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Carlson's last puzzle; will it go the way of Fermat's last theorem?

Alexander Grosu and Fred Landman

Tel Aviv University

## 0. INTRODUCTION

In his seminal and pioneering study of degree relatives, Carlson (1977) noted two major types of environment that appeared to allow the CP-internal "relativized" nominal of a degree relative, but not that of a restrictive or appositive relative. These were: (i) environments with narrow-scope properties, and (ii) a null VP that has been elided under "antecedent-contained" conditions. The problem posed by (i) was elucidated to a significant extent by Carlson; subsequently, Heim (1987) offered a number of valuable refinements, and more recently, Grosu and Landman (1996) proposed a complete analysis of degree relatives and other constructions which went beyond Carlson and Heim in both breadth and depth. In contrast to (i), neither Carlson, nor Heim, nor (to the best of our knowledge) anyone else was able to shed any light on (ii). The purpose of this paper is to remedy this state of affairs by proposing a solution to (ii) which relies on central aspects of the analyses of (i) proposed in the studies cited above, and in particular in Grosu and Landman (op. cit.).

The paper is organized as follows. In section 1, we outline the major features of the analysis of degree relatives proposed in those earlier studies, as well as the kind of solution put forward in them with respect to the problems raised by facts of type (i). In section 2, we address the problems raised by facts of type (ii) and propose a solution to the specific problems noted by Carlson. In section 3, we extend the proposals of section 2 to other types of data, in particular, to appositive relativization and to VP-Deletion constructions that do not involve relative clauses. In section 4, we return to our analysis of degree relatives and point out a further empirical advantage of our approach.

## 1. BACKGROUND

Carlson (1977) observed that relativization into a variety of narrow-scope contexts is possible in English, provided that *wh*-pronouns are not used. The phenomenon is illustrated in (1) in relation to the presentational *there*-insertion context.

- (1) a. \*John and Mary, who there were -- at last night's party, are my best friends.  
 b. \*The students who there were -- at the party behaved rather unseemingly.  
 c. The students (that) there were -- at the party behaved rather unseemingly.

(1a) shows that appositive relativization, which in standard contemporary English **must** utilize *wh*-forms, is incompatible with the presentational context. (2a) shows that restrictive relativization, which **may** utilize *wh*-forms in English, is also incompatible with the context at issue when it utilizes such forms. (3a) shows that relativization out of that context is possible when no *wh*-form is used (the relative may be introduced by *that*, or exhibit no marker of subordination at all). Grosu and Landman's account of such facts, which was an adaptation of proposals made in Heim (1987), was essentially the following: at LF, the "gap" indicated by "--" must contain an individual variable bound by an existential operator (this is essentially Milsark's 1974 analysis of the *there*-construction). In appositives, the gap in question must be construed as a definite anaphoric pronoun, and in restrictives, as an individual variable bound by an abstraction operator with CP-scope. These two requirements cannot be satisfied simultaneously. That is, in the case of the appositive, the variable in the gap cannot both be definite and be bound by the existential operator; in the case of the restrictive, this variable cannot be bound both by the existential operator and by the abstraction operator. Hence, the infelicity of (1a,b). In (1c), a different strategy is available, which makes it possible to avoid a clash. Specifically, it may be assumed that the gap is filled at LF by a more complex object having essentially the form *d many students*, where *d* is a degree variable modifying the noun. This more complex object makes it possible to reconcile the narrow-scope requirements of the presentational context with the need to have an operator-binding configuration with CP scope in the following way: the individual variable is bound by an existential operator (on which the noun acts as a restrictor), and the degree variable is bound by an abstraction operator with relative-clause scope. - For the sake of completeness, we note that neither Carlson, nor Heim, nor Grosu and Landman had an interesting account of why degree relativization, in contrast to appositive or restrictive relativization, disallows *wh*-pronouns in English. We brought up this point, however, because it constitutes a useful diagnostic for identifying certain types of relatives (in particular, non-appositives with *wh* pronouns are necessarily restrictives).

