

Adjunct modification

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The central claim in this paper is that adverbs display categorial behavior. An abstract language CAT is developed as model of adverbial modification, which as opposed to many recent approaches to adverb orders does not make use of head movement operations for the account of different adverb orders. In the first part of the paper, it is argued that the "functional specifier" theory of adverbs (cf. Cinque 1999) cannot account for certain adverbial scope phenomena and that instances of surface mismodifications (i.e. patterns in which the modifying adverb and verb are not next to each other in surface structure) should not be analyzed in terms of head movement operations. The second part of the paper shows how CAT, as a model of adverbial modification, can account for these phenomena.

1. Introduction

Roughly speaking, an adverb modifies what it is next to in surface structure. There are two sorts of exceptions. First there are cases in which the modifiee has moved away from the adverb by Head-to-Head movement. I will argue here that such cases are illusions raised by a misunderstanding of the nature of modification. Second, there are some true cases of mismodification which I will treat briefly in the end-cases where an adverb is not adjoined to its modifiee.

I will focus exclusively here on Romance and English, and especially on Cinque's (1999) treatment of adverbs, and in particular on the relation between modification and morphologically motivated Head-to-Head movement that he puts forward. I do this because Cinque's theory is a particularly appealing version of that theory, and because I do believe that my remarks will carry over to other accounts in the Pollockian vein of clausal analysis.

Cinque posits that adverbs are generated exclusively in the specifiers of functional projections, and that in fact the typology of adverbs reduces to the typology of functional elements. If one adverb takes another adverb in its scope, it is because the functional element hosting the one is higher in clause structure than the functional element hosting the other.

I will develop a different notion of adverbial scope in some ways

more liberal than Cinque's and in some ways more restrictive. In particular, I think that Cinque and others who have studied adverbial interactions have overlooked the possibility of one adverb directly modifying another by appearing in its specifier (section 5), a full analysis of which undermines the conclusions about adverbs arrived at and built upon in this line of work. On the basis of Cinque's and other data I will argue that Adverbs exhibit a *categorical* behavior. In the next section I will outline an abstract language CAT (short for "categorical"), which I will first use as an analytic tool, and ultimately as a model of adverbial modification. In subsequent sections I will review Cinque's findings, recasting them in such a way that in section 6 CAT can be put forward as a direct and transparent model of adverb modification.

2. The language CAT

Suppose we have a set of elements (A, B...) set in some fixed hierarchical relation to one another; (1) uses the notation of subcategorization to link the elements together. The functional elements that define clause structure are such a set, and if Cinque is right, the adverbs that occur in the specifiers of the projections of those elements will be another such set.

- (1) a. $A_B; B_C; \dots$
b. The Rule of Combination (Geach's rule):
 $X_Y + Y_Z \rightarrow X_Z$

If we interpret " $_Y$ " to mean "X takes YP as a complement to its right", then the sequence of elements in (1a) define a single structure, the "Right Linear Spine" (2):

- (2) The Right Linear Spine (RLS): $[A > [B > [C > [D > E]]]]$

However, if we interpret " $_Y$ " as having less content, we get more structures than just the RLS. I will be interested in the set of structures that arises from taking " $_Y$ " as meaning, "X takes a Y° or YP complement on either the left or right"; so, all of the following will be admitted:

- (3) a. $[X Y^\circ]_{XP}$
b. $[X YP]_{XP}$
c. $[Y^\circ X]_{XP}$
d. $[YP X]_{XP}$

(3a) illustrates the convention of the inheritance of type from heads. If subcategorization bundles together three kinds of restrictions on the complement, type, level and left/right direction, then (3) is what we get if we drop level and direction.

If we add to type inheritance from heads a further rule, Geach's rule (1b), the inheritance of subcategorization from the nonhead, then we admit a host of new structures; all of the following, for example:

- (4) a. $[[B < A] > C]$
b. $[C < [A > B]]$
c. $[[A > B] > C]$

In these, the carat is used to distinguish the head from its complement; the carat points at the complement. In (4a) for example, $[B < A]$ is an A type thing, which inherits B's subcategorization for C type things.

I will call the language so defined CAT, (for categorical) as Geach's rule is prominent in its formulation. For a fixed set of N elements in hierarchical relation it defines a finite set of permutations of those elements. Those permutations become a vanishingly small subset of the total set of permutations of N ($= N!$).

There is another equivalent way to define CAT. Suppose we start with the RLS, as in (2). Consider the set of structures that can be generated from RLS by repeated application of the following two operations:

- (5) "Spinal" operations:
Flip: $[A > B] \rightarrow [B > A]$
Reassociate: $[A > [B > C]] \rightarrow [[A > B] > C]$

Call this set RLS+. It can be shown that $RLS+ = CAT$. First, Flip and Reassociate are both reversible and CAT preserving. Any member of CAT can be mapped onto RLS by some combination of Flip, Reassociate, or their inverses; hence, any member of CAT can be generated by some combination of Flip, Reassociate, or their inverses. See Williams (1998a) for a more detailed demonstration.

It is useful to have RLS+ as an alternative formulation of CAT, because RLS+ mimics movement—in fact, it mimics movement of any constituent moved over an unbounded distance. To see this consider the following derivation:

- (6) a. [A>[B>[C>[D>[E>[F>[G>[H>[I J]]]]]]]]
 b. Derivation:
 1. [A>[B>[C>[D>[E>[F>[G>[H>[I J]]]]]]]]
 → Reassociate:
 2. [A>[B>[[[[[C>D]>E]>F]>G]]]]>H]>[I J]]
 → Flip:
 3. [A>[B>[H<[[[[C>D]>E]>F]>G]]]]>[I J]]

On the other hand, Flip and Reassociate cannot simulate several situations that can arise with multiple "interacting" movements. First, it cannot simulate the movement of a moved-over constituent; in (6b3), for example, the leftward carat pointing at H prevents Reassociation involving H or anything to the right of H, so that material cannot be moved over H. Second, if H is complex, nothing can be moved out of H, because to do so, it would have to "reassociate" out of H, but this will not happen again because the carat pointing at H points differently from the surrounding carats, so Reassociate cannot apply. In sum then:

- (7) Flip and Reassociate cannot simulate
 1. Movement of moved-from nodes
 2. Extraction from moved nodes

It is possible that any set of transformations of RLS that obeys (7) is equivalent to RLS+ (and hence CAT) but I have not been able to show this.

