Compositionality in Quantifier Phrases and Quantifier Words
Lecture 3
Comparatives and superlatives decomposed

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- **Compositionality**
  The meaning of a complex expression is a function of the meanings of its parts and how they are put together.

- **What are the "parts"?**
  This question can be asked in many ways: Surface constituents? LF constituents? Only audible parts? Also phonetically empty ones? What about type shifters? Etc.

- **Our question**
  Are **phonological words** necessarily parts, even minimal (primitive) parts**,** that a compositional grammar should take into account? If not, what parts are to be recognized?

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Lesson from yesterday

- Words are not distinguished building blocks in syntax or morphology.
- Then, we do not expect words to be distinguished building blocks for compositional semantics.
- Specifically, word boundaries are neither upper bounds nor lower bounds for compositional semantics.

  Not "lower bounds"
  "Words" are not compositional primitives. Complex meanings cannot be simply written into the lexical entries, without asking how the parts of the word contribute to them.
  Not "upper bounds"
  Parts of a "word" may reach out to interact with, or operate on, the rest of the sentence. (NB Barker's parasitic scope formalizes a very similar kind of action.)

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- Words are not distinguished building blocks in syntax or morphology.
- Then, we do not expect words to be distinguished building blocks for compositional semantics.
- Specifically, word boundaries are neither upper bounds nor lower bounds for compositional semantics.

Plan
Recap why amount superlative *most* is a poster child for the "no word boundaries" approach (Heim 2001, Hackl 2009),

and reap some further benefits by pursuing that approach even more vigorously.

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Background: Superlatives

Who climbed the highest mountain?

Absolute reading, ABS
`Who climbed the mountain that is higher than any other mountain [in the area]?'
Relative readings, REL
`Who climbed a higher mountain than how high a mountain anyone else climbed ?'

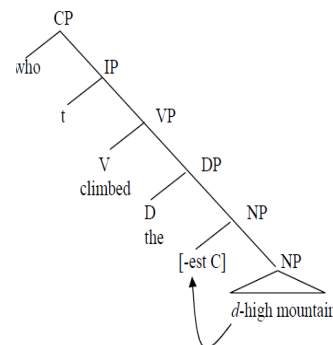Heim 1985, Szabolcsi 1986, Hackl 2009, others:
In ABS, *-est* has DP-internal scope.
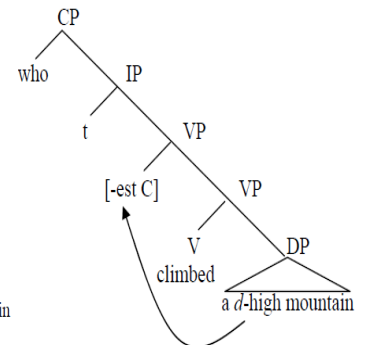In REL, *-est* has sentential scope.
Calls for setting aside word boundaries for scope assignment.

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Absolute   Relative

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Most as a superlative: *many-est*

- Like *highest*, *most* and *fewest* have relative readings:
  Who climbed the most/fewest mountains?
  `more/fewer than anyone else climbed'
- Like *highest, most* has an absolute reading, which is equivalent to the classical proportional reading:
  Most (of the) men snore =
  $$|\text{MEN} \cap \text{SNORE}| > |\text{MEN} \cap \text{NOT SNORE}|$$
  But *fewest* doesn't:
  * *Fewest (of the) men snore*

Hackl 2009: A decompositional analysis can explain these; one that takes *most, fewest* to be lexical primitives cannot.

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(Hackl 2009)

- MANY $(d)(mtns)$ = $\lambda x[P(x) \wedge |x| \geq d]$
  `the set of pluralities *x* with a property (e.g. *mountains*) and with cardinality at least *d*'

- If defined, -EST$(C)(B)(x)$ is true iff
  $\forall y[(y \in C \wedge y \neq x) \rightarrow \max\{d : B(d)(x)\} > \max\{d : B(d)(y)\}]$
  `in the set *C* of pluralities, *x* has a greater degree of *B*-ness than any $y \neq x$'

- -EST$(C)(B)(x)$ is defined iff *x* has an alternative in the context set *C* of things with some degree of *B*-ness.
  (If *B=blue*, then members of *C* are somewhat blue, if *B=numerous*, then members of *C* are not empty, ...)