Carlson and Heim assumed that degree relative clauses have the essential semantics of comparative clauses; thus, both types of clauses were assumed to designate a degree, in particular, the maximal element of the set of degrees designated by the lambda abstract. Grosu and Landman argued that this kind of analysis, while presumably appropriate for comparatives, is insufficient for degree relatives. Specifically, they argued that abstraction and subsequent "maximalization" must apply not just to degrees, but to ordered triples that consist of (a) a degree, (b) a plural individual whose cardinality is given by that degree, and (c) a sortal predicate (corresponding to the external head noun) which characterizes the plural individual. A corollary of this analysis is that CP defines a unique plural individual, with specific sortal and cardinality properties, so that the only role that the CP-external material in head position can play is a resumptive one. This modification of the Carlson-Heim analysis has the following advantages over its predecessors: (A) it correctly predicts that "subdeletion" is impossible in degree relatives (because the sortal must be "resumed"); (B) it correctly allows the entire construction to designate a plural individual, not just a degree (because the individual is a member of the maximal triple that constitutes the meaning of CP); (C) it correctly predicts that the class of external D(eterminer)s is restricted to definites and universals, as illustrated in (2) (weak or partitive D's violate resumptiveness); (D) it yields a reasonable account of the fact that degree relatives (in contrast to restrictives and appositives) may not iterate (stack), as shown in (3) (since the sortal and cardinality properties of the plural individual are fixed within CP, they cannot be independently specified within multiple CP's).

- (2) I took away {every, all the, those, the (three), #three, #many, #most}

books that there were -- on the desk.

- (3) The only sailor that there was on the boat (\*that there had been on the island)  
 died in the explosion.

To summarize, degree relativization is compatible with narrow-scope contexts because the individual variable may be narrowly bound and the degree variable may be widely bound. In contrast, restrictive relativization is incompatible with narrow-scope contexts because there is only an individual variable, which cannot be both narrowly and widely bound; appositive relativization is also incompatible with narrow-scope contexts, because the "relativized" nominal is a definite discourse anaphor, which necessarily has widest scope. These

distinctions have been demonstrated and justified in relation to the presentational *there* context, but comparable distinctions can be found in a variety of additional narrow-scope contexts, as partly illustrated in (4)-(7).

- (4) a. Every kilo {that, \*which} you put on -- increases the risk of a heart attack.  
 b. \*Two kilos that you put on -- increase the risk of a heart attack.
- (5) a. Every minute {that, \*which} the movie lasted -- past midnight increased my discomfort.  
 b. \*Two minutes that the movie lasted -- past midnight increased my discomfort.
- (6) a. John is almost the doctor {that, \*who, \*which} his father was -- .  
 b. \*John is almost a doctor that his father was -- .
- (7) a. Every time {that, \*which} the bell rang --, I opened the door.  
 b. \*Three times that the bell rang --, I opened the door.

Furthermore, the semantic category of degree relatives finds realization not only in the form of overtly headed relatives with an internal "gap", but also in a number of additional external forms, for example, as free relatives, which, as Grosu and Landman (1996) argue, have an overt CP-internal "relativized" nominal (the *wh*-phrase) and null CP-external resumptive material; we will make some use of free relatives below.

## 2. CARLSON'S PUZZLE

In the preceding section, we summarized the major points of Grosu and Landman's solution to data of type (i). In this section, we take up Carlson's data of type (ii). An illustrative paradigm is provided in (8).

- (8) a. Marv put everything {\*which, that, Ø} he could -- in his pocket.  
 b. Marv put {everything, (all) the things, the three, \*three/\*few/\*most things} he could -- in his pocket.

The infelicity of *which* and of weak or partitive D's shows plainly that restrictive relativization is here excluded. The exclusion appears to be due not to a narrow-scope context for the "relativized" nominal, as in (1), but rather to the fact that this nominal is a proper subpart of an elided VP, which moreover has arisen due to antecedent-contained deletion (ACD); this, in any event, was Carlson's characterization of the phenomenon.

