Decomposing Modal Superlatives

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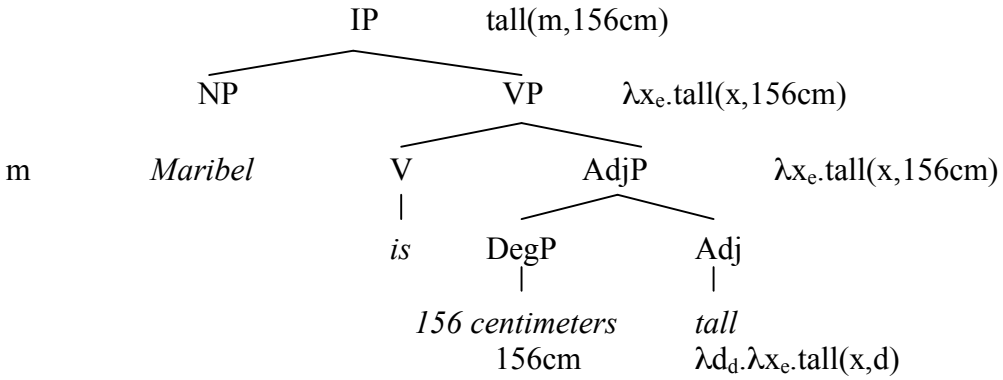
1. Introduction

■ It is assumed that gradable adjectives denote relations between individuals and degrees: (1). Gradable adjectives are downward monotonic; that is, if Maribel is 156cm tall, then *tall(m,156cm)* is true, *tall(m,155cm)* is true, *tall(m,154cm)* is true, etc.

(1) Maribel is 156 centimeters tall.



■ The comparative morpheme *-er* and the superlative morpheme *-est* operate on the degree argument of gradable predicates. Intuitively:

(3) John is tall**er** than Bill ⇔ John is tall to a degree to which Bill is not
⇔ ∃d [tall(j,d) ∧¬tall(b,d)] (Seuren 1973)

(4) John is the tall**est** (in group C)
⇔ John is tall to a degree to which nobody else in group C is tall
⇔ ∃d [tall(j,d) & ∀z∈C [z≠j → ¬tall(z,d)]] (Heim 1999)

■ Superlatives with modal modifiers like *possible* (Corver 1997, Larson 2000, Schwarz 05): Prenominal *possible* with superlatives, as in (7)-(8), gives rise to two readings. Some interesting syntactic restrictions have been observed: ① and ②.

(7) I bought the largest possible present.
a. "Out of objects that were possible presents, I bought the largest one."
b. "I bought as large a present as it was possible for me to buy."

(8) I talked to the fewest possible guests.
a. "Out of the individuals that were possible guests, I talked to the fewest."
b. "I talked to as fewest guests as it was possible for me to talk to."

⇨ Ambiguous: (a) Regular Noun modifier *possible*
(b) Modal superlative reading: "as X as possible"

- RESTRICTION ①: Postnominal *possible* only has modal superlative reading (Larson00).

(9) I bought the largest present possible.
a. * "Out of objects that were possible presents, I bought the largest one."
b. "I bought as large a present as it was possible for me to buy."

(10) I talked to the fewest guests possible.
a. * "Out of the individuals that were possible guests, I talked to the fewest."
b. "I talked to as fewest guests as it was possible for me to talk to."

- RESTRICTION ②: Prenominal *possible* requires syntactic locality with the superlative morpheme *-est* in order for the modal superlative reading to arise. (Schwarz 2005):

(11) Ich habe das größt.**e** möglich.**e** Geschenk gekauft.
I have the largest.**Infl** possible.**Infl** present gekauft
'Out of the possible presents, I bought the largest one.' REGULAR MODIFIER

(12) Ich habe das größt möglich.**e** Geschenk gekauft.
I have the largest possible.**Infl** present gekauft
'I bought as large a present as it was possible for me to buy.' MODAL SUPERLATIVE

(13) I bought the largest **affordable** possible present.
a. "Out of objects that were affordable possible presents, I bought the largest one."
b. * "I bought as large an affordable present as it was possible for me to buy."

