hard to deal with Kim.

The Adj is in a progressive form in (i) and occurrs with manner adverbials in (ii).

[7] David Dowty (p.c.) pointed out to me that the basic semantic facts were discovered in the early seventies probably by Lakoff, Ross and/or McCawley. However, I could not find the exact references.

and that of the *than*-clause.

One of the most important points about the semantics of *tough*-constructions shown by the difference between the sentences in (6) is that the *tough*-Adj denotes a three-place semantic relation (when there is a PP) among two individuals and an action. With this argument structure, we can account for the fact that the two sentences can have different truth conditions, because the relations in these sentences hold between different objects. In contrast, the Adj in (5) describes a two-place relation between an individual and an activity.

As for the second semantic property to be considered, there are certain semantic restrictions on the experiencer phrase[8] of *tough*-constructions (i.e. the *for*-phrase) (cf. sec. 5.1.3.2):

(8) a. *This novel is unpleasant for this machine to translate.
    b. *The Titanic is amusing for any iceberg to sink.

As an experiencer, the NP within the [*for*-NP] phrase cannot usually be inanimate or abstract. Notice that only an animate thing which has feelings, perceptions or emotions can be an experiencer.

8.2.2. A Control Analysis: Jacobson (1991)

For the account of the understood object in *tough*-constructions, Jacobson (1991) extends the the "Lexical Entailment Theory of Control" (LETC) of Chierchia (1984) and Dowty (1985). This theory says that control is essentially a fact about lexical meaning, and was originally developed for the account of the understood subject of "control Vs/Adjs". Jacobson (1991) argues against any binding-type analyses, claiming that the gap interpretation in *tough*-

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[8] As we saw in Ch. V, the [*for*-NP] phrase is the experiencer of the *tough*-Adj (a higher PP) and at the same time the subject of the lower clause. When we say "experiencer phrase", we refer to the [*for*-NP] phrase as functioning as the experiencer of the Adj.

constructions is simply a matter of control.

Remember that we rejected any raising analyses of *tough*-constructions for syntactic reasons (cf. sec. 5.1.3.1). Jacobson (1991: 23) rejects not only these raising analyses but also those binding analyses which employ essential/distinguished variables to capture the semantic connection between the subject and the gap. According to traditional binding approaches[9], gaps (in UDCs, and pronouns) are translated as variables, and the constructions containing these gaps are represented by lambda-abstaction on these variables (cf. Pollard 1988: 408, Partee et al. 1990: 357-8). In these binding analyses, the meaning of the gapped VP (VP//NP) in sentences like (9) below, for example, is represented as $\underline{move(x)}$, where x is a distinguished variable (cf. Jacobson 1984). Then 'hard for me' combines with this argument. According to the semantic rule for this combination, $\underline{hard'(me')}$ is applied to $\underline{move(x)}$ and the resulting unit is λ-abstracted over the variable. Hence we get $\underline{\lambda x[hard'(me')(move(x))]}$ for *hard for me to move*. One aspect that should be noticed about these binding analyses is that the gapped VP is regarded as a property rather than a relation.

Jacobson's (1991: 24) control analysis of *tough*-constructions can be summarized as follows. A *tough*-Adj can have three arguments: a PP, a gapped VP (VP//NP) and a subject phrase. In a sentence like the following,

(9) That rock is hard for me [__ to move __].

The Adj *hard* itself has the properties which give rise to the following characteristics of the construction: i) *that rock* is the controller of the object gap of the lower VP, and ii) *for me* is the controller of the subject gap. Among the three arguments of the Adj, two arguments are controllers. Mechanisms for

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[9] Recently there have been developed Function Composition (FC) approaches within a tradition of Categorial Grammars (Steedman 1987, 1988; Szabolsci 1989, 1991). These approaches do not use essential variables and hence are called "No-Essential-Variables Approaches".

ensuring these facts are lexical entailments, which can be represented by the meaning postulates of each lexical item. Under the assumption that the VP//NP denotes a two-place relation R, "each *tough* adjective entails something about the individual denoted by the PP standing in the R relation to the individual denoted by the subject." Here the gapped VP is assumed to be a relation, in contrast to the traditional binding approaches.

We can construct a meaning postulate to capture the control relations assumed in (9) (cf. Jacobson 1991: 24). Informally speaking, the *tough*-Adj *hard* denotes a three-place relation among two individuals 'that rock' and '(for) me', and a two-place relation '(to) move'. In this case, one of the entailments conveyed by the three-place relation *hard* is that '(for) me' stands in the '(to) move' relation to 'that rock'. Assuming that x, y, R and @ are the denotations of the subject argument, the PP argument, the two-place relation, and the three-place relation, respectively, we can write the meaning postulate as follows:

(10) $\forall x \forall y \forall R[@(y)(R)(x) \longrightarrow R(x)(y)]$

Here the subject argument of the three-place relation (i.e. x) is interpreted as the object argument of the two-place relation.

