A unified analysis of *the same*, phrasal comparatives, and superlatives

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Introduction

Heim 1985 notes the similarity between the following phenomena:

- *Internal readings of* the same *or* different
- *Phrasal Comparatives*
- *Superlatives*

In essence (cf. Barker 2007) each construction has a quantificational element whose scope target does not exist until another quantifier in the sentence undergoes QR, which creates an intermediate adjunction site for its own (parasitic) raising.

This is 'parasitic scope' (cf. Barker for *the same* and Bhatt & Takahashi 2007 for phrasal comparatives)

This is also known in the syntax literature as 'tucking in' (cf. Richards 1997).

Our Goal:
1. Borrow Barker's type-theoretic replacement for 'tucking in' in which **THE SAME N** is scope taking.
2. Preserve benefits while extending analysis to **MORE** and **THE MOST** in the same way.
3. Show that a categorial framework in which the pheno- and tectogrammar are distinguished is advantageous in providing a non-ad-hoc compositional analysis of parasitic scope.

FRAMEWORK: We use a curry-esque categorial grammar for our analysis, like Lambda Grammar or Abstract Categorial Grammar (cf. Oehrle 1994)

3 COMPONENTS:
Phenogrammar: locus of word order and morpho-syntax, a lambda calculus
Tectogrammar: locus of argument structure, a linear logic (function constructor: ⊸ 'lollipop')
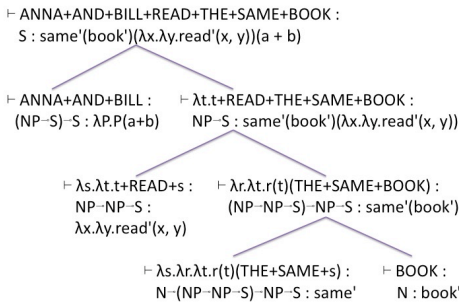**Semantics:** locus of meaning, a lambda calculus

Each sign is represented by its three types:
Pheno : Tecto : Semantic

The Same

(1) Anna and Bill read the same book

First reading: There is some book that both Anna and Bill read. (**Plural Associate**: Anna & Bill) (below)

Second reading: Anna and Bill both read a/the book that was previously mentioned (**Diectic**)

⊢ ANNA+AND+BILL+READ+THE+SAME+BOOK :
  S : same'(book')(λx.λy.read'(x, y))(a + b)

⊢ ANNA+AND+BILL :   ⊢ λt.t+READ+THE+SAME+BOOK :
(NP⊸S)⊸S : λP.P(a+b)   NP⊸S : same'(book')(λx.λy.read'(x, y))

⊢ λs.λt.t+READ+s :   ⊢ λr.λt.r(THE+SAME+BOOK) :
NP⊸NP⊸S :   (NP⊸NP⊸S)⊸NP⊸S : same'(book')
λx.λy.read'(x, y)

⊢ λs.λr.λt.r(t)(THE+SAME+s) :   ⊢ BOOK :
N⊸(NP⊸NP⊸S)⊸NP⊸S : same'   N : book'

This reading of (1) is true just in case there is a constant function *f* from the doubleton set of Anna and Bill to the set of books such that for each member *x* of the plural, *x* read *f(x)*. This is encoded as:

[[same]](P)(R)(X) is True if and only if
$\exists f. \forall x <_a X. P(f(x))$ and $R(x)(f(x))$

In the example above, this comes out as:
$\exists f. \forall x <_a (a+b)$. book'$(f(x))$ and read'$(x)(f(x))$
   (for full specification of *f* as constant, etc., see paper)
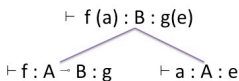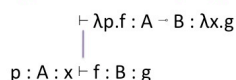
RULES AND AXIOMS:

2 Kinds of Axioms:

Nonlogical Axioms – Lexical Items (e.g. John: NP: j)
Logical Axioms – Traces (e.g. p : NP : x ⊢ p : NP : x)

2 Rules:

Modus Ponens (MP) (= *Merge, Fn. Application*)

⊢ f (a) : B : g(e)

⊢ f : A ⊸ B : g   ⊢ a : A : e

Hypothetical Proof (HP) (akin to *Move*)

⊢ λp.f : A ⊸ B : λx.g

p : A : x ⊢ f : B : g

Phrasal Comparatives

(2) Anna owes Bill more than Clara.

First reading: Anna owes more to Bill than Anna owes to Clara. (**Associate**: Bill) (below)
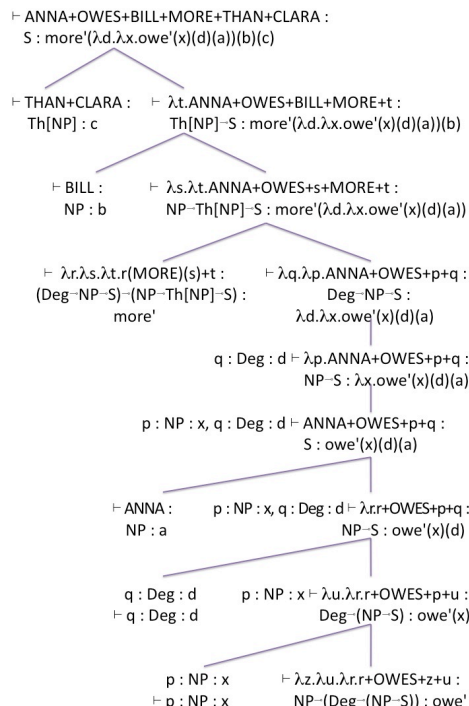
Second reading: Anna owes more to Bill than Clara owes to Bill. (**Associate**: Anna)

Here, *more* is responsible for taking a Deg & NP abstract (continuation) and returning a function looking instead for two NPs, one of them with *than*.

[[more]](G)(x)(y) is True if and only if
max(λd.G(d)(x)) > max(λd.G(d)(y))

Thus, in the example below,

more'(λd.λx.owe'(x)(d)(a))(b) becomes
max(λd.owe'(b)(d)(a)) > max(λd.owe'(c)(d)(a))

I.e. the maximum of what Anna owes Bill is greater than the maximum of what she owes Clara, as desired.

⊢ ANNA+OWES+BILL+MORE+THAN+CLARA :
  S : more'(λd.λx.owe'(x)(d)(a))(b)(c)

⊢ THAN+CLARA :   ⊢ λt.ANNA+OWES+BILL+MORE+t :
Th[NP] : c   Th[NP]⊸S : more'(λd.λx.owe'(x)(d)(a))(b)

⊢ BILL :   ⊢ λs.λt.ANNA+OWES+s+MORE+t :
NP : b   NP⊸Th[NP]⊸S : more'(λd.λx.owe'(x)(d)(a))

⊢ λr.λs.λt.r(MORE)(s)+t :   ⊢ λq.λp.ANNA+OWES+p+q :
(Deg⊸NP⊸S)⊸(NP⊸Th[NP]⊸S) :   Deg⊸NP⊸S :
more'   λd.λx.owe'(x)(d)(a)

q : Deg : d ⊢ λp.ANNA+OWES+p+q :
             NP⊸S : λx.owe'(x)(d)(a)

p : NP : x, q : Deg : d ⊢ ANNA+OWES+p+q :
                         S : owe'(x)(d)(a)

⊢ ANNA :   p : NP : x, q : Deg : d ⊢ λr.r+OWES+p+q :
NP : a   NP⊸S : owe'(x)(d)

q : Deg : d   p : NP : x ⊢ λu.λr.r+OWES+p+u :
⊢ q : Deg : d   Deg⊸(NP⊸S) : owe'(x)

p : NP : x   ⊢ λz.λu.λr.r+OWES+z+u :
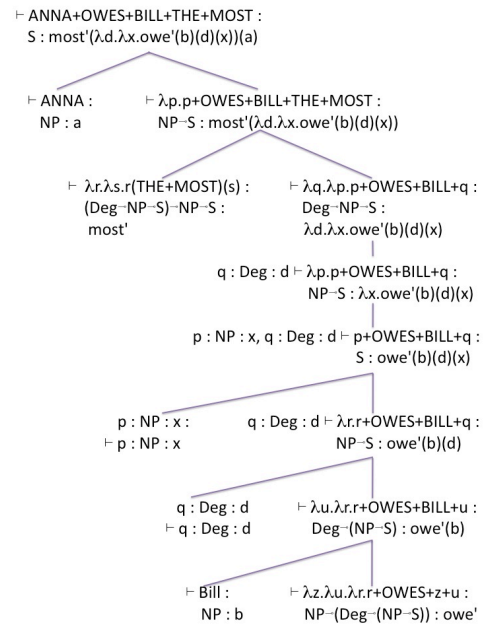⊢ p : NP : x   NP⊸(Deg⊸(NP⊸S)) : owe'

Superlatives

(3) Anna owes Bill the most.

First reading: The amount Anna owes Bill exceeds the amount anyone else owes Bill. (**Assoc**: Anna) (below)

Second reading: The amount Anna owes Bill exceeds the amount Anna owes anyone else. (**Associate**: Bill)

⊢ ANNA+OWES+BILL+THE+MOST :
  S : most'(λd.λx.owe'(b)(d)(x))(a)

⊢ ANNA :   ⊢ λp.p+OWES+BILL+THE+MOST :
NP : a   NP⊸S : most'(λd.λx.owe'(b)(d)(x))

⊢ λr.λs.r(THE+MOST)(s) :   ⊢ λq.λp.p+OWES+BILL+q :
(Deg⊸NP⊸S)⊸NP⊸S :   Deg⊸NP⊸S :
most'   λd.λx.owe'(b)(d)(x)

q : Deg : d ⊢ λp.p+OWES+BILL+q :
             NP⊸S : λx.owe'(b)(d)(x)

p : NP : x, q : Deg : d ⊢ p+OWES+BILL+q :
                         S : owe'(b)(d)(x)

p : NP : x :   q : Deg : d ⊢ λr.r+OWES+BILL+q :
⊢ p : NP : x   NP⊸S : owe'(b)(d)

q : Deg : d   ⊢ λu.λr.r+OWES+BILL+u :
⊢ q : Deg : d   Deg⊸(NP⊸S) : owe'(b)

⊢ Bill :   ⊢ λz.λu.λr.r+OWES+z+u :
NP : b   NP⊸(Deg⊸(NP⊸S)) : owe'

We want this sentence to mean that Anna is the unique maximizer (*um*) of the function that maps people to how much they owe Bill. Thus:

[[most]](G)(y) is True iff ***um*(y)(λx.max(λd.G(d)(x)))**

Meaning Postulate: ⊢ um = λx.λf. $\forall$ y((y ≠ x) → f(x) > f(y))

In other words, our semantic form above simplifies to:
$\forall$ y ((y ≠ Anna) → ((max λd.(Anna owes Bill d)) > (max λd.(y owes Bill d))))

Selected References

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