(14) I bought the most **expensive** possible present.
a. "Out of objects that were possible presents, I bought the most expensive one."
b. * "I bought as expensive a present as it was possible for me to buy."

■ Previous analyses of the modal superlative reading:

- Larson (2000) on ①: *possible* + ACD generated postnominally; promotion to prenominal position.
- Schwarz (2005) on ②: non-decomposible degree operator *-est possible*.

(15) $[\![\text{-}est\ possible]\!]^w = \lambda P_{<s,dt>}.\ \forall d\ [\ \exists w'[wRw'\ \&\ P(w')(d)=1] \rightarrow P(w)(d)=1\ ]$

■ Goal of this talk

To provide a COMPOSITIONAL ANALYSIS of the MODAL SUPERLATIVE READING that:

(i) allows us to reconcile the observations ① and ② about its surface syntax,
↳ *[-est possible]* (together with some covert material) will be treated as a syntactic unit (with Schwarz 2005, contra Larson 2000), further decomposible (contra Schwarz 2005).
↳ The modal superlative reading arises from an LF structure with an ACD clause (with Larson 2000, contra Schwarz 2005).

(ii) uses LF structures independently motivated for superlatives and degree constructions,

(iii) and derives the correct truth conditions.
↳ (7b): "I bought as large a present as it was possible for me to buy (and no larger)."

■ Consequences for the bigger picture of comparative and superlative constructions:[1]

- Comparative *-er*: crosslinguistically, we find a 3-place predicate *-er*, as in (16)-(17), and a 2-place predicare *-er*, as in (18)-(20) (Bhatt and Takahashi 2008).

(16) Atif-ne Boman-se zyaadaa kitaabe parh-i (Hindi-Urdu)
Atif-Erg Boman-than more books.f read-Pfv.FP1
'Atif read more books than Boman.'

(17) $\lambda x_e.\lambda P_{<d,et>}.\lambda y_e.\ \exists d\ [P(d)(y)\ \&\ \neg(P(d)(x))]$

(18) John is taller than Mary is.
a. LF: [-er [(than) 1 Mary is <t_1-tall>]] [2 John is t_2-tall]
b. $[\![2\ John\ is\ t_2\text{-}tall]\!]^w$ = $\lambda d'.\ tall(j,d')$
c. $[\![1\ Mary\ is\ t_1\text{-}tall]\!]^w$ = $\lambda d'.\ tall(m,d')$

(19) $\lambda Q_{<d,t>}.\lambda P_{<d,t>}.\ \exists d\ [P(d)\ \&\ \neg(Q(d))]$

(20) John is taller than 2 meters.
a. LF: [-er [(than) 2 meters]] [2 John is t_2-tall]
b. $[\![2\ John\ is\ t_2\text{-}tall]\!]^w$ = $\lambda d'.\ tall(j,d')$
c. $[\![2\ meters]\!]^w$ = $\lambda d'.\ d' \leq 2m$
c'. $[\![2\ meters]\!]^w$ = 2m
Type shifter SHIFT = $\lambda d''.\lambda d'.\ d' \leq d''$
SHIFT($[\![2\ meters]\!]^w$) = $\lambda d'.\ d' \leq 2m$

- Superlative *-est*: the 3-place predicate *-est* and the 2-place predicate *-est* have been proposed as theoretical alternatives to each other. Evidence for the 3-place lexical entry (21) comes from cases like (22), with overt argument of type <e,t>. The present talk provides empirical evidence that we also need the 2-place lexical entry (23).

(21) $\lambda C_{<e,t>}.\lambda P_{<d,et>}.\lambda x_e.\ \exists d\ [\ P(d)(x)\ \&\ \forall z \in C[z \neq x \rightarrow \neg(P(d)(z))]\ ]$

(22) John is the tallest among the candidates.

(23) $\lambda C_{<dt,t>}.\lambda P_{<d,t>}.\ \exists d\ [\ P(d)\ \&\ \forall Q \in C\ [Q \neq P \rightarrow \neg(P(d))]\ ]$

■ Plot of the rest of this talk:

§2. Background: LF analyses of superlatives.