CAT thus described has exactly the right properties to simulate the adverbial modification systems if true mismodification is excluded. In order to establish this, I will first review the situation with Adverbs in Romance, relying heavily on Cinque (1996, 1999) (section 3) and English (section 4).

3. *Adverbs and movement in Romance*

Morphologically motivated head movement creates situations of surface mismodification—situations in which an adverb is not next to, and hence not adjoined to, its modifiee in surface structure. So in the now standard Emonds/Pollockian (Emonds 1978; Pollock 1989) surface structure of French we find (8a) analyzed as (8b), where the adverb appears to mismodify the VP, as it does not seem to be adjoined to it in the following:

- (8) a. Jean frappe souvent Pierre
 'John hits often Pierre'
 [V ... [Adv [... t]]]]
 Jean [frappe souvent]_V Pierre

But there is another analysis of (8a) in which the modification is true—(8c) above, in which the adverb modifies the verb by itself instead of the VP. Evidence in favor of (8c) comes from English, which differs from French for (8a), but not for some closely related cases:

- (9) a. *John [hits often]_V Mary
 b. John relied often on Mary
 c. John often [relied on Mary]
 d. John often [hit Mary]

When the complement is a PP, French and English are identical again. In the Pollockian analysis, (9a) and (9b) are parallel—movement should apply to (9a) and (9b) equally, but does not. But in the adjunction-to-V° analysis we may draw the distinction in the following way:

- (10) a. John [hit often]_{V°} Mary
 b. John [relied often]_{V°} on Mary

The difference between (9a) and (9b) would appear to be a difference of case assignment: adjunction to a case-assigner is bad in English (10a), but not to a non case-assigner (10b). The difference between French and English then would be in whether a complex V° could be a case assigner: yes in French, no in English.

Some further cases support this treatment. In the Pollockian analysis, the adverb syntactically has scope over the direct object; but in the Adjunction-to-V° analysis it does not; scope facts favor the second analysis:

- (11) a. Jean [frappe souvent] chaque garçon
 b. not: Jean [frappe [souvent [V chaque garçon]]
 c. Jean frappe [[souvent chaque] garçon]

(11a) has uniquely the reading where *souvent* < *chaque*, as the Adjunction-to-V° structure would suggest.

What is needed to implement structures like (11a) is a rule which will pass up the theta structure of the verb through adjunction. Such a rule is given in Williams (1994) as an alternative to the Pollockian movement analysis.

- (12) $[V_{(A1, A2, \dots)} + AdvP]_{(A1, A2, \dots)}$

The rule needed may be nothing more than X-bar projection. Since V is the head of the adjunction structure, X-bar projection dictates that the subcategorization of the head be made a property of the whole. Because the heart of the analysis is the inheritance of subcategorization, I will call such analyses "Geachian", even though Geach's rule is perhaps more properly understood to refer to inheritance of subcategorization from the *non*head (the rule in (1b)) (see Williams 1994, 1998).

I will now turn to Cinque (1996, 1999), a detailed study of adverb behavior in the Pollockian mold. As mentioned earlier, Cinque's adverbs are introduced into structure exclusively as the specifiers of functional elements. In this regard, we may regard his clausal structure as a Right Linear String (RLS) at least in so far as adverbs go—if one adverb is to the left of another, it takes the other in its scope. Cinque cites the following paradigms to illustrate the relation of adverbs to the functional clause structure:

- (13) a. Gianni oggi per fortuna probabilmente forse intelligentemente *sarà* invitato
 b. Gianni oggi per fortuna probabilmente forse *sarà* intelligentemente invitato
 c. Gianni oggi per fortuna probabilmente *sarà* forse intelligentemente invitato
 d. Gianni oggi per fortuna *sarà* probabilmente forse intelligentemente invitato
 e. Gianni oggi *sarà* per fortuna probabilmente forse intelligentemente invitato
 f. Gianni *sarà* oggi per fortuna probabilmente forse intelligentemente invitato
 'Gianni will today luckily probably perhaps intelligently be invited'
- (Cinque 1996, ch. 1, ex. (37)).

Each of the adverbs occupies the specifier of a different functional element, and the verb *sarà* occupies a different functional head position in each of (13a-f), presumably arriving there through movement, though since the movement appears to be optional it is perhaps not "morphologically motivated" in the most straightforward sense. But suppose instead one took a view of adverbs like that proffered in the first sentence of this essay – that is, adverbs adjoin to their modifiee; under such a view are we then compelled to conclude that in exam-

ples like (13) the adverbs are modifying different things in the six cases? Maybe so; but maybe the difference is imperceptible; since *sarà* is a semantically empty verb the difference between modifying invitato and *sarà invitato* may not register. A more interesting case is the following, in which the supposedly moving verb is the contentful verb *rimesso*:

- (14) a. Da allora non hanno di solito mica più sempre completamente *rimesso* tutto bene in ordine
 b. Da allora non hanno di solito mica più sempre *rimesso* completamente tutto bene in ordine
 c. Da allora non hanno di solito mica più *rimesso* sempre completamente tutto bene in ordine
 d. Da allora non hanno di solito mica *rimesso* più sempre completamente tutto bene in ordine
 e. Da allora non hanno di solito *rimesso* mica più sempre completamente tutto bene in ordine
 f. Da allora non hanno *rimesso* di solito mica più sempre completamente tutto bene in ordine
 'Since then, they haven't usually not any longer always [completely? ESW] put everything well in order'
 (Cinque 1996, ch. 1, ex. (24)).