Under Jacobson's (1991) approach, the characteristics of *tough*-constructions discussed in sec. 8.2.1. can be accounted for as follows. First, the LETC (Lexical Entailment Theory of Control) is adopted for the interpretation of gaps. Second, the fact that the subject/controller of the Adj is always the understood object can be stated by referring to the subject of the Adj in the relevant meaning postulates. Third, the fact can be handled most naturally by the LETC that the subject of a *tough*-Adj might have some semantic effect. This theory says that each V or Adj can have different entailments associated with its argument positions. Hence, some *tough*-Adjs may have some entailments imposed on their subject positions (cf. (6-7)) and some may not (e.g. *impossible*, cf. Jacobson 1991: 24-25). Fourth, semantic restrictions on the

experiencer phrase can also be expressed in the meaning postulates describing the entailments of the Adj.

Jacobson's (1991) crucial semantic arguments against any analyses which bind a variable in the gapped VP complement are represented by the examples of "Null Complement Anaphora" (p. 23, 26):

(11) ?This rock is hard for me to move, but that rock is easy for John.

When the missing material in the second conjuct is understood as *to move*, *that rock* is understood as the object of *move*. She argues that, under a binding analysis, the semantic linkage between the subject and the gap is accomplished only when the VP complement combines with the Adj. This is impossible for the second conjuct because there is no VP (hence, no gap to be bound). In a word, there is no way for *that rock* to bind the gap in the understood complement. The phenomenon in (11) seems to constitute a strong argument against binding analyses.

There are some other difficulties with traditional binding analyses. As we observed above, the most important difference between a binding analysis and a control analysis is that a *tough*-Adj is treated as a relation among two individuals and a property in the former, but two individuals and a relation in the latter. David Dowty (p.c.) pointed out some advantages of the control approach with reference to this difference.

First, the analysis in terms of a relation is more intuitively correct than an analysis using a property. For example, the following sentence,

(12) The rock is hard to lift.

can best be described as classifying 'the rock' as 'hard/difficult' with respect to the action of lifting. Because this action is something that can be done to an object, it represents a relation. Under a property approach, the sentence would be interpreted as classifying the rock as difficult with respect to the activity of lifting *the rock*. This second reading seems to be less natural than the first

reading. At least, the binding reading is somewhat redundant.

Dowty's point is that the only activities with respect to which it makes sense to classify an object as 'easy', 'tough', 'interesting' etc. are those activities in which that object itself is used. But this is just a redudant way of saying that *tough*-Adjs are relations among an object, a PP argument, and a (two-place) relation, not among an object, a PP argument and (one-place) property. The analysis in terms of a relation predicts that this generalization will hold.

Second, a relation approach provides a more straightforward account of the implicit comparative semantics in *tough*-sentences:

(13) This problem is easy to solve.

This sentence involves an implicit comparison of 'this problem' with other contextually provided problems with reference to the action of 'solving' (cf. (7)). Under a property analysis, the elements we have to deal with to obtain the comparative semantics are as follows: i) this problem, ii) other contextually implicit problems, and iii) the activity of solving *this problem*. The dilemma here is that we cannot use the activity of solving this problem to get a ranking of difficulty involved in solving other implicit problems. That is, we cannot directly combine other problems with a relation of 'solving' because it has already become a property (i.e. 'solving this problem'). Hence we need to "decompose" the element in (iii) into a relation ('solving') and the object ('this problem'), which leads to a violation of compositionality.

Thus far, we have observed some advantages of Jacobson's (1991) relation analysis over the traditional property analysis. There are also some difficulties with her analysis. First, according to her analysis, there is no syntactic relation between the PP complement of a *tough*-Adj and the VP//NP comlement. However, we observed in sec. 5.1.3.2 that we need to assume that the PP complement has an additional role of being the syntactic subject of the lower clause. As Jacobson (1991: fn. 5) herself admits, her system cannot account for the fact that the PP can have a parasitic gap:

(14) ?John would be hard [for friends of e] [to admire e].

The PP *for friends of* and the gapped VP *to admire* are two separate complements of the Adj *hard*, and the founder of the gap is the gapped VP. Hence the parasitic gap is outside the domain of the founder of the gap. However, the parasitic gap must occur in the domain of the founder, and the relation between real and parasitic gaps are regulated by syntactic mechanisms (GKPS, pp. 162-7).

Data like (14) show that a part of Jacobson's (1991) control system is not correct. That is, the PP is not the controller of the subject of the gapped VP. However, it is a syntactic subject of the VP as in our approach. We will see in sec. 8.2.3 how our mechanism can provide the information that the PP is the subject of the gapped VP as well as the experiencer of the *tough*-Adj.

Second, in some *tough*-related constructions, triggering elements themselves are not (heads of) predicates:

(15) a. John is <u>too nasty</u> to make friends with.
    b. Tom is <u>tall enough</u> for us to see.
(16) a. Chris is <u>an easy person</u> for us to please.
    b. Robin is <u>too kind a person</u> to take advantage of.
    c. This is <u>a light enough ball</u> to throw.