§3. Proposal using the 2-place lexical entry *-est*.

§4. Some failed attempts with the 3-place lexical entry *-est*.

§5. Concluding remarks.

[1] Thanks to Irene Heim (p.c.) for pointing out the relevance of the comparative data.

2. Background: LF analyses of superlatives

■ Ambiguity found in superlatives with covert argument C (Szabolcsi 1986, Heim 1999):

(24) John climbed the highest mountain.
a. ABSOLUTE reading: "John climbed a mountain higher than any other mountain."
b. RELATIVE reading: "John climbled a higher mountain than anybody else climbed."

(25) Who wrote the largest prime number on the blackboard?
a. Nobody, of course! There is no largest prime number! ABSOLUTE reading
b. John did. He was the only one above 100. RELATIVE reading

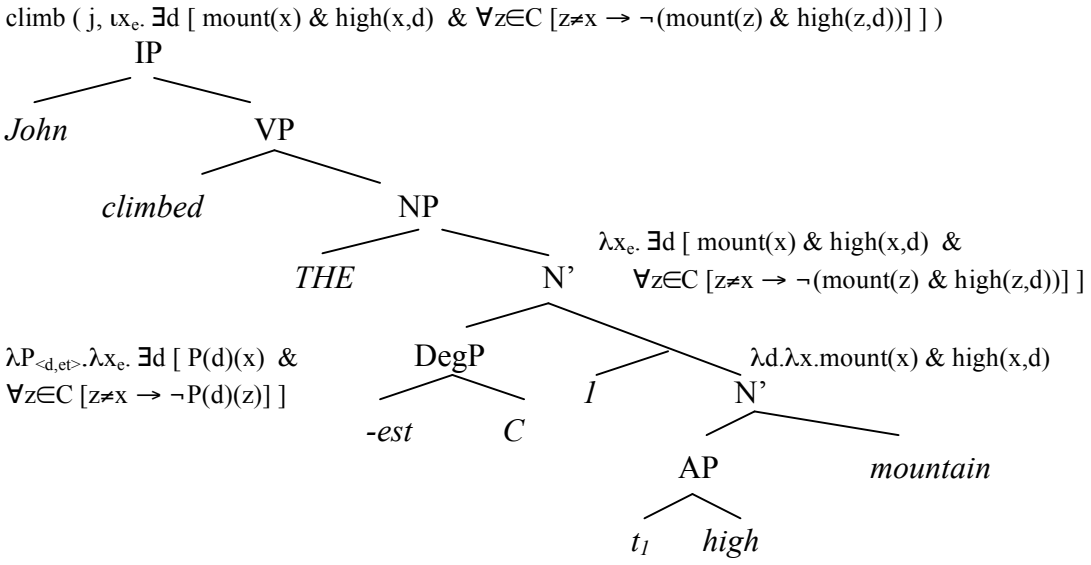
2.1. Analysis of the ambiguity using 3-place *-est*. (Heim 1999)

(26) 3-place lexical entry and presuppositions:
$[\![\text{-}est]\!] = \lambda C_{<e,t>}.\lambda P_{<d,et>}.\lambda x_e.\ \exists d\ [\ P(d)(x)\ \&\ \forall \in C\ [z \neq x \rightarrow \neg(P(d)(z))]\ ]$
Presuppositions:
(a) the third argument, x, is a member of the first, C.
(b) all the members of the comparison set C have the property P to some degree.

■ Assumptions:
-est can undergo LF movement out of its host DP.
The definite article *the* is semantically vacuous. Instead, THE or A.
Thesis:
The LF position of *–est* determines, to some extent, the possible choices for C, which in turn determines whether we get the absolute or the relative reading.

■ The ABSOLUTE reading:

(27) John climbed the highest mountain.