Here, the notion that an adverb is modifying what it is adjoined to must countenance a difference between (14a) and (14b), for example, where *completamente* is modifying *rimesso* in (14a), but *tutto* in (14b), an unattractive conclusion if (14a-f) are synonymous, as Cinque represents them to be. But in fact, perhaps that is the right conclusion here as well. In (14a), for example, *completamente* is probably adjoined not to *rimesso* by itself, but rather to the entire VP starting with *rimesso*. In that position, it can be perceived as modifying *tutto*, so long as *tutto* is the focus of the sentence, or part of it, as an instance of *attraction to focus* (as in Jackendoff (1972)). Jackendoff showed that focus and negation interact in such a way that negation is understood as applying directly to the focus itself; so, for example, a sentence like *Bill didn't want to talk to JOHN* is synonymous with *It wasn't JOHN that Bill wanted to talk to*, as long as *John* is the narrow focus.

The synonymy of the examples in (14) suggests that attraction to focus is relevant for adverbs like *completamente* as well.

4. Other ways for adverbs to modify

I will now raise some questions about Cinque's most basic

assumption, that adverbs are introduced in specifiers of functional projections. There are adverbs which are demonstrably not a part of the clausal functional structure but which nevertheless behave just like the adverbs which are. The possibility for an adverb to modify something other than the verb+functional structure has not been investigated sufficiently, although some elements of understanding in the area have been long recognized.

In English, we find that some inconsistencies arise in trying to situate adverbs with respect to supposedly fixed elements of a clause's predicate-argument structure; so:

- (15) a. Slowly, John left the room
 b. John probably left the room
 c. *Slowly, John probably left the room.
 d. Probably John slowly left the room.
 e. Probably John left the room
 f. John slowly left the room.

(15a) shows that *slowly* can occupy the initial position, and (15b) shows that *probably* can modify the medial position; however, while independently valid, these two situations are not compatible with one another, as (15c) shows. (15a-f) tend to show that adverbs are ordered with respect to one another without being ordered with respect to the predicate argument structure of the sentence. This is a potential problem for Pollockian analyses, unless subject and verb are subject to a good deal of optional movement in otherwise empty functional structure. But if they are, something must coordinate the movement of the two, to insure that verb does not cross over subject. Of course sometimes the verb does cross over the subject, but not "optionally"!

Further support for that view comes from the behavior of adverbs that modify elements other than the verb+functional structure of the clause.

- (16) a. John nearly ate all of them
 b. John ate nearly all of them

- (17) a. I talked to nearly all of them.
 b. I nearly talked to all of them.
 c. *I talked nearly to all of them.

(16a) has a reading very nearly the same as (16b), because of the mechanism of attraction to focus. What is of special interest is the structure and interpretation of (16b). (17) clearly shows that the

adverb is attached directly to the quantifier itself, and thus is not at all a part of the functional structure of the main clause—in (17b) for example the adverb is inside the prepositional phrase. This by itself should not cause alarm, but together with the following it radically undermines the notion that adverbs can be explicated in terms of clausal functional architecture:

- (18) a. I talked to probably (nearly) all of them
 b. *I talked to probably them

- (19) a. I probably talked to nearly all of them
 b. *I nearly talked to probably all of them
 c. Probably all x (I nearly talked to x)
 d. #Probably (I nearly talked to all)

(18) shows that *probably* can also adjoin to quantifiers, even quantifiers inside of prepositional phrases. (19b) shows that the intervening ordering restrictions illustrated earlier hold between adverbs even when the adverbs are not part of the same functional structure; that is, *probably*, even when it is in a PP, must have wider scope than *nearly* in the main clause. This suggests that even when it is attached to a quantifier, *probably* must get sentential scope. It does so, in all likelihood, by "piggybacking" on the quantifier *all*—*all* is assigned broad sentential scope, and *probably*, by virtue of modifying *all*, gets wide scope as well, in fact wider than *all*. If this is correct, then (19b) is bad exactly because *nearly* traps *all*, and hence *probably*, in too small a domain. In fact, there is possibly a marginal reading for (19b) with *all*, and hence *probably*, having wide scope, as indicated in (19c); but there is no reading like (19d), in which *probably* gets wide scope and *all* does not.

The rule we have implicitly used in explicating (19) is that when an adverb specifies a element A, it has A in its scope, as well as anything that A has in its scope. We will make heavy use of this rule in what follows, as it is our means of providing alternative structures to the "RLS" structure that Cinque posits for all adverbs.

The sort of theory I would oppose to Cinque's is one in which adverbs are adjoined to their modifiees in surface structure. So in particular, an adverb between the verb and the direct object is adjoined to the verb, beneath the direct object.

The adjunction of the adverb to the verb does not change the verb's properties—if the verb took a direct object before the adjunction, then it takes a direct object after the adjunction. Under this

Geachian view, the Pollockian examples, like (11), are not cases of "surface mismodification", by which I mean they are not cases in which the apparent modifiee in surface structure is different from the real modifiee, and so they provide no incentive to posit movement.