In these sentences, the triggering elements (*too, enough* and *easy*) are inside the underlined phrases. To produce the required relation between the matrix subject and the gap in the VP under the control analysis, we need to refer to these underlined phrases rather than the triggering elements. The triggers themselves do not bear any direct relation to the subject and VP//NP complements[10]. Hence, we cannot establish the relations necessary to produce the meaning of the understood object under pure lexical entailment

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[10] One might try to solve the problem by assigning categories (AP/(VP/NP))/A and (N/(VP/NP))/N to the *too/enough* in (15) and the *easy* in (16a), respectively, under a categorial analysis. We will realize that this kind of approach is not very effective when we consider the data in (16b-c) and (20).

approaches.

In the underlined phrases in (15-6), the triggers and the heads are different lexical items. The predicate-hood of the phrases is inherited from their heads. The sources of the relevant inheritance properties (i.e., the VP//NP-licensing property and the headness property) are not the same in those phrases. Hence, strictly speaking, the property of licensing the gapped VP has nothing to do with the the fact that a word/phrase is (the head of) a predicate. The situation is different in examples like the following:

(17) This problem is <u>very easy</u> to solve.

Here both of the inheritance properties originate from *easy*. Thus we can assume that *very* is simply transparent to all the inheritance properties of the underlined phrase. However, we need a separate syntactic mechanism to deal with the inheritance of the property of licensing the gapped VP in examples like (15-6).

One possible way of solving the problem related to the data in (15-6) is to assume that the sentences are related to the following sentences by some mechanism (e.g. Extraposition):

(18) a. John is [[too to make friends with] nasty].
    b. John is [tall [enough for us to see]].
(19) a. John is an [[easy for us to please] person].
    b. Robin is [[too to take advantage of] kind] a person.
    c. This is a [sharp [enough to cut the salami with]] knife.

In these strings the triggers are directly related to the complements, the PP and the gapped VP. Hence the lexical entailment approach in Jacobson (1991) would be directly applicable if we assume that the subject of the main predicate is accessible in some way.

However, this solution does not seem to be very good. First of all, the strings in (18-9) are not grammatical sentences (except (18b)??). Hence the application of the mechanism assumed (e.g. Extraposition) must be applied obligatorily. We have rejected this kind of analysis throughout this

dissertation. If we are going to admit ungrammatical strings, there would not be any strings that cannot be used. Second, the assumed units containing the triggers are not predicates in (18-9). They are just modifiers. Hence we must assume that (a part of) the modifier of a predicate can also be used to establish the relation between the subject argument of the predicate and the VP gap of the modifier. One might argue that the correct syntactic analyses are as in (15-6), but the corresponding semantic argument structures are as in (18-9). However, even under this assumption, we cannot avoid the problem just described, let alone the problem of associating syntactic structures with corresponding semantic structures.

Even though there might be some way of handling the data in (15-6) under Jacobson's (1991) analysis, it would involve a lot of complications. However, we can analyze the sentences with the same mechanisms as those for the *tough*-constructions, as we will see in sec. 8.3. There are somewhat more complex examples which show the same point:

(20) a. This event is harder right now than anyone would have imagined
      for him to just accecpt e. (cf. (12), Ch. VII)
    b. Robin isn't easy enough to talk to e to approach e directly
      on this problem. (cf. (217), Ch. V)

In sentence (a) one instance of the word *harder* is related to two different (sets of) phrases (i.e. the compared phrase and the PP-VP//NP). In (b) *easy* is related to *to talk to* and *enough* is related to *to approach ... this problem*.

8.2.3. A Revised Control Analysis

In this section, we will provide a revised control system for the interpretation of the gap in *tough-* and similar constructions. In this system, the denotation of the gapped VP is a relation rather than a property as in Jacobson (1991). However, there are some differences between these two analyses. We argued in Ch. V that the PP and the gapped VP are not

complements of the *tough*-Adj even though they are licensed by this Adj. They are modifiers of the constituent containing the Adj. In addition, the PP is partly the syntactic subject of the gapped VP. These differences will lead to solutions of the problems of Jacobson's (1991) analysis.

We will use lower-case letters to indicate semantic types of syntactic categories. For example, the semantic type of the syntactic category NP would be np. We propose to use type np/np for the gap in *tough*- and related constructions[11]. Type np/np represents an identity function ($\lambda x[x]$). We will use the following basic combinatory rules as well[12]:

(21) Function Application (FA)

     x/y: f y --> x: f(y)

(22) Function Composition (FC)

     x/y: f y/z: g --> x/z: $\lambda v[f(g(v))]$

With these mechanisms, we can provide an analysis of the following sentence:

(23) John is hard to convince e.

First of all, this sentence has the following syntactic structure (cf. Ch. V):

---

[11] In No-Essential-Variables approaches as in Szabolcsi (1989), pronouns and reflexives are represented as identity functions. I think we can use the same category for the gaps in both *tough*-constructions and structural UDCs.

[12] We are using the combinatory rules only for the purpose of semantics. Hence we would use slash (/) as being neutral to the direction of combination, which is relevant in syntax.