- Note: same –EST in both relative and absolute readings   8

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absolute *[the] tallest* : relative *[the] tallest* =
proportional *most* : relative *[the] most*

Who climbed the tallest mountain?

a.	`a mountain$_C$ taller than any other mtn$_C$'	ABSOLUTE
b.	`a mountain taller than how tall a mtn anyone$_C$ else climbed'	RELATIVE

Who climbed *die meisten Berge*?

a_1.	`more mountains$_C$ than how many mtns$_C$ he didn't climb'	
a_2.	`a mountain-set$_C$ with greater cardinality than the cardinality of any other mtn-set$_C$'	
b.	`a mountain-set with greater cardinality than the mtn-sets anyone$_C$ else climbed'	RELATIVE

PROPORTIONAL = ABSOLUTE

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Is the best good enough?
The view from suppletion, cross-linguistically

The Comparative-Superlative Generalizations (Bobaljik, to app)

ABB	good – better – best	
ABC	bonus – melior – optimus	
AAB unattested	good – gooder – best	
ABA unattested	good – better – goodest	

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(Bobaljik, to app)

The Comparative-Superlative Generalizations

ABB		good – better – best
ABC		bonus – melior – optimus
AAB	unatt.	*good – gooder – best*
ABA	unatt.	*good – better – goodest*

The Containment Hypothesis:

The representation of the superlative properly contains that of the comparative.

[[[adjective] comparative] superlative]
`Adj   + more than   + all others'

Hung.	*sok*	*többb*	*legtöbb*
	many/much	more	most

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(Bobaljik, to app)

- Together with Distributed Morphology's Late Insertion (Realization), Under-specification, Elsewhere Ordering, and Locality, Containment accounts for the Comparative-Superlative Generalizations.
- Why Containment?
  Not part of UG. Due to intrinsic limits on possible morpheme meanings.
  Related to the Complexity Condition (no more than one interpretable feature per head).

- If Containment is correct, Hackl's **MANY-EST** does not decompose enough (ought to be **MANY-ER-T**)
  It accounts for ABB and ABC, but not for *ABA or *AAB.

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I hope to show that
[[[d-MANY] comparative] superlative]
facilitates
revisiting and resolving
some interesting further issues,
focusing mainly on relative superlatives.

- I argue that there are two distinct comparative constructions out of which relative superlatives are built.

- The two superlative constructions are morpho-syntactically different but truth-conditionally equivalent.

- But they are not equal in offering an insight into why these superficially definite noun phrases notoriously pattern with indefinites.

- Furthermore, if the hypothesis of Transparent Interfaces is correct (Hackl 2009; Lidz et al. 2011), the two analyses predict different processing strategies.

- The approach I am pursuing aligns with those that hold that the task of compositional semantics does not end with producing the correct truth conditions.

A classical dilemma
What do relative superlatives compare?
Mountains or climbers?

"We differ from Heim in that for us both readings of the superlative noun phrase in [*Who climbed the highest mountain?*] involve comparing mountains relative to height…"

(Farkas & Kiss 2000: 441)

"Do we compare the heights of the mountains climbed, or the climbing achievements of the climbers? Do the sentences mean different things depending on whether we compare mountain heights or mountain climbers' achievements?"

(Sharvit & Stateva 2002: 453)

An intriguing situation!

Outstanding semanticists puzzle, not so much over what the exact truth conditions are, but, what these sentences are about.

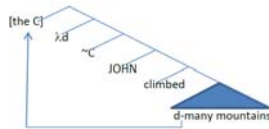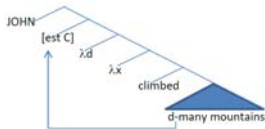And apparently, they come to different conclusions.

Consider the two views in their recent forms:
Heim 2000/Hackl 2009 and Krasikova 2012.

The two analyses

Heim/Hackl   Krasikova
climbers   degree-sets of mountains

[-est C] [λd λx. x climbed d-many mtns]

[[-est]] = λC λD λx. $\forall$y$\in$C[x$\neq$y $\rightarrow$
        max{d: D(d)(x)} > max{d: D(d)(y)}]
C = {x: $\exists$d. x climbed d-many mtns}

the is interpreted as $\exists$

[the MAX C] *[λd. J climbed [d-many mtns]~C]

[[the]] = λQ: $\exists$!D[Q(D)]. ιD[Q(D)]
MAX(Q) = λD[Q(D) $\wedge$ $\forall$D'[C(D') $\rightarrow$ D'$\subseteq$D]]
C = {D: $\exists$x[D= λd$\exists$Y[mtns(Y) & climbed(Y)(x) &
                                        |Y|$\geq$d]}

-est is a syntactic feature on most
                        (worlds left out by AS)

For Heim/Hackl, C is the set of individuals who climbed some number of mountains or other.

