On the Constituent Structure of Infinitives and Gerunds in English

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In this paper, I discuss the constituent structure and syntactic category of English infinitives and gerunds—two closely related issues in the syntax of nonfinite complements in English that have emerged since the publication of Rosenbaum 1967, the first major work on nonfinite complementation in a generative framework. For the purposes of the present discussion, I will essentially assume the principles and categories of Government and Binding Theory (as developed in Chomsky 1981, 1982, 1986), and X-bar Theory (cf. Chomsky 1970 and Jackendoff 1977), with minor modifications. After reviewing the major competing hypotheses, and weighing the arguments, on the syntax of English infinitival and gerundive complements, I will conclude that both infinitives and gerunds are essentially clausal in constituent structure, with the proviso that Poss-*ing* gerunds are clauses embedded in noun phrases.

1 Introduction

The following morpho-syntactic types of nonfinite complements (and adjuncts) occur in English:

1. *to*-infinitives,
2. naked infinitives,
3. gerunds (and *-ing* participles), and
4. *-ed* participles.

The term *nonfinite* will be used, following accepted practice, to refer to the form of a sentence or clause which is not marked for the categories of mood, tense, number, and person, though it will be marked for voice and aspect. Attention will be focused on *to*-infinitival and gerundive complements. I will say nothing about type 4 complements (though they are frequently inadequately treated in standard reference grammars, such as, e.g., Quirk et al. 1985), and very little about naked infinitives or *-ing* participles.

Two major classes of competing hypotheses have been proposed on the syntactic category and constituent structure of nonfinite constructions in English in generative grammar and frameworks sympathetic to

it. Chierchia (1984), for example, argues that English infinitives and gerunds are verb phrases, while in Chomsky 1981, and much other work inspired by GB, either both infinitives and gerunds, or at least the former, are analyzed as embedded sentences. Koster and May (1982) address the issue directly in an influential article, where they provide a detailed comparison of the predictions the VP hypothesis and the clausal hypothesis make, and they conclude that infinitives—and as the analysis, they claim, extends readily to gerunds, they too—are sentences in English.

Not all hypotheses treat infinitives and gerunds uniformly, though. It is often argued, principally, and sometimes exclusively, on distributional grounds, that infinitives and gerunds must be assigned to different categories. In Chomsky 1981, for example, infinitives are sentences, and gerunds are NPs, although Chomsky leaves open the possibility that gerunds "might be analyzed as containing a clause internal to the NP" (p. 223, fn. 10). In the lexicalist framework of Maxwell (1984), which might be characterized as intermediate in a sense between the VP hypothesis and the clausal hypothesis, infinitives and gerunds are likewise treated differently. Maxwell claims, quite surprisingly perhaps, that gerunds but not infinitives are sentences in English, the latter taken to be VPs. Finally, it has also been proposed that *to*-infinitives should be treated as prepositional phrases headed by the particle *to,* analyzed as a preposition, and thus kept distinct from gerunds, which are claimed to be noun phrases (Duffley and Tremblay 1994). These and related issues are discussed in sections 2 and 3 below.

2 The Constituent Structure of Infinitives

2.1 The PP Hypothesis

An intriguing but extremely problematic proposal concerning the category of English *to*-infinitives is put forth by Duffley and Tremblay (1994), who argue that "the best way to describe the syntactic role of the *to*-infinitive seems to be to analyze it as a prepositional phrase having an adverbial function with respect to the main verb."

Duffley and Tremblay argue, following Emonds (1976), that gerunds but not *to*-infinitives are NPs. The significance of the NP status of gerunds for their hypothesis is to confirm that gerunds and *to*-infinitives are different syntactic categories. This would lend indirect support to

Duffley and Tremblay's claim that *to*-infinitives are PPs in the function of adverbials, in contrast to gerunds, which, being NPs, have the function of direct object complements on the matrix verb.

In support of their proposal that *to*-infinitives are PPs, Duffley and Tremblay (1994:570) argue, incorrectly, that the *to* particle of the infinitive is parallel to a P in a PP in that both may be used as 'pro-forms' to represent the XP they head in sentences like

(1) a. He crawled through the tunnel.
b. Then his brother crawled through too.

(2) a. He tried to open the door.
c. Then I tried to as well.

The argument fails simply because *through* is an AdvP in (1b) and not a P. A preposition cannot behave in ways claimed by Duffley and Tremblay, cf.

(3) a. John put the vase on the table.
b. *Mary put the vase on too.

(4) a. John sat on a chair.
b. *Mary sat on too.

In another argument, Duffley and Tremblay suggest a parallelism in structure between the following examples.

(5) a. She longed for peace and quiet.
b. She longed to be quiet.

They argue that the occurrence of an infinitival complement on prepositional verbs, such as *long for,* which subcategorize for PPs, is not exceptional since the *to*-particle is in fact a P. But then what about the many non-prepositional verbs like *want, like, try,* etc. which take infinitival complements? It would be extremely dubious to assume that they are characterized by two subcategorization frames: one with a direct object NP and another with a PP (of a unique sort which may contain exclusively the preposition *to* and no other prepositions), let alone the other part of the claim that this PP is an (obligatory) adverbial.

It would be equally problematic to assume that there are PPs in English of the form $[_{PP}\ [_{P}\ \text{to}]\ [_{\alpha}\ \ldots]]$, where α can only be a naked infinitive. Notice that we would still have infinitives, but all would be naked, *to*-infinitives having been eliminated from the grammar by being converted to PPs. If, on the other hand, α is a clause, then an important generalization will again be lost, since on this assumption the lexical entries for all non-prepositional verbs of the *want* type will have to be restructured so that they can take PP complements of this very special kind. These are highly undesirable consequences, therefore the hypothesis must be rejected as untenable.

2.2 *The Clausal Hypothesis*

The assumption that English infinitives, as well as nonfinite complements in general, are sentences is well supported by theoretical as well as empirical arguments. Greenbaum (1980) and Quirk et al. (1985) present some relevant arguments informally. The essence of their arguments can be summarized like this: the constructions under discussion are regarded as sentences because their internal structure can be analyzed into the same constituents as independent sentences. A more formal discussion of the subject within a generative framework is offered by Koster and May (1982), who consider both the internal and the external syntax of nonfinites.

Koster and May argue that infinitive complements on verbs, and that in fact all infinitives, are sentential. They assert, also, that the analysis extends readily to gerundial complements. In this type of analysis the complementizer and subject which are absent from superficial structure are represented by lexically empty categories.

In this approach, "there are two types of clausal complements, finite and non-finite, symmetrical with respect to internal phrase-structure" (ibid., 116). It is assumed in general in what is referred to here as the clausal hypothesis that in infinitival and gerundial complements that lack a surface subject and complementizer "the missing constituents ... are in fact categorically present, but devoid of terminal elements" (ibid., 117).