(24)

```
         S
    NP        VP
    |      V       AP!  !
  John   |     AP!.. L!      VP//NP
        is   |           V        VP//NP
           hard          |
         !VP//NP L!      to    V          NP//NP
                              |            |
                          convince         e
```

According to the AT principle (1) in sec. 8.1, what is licensed by the LICENSOR feature becomes an argument of its sister node containing the feature. By applying this principle, we can build the following semantic type tree:

(25)

```
          s
    np         s/np
    |     (s/np)/ap        ap
  john'    is'    ap/(vp/np)      vp/np
                    |          vp/vp      vp/np
                  hard'         |
                               to'    vp/np       np/np
                                       |           |
                                   convince'       e
```

Notice that the semantic type of *hard* is <u>ap/(vp/np)</u> even though the corresponding syntactic category is an AP.

Based on the type tree in (25), we can derive the meaning of sentence (23) as follows:

(26) a. e: $\lambda x[x]$
   b. (to) convince e (FC): $\lambda v[\text{convince}'(\lambda x[x](v))]$
   $\qquad\qquad\qquad = \lambda v[\text{convince}'(v)]$
   c. (is) hard to convince e (FA): $\text{hard}'(\lambda v[\text{convince}'(v)])$
   d. John is hard to convince e (FA): <u>hard$'(\lambda v[$convince$'(v)])$](john$'$)</u>

The gapped VP denotes a relation as in Jacobson (1991), and the information about the gap in the VP is not provided by the semantic procedure introduced. As we observed before (cf. (10)), that information is provided by the lexical

entailments of the *tough*-Adj *hard*.

One important difference between Jacobson's (1991) analysis and the present analysis lies in the syntactic difference in the relation between the *tough*-Adj and the gapped VP. In the former, the gapped VP is a complement of the Adj. In the latter, the gapped VP is an adjunct of the AP containing the *tough*-Adj even though the VP is in the LICENSOR value of the Adj. This syntactic difference leads to a semantic difference. The denotation of the gapped VP is an argument of the *tough*-Adj because of the semantic type of the Adj itself in Jacobson's (1991) analysis. However, the gapped VP becomes an argument of the AP containing the Adj by the AT principle in our framework. We cannot see this difference in the translations of *tough*-constructions because the trigger is the same as the predicate of the construction. However, the difference will become evident when we analyze sentences like (15-6).

In Ch. V, we have argued for the following structure when the *tough*-Adj occurs with a *for*-phrase:

(27)

```
                              AP
      AP!(PP)-VP//NP L!                VP//NP
                            /    \
      easy!(PP)-VP//NP L!      PP        VP//NP
                             /  \       /    \
                           for me    to please e
```
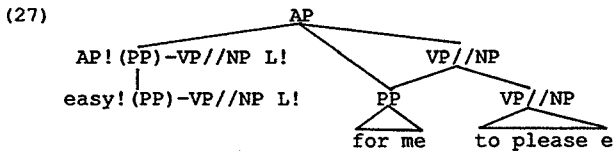
In our approach, the information that the PP is a daughter of the higher AP and at the same time the subject of the VP comes from this syntactic structure itself. In sec. 8.2.2, we saw that we cannot rely only on lexical entailments to make it sure that the PP is the controller of the subject of the lower VP, with reference to such examples which contain parasitic gaps in the PP.

Let us see how we can derive the meaning of the expression represented by the structure in (27) under the present approach:

(28)
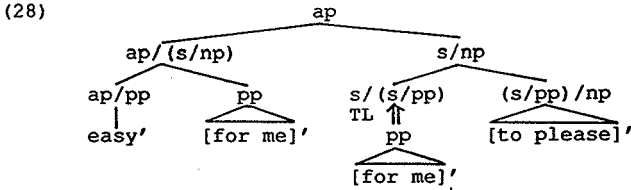
There are two phrases licensed by the LICENSOR feature on the AP: PP and VP//NP. Hence each of these phrases, in turn, becomes the argument of the AP due to the AT principle. A few comments are in order for the assignment of types: s/np, s/pp and s/(s/pp). First, notice that VP in the GKPS system represents both a VP without its subject (i.e. unsaturated VP) and an S with its subject (saturated VP). Second, PPs can be the subject of a sentence:

(29) <u>Under the bed</u> is a good place to hide your wallet.

Third, we employ Type Lifting (TL), which applies only to semantic types in our framework, as is the case with other rules:

(30) Type Lifting (TL)

x: f --> y/(y/x): λFF(f)

This is a well-established mechanism in the literature, especially for the account of semantic diversities of syntactic categories (Partee (1987) for NP types) and for the account of various syntactic phenomena (Dowty 1988).