One reason why this phenomenon seemed mysterious (to Carlson) is, we submit, that the characterization just provided is incorrect. As shown in (9), restrictive relativization, forced by the weak D's, is possible under the two conditions identified by Carlson, that is, (I) proper containment of the "relativized" nominal within an elided VP, and (II) ACD.

- (9) a. Bob kissed {many, three, most} girls that his brother  
 {**didn't, wouldn't, refused to**} -- .  
 b. John has read quite a few books that Mary **also** has -- .  
 c. This chap can do {many, quite a few} things that no **other**  
 individual {can, could, would} -- .  
 d. The president is reluctant to take steps which, in his view,  
 only **God** {may, should, ought to} -- .  
 e. Due to his injury, Bob is unable to lift several objects  
 that he once **effortlessly** could -- .

One thing that distinguishes the data in (9) from those in (8) is that the relative clauses in the former, but not in the latter, contain an instance of **sentence stress with focus import**. We will argue in what follows that this property, but not Carlson's (I)-(II), needs to be appealed to in constructing an explanatory account of the contrasts in (8).

Cinque (1993), building on earlier studies, shows that sentence stress may arise in virtue of the application of mechanical procedures (which, essentially, cyclically reinforce certain instances of lexical stress). Such instances of sentence stress may be used to express focus (essentially, an informational choice out of a number of conceivable alternatives; Rooth 1992); at the same time, focus may also be expressed by stressing some item that does not receive stress in the manner just noted, either because the item in question is not in a structural position that leads to sentence stress (through cyclic reinforcement of lexical stress), or because it lacks lexical stress altogether. Reinhart (to appear) argues that the latter way of conveying focus import is "marked" and that the former is "unmarked". Now, observe that the relatives in (8) consist of a pronoun and an auxiliary, neither of which carries lexical stress; accordingly, unmarked sentence stress cannot be assigned within the relative; furthermore, the discourse context does not seem to license marked stress on any of these two items (in particular, there seems to be no obvious grounds for construing them as contrasted with



anything else); accordingly, the relative CP's cannot include a focus. In contrast, the relative CP's in (9) all include a stressable item, and thus a possible focus (the items in boldface script). In (9b, e), stress is assigned in virtue of the unmarked procedure, and in the remaining subcases of (9), stress is of the marked variety (see Cinque *op. cit.* for justification of this point). This distinction is not, however, of particular importance here; what matters is that the relatives in (9), but not those in (8), include a focus.

What has just been said suggests that something like (10) is a more adequate descriptive generalization than Carlson's conjunction of (I) and (II).

(10) DR's need not contain a focus; restrictive relatives must.

In fact, (10) yields better empirical predictions not only with respect to data like (9), but also with respect to data like (11), which do not involve ACD, and thus fall outside the predictions made by Carlson's conjunction of (I) and (II).

- (11) a. #A boy who loves Mary hit a boy who does -- .  
 b. A boy who loves Mary hit a boy who **doesn't** -- .  
 c. A boy who loves May hit a man who **also** does -- .

At the same time, (10) does as well as (I)-(II) in respect to data like (12), where VP-Deletion has not applied (note that the overt VP includes stressable items).

(12) Marv put in his trunk three things which he could {fit **in**, **put** there}.

There is only one type of data known to us with respect to which (10) appears to be too strong as it stands. As shown in (13), restrictive relatives may fail to exhibit a focus when they fall entirely within the defocused portion of a focus construction.

(13) A boy who loves Mary hit {a **girl**, **another** boy} who does -- .

We have thus seen that, with the exception of cases like (13), (10) appears to express a true generalization. We will now attempt to derive this generalization from deeper considerations. As a preliminary to this enterprise, let us take a look at some basic (and minimally controversial) properties of focus constructions. A focus construction is a linguistic constituent, contained within a single illocutionary unit, and which is (minimally) partitioned in the following way: Intonationally, there is a peak (a bearer of sentence stress) and a string of deaccented and/or deleted material; informationally, (some constituent that properly contains) the bearer of sentence stress is construed as focus, and the deaccented/deleted

remnant of the partitioned constituent is construed as "focus-related topic" (Tancredi 1992). The import of "focus-related topic" is, roughly, "topic whose content is determined by the discourse context of the focus construction."