Many questions about adverbs are not touched by this view—for example, why *"slowly John probably left" is ungrammatical. The answer though would take the following form. First, *slowly* can modify either a VP or an S, as in :

- (20) a. Slowly Bill untied the boxes
b. Bill slowly untied the boxes

There is a slight difference in meaning between the two, which comes out more strongly when the subject is quantified:

- (21) a. Everyone slowly untied their shoes
b. Slowly everyone untied their shoes

(21a) suggests individual slownesses, whereas (21b) suggests that the whole multipart event transpired slowly—in other words, *slowly* is in the scope of *every* in (21a) but not in (21b).

Probably naturally attaches to S. But it also attaches to VP, in fact even more naturally:

- (22) a. Probably John left early
b. John probably left early

(22a) seems to need no explanation, as *probably* is adjoined to S, which is its privileged modifiee. Actually, though, (22a) is more specialized in its interpretation than (22b), meaning something like "It was probably that John left early (which caused us to miss him)", rather than being the raw statement of probability which (22b) expresses most directly. Of (22b) we can say that *probably* is attaching to a "propositional core", since the VP contains some internal representation of the subject; the node formed by the adjunction of the adverb to the VP inherits the VP's need for the subject, however that is expressed—in the following, as in Williams (1994), it is expressed by the inheritance of the index *i* by all dominating nodes:

- (23) [probably [_{left_i} early]_i]
(A_i)

In this way the subject is "exported" beyond the propositional core of the VP.

This still leaves unexplained **Slowly John probably*; what we have left out of the picture is that *probably* MUST be interpreted as the most external operator, no matter where it is generated. So, for example, if the subject is quantified, the only interpretation for *probably* is wider than that the quantifier; in other words, the following example expresses the probability of a multipart event, not the summation of individual probabilities:

- (24) Everyone probably left early
#Everyone [probably [t left early]]

Not that the latter possibility would be an incoherent reading—it is in fact an available reading of the following:

- (25) Everyone is likely to leave—
John is likely to leave,
Mary is likely to leave,
etc., so everyone is likely to leave.

It can be true of each person that that person is likely to leave, without it being likely that everyone will leave (just have enough people).

Similarly, *probably* must be interpreted outside of other clause level modifiers like *recently*:

- (26) a. Probably John recently left.
b. *Recently John probably left.

The failure of *probably* to behave like *likely* has I think to do with the "nonrestrictive" character of *probably*—it is not really part of the assertion, the way the adjective *likely* is. Like nonrestrictive adjectival modifiers *probably* requires comma intonation when used in final position. Nonrestrictive modifiers cannot be subordinate to other modifiers, and this is the reason that *probably* cannot be interpreted as subordinate to other adverbs like *slowly* and *recently*. Again it is not because the reading would be incoherent; *Recently John probably left* would mean *Recently, it was probable that John left*, but again, *probably* cannot be subordinate to a restrictive modifier like *recently*.

Implicit in all this is the requirement that Adverb A must be in the scope of Adverb B in the structure:

(27) AdvA NP AdvB VP

But this follows if the modiffee is what the adverb is adjoined to; Adverb A is adjoined to a phrase containing the phrase that Adverb B is adjoined to. Furthermore, while NP can be "exported" from VP over Adverb B by the mechanism alluded to earlier, there is no equivalent mechanism for exporting Adverb A outside of Adverb B—unsatisfied arguments are inherited, but nothing else.

Because Adverb modification is transparent to arguments in this way, we can easily think of a string of adverbs in the same clause as modifying each other, the arguments all "imported":

(28) probably ... [...recently... [... slowly ... [...VP]]

This structure very much resembles the RLS of Cinque's account, but of course without the functional structure of his account.

5. *Moving the verb over the adverb*

The adverbs that occur between the verb and the direct object provide a crucial testing ground for theories of modification, in particular, the Cinque/Pollockian versus the Geachian. Cases with a single adverb in that position do not narrow down the possibilities appreciably—we have already seen how they might be treated in both movement and nonmovement theories. But cases with two adverbs in that position naturally raise the question of which adverb has the widest scope, and different theories give different answers. A theory in which such adverbs are adjoined to the head verb suggests that the second adverb will have scope over the first (as in (29b)), whereas a theory of the sort that Cinque proposes makes the opposite prediction (as in (29c)):

- (29) a. V Adv₁ Adv₂ NP
 b. [[V Adv₁] Adv₂]V NP Adv₂ > Adv₁
 c. [V [Adv₁ [Adv₂ [t V NP]]] Adv₁ > Adv₂

In fact in such cases in Italian, the first adverb does have scope over the second. *Forse* and *saggiamente* are two adverbs that must be in the fixed interpretive order *forse>saggiamente*, and the order "V *forse* *saggiamente* NP" is grammatical. This order is exactly what is expected under Cinque's theory (as (30b) illustrates), but not under a

theory in which the two adverbs are successively adjoined to the right of V:

- (30) a. Gianni accetterà *forse* *saggiamente* il vostro aiuto
 'Gianni will accept perhaps wisely your help'
 (Cinque 1996 ch. 2, example (46))
 b. [V [*forse* [*saggiamente* t]]] *forse>saggiamente*

At first glance this would seem to favor the Cinquean account over the Geachian, and to show that such cases are cases of surface mismodification. In fact though there is already a mechanism to get the correct interpretive order from the linear order in (30a) in a Geachian account; if *forse* is a specifier of the adverb *saggiamente*, as in (31), then it will have wider scope:

- (31) [[V [_{AdvP} Adv₁ P [_{Adv₂}]]]V NP] Adv₁>Adv₂

So (30a) does not by itself provide definitive evidence in favor of either view.