For Krasikova, C is the set of maximal degree-sets that characterize cardinalities of mountains climbed by someone or other.

For Heim/Hackl, *JOHN climbed the most mountains* says that John has the property of being the individual in C who is associated with the highest cardinality of mountains climbed.

For Krasikova, it says that the unique largest degree-set in C that characterizes cardinalities of mountains climbed by anyone is associated with mountains that John climbed.

The two analyses

- Take different perspectives (compare climbers vs. compare cardinalities of mountain-sets);
- Are truth-conditionally equivalent;
- Differ in how well they can explain that relative superlatives are indefinite, despite the presence of a definite article (cf. Szabolcsi 1986, 2000).

Relative superlatives are indefinite

- Relational *have*:

    Who has <u>three</u> siblings?

  \# Who has <u>the</u> siblings?

    Who has <u>the most</u> siblings?

- Adnominal *each*:

    Who gave the children <u>three</u> books each?

  \# Who gave the children <u>the</u> books each?

    Who gave the children <u>the most</u> books each?

    \`Who gave more books per child than
      how many books per child anyone else gave?'

Who explains indefiniteness?

Krasikova:

unicity pertains to degree-sets, not to individuals

MARY has the tallest sibling / the most siblings

'the unique maximal degree-set D such that anyone has sibling(s) with tallness/ cardinality D is a degree-set D such that Mary has sibling(s) with tallness/ cardinality D'

Heim/Hackl:

stipulate that in the relative superlative construction, *the* means ∃.

If truth-conditionally Heim/Hackl = Krasikova, but only Krasikova explains indefiniteness, do we need both analyses?

Claim: The two analyses correspond to two different superlative constructions, which are built from two different comparative constructions.

Two new members of the family:

                    more
Heim/Hackl: *%most = more than any other / Russian*

                    the more
Krasikova: *the most*

                        If so, H/H have no "*the*-problem."

Stressed *more*

<u>Context</u>:   Bill made $100.
… John made MORE money.
… John made MORE money than Bill (did)/than $100.

"Relative comparative" *more*

<u>Context</u>:   John and Bill worked.
... Who made more money?
... Of the two, who made more money?
... Who made more money than the other (did)?

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more

Plain stressed *MORE*: combines with freely chosen *than*-clause (*than Bill, than $100*, etc.)

De-stressed "relative comparative" *more* doesn't take such a freely-chosen *than*-clause. At most *than the other* can be added.

(An "elided" *than*-clause is interpreted in the same way as the possible overt *than*-clause, in each case.)

Heim & Hackl's superlative is intuitively built off of this latter construction, with *more than anyone else* in the place of *more than the other*.

Is there a relative *most*?
Naturally occurring examples

When only one promotional code can be used - pick the one that saves you most money!

[I]t's good to keep track of all your expenses in a spreadsheet, so you can see what you are spending most money on in the garden.

Which animal has most hair per square inches on its body?

Most races are won by the guy who has most luck at the collisions at the start.

Exists, but fairly rare outside headlines.

But perfectly fine with adverbial and predicative superlatives:

Who spoke most / loudest?, Who was loudest?

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Russian: *more than all* `most'

Only relative superlative reading

• MASHA v ijune prochitala bol'she vsex   knig.
  Mary   in June read   more   all.gen books
  `MARY read more books than anyone else'

• Bol'she vsego   knig   Masha prochitala v ijune.
  more   all.gen   books Mary   read   in June
  `Mary read more books in JUNE than in any other period'

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the more
Naturally occurring examples

Sarah wrote the more books, but Elizabeth is the better remembered.

Bunker Hill was not won by the side which had the more courage, but by that which had the more ammunition.

Who makes the more money, football players or baseball players?

[W]e all know who has the more medals between these two soldiers.

In the event of a tie, the team that has the fewer points scored against it will win.

(Put aside conditionals: "the more we work, the less we earn")

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the more is syntactically distinct from *more*: it doesn't take a *than*-clause

Context: John and Bill worked.