Turning now to the problem at hand, we begin with a consideration of restrictive relatives. The standard position on the semantics of restrictive CP's is that they are predicates formed by abstraction over an individual variable, the quantificational, cardinality and/or sortal properties of the set thus defined being ultimately determined by material **external** to CP (the D and NP in head position). In constructions where the CP-internal variable and the abstraction operator that binds it are unambiguously associated with the "relativized" element -- a state of affairs found, for example, when there is an extraction chain headed by a wh-pronoun or null operator -- we may expect the "relativized" element, in particular, a wh-pronoun, to be unable to function as a focus, since the ultimate binding of the variable by a CP-external D excludes a set of alternative construals for the relativized element, and thus a necessary condition for focus. This prediction is confirmed by the deviant version of (14), in which a contrastive focus construal for a wh-pronoun is attempted.

(14) This is the fellow whose **mother** I like, and that is the fellow  
 {whose **father**, \***whom**} I like.

It emerges from the above that restrictive relativization imposes a semantic partition on a relative clause, in particular, a partition into an element whose value is externally fixed and a "remainder" which is predicated of it. We wish to suggest that the "unmarked" state of affairs is for this semantic partition to induce a corresponding informational partition such that the "relativized" element is construed as a focus-related topic, and the remainder of the relative, as an **informative** comment on it, which must therefore include a focus (compare this proposal with the view of unmarkedness in Reinhart, to appear). If this conclusion is on the right track, the infelicity of the starred versions of (8) and (11) is predicted, since the "remainder" of the various relatives includes no focus.

As is well known, marked focus partitions are possible, if licensed by the discourse context. In (13), the marked contrastive stress pattern forces an informational partition of the entire sentence which places all of the two relative clauses within the focus-related topic. Crucially, this partition is consistent with the structurally imposed requirement that the wh-pronouns not

be foci. Since marked informational partitions win over unmarked ones, the "remainder" of the two relatives need not contain a focus. The felicity of (13) is thus unproblematic.

Turning now to degree relatives, recall that the content of the "relativized" nominal is wholly determined within CP. Therefore, no subelement of a degree relative (necessarily) has its content determined CP-externally. If so, there is no reason to expect that degree relatives should induce (unmarked) informational partitions of any kind. And in fact, both the "relativized" nominal and the "remainder" of a degree relative are free to contain or not contain a focus. We illustrate this state of affairs in relation to free relatives, which, as noted in section 1, are also maximalizing constructions; we utilize them, rather than Carlson's kind of degree relatives, because their "relativized" nominal is overt, and thus stressable.

(15) a. John took away [what there was on the desk].

b. Please send to Mary [what I brought up], not [whom I brought up].

c. I will send [what I can] to your relatives.

(15a-c) show, respectively, that a focus may occur within the "remainder" of CP, on the "relativized" element, or not within CP at all. This last option is exactly parallel to the felicitous versions of (8). Putting it together with what has been said about restrictive relatives, we have in effect provided an account of the contrasts in (8), and thus, a solution to "Carlson's puzzle."

Before concluding this section, we would like to briefly return to our characterization of extraction chains in restrictive relatives as **necessary** structural counterparts of the operation of abstraction over an individual variable. In relatives with resumptive pronouns, the latter is a **typical**, but not a **necessary** reflection of the individual variable, since the latter may be pragmatically implied, as illustrated by the colloquial English example in (16) (adapted from Akmajian and Kitagawa 1976).

(16) This is the kind of car that the carburettor never works properly.

If so, we may expect what appear to be resumptive pronouns to allow a (contrastive) focus construal. The Hebrew example in (17) and its English translation illustrate this possibility.

(17) Ze ha-baxur še ani ohev et axoto, ve ze ha-baxur še ani ohev oto.

"This is the boy (such) that I like his sister, and that's the boy (such) that I like him."