But the double right-adjunction structure in (b) is an embarrassment to a Geachian theory, as the order *saggiamente...forse* is not allowed at all:

- (32) a. [[[V Adv₂]V Adv₁]V]VP Adv₁>Adv₂
 b. *Gianni accettera *saggiamente forse* il vostro aiuto
 (Cinque 1999 Chapter 1, ex. 46b)

If (32a) were allowed, then the fixed interpretive order *forse>saggiamente* should be realizable as the order in (32b). In order to block (32b) in the Geachian account, it is necessary to block multiple adjunction to the head—only a single adverb may be adjoined to V. As we will see English does not seem to have this property, so we will take this as a parametric difference: whether single vs. multiple adjunction is allowed.

Example (33a) below shows that this restriction holds as well for adverbs after the direct object, presumably adjoined to VP; interpretively *più* must dominate *sempre*, and in postobject position this order can only be realized as the order *più...sempre*, not as *sempre...più*, suggesting again that multiple adjunction of the kind in (33c) is barred, permitting only (33d). In Cinque's account the order follows from the *più* being in the specifier of a higher functional projection than *sempre*. In the Geachian theory, *più* is a specifier of *sempre*, as in earlier examples.

- (33) a. Gianni non vince le sue partite già più sempre BENE
 G. does not win his matches already any longer always well
 b. *Gianni non vince le sue partite già sempre più BENE
 (Cinque 1999, ch. 1, ex. (62a,b))
 c. [[V NP] Adv] Adv] Adv]
 d. V NP [[Adv] Adv Adv Adv] Adv]

English lacks the constraint against multiple adjunction, so in fact although the two adverbs *thoroughly* and *always* are in the fixed interpretive order *always>thoroughly*, that interpretive order can be realized as either order of adverbs in the postobject position:

- (34) a. John [[won the games] thoroughly] always]
 b. John [[won the games] [always] AdvP thoroughly] AdvP]

(34a) arises from multiple adjunction (to VP), whereas (34b) arises from Adverb specification.

The contrast between Italian in (33) and English in (34) strongly suggests that the prohibition against multiple adjunction is parametric, and we will henceforth assume that the Geachian theory is committed to some such restriction.

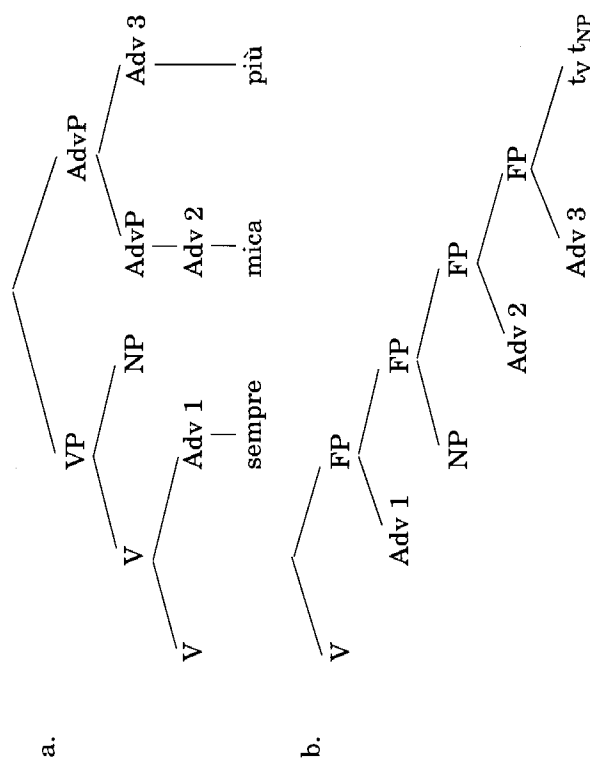
As things stand now, both theories (Cinquean and Geachian) account for the facts concerning two adverbs after the verb where the adverbs are either both between the verb and direct object, or they are both after the direct object. But the theories diverge again for cases of a pair of adverbs which are split between the two positions, as in (35b) below:

- (35) a. Da allora, non accetta i nostri inviti mica più sempre
 since then, he doesn't accept not any longer always our invitations
 V NP [[Adv1] AdvP Adv2] AdvP Adv3] AdvP
 b. Da allora, non accetta sempre i nostri inviti mica più
 [[V Adv3] NP] [[adv1] AdvP adv2] AdvP] 1>2>3
 (Cinque 1999, ch. 1, ex. (92a))

(35a) illustrates the fixed interpretive order for the adverbs *mica>più>sempre*. If adverbs exclusively occupy the specifiers of functional projections, then (35b) is completely unexpected, as it appears that *sempre* has the highest possible scope, as it is to the left of the other adverbs; the structure would be the one in (36b) below, with *sempre* in the Adv1 position. On the other hand, if the appearance of an adverb between the V and its direct object were due to

adjunction to V, then the structure would be the one in (36a), which properly assigns *sempre* narrow scope with respect to the other adverbs, because it is lower in the tree than the other adverbs:

(36)



One response to (36b) in a Cinquean system would be to posit a rule of adverb movement, with the understanding that adverb interpretation is determined by the pre-movement structure; such a proposal appears in Cinque (1996). So a structure like (36c) with *sempre* in the Adv3 position could be transformed into (35b) by moving *sempre* leftward. However, a general rule moving adverbs leftward would leave us in the position that a set of adverbs in some fixed interpretive order could occur in any surface order, and this is grossly false. So, for example, we do not have the following:

- (37) *Da allora, non accetta i nostri inviti sempre mica più
 V NP [[sempre] AdvP mica] AdvP più] AdvP
 (Cinque 1996 ch. 2, examples 93)

If the adverb *sempre* could move to the left, and if the verb and direct object were also free to move indefinitely far to the left, as they seem to have to be in Cinque's theory, then (37) is easily derived.