Then the types and operations used in (28) are not arbitrary. We need them for the analyses of other sentences as well. Now we can derive the meaning of (27) based on the semantic type tree (28):

(31) a. easy for me (FA): easy'(me')
   b. for me: me' --> (TL): λF[F(me')]
   c. for me to please e (FC): λv[λF[F(me')](λx[please'(x)](v))]
       = λv[[please'(v)](me')]
   d. (is) easy for me to please e (FA): easy'(me')(λv[[please'(v)](me')])
   e. John is easy for me to please (FA):
       <u>easy'(me')(λv[[please'(v)](me')])(john')</u>

The matrix subject *John* will be interpreted as the object of *please* by way of control.

At this point, we need to reconsider the phenomenon in sentence (11) (from sec. 8.2.2), which is assumed to be an unsolvable problem for (traditional) binding approaches:

(11) ?This rock is hard for me to move, but that rock is easy for John [ ].

Unlike Jacobson's (1991) framework, the PP and the gapped VP are not complements of the *tough*-Adj in our framework. Hence the deletion of the VP//NP in the second conjunct is not a matter of Null Complement Anaphora, which is described as a lexical argument drop process. It is rather handled as a kind of syntactic ellipsis, just as in the following example:

(32) Sue can solve this problem but Mary can't [ ].

We can derive the meaning of the second conjunct by selecting an appropriate meaning for the deleted part from the first conjunct. Likewise, in sentence (11), we can select the meaning of *to move e* from the first conjunct for the interpretation of the second conjunct. Notice that the denotation of *to move e* is $\lambda v[move'(v)]$ (a relation) rather than $\underline{move'(x)}$ (a property). The relation meaning will fit in the second conjunct without any restrictions, and the gap will be controlled by 'that rock' rather than 'this rock' just like in Jacobson's (1991) analysis.

Now let us consider how the present system can account for the characteristics of *tough*-constructions observed in sec. 8.2.1. Jacobson's (1991) system and the present system are basically the same in the sense that the gapped VP is interpreted as a relation rather than a property. First, for the interpretation of *tough*-gaps, we have the same mechanism as that of Jacobson (1991) (i.e. a control mechanism) despite the syntactic difference on the status of the PP and the gapped VP. Second, we capture semantic restrictions on the experiencer PP and the fact that some *tough*-Adjs have a semantic effect on

their subject positions, by lexical entailments associated with each of the Adjs. Even though the PP is not a complement of the Adj, lexical entailments can refer to the PP because it is a part of the LICENSOR value of the Adj. We syntactically guarantee that the experiencer PP is also the subject of the lower VP in our approach, because this phrase is dominated by both AP and VP//NP. Third, the present system is not subject to the difficulties regarding redudancy and implicit comparative semantics in *tough*-sentences because we treat the gapped VP as a relation.

One issue to be considered about our control system is that there is a mismatch between syntactic categories and semantic types. Let us examine the following trees:

(33) a.
```
              AP
      ┌────────────────┐
  AP!VP//NP L!      VP//NP
```
b.
```
              ap
      ┌────────────────┐
  ap/(vp/np)         vp/np
```
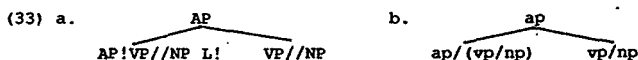
We can see a mismatch between the lower AP and its type ap/(vp/np). The AT principle is responsible for this mismatch. That is, the category which contains a semantically potent LICENSOR takes its sister (i.e. the LICENSOR's value) as its semantic argument. However, as we observed in sec. 8.1, the AT principle does not seem to be arbitrary.

Remember that there are some difficulties with Jacobson's (1991) analysis in dealing with the examples with a parasitic gap in the PP, and examples where the trigger is somewhere inside the predicate. We have already provided an analysis for the former problem. The analysis of the latter examples in our framework will be provided at the beginning of next section.

8.3. Other Constructions

In *tough*-constructions, the information about the gap is provided by the lexical entialments of the *tough*-Adj. For the other constructions which we observed in sec. 5.1 (constructions similar to *tough*-constructions), the same

mechanisms for the *tough*-constructions will be used except for the construction-specific semantic effects. Let us examine the following sentences which represent each of the constructions to be considered here:

(1) a. The game was a breeze for Tom to convince her to win.
  b. The house is ready for Tom to force Jim to buy.
  c. Kevin is a tough man to argue with.
  d. The cake took Mary all day to bake.
  e. John is too nasty to ask Mary to make friends with.
  f. Tom is tall enough to imagine my little son could have seen.

In those constructions in (1a-d), there is no special semantic relation between the phrase which contains the trigger and the VP with the gap, just as in *tough*-constructions. The compositional semantics of FA and FC would be enough to get the meaning of the whole sentence.