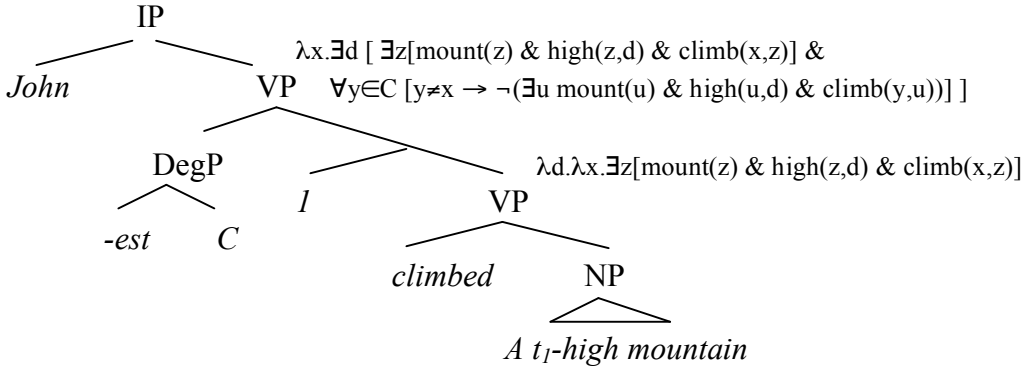
(28) a. LF: John climbed [THE [–est C] 1 [t_1-high mountain]]
b. Absolute reading: C = {x: x is a mountain on earth}[2]

[2] (28a) also allows for the relative reading. See Heim (1999), Sharvit & Stateva (2002), Büring (2007).

■ The RELATIVE reading:

(29) John climbed the highest mountain.

∃d [∃z[mount(z) & high(z,d) & climb(j,z)] & ∀y∈C [y≠x → ¬(∃u mount(u) & high(u,d) & climb(y,u))]]



(30) a. LF: John [–est C] 1 [climbed [A t_1-high mountain]]
b. Due to presuppositions in the lexical entry of *-est*, C has to be a set containing John and other (relevant) climbers of mountains with some degree of height or other.

2.2. Analysis of the ambiguity using 2-place *-est*. (Heim 1999)

(31) [[*-est*]] = $\lambda C_{<dt,t>}.\lambda P_{<d,t>}.\ \exists d\ [\ P(d)\ \&\ \forall Q \in C\ [Q \neq P \rightarrow \neg Q(d)]\ ]$
Plus presupposition: P is a member of C.

■ Assumptions:
-est can undergo LF movement out of its host DP.
The definite article *the* is semantically vacuous. Instead, THE or A.
Observation:
The relative superlative reading is sensitive to Focus: (32).
Thesis:
The LF position of *–est* and the focus structure of its sister together determine whether we get the absolute or the relative reading.

(32) a. John wrote the longest letter to MARY.
b. JOHN wrote the longest letter to Mary.

■ RELATIVE reading:

(33) JOHN climbed the highest mountain.

(34) LF: [-est C] 1[$JOHN_F$ climbed A t_1-high mountain] ~ C
where C ⊆ { λd. John climbed a d-high mountain,
λd. Bill climbed a d-high mountain,
λd. Chris climbed a d-high mountain}

(35) ∃d [John climbed a d-high mountain &
¬(Bill climbed a d-high mountain) &
¬(Chris climbed a d-high mountain)]

■ ABSOLUTE reading [MR's version]

(36) Extra assumption: Traces and other empty categories can be focus-marked.

(37) a. I met the person that John wrote the longest letter to t_F. Cf. (32a)
b. I met the person that t_F wrote the longest letter to Mary. Cf. (32b)

(38) How does one impress Mary?
By PRO_F writing the longest letter to her.

(39) John climbed the highest mountain.

(40) LF: John climbed THE 2 [[-est C] 1[$t_{2,F}$ d_1-high mountain] ~ C]
Hence, it is presupposed that
C ⊆ { λd. d-high mountain (Everest),
λd. d-high mountain (Kilimanjaro),
λd. d-high mountain (Aneto) }

(41) John climbed the unique x: ∃d [d-high mountain(x) &
∀Q∈C [Q≠λd'.d'-high mountain(x) → ¬Q(d)]]

3. Proposal using the 2-place lexical entry *-est*.

(42) John climbed the highest possible mountain.
a. Modal superlative reading: "He climbed as high a mountain as it was possible for him to climb".

