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RELATIVE DEGREES AND DEGREE RELATIVES
Seminar on relative clauses, LLF/SFL, Paris, February 10, 2020

1. INTRODUCTION: THE PHENOMENON

Starting point: existential/*there*-relatives (Carlson 1977, Heim 1987):

(1)　a.　I took with me the three books that/Ø there were __ on the table.
　　　b.　#I took with me the three books which there were __ on the table.

Special properties (see Grosu and Landman 2017 for some caveats):

➢　interpretation: the relative can be interpreted as denoting an amount
➢　relativizer: only *that* and Ø are allowed
➢　definiteness: the relative gap can appear as an associate of *there* (which normally does not allow any strong DPs including traces)
➢　no stacking

Amount: **the identity of substance is not necessary**:

(2)　a.　It will take us the rest of our lives to drink **the champagne that they spilled that evening**.

　　　b.　We will never be able to recruit **the soldiers that the Chinese paraded last May Day**.

The ambiguity of ACD relatives is also analyzed as a case of amount reading:

(3)　Martha put everything she {could, should have, wanted to} in the car.

"The amount she could until the car was full"

2. SYNTAX: THE COVERT DEGREE INSIDE THE RELATIVE

Explanation for the contrast: the gap in (1b) is an *e*-type variable and definite, the gap in (1a) is a *d*-type variable (a degree) and forms part of an indefinite NP:

(4)　a.　λd . there are [**d-many books**] on the table
　　　b.　λd . ∃x [books (x) & |x| = d & on-the-table (x)]

Note the tacit assumption that the relative clause attaches below the cardinal

The head noun *books* is interpreted inside the relative clause and then raises out of it:

(5)
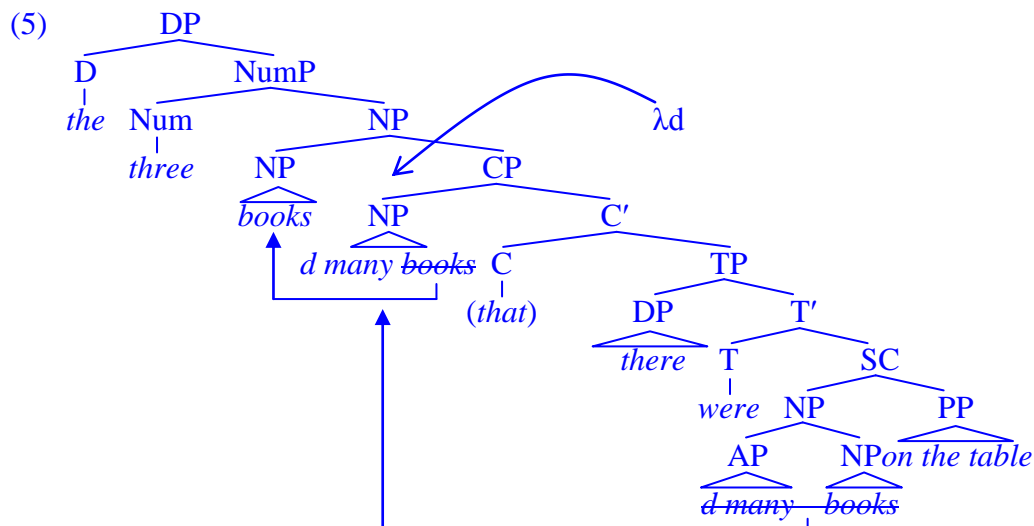
Then we are given some vague understanding that the construction should be analyzed as (6), yet how does this compose?

(6)   as many books as there were books on the table

3.   G&L SOLUTION

Grosu and Landman 1998: degrees must keep track of what they measure:

(7) $[\![\text{three}]\!] = \lambda P \lambda x \ . \ P(x) \wedge \textbf{DEGREE}_P(x) = \langle 3, P, x \rangle$ Grosu and Landman 1998
    This is defined for plural individuals x

To unpack: normally degrees are points on a scale (intervals, for some people). Here a degree (still on a scale) is relativized to units of measure (which seem to be taken as identical to the corresponding items, but this is not made clear, we'll see)

(8) $[\![\text{three books}]\!] = \lambda x \ . \ \text{BOOKS}(x) \wedge \textbf{DEGREE}_{\textbf{books}}(x) = \langle 3, \text{BOOKS}, x \rangle$

Which gives us:

(9)   a.   There are three books on the table.
        b. $\exists x \ . \ \text{BOOKS}(x) \wedge \textbf{DEGREE}_{\textbf{books}}(x) = \langle 3, \text{BOOKS}, x \rangle \wedge \text{on-the-table}(x)$

The denotation of the relative clause is then:

(10)   a. $\lambda d \ . \ \exists x \ . \ d = \langle |x|, \text{books}, x \rangle : \text{books}(x) \wedge \text{on-the-table}(x)$
        b.   the set of all degrees (triples) such that there is an object measured is books and is on the table

How does this compose with *books* in the main clause?