The major arguments center around three aspects of infinitive complements. First, it is demonstrated that infinitives not only have parallel phrase structure with finite clauses, but they also share the important syntactic property with finite clauses that a number of syntactic

processes that affect the latter also affect the former. Second, it is shown that "infinitives (and gerunds) must have subjects at some level of representation" (ibid., 136). Third, it is pointed out that certain properties of the semantic component and of X' syntax provide further arguments for the claim that infinitives and gerunds are clauses.

Since many syntactic processes affect finite as well as nonfinite clauses but never VPs, they can be used to distinguish between VPs and clauses.

2.3 *Pseudo-Clefting*

Clauses but not VPs may occur in the focus of a pseudo-cleft:

(6) a. What he suspected was [$_{CP}$ that Bill saw Monument Valley]
b. *What he suspected that Bill was [$_{VP}$ saw Monument Valley]

(7) a. What he wanted was [$_{CP}$ for Bill to see Monument Valley]
b. *What he wanted for Bill was [$_{VP}$ to see Monument Valley]

(8) What he wanted was [$_{CP}$ to visit Monument Valley]

Koster and May note that only *for-to* infinitival complements may be pseudo-clefted, that is, pseudo-clefting of an infinitive complement is restricted to matrix verbs that allow or require a complementizer C in their clausal CP complement to be filled by the C *for* (1982:132, fn. 10). This group of verbs may be identified semantically as the subclass of "subject-oriented" (see Maxwell 1984) emotive verbs (see Kiparsky and Kiparsky 1971, Maxwell 1984, and also Quirk et al. 1985), which describe the opinion or emotional attitude of the person denoted by the subject. The class includes *want, like, hate, prefer,* etc. but not *believe, know, try,* or *condescend,* for example, which seem to belong in the class of "epistemic" verbs that are characterized by Chomsky and Lasnik (1977:475) as selecting a 0 (zero) complementizer. Verbs of the latter group do not select the complementizer *for* and they do not allow pseudo-clefting of their infinitival complements, as is demonstrated by the following examples.[1]

[1] It must be noted, however, that analyses as well as acceptability judgments sometimes vary, as in this case. (10) above is rejected as ungrammatical by Koster and May, but a close analog is deemed acceptable in Boskovic 1997, where, importantly, it

(9) *What John believes is him to have seen Monument Valley.

(10) *What John tried was to see Monument Valley.

(11) *What the manager condescended was to have lunch with us in the canteen.

2.4 *Extraposition from NP*

Since infinitival VPs do not extrapose but finite clauses with filled C, as in (12b), may, extraposition of an infinitive, as in (13b), testifies to its clausal status (cf. Koster and May 1982:133).

(12) a. A book which we didn't like appeared.
b. A book appeared which we didn't like.

(13) a. A book on which to work appeared.
b. A book appeared on which to work.

2.5 *Finite and Infinitival Clauses Conjoined*

A universal constraint on coordination requires that the coordinated constituents be of the same syntactic category. Therefore we do not expect to find VPs coordinated with clauses. But, as Koster and May observe, infinitives do have the ability to conjoin with finite clauses, which furnishes us with a further argument in favor of the sentential status of infinitival complements. Consider the following examples:

(14) To write a novel and for the world to give it critical acclaim is John's dream.

(15) John expected to write a novel but that it would be a critical disaster.

supports the minimalist claim that all control infinitives are IPs, which, in turn, justifies Boskovic's move, motivated by economy considerations, to eliminate c-selection from grammar (p. 21):

(i) What the terrorists tried was [$_{IP}$ PRO to hijack an airplane]

Alternatively, it might also be that we are simply witnessing variability, or perhaps even an ongoing change, in the use of patterns of complementation in the sense of Mair (2002), which then means that we indeed need different grammars of complementation to account for dialectal differences.

However, acceptability judgments with regard to such sentences do not seem to be unanimously positive. Quirk et al. (1985:947), for example, assert quite the contrary, saying that "the members of coordinate constructions tend to be parallel both in their structure and in their meaning" therefore "it is scarcely acceptable for different types of nonfinite clause to be coordinated, or for finite dependent clauses to be coordinated with nonfinite clauses, even where there is a strong semantic affinity between the two clauses." They assert that "it seems impossible, for example, to coordinate a nominal infinitive with an *-ing* clause" (ibid.):

(16) *George likes *going to the races* and *to bet on the horses.*

But they, too, admit that "occasional examples such as the following occur" (ibid.):

(17) The empress, *nearing her death* and *surrounded by doctors and necromancers,* was no longer in control of her ministers.

(18) The curfew bell rang at sunset every evening, *to warn the citizens that it was time for bed,* and *so that secret defensive measures could be taken by the army.*

2.6 *WH-Movement*

Consider the following examples:

(19) a. I wonder [$_{CP}$ [$_{C}$ what] to do].
b. a topic [$_{CP}$ [$_{C}$ on which] to work]

The only way to account for the existence and structure of such sentences on the VP hypothesis is to assume that not only finite clauses but VPs too are introduced by C, which would raise serious problems. In addition, on this assumption we would also have to allow VPs 'to function as relative clauses' within NPs. As Koster and May (1982:133) observe, *Wh*-movement is "a typical S'-rule moving WH-phrases to COMP." The fact that it appears to apply in 'subjectless' infinitival complements is interpreted by Koster and May, following Chomsky (1980) and Williams (1980), as direct evidence that infinitives are sentential.

As I have already suggested above, certain distributional properties of infinitives (and some *-ing* participles) also point to their sentential status. It is noted in Chomsky and Lasnik 1977 that infinitives pattern with finite clauses in that they occur as restrictive relatives:

(20) a. I found a poem to memorize.
b. I thought up a topic for you to work on.
c. I found a topic on which to write my term paper.
d. There is a man to fix the sink at the front door.
e. If you find anyone to fix the sink, let me know.

As the following sentences show, *-ing* participles also pattern with finite clauses in that they occur as restrictive relatives in noun phrases:

(21) a. I found a sentence requiring careful analysis.
b. There is a man selling cherries at the front door.
c. If you find anyone carrying a large umbrella, call me.

Such participial relatives are more restricted in occurrence than their infinitival counterparts. Participial relatives occur only with a null subject which is always coreferential with the noun phrase which they modify. So the participial counterparts of (20a–c) do not exist:

(22) a. *I found a poem memorizing.
b. *I thought up a topic you working on.
c. *I found a topic on which writing my term paper.

2.7 *Topicalization*

As Koster and May (1982:129), in agreement with Jackendoff (1977), observe, sentences may be topicalized under certain restrictions, but VPs may never undergo topicalization:

(23) a. That you were coming tomorrow, no one ever expected Bill to find out.
b. *Coming tomorrow, no one ever expected Bill to find out that you were.

