

Superlative Displacement in ‘Sandwich’ Scenarios*

Peter Hallman

Austrian Research Institute for Artificial Intelligence

peter.hallman@ofai.at

January 2023

Abstract

This paper seeks to reconcile the ‘movement’ account of the interpretation of superlative and comparative degree quantifiers with a class of apparent counterexamples. Superlative and comparative degree quantifiers compare the extent to which a target term and alternatives to the target instantiate a gradable property. On the movement analysis, the target and the gradable property are determined by the scope of the degree quantifier in the syntactic structure. As a structural consequence, terms in the scope of the degree quantifier are indifferent to the presence of the degree quantifier. This leads to incorrect empirical predictions in some contexts, apparently undermining the movement account. I provide an analysis of these contexts in which the unexpected interaction of degree quantifiers with other terms in their scope is a side effect of quantification over situations inherent in the degree quantifier itself. This solution applies uniformly to superlative and comparative constructions.

1 Introduction

One analytical approach to superlative constructions in English and other languages admits variation in the position of the superlative morpheme in the semantic composition, connecting divergent readings of the superlative to different syntactic scope configurations. This approach is known to make incorrect predictions in contexts known as ‘sandwich’ scenarios, described in detail in section 2. Another approach decouples readings of the superlative from the syntactic scope of the superlative morpheme. In this paper, I compare the two

*I wish to express my gratitude to two anonymous reviewers whose comments and criticisms were invaluable to this work. All errors are my own. The research reported here was financially supported by the Austrian Science Fund (FWF) grant no. P30409-G30.

approaches and consider how a scope-based analysis might be modified to make correct predictions in sandwich scenarios. In section 2, I describe the problem and its theoretical context in detail and in section 3 propose a situation theoretic solution that seeks to reconcile the scope-based analysis of the superlative with the sandwich problem. Section 4 extends the analysis to modal environments (so called ‘upstairs de dicto’ readings of superlatives). Section 5 describes some additional dimensions to the issue, including a demonstration that unlike the non-scope based approach, the solution I provide fulfils a desideratum articulated by Büring (2007a), which is that it extends naturally to comparative constructions, which display a similar pattern.

2 Previous analyses and the sandwich problem

Superlative sentences like (1) display an ‘absolute’ and a ‘relative’ reading (Ross 1964, Heim 1985, 1999, Szabolcsi 1986). On the absolute reading, we compare mountains and assert that Alex climbed the highest one. On the relative reading, we compare Alex with other mountain climbers and assert that Alex exceeds the others in terms of how high a mountain they climbed. The two readings have different truth conditions: Alex might exceed all others in terms of how high a mountain she climbed without having necessarily climbed the absolute highest mountain.

(1) Alex climbed the highest mountain.

Two ways of treating the absolute/relative ambiguity have emerged. One characterizes it as a structural ambiguity (Szabolcsi 1986, Heim 1999, 2001, 2006, Hackl 2000, Stateva 2000, and others). Heim (1999) proposes the definition for *est* in (2). This definition is true of a degree relation R and an individual x if x bears R to a degree that all alternatives y do not bear R to. Gradable adjectives like *high* are degree relations, in this case a relation between a height and an individual. Such degree relations are taken to be downward monotone; if an individual bears the relation to a degree, it bears it to all lesser degrees (Cresswell

1976, Heim 1999). The contextual index C represents the set of salient individuals under discussion, from which values for x and y are drawn.

$$(2) \quad \llbracket \text{est} \rrbracket^C = \lambda R_{\langle d, \langle e, t \rangle \rangle} \lambda x_e . \exists d R(d)(x) \ \& \ \forall y [y \neq x \ \& \ y \in C \rightarrow \neg R(d)(y)]$$

In the derivation Heim (1999) proposes for the absolute reading of (1), *est* moves to the edge of the NP that dominates its base position in the AP *high*, deriving the logical form (LF, a structured representation of meaning potentially differing from the surface ‘phonological form’, or PF) in (3a). The numbers in (3a) represent abstraction indices over variables in their scope. The index ‘1’ represents abstraction over the variable x representing a mountain. The index ‘2’ is inserted as a result of movement of *est* and represents abstraction over the trace of *est*, itself denoting a degree variable representing x ’s height.¹ As a result of movement of *est*, then, the NP to which *est* adjoins is interpreted as a degree relation, a relation between a degree and an individual, in this case the relation *be a d -high mountain*. *est* then applies to this relation, deriving a property of individuals which can only hold of one individual—that individual that exceeds the others in C in terms of the degree relation. I assume for concreteness that the definite article in this case denotes the iota operator, which maps a property to the unique individual with that property, if there is one. On the basis of that assumption and the denotation of *est* in (2), the logical form in (3a) composes as the formula in (3b). This says that Alex climbed the unique mountain that is higher than all other mountains in the contrast set C .

$$(3) \quad \begin{array}{l} \text{a. Alex climbed the } [\text{est } [1 [2 [x_2 \text{ is a } d_1\text{-high mountain}]]]] \\ \text{b. Alex climbed } \iota x [\exists d \text{ high}(d)(x) \ \& \ \text{mountain}(x) \ \& \ \forall y [y \neq x \ \& \ y \in C \rightarrow \neg \text{high}(d)(y) \\ \ \& \ \text{mountain}(y)]] \end{array}$$

The ingredients at work in (3a)—the definition in (2) and covert syntactic movement—also derive the relative reading, if we admit some flexibility in the interpretation of the definite article, as described below. Moving *est* to the level of the VP, illustrated in (4a), results in a composition that compares Alex to other individuals who climbed mountains, as

¹See Heim and Kratzer (1998) on the semantic correlates of syntactic quantifier movement.

illustrated in (4b). Movement of *est* to VP derives a degree relation at that level. When *est* applies to this degree relation, it derives a description of an individual who climbed a higher mountain than anyone else in *C*. According to (4a), this person is Alex.

- (4) a. Alex est [1 [2 [x_2 climbed a d_1 -high mountain]]]
 b. $\exists d$ Alex climbed a d -high mountain & $\forall y[y \neq \text{Alex} \ \& \ y \in C \rightarrow \neg y$ climbed a d -high mountain

It is crucial for this result that the definite article that appears overtly in (1) is not interpreted as such. Otherwise, the description with respect to which we compare mountain climbers would be one that refers to the same unique mountain across mountain climbers. But this would subvert the relative reading, since there we want to compare the climbers in terms of the heights of their respective, potentially distinct, mountains. It must be possible, if this approach is correct, to construe *the* as an indefinite article in relative superlative constructions, as depicted in (4a). Why this is possible remains an open question.

This inexplicable aspect of the analysis in (4a) gives one pause to consider whether an alternative analysis is available for the relative reading in which the definite article is interpreted uniformly. In fact, as Heim (1999) points out, the relative interpretation for (1) can be accommodated in the derivation for the absolute reading in (3) by contextually restricting the contrast set *C* to the set of mountains climbed by the various mountain climbers we are interested in. Then we indirectly compare mountain climbers, but are directly still comparing mountains. Following Sharvit and Stateva (2002), I refer to this as the ‘DP-internal’ analysis of the relative reading, since although *est* moves from its base position in this view, it remains within the superlative DP, where it is interpreted.² This is unlike the analysis in (4a), where *est* is extracted from DP and moved to a position adjoined to VP, which I refer to as the ‘DP-external’ analysis.

²It is unclear whether this placement for *est* involves movement of *est* from a position local to the associated adjective. Abney (1987), Cinque (2010) and others claim that *est* is base generated in a high position in the DP and the adjective to which it is suffixed has moved to a position local to *est*. Still other analyses claim that *est* is interpreted not at the NP edge but within its adjectival host (Matushansky 2008, Coppock and Beaver 2014, 2015).

Although the DP-internal approach can indirectly accommodate a relative reading for sentences like (1), Heim (1999) claims that the DP-external approach is vindicated by sentences like (5). This sentence has a reading that describes the results of a survey we have taken of a group of mountain climbers, who have each named the height such that they need to climb a mountain that high, for example to qualify for membership in a mountain climbing club, without having any particular mountain in mind, and Alex named the greatest height.

(5) Alex needs to climb the highest mountain.

In this case, we are not describing the highest mountain in some contrast set, since (5) does not assert the existence of any particular mountains. This example therefore resists an analysis that simply manipulates the content of the contrast set C . But covert movement of *est* over the modal verb *need*, as depicted in (6a), derives the reading in (6b) for (5) that is true in the situation described above. We are comparing Alex with others in terms of how high a mountain they need to climb. Sharvit and Stateva (2002) call this an ‘upstairs de dicto’ reading of (5), ‘upstairs’ because the superlative is interpreted above the modal and ‘de dicto’ because existential quantification over mountains obtains below the modal. On the DP-internal approach, it would appear to be impossible in this case to collect a salient set of mountains for the purposes of comparison, since no one has a need involving any particular mountain.

(6) a. Alex est [1 [2 [x_2 needs to climb a d_1 -high mountain]]]
 b. $\exists d$ Alex needs to climb a d -high mountain & $\forall y[y \neq \text{Alex} \ \& \ y \in C \rightarrow \neg y$ needs to climb a d -high mountain]

As Stateva (2000) points out, the DP-external analysis is also capable of characterizing an ambiguity among upstairs de dicto readings of the negative superlative *least* in structural terms. Suppose Kyle needs to climb a mountain that is at least 1000m high, Parker a mountain that is at least 1500m high, and Alex a mountain that is at least 2000m high, and the climbers are allowed to exceed these minimums. The sentence in (11a) can describe this situation. Sharvit and Stateva call this the ‘at least’ upstairs de dicto reading of (11a).

But (11a) can also be felicitously uttered in relation to the maximum heights the mountain climbers are allowed to ascend to (lest they exceed their capabilities, for example), as when Kyle needs to climb a mountain that is no higher than 1000m, Parker a mountain that is no higher than 1500m and Alex a mountain that is no higher than 2000m. Sharvit and Stateva refer to this as the ‘at most’ upstairs de dicto reading.

(7) Kyle needs to climb the least high mountain.

If we define *least* as the inverse of *est*, as in (8a) (to fail to bear a certain degree relation to a degree that every alternative bears it to), then the ‘at least’ upstairs de dicto reading falls out from the DP-external logical form in (8b), where *least* has moved above the modal verb. Plugging the definition of *least* in (8a) into the logical form in (8b) yields the formula in (8c), which is true when there is a degree such that Kyle does not need to climb a mountain that high (e.g. 1001m) but everyone else needs to climb a mountain that high. This is the case in the ‘at least’ scenario described above.

- (8) a. $\llbracket \text{least} \rrbracket^C = \lambda R_{\langle d, \langle e, t \rangle \rangle} \lambda x_e. \exists d \neg R(d)(x) \ \& \ \forall y [y \neq x \ \& \ y \in C \rightarrow R(d)(y)]$
 b. Kyle least [1 [2 [x_2 needs to climb a d_1 -high mountain]]]
 c. $\exists d \neg \text{Kyle needs to climb a } d\text{-high mountain} \ \& \ \forall y [y \neq \text{Kyle} \ \& \ y \in C \rightarrow y \text{ needs to climb a } d\text{-high mountain}]$

Drawing on Rullmann’s (1995) similar analysis of comparative *less*, Stateva (2000) claims that *least* is composed of the base adjective *little* and the superlative suffix *est*, and that the ‘at most’ reading of (7) