Amount Relatives and the Presuppositional/Cardinal Distinction

Amount Relatives and the Presuppositional/Cardinal Distinction

Victoria Tredinnick

University of Pennsylvania

In this paper I propose a reanalysis of the amount relative, as first described in Carlson (1977a). The framework of Diesing (1992) provides the inspiration for the present analysis, under which amount relatives are restrictive relatives that are headed by a presuppositional NP. In particular I argue that the amount reading arises when there is more than one quantifier in the NP that contains the relative clause and when the denotation of an operator-variable pair associated with the head of the relative clause is mapped onto the restrictive clause of the second quantifier.

1. The amount relative reading

Carlson describes a type of relative clause which he terms the "amount relative".[1] An ordinary restrictive relative is given in (1). Sentences which contain relatives that are ambiguous between restrictive and amount readings are given in (2). The sentences in (3) have only the amount reading.[2]

(1) a. Huey put [everything which e was red] in his crib. (*AR/RR)
b. Max threw out [everything that e was old] (*AR/RR)

(2) a. Max put [everything/all/what he could e] in his pocket. (AR/RR)
b. Max threw out [the/those things that he could e] (AR/RR)

(3) a. This piano weighs [every pound that they said it would e] (AR/*RR)
b. [Any men there were e on the life raft] died.OB (AR/*RR)

[1] I wish to stress that much of the data and empirical observations in this paper were first noted by Carlson.

[2] The AR reading is most evident in antecedent-contained deletion contexts (in (2) and (3a)) and in *there*-insertion contexts (in (3b)). Most examples of ARs in this paper are therefore of one of these two types.

Amount relatives (ARs) contrast with ordinary restrictive relatives (RRs) in a number of ways which will be detailed throughout the paper.[3] First, they have truth-conditionally distinct interpretations [Carlson 1977a]. The RR in (1a) has the interpretation in (4), but the AR in (2a) does not have the corresponding interpretation in (5).

(4) $\forall x$ [x was red $\rightarrow$ Huey put x in his crib] (RR)

(5) $\forall x$ [Max could put x in his pocket $\rightarrow$ Max put x in his pocket] ($\neq$ AR)

The exact nature of the logical form that I am proposing for the ARs in (2) and (3) will be introduced in a later section. For now, it is enough to see that the interpretations of ARs and RRs are distinct.

According to Carlson, the amount relative in (2a) "is a statement about Max's being able to put a certain number of things in his pocket, and not a statement about each particular object in the area that is able to be put in his pocket. So [(2a)] makes the claim that the whole of that number or amount of things were placed as specified" [p.529]. The AR reading excludes a nonsensical scenario such as the one where Max put more marbles in his pocket than his pocket could hold; it also excludes the case where Max put each thing into his pocket individually and removed it immediately, such that the pocket would never become full. Both of these correspond to the RR reading of (2a), which is a statement about each object in the area.

In contrast, the restrictive relative in (1a) can only be understood to be a statement about each red object in the area; it has no AR reading. Thus (1a) is false if there is some red object which is not in the crib, whereas (2a) is not necessarily false in the case where there is, say, a marble which is not in Max's pocket. All that is necessary under the amount reading is that Max's pocket be full or otherwise contain all that it can given the circumstances (e.g., taking into account time limitations, Max's ability to stuff his pockets, the strength of the pocket material, etc.).[4]

Like the contrast between the RR in (1a) and the AR reading of (2a), the contrast between the two readings of (2a) is also a truth-conditional one. The RR reading of (2a) is false if there is some thing which Max could put in his pocket which is not in his pocket, say, a marble. As noted, the AR reading of (2a) does not result in a false statement as long as the pocket contains some amount such that that amount could be put in the pocket. Similarly, (1b) must be false if there is some old thing that was not thrown out. On the AR reading (2b) is not necessarily false if there is some thing Max could throw out that was not thrown out.

It is the thesis of this paper that the AR reading arises when the operator-variable pair associated with the head of the relative clause forms the restrictor for another operator,

[3]Though both are restrictive relatives, I reserve the term "restrictive relative" for the ordinary restrictive reading and "amount relative" for the amount reading.

[4]It should be noted here that the modal *could* will always be interpreted with respect to some sort of constraint given by the context. The modal possibility in (2a) could be interpreted with respect to things of a size small enough to fit into Max's pocket, with respect to things he was dexterous enough to handle, etc. Given a certain ordering source (as determined by the "conversational background" of Kratzer (1991)), it may describe deontic possibility – as for instance in the case where Max was allowed to put into his pocket only those things which he owned.

Constraints on the interpretation of the possibility operator associated with *could* are thus present even on the RR reading. However, on the AR reading the restriction on the possibility operator is explicity provided by the amount described by the relative clause, as will be argued below. Further, this restriction is of the sort that is consistent only with a "circumstantial" modal base (again, as determined by the conversational background) – that is, where Max is able to put things in his pockets only so far as allowed by present circumstances: time limitations, strength of the pocket material, etc.

such as the possibility operator associated with *could* in (2). This is tied directly to the presuppositional nature of the NP in question and the fact that it raises at LF to form a restrictive clause to accommodate an existential presupposition. On the RR reading, the universal quantifier takes wide scope with respect to the possibility operator. To this end, note that the ARs in (3) also contain a quantifier in addition to the one associated with the NP head. In the case of (3a) it is the modal necessity operator and in (3b) it is the existential operator.[5] Finally, note that the RRs in (1) contain only one quantifier, the one associated with the head of the relative. For this reason the AR reading is unavailable in (1).