### 1. APPOSITIVE RELATIVES AND OTHER CONSTRUCTIONS

While Carlson did not directly discuss the possibility of ACD "into" appositive relatives, later writers, in particular, May (1985), ruled out this possibility (on grounds that need not concern us here), and sought support in infelicitous data like (18a).

(18) a. \*Dulles suspected Philby, who Angleton did --.

b. Dulles suspected Philby, who, incidentally, Angleton did -- as well.

c. Dulles suspected Philby, who Angleton, incidentally, **didn't**.

But Hornstein (1994) observes that the operation at issue is sometimes permitted, and illustrates this option with (18b); we provide an additional illustration in (18c). Now, Hornstein was unable to provide an explanation for the contrast in felicity between (18a) and (18b). We will show that this contrast yields to a natural extension of the account we provided with respect to Carlson's puzzle.

To begin with, observe that the "remainder" of the relative in (18a) does not include a possible focus. Thus, marked (contrastive) stress is not obviously licensed by the context, and unmarked stress is not possible either, because (i) it is not assignable to subjects (Cinque 1993), and (ii) the auxiliary carries no lexical stress. In (18b-c), on the other hand, sentence stress can fall on the boldfaced items, so that the CP "remainder" may include a focus. Are there grounds for assuming an informational partition of appositives along the lines that we proposed for restrictives? As far as we can see, the grounds for doing so are even more immediate than in the previously considered case. Uncontroversially, appositive relatives are declarative illocutionary units, in which the chain headed by the *wh*-phrase is a discourse anaphor whose content is externally fixed by its antecedent. It seems equally uncontroversial that a declarative illocutionary construction must be informative, and thus contain a focus. Since the *wh*-phrase has its content externally fixed, it can only be construed as focus-related

topic; this assumption is supported by the data in (19), which are entirely parallel to those in (14).

- (19) This is John, whose **brother** I like, and this is Bill,  
{whose **sister**, \***whom**} I like.

The focus can thus only be contained within the "remainder"; the absence/presence of a focus in (18a)/(18b-c) can thus be viewed as responsible for the observed contrasts in acceptability.

Note that, since appositives are illocutionary units, the informational partition just proposed is a necessity, not merely an unmarked state of affairs. Given the impossibility of a focus construction that cuts across illocutionary boundaries, appositives that fail to contain a focus cannot be "salvaged" by the kind of strategy employed in (13), as shown by the infelicity of (20a). The only way that we can see to salvage such data is to ensure that the relatives themselves contain foci, as is the case, for example, in (20b).

- (20) a. \***John**, who loves Mary, hates **Bill**, who does.  
b. John, who loves Mary, hates **Bill**, who **doesn't**.

The kind of account that we have offered with respect to the contrasts in (8) and (18) can easily be extended to VP-Deletion data that do not concern relative clauses, and which, to the best of our knowledge, have not been satisfactorily explained so far. Thus, consider the contrast in felicity between the reduced version of (21a) on the one hand and the full version of (21a) and (21b) on the other.

- (21) a. John went to Paris, and Mary did --, \*(**too**).  
b. John went to Paris because **Mary** did --.

In (21a), the second conjunct is a declarative illocutionary unit, and must contain a focus. This requirement is not satisfied by the reduced version, because **Mary** is not a possible target of unmarked sentence stress, and is not naturally contrastible with **John**, either. The full version, however, does contain a possible focus, and so does the adverbial clause in (21b), since **Mary** is construable as contrasted with **John**. - We provide in (22) a comparable set of data, in which the sentences with elided VP's are independent discourse sentences.

- (22) a. John picked up a book. \*Later on, he did --.  
b. John picked up a book. Later on, he did -- **again**.  
c. John did not do his homework on Monday. On Tuesday, he **did** --.  
d. John did not burn that paper. **Mary** did --.

#### 4. TYPING UP ONE LOOSE END

The contributory part of this paper has addressed only facts of type (ii) (see Introduction). In this last section, we address one fact of type (i) which was not discussed in Grosu and Landman (1996). We will show that their modification of the Carlson-Heim analysis yields a straightforward account of the fact in question.