Similarly, clauses but not VPs may occur in subject position, which clearly shows that the infinitives and gerund below are all clauses:

(24) a. That Gödel proved the continuum hypothesis was his greatest achievement.
b. For Gödel to prove the continuum hypothesis would have been his greatest achievement.
c. To prove the continuum hypothesis would have been Gödel's greatest achievement.
(Cf. Koster and May 1982:129–30.)
d. (Gödel) proving the continuum hypothesis was a great achievement.

2.8 *Complementizers in Dutch*

Assuming that only embedded clauses but not phrases may be introduced by complementizers, the presence of a complementizer may be taken as evidence that the constituent it precedes is a clause. Dutch *om*, like English *for*, is not a singular category but a phonological entity that corresponds to two different grammatical categories: preposition and complementizer. The former may take an NP complement, the latter introduces a clause.

The parallel between the complementizers *for* and *om* introducing infinitival complements extends to both being optional (in certain dialects of the respective languages (cf. Koster and May 1982, and Chomsky and Lasnik 1977).

(25) a. Would you like for Agnes to reply?
b. Would you like Agnes to reply?

(26) a. John probeerde om het boek te lezen.
John tried C the book to read
'John tried to read the book'
b. John probeerde — het boek te lezen.
'John tried to read the book'

Assuming that complementizers but not prepositions may be optional (cf. Chomsky and Lasnik 1977), the absence of *for* and *om* in the respective examples is evidence to their status as complementizers (as opposed to prepositions),[2] and the presence of these complementizers in

[2] For additional empirical evidence that the preposition *om* is distinct from its complementizer homonym in Dutch see Koster and May 1982.

the respective examples is evidence that the infinitives that follow them are sentences. Furthermore, because of the parallelism in structure between the (a) and (b) examples in (25) and (26), the same observations count as evidence that the infinitives in the (b) examples are also sentences.

2.9 *Subject-Oriented Adverbs in Object-Control Structures*

An argument similar to the one constructed from the presence of complementizers in the preceding section can be constructed from the presence of subjects. If embedded sentences are assumed to have the structure

(27) $[_{CP}\ [_{IP}$ NP INFL VP]]

then the presence of subjects in infinitives and gerunds can be taken as evidence that they are embedded sentences.

Koster and May (1982:136) observe that certain adverbs, such as *intentionally* and *carefully,* are regularly interpreted as predicated of the subject of the sentence in which they occur. This is the case in

(28) John married Mary intentionally.

But in examples like the following the property expressed by the adverb is understood as predicated of the surface object NP.

(29) a. John forced Bill to hit Harry intentionally.
b. I persuaded Bill to carefully cut the cake.

The only way to accommodate these facts in the VP hypothesis is to formulate some (ad hoc) rule that says that such subject-oriented adverbs express properties predicated of the subject except after verbs like *force, persuade, ask,* etc. This amounts to saying that such adverbs are sometimes subject-oriented and sometimes object-oriented, the consequence of which is that an otherwise interesting empirical generalizations is lost.

This apparent irregularity is easily explained, however, if these examples are assumed to have the following structures:

(30) a. John forced $Bill_2$ [PRO_2 to hit Harry intentionally].

b. I persuaded $Bill_2$ [PRO_2 to carefully cut the cake]. (ibid., 136)

If the infinitives are assumed to have a (phonetically unrealized) subject, the regularity of the behavior of subject-oriented adverbs is restored, and the generalization can be maintained. The adverbs will be construed as expressing a property predicated of the embedded subject, and under control by the matrix object with which it is coreferential, the property is eventually predicated of the matrix object.

Since without assuming PRO (the phonetically empty subject controlled by the matrix object) in the embedded infinitives we would lose an explanation for the regularity of subject-oriented adverbs in English, and since the assumption of PRO in otherwise 'subjectless' infinitives helps restore the generalization, it may be taken as evidence that all infinitives have subjects, hence all are sentential.

2.10 C-Commanded Predicates

Koster and May (1982) show that a further argument may be constructed in favor of the clausal hypothesis on the constituency of infinitives and gerunds assuming Williams' (1980) condition on predication, which requires that predicates be c-commanded by an argument with which they are coindexed. What the argument directly shows is, again, that infinitives and gerunds have subjects, and therefore it provides indirect evidence that infinitives and gerunds are sentences. Consider the following example (cf. Koster and May (1982:136):

(31) *John* ate the meat *nude.*

Given a reading of (31) on which *nude* is predicated of *John,* the predicate *nude* is co-indexed with the subject NP, its c-commanding argument.

Now consider the following examples (ibid.):

(32) a. [PRO eating the meat *nude*] is a little obscene.
b. [PRO killing the giant *by himself*] made David famous.

The complement clause in (32a) must be construed as having an unspecified subject in order for there to be an argument of which *nude* is predicated, simply because there is no other c-commanding NP for the predicate to be coindexed with. In (32b) the NP *David* controls PRO, thus

the adverb *by himself* is predicated of this NP, since *David* does not c-command *by himself.* Similarly, *nude* is predicated ('via PRO') of *David,* the controller NP for PRO in (33), once again because *David* does not c-command *nude:*

(33) [PRO eating the meat *nude*] made David famous.

Summarizing, a c-commanding condition on predication, if correct, provides evidence that "subjectless" English infinitives and gerunds have phonetically null subjects, therefore they are sentences.

2.11 Bound Anaphora

A further argument that supports the hypothesis that both infinitives and gerunds are sentences in English derives from considerations of the binding relation that holds between anaphors and their antecedents. These considerations again directly show that infinitives and gerunds have subjects, and that therefore they are sentences.

Assuming Chomsky's (1981) principles of Binding Theory, Koster and May (1982) show that phonetically unrealized subjects must be postulated in the syntactic representation of "subjectless" infinitives and gerunds, otherwise many infinitives and gerunds that contain reflexive pronouns (i.e., anaphors) will be incorrectly ruled out as ungrammatical on the grounds that they violate Principle A of Binding Theory.

Given that binding is a coreference relation between an anaphor (a reflexive or a reciprocal) and a coindexed antecedent that c-commands it, it must satisfy the following conditions:[3]

(34) Binding Theory
- a. Anaphors must be bound in their governing category.
- b. Pronouns must be free in their governing category.
- c. All other NP's must be free in all governing categories.

[3] The principles of Binding Theory are given in the form in which they appear in Koster and May 1982. For alternative formulations see, e.g., Chomsky 1981, 1982, and Haegeman 1991.