Carlson notes that his analysis predicts that both AR and RR readings are available in (1), but that they yield equivalent interpretations. Under the present account, both readings are available only insofar as there is another operator available (existential, possibility, etc.) to provide the AR reading. Thus the following minimal pair:

(6) a. Max ate everything that would fit in his pocket. (AR/RR)
    b. Max ate everything that fit in his pocket. (*AR/RR)

Only (6a) has a reading under which some things that were small enough to fit into Max's pocket were in fact not eaten (the AR reading). Similarly with (7):[6]

(7) a. You may eat everything that will fit in your pocket. (AR/RR)
    b. You may eat everything that fits in your pocket. (*AR/RR)

Only (7a) has a reading under which the amount of things you may eat is limited to the size of your pocket (the AR reading). On the RR readings, both sentences in (7) allow you to eat everything such that that thing will fit in your pocket.

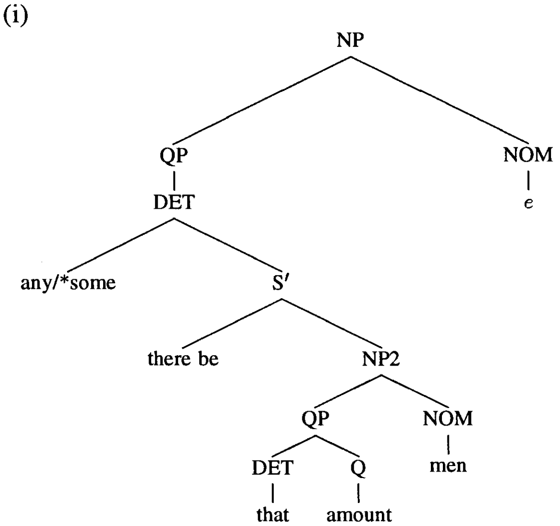
Carlson (1977a) gives a purely syntactic analysis in terms of construction-specific transformations from which the various properties of ARs can be made to follow.[7] Under his analysis, RRs are structurally distinct from ARs and are in fact more closely related in form to the comparative construction, as it was understood at that time. I propose an

[5] RR readings are ruled out here for independent reasons which will be discussed in sections 5 and 4, respectively.

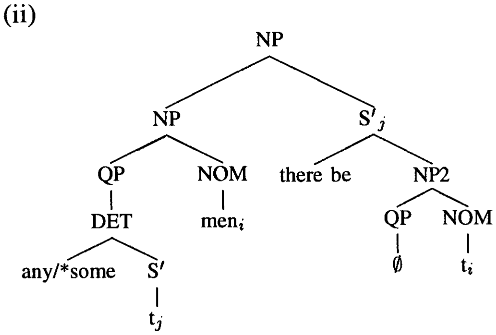
[6] Here I am treating *will* as a modal and not a tense marker.

[7] That is, an amount relative such as *any men there were* starts out looking like (i). Then "the QP in NP2 is deleted, the NOM of NP2 is raised into head position, and the relative clause under the DET is extraposed to the end of the NP" [p.524], resulting in (ii).

(i)



(ii)



analysis that follows from more general principles of the syntax and semantics, taking as basic the Mapping Hypothesis of Diesing (1992). Before going on, however, I would like to make clear certain aspects of the framework assumed here.

2. Notation and assumptions

The contrast between cardinal and presuppositional NPs (where the strong NPs of Milsark (1977) are presuppositional and the weak NPs are ambiguous between cardinal and presuppositional readings) is syntactically represented in Diesing's (1992) framework in terms of whether the NP remains in the VP and receives existential closure (in the case of cardinal NPs) or undergoes QR and is interpreted with a restrictive clause (in the case of presuppositional NPs). Thus the interpretation of the subject NP in (8) involves some set of cows that is presupposed to exist. The subject NP in (9) does not. Instead, the existence of three cows is merely asserted.

(8) Most cows are eating grass.
(9) Three cows are eating grass.

This is explained within Diesing's framework by the fact that the presuppositional NP *most cows* raises out of the VP via QR, forming a restrictive clause and thereby triggering presupposition accommodation. The cardinal NP *three cows* remains inside the VP, where it undergoes existential closure.[8]