  We will analyze the constructions in (1c), (1e) and (1f) because these constructions have a different pattern from the *tough*-constructions. Based on the syntactic trees in sec. 5.1.4, we can provide the following semantic type trees and translations of the constructions:

(2) a.

```
                              np
          _____
         np/(vp/np)                      vp/np
        _____              _____
       np/n       n            [to argue with e]'
        |       _____
        a'     n/n    n ·
               |      |
             tough'  man'
```

    ---> [a' (tough' (man'))] (λx[argue-with' (x)])

  b.

```
                                ap
          _____
       ap/(vp/np)                           vp/np
      _____              _____
     ap/a     a  ·        [to ask Mary to make friends with e]'
      |       |
     too'   nasty'
```

    ---> [too' (nasty')] (λx[ask...with' (x)])

```
c.                                ap
           ap/ (vp/np)                        vp/np
           a         ap\a      [to imagine ... could have seen e]'
           |          |
         tall'      enough'
         ---> [enough'(tall')](λx[imagine...seen'(x)])
```

What these analysis trees show is that exactly the same mechanisms as those for the *tough*-constructions (cf. (25) in sec. 8.2.3) are used for these constructions. According to the AT principle, the highest node containing the LICENSOR feature (NP in (a) and AP in (b-c)) becomes a functor which takes the VP//NP sister as its argument. The control relation between the matrix subject and the gap in the VP is established at this point of the structure due to the roles of the LICENSOR feature and the AT principle. · Here the difference between the present analysis and Jacobson's (1991) becomes evident. The position of the triggering element does not affect the analysis at all in our approach. None of the triggers involved here are predicates themselves. They are just a part of the predicate. The trigger is an attributive Adj in (a) and it is an adverbial modifier in (b-c).

One might argue that lexical entailments cannot capture the relation between the matrix subject and the gap in the VP in our approach because the relations among the trigger, the gapped VP and the matrix subject are represented syntactically rather than lexically in some sense. However, these relations can be established by way of lexical properties as well. First, the trigger has the information about the gapped VP as the value of its LICENSOR feature. In other words, the property of licensing a gapped VP is inherited from a particular lexical item by way of the LICENSOR feature. Second, the subject argument of the trigger will turn out to be the same as the matrix subject regardless of whether the trigger is a predicate or just a part of the predicate. If it is a part of a predicate, it cannot have its own subject. Hence the subject of the category which is modified by it will be its subject by inheritance. Hence we can still maintain that what is involved in obtaining

the control relation are lexical properties.

We can provide the same analyses for the sentences in (20) in sec. 8.2.2:

(3) a. [harder'(than...imagined')](λx[just...accept'(x)])
   b. [enough'(easy')(λx[please'(x)])](λy[approach...problem'(y)])

In (a) the subject argument of <u>harder'</u> (eventually, that of <u>harder'(than...imagined')</u> will be interpreted as the object argument of <u>accept'</u>. In (b) the subject argument of <u>enough'(easy')</u> will be interpreted as the object gap of *please*, and that of <u>enough'(easy')(λx[please'(x)])</u> as the gap of *approach*. The subject arguments of these two expressions will turn out to be the same.

As we observed before, one of the difficulties of Jacobson's (1991) analysis arises because the trigger of the construction concerned is not always the predicate (cf. the data in (15-20), sec. 8.2.2). It can occur somewhere inside the predicate, the position of which is not fixed. The relevant phrase for the application of lexical operations in her approach is the predicate rather than the trigger. However, our system does not have this kind of problem, as we saw in (2). The gapped VP is not an argument of the trigger itself. We need not manipulate the category/type of the trigger to capture that the VP is a semantic argument of the predicate containing the trigger. This fact is captured by the AT principle even though the trigger is in a lower position. Thus, we have a general semantic framework for the interpretation of the gap in both *tough-* and related constructions. This general framework will automatically capture that all the constructions have the same properties regarding the interpretation of the gap.

At the beginning of this section, we noticed that the constructions in (1a-d) do not have a special semantic relation between the trigger-containing phrase and the VP with the gap. However, in the case of (1e-f), there are construction-specific meanings caused by the lexical items *too* and *enough*. In the former case, the gapped VP is a negative result of what is represented by the phrase containing *too*. In the latter case, the VP represents a (positive)

result. Because these are construction-specific properties, they cannot be captured with a general principle. The only difference between these two constructions is that the former contains *too* but the latter contains *enough*. Therefore, the difference should be captured with referece to these lexical items. They have the same LICENSOR feature, [(VP(//NP)) LICENSOR], but this only indicates that they license the same syntactic category.

Even though two different lexical items license the same syntactic category, the semantic effects of these items are not necessarily the same. To capture this differnce, we will assume that each lexical item with a LICENSOR feature has its own entailments regarding the relation between (a phrase containing) this lexical item and the value of the feature (i.e. the target). Let us call these lexical entailments "licensor entailments"[13]. The exact category of the phrase containing the trigger will be determined when the target is licensed. It is the category which contains a semantically potent LICENSOR feature. The licensor entailment of *too* is that the target vp/np is a negative result of (the phrase containing) the trigger. For example, in *too nasty to ask Mary to make friends with* of (1e), we can derive its interpretation [too'(nasty')](λx[ask...with'(x)]) by following the general procedures provided above. The licensor entailment will ensure that λx[ask...with'(x)] is a negative result of too'(nasty').

In the rest of this section, we will sketch some semantic aspects of the other constructions discussed in this dissertation. We will focus on only those semantic aspects which are related to the AT principle and interpretation of gaps, if any.