(35) Governing Category
α is the governing category for β if and only if α is the minimal category containing β and a governor of β, where α = NP or S. (See Chomsky 1981:188)

Now consider the following examples (cf. Koster and May 1982:137):

(36) a. John said [it was difficult *to shave himself*].
b. Mary said [that *shaving herself* was a pain in the neck].
c. *Helping oneself* would be difficult.

All these grammatical examples constitute violations of Principle A of the Binding Theory if the italicized nonfinites are analyzed as VPs. Furthermore, (36c) poses the additional problem of a VP appearing in subject position, already noted (see section 2.7 above). If, however, the examples are assigned the structures indicated below, none of the violations will arise, nor will we have to swallow VP subjects any longer (cf. ibid.).

(37) a. $John_2$ said [it was difficult [PRO_2 to shave $himself_2$]].
b. $Mary_2$ said [that [PRO_2 shaving $herself_2$] was a pain in the neck].
c. [PRO_2 helping $oneself_2$] would be difficult.

In (37a–b), the reflexives no longer have their antecedents outside their governing categories, since *himself* as well as *herself* is now a clause-mate with its antecedent (PRO) which binds it.

In (37c), without the postulation of an empty subject (PRO) the reflexive *oneself* would not have an antecedent at all.

To summarize, the consideration of anaphoric binding suggest that we must postulate intermediate (empty) subjects in "subjectless" infinitives and gerunds, thereby providing further support for the hypothesis that these complements are sentences.

2.12 Floated Quantifiers

It has been observed (cf. Koster and May 1982, quoting D. Pesetsky, personal communication) that a quantifier may be floated off its NP in a

superordinate clause and land in an infinitival complement, producing a fairly acceptable sentence:

(38) a. ?The men promised the women to all come to the party.
b. ?The men persuaded the women to all come to the party.

Such floated quantifiers, as Koster and May observe, may be construed as anaphors with respect to the Binding Theory. Assuming that this is correct, given the semantic interpretations of these examples, the antecedent of *all* in (38a) is the subject NP *the men,* and in (38b) *all* is bound by the object NP *the women.* The solution, once more, is to postulate an empty subject in the embedded sentences.

(39) a. The men$_2$ promised the women [PRO$_2$ to all$_2$ come to the party].
b. The men persuaded the women$_2$ [PRO$_2$ to all$_2$ come to the party]. (ibid., 137)

Now both *all*s will be bound by the respective PROs. Furthermore, each will be construed with the NP which it was floated off, the construal based upon, and mediated by, the relation that holds between PRO and its controlling NP *the men* in (38a), and PRO and its controlling NP *the women* in (38b), given that *promise* and *persuade* are marked as subject-control and object-control, respectively.

These observations, *ceteris paribus,* allow us to make the generalization that floated quantifiers are interpreted as floated off the NP controlling the embedded subject.

2.13 Split-Antecedent Phenomena

Koster and May (1982:138) observe a very important difference between personal pronouns like *they* and anaphors like *each other:* the former may have split antecedents but the latter requires a unary antecedent. The personal pronoun *they* may be construed in (40a) as coreferring to John and Mary, but *each other* in (40b) cannot be interpreted as coreferential with the NPs *John* and *Mary,* as the ungrammaticality of the example shows.

(40) a. *John* told *Mary* that *they* had to leave.

b. **John* talked with *Mary* about *each other.*

The verb *propose* has the remarkable property that it allows its subject and prepositional object arguments to jointly determine the reference of the understood subject of the complement (split-control):

(41) *John* proposed to *Mary* to go to the movies.

On the most natural reading of (41), it means that 'John suggested to Mary that *they* go to the movies'. In other words, the understood subject in (41) behaves like *they* in (40): both are coreferential with two distinct NPs, that is, both have split antecedents. Now consider (42) with *each other* in the complement, which requires a unary antecedent:

(42) *John* proposed to *Mary* to help *each other.*

The fact that (42) is grammatical, that *John* and *Mary* cannot be the direct split antecedents for *each other,* and third, that *each other* requires the presence of a unary antecedent show that it has the following structure:

(43) $John_i$ proposed to $Mary_j$ [PRO_{ij} to help $each\ other_{ij}$].

These considerations again show that we must postulate a phonetically empty category as the subject of nonfinite complements in English, which entails that they are clauses.

2.14 *The Problem of 'VP-Complementizers'*

As noted by Riemsdijk and Williams (1986:135), the existence of sentences like (44) creates serious problems for the VP hypothesis, on which it is claimed that all infinitives are base-generated in their surface form, that is as VPs, and as such they obviously do not contain PRO subjects.

(44) John wonders what PRO to do.

On the VP hypothesis, in order for the grammar to generate the structure of such sentences, VPs must be assumed to contain a C position (into which the *wh-* word is moved from its base-generated θ-position). If, however, VPs are of the structure

(45) $[_{VP}\ [_{C}\ \ldots]\ldots]$

then some rather artificial mechanism is necessary to bar such a C position from the VPs of finite clauses, or, at least the C of finite VPs must somehow be prevented from being filled, in order to block the generation of ungrammatical structures like

(46) *John $[_{C}$ who$_i]$ saw e_i

This problem does not arise at all on the clausal hypothesis.

2.15 The Structure at LF and CS

Let us assume that Logical Form (LF) is the level of representation where predicates are paired up with their arguments in propositional representations, and Conceptual Structure (CS) is a level of representation beyond LF where linguistic expressions are brought into correspondence with mental representations. On the simplest assumption, the syntactic counterpart of a proposition is a sentence. If predicate–argument structures correspond to syntactic representations in such a way that every predicate and each argument of every predicate is represented as a constituent in syntactic structure, then the mapping of syntactic representation onto Logical Form (which in turn is brought into correspondence with Conceptual Structure) is straightforward. This is the case on the clausal hypothesis, where there is a one-to-one correspondence between logical and syntactic subjects, and logical and syntactic predicates, with the consequence that there is no predicate without a corresponding subject either in logical or in syntactic representation. For concreteness, consider the following example (cf. Koster and May (1982)):

(47) John$_2$ wants [PRO$_2$ to try [PRO$_2$ to date Mary]].

Every verb in (47) has a corresponding subject, so subject–predicate relations can directly be read off the syntactic representation. This is, I believe, a desirable consequence if the 'simpler the better' principle applies to the syntax–semantics interface.

Under the VP hypothesis the single subject in (47) would be related to three different verbs, and the verb in (48) would not be related to any subject at all.

(48) [PRO to leave now] is impossible for John.

The subject–predicate pairing would only be reconstructed at the level of logical representation, where the crucial point to notice is that it *would* be reconstructed at *some level* of representation. In other words, the clausal nature of infinitives and gerunds *would be* recognized at the level of logical representation, but there only. It is a corollary of the VP hypothesis that semantic structures are derived independently of syntactic structures (cf. Chierchia 1984).