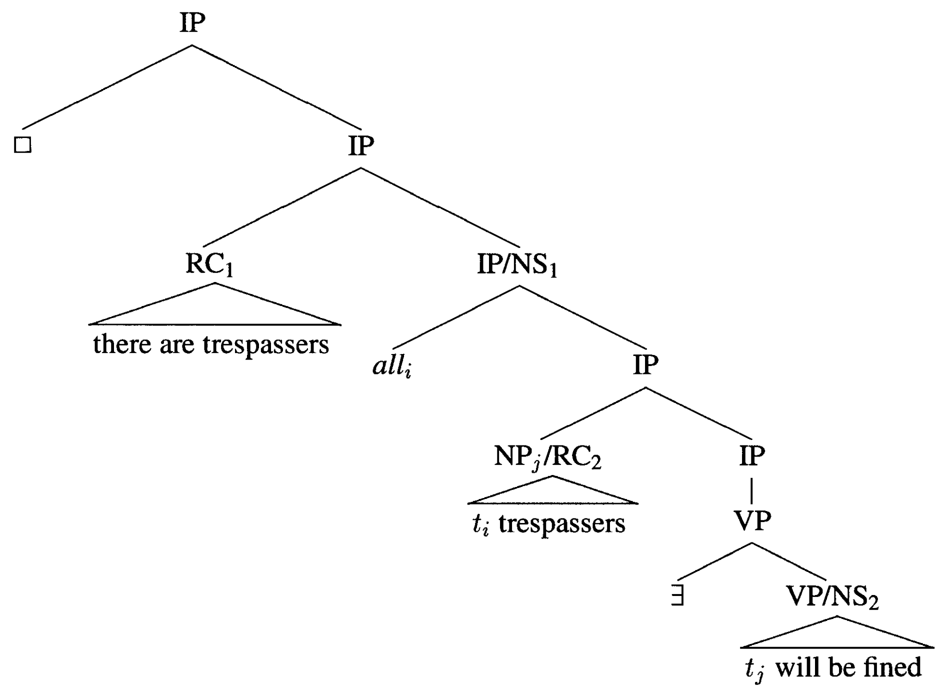
The logical representations used in this paper are to be interpreted in the following manner. All quantifiers take a restrictive clause (RC) and have a nuclear scope (NS). The RC identifies the set over which the quantifier ranges; the NS contains the properties which hold of the entities thus picked out. A tripartite logical structure is read off the syntax according to the Mapping Hypothesis, wherein material outside the VP is mapped onto the RC and material inside the VP is mapped onto the NS. A more complicated example is given in (10) [adapted from Diesing].

(10) a. All trespassers will be fined.
b. $\Box$ [RC_1 there are trespassers] [NS_1 $\forall x$ [RC_2 x is a trespasser] [NS_2 x will be fined]]
"Necessarily (insofar as there are trespassers), all x such that x is a trespasser will be fined."

The relation of the logical representation in (10b) to the syntax is shown in the LF given in (11).

[8] Diesing's analysis assumes that the subjects of stage-level predicates originate VP-internally.

(11) LF:



The necessity operator □, associated with *will*, undergoes QR to a position adjoined to IP (following Heim (1982)). It has in its restrictive clause (RC_1) an existential presupposition on trespassers. This is Diesing's "presupposition accommodation", which constitutes the restriction on the modal operator. The rest of the sentence forms its nuclear scope (NS_1), which contains the tripartite structure associated with the universal quantifier *all*. The presuppositional NP *all trespassers* also undergoes QR to form a restrictive clause (RC_2). In the case of *all trespassers*, QR corresponds to NP-raising followed by Det-raising (with adjunction to IP in both cases). The material left behind in the VP forms the nuclear scope (NS_2). Any free variables left in NS_2 would be existentially closed. For nominal quantifiers, the nuclear scope is the matrix VP; for other operators, the nuclear scope need not be the VP, as evident in (11). Existential closure must then be understood as a syntactic operation on the VP, not on the nuclear scope per se.

According to Diesing, the NP *all trespassers* lends its existential presupposition to the RC of the necessity operator in (11). The tripartite structure associated with the universal quantifier *all* remains in the NS of that necessity operator. Note that the existential associated with presupposition accommodation in RC_1 is represented as "there is" and the existential on the NS associated with existential closure is represented as "$\exists$". This is the notational practice in Diesing, which I follow here. Though this is not made explicit by Diesing, I assume that there is an important difference between the existential which appears in the RC and is associated with presupposition accommodation, and the existential which appears on the NS and is associated with existential closure. Presupposition accommodation asserts the existence of such *types* as the quantifier ranges over (here, all possible worlds with trespassers in them). That is, it specifies that there is a set to which the quantifier may be applied; it assures that quantification will not be vacuous. On the other hand, existential closure asserts the existence of a particular entity or *token* without reference to other parts of the representation. I take this difference to stem from inherent properties of the RC and NS, respectively.

Amount relatives are headed by presuppositional NPs. Thus the NP corresponding to the amount relative must raise out of the matrix VP to be interpreted, from where its contents cannot be mapped onto the NS. Under the AR reading, material associated with this structure is mapped onto the RC of another quantifier, resulting in a configuration which is ultimately interpreted as the amount relative. Under the current proposal ARs are in fact a species of restrictive relative clause and will receive whatever structural analysis is appropriate for ordinary RRs. Where they differ is in their semantic interpretation, to which I now turn in more detail.

3. The AR set

The amount relative is characterized by an interpretation which involves an existential presupposition on a set which is construed as the amount (what I call the "AR set").[9] Two things are required for formation of the AR set. First, the relative must be headed by one of a subset of the universal quantifiers. Second, there must be another quantifier present for which the AR set forms the restriction.