3.1.   Maximization

Carlson: degree relatives can only occur with certain determiners

(11)   a.   I took with me every book/any books/the books/the three books/three of the books that there was/were __ on the table.

        b.   #I took with me three books/few books/many books/some books/most books/no books that there were __ on the table.

Grosu and Landman 1998: in degree relatives, maximization takes place at the CP level:

(12) $\lambda d \ . \ d = \max \ \{\langle |x|, \text{BOOKS}, x \rangle : \text{BOOKS}(x) \wedge \text{ON-THE-TABLE}(x)\}$

Motivation: it happens to degrees in other contexts, e.g., in the comparative CP

3.2.   The interpretation of the head noun

Idea: it is interpreted inside the relative, but the outer copy forces the entire NP to denote the *kind* of entity that its head denotes, i.e., a set of sums of individuals

Two additional operations postulated: SUBSTANCE (applying to the degree CP and extracting the substance measured) and X (composing the degree CP with the head NP as *three* does):

(13) SUBSTANCE $(CP) = \{x : \langle |x|, P, x \rangle \in CP\}$

SUBSTANCE applies by default. Sometimes it doesn't and then we get the identity-of-quantity interpretation (the Chinese soldiers, the spilled wine)

How does the cardinal combine with the NP + maximized degree relative combo?
It does not restrict the denotation of the plural NP, it must be identical to the first member of the triple. The compositional semantics is not provided (but it's actually pretty easy)

(14)   a.   three books that there were __ on the table

      b.   = $\{\bigsqcup\{x \in$ BOOK: ON-THE-TABLE $(x)\}\}$
            if $|\bigsqcup\{x \in$ BOOK:ON-THE-TABLE $(x)\}| = 3$;
            undefined otherwise

      c.   the set of the sum of all books on the table if there are three books on the table

This has to be definite, so existential DPs cannot be formed on the basis of a degree relative

3.3. Further complications

The determiner does not have to be the definite article:

(15) I took with me every book that there was on the table.   ✓substance, ✗quantity

Despite the presence of *there*-construction (15) can only be interpreted as identity of substance

Grosu and Landman 1998 come up with a very complex analysis permitting the combination of (14) with other determiners and also cases like (15)

The reason why degree relatives cannot stack lies in the head-raising analysis

3.4. Problems

The hypothesis that degrees are triples does not help with the champagne example:

(16) It will take us the rest of our lives to drink the champagne that they spilled that evening.

Mass nouns cannot be used as units of measure

In addition, same interval on the same scale can be two different degrees:

(17)   a. $\llbracket 3\text{cm}\rrbracket = \lambda x$. centimeters $(x) \wedge$ **DEGREE**$_{\text{centimeter}}(x) = \langle 3, \text{centimeters}, x\rangle$
      b. $\llbracket 30\text{mm}\rrbracket = \lambda x$. millimeters $(x) \wedge$ **DEGREE**$_{\text{millimeter}}(x) = \langle 30, \text{millimeters}, x\rangle$

Is this counter-intuitive? I'm not sure. Language might not know that 3cm=30mm

Taking a step back from (15):

    ➢   *there*-construction + *that*-relativizer entail a degree analysis
    ➢   yet semantically this doesn't look like degrees are involved!

4. ALTERNATIVES

Facts to explain:
    ➢   the identity of substance reading
    ➢   the restrictions on the determiner, the relativizer and stacking
    ➢   compatibility with *there*-construction
    ➢   the ambiguity of ACD relatives

General picture: there can be no unified analysis

4.1. von Fintel 1999

Very good summary of G&L, provides a non-modal example of an amount relative:

(18) There isn't the water in the sink that there is in the bathtub.

Multiple copy interpretation (cf. Hackl 2000):

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

4.2. Butler 2001: dynamic semantics

Focus on ACD relatives, which can be interpreted restrictively or exhaustively:

(20) Peter ate everything that would fit in his pocket.

    a. **Restrictive reading:**
        Peter ate everything (relevant) that was of an appropriately small size.
        $\forall x(P(x) \rightarrow A(x))$

    b. **Exhaustive reading:**   amount
        Peter ate a pocketful of something.
        $\exists x(P(x) \wedge \neg \exists y \, [x \neq y \wedge P(y) \wedge \Box(P(y) \rightarrow P(x))] \wedge A(x))$

Degree relatives only receive an exhaustive interpretation

Notes a problem with the maximization analysis: sometimes a minimum is required:
But is this a degree relative?

(21) The money that Peter can live on is small.

Butler's alternative: exhaustification instead of maximization

Dynamic-semantic account assuming that relative clauses introduce discourse referents which can then be equated with the head:

(22) a. restrictive reading:
        for every thing that Peter ate it would fit in his pocket

    b. exhaustive reading:
        what Peter ate would fit in his pocket

Non-compositional, the determiner simply ignored

4.3. McNally 2008: there is some confusion here

Carlson 1977: two properties shared between certain types of relative clauses: the restriction on the relativizer (*that/Ø/*which*) and the restriction on the determiner (only strong ones)

McNally 2008: amount relatives and relatives out of existentials are two different things:

    ➢ identity of substance: for amount (champagne) relatives only

    ➢ the head noun in relatives out of existentials permits further modification by DP-internal *only*, which blocks amount readings:

(23) **existential relative:**
    a. The only reasons there are are reasons for action…
    b. You drank the only beer there was left.

(24) **substance/amount reading not available**
    a. It will take days to drink the only champagne they spilled that evening.
    b. Marv put the only thing(s) he could in his pocket.
    c. ??The books cost the only amount of money we had.

Why is amount reading incompatible with *only*? Because maximization (hence, uniqueness), which is absent from existential relatives

Why is the relativizer restricted? Because *who* and *which* are disallowed with singleton sets (idea originally due to Heim 1987) or, as explained by McNally 1997, the correlate in *there*-construction is kind-denoting and this denotation is incompatible with *which/who*

Summary: nothing on amount relatives, but good reasons for excluding existential relatives

4.4. Herdan 2008: lay off the champagne

Herdan 2008 looks at ACD relatives:

(25) a. Marv put in his pocket everything (that)/*which he could.
 b. Marv put in his pocket everything/#something that he could.

Herdan 2008: *there*-relatives and ACD-relatives are not about quantification over degrees:
 ➢ G&L: unify existential relatives with amount relatives
 ➢ McNally 2008, 2009: *there*-relatives are just plain restrictive relatives (no degree reading)

Neither proposal can derive ACD-relatives

Proposal: *there*-relatives are the real amount/degree relatives, involving a covert superlative morpheme which absorbs the degree and yields an individual

ACD-relatives are analyzed by appealing to E-type interpretation

Novel data from Romanian: ACD relatives with *which*

4.5. Szczegielniak 2013: degrees as heads or phrases

Empirical domain: champagne-relatives like (2) and Spanish neuter degree relatives:

(26) Jose no entendió lo hermosa que era la novela.
 Jose NEG understood the.N.SG beautiful.F.SG that was the novel.F.SG
 Jose did not undestand how beautiful the novel was.

Proposal: a head-internal analysis for the DegP only and arguments for it

From **idioms**:

(27) At the morgue, it would take us just a day to **get the creeps** that a cemetery gives in a year.

 A. Literal meaning: creeps are items
 B. #Idiom reading involving the degree of the amount of creeps

Relativization of this idiom is possible:

(28) At the morgue I get the creeps that only a cemetery gives.

Same argument from **binding**:

(29) It would take us all year to paint the portraits of himself$_i$ that John$_i$ burned in a fit of paranoia.

 A. #type of portrait
 B. painting the actual burned canvas
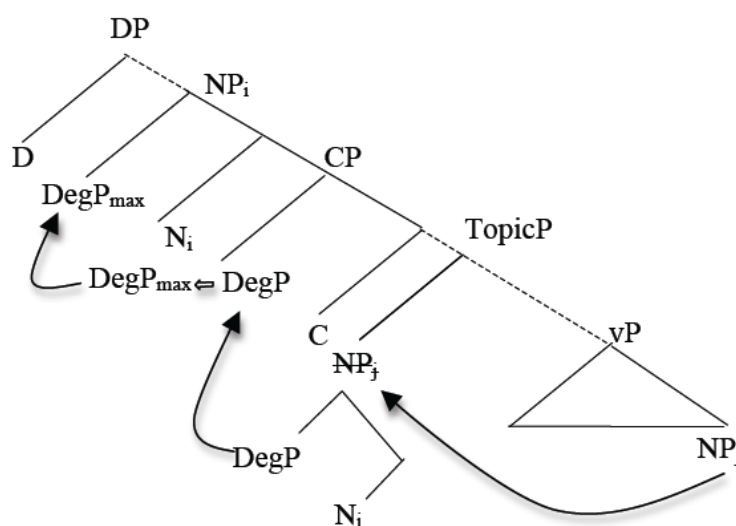 C. #paint the amount of portraits

