Amount Relatives and the Meaning of Chains

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Goals

empirical:	amount relatives (ARs)
semantics:	compositional derivation of two readings of ARs
architecture:	one item – two contributions (movement? co-binding?)
speculation:	a completely different way of looking at it

Carlson's Discovery (Carlson 1977)

(1)   The books $\left\{ \begin{array}{c} \text{that} \\ \varnothing \\ \text{* which} \end{array} \right\}$ there are on the table are useless.

Puzzle: Why no Definiteness Effect (DE) in (1)?

(2)   *Few people admitted that there had been them at the party.

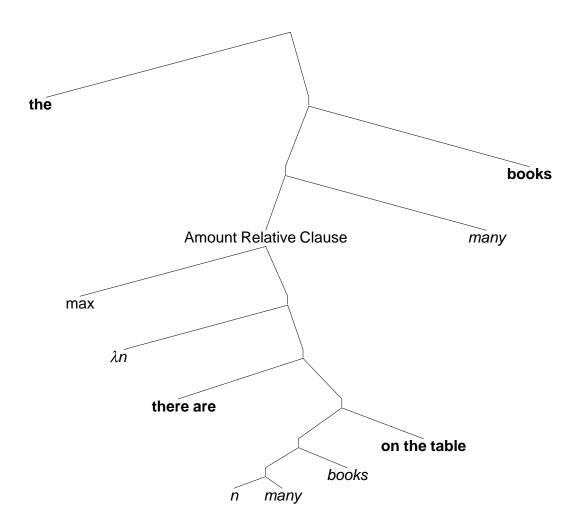(3)   *No perfect relationship is such that there is it.

(examples from Heim 1987)

Correlations

➢ Apparent relativization of the *there*-associate
➢ Possibility of Antecedent-Contained Deletion
➢ No *wh*-relative pronoun allowed
➢ Limited class of determiners (*the, every, all (the),* FC-*any*)

Carlson's Idea: Amount Relatives (degree-denoting relative clauses)

➢ The relative clause specifies the amount/number of books referred to.

➢ It functions as a cardinality modifier.

➢ It denotes the number of books on the table.

➢ The noun **books** moves from the RC-internal position into the external head position. We will see that it is semantically active in both positions!

the books there are on the table $\Rightarrow$

the

books

many

Amount Relative Clause

max

λn

there are

on the table

books

n   many

Circumvention of the DE

(4)   a. * There was that horse in the pasture.
      b. * There were those horses in the pasture.
      c. There were that many horses in the pasture.

Some Degree Semantics (e.g. Cresswell 1976)

(5)   There are more books on the table than there are on the shelf.

      The maximal n such that there are n-many books on the table
      is larger than
      the maximal n such that there are *n-many books* on the shelf

The Composition of Amount Relatives

(6)   there were n-many books on the table

      $\exists$x: books(x) & on the table(x) & many(n,x)

      many (n,x) $\Rightarrow$ x has n atomic individuals as parts

      For perspicuity's sake, let's write $|\mathbf{x}| = \mathbf{n}$ for **many(n,x)**

      There is a plurality x of books on the table which has n atomic
      individuals as parts.

      There is a plurality of n books on the table.

(7)   The amount variable *wh*-moves. We get a predicate of amounts:

      λn. $\exists$x: books(x) & on the table(x) & $|$x$|$ = n

      The set of numbers n such that there is a plurality of n books on the
      table.

(8)   Maximalization:

$$\max \left(\lambda n.\ \exists x: \text{books}(x)\ \&\ \text{on the table}(x)\ \&\ |x| = n \right)$$

max is a function that applies to a set and returns the maximal element in that set. Here it will give us the number n such that there are exactly n books on the table.

(9)   (that there were *n-many books* on the table)-*many* books

$$\lambda x.\ \text{books}(x)\ \&\ |x| = \max\left(\lambda n.\ \exists y\text{: } books(y)\ \&\ on\ the\ table(y)\ \&\ |y| = n \right)$$

$$\lambda x.\ \text{books}(x)\ \&\ |x| = \big| \text{books on the table} \big|$$

The set of pluralities of books that have the same number of individuals as there are books on the table

(10)   ≈ as many books as there were *books* on the table

➢ It remains quite unclear what the determiner *the* would be doing.

Books in Two Places

➢ Note that for this account to work, the nominal (*books*) has to make a contribution in two places: inside the relative clause and in its surface position. According to Carlson's analysis, the nominal originates inside the amount relative and raises to its surface position. He does not comment on the fact that it needs to be interpreted in both positions.

(11)   No subdeletion in amount relatives:

    a. I saw more bulbs than Jeb saw flowers.
    b. * I saw the bulbs that Jeb saw flowers.

Real Life Amount Readings ("Identity of Quantity")

    (12)   It will takes us the rest of our lives to drink the champagne that they spilled that evening. (Heim 1987: (40)).