3.1 The NP head

That ARs are headed by only a subset of the universal quantifiers is something that was not noted by Carlson, who observed that ARs occur only with strong NPs (i.e., those NPs which may not appear in *there is* sentences). In particular his analysis relies on a restriction on the DET position inside the [QP,NP] that prohibits weak determiners from appearing there, as indicated in the trees in footnote 7. The fact that amount relatives occur only with strong determiners is thus reduced to a stipulation by Carlson.

Diesing (1992) comes closer to the correct generalization by noting that ARs are simply RRs which are headed by presuppositional NPs and which have undergone QR as a result. I add here the observation that it is only a subset of the presuppositional NPs which occur in ARs, namely, those with the determiners listed in the first column in (12):

(12)

ARs occur with:	ARs do not occur with:
every	*neither*
any	*no*
all	*each*
the	*both*
that (non-deictic)	all nonuniversal strong determiners
what (including free relatives)	all weak determiners

The determiners acceptable in the head position of the amount relative are a subset of the universal quantifiers and include only those which pick out every member of the set over which they quantify (thus excluding *neither* and *no*) and those which permit a collective interpretation of the entities thus picked out (thus excluding *each* and *both*). In section 3.3 I return to a more precise characterization of the type of quantifier that may appear in the head position.

Thus the following sentences, where the relative is headed by an NP that is not universally quantified, do not have an amount reading:

[9] I use "AR set" in an attempt to avoid a problem with terminology here. Both "set" and "amount" are usually taken to indicate things which are nonreferential. The AR set is neither a set nor an amount in the usual senses given to these words. Unlike a set, it is not abstract; unlike an amount, it is referential. For this reason, a lower-case variable is used in the logical representations ("x composed of things y") rather than the usual upper-case variable reserved for higher-order entities like sets. In other words, the AR set is an individual.

(13) a. Max put [some things he could put e in his pocket] on the shelf. (*AR/RR)
b. Max threw out [several things that he wanted to get rid of e] (*AR/RR)
c. *This piano weighs [many pounds that they said it would weigh e] (*AR/*RR)
d. *[Five men there were e on the life raft] died. (*AR/*RR)

Nor do the universal determiners *each* and *no* yield an amount reading:

(14) a. Max put [each thing he could put e in his pocket] on the shelf. (*AR/RR)
b. Max put [nothing that he could put e in his pocket] on the shelf. (*AR/RR)

3.2 The "other" quantifier

When there is more than one quantifier in the NP that contains the relative clause, the relative clause denotation may be caught inside the restrictive clause of the other quantifier, yielding the AR set as a presupposed entity corresponding to an amount of things. This is illustrated for (2a), repeated here as (15a).

(15) a. Max put [everything he could e] in his pocket (AR/RR)
b. $\Diamond$ [RC there is x composed of things y: Max put x in his pocket] [NS Max put x in his pocket]
"Max put [an amount described by the set of things such that it was possible for him to put that amount of things in his pocket] in his pocket." (AR)

Because the AR is headed by a presuppositional NP, it undergoes QR to a position outside the NS associated with the matrix VP. The relative clause denotation therefore appears in the RC of the wide-scope quantifier rather than in its NS (as for instance was the case in (10)). In (15b), the modal possibility operator $\Diamond$ is contributed by *could*; presupposition accommodation yields the existential statement in the restrictive clause of $\Diamond$; and the universal quantification associated with *every* is contained in "x composed of things y ...", ultimately interpreted as an amount.

The RC in (15b) accommodates the presupposition realized as the AR set. The set in question is not the usual one associated with the interpretation of quantifiers but rather one defined over the operator-variable construction in the relative clause. For this reason, the universal quantifier contributed by *every* is not present in the logical representation in (15). Instead we have what is represented as "x composed of things y ...", the result of applying the universal quantifier associated with the head NP to the set associated with its first argument ("y is a thing") and intersecting it with its second argument. What began as an intensional object (a set giving the domain) now describes a pure extension (the entities picked out of that domain: the AR set).

In other words, what is incorporated into the restrictive clause of the possibility operator in (15) is not the tripartite structure associated with $\forall$ (i.e., a set of directions), but rather what obtains after following these directions. In this way, the variable y is lost to the representation, with the consequence that the individual members of that set are no longer available to participate in the semantics as open variables (hence the practice adopted here of leaving "y" in a plain font). What allows the loss of the variable y? Recall that the amount interpretation arises only in cases where the quantifier is universal. All variable assignments must be made (effectively eliminating the y variable), so that the collection of entities which results is available to be interpreted as an amount.[10]

[10]Another approach to the semantics of amount relatives which takes into account the way in which the semantics of ARs is built up is given in Grosu (1994), where it is argued that ARs differ from ordinary RRs in that the order of composition of the arguments of the quantifier on the head noun is reversed. Grosu argues that the quantifier combines first with the relative clause and secondly with the head noun. (The ordinary RR

When there is no other quantifier in the domain, the RR reading is the only option even when the relative clause is headed by a universal determiner. This is shown in (16), with (1) repeated here as (16a).