(43) 2-place lexical entry:
[[*-est*]] = $\lambda C_{<dt,t>}.\lambda P_{<d,t>}.$ ∃d [P(d) & ∀Q∈C [Q≠P → ¬Q(d)]]
Plus presupposition: P is a member of C.

■ IDEA using the 2-place *-est* in (43):

- Sometimes the comparison argument slot $\lambda C_{<dt,t>}$ is filled by a free variable. Then the value of C is resolved contextually, often via focus, as in §2.2. Cf. comparatives (44).

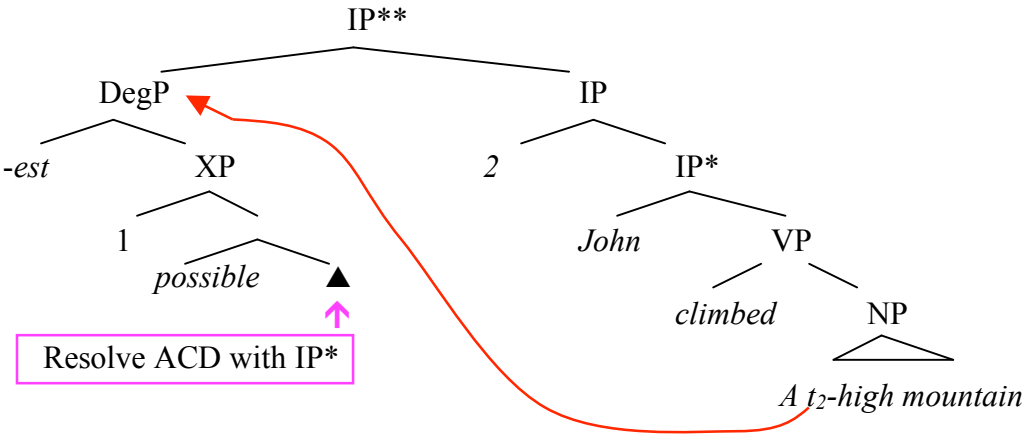
(44) a. John is taller.
b. John sent most pictures to MARY.
c. JOHN sent more pictures to Mary.

- Sometimes the comparison argument slot $\lambda C_{<dt,t>}$ is filled with syntactic material. The denotation of this material is directly fed into the slot $\lambda C_{<dt,t>}$. We claim that this is the case of the modal superlative reading at issue. Cf. comparative in (45).

(45) John is taller than Mary is / than 2m. (=(18),(20))

■ Example:

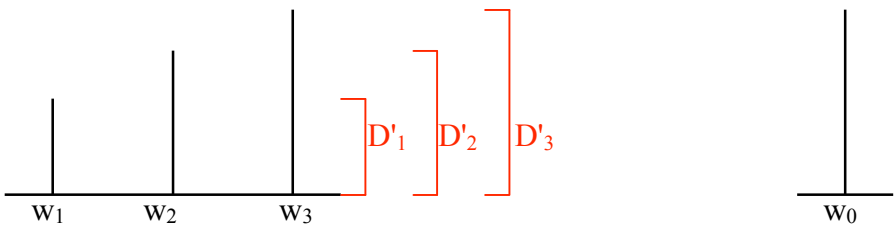
(46) John climbed the highest possible mountain.