To summarize, there is overwhelming evidence that nonfinite complements have subjects at some level of representation. The arguments discussed in the preceding sections also suggest that the appropriate level of representation of the clausal structure of nonfinite complements is S-structure.

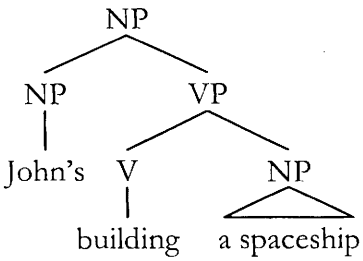
3 The Constituent Structure of Gerunds

As we have seen in the preceding sections a number of observations suggest that not only infinitives but also gerunds have a clausal structure in English. Although I believe that in general it is correct to assume a clausal internal structure for gerunds, we must note a few problems in this respect, since the evidence is not conclusive.

One of these problems concerns the topmost node dominating a gerundive complement. Assuming the principles of X' Syntax (cf. Jackendoff 1977) and Government-Binding Theory (cf. Chomsky 1981, 1982, 1986), on which embedded clause complements are normally analyzed either as IP or as CP, the possibilities include IP, CP, and NP (dominating IP).

Jackendoff's (1977) proposal is that gerunds (Chomsky's (1970) 'gerundive nominals') have the internal structure of sentences, but at the maximal level of projection, which is level X''' in Jackendoff 1977, they are NPs. This is a most problematic option, however: if basic principles of X-bar Theory are to be observed, we cannot simply stick an NP node at the top of a complement clause, or else the X-bar theoretic principle is violated which requires that all phrases be endocentric. There are at least two reasons that (49b) cannot be the structure of (49a) below. First, the topmost NP lacks a head, and second, V cannot project an NP (cf. Abney 1987).

(49) a. John's building a spaceship

b. 

(cf. Abney 1987:17)

If one takes categorial, structural, as well as functional criteria into consideration, the following *-ing* forms may be distinguished (cf. Chomsky 1970, Williams 1975, Quirk et al. 1985, Abney 1987, Pullum and Zwicky 1991, and Laczkó 1995):

Progressive *-ing:*	Brown is painting his daughter.
Premodifier *-ing:*	the silently painting man
Postmodifier *-ing:*	The man driving the bus is Norton's best friend.
Absolute *-ing:*	Brown painting his daughter that day, I decided to go for a walk.
	With me singing madrigals, everyone will be amused.
	Having died, they were no further use to us.
Adverbial *-ing:*	John decided to leave, thinking the party was over.
Acc-*ing:*	I watched Brown painting his daughter.
PRO-*ing:*	I enjoyed reading *The Bald Soprano.*
Poss-*ing:*	I dislike Brown's painting his daughter.
Action nominal:	his looking up of the information
(*Ing-of*)	John's singing of the Marseillaise
Verbal noun:	Brown's deft painting of his daughter
Deverbal noun:	Brown's paintings of his daughter

Since this paper is concerned with nonfinite complements on verbs, only the following *-ing* constructions will be relevant to the discussion: Acc-*ing*, Poss-*ing*, and (argumental) PRO-*ing*. Therefore progressive *-ing*, pre- or postmodifying *-ing*, absolute (Nom- or Acc-) *-ing*, adverbial *-ing*, which are commonly called the 'present participle', will not be discussed.

Noun phrases with a head noun in *-ing* will also be excluded from the investigation as irrelevant. This class includes action nominals in *-ing*, Abney's (1987) "*Ing-of*",[4] verbal nouns, and deverbal nouns. The head of all these nominal structures is lexically derived by *-ing*, hence *-ing* does not project its own functional category in any of them.

3.1 Why Gerunds Are Noun Phrases

The principal motivation for the assumption that gerunds, but not infinitives or *that*-clauses, are dominated by an NP/DP node at the level of X^{max} derive from their external syntactic properties, and include the following (cf. Horn 1975, Jackendoff 1977, and Abney 1987):

Gerunds, but not *that*-clauses or infinitives, occur in all NP positions, namely, they can be (a) the subject of questions, (b) the subject of relative clauses, (c) the subject of infinitival clauses, (d) the subject of a sentence following a sentence-initial adverb, (e) the object of prepositions, and (f) the focus of clefts:

(50) a. What would { John's leaving / *that John left / *for John to leave } reveal about him?

b. a man who { John's leaving / *that John left / *for John to leave } would irritate

[4] Abney classes *Ing-of* constructions with gerunds in spite of the fact that they have nothing in common with Acc-*ing* or Poss-*ing* gerunds except their superficial morphological form. In addition to the inability of the *-ing* form in *Ing-of* constructions to Case-mark its object, for example, phonological evidence also testifies to the categorial difference. As Laczkó (1995:250–51) shows, *Ing-of -ing*, like derivative *-ing* and unlike gerundial *-ing*, does not display an alternation between a velar and an alveolar realization, cf.

(i) the enemy's destroying the city
(ii) the enemy's destroyin' the city
(iii) the enemy's destroying of the city
(iv) *the enemy's destroyin' of the city
(v) *singing outside the buildin'

c. It would be disgraceful for $\left\{\begin{array}{l}\text{John's leaving}\\ \text{*that John left}\\ \text{*for John to leave}\end{array}\right\}$ to bother us.

d. Perhaps $\left\{\begin{array}{l}\text{John's smoking stogies}\\ \text{??that John smokes stogies}\\ \text{??(for John) to smoke stogies}\end{array}\right\}$ would bother you.

e. I learned about $\left\{\begin{array}{l}\text{John's smoking stogies}\\ \text{*John smokes stogies}\\ \text{*(for John) to smoke stogies}\end{array}\right\}$.

f. It's $\left\{\begin{array}{ll}\text{John's smoking stogies} & \text{that I can't abide.}\\ \text{*that John smokes stogies} & \text{that I can't believe.}\\ \text{*for John to smoke stogies} & \text{that I won't permit.}\end{array}\right\}$

Another nominal property of gerunds is that they may not contain sentence adverbial PPs:

(51) *John's $\left\{\begin{array}{l}\text{to our delight}\\ \text{in his haste}\\ \text{for some reason}\end{array}\right\}$ leaving so early didn't distress Sue.

Note, however, that nominal relative clauses, also called 'free relatives', may also occur in all the positions illustrated in (50) above, although they cannot be derived from NPs, as Jackendoff (1977) shows. Consider the following examples (cf. Jackendoff 1977 and Abney 1987):

(52) a. What would what the FBI found out reveal about John?
b. a man to whom what you found out would be a nuisance
c. It would be disgraceful for what you found out to be revealed.
d. Perhaps what John found out would upset you.
e. I heard about what you did.
f. It's what you have in your head that counts.

