

# *Result clauses and the structure of degree phrases\**

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## **Abstract**

I am concerned here with the structure of Degree Phrases which introduce Result clauses. After demonstrating that degree words select these clauses, I look at some previous proposals regarding this structure. I consider Abney's (1987) account, an extraposition-based version using Jackendoff's (1977) work, and finally Baltin (1987), which involves both selection and extraposition. Next, I introduce my proposal, that functional categories can project shells, and analyse Degree Phrases in this way. Lastly, I propose a possible semantic analysis, which is intended to demonstrate that my syntactic account is superior to the others.

## **1 Introduction**

The topic of concern in this paper is the structural representation of Degree Phrases that introduce Result clauses. The base-generated order shown in (1) is the canonical case I shall be considering:

(1) John is so angry that we cannot talk to him.

The theory I propose here extends Larson's (1988a) analysis of double object verbs to functional categories. Analyses by Abney (1987), Jackendoff (1977) and, in particular, Baltin (1987) will be considered and will be found to be wanting. The evidence against

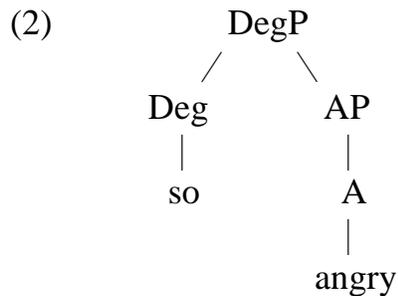
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\*I would like to thank Hans van de Koot for his continued support and encouragement, I thank Rita Manzini for her helpful comments, and also Richard Breheny and David Adger for discussing the semantic analysis with me. I also thank my parents for their support, financial and otherwise. Comments can be mailed to the author at: jonathan.white@ucl.ac.uk.

them will be shown to favour my approach. I shall conclude by considering a possible semantic analysis of Result clauses, which will also demonstrate the advantages of my analysis. The general framework I am assuming is the Minimalist Program of Chomsky (1995), incorporating the restrictive theory of phrase structure of Barbiers (1995).

## 2 Selection properties of degree words

Following Abney (1987), I assume that the degree word *so* in (1) projects a Degree Phrase (DegP) and heads the sequence *so angry*, selecting the AP:



As Abney notes (p.299), not only APs but quantifiers like *much* and adverbials may be selected by degree words as well:

- (3) a. so/too much  
b. so/too many

- (4) a. so/too hungrily  
b. so/too quickly

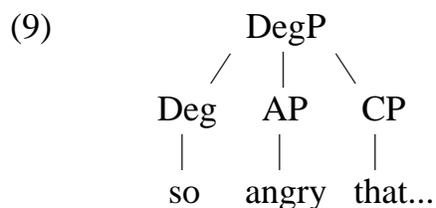
*Much*, etc. are treated as subclasses of adjective, with a two-way feature classification to distinguish each case.

A selection relationship also exists between the degree word and clause in (1), which has been demonstrated by both Abney and Baltin (1987). Particular items require a different value for finiteness for the clause, shown in (5)-(7); and, without a degree word, no clause is possible in (8):

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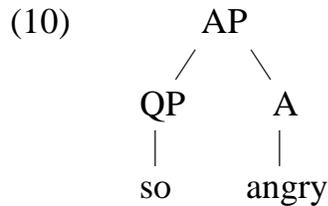
- (5) a. Mary was so sad that she cried.  
 b. \*Mary was so sad to cry.
- (6) a. Mary was too sad to cry.  
 b. \*Mary was too sad that she cried.
- (7) a. Mary was sad enough that she cried.  
 b. Mary was sad enough to cry.
- (8) a. \*Mary was sad that she cried.  
 b. \*Mary was sad to cry.

How should this selection relationship be instantiated structurally? Since Williams (1980),  $\theta$ -roles have been assumed to be assigned under sisterhood — a verb assigns a  $\theta$ -role to its complement, and the intermediate V' projection compositionally assigns a role to the Specifier which is sister to it. The simplest assumption we can make about selection by a functional category, to use Abney's (1987) term, like Degree is that it also holds through sisterhood. Abney proposed for this reason a ternary branching structure for the Degree Phrase in (1):

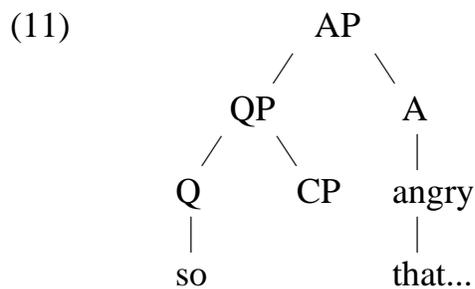


This is not a possible representation under current assumptions about binary branching (cf. Kayne 1984, 1994 and also Barbiers 1995), so we should consider a different approach.