(47) [-est [1 possible <John climbed A t_1-high mount>]] [2 John climbed A t_2-high mount]

(48) a. ⟦*2 John climbed A t_2-high mountain*⟧ =
λd. ∃x [mount(x) & climb(j,x) & high(x,d)]
b. ⟦<*John climbed A t_1-high mountain*>⟧ =1 iff
∃x [mount(x) & climb(j,x) & high(x,g(1))]
c. ⟦*possible* <*John climbed A t_1-high mountain*>⟧ =1 iff
◊∃x [mount(x) & climb(j,x) & high(x,g(1))]
d. ⟦*1 possible* <*John climbed A t_1-high mountain*>⟧ =
λd. ◊∃x [mount(x) & climb(j,x) & high(x,d)]
e. ⟦*-est*⟧ = $\lambda C_{<dt,t>}.\lambda P_{<d,t>}.\ \exists d\ [\ P(d)\ \&\ \forall Q \in C\ [Q \neq P \rightarrow \neg Q(d)]\ ]$
f. SHIFT: $\lambda D_{<d,t>}.\lambda D'_{<d,t>}.\ \exists d'\ [D(d')\ \&\ D'=\lambda d''.d'' \leq d']$
g. SHIFT (⟦*1 possible* <*John climbed A t_1-high mountain*>⟧) =
$\lambda D'_{<d,t>}.\ \exists d'\ [\ \Diamond\exists x[\text{mount}(x)\ \&\ \text{climb}(j,x)\ \&\ \text{high}(x,d')]\ \&\ D'=\lambda d''.d'' \leq d'\ ]$
h. ⟦IP**⟧ = 1 iff
∃d [∃x[mount(x) & climb(j,x) & high(x,d)] &
∀D' [(∃d' [◊∃x[mount(x) & climb(j,x) & high(x,d')] & D'=λd".d"≤d' &
D' ≠ λd. ∃x [mount(x) & climb(j,x) & high(x,d)]) →
¬D'(d)]]
Plus the presupposition:
∃d' [◊∃x [mount(x) & climb(j,x) & high(x,d')] &
λd. ∃x [mount(x) & climb(j,x) & high(x,d)] = λd".d"≤d']

(49)



■ Other examples and assumptions:
- *most* as *-est* + *many* (Hackl 2009)
- *least* as *-est* + LITTLE + *many*, where LITTLE basically amounts to negation and can scope out. (Heim 2006)

(50) John climbed the most possible mountains.

(51) [-est [1 possible <John climbed t_1-many mounts>]] [2 John climbed t_2-many mounts]
a. ⟦[2 *John climbed* t_2*-many mountains*]⟧ = $\lambda d.\ \exists x$ [mount(x) & climb(j,x) & |x|≥d]
b. SHIFT (⟦[1 *possible* <*John climbed* t_1*-many mountains*>]⟧) =
$\lambda D'_{<d,t>}.\ \exists d'$ [$\Diamond \exists x$[mount(x) & climb(j,x) & |x|≥d')] & $D'=\lambda d''.d''\leq d'$]

(52) John climbed the least possible mountains.

(53) [-est [1 possible <LITTLE John climbed t_1-many mounts>]] [2 LITTLE John climbed t_2-many mounts]
a. ⟦[2 LITTLE *John climbed* t_2*-many mountains*]⟧ =
$\lambda d.\ \neg\exists x$ [mount(x) & climb(j,x) & |x|≥d]
b. SHIFT (⟦[1 *possible* <LITTLE *John climbed* t_1*-many mountains*>]⟧) =
$\lambda D'_{<d,t>}.\ \exists d'$ [$\Diamond\neg \exists x$[mount(x) & climb(j,x) & |x|≥d')] & $D'=\lambda d''.d''\leq d'$]

4. Some failed attempts with the 3-place lexical entry *-est*.

(54) 3-place lexical entry:
⟦*-est*⟧ = $\lambda C_{<e,t>}.\lambda P_{<d,et>}.\lambda x_e.\ \exists d$ [P(d)(x) & $\forall \in C$ [$z\neq x \rightarrow \neg$(P(d)(z))]]
Presuppositions:
(a) the third argument, x, is a member of the first, C.
(b) all the members of the contextual argument C have the property P to some degree.

4.1. Scoping 3-place *-est* out of the host NP.

■ LF and truth conditions:

(55) John climbed the most possible mountains.