(16) a. Huey put [everything which e was red] in his crib. (RR)
$\forall x$ [RC x was red] [NS Huey put x in his crib]
b. Max put [anything he wanted to own e] in his pocket. (RR)
$\forall x$ [RC Max wanted to own x] [NS Max put x in his pocket]

The NPs that contain the relative clauses in (16) are of course presuppositional in that at LF they have a RC of their own (e.g., "x was red"), but it is not the case that the structure associated with the universal is itself presupposed.

3.3 More on the nature of the universal quantifier

Another way of thinking about the nature of the AR set appeals to a distinction between collective and distributive interpretations of certain quantifiers. Universal quantifiers such as *every, what, those*, etc. do not exhibit quantificational behavior insofar as they have readings that are collective rather than distributive [Kroch 1974]. That is, the determiners listed in the first column in (12) yield collections or groups, rather than sets of individuals. Thus *each* and *both* are excluded from appearing in the head position on the grounds that they do not have collective readings. The collective known as the AR set does not make reference to the individual entities of which it is composed; these are instead collected together and must be taken to have a single denotation, which in the case of the AR is understood as the amount. The semantics involved is in many ways analogous to the semantics of collective nouns such as *group* or *team*.

In boolean terms, all quantifiers which can appear in the head position of ARs have an interpretation under which they denote the entire domain: they denote {a,b,c,d} rather than {a}, {b}, {c} and {d}.[11] Because the AR set is finite, it has a size: it may be taken to denote a finite amount.

---

interpretation is arrived at by first combining the quantifier with the head, and then with the relative clause.) Thus the AR in (i) has the meaning paraphrased in (ii) [from Grosu 1994:108-9]:

(i) [The people that there were at Mary's party] got very drunk. (AR)
(ii) "There were some entities at Mary's party; those people got very drunk."

Contrast with the meaning of the RR in (iii) as given in (iv) [also from Grosu]:

(iii) [The people who attended Mary's party] got very drunk. (RR)
(iv) "The people such that they attended Mary's party got very drunk."

The insight here appears to be similar, although its execution is quite different from the one proposed in the present paper. Note that the first part of the paraphrase in (ii) ("there were some entities at Mary's party") can be taken to be representative of a presupposition of the sort I describe above – an amount with particular properties, of which something is then predicated in the second part of (ii). However, Grosu's analysis goes no further toward formally characterizing the "amount" reading than might be inferred from this paraphrase. Further, on a relational view of quantifiers, the quantifier defines a relation of set inclusion. The order of composition, on this view, should not have an effect on the semantics, as is there no "ordering" in the temporal sense involved. Finally, his semantic analysis is paired with a syntactic analysis in which ARs and RRs differ structurally. In this paper I assume a unified syntax for ARs and RRs, with the two interpretations arising from the different possibilities available given the Mapping Hypothesis.

[11]This is known as the property of being a "principal filter". According to Bell and Machover (1977:133-8), "a *filter* in a Boolean algebra *B* is a *non-empty* subset *F* of *B* satisfying the following conditions:

(i) $x, y \in F \Rightarrow x \wedge y \in F$,
(ii) $x \in F \ \& \ x < y \Rightarrow y \in F$,
(iii) $0 \notin F$.

A further consequence of the fact that the quantifier denotes a finite amount (and in particular the top of a lattice structure corresponding to the domain) is that it has an upper bound. This upper bound plays a part in the interpretation of ARs, forming the basis for a Gricean scalar implicature (an aspect of ARs which will be more or less prominent depending on context). Note that the ARs in (17) each have what we might call a "least amount" component to their interpretation:

(17) a. He'll finish what he can.
 b. Max put the things he could in his pocket.
 c. I ate any chocolates there were on the table.

The sentence in (17a) is usually taken to mean "he'll finish what *little* he can", the sentence in (17b) "Max put what *few* things he could in his pocket", and the sentence in (17c) "I ate what *few* chocolates there were on the table". These implicatures are generated on the upper bound of the amount (akin to Horn's (1984) Q-based implicature).

3.4 A final example and a note on modals

One final example is given to illustrate the analysis. The sentence in (18a) is ambiguous between AR and RR readings. The amount interpretation of (18a) is given in (18b) and the ordinary restrictive interpretation in (18c).

(18) a. Max ate [everything that e would fit in his pocket] (AR/RR)
 b. $\Diamond$ [RC there is x composed of things y: Max put x in his pocket] [NS Max ate x]
 "Max ate [an amount described by the set of things such that it was possible for him to put that amount of things in his pocket]." (AR)
 c. $\forall x$ [RC$_1$ $\Diamond$ [RC$_2$ there are things] [NS$_2$ Max put x in his pocket]] [NS$_1$ Max ate x]
 "Max ate [everything such that it was possible (insofar as there are things) for him to put that thing in his pocket]" (RR)

In (18c) the wide-scope quantifier is $\forall$, which contains in its RC the tripartite structure associated with the narrow-scope modal operator. No amount interpretation is available for this configuration, since the modal operator corresponds to existential rather than universal quantification, and we have already seen that the quantifier in this position must be universal. What happens when a modal corresponding to a universal is used here? Sentences of this type are given in (19):