Another analysis of Degree Phrases had them generated as a QP in the Specifier of the AP, etc. they modified (cf., for example, Jackendoff 1977):



A Result clause may be attached as the complement to the Q head, thus dealing with the selection data in (5)-(8):



Given that the Result clause surfaces to the right of *angry* in (1), the CP must then be extraposed from its position in (11), which will be obligatory since the following is ungrammatical:

(12) \*John was so [that we cannot talk to him] angry.

This could be done by moving the CP to the right. But I assume, following Kayne (1994) and Barbiers (1995), that rightward movement is impossible. Alternatively, we could follow the theories of extraposition in Guéron and May (1984) and Culicover and Rochemont (1990) in assuming that Result clauses are actually base-generated unattached to  $Q^0$  in (11), but are linked to it at LF. Their approaches involve right-adjunction to clausal nodes, but, as was the case with rightward movement, I assume that this is impossible. Even if this were a suitable attachment site for the Result clause, there is still the problem of coping with (5)-(8). Lowering the CP into the complement position of Q in (11) is also ruled out by Kayne, etc. The theories of Guéron and May, and Culicover and Rochemont are predicated on the assumption that selection relationships hold through government at LF. Given that lowering is impossible, the only other option is to raise  $Q^0$  into a government relation with the Result clause. The degree head *so* is independently assumed to have quantificational properties (Rouveret 1978), and therefore must raise to a scope position by LF. Thus, *so* is assumed to create the

necessary configuration to allow it to select the Result clause. But this approach violates the pervasive generalisation that selectional properties<sup>1</sup> of heads are satisfied in the root position of a head's chain (cf. Brody 1995 for discussion).

The most serious problem for extraposition-based accounts comes from the well-known fact that (13) is possible:

(13) Who was John too angry [to visit t]?

It has been noted before that extraposed constituents are opaque for extraction. This can be seen in the following from Guéron (1980):

- (14) a. Who did you read a book by last summer?  
 b. \*Who did you read a book last summer by?

(14b) is out because the PP is in an adjoined position. The same should also hold for (13). This, therefore, points towards an analysis that does not rely so heavily on extraposition. One such account is that in Baltin (1987).

### 3 Baltin's analysis

Let us consider the base structure Baltin proposes for the example in (15):

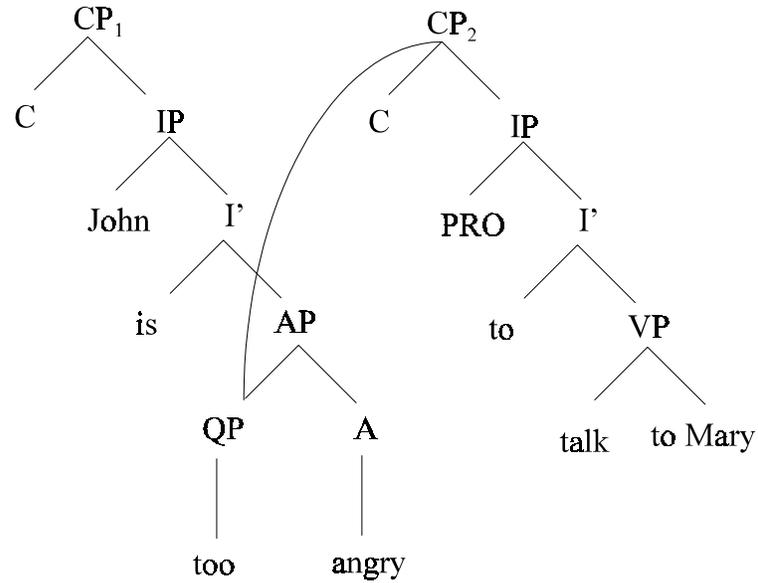
(15) John is [too angry to talk to Mary].

Baltin notes that two different structures appear to be necessary to account for all the properties of Result clauses. The first is the discontinuous constituency between the degree head and Result clause. This is shown in (16):

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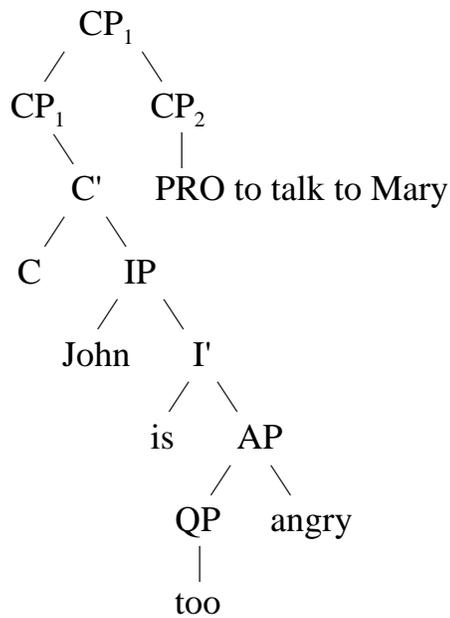
<sup>1</sup>As pointed out by Riça Manzini (p.c.), it is a moot point whether this generalisation is relevant in this regard. In particular, whether functional categories, which since Abney (1987) have been known to select differently from lexical heads, should be covered by it. This issue will not be covered in this paper, but I refer the reader to later work, e.g. White (in progress).