  JOHN made more money than the other.
  John made MORE money than Bill.

* JOHN made the more money than the other.
* John made the MORE money than Bill.

They do not simply differ in the presence or absence of the word *the*.

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Likewise in French, Hungarian
√ the more [of the two] -- * the more than

Qui a bu plus de vin, Jean ou Pierre?
Qui a bu le plus de vin, Jean ou Pierre?   *le plus de* is also
                                             the superlative

Qui a bu plus de vin que Marie?
* Qui a vu le plus de vin que Marie?

Ki ivott több bort, Jani vagy Pali?
Ki itta a több bort, Jani vagy Pali?   the superlative is
                                             a legtöbb

Ki ivott több bort, mint Mari?
* Ki itta a több bort, mint Mari?

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How do the meanings of *more* and *the more* differ?

Who drank more wine?   interested in
Ki ivott több bort?   what people did

Who drank the more wine?   interested in
Ki itta a több bort?   the greater amount
                              of wine drunk and
                              who it was drunk by

Parallels the difference between the two views regarding what relative superlatives compare.

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Comparatives and superlatives

JOHN made more money
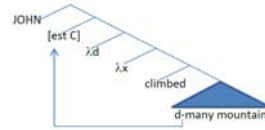(than the other)

… JOHN made %most money
(= more than anyone else)

JOHN made the more money
(of the two/*than the other)

… JOHN made the most money
(of all/*than anyone else)

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Heim/Hackl   Krasikova
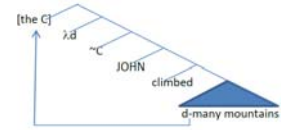
climbers   degree sets of mountains

[-est C] [λd λx. x climbed d-many mtns]

$[[-est]] = \lambda C\, \lambda D\, \lambda x.\ \forall y \in C[x \neq y \rightarrow$
$\quad max\{d: D(d)(x)\} > max\{d: D(d)(y)\}\ ]$
C = {x: ∃d. x climbed d-many mtns}

the is interpreted as ∃ ???
Problem solved!
`more than any other'
cf. Russian bol'she vsex / vsego

[the MAX C] *[λd. J climbed [d-many mtns]~C]

$[[the]] = \lambda Q: \exists !D[Q(D)].\ \iota D[Q(D)]$
MAX(Q) = λD[Q(D) ∧ ∀D'[C(D') → D'⊆D]]
C = {D: ∃x[D= λd∃Y[mtns(Y) & climbed(Y)(x) &
|Y|≥d]}

-est is a syntactic feature on most

`the largest D associated with any'

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Both analyses have to be broken down into smaller pieces, and ones whose meanings are kept stable

Follow Bobaljik's recipe:
[[[many] comparative] superlative]

Demonstrate that these constructions can in principle co-exist in the same language,

and the fact that different languages favor different constructions does not entail a cross-linguistic discrepancy in the meanings of the pieces.

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Building blocks

d-many/much	λNλd∃a[N(a) ∧ |a|≥d]
-er	λGλF[max(F) > max(G)]
than Bill (did)	λP[P(Bill')]
than the other	λTλu[T(ιv[v≠u ∧ v∈C{v,u}])])(u)]

where C{v,u} is retrieved from context

-t = than_ anyone_else

λTλu∀v[v≠u ∧ v∈C][T(v)(u)]

where |C|>2 and C is retrieved from the context

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Replicating Heim/Hackl

made MORE money than Bill (did) =

than_ Bill_did $^\delta$ (-er$^\gamma$ ((d-much$^\alpha$ (money))$^\beta$ (made)))

λy[max(λd∃a[made'(a)(y) ∧ money'(a) ∧ |a|≥d])
  > max(λd∃a[made'(a)(Bill') ∧ money'(a) ∧ |a|≥d])]

α = λgλhλf[g(fh)]; β = λXλRλz[X(λgλy[R(y)(z) ∧ g(y)])];
γ = λYλPλxλy[Y(Px)(Py)]; δ = λZλTλu[Z(Tu)]

made %most money =

-t (-er$^\gamma$ ((d-much$^\alpha$ (money)) $^\beta$ (made)))

λu∀v[v≠u ∧ v∈C]
  [max(λd∃a[made'(a)(u) ∧ money'(a) ∧ |a|≥d])
> max(λd∃a[made'(a)(v) ∧ money'(a) ∧ |a|≥d])]