Chomsky (1986) too raises the possibility that gerunds may be NPs, but he finally appears to conclude that gerunds are CPs, that is, they have a C position. This raises the problem that gerunds, as contrasted with finite and infinitival clauses, do not appear ever to be introduced by complementizers, at least not by *wh*-complementizers, as is shown by the following paradigm (cf. Chomsky 1986:84):[5]

(53) a. I remembered that he read the book.
b. I remembered his reading the book.
c. I remembered why he read the book.
d. *I remembered why his reading the book.

On the assumption that gerunds as well as infinitives are CPs, the problem of constituency would practically reduce to the exceptional character of gerunds that they do not occur with *wh*-complementizers. I will consider the arguments for the sentential status of gerunds in the following section.

3.2 Why Gerunds Are Sentences

As we saw in the previous section, distributional properties of gerunds suggest that they are noun phrases. Let us now consider aspects of their internal structure that they share with ordinary sentences, *that*-clauses, and infinitival clauses, which would favor a sentential analysis. The reasons that gerunds ought to be analyzed as sentences include the following (cf. Jackendoff 1977 and Abney 1987):

We find both English aspectual auxiliaries in gerunds, as in ordinary sentences:

(54) a. Byrne having been refusing the offer just when Nixon arrived
b. Byrne's having been refusing the offer just when Nixon arrived

[5] This sharp contrast between finite and infinitival clauses on the one hand and gerunds on the other may diminish somewhat if *from* in gerundive complements on verbs like *prevent, stop,* etc. is analyzed as a complementizer, as Mair (2002), for example, seems to allow, in sentences like *This prevented me from leaving early.*

Gerunds may contain the same range of adverbs as ordinary sentences:

(55) a. John sarcastically criticizing the book
b. John's sarcastically criticizing the book
c. John criticizing the book too often
d. John's criticizing the book too often
e. John refusing the offer in a suspicious manner
f. John's refusing the offer in a suspicious manner

Transformations, such as Extraposition, Subject Raising, Tough Movement, Dative Movement, and Particle Movement, which otherwise apply in finite and infinitival clauses, also apply in gerunds:

Extraposition and Subject Raising:

(56) a. That John will win being certain
b. It(s) being certain that John will win
c. John('s) being certain to win

Tough Movement:

(57) a. It(s) being easy to please John
b. John('s) being easy to please

Dative Movement:

(58) a. John('s) giving a book to Bill
b. John('s) giving Bill a book

Particle Movement:

(59) a. John('s) looking up the information
b. John('s) looking the information up
c. *John's looking of the information up

V+*-ing* assigns Case to its argument:

(60) a. John destroyed the spaceship.
b. John('s) destroying the spaceship
c. *John's destruction the spaceship

Gerunds take adverbial rather than adjectival modification:

(61) a. Horace('s) carefully describing the bank vault to Max
b. *Horace's careful describing the bank vault to Max

ECM is possible in tensed sentences and gerunds but not in noun phrases:

(62) a. John believed Bill to be Caesar Augustus.
b. John('s) believing Bill to be Caesar Augustus
c. *John's belief Bill to be Caesar Augustus

Object-control constructions occur in gerunds and tensed sentences but not in noun phrases:

(63) a. I persuaded John to leave.
b. me/my persuading John to leave
c. *my persuasion of John to leave

Gerunds may contain secondary predicates with a resultative meaning. This is not possible in noun phrases:

(64) a. We painted the house red.
b. us/our painting the house red
c. *our painting of the house red

Gerunds and tensed sentences may contain concealed questions, noun phrases cannot:

(65) a. I considered sabotage.
b. me/my considering sabotage
c. *my consideration of sabotage

Finally, Abney (1987) points out that noun phrases *may* contain subjects, but their presence is not obligatory. Ordinary sentences, infinitives, and gerunds, on the other hand, *require* the presence of a subject. The observations suggest that gerunds must be analyzed as sentences.

*3.3 Differences between Acc-*ing *Gerunds and Poss-*ing *Gerunds*

The arguments that we reviewed in the previous section all appear to suggest a uniform clausal analysis of gerunds. In this section I will discuss some properties of Poss-*ing* gerunds that distinguish them from Acc-*ing* gerunds (cf. Horn 1975, Williams 1975, Reuland 1983, Abney 1987, and Webelhuth 1995).

Extraction is possible from Acc-*ing* but not from Poss-*ing:*

(66) a. We remember him describing Rome.
b. the city we remember him describing
c. What do you remember him describing?

(67) a. We remember his describing Rome.
b. *the city we remember his describing
c. *What do you remember his describing?

In subject position of a tensed sentence, conjoined Acc-*ing* gerunds behave differently from conjoined Poss-*ing* gerunds: the former take singular agreement (like conjoined *that*-clauses and infinitives, and unlike conjoined NPs), while the latter induce plural agreement on the verb (like conjoined NPs):

(68) a. John playing the piano and Fred singing a song *were/was terrifying.
b. John's coming and Mary's leaving bother/*bothers me.

Acc-*ing* gerunds cannot but Poss-*ing* gerunds can be coordinated with other NPs:

(69) a. *Kennedy having made a big mistake and the recent unrests have left the country shaken.
b. Kennedy's having made a big mistake and the recent unrests have left the country shaken.

Acc-*ing* constructions occur in argument, as well as adjunct positions; Poss-*ing* gerunds occur only as arguments:

(70) a. John being a spy, Bill thought it wise to avoid him.

b. *John's being a spy, Bill thought it wise to avoid him.

Acc-*ing* gerunds may take sentence-adverbials in adjunct positions (though not in argument positions); Poss-*ing* gerunds do not allow sentence-adverbials:

(71) a. John probably being a spy, Bill thought it wise to avoid him.
b. *I was worried about John probably being a spy.
c. *I was grateful for John's fortunately knowing the answer.

Although in general both Acc-*ing* and Poss-*ing* gerunds permit pleonastic subjects, only Acc-*ing* permits *there:*

(72) a. I was worried about it being too obvious that Charlie was lying.
b. I was worried about its being too obvious that Charlie was lying.
c. I approve of there being a literacy exam for political candidates.
d. *I approve of there's being a literacy exam for political candidates.

Acc-*ing* gerunds but not Poss-*ing* gerunds occur as complements on perceptual matrix verbs:

(73) a. I can't hear John playing the piano.
b. *I can't hear John's playing the piano.

Finally, it is, I think, in order for me to point to a non-argument concerning the status of Acc-*ing* and Poss-*ing* gerunds. Horn (1975) argues that Acc-*ing* gerunds do not occur in the focus of cleft sentences. He gives the following example (also cited by Reuland, who appears to adopt Horn's position on this matter):

(74) *It was John kissing Mary that upset everyone.