(16)



The other configuration is the one created by extraposing the Result clause (Baltin also acknowledges the need for an LF process checking the head-complement relation between *too* and CP<sub>2</sub>), and is shown below:

(17)



One possibility Baltin considers is of combining the two structures in (16) and (17), with the Result clause having two mother nodes. This is not possible under Barbiers' theory of phrase structure, but Baltin, in fact, rejects it for reasons which I will not go into here. He states (p.23) that the two structures are the locus of different principles of the grammar. The version in (16) is where thematic relations hold, and is where transformations operate from. In (17), though, we have the configuration where, for example, the binding theory applies.

There is evidence from the syntax of Result clauses against this dichotomy. The simplest data showing this is the following, where a polarity item in a Result clause is licensed by a negation in the matrix:

(18) John isn't too angry to see anyone.

I will follow here Progovac's (1994) account, where English negative polarity items are treated as anaphors. In order to make the theory work in cases like (18), the status of *anyone* as a quantifier is utilised. *Anyone* must raise by QR to a scope position, which will take it into the binding domain of the negation. (17) is the only representation where binding can take place, and raising there of *anyone* will be ruled out because it will not be to a c-commanding position.

Larson (1988a) provides several tests for c-command which he uses in his discussion of double object verbs, one of which I shall exploit:

(19) Each worker<sub>i</sub> was too partisan [for the other<sub>i</sub> to be convinced].

Larson points out that, for binding to be possible in (19), *each worker* must c-command *the other*, and this would not hold if the structure was as in (17). An interesting example to add to this one is (20), which Baltin himself cites in favour of structure (17):

(20) \*They<sub>i</sub> were too partisan [for each other<sub>i</sub> to be convinced].

But if we compare this to (21), which contains a bound pronominal, it cannot be the case that *they* does not c-command the reciprocal in (20):

(21) Each worker<sub>i</sub> was too partisan [for him<sub>i</sub> to be convinced].

Since *him* can be bound by a matrix subject but *each other* cannot, we can conclude that

the Result clause is the binding domain for each one.

The c-command data seems to be contradicted by the following, where no Principle C violation results if we coindex a higher pronoun with an R-expression in a Result clause:

- (22) The teachers thought he<sub>i</sub> was too arrogant [for John<sub>i</sub> to be considered for the prize].

French also exhibits a similar effect in the following, from Rouveret (1978):

- (23) Jean croit qu' elle<sub>i</sub> était trop honnête pour que Marie<sub>i</sub> lui mente.  
 Jean believes that she was too honest that Marie to-him would lie.

But this data is not really convincing evidence against my analysis, since the unembedded example below is ruled out:

- (24) \*He<sub>i</sub> was too arrogant [for John<sub>i</sub> to be considered for the prize].

If *he* does not c-command *John* in (22), then surely it must not do so in (24) either. That being the case, why do we have a difference in grammaticality?<sup>2</sup>

The analysis of the data in (19)-(21) is given further support by the fact that the construction in (22) admits the same polarity item licensing and binding data as above:

- (25) a. The teachers thought John wasn't too arrogant to exclude anyone.  
 b. The teachers thought each worker<sub>i</sub> wasn't too arrogant to exclude the other<sub>i</sub>.

I will therefore leave (22) and (23) as problems.

An important fact for any theory of Degree Phrase structure is that extraction is possible from a PP-complement of the adjective, when that adjective's degree modifier selects a Result clause:

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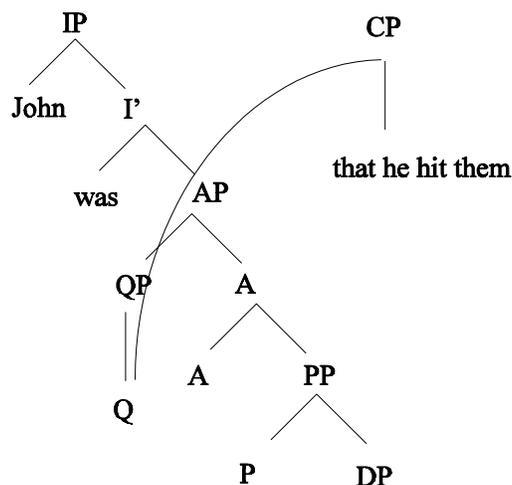
<sup>2</sup>It could be possibly be argued that this due to a pragmatic constraint on backward anaphora. For example, Williams (1994) notes that two types of constraint have been argued for. One is that there must be a previous discourse antecedent; the other, that the pronoun must appear in a clause that is subordinate to the antecedent. In (24), neither of these holds, so this is a possible explanation. However, the identical conditions hold with respect to (22), so this points towards a syntactic difference between them.