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Replicating Krasikova's
MARY made the most money

d-much	λN λd ∃a [N(a) & μ(a) ≥ d]
-er	λG λF[max(F) > max(G)]
C	λD ∃x[D=K(x)]

where K = (d-much $^\alpha$ (money)) $^\beta$ (made) =
  λzλd∃a[made(a)(z) & money(a) & μ(a) ≥ d]

Replace [[**the** MAX C]] with [[**the -t (-er)** C]] =
  ιD[C(D) → ∀D'[C(D') → (D=D' ∨ -er(D')(D))]]
Finish, as Krasikova, with distributive predication:
  [[the of-all er C]] *[K(Mary)]

Similarly for *the more money*, with *of-the-two*.

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Spelling out some details

α(d-much) = λg λh λf[g(fh)](λN λd $\exists$a[N(a) $\wedge$ |a|$\geq$d])

   = λh λf[λN λd $\exists$a[N(a) $\wedge$ |a|$\geq$d](fh)]

   = λh λf λd $\exists$a[f(h)(a) $\wedge$ |a|$\geq$d]

α(d-much)(money') = λf λd $\exists$a[f(money')(a) $\wedge$ |a|$\geq$d]

β(α(d-much)(money')) = λX λR λz[X(λg λy[R(y)(z) $\wedge$ g(y)])]

   (λf λd $\exists$a[f(money')(a) $\wedge$ |a|$\geq$d]) =

   = λR λz λd $\exists$a[R(a)(z) $\wedge$ money'(a) $\wedge$ |a|$\geq$d]

β(α(d-much)(money'))(made') =

   = λz λd $\exists$a[made'(a)(z) $\wedge$ money'(a) $\wedge$ |a|$\geq$d]

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Spelling out some details, 2

γ(-er) = λYλPλx λy[Y(Px)(Py)](λGλF[max(F)>max(G)]) =
   λP λx λy[max(Py)>max(Px)]

γ(-er)(β(α(d-much)(money'))(made')) =
   λx λy[max(λz λd $\exists$a[made'(a)(z) $\wedge$ money'(a) $\wedge$ |a|$\geq$d](y)
      > max(λz λd $\exists$a[made'(a)(z) $\wedge$ money'(a) $\wedge$ |a|$\geq$d](x)]

δ(Bill') = λZ λT λu[Z(Tu)](λP[P(Bill')]) = λT λu[T(u)(Bill')]

made-more-money-than-Bill(-did)' =
   δ(Bill')(γ(-er)(β(α(d-much)(money'))(made'))) =
   λT λu[T(u)(Bill')](λx λy[max(λd $\exists$a[made'(a)(y) $\wedge$
   money'(a) $\wedge$ |a|$\geq$d]) > max(λd $\exists$a[made'(a)(x) $\wedge$
   money'(a) $\wedge$ |a|$\geq$d])])

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Spelling out some details, 3
Krasikova 2012

John made the most money
[the MAX C] *[λd. JOHN made [$\exists$ d most money]~C]
MAX(Q) = λD[Q(D) $\wedge$ $\forall$D'[C(D') $\rightarrow$ D'$\subseteq$D]]
[[the]] = λQ: $\exists$!D[Q(D)]. ιD[Q(D)]
C = {D: $\exists$x[D= λd$\exists$Y[money(Y) $\wedge$ made(Y)(x) $\wedge$ |Y|$\geq$d]}

"Beck [2011] assumes that a set of degrees may saturate the degree argument of some degree predicate by acting as a plurality of degrees interpreted distributively. To derive distributive readings, she introduces Link's star operator, to the effect that the plurality of degrees receives sentential scope... Given the standard definition of *, which in this case turns a degree set into its power set, the resulting truth conditions boil down to [i]:
[i] $\exists$X[X is money in *w* $\wedge$ John made X in *w* $\wedge$
      $\forall$d[d$\in$[[the C]](*w*) $\rightarrow$ card$_w$ (X) $\geq$d]]"

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Spelling out some details, 4
Replicating Krasikova
Define C in terms of our smallest pieces as above:

d-much   = λNλd$\exists$a[N(a) $\wedge$ |a|$\geq$d]

-er   = λGλF[max(F) > max(G)]

(d-much$^\alpha$ (money))$^\beta$ (made)   =
      λzλd$\exists$a[made(a)(z) & money(a) & |a|$\geq$d]

C = λD$\exists$x[D=*(d-much$^\alpha$ (money))$^\beta$ (made)*(x)]

Krasikova's MAX is our *-t(-er)*, type to be adjusted.