---

[13] Under the present approach, if the special characteristics of a construction are due to a particular lexical item, they are captured with reference to the licensor entailments rather than the special semantic counterpart of a syntactic rule (cf. the rule-to-rule approach).

First, as we pointed out before, Right Node Raising (RNR) constructions have very special properties which are not shared by other constructions (cf. sec. 5.2). These specialties are apparent in semantics as well. They do not seem to be subject to the AT principle and the control mechanisms. The following sentences (repeated from sec. 5.2.2),

(4) a. John hummed, and Mary sang, the same tune.
   b. The Red Sox beat, and the Giants were beaten by, different teams.

indicate that the factor is directly related to the whole conjunction. I do not have a specific mechanism to account for the semantic facts observed in such examples as (4). I think we can use the (inherited) LICENSOR feature on the factor as a marker for preventing direct semantic combination of the factor and its sister. The basic idea is that the factor is syntactically licensed in its site of origin but it is semantically licensed "later" when the LICENSOR feature licenses the DBS feature ($\backslash\backslash$) (cf. the analysis tree (33) in sec. 5.2.3). More specifically, the meaning of the factor is stored in the stack along with the LICENSOR feature and it combines with the conjuncts when the LICENSOR feature is discharged from the stack (cf. the Cooper storage).

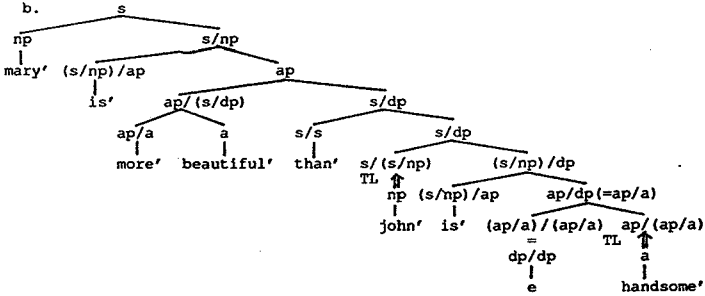Second, for comparative constructions, we will propose the following analysis. When we apply the AT principle to the syntactic structure (5a), we get the semantic type tree (5b):

(5) a.   AP! !   b.   ap
        AP!.. L!   S[than]|DP   ap/(s/dp)·   s/dp

Now we can analyze the following sentence (6a) as in (6b):

(6) a. Mary is more beautiful than John is *x* handsome.

```
b.              s
        np ─────────────── s/np
        │              ┌────────────┴──────
     mary'  (s/np)/ap              ap
        │      ┌──────────┴──────────────
       is'   ap/(s/dp)              s/dp
          ┌─────┴─────       ┌────────┴──────────
        ap/a    a          s/s            s/dp
         │      │           │        ┌──────┴────────
       more' beautiful'   than'  s/(s/np)      (s/np)/dp
                                   TL ⇧     ┌──────┴──────
                                  np (s/np)/ap   ap/dp(=ap/a)
                                   │    │      ┌─────┴────────
                                 john'  is' (ap/a)/(ap/a)  ap/(ap/a)
                                              =            TL ⇧
                                            dp/dp           a
                                             │              │
                                             e          handsome'
```

Notice that type *dp* is the same as type *ap/a*. That is, type *dp* takes type *a* and becomes type *ap*. Based on the analysis tree in (6b), we can derive the meaning of sentence (6a) as follows:

(7) Translation of sentence (6a):

    a. handsome (TL): $\lambda F[F(\text{handsome}')]$
    b. e: $\lambda y[y]$
    c. (is) e handsome (FC): $\lambda x[\lambda F[F(\text{handsome}')](\lambda y[y](x))]$
                   $= \lambda x[x(\text{handsome}')]$
    d. john (TL): $\lambda F[F(\text{john}')]$
    e. john is e handsome (FC): $\lambda x[\lambda F[F(\text{john}')](\lambda v[v(\text{handsome}')](x))]$
                      $= \lambda x[x(\text{handsome}')(\text{john}')]$
    f. than john is e handsome (FC): $\lambda v[\text{than}'(\lambda x[x(\text{handsome}')(\text{john}')](v))]$
                          $= \lambda v[\text{than}'(v(\text{handsome}')(\text{john}'))]$
    g. more beautiful (FA): $\text{more}'(\text{beautiful})$
    h. more beautiful than john is e handsome (FA):
         $[\text{more}'(\text{beautiful}')](\lambda v[\text{than}'(v(\text{handsome}')(\text{john}'))])$
    i. mary is more beautiful than john ia e handsome (FA):
         $[[\text{more}'(\text{beautiful}')](\lambda v[\text{than}'(v(\text{handsome}')(\text{john}'))])](\text{mary}')$

The meaning provided in (7i) is the final one that can be obtained by our mechanisms introduced thus far, but it is not yet complete. We need another mechanism to provide the value for the λ-abstracted variable in the target (i.e., the degree of John's handsomeness). However, I think this variable should be bound by pragmatic factors (cf. (44-5) in sec. 6.1.2).