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(26) Who was John so [angry with t] [that he hit them]?

Baltin's account handles this fine. The base-generated structure, which would be the input to the *wh*-movement operation, is as follows:

(27)



Clearly, a PP-complement of A will be transparent for extraction here.

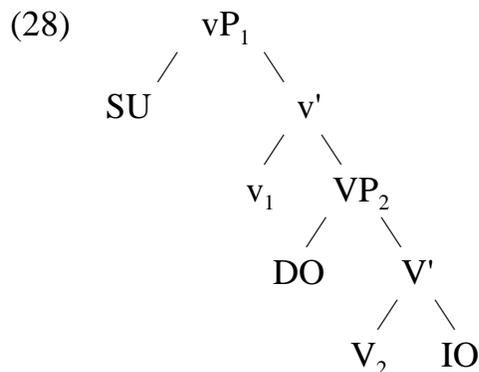
This now completes my critical look through previous theories of the structure of Result clauses. I have, I believe, demonstrated in these first sections that these analyses by Abney, Jackendoff and Baltin have many problems accounting for the data given. Let us now turn to my proposal.

#### 4 Shell structures

Recall again some assumptions I made earlier in this paper. The first was that the degree word projected a DegP, and directly selected for AP. The second was that Deg<sup>0</sup> also selected for the Result clause. Thus, we have to account for the fact that these degree heads select two categories. I have already pointed out in the second section of this paper that Abney assumed a ternary-branching structure. Given that this is not possible under Barbiers' (1995) phrase structure, let us consider an alternative.

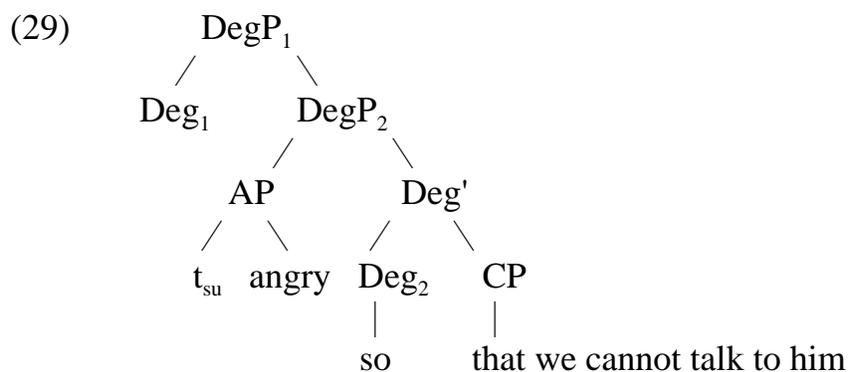
Larson (1988a) has proposed, on the basis of facts concerning c-command relationships between the internal arguments of double object verbs, that such VPs

should have the structure below:



The interpretation of Larson's proposal I assume is that the lexical item is inserted into  $V_2$  in (28), and then is raised to adjoin to  $v_1$ , a light verb which licenses the presence of SU.

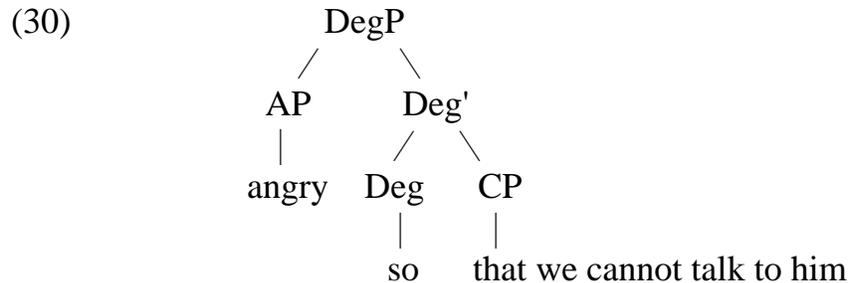
Just as a verb can have a shell which contains its arguments, a functional category, I assume, can project one containing the categories it selects. Let us consider the degree word in the first example, *so*, which selects an AP and a finite CP. I propose the following representation (although I assume Barbiers' 1995 analysis where Specifiers are adjoined categories, I will still use the traditional X' notation):