A and C are ok, if no reflexive

Proposal: **DegP is raised out of CP and shared** between the internal and external NP, which are **matched**

(30) Raising of DegP explains no stacking

Derivation of

It would take us all year to drink the champagne that you spilled at the the party ($N_i = N_j = $ *champagne*, strikethrough = ellipsis under identity)

Spanish facts: what raises is a head (Deg^0), which requires pied-piping of the AP predicate

4.6. Mendia 2017: English has no degree relatives, Spanish does

Mendia 2017: amount relatives are a case of deferred reference: they refer to the amount and not to the entity denoted by the relativized NP
  ➢ the relativized DP is a definite amount
  ➢ the relativized NP is actually indefinite (despite the determiner)
  ➢ there is always a comparison of two amounts *of the same stuff*

NB: like Grosu and Landman 2017, Mendia includes into consideration amount relatives with an overt *amount* noun as head

These properties also characterize **kind readings** of examples like (2), as in:

(31) a. It will take us the rest of our lives to find **the champagne that they spilled that evening**.

  b. We will never be able to recruit **the soldiers that the Chinese paraded last May Day**.

Mendia 2017: amount interpretations are a special case of kind interpretations

Evidence and cross-linguistic comparison

Context dependency: manipulating the context can bring into focus either the amount or the kind reading:

(32) We lost the battle because we didn't have the soldiers that the Imperial Army had.

Amount interpretation can be achieved **without a relative clause**:

(33) with PPs
    a.   We lost the battle because we didn't have the soldiers of the Imperial Army.
    b.   We used to organize a soccer team, but we don't have the students in the department anymore.

(34) with bare DPs
    a.   We lost the battle because we didn't have the soldiers.
    b.   We used to organize a soccer team, but don't have the students anymore.

The definite article and the choice of the relativizer are constrained in the same way for kind and amount relatives (but also for existential relatives, see above)

Kind and amount are also connected in nominal exclamatives:

(35) a.   It's amazing the cars he owns.
    b.   The cars he owns!

(36) a.   kind: what's remarkable/surprising is the kinds of cars he owns.
    b.   amount: what's remarkable/surprising is how many cars he owns.

Mendia 2017 argues **against a covert degree operator** in English amount relatives (e.g., on the basis of their non-islandhood) and provides a way of deriving amount readings from kind readings

Novel empirical data from Spanish

Spanish has amount relatives, English doesn't:

(37) [Context: The same number of friends attended both our birthday parties, but they were different friends.]

    a.   The friends that came to your party came to my party.   FALSE

    b.   A mi fiesta vinieron los amigos que vinieron a la tuya.   TRUE
        to my party came   the friends that came   to the yours
   *The number of friends that came to your party came to my party.*

Spanish can do what English does and more (see also (26)):

(38) Me   pregunto las   manzanas que   trajo   Pedro.
    1SG.DAT   ask   the.F.PL apples   that   brought   Pedro
    I wonder how many apples Pedro brought.

4.7. Grosu and Landman 2017: overview and retrofitting

This, like the previous, is a very good place to look for a literature review in

Grosu and Landman 2017 assimilate amount relatives to relatives with an overt head noun *amount*: the relative modifies the null noun AMOUNT:

(39)
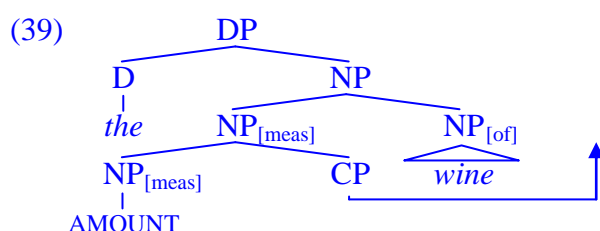
It remains a mystery to me how the noun *wine* gets into the relative clause under this view

However, because they can have the null AMOUNT both inside and outside the relative clause, they can deal with *there*-relatives as well

5.   CONCLUSION

Multiple types of relatives are gathered under the umbrella of degree relatives

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