    (13)   There isn't the water in the sink that there is in the bathtub.
          (Lisa Selkirk, pc. to Irene Heim)

Further Evidence for Amount Abstraction $\Rightarrow$ Negative Islands

    (14)   Please give me the books that aren't on the table.

    (15)   *Please give me the books that there aren't on the table.

    (16)   *There are more books on the table than there aren't on the shelf.

Amount Idioms

    (17)   The headway that Mel made was satisfactory. (Carlson)

    (18)   The many books that Mary has to read for the course are a problem.

          (Heim, Vienna lectures)

Possible analysis: covert clausal complementation of some sort

    (19)   It was satisfactory that Mel made the headway he made.

    (20)   It is a problem that Mary has to read (so) many books for the course.

Alternative: *satisfactory, be a problem* as predicates of amounts (of headway made, of books Mary has to read for the course).

    (21)   a. Mel made a satisfactory amount of headway.

            b. Mel made satisfactory headway.

Grosu & Landman's Objection

The "identity of quantity" reading isn't the only reading these sentences have. In fact, normally we only get an "identity of objects" reading.

    (22)   I took with me the books that there were on the table.

            "cannot mean that I took with me from the library as many books as there were books on the table in the kitchen; it only means that I took those actual books in the kitchen." (G&L, p. 133)

    (23)   How many books did you take from the library?

            a. I took as many books as there are on this table.
            b. I took (all) the books that there are on this table.

Hope for Carlson/Heim?

    (24)   "Identity of objects" entails "identity of quantity"

            So, perhaps, we always just have identity of quantity but it is sometimes pragmatically strengthened into identity of objects

    (25)   How many books did you take?

            a. I took as many books as there were on the table.
            b. I took however many books there were on the table.

Amount relatives have genuine identity of objects readings

    (26)   A: You will get an F because you didn't read the books that there are on the reading list.

            B: What do you mean? There are ten books on the reading list and I did read ten books.

Grosu & Landman's Analysis

➢ Degrees are not simple numbers but triples of a number, a property and a plurality.

➢ Degrees are used to store information about the object measured other than its dimensions. They also store a sortal the object falls under and in fact the object itself.

➢ This semantic storage mechanism allows G&L to interpret the nominal only in its internal source position (its syntactic movement is said to be semantically inert).

➢ The "identity of objects' readings is achieved by retrieving the object from the degree triple.

➢ Similar to other semantic storage systems as alternatives to syntactic movement.

(27) $\langle$n, books, x$\rangle$

measure value, measure domain/sortal, object measured

(28) $DEGREE_P(\langle n,R,y\rangle,x)$ iff x = y and P = R and P(x) and $|x| = n$

A triple <n,R,y> is the degree (relative to sortal P) of x iff

(i) y is x (the object measured)
(ii) R is P (the measure sortal)
(iii) P is true of x (the object falls under the measure sortal)
(iv) n is the amount of x

(29) $[\![three]\!] = \lambda P. \lambda x. P(x)$ & $DEGREE_P(\langle 3,P,x\rangle,x)$

(30) $[\![three\ books]\!] = [\![three]\!]([\![books]\!]) = \lambda x.\ books(x)$ & $DEGREE_P(\langle 3,books,x\rangle,x)$
      $= \lambda x.\ books(x)$ & $|x| = 3$

the set of pluralities containing exactly three books

(31) $[\![d\ many]\!] = \lambda P\ \lambda x.\ P(x)$ & $DEGREE_P(d,x)$

(32) $\lambda d.$ that there were (d many books) on the table

$\lambda d.\ \exists x\left(books(x)\ \&\ DEGREE_{books}(d,x)\ \&\ on\ the\ table(x)\right)$

$\lambda\langle n,P,y\rangle.\ \exists x\left(books(x)\ \&\ DEGREE_{books}(\langle n,P,y\rangle,x)\ \&\ on\ the\ table(x)\right)$

$\lambda\langle n,P,y\rangle.\ \exists x\left(books(x)\ \&\ P = books\ \&\ x = y\ \&\ |x| = n\ \&\ on\ the\ table(x)\right)$

$\lambda\langle n,books,y\rangle.\ books(y)\ \&\ |y| = n\ \&\ on\ the\ table(y)$

the set of all measure triples, of which the object measured is a sum of books on the table

➢ Note: even though the *there*-construction quantifies away the variable introduced by *books*, a second individual variable is introduced to be manipulated higher up in the structure. This variable is introduced as one of the three components of G&L-degrees. A kind of *Existential Disclosure.*

    (33) λx. there is someone who is x in the garden

    (34)   There is someone who is Bill Clinton in the garden.

            vs. There is Bill Clinton in the garden.