In Cinque (1999) adverb movement per se is eliminated, in favor

of movement of the adverb as part of a verbal projection. He cites the following against pure adverb movement:

- (38) *Lui non ha sempre_i rivisto i suoi appunti mica più t_i bene
 He hasn't always corrected his notes any longer well
 (Cinque 1999, ch. 1, ex. (101))
 NOT: adv1 adv2 adv3 ⇒ adv2 adv1 t adv3

In this example, the middle of three adjacent adverbs has moved above the verb and the top adverb—if such movement were allowed, then any surface order of adverbs could realize any underlying interpretive order. Such movement will be barred if movement of the adverb is always accompanied by movement of the V, so we have, for example,

- (39) A Natale credo che avesse di già [completamente perso la testa]
 ^
 'At Christmas, I think that he had already completely lost his mind'
 (Cinque 1999, ch. 1, ex. (94))

But in fact this seemingly more limited sort of adverb movement does not really solve the overgeneration problem of Cinque's original proposal. Under the revised view, (35b) will have the following structure:

- (40) Da allora, non accetta sempre i nostri inviti mica più
 [V sempre]_{Vx} ...NP... [mica [più t t_{Vx}]]

Here *sempre* has moved as a part of the V^x complex from a position beneath the adverbs *mica* and *più*. The problem is that without further constraint we can still derive any order for the adverbs in any position; so, for example, if both V and NP in (40) simply move higher than V^x then we will have derived the incorrect order "V NP sempre mica più" which we know to be ungrammatical from (37). And such free optional movement seems inevitable in Cinque's system, as we have observed earlier.

We will return to some questions about the role of movement in Cinque's system shortly, and what an appropriate set of constraints on movement might be. At this point though I want to emphasize that the Geachian account of adverbs derives the correct readings instantly, and without movement and its potential to overgenerate. The following is a summary of the grammatical and the ungrammatical cases under discussion, followed by the Geachian structure, fol-

lowed by the predicted order of interpretation; in (42) are the ungrammatical cases that arise from multiple adjunction, with their interpretive orders:

- (41) a. V Adv NP [V Adv] NP
 b. V Adv1 Adv2 NP [V [Adv1] Adv2] NP Adv1>Adv2
 c. V NP Adv1 Adv2 [V NP [[Adv1] Adv2]] Adv1>Adv2
 d. V Adv1 NP Adv2 [[[V Adv1] NP] Adv2] Adv2>Adv1
- (42) a. [V Adv1] Adv2 Adv1<Adv2, No Multiple Adjunction
 b. [V NP [Adv1 [Adv2] Adv1<Adv2, No Multiple Adjunction

The striking thing about the "split" cases (41d) is that in the Geachian account they are inevitable, whereas in the Cinquean account the facts of such cases depends entirely on what movements are allowed, a question to which there is no current answer in Cinque's work or elsewhere. The Geachian account is "minimal" in the sense that some rule must be given to account for modification; any answer more complicated than "modify the thing you are adjoined to in surface structure" calls for vigorous empirical argument. The only unpleasant feature of the Geachian account is the parameterized restriction on multiple adjunction, but in fact something like that will be needed in any cases to account for why English, but not Italian or French, shows the behavior in (34).

Cinque (1999) does in fact offer a very concrete empirical argument in favor of movement based on the behavior of some English adverbs. Below are the judgments about scope order that Cinque adopts from Andrews (1983):

- (43) a. John knocked on the door intentionally twice
 twice>intentionally [&! ESW]
 b. John knocked on the door twice intentionally
 intentionally>twice
 c. ?John twice intentionally knocked on the door
 twice>intentionally
 d. ??John intentionally twice knocked on the door
 intentionally>twice
 (Cinque 1999, ch. 1, ex. (106)-(107))

On the basis of these judgements, Cinque concludes that twice must be ambiguous, since it can have two different scope relations with *intentionally*, as these examples show.

- (44) $\text{twice}_1 > \text{intentionally}$ (entire event)
 $\text{twice}_2 < \text{intentionally}$ (repetition of verb action)

The notion that adverbs are in a fixed 1-1 relation with functional elements forces this view. Cinque bases an argument against right adjunction (and hence in favor of movement) of adverbs on the following example, with the judgment about scope order again adopted from Andrews:

- (45) John intentionally knocked on the door twice (favors *intentionally* > *twice*)

The explanation involves the possible transforms of the following structure

- (46) [twice_1 [intentionally [twice_2 [VP]]]]

In order to derive "twice VP intentionally" with lower scope for *twice*, (46) (without *twice*₂) is transformed in the following way:

- (47) intentionally [twice_1 VP_i] $\Rightarrow$ [twice_1 VP_i] intentionally t_i

This derivation arrives at a correct available reading for the sentence, but Cinque's argument is based on the unavailability of any *twice* > *intentionally* reading for (45). On this point Cinque says,

"...the other reading with *intentionally* taking scope over *twice* is not derivable from ([C's] 116). It can be derived only from a structure like ([C's] 119), in which *intentionally* is higher than *twice*₁, by moving XP around *intentionally*".

- (48) (C's 116) John (twice_1) [XP intentionally [VP knocked (twice_2) on the door]]
 (C's 119) John intentionally [(twice_1) [VP knocked (twice_2) on the door]]
 (Cinque 1999, p. 28)

(C's 119) is supposed to be bad because **intentionally* > *twice*₁. But in fact, these examples misrepresent the possibilities, because the variant of (Cinque's 116) in which the VP "knocked on the door" has not already moved to the left of *twice*₂ could serve as a source for the supposedly missing reading in the following way:

- (49) a. John (twice_1) [intentionally [(twice_2) knocked on the door] VP_1] VP_2
 $\rightarrow$ John [(twice_2) knocked on the door] VP_1] intentionally t_{VP_1} VP_2

Here, the lowest VP (VP_1) is moved over *intentionally*, so that the *twice* just after the subject is *twice*₂, not *twice*₁. So I think Cinque's own theory will derive the supposedly missing reading.