Horn's generalization is not entirely correct. Acceptability judgments concerning clefts and pseudo-clefts seem to show considerable variation.

There are many speakers for whom clefted Acc-*ing* gerunds are just as acceptable as clefted Poss-*ing* gerunds, as the following examples show:

(75) a. It was the moon rising over the mountain that we saw. (Akmajian 1977)
b. It's Fred losing that I can't stand the thought of. (Bresnan 1982)

In view of these data, Horn's generalization cannot be maintained. At least for a group of speakers, Acc-*ing* gerunds and Poss-*ing* gerunds do not differ as potential cleft foci.

The arguments presented in this section appear to support an account on which Acc-*ing* gerunds and Poss-*ing* gerunds are different categories. In view of the nominal properties of the Poss-*ing* construction presented in this section and section 3.1 above, and the clausal properties of the Acc-*ing* construction discussed in this section and section 3.2 above, the proper analysis seems to be that Acc-*ing* gerunds are clauses and Poss-*ing* gerunds are noun phrases. I take them up for a closer look in the remaining two sections.

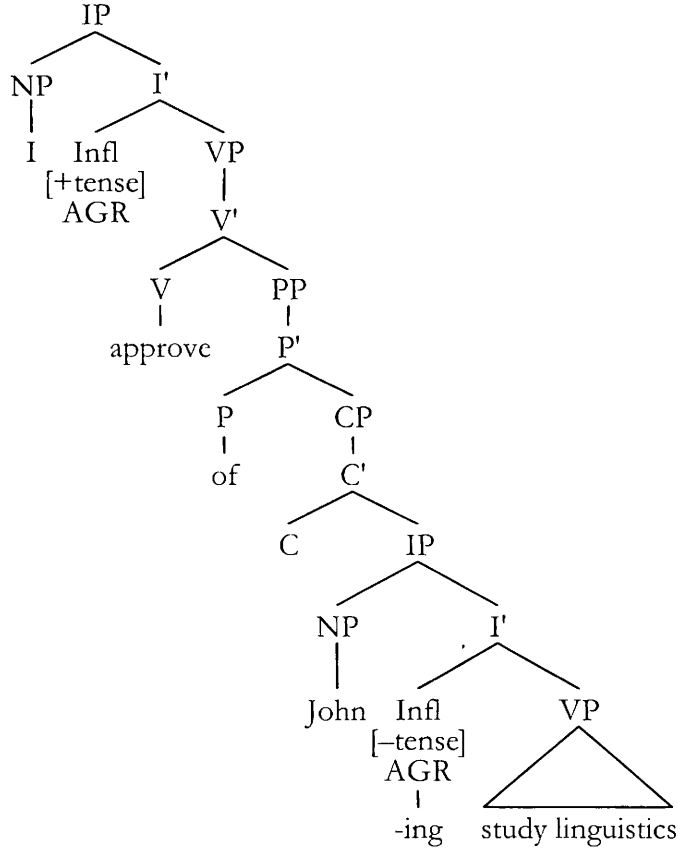
*3.4 Why Acc-*ing *Gerunds Are Sentences*

Reuland (1983) shows that at least some gerunds (what he calls NP-*ing* constructions, to be distinguished from Poss-*ing* gerunds) must be analyzed as CPs with an empty C position. On his account, *-ing* is Infl, which contains AGR, an abstract nominal agreement marker in finite clauses, which transmits Case to the subject. AGR transmits nominative Case to the subject in tensed clauses, where Infl is marked [+tense]. In NP-*ing* constructions, which on his account are tenseless finite clauses, *-ing* realizes the nominal element AGR in Infl. The finiteness of such tensless clauses consists in Infl transmitting its Case (which it receives from the matrix verb or preposition) to the subject of the complement clause. PRO in 'subjectless' gerunds escapes government and Case-marking, because, by assumption, Affix Hopping may apply either in the syntax, disallowing *-ing* to transmit Case to the subject, thus licensing PRO, or in PF, allowing Case to be transmitted to an overt subject, which it governs prior to the application of Affix Hopping. Thus, when Affix Hopping takes place in the syntax, gerunds with PRO subjects are derived, when it applies in PF, gerunds with overt subjects are derived.

In either case, a gerund is a CP. On these assumptions, the structure of (76a) is (76b):

(76) a. I approve of John studying linguistics.

b.



Johnson (1988) also comes to a similar conclusion from quite different assumptions. His arguments derive from the assumption that clauses introduced by a temporal preposition contain an empty operator (*Op*), which moves to C. This is based on the observation (credited to Geis 1970) that sentences containing temporal prepositions introducing a clause are ambiguous with respect to the interpretation of the temporal preposition. Thus, (77) has the two interpretations in (78):

(77) Liz left before you said she had.

(78) a. 'Liz left before the time of your saying that she left'

b. 'Liz left before the time which you said she had left at'

The ambiguity is accounted for if (77) contains *Op* (a phonologically null *when*), which may move from either the *said*-clause or the one embedded in it, yielding the two different representations in (79), which correspond to the interpretations in (78):

(79) a. Liz left [$_{PP}$ before [$_{CP}$ Op_i [$_{IP}$ you said [$_{CP}$ she had] t_i]]]
b. Liz left [$_{PP}$ before [$_{CP}$ Op_i [$_{IP}$ you said [$_{CP}$ she had t_i]]]]

On the simplest assumption, gerunds introduced by temporal prepositions have the same structure:[6]

(80) Liz left [after [$_{CP}$ Op_i [PRO saying [she wouldn't] t_i]]]

On Johnson's account, phonetically overt subjects of gerunds are Case-marked (and governed) by some X^0 category outside the gerund. Consider, for example, (81a), which has the structure in (81b):

(81) a. I remember him telling the story.
b. I remember [$_{IP}$ him telling the story]

In (81b) *remember* governs (and Case-marks) the embedded subject across IP. The null subject of gerunds, on the other hand, is protected from government by a verb or preposition in the matrix clause thus:

(82) I remember [$_{CP}$ [$_{IP}$ PRO telling the story]]

The matrix verb in (82) is prevented (by CP) from governing the subject inside IP, so PRO may occur. On Johnson's account, then, gerunds with overt subjects are bare IPs, and gerunds with phonetically null subjects are CPs. Whichever account is assumed (Reuland's or

[6] Such temporal gerunds do not display the scope ambiguity we saw in the finite clauses, and, second, they may not contain overt subjects, as the examples below show, but these observations are irrelevant to the point being made about their internal structure:

(i) *Liz left [after [$_{CP}$ Op_i [PRO saying [she wouldn't t_i]]]]
(ii) *Liz left after him saying that she wouldn't.

Johnson's), Acc-*ing* gerunds are sentences, and at least PRO-*ing* constructions are CPs.