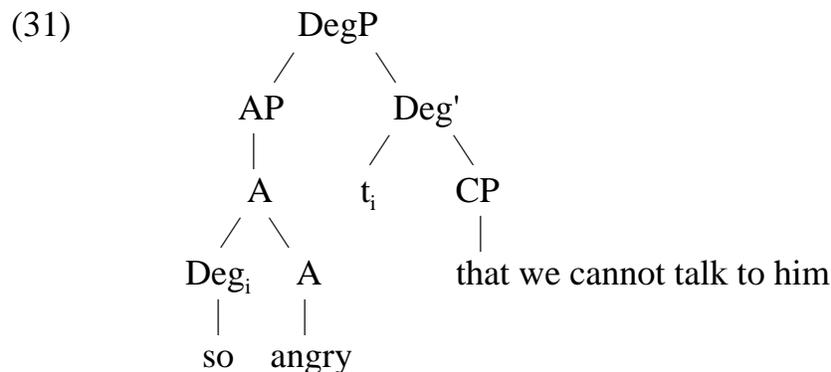
As occurs with  $V_2$  in the VP-shell in (28),  $Deg_2$  needs to raise to  $Deg_1$ . In order to get the required PF ordering of the adjective and degree word, this must take place overtly in the case of *so* in (29) and *too*. We also need to take into account *enough*, which is found after the adjective. I conclude from this that  $Deg_1$  can have either a strong or a weak feature. The version with the strong feature selects either *so* or *too*; and the weak one selects *enough*.

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Something I must do immediately is justify the presence of the projection of Deg<sub>1</sub> in (29). In other words, why can the structure not be (30), which equally well captures the selection data from section 2<sup>3</sup>?



We must determine how *so* ends up in front of *angry* in the surface string here. We could just raise it by head-movement to adjoin to *angry*, similar to what happens in the full shell approach:



But this is an illegitimate operation, with *so* not moving to a c-commanding position. A self-attachment operation with Deg<sup>0</sup> adjoining to DegP will be out, since it is not at all clear what property of Deg<sup>0</sup> could be satisfied by overtly adjoining to itself, and there is no plausible higher head that could host *so*. Syntactically, then, we have a problem with

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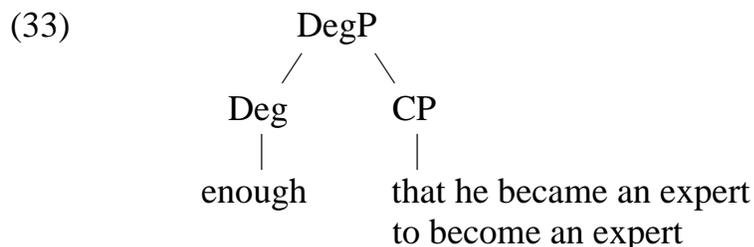
<sup>3</sup>Another point raised by Rita Manzini (p.c.) was that Deg<sub>1</sub> is really just a terminological device. We should ideally find some language where Deg<sub>1</sub> is spelled-out overtly. Theory-internally, there is also the problem that v<sub>1</sub> can be justified in a VP-shell semantically because it licenses the subject. Here, there is no category that appears in its Specifier. I acknowledge both these points as problems, but do not offer any solution to them.

deriving the correct word order if we assume (30) instead of (29).

A shell will not be required in all cases, of course, since there are situations where a degree head only selects a single category. Baltin cites the following examples with *enough* acting adverbially, and only subcategorising for a CP:

- (32) a. John worked on the problem [enough [that he became an expert]].  
 b. John worked on the problem [enough [to become an expert]].

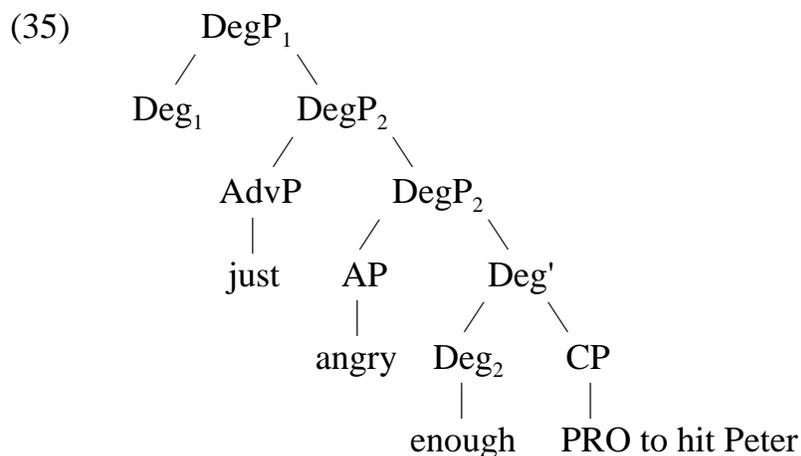
The simpler structure given below will suffice in these cases:



We also need to ascertain where adverbial modifiers of degree words are attached:

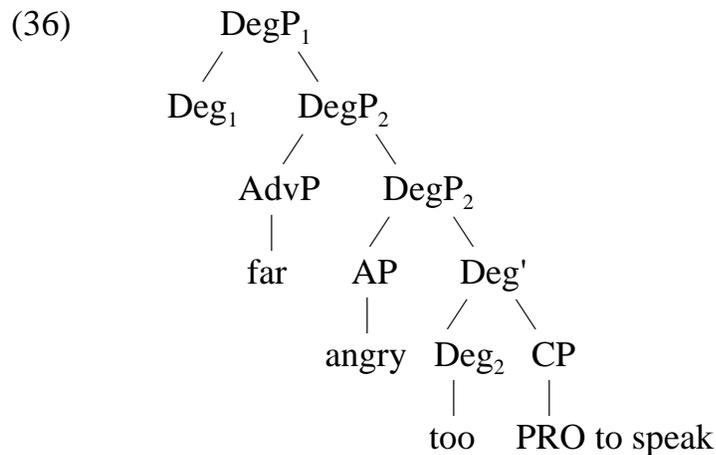
- (34) a. John is [far too angry [PRO to speak]].  
 b. John is [just angry enough [PRO to hit Peter]].

In the theory assumed so far, the simplest solution is that they are adjoined to  $\text{DegP}_2$  (Barbiers' phrase structure differs from Kayne's in that multiple left-adjunction to a category is possible):

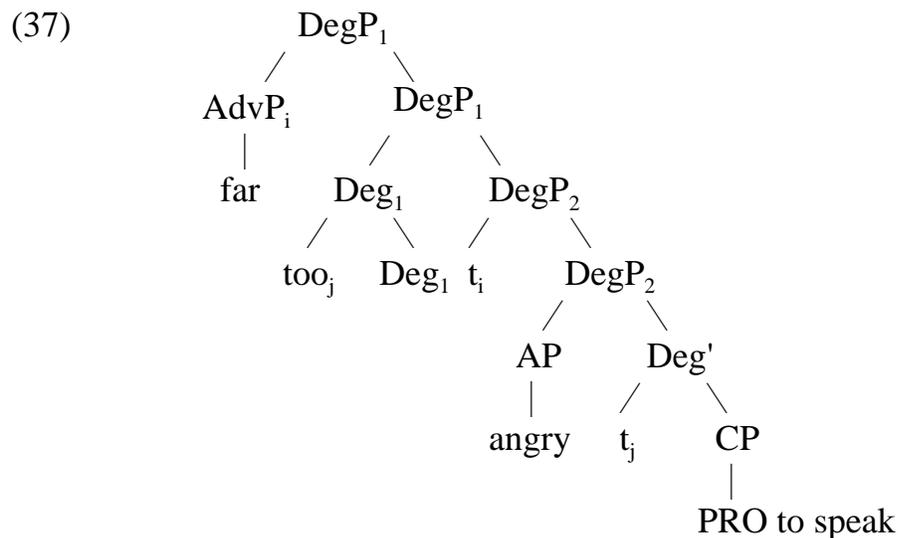


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Nothing more needs to be said here about (34b), but there is a problem with (34a), though. Consider the base-structure:



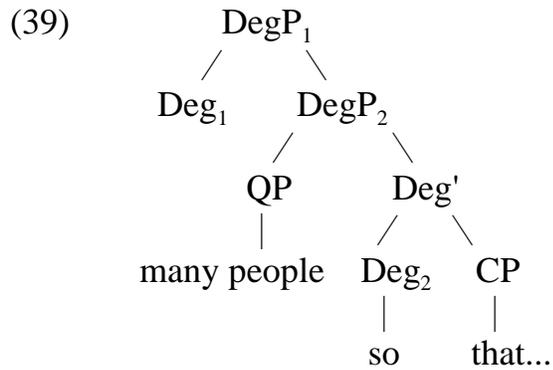
Clearly, some more movement needs to occur here to achieve the correct surface order. I have assumed that *too* raises overtly, and now we also need to assume that *far* raises as well, since it surfaces before the degree word:



Nominals as well as APs can be modified by degree words which select clauses:

(38) I saw [so many people [that I haven't been able to speak to them all]].

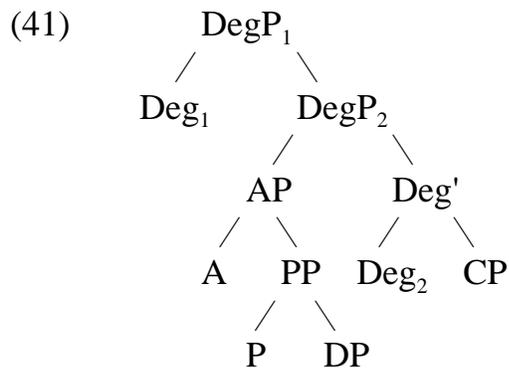
I assume the following structure, with a QP in place of the AP in (29):



Returning again to the cases where the PP-complement of an adjective is transparent for extraction, I repeat (26) as (40):

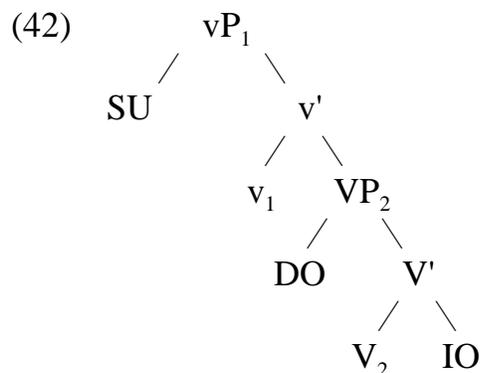
(40) Who was John so [angry with t] [that he hit them]?