(19) a. Max put [everything that e was supposed to be in his pocket] on the shelf. (AR/RR)
 b. This desk weighs [every pound they said it would e] (AR/*RR)

The only amount readings available in (19) are those associated with the quantificational head of the NP in the scope order $\Box - \forall$. The scope order $\forall - \Box$ will yield an RR rather than an AR reading.[12] Given what has been said so far we might expect the amount interpretation to be generated, no matter what the order of the universal quantifiers. However, the modal necessity operators in (19) do not yield an AR reading calculated over possible worlds when they are combined with a universally quantified NP in the head position. One reason for this is that truth conditional differences such as those described above for sentences involving possibility do not arise in (19). Universal quantification leaves no room for a situation in which the size of the amount in the AR reading can be different from what is obtained with

...A filter is said to be *principal* if it is generated by (the singleton of) a single (non-zero) element". Further, "a filter in *B* is principal iff it has a finite base", where "a subset *X* of *F* is called a *base* for F if for each $y \in F$ there is $x \in X$ such that $x < y$". Note that this definition also excludes the negative universals *neither* and *no*, as desired.

[12] In the case of (19b) the RR reading is ruled out for independent reasons prohibiting the relativization of expressions of amount.

the universal quantifier under the RR reading. If this were all, it might be sufficient to claim that both AR readings are present, though indistinguishable. However, I take seriously the problem of what it would mean to talk about a *finite amount* of possible worlds. There is simply no collective interpretation available to $\Box$ and for this reason, then, an AR reading is ruled out when that amount would be associated with the modal necessity operator or other such universal, as in (19).

Given the theory of the AR set as just described we can now account for the rest of the data adduced in Carlson (1977a) in a principled fashion.

4. Existential sentences

ARs can be relativized out of *there is* sentences, as in (20), but this is not the case with RRs, as in (21) [Carlson 1977a]:

(20) [Anyone there was e on the life raft] died. (AR/*RR)

(21) *[Someone there was e on the life raft] died. (*AR/*RR)

The requirement that the AR set be defined over a relative clause headed by a universal quantifier rules out the possibility of a nonuniversal head even when that head may nonetheless be presuppositional, as in (21). An AR interpretation is therefore not available for (21). The RR interpretation is also ruled out, for reasons given directly below.

The logical representation for (20) is given in (22), where the existential quantifier associated with *there is* sentences takes in its scope the tripartite structure associated with the presuppositional head of the relative clause.

(22) $\exists$ [[x composed of people y: x was on the life raft] $\wedge$ x died]
"There exists [an amount described by the set of people such that that amount of people were on the life raft] and that amount of people are dead." (AR)

By definition the existential quantifier has no restrictive clause. The AR set is nonetheless existentially quantified here by virtue of appearing in its scope. The operator-variable construction in the relative clause identifies the content of the AR set as usual. The representation in (22) thus includes an existential presupposition on an amount of men brought about by the interaction between the existential quantifier associated with *there is* sentences and the universal quantifier *any*. The AR set is introduced by *any* and the existential presupposition by *there is*.

The definiteness effect is avoided in (20) since the variable in the relative clause is bound by the quantifier associated with *any* and not by the existential quantifier, which instead scopes over the AR set. The AR set represents a weak NP in that it remains an unspecified (though finite) amount (e.g., "an amount" rather than "the amount"). It may therefore appear under the existential quantification associated with *there is* sentences.

On the other hand, restrictive relative formation is not possible out of *there is* sentences. The logical representation associated with the RR reading has *any* taking wide scope with respect to the existential quantifier, in which case vacuous quantification results. This is shown in the ill-formed (23) for the ungrammatical RR interpretation of (20).

(23) $\forall x$ [RC_1 there is y [NS_2 y is a person $\wedge$ y is on the life raft]] [NS_1 x died]
"For all x such that there is a y such that y is a person and y is on the life raft, x died." (*RR)

In (23), $\forall$ is not indexed with a variable in its RC. Therefore, no set is specified as the domain over which the quantifier ranges and the configuration results in vacuous quantification for $\forall$. An RR reading here will always result in vacuous quantification, no matter what type of quantifier is substituted. Thus when the quantifier associated with *any* raises at LF it can only do so with narrow scope, resulting in the AR configuration given above in (22).

5. NPs that describe nonreferential amounts

ARs appear to relativize NPs that describe (nonreferential) amounts such as *pounds* in *weigh 5 pounds*, which otherwise cannot be relativized [Carlson 1977a]:

(24) a. [Those pounds that Max weighs *e*] make little difference. (AR/*RR)
b. *[Many pounds that Max weighs *e*] make little difference. (*AR/*RR)

In (24a) it is not *pound* that is relativized but rather the AR set of which it becomes a part. As noted, the AR set represents a finite amount, the independent elements of which are no longer available to the representation.