In any case though I think the judgment about (46) is mistaken, or at least misinterpreted. First, there seem to be not just two *twice*'s, but indefinitely many; I find that (50) can be extended at will, inhibited only by the complexity of the event structure referred to:

- (50) John did it twice] three times [four times] two times [...]

So an explanation in terms of two *twice*s would seem beside the point.

Second, Andrew's judgment is most likely not a grammaticality judgment. I believe that it arises from the action of the natural language parser, operating under principles that are now at least partially understood. Specifically, it seems plausible to me that for the two adverbs in the sequence

- (51) Adv₁ VP Adv₂

Adv₁ will most naturally be interpreted as having wider scope than Adv₂ under Frazier's principle of Late Closure (see Frazier & Rayner 1982). As the parser incrementally takes in words from left to right building partial constituents at every point, it faces many points of temporary ambiguity—is the current word part of the phrase under construction, or is it the first word in the next phrase? Late Closure says that the parser's first guess is that the current word is a part of the currently "open" phrase; hence the current phrase is always closed "late" rather than "early". But this will mean that in a sequence like (51) the second adverb will be interpreted as a part of the VP which precedes it; since the first Adv₁ already takes that VP in its scope, Adv₂ will most naturally be taken as falling in the scope of Adv₁. This I think fully explains Andrew's observation:

- (52) a. John intentionally knocked on the door twice
 b. John [intentionally [(knocked on the door] VP_0 twice] VP_1] VP_2
 c. John [intentionally [knocked on the door] VP_0] VP_1 [twice] VP_2]
 (dispreferred by Late Closure)

In (52b) VP₀ is kept open to include *twice*; in (52c), it is prematurely closed.

The idea that (45) has more to do with parsing than with grammar is further supported by the way that Late Closure interacts with intonation. An intonational pause defeats Late Closure, as the following sort of example shows:

- (53) a. John saw the man with the binoculars
b. John saw the man, with the binoculars

As is well known, while (53a) is ambiguous, it favors the reading in which the man has the binoculars, not John, and this follows if Late Closure prefers the PP inside the Direct Object, rather than outside of it; but in (53b) the intonation break defeats Late Closure, giving only the reading in which it is John with the binoculars. But exactly the same is true of (45), as shown in (54).

- (54) John intentionally knocked on the door, twice (*twice > intentionally*)

I would conclude then that the cases just discussed provide no special evidence for the "functional specifier" theory of adverbs, and for the movement that is needed to account for adverb orders. Rather, the complex of facts he discusses are naturally dealt with, in some cases ineliminable, under a theory of the sort we are calling "Geachian", where adverb directly modifying adverb replaces adverb movement in accounting for how different serial orders of adverbs can realize one and the same fixed interpretive order. I will explore in the next section a more precise idea of how serial and interpretive orders are formally related.

6. CAT as a model of adverbial modification.

The data just exposed strongly suggests that CAT might be a good model of adverbial modification. First, the hierarchical arrangement of adverbs is modeled by the Right Linear String, *probably > recently > quietly*... Second, both Flip and Reassociate are instantiated. Flip is instantiated by pairs of sentences which differ solely in the left vs. right positioning of the adverb:

- (55) a. John probably [recently paid Bill]
b. John [recently paid Bill] probably

Reassociate models pairs of sentences in one of which Adv₁ takes Adv₂ in its scope, and in the other of which Adv₁ specifies Adv₂:

- (56) a. John probably [quietly left]
b. John [[probably_{AdvP}] quietly]_{AdvP} left

This suggests that given a fixed interpretive sequence of adverbs, exactly the CAT permutations of those adverbs could realize that sequence. If true, this would suggest that movement was not a factor in adverb placement, as CAT is the set of permutations of elements that combine purely by virtue of type subcategorization.

I will concentrate on showing that CAT is sufficient to account for the main lines of adverbial modification; but before doing that, I want to point out one respect in which CAT is too generous—Adverbial specification cannot be flipped:

- (57) a. Probably slowly John opened the door
b. *[Slowly [probably]] John opened the door

AdvP permits no post-head elements, for reasons not presently understood, so an adverb cannot modify an adverb by adjoining to its right. But this restriction intersects with CAT to give a very accurate model of adverbial modification.

Modeling adverbial modification by CAT makes quite specific predictions on possible orders. It predicts, for example, that it will be impossible to move the middle of three adverbs to the left of two other adverbs, unless it pivots around the verb:

- (58) a. [[V] < Adv₁] < Adv₂] < Adv₃] → *V Adv₂ Adv₁ Adv₃
b. [[V] < Adv₁] < Adv₂] < Adv₃] → [Adv₂ > [[V] < Adv₁] < Adv₃]
c. V Adv₁ NP Adv₂ Adv₃ > Adv₁

(58b) is simply an application of Flip. (58a) on the other hand cannot be derived by any combination of Flip and Reassociate, and so lies outside of CAT. This models the facts about adverb order observed in the previous two sections. Likewise, it predicts that when two adverbs occupy the pre- and post-direct object positions, as in (58c), the interpreted order must be the reverse of the linear order.

I have spoken of Flip and Reassociate as movement operations but of course they are not part of the CAT theory, which has no movement, but rather theorems about it. The two operations facilitate comparison with movement theories, since to make a comparison, we

may consider how closely movement in the movement theory resembles Flip and Reassociate.