Recall (from section 1) that Carlson-Heim attributed to degree relatives the essential semantics of comparatives; in particular, they assumed that such constructions can only designate **degrees**, but not **individuals**. Grosu and Landman, however, pointed out that this view of degree relatives is too restrictive, and showed that degree relatives can also designate individuals; illustrations of this option are the data in (23), which imply that Bob took away the very books that there were on the desk, not just some set of books with equal cardinality.

- (23) a. Bob took away [the few books that there were -- on the desk].  
b. Bob took away [every book that there was-- on the desk].

To allow for this option, Grosu and Landman proposed that the meaning of relative CP's like those in (23) must be an ordered triple, one of whose members is a plural individual (see section 1 for more details). A consequence of this move is to make the plural individual (**and** its atoms) available for further semantic manipulation; for example, the plural individual can be used in constructing a referent for the bracketed constituent in (23a), and its atoms can be used for universal quantification at the DP-level in (23b) (see Grosu and Landman for details).

An additional prediction of the proposal just noted is that the plural individual and its atoms should be able to interact with operators that take scope over them. In contrast, Carlson specifically assumed that such interaction is not possible, and maintained (in his section 2.4) that data like (24) support his assumption.



(24) a. Max ate everything {which, that} would fit in his pocket.

b. Max put everything he could -- in his pocket.

Thus, he claimed that the version of (24a) with *which* can only mean that Max tried to fit all the edible things (within the universe of discourse) *one by one* in his pocket and then ate all those that had fitted in his pocket *individually*; the version with *that*, on the other hand, is claimed to allow a reading which limits Max to eating just the set of objects that fit in his pocket *together*. (24b), which is necessarily a degree construction (see section 2), was claimed to allow only the latter type of reading, that is, one on which Max put in his pocket just the set of objects which together correspond to the maximal capacity of his pocket. Carlson proposed that these (presumed) facts follow from the assumption that only a cardinality, but not the atoms of a plural individual, are in the scope of the corresponding modals in (24a-b).

As implied by the parenthesized qualification in the preceding sentence, we view Carlson's claims as factually incorrect. This is perhaps hard to detect in relation to the data in (24), and for the following reasons. Since *that* relatives can be either degree relatives or restrictives, the fact that the version of (24a) with *that* has a distributive reading can in principle be a property of just the restrictive construal. In (24b), where the relative is unambiguously a degree relative, the practical impossibility of exceeding the capacity of one's pocket by putting into it all the objects that could fit in it one at a time is an obscuring factor.

Before tackling Carlson's example (24b) directly, we will first discuss a clearer case, that of free relatives. Free relatives, which are necessarily maximalizing constructions, allow the missing reading readily.

The data in (25a-b), which are parallel to (1c) and the felicitous versions of (8) respectively, show that free relatives *can* be of the maximalizing type; (25c), which is parallel to (3), shows that they *must* have this status.

(25) a. Bob took away whatever (objects) there {was, were} -- on the desk.

b. John put what(ever) he could -- in his pocket.

c. What(ever) John buys (\*what(ever) he gives to Mary)  
is invariably expensive.

Now, consider (26).

(26) John took away whatever (books) he could fit in a particular mold.

We submit that this sentence allows a reading on which the books were individually checked against the mold.

Finally, we come back to Carlson's degree relative in (24b). While we agree that, for reasons already mentioned, in out of the blue situations, a distributive reading is hard to get for (24b), this reading does emerge when we put (24b) (substituting *book* for *thing*) in an appropriate context, as, for example, in (27).

(27) In the game show, Max was presented with a pile of books, some of which  
were small enough to fit in his pocket, while others were too big. He worked  
as hard as he could, and within the time limit, he put, one after another,  
every book he could in his pocket.

This shows that the atoms of the plural individual can be distributed over by the modal, confirming the predictions of Grosu and Landman's modification of Carlson's analysis.

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