In much the same way, the comparative construction takes amounts/degrees as the basic units which it manipulates, treating them as though they were referential and using expressions which talk about the cardinality of sets in argument position (e.g., *John put [more books than magazines] on the shelf*). In some sense, then, whereas the comparative is a two-place expression of amount (the difference between amounts $|a|$ and $|b|$), the amount relative may be thought of as a one-place expression of amount (the amount $|a|$).

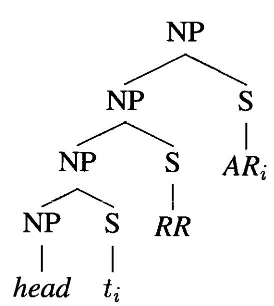
6. Stacking

ARs cannot be stacked, whereas RRs can [Carlson 1977a]. Ungrammaticality results in each case where an AR is the stacked, or second, clause:

(25) That desk weighs . . .
a. *every pound [they said it would weigh *e*] [that I had hoped it wouldn't *e*] (*AR-AR)
This shelf contains . . .
b. some books [I bought *e* at the store] [that I thought *e* were cheap] (RR-RR)
c. every book [there was *e* at the store] [that I thought *e* was cheap] (AR-RR)
d. *every book [I thought *e* was cheap] [that there was *e* at the store] (*RR-AR)
I ate . . .
e. any meat [there was *e* on the table] [that *e* wasn't spoiled]] (AR-RR)
f. *any meat [that *e* wasn't spoiled] [that there was *e* on the table] (*RR-AR)

Given a semantic composition defined over the syntactic structure, interpretation proceeds bottom-up in the tree so that the NP head in the ungrammatical sentences in (25a,d,f) will have already combined with the clause following it, rendering formation of the AR set over *pound, book,* or *meat* impossible in the case of the second clause.

Note that the sentences in (25d,f) also have grammatical readings wherein heavy shift has taken place, yielding the surface order *head* – t_i – *RR* – AR_i.[13] This is schematized in (26):

(26)


[13]Thanks to Tony Kroch for pointing this reading out to me.

Heavy shift nonetheless preserves the compositionality analysis given for (25), since the shifted constituents are added to the interpretation at the position of their trace. ARs also allow extraposition of the clause portion (e.g., *Max put everything* t_i *in his pocket [he could]*$_i$). Again this poses no problem for a compositional semantics.

7. Antecedent-contained deletion

As predicted under Diesing's theory, only presuppositional NPs are licensed in ACD contexts because only presuppositional NPs are available to undergo QR. The standard account of ACD contexts, as given in May (1985), assumes QR of the NP containing the deletion and copying of the antecedent in the place of the deletion. This is shown in (28) for (27).

(27) Max put [everything he could *e*] in his pocket. (AR/RR)

(28) a. S-STR: [IP Max [VP put [NP everything he could [VP *e*]] in his pocket]]
b. QR: [IP [NP everything he could [VP *e*]]$_i$ [IP Max [VP put [NP t_i] in his pocket]]]
c. COPYING: [IP [NP everything he could [VP put [NP t_i] in his pocket]]$_i$ [IP Max [VP put [NP t_i] in his pocket]]]

ACD contexts containing cardinal NPs in the head position result in an ill-formed ACD structure, since QR is not possible in that case. That is, without QR (29) both violates the no c-command condition on VP-deletion and presents the problem of infinite regress after the copying procedure takes place.

(29) *Max put [several/many/six things he could *e*] in his pocket.

The sentence in (27) has both an amount interpretation, where it is about the amount x of things y that Max put in his pocket and a non-amount interpretation, where the sentence is about each thing x that Max put in his pocket. The logical representations are given in (30) and (31), respectively.

(30) $\Diamond$ [RC there is x composed of things y: Max put x in his pocket] [NS Max put x in his pocket]
"Max put [an amount described by the set of things such that it was possible for him to put that amount of things in his pocket] in his pocket." (AR)

(31) $\forall x$ [RC_1 $\Diamond$ [RC_2 there are things] [NS_2 Max put x in his pocket]] [NS_1 Max put x in his pocket]
"Max put [everything such that it was possible (insofar as there are things) for him to put that thing in his pocket] in his pocket" (RR)

In (30) the AR set (i.e., the amount corresponding to the set of things ultimately picked out by $\forall$) is inside the restrictive clause of the modal possibility operator, constituting its restriction.

Note also that the universal determiners *each* and *no* are acceptable in this construction, though not with an amount reading.

(32) a. Max put [each thing he could] in his pocket. (*AR/RR)
b. Max put [nothing he could] in his pocket. (*AR/RR)

Because the quantifiers in question are presuppositional, the NP with which they appear may raise out of the ACD configuration at LF. The amount reading is not available here since these quantifiers are either necessarily distributive (in the case of *each*) or do not exhaust the set over which they quantify (in the case of *no*). The presence of a strong quantifier is enough to license the ACD context but these particular quantifiers are not of the type required for formation of the AR set. The RR reading is then the only one available for the sentences in (32).

8. Conclusion: A coindexation restriction on ARs

Finally, I wish to point out a coindexation restriction which holds of ARs in ACD contexts. To my knowledge, this has not been noted before in the literature. ACD contexts impose on ARs the requirement that the subject of the relative clause be coreferential with the subject of the matrix clause, as in (33a-b), or exist in a bound variable relation with it, as in (33c).