-t   = λTλu$\forall$v[v$\neq$u $\wedge$ v$\in$C][T(v)(u)]

Replace Krasikova's **[[the max C]]**
with   [[*THE -t(-er) C*]].

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Is focus a critical factor?

Relative readings don't depend on focus on another phrase,

  We should console the girl who got the fewest letters.
   (Szabolcsi 1986)
  How do you win this game? By making the fewest errors.
  I don't want to get the fewest letters.
   (after Heim 1999, citing C.L.Baker)

although such focus, if present, is one of the devices that can help determine the frame of comparison.

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Unicity presupposition in adjectival superlatives: individuals vs. degree sets

Heim/Hackl and Krasikova have an edge over Farkas & Kiss (2000: fn 15) in a situation where Sue's sibs are 6'4" and 6'2"; all others' sibs <6'
(i) *SUE has a taller sib than anyone else*
(ii) *SUE has the tallest sibling*
Both are true, not presupposition failures.

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Appendix on Absolute Superlatives

Recall Hackl 2009:
die meisten Berge is ambiguous between the relative and the absolute/proportional readings

Does Hackl's argument that the proportional determiner is just the absolute version of the relative one carry over to English and other languages?

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What do these English sentences mean?

Absolute superlatives

Mary hates most sandwiches.	✓kinds	* pieces
Mary tasted most sandwiches.	✓kinds	* pieces
Mary tasted most of the sandwiches.		✓ pieces

* Mary caught most burglars.		* persons
Mary caught most of the burglars.		✓ persons

* Mary drank most whiskey.		* stuff
Mary drank most whiskeys.	✓kinds	
Mary drank most of the whiskey.		✓stuff

ALTHOUGH in comparatives and relative superlatives,

MARY tasted **more**/**the most** sandwiches.	✓pieces
MARY caught **more**/**the most** burglars.	✓persons
MARY drank **more**/**the most** whiskey.	✓stuff

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Most NP is generic, and so distributive

Crnic 2009, with reference to
Matthewson 2001, Nakanishi & Romero 2004, Lønning 1987

Most NP = *most* + *bare plural/mass term*, a kind-quantifier.

Most NP combines with a kind predicate, or
with a non-kind predicate, if the predicate is shifted
via Chierchia's DKP (Derived Kind Predication) or GEN_C operator.

DKP collapses *all/most/some NP*. Go for GEN_C.

GEN_C distributes the predicate to minimal realizations of a subkind, and so collective, cumulative, and mass-amount readings are out.

Subtrigging enables one-member kinds: episodic readings, still distributive.

Crnic unfortunately starts from a primitive *most*. In any case, the data show that absolute *most* is not simply a DP-internal version of the relative one (in all its uses, in every language).

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Same for Hungarian

A legtöbb NP on its absolute reading is like *most NP*,
not *most of the NP*, and is not ambiguous,
unlike *die meisten NP*, although superficially it resembles the latter.

Mari utálja / megkóstolta a legtöbb szendvicset.	✓ kinds	* pieces
Mary hates / tasted most (kinds of) sandwiches.		

* Mari elfogta a legtöbb betörőt	* kinds	* persons
* Mary caught most burglars		

* Mari megitta a legtöbb tejet	* kinds	* stuff
* Mary drank most milk.		

Mari megitta a tej (leg)nagyobb részét.	✓ stuff
Mary drank the larger/-est part of the milk [=most of the]	

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Summary

The analysis [[[many] comparative] superlative] helped us

to discover a "new" comparative (*the most*) and a "new" superlative (*most, bol'she vsex/vsego*),

and to straighten out the definiteness and the unicity issues with relative superlatives.

We discovered a new and as yet unsolved problem re:
absolute *most [of the]* vis-á-vis relative *most*.

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Barker, 2007. Parasitic scope. L&P 30.

Bobaljik, to app. Universals in Comparative Morphology. MIT Press.

Crnic 2009, http://www.univie.ac.at/sub14/proc/crnic.pdf .

Farkas & Kiss 2000, Comparative and absolute … superlatives, NLLT 18.

Hackl 2009, On the grammar and processing of …, NLS 17.

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