In my Larsonian solution, the AP is a Specifier in the lower shell of DegP<sub>2</sub>:



This does seem to be a problem since Specifiers are usually assumed to be islands. But I do not believe this really is so. Consider the standard VP-shell structure again, repeated here as (42):

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We have a distinction in terms of extractability between the two Specifier positions in (42), viz.:

- (43) a. \*Who are there [pictures of t] hanging on the wall?  
 b. Who did you give [a picture of t] to Mary?

In a *Barriers*-type solution, this can be accounted for by assuming that  $v_1$  L-marks  $VP_2$  in (42), and thus renders DO transparent for extraction in (43b). The position of SU, though, will not be L-marked by  $I^0$ , or whatever functional category selects for  $VP_1$ . By analogy, then, we can say that  $Deg_1$  also renders AP transparent in (41), thus allowing (40). There is also the issue of how we allow the subject of the predicate AP to raise to check Case, but I will not go into this here.

This concludes the syntactic argumentation in favour of my approach to the structure of Result clauses. The final section of the paper will consider the semantics of this construction, which, I will argue, also favours my approach over the others already mentioned. Before I do this, though, I will just summarise the results of sections 2-4. I considered three previous approaches to this area. The first was from Abney (1987), and used the ternary branching structure (9). This was ruled out in principle, I assumed, because of current assumptions that phrase structure is only binary branching. Then I looked at Jackendoff's (1977) version, which base-generated the degree head as the Specifier of AP, (10), and the Result clause was the complement to that head, (11). I noted that an obligatory extraposition operation was needed to give the correct word-order. This, though, gave rise to many problems over recreating the head-complement link with  $Q^0$  (cf. p.3) and the fact that extraposed constituents are usually islands, which Result clauses are not. Finally, I turned to Baltin's version. He argued for two separate structures with the Result clause as the complement to Q in the Specifier of AP, (16), the

same as Jackendoff assumes, and adjoined at the clausal level, (17). The theory as stated could not cope with data relating to the c-command requirement between the matrix and Result clauses. My own proposal took Larson's shell analysis of VPs, and applied it to the case of DegPs. I demonstrated that the outer DegP projection was necessary, and, among other things, that we could account for extraction possibilities. Finally in this paper let us turn to a possible semantics of the Result clause construction.

## 5 Semantics

I aim to show in this section how semantic considerations favour my analysis, where the degree head selects both the AP and CP, over the others I have referred to above. The analysis, which is rather sketchy, is based on Klein's (1980) and Larson's (1988b) analysis of comparatives (cf. White in progress for further discussion on this). I am in agreement with Zwarts (1995) about the basic function of degree words in sequences like *so cold*. Zwarts assumes that adjectives may have a role in their argument structure, similar to the event role that verbs have, that indicates their 'gradeability', i.e. the amount to which some entity has the property denoted by the adjective. This role will, then, be bound by the degree head.

I will now briefly sketch out Klein's and Larson's analysis of comparatives to show the method I intend to employ in my approach to Result clauses. The typical comparative construction they consider is as below:

(44) John is angrier than Bill is.

They argue that the best way to consider the semantics of (44) is that there is a logical relation between the degree values of the matrix and comparative clause predicates. That is, we relate the degree to which John is angry to the degree to which Bill is angry. They translate this logically along the following lines (I am adjusting this somewhat to take account of Zwarts' suggestion, referred to above, that the gradeability role of *angry* is another argument of it):

(45)  $\exists d$  [angry(john,d) &  $\neg$ angry(bill,d)].

This means, then, that John is angry to some degree *d*, and Bill is not (I argue in White (in progress) that, in fact, this is an incorrect analysis, but it serves the purpose of introducing the method I am going to use below).

Let us now consider the cases of Result clauses. The first one I shall look at involves *so*:

(46) John was so cold that he left.