    (35)   Maximalization (basically as before)

    (36) $\text{SUBSTANCE}\left(\max\left(\lambda\langle n,\text{books},y\rangle.\ \text{books}(y)\ \&\ |y| = n\ \&\ \text{on the table}(y) \right) \right)$

            = the maximal sum of books on the table

            $\Rightarrow$ identity of objects

➢ The identity of quantity readings (true amount readings) are obtained by working with the amount and sortal parts of the degree triple.

Criticism

➢ Non-standard assumptions about degrees designed to pass on information up the tree. Essentially mimics movement.

➢ Danger of overgeneration. Why don't *as many as*-sentences have identity of objects readings?

An Alternative?

First a slight variation on the Carlson/Heim analysis. Give up on the assumption that *there* effects existential quantification. The only quantifier inside the relative clause is the cardinal quantifier *d many*.

(37)   *n many books on the table*

$$[\![\text{n many}]\!] = \lambda P\, \lambda Q.\, \big| P \cap Q \big| \geq n$$

(38)   the books (that there are n many books on the table)-many
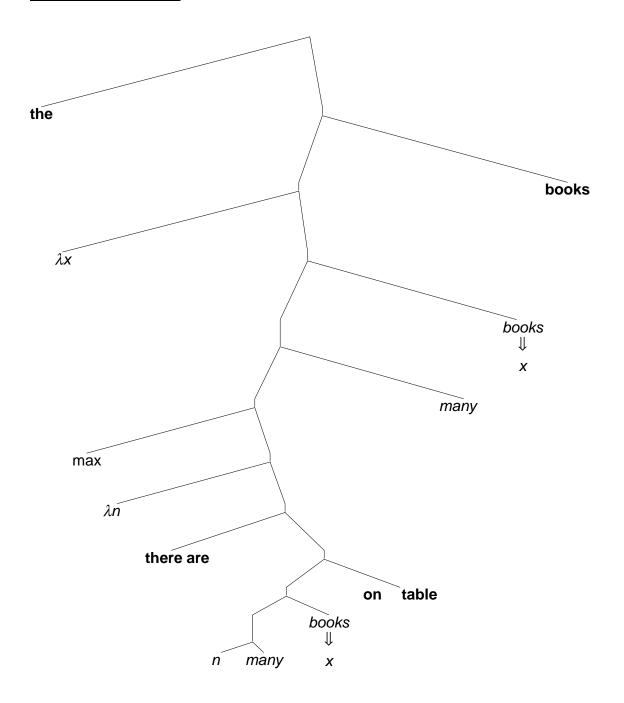
delete link, interpret both copies of *books*

$$\text{the} \left(\lambda x.\, \text{books}(x) \,\&\, |x| = \max \Big(\lambda n.\, \text{n many}(\text{books})(\text{on the table}) \Big) \right)$$

the noun phrase *n many books* inside the relative clause is a weak quantifier (OK in *there*-context)

the resulting degree/amount description is predicated of the plurality of books the whole DP refers to

$\Rightarrow$ this again is the identity of quantity reading

One More Movement

the
   books

λx

books
⇓
x

many

max

λn

there are

on   **table**

books
⇓
x

n   *many*

The head nominal moves out of the relative clause. It moves one more step. It binds two variables.

(39)   the books books (that there are n many books on the table)-many

        interpret link, treat both tails as bound plurality variables

        the books $\lambda x.\ x$ (that there are n many of x on the table)-many

        the $\left(\lambda x.\ \text{books}(x)\ \&\ \left(\lambda y.\ |y| = \max\left(\lambda n.\ n\ \text{many}(\text{of } x)(\text{on the table}) \right) \right)(x) \right)$

        $= $ the $\left(\lambda x.\ \text{books}(x)\ \&\ |x| = \max\left(\lambda n.\ n\ \text{many}(\text{of } x)(\text{on the table}) \right) \right)$

(40)   *of x* $\Rightarrow$ the set of individuals in the plurality x

(41)   <u>Identity of Quantity</u>

        $\lambda x.\ \text{books}(x)\ \&\ |x| = \left| \text{books} \cap \text{on the table} \right|$

        <u>Identity of Objects</u>

        $\lambda x.\ \text{books}(x)\ \&\ |x| = \left| x \cap \text{on the table} \right|$

(42)   so far:

        predicate that is true of any plurality of books s.t. all of them are on the table

(43)   <u>the</u> books that there are on the table

        definite plural determiner picks out the maximal element from a set

        ➔ widespread assumption

(44)   *the books that there are on the table*

= the maximally inclusive plurality x of books such that the number of individual parts of x is the same as the number of individual parts of x that are on the table

= all the books on the table

What about the Definiteness Effect?

(45)   Partitives are OK in *there* sentences

Where are my horses?
There are six of them in the pasture.

(46)   Problem: partitives are only OK in *there*-sentences with a coda

a. * There were two of my brothers.
b. There were two of my brothers on that flight.