Finally, although Abney recognizes that "Acc-*ing* has the distribution of a noun phrase but no other noun phrase properties," this is sufficient for him to class Acc-*ing* gerunds with noun phrases (1987:173). However, this observation, which is based exclusively on external syntactic considerations, does not, in itself, justify such a conclusion. As we have seen above, considerations of internal syntax appear to outweigh the single argument from distribution, which is, again, a property of Acc-*ing* gerunds that they share with finite as well as infinitival clauses. Therefore my conclusion is that Acc-*ing* gerunds and PRO-*ing* gerunds are sentences (either with a uniform CP structure, as Reuland argues, or with the option that some gerunds project only up to IP, as Johnson claims; I leave this issue for future research).

3.5 *The Poss-*ing *Griffon*

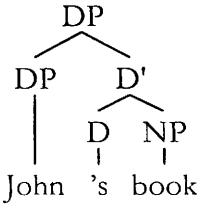
As Abney notes, "the English Poss-*ing* construction is not simply a noun phrase with sentential properties, but has a decidedly griffon-like structure. Its "forequarters" (i.e., its external distribution and its subject) are that of a noun phrase, while its "hindquarters" (its complement structure) are that of a verb phrase" (1987:165).

On Abney's account, noun phrases are DPs, headed by a D(eterminer). In a noun phrase, D projects its own functional category (DP) and takes an NP complement, the projection of N.[7] For the purposes of the present discussion I will assume his proposal (suggested to him by Richard Larson) on which possessive *'s* is D.[8] On these assumptions, a possessive noun phrase like (83a) has the structure in (83b) (cf. Abney 1987:79):

[7] In Abney's analysis, N projects a single level only, so N' = NP, a maximal projection. I will not discuss this nonstandard X-bar theoretic assumption here.

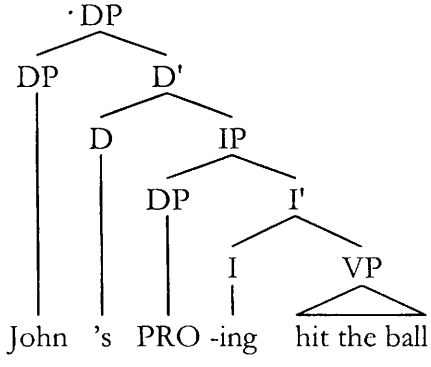
[8] This is not Abney's final analysis of possessive noun phrases. I prefer his *'s*-as-D account to his *'s*-as-case-marker analysis because I find the idea unattractive that *'s* is a postpositional Case-marker (K). I cannot discuss my reservations about it in detail here; suffice it to say that it would be a most peculiar category in English (the only one, and a very special one, of its kind), and, second, this account does not generalize to languages like Hungarian (as Abney claims), where there are no postpositional Case-markers, since Hungarian postpositions assign both Case and theta-role to their arguments (which K does not do).

(83) a. John's book

b. 

When the analysis is extended to Poss-*ing* gerunds like (84a), they can be assigned the structure in (84b):

(84) a. John's hitting the ball

b. 

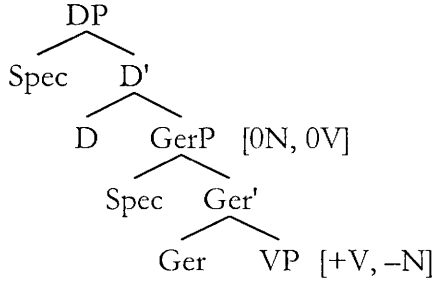
On this analysis, *-ing* is Infl, which is a natural assumption, and *'s* is D, which assigns Case and the Possessor theta-role to the external subject in [Spec, DP]. D takes IP as complement, and D and *-ing* occupy two distinct functional-element positions, as is natural to assume. The structural parallel with Acc-*ing* and PRO-*ing* gerunds is obvious: *-ing* is Infl in all, and all three are essentially clausal. The nominal distribution of Poss-*ing* is predicted—IP is embedded in DP, with the subject occupying an operator position in [Spec, DP]. As Abney notes, "in effect, this analysis involves the embedding of a PRO-*ing* structure under a noun-phrase specifier" (1987:200).[9]

[9] D in this structure corresponds to C in CP gerunds, and DP corresponds to CP. In fact, another option would be to extend the CP analysis to Poss-*ing* gerunds, with *'s* generated in C position. On these assumptions, Acc-*ing* and Poss-*ing* would still be assigned different structures, as apparently desired. The structure of Poss-*ing* gerunds would still be reminiscent of the structure of Hungarian possessive DPs (a chief motivation for Abney's DP analysis of noun phrases and Poss-*ing* gerunds): the subject

Borgonovo's (1994) solution to the categorial problem posed by gerunds is to assume the existence of mixed or unspecified categories in grammar. Given a feature system for the characterization of syntactic categories, such as that proposed by Chomsky (1970), categories may be identified as feature complexes. What Borgonovo proposes is the possibility that mixed categories, such as the English gerund, be unspecified for certain categorial features.

Mixed categories are categories that seem to behave like a major category up to a certain level of projection, and a different functional category beyond that level (cf. Borgonovo 1994:21). Borgonovo argues that the puzzling behavior of gerunds (that they sometimes behave as CPs and sometimes as NPs) may be resolved by assuming that there are projections in grammar that are underspecified for syntactic category status. Borgonovo assumes that *-ing* projects a syntactically underspecified functional category termed GerP. GerP, then, sometimes behaves as an NP, like in Poss-*ing* structures, sometimes as a CP, like in Acc-*ing* gerunds. The structure assigned by Borgonovo to Poss-*ing* gerunds is this (cf. 1994:26):

(85)



(85) is essentially an Abney-style structure (and may, therefore, be considered a notational variant thereof), except that GerP replaces IP (in Abney's D–IP analysis), and Ger, a radically underspecified (non)cate-

would occupy the operator position in [Spec, CP], which would then correspond to the position of Dative/Genitive possessors (*Jánosnak* [John's] in *Jánosnak a kalapja*, ['John's hat']) in Hungarian DPs (and not to the position of nominative possessors, as Abney assumes, cf. *János* [John] in *János kalapja* [John's hat]). Note in this respect that -NAK ['s] on Genitive possessors is not regarded as a true Case-inflection in Hungarian, but a marker of an operator position, where the possessor may move (cf. Szabolcsi and Laczkó 1992). I must leave it at that, since to pursue this idea any farther would lead us too far afield.

gory replaces Infl. Otherwise the two analyses make the same predictions and either account is consistent with standard assumptions. As they are essentially equivalent, conventional economy considerations may decide between them. Thus, when (85) is pruned by removing all dispensable material, Occam's razor leaves us with a D–IP structure.

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