I follow Klein (1980) in assuming that these gradeable adjectives are interpreted in a 'fuzzy' way. The denotation of *cold* can be indicated as a continuum of 'cold'-ness, of which the entity predicated of it has a certain value. The situation in (46) is that John has a certain tolerance of cold, but that there is a certain level above which he cannot stand and must leave. This can be indicated in the following way, where the points on the line indicate certain degrees of 'cold'-ness from low to high:

(47)  $\leftarrow d_1 - d_2 - d_3 - d_4 \rightarrow$

Let us assume that  $d_3$  is John's tolerance level (this of course will be pragmatically defined). Thus, (46) means that, when John is cold to level  $d_3$  or higher, he has to leave. Putting it another way: at every point equal to or above  $d_3$  in (47), John is so cold that he must leave. A way of encoding this logically, pointed out to me by David Adger (p.c.), is as follows:<sup>4</sup>

(48)  $\forall d [(cold(john,d) \ \& \ d \geq C) \rightarrow \diamond \neg leave(john)].$

In this formula,  $d$  refers to the 'gradeability' role of the predicate *cold*, and  $C$  to the cut-off point on the continuum at which the consequent occurs, i.e.  $d_3$ . (48) can be read as: for every degree, if John is cold to that degree, and that degree is equal to or above the cut-off point, then John will leave. The meaning of (42) entails that the consequent *leave(john)* must be true, also clear from the fact that it cannot be contradicted:

(49) \*John was so cold that he left, but he didn't.

This is, of course, predicted by the use of the logical implication in (48). We can see that, semantically, Result clauses involve a logical relation between the degree value of some

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<sup>4</sup>There is also a causal link between the two arguments of the implication, in that John being cold must cause John's leaving. We can see where this breaks down in the example *?John was so cold that Peter left*.

predicate that results in the possibility of some proposition being true. The structure I have proposed, where the degree head selects both the predicate AP and proposition CP, clearly enables us to encode this syntactically. Jackendoff's and Baltin's approaches, on the other hand, only admit a selection relation between the degree word and CP, and assume that the degree head is in the Specifier of AP. Thus, we have a relation of modification between them. Zwarts (1992) argues (p.48) that, intuitively, we see the degree word as an operator which binds a restriction in a lexical predicate. Modification, on the other hand, involves a process of identification between two thematic positions. If we take a simple DP like *red book*, we can interpret this as 'x is a book, and x is red'. This is in no way the same process as that going on between Deg and A, and so theories that advocate such a relation will have serious problems. Abney's version, though, does, like mine, involve the degree word selecting both categories and would give us the correct reading. Of course, there are the syntactic problems with it which I noted in section 2. But, very clearly, we do get the right result from my proposal.

Let us now turn to the case of *too*:

(50) John was too cold to move.

This, like *so* above, also refers to every degree on the continuum in (47) above a certain point. It means something like: for every degree equal to or above a certain point, John might not move. The modality in the last sentence is correct, I believe, since we can contradict the Result clause here:

(51) John was too cold to move, but he did anyway.

Thus, the semantics for (50) will be:

(52)  $\forall d [(cold(john,d) \& dC) \rightarrow \diamond \neg move(john)]$ .

For every degree, if John is cold to that degree and that degree is equal to or above the cut-off point C, then John might not move.

Finally, we must consider the cases involving *enough*. Firstly, I will look at the infinitival version:

(53) John was warm enough to move.

This case is similar to the example of *too* above, in that the Result clause is only a

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possibility:

(54) John was warm enough to move, but he didn't.

But, conversely, it refers to a positive possibility, unlike to negative Result with *too*. Thus, I give the semantics of (53) as:

(55)  $\forall d [(warm(john,d) \& dC) \rightarrow \diamond move(john)]$ .

Lastly, we come to the finite case of *enough*:

(56) John was warm enough that he moved.

This is different from the infinitival (52), in that the Result cannot be contradicted:

(57) \*John was warm enough that he moved, but he didn't.

It appears, in fact, that this has the same semantics as *so*: for every degree, if John is warm to that degree and that degree is equal to or above the cut-off point C, then John will move (see (48) above). This does, of course, imply that there will only be a pragmatic difference between (56) and (46), but I will not comment on this prediction further at this time.

In conclusion, we can see, as a result of this discussion, that the semantics of each type of Result clause comprises a logical relation mediated by the degree word between the predicate syntactically represented (here) by AP and the Result clause. If we want to keep the close link between syntax and semantics inherent in the assumption that syntax projects an LF representation, there should also be a syntactic link between the AP and Result clause mediated by the degree head. This is clearly present in my analysis, but crucially is not in all other approaches except Abney's, a point I set out fully above, and will not repeat again. This does, then, provide extra evidence in favour of my approach.

## 6 Conclusion

My goal in this paper has been to argue that current assumptions about phrase structure make standard proposals about the structure of Degree Phrases that introduce Result

clauses redundant. I proposed that the data could best be accommodated if we assume that functional categories can project a shell structure, where the selected categories occupy the Specifier and complement positions in the lower shell. I have also attempted to show that the semantics of the Result clause construction under a framework where the degree value of an adjective is quantified also points towards the type of analysis I proposed earlier.

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