(Heim, class handout 1986)

(47)   Amount relatives are OK without a coda

I have read all the good books that there are.

(48)   Could (47) be an identity of quantity case?

Yes. In fact, identity of quantity reading will coincide with any putative identity of objects reading!

A plurality of books that contains just as many members as the plurality of all the books that exist simply must contain all the books that exist.

Interim Summary

We have a compositional derivation for the two readings of ARs. It works without semantic storage and without non-standard assumptions about what degrees are. It comes with a price: we have movement of an item that is then interpreted both in its source position and in its target position.

Movement without Chain Formation?

Apparently a respectable possibility in recent minimalist syntax.

➢ Hornstein (1999) analyzes Control structures as involving NP-movement.
➢ Lechner (1999) uses the possibility in the analysis of comparatives.

Alternative? Pronominals with particular binding requirements?

Imagine that the amount relative contains a silent pronominal. This item comes with the requirement of having to be bound quite locally.

The head nominal is generated external to the AR. It moves slightly to establish a binding relation with the silent pronominal inside the AR.

The two readings for ARs come about by choosing two different types for the binding chain (type e for identity of objects; type <et> for identity of quantity).

Considerations

Locality conditions? Something like Control Theory?

A Third Way? (cf. Shimoyama on Japanese IHRCs)

(49) The books that there are on the table are useless.

$\Rightarrow$ There are books on the table. The books are useless.

(50) Interpret AR (after reconstruction of head nominal) as separate assertion.

Matrix sentence contains an E-type pronoun (disguised definite description), whose content is recovered from AR.

(51) Crucial kind of example for Japanese IHRCs:

Taro-wa　[[Yoko-ga　reezooko-ni　**kukkii-o**　　**hotondo**
Taro-TOPIC　　Yoko-NOM refrigerator-LOC cookie-ACC　most

irete-oita] –no] –o　　paatii-ni　motte itta
put-AUX　　-NM　-ACC party-to　　brought

'Yoko put most cookies in the refrigerator and Taro brought them (= the cookies Yoko had put in the refrigerator) to the party.'

Clearly, we would not have much hope for an analysis that has some relative clause operator binding a variable introduced by *most cookies*, a strong quantifier.

(52) Similar puzzles in English ARs:

a. I want to talk to every witness that there may be.

= There may be witnesses. I want to talk to every witness.

b. Any beer that there may be in that cooler is mine.

= There may be beer in that cooler. Any of it is mine.

Let's look at one of these examples in more detail:

(53)   *I want to talk to every witness that there may be.*

does not mean:

I want to talk to everyone who may be a witness.

also does not mean:

I want to talk to every x such that x is a witness and x possibly exists.

(54)   Step 1

Reconstruct head nominal into its source position.
[We also mess around with plurality.]

 I want to talk to every [there may be witnesses]

Step 2

Interpret "relative clause" as separate assertion.
Interpret the remaining NP as containing an E-type pronoun.

There may be witnesses.
I want to talk to every one of them (= the witnesses).

Step 3

While the universal quantifier (*every one of the witnesses)* triggers an existence presupposition, the entire construction explicitly does not carry such a presupposition. This would in fact clash with the asserted (mere) possibility of there being witnesses.

The presupposition conflict is resolved by locally accommodating the presupposition into the restriction of *want* , which is a modal quantifier over worlds.

There may be witnesses.
If there are witnesses, I want to talk to every one of the witnesses.

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Appendix 1: Overt Numerals

(55)   the $\left\{\begin{array}{l} \text{three} \\ \text{many} \\ \text{few} \end{array}\right\}$ books that there are on the table

Note: the numeral cannot originate inside the relative clause, since by assumption the wh-element moved to Comp in the relative clause corresponds to the amount modifier in there.

(56)   <u>Grosu & Landman</u>:

the numeral combines with (the singleton set of) a plurality (the maximal sum of books on the table)

the numeral <u>specifies</u> the cardinality of the plurality

$[\![\text{three}]\!] = \lambda P: |P| = 3.P$

if the cardinality of P is 3 then the numeral will return P, otherwise the function is undefined

➔ a "test"

(57)   <u>The Alternative</u>:

the numeral combines with a predicate true of any plurality of books on the table

three intersectively picks out the three-membered pluralities

the definite plural determiner will want to pick out the maximal three-membered plurality

if there are only three books on the table there will be one maximal three-membered plurality of books on the table ➔ fine

if there are more than three books on the table there will be more than one three-membered plurality of books on the table ➔ *the* will not be able to return a result

Appendix 2: Determiner Restrictions?

Carlson: those determiners that can co-occur with a cardinal expression under them

Grosu & Landman: those determiners that "preserve maximality"

E-type: those determiners that can head an E-type expression (essentially only *the*)