(56) [-est possible (...)] 1 John climbed [A mountains IN A [[t_1 LARGE] AMOUNT]]

$\lambda d_d.\lambda n_e.$ amount(n) & large(n,d) &
$\exists$x [mountains(x) & climb(j,x) & |x|≥n]

$\lambda n'_e.\ \Diamond\exists y\exists d$ [mountains(y) & |y|≥n' & climb(j,y) & large(n',d)]

(57) $\lambda n_e.\ \exists d$ [amount(n) & large(n,d) & $\exists$x [mountains(x,w_0) & climb(j,x,w_0) & |x|≥n] &
$\forall n' \in$ ⟦*possible (...)*⟧ [$n'\neq n \rightarrow \neg$(amount(n') & long(n',d) & $\exists$x [mountains(x,w_0) & climb(j,x,w_0) & |x|≥n'])]]
➔ Add ∃-closure at the top?

■ Results:

😐 The top node of the computation ends up with the wrong type. But perhaps one can posit a default existential closure there. If so, then the derived truth conditions are the ones we were aiming for.

☹ The type of LF used is that for relative readings. But, if the 3-place version of *-est* and *LITTLE* can extract that high in (56), then one would expect for them to also be able to extract to the position immediately under *John*. This would derive the relative reading comparing mountain-climbers and their achievements in (58). But this is not a possible reading of sentence (55).

(58) Missing relative reading wrt mountain-climbers:
a. LF: John [-est possible (...)] 1 climbed [A mountains IN A [[t_1 LARGE] AMOUNT]]
b. Paraphrase: "Out of the mountains climbers for whom it is allowed to climb some amount of mountains, John is the one for whom the greatest achievement --the largest interval-- is allowed."

4.2. Scoping 3-place *-est* inside the host NP.

■ LF and derived truth conditions:

(59) John climbed the fewest possible mountains.

(60) John climbed [A mountains IN A [-est possible (...)] 1 [[t_1 LITTLE LARGE] AMOUNT]]

$\lambda d_d.\lambda n_e$. amount(n) & ¬large(n,d)]

$\lambda n'_e$. ◊¬∃y∃d [mountains(y) & |y|=n' & climb(j,y) & large(n',d)]

(61) ∃x [mountains(x) & climbed(j,x) & ∃n [|x|=n &
∃d [¬large(n,d) & ∀n' ∈ ⟦*possible (...)*⟧ [n'≠n → large(n',d)]]]]

(62) Paraphrase:
"Out of the amounts such that it is possible for John to fail to climb that amount of mountains, there is a mountain-sum that John climbed whose cardinality is the smallest of those amounts."

■ Results:

☹ The resulting truth conditions that are TOO WEAK:

(63) Scenario: The rules in w_0 permit that John climbs 10 mountains or more. In w_0 John happens to climb exactly15 mountains.
Sentence (59) → FALSE
Formula (61) / paraphrase (62) → TRUE

5. Concluding remarks

■ A compositional analysis of the modal superlative reading has been proposed that:

(i) reconciles the observations about its surface syntax, namely:
- Locality requirement: *[-est [possible ▲]]* is a syntactic unit.
- Prenominal *possible* can be a regular N-modifier or a reduced Relative Clause. Regular adjectival modifiers do not generally postpone in English; (reduced) Relative Clauses can postpone. Hence, if *possible* appears postnominally, it must be introducing a reduced Relative Clause with an elided IP. This reduced RC with ellipsis can in principle be interpreted as ranging over degrees (= modal superlative reading), or as relative clause ranging over individuals (=regular modifier reading). However, it seems that, independently of *-est*, reduced RCs with ellipsis cannot be interpreted as ranging over individuals: (64). We leave this question open.

(64) a. I bought a present that it was possible for me to buy.
b. I bought a present possible for me to buy.
c. * I bought a present possible.

(ii) uses Logical Form structures independently motivated for superlatives and degree constructions:
- 2-place lexical entry for *-est*. Cf. comparatives.
- Relative LF
- Decomposition of *most* as *-est* + *many* and *least* as *-est* + *LITTLE* + *many*.
- Scope of *LITTLE*

(iii) and derives the desired truth conditions:
"(exactly) as X as possible"

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