Lastly, there are result clause constructions. Dowty (1991: 35-9) provides an analysis of these constructions. Our analysis provided in sec. 6.2 is fully compatible with his analysis even though the frameworks used are different. We have the following syntactic and semantic trees:

(8) a.   S! !   b.   s
         _____   _____
        S!.. L!   S[that]   s/s   s
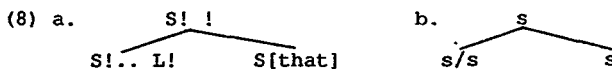
According to the semantic type tree in (b), the following sentence will be interpreted as p(q):

(9) [John is so big] (p) [that he cannot live here] (q).

This interpretation represents just the functor-argument relation between clause p and clause q, which is obtained by the AT principle. We need to represent the construction-specific semantic effect of the trigger. Remember that we employed licensor entailments to capture the special semantic effect in *too/enough* constructions above. Hence we can say that the lexical item *so* has a licensor entailment of the following (adopted from Dowty 1991: 37)[14]:

(10) If p translates into p' then $F_i(p)$ translates into that function
     on sentence meanings q such that:

     the extent x_0 and ... and the extent x_n to which p' causes
     it to be the case that q'.

The multiple variables (x_0 ... x_n) are necessary to handle the examples of many-to-one relations between trigger and target (cf. (16) in sec. 6.2).

_____

[14] The corresponding syntactic rule is as follows:

(i) If p ∈ S[+so], then $F_i(p)$ ∈ S/S[that], where $F_i(p)$ = p.

Chapter IX. CONCLUSION

In this dissertation, we have provided an analysis of Type A and Type B constructions under an IPSG framework. These constructions are lexically triggered. The lexical trigger and (all or part of) the target can be unboundedly separated from each other. The lexical triggering of the constructions is implemented into the framework by assuming that each lexical item concerned (i.e. the trigger) has a FOOT feature LICENSOR as an innate syntactic property that is listed in the lexicon. The discontinuity relation between a trigger and its target is captured by the licensing mechanisms introduced. The trigger is the source of a LICENSOR feature, and this feature propagates through the tree by way of a stack. Then, at some point, the feature licenses the target. Once this target is licensed, the special relation between a trigger and its target will have been established. The unboundedness between a trigger and its target is due to the behavior of a SLASH(-like) feature in the target or that of the LICENSOR feature itself.

One of the most important contributions of the present study is that we factored a new homogeneous group of constructions (Type A/B constructions) out of two different types of constructions (UDCs and DDCs). We provided a unified account of this newly sorted group of constructions. By doing this, we have explicitly captured the differences and similarities between Type A constructions and other UDCs, and between Type B constructions and other DDCs. For example, in our analysis, we have provided a motivation for the basic differences between Type A (i.e *tough-* and similar) constructions and structural UDCs. We provided a lexically oriented mechanism for Type A constructions rather than assuming stipulative rules (cf. Hukari & Levine

1991a: 138-9). More importantly, similarities between Type A and Type B constructions have become apparent.

The IPSG framework explored in this work has more power than a pure Context-Free Grammar formalism because it is an (Linear) Indexed Grammar. However, it is generally agreed that we need more power than that of Context-Free Grammar for the analysis of natural languages. For example, the crossed dependency construction in Swiss German (cf. sec. 4.1) requires (at least) the power of a Linear Indexed Grammar. In this respect, our system employs mechanisms that are necessary for other independent purposes. The present framework employing stack mechanisms has some advantages over other grammatical frameworks which do not have such mechanisms. First, we need not assume Extraposition in those cases where we should posit ungrammatical "source" sentences (cf. Chs. V and VI). Second, we need not employ "flattening" or "liberation" mechanisms that are required to account for interactions between different constructions in other frameworks (cf. ch V and ch VII). Some liberation mechanisms are not well-motivated, and are thus open to the criticism that they are merely used to manipulate structures for the application of existing rules to complex strings.

I think we have provided a reasonable account of the constructions considered in this dissertation. We analyzed in detail *tough*- and similar constructions, Right Node Raising (RNR) constructions, and comparative constructions. In addition, we provided a solution for the problem of excluding ungrammatical crossed-dependency sentences in English. It has been assumed that a (surface) constraint could be posited for this purpose (e.g. the "Nested Dependency Constraint"), but not all crossed-dependency sentences are ungrammatical. We also provided semantic mechanisms which are compatible with the syntactic stack mechanisms introduced in the dissertation.

However, we need further research into some topics which are not discussed in this dissertation. First, we are assuming three different types of indices: structural indices, lexical indices (i.e. LICENSORs), and SLASH/GAPs

(cf. Ch. VII). We are assuming that not all of these indices can be stored on the same stack. Thus, we need different stacks for them. This might increase the power of the grammar beyond that of Indexed Grammars. Second, our grammar is based only on data from English. However, other languages have constructions similar to those analyzed in this work. Cross-linguistic studies would provide us with new insights into the present system.

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