(33) a. Max_i put everything he_i could in his pocket. (AR/RR)
b. Max_i threw out everything he_i could. (AR/RR)
c. Everyone_i will finish what they_i can. (AR/RR)[14]

The coindexation restriction is not present in ACD contexts where there is no AR reading available:

(34) Max put everything Susan did in his pocket. (RR)

The AR reading is lost in the ACD sentences in (35), where the subjects are no longer coindexed. The only interpretation available is the RR one.

(35) a. Max_i put everything Susan_j could in his pocket. (*AR/RR)
b. Max_i threw out everything Susan_j could. (*AR/RR)
c. Everyone_i will finish what Susan_j can. (*AR/RR)

Outside of an ACD context the AR reading again surfaces freely in the absence of coreferential NPs:

(36) a. Max_i put everything Susan_j could put in his pocket in his pocket. (AR/RR)
b. Max_i threw out everything Susan_j could throw out. (AR/RR)
c. Everyone_i will finish what Susan_j can finish. (AR/RR)

The explanation of these somewhat strange facts lies in the nature of the logical representations that I have proposed for the amount relative and the interpretation of indices at LF. The AR reading of (33a) is given in (37).

(37) $\Diamond$ [RC there is x composed of things y: Max put x in his pocket] [NS Max put x in his pocket]
"Max put [an amount described by the set of things such that it was possible for him to put that amount of things in his pocket] in his pocket."

The logical representation given in (37) has as its source an LF in which the variable x in the RC has come about via a syntactic copying procedure. This is the only way in which it differs from the logical representations associated with ARs in non-ACD contexts.

The coindexation requirement holds only of ARs in ACD contexts, rather than all AR configurations, because the syntactic coindexation induced by the copying procedure comes with a coreference requirement. In (37) the variable x which appears in the RC and NS of the wide-scope quantifier corresponds to the AR set: "an amount described by the set of things such that . . . " Crucially, it is in the ". . . " that the referential expression *Max/him* is contained. The content of this variable is fixed insofar as the reference of the NP *Max* in the RC is fixed and must be coreferential with the NP in the NS from which it derives. Not surprisingly, then, this coindexation restriction holds only in ACD contexts. On the other hand, the AR in (36a), a non-ACD context, allows the logical representation given in (38).

[14] I have not discussed the amount relative reading of free relatives in this paper. They pattern differently from the rest of the amount relatives in a number of ways, but space does not permit a discussion here.

(38) $\Diamond$ [RC there is x composed of things y: Susan put x in her pocket] [NS Max put x in his pocket]
"Max put [an amount described by the set of things such that it was possible for Susan to put that amount of things in her pocket] in his pocket."

In (38), the source of which does not involve ACD, varying coreference is allowed: *Susan* and *Max* appear in the RC and NS, respectively.

Nor is it surprising that the coindexation restriction should hold only of ARs. The logical representation of the RR in (34) is given in (39). Here, the variable in question is simply a variable over things x.

(39) $\forall x$ [Susan put x in her pocket] [Max put x in his pocket]
"For all x such that Susan put x in her pocket, Max put x in his pocket." (RR)

Regardless of the fact that (34) has as its source an LF in which syntactic copying has taken place, the NPs in question are not themselves contained in the variable at any level of interpretation. Thus the logical representation in (39) says nothing about the coindexation of the NPs *Susan/her* and *Max/him*, leaving these NPs free to be interpreted in whatever ways are available given the syntax.

References

Bell, J. and M. Machover (1977) *A Course in Mathematical Logic*. Amsterdam: North-Holland Publishing Co.

Carlson, G. (1977a) "Amount relatives". *Language* 53:520-542.

Diesing, M. (1992) *Indefinites*. Cambridge: MIT Press.

Grosu, A. (1994) "The structural diversity of restrictive and amount relatives". Israel Association for Theoretical Linguists 1: Proceedings of the 9th Annual Conference, Ben Gurion University of the Negev, 1993, pp108-127.

Heim, I. (1982) *The Semantics of Definite and Indefinite Noun Phrases*. PhD dissertation, University of Massachusetts.

Horn, L. (1984) "Toward a new taxonomy for pragmatic inference: Q-based and R-based implicature". In Schiffrin, D. (ed) *Meaning, form, and use in context*, GURT 1984, pp11-42. Washington DC: Georgetown University Press.

Kratzer, A. (1991) "Modality". In A. von Stechow and D. Wunderlich (eds) *Semantics*. de Gruyter.

Kroch, A. (1974) *The Semantics of Scope in English*. PhD dissertation, MIT. Published by Garland, NY, 1979.

May, R. (1985) *Logical Form: Its Structure and Derivation*. Cambridge: MIT Press.

Milsark, G. (1977) *Toward an Explanation of Certain Peculiarities of the Existential Construction in English*. PhD dissertation, MIT. Published by Garland, NY, 1979.

Victoria Tredinnick
Department of Linguistics
University of Pennsylvania
619 Williams Hall
36th and Spruce Streets
Philadelphia, PA 19104-6305

victoria@unagi.cis.upenn.edu