Cinque's theory is a theory with movement, and all adverb orders are derived by transformation of RLS. Cinque's movements are capable of deriving non-CAT orders, even the restricted movement of Cinque (1999). All orders of three elements are CAT orders, but for any higher number, the CAT orders are a vanishing subset of the total orders. With four items ($a > b > c > d$), for example, there are two nonCAT orders:

- (59) a. c a d b
b. b d a c

Movement of the sort that Cinque posits is capable of deriving both of these orders from an underlying RLS ($[a > [b > [c > d]]$):

- (60) a. a b c d $\Rightarrow$ a [c d] b $\Rightarrow$ c a [t_c d] b
b. a b c d $\Rightarrow$ a d b [c t_d] $\Rightarrow$ [c t_d] a d b

So, for example, if d is a verb and a, b, c are adverbs, the following shows the derivation of an impossible surface order:

- (61) Adv₁ Adv₂ Adv₃ V $\Rightarrow$ Adv₃ Adv₁ V Adv₂ (like (60b))

In order to block such derivations, Cinque's theory must be supplemented with constraints on movement of the following sort:

- (62) Constraints on Movement
a. block extraction from already-moved constituents (for (60a))
b. block movement of extracted-from constituents (for (60b))

(62a) will rule out (60a), and (62b) will rule out (60b). These constraints will eliminate a good deal of the non-CAT orders, perhaps all. I have not been able to determine if there are any nonCAT structures still generated.

Constraining movement so that the output resembles CAT looks like an empirically worthy goal, but once achieved, it suggests eliminating movement entirely, and simply taking CAT as the model.

One reason to maintain movement would be if the constraints on movement needed to achieve CATlike behavior in one domain were needed anyway in another domain. But such is not the case

with the constraints just considered. (62a) rules out traces bound under reconstruction, but exactly that seems to be needed for the following:

- (63) How [t_i happy]_k is Bob_i t_k

Here (62b) is violated—the already extracted-from AP (under the XP Internal Subject Hypothesis) is moved by Wh-movement. Likewise, we find violations of (62a) in languages which permit Wh-extraction from SpecAgrS, a derived position.

So the constraints in (62) cannot be applied generally to movement, only to the movements needed to get Verb and Adverb orders right. Of course it is always possible to restrict the applicability of the Constraints on Movement to systems that have CATlike behavior. But then it is not obvious that we have a proposal different from the one at hand. What is most important empirically is to characterize processes differently, and of course accurately. My own suspicion is that CATlike behavior will be found wherever the "argument of" relation is being played out, and not elsewhere; but this is what CAT is the calculus for in the first place.

7. True Mismodification

Mismodification does arise in language—it is usually called a bracketing paradox (In the rest of the Text, "&" is used to mark ambiguous examples, and "~&" to mark unambiguous examples):

- (64) a. &a beautiful [dance -er]
b. beautiful[dancer]
c. [-er {beautiful dance}]

As it is sometimes put, the ambiguity of *beautiful dancer* arises from ambiguous modification by *beautiful*—on one meaning, *beautiful* modifies *dancer* as a whole, and on the other meaning it modifies *dance* (64b). In the second meaning, *beautiful* mismodifies. It is important to understand exactly the circumstances in which this arises. It essentially happens only when necessary—that is, if proper modification is possible, then that is the only grammatical result. So, for example (65a) below is not ambiguous, even though it should be synonymous with *beautiful dancer*:

- (65) a. a beautiful [person who *dances*]
 b. a person who [dances beautifully]
 c. *a [beautiful dance] –er

The reading parallel with (64c) is (65b). The difference between the two cases is that there is a proper modification for the reading represented by (65b), namely (65b) itself. There is no corresponding structure for the *beautiful dancer*—it would be (65b), and that is why the mismodification is permitted for that case.

A similar point can be made about compounds. There is a regular rule which relates compound structure to intonation; as Liberman (1975) describes it, the accent goes on the left member of a compound, unless the right member branches:

- (66) a. kitchen [TOWEL rack]
 b. [KITCHEN towel] rack

We may now ask, why don't bracketing paradoxes arise with compounds? That is, why can't (66a) mean the same thing as (66b)? If our approach is correct, (66a) is limited in its meaning by the existence of (66b). I believe that all theories of bracketing paradoxes miss this point—any rule or process that restructures cases of mismodification like those in (64) will apply in (65) as well. Any such restructuring must be constrained by whether there is a proper modification with the intended meaning.

The example just given involves adjectives, but there are completely parallel examples with adverbs. In the previous sections I have argued that the functional projections in syntax, and movement of predicates and arguments among them, do not give a good model of adverb distribution. For this and other reasons I have argued elsewhere that the functional elements are not present in syntax as independent items, but only as parts of words. But this conclusion itself gives rise to mismodification of the sort illustrated in (64).

It is well known that the adverbs *probably* and *completely* differ in their target modifiee—*probably* is a sentential adverb, and modifies something like Tense, and *completely* modifies something like V itself. Given this, the case below is roughly correct—if Tense is the outside element of the unit T+V, then *probably* can modify Tense adjoining to the Tensed verb:

- (67) John probably [clean+ed] it out. (probably[-ed[clean]])

But if this is the correct view to take of *probably*, then the following is a kind of mismodification, since *completely* and V are not adjacent, as T intervenes:

- (68) John completely [clean+ed] it out.
 (??completely[-ed[clean]])

In fact, (67) and (68) are completely parallel to the *beautiful dancer* case. And we may extend the logic of that case to the problem posed by (68)—the mismodification in (68) is permitted exactly because the structure of proper modification cannot be generated:

- (69) *[completely clean]_V –ed

We may see the role of the existence of proper modification structures in the following:

- (70) *John completely [will clean it out]

(70) is a case of mismodification, and is ungrammatical exactly because proper modification is possible in this case:

- (71) John will [completely [clean it out]]

The model of grammar that encompasses such mis-structuring is beyond the scope of this paper, but see Williams (1998a) for a preliminary formulation and Williams (in preparation) for a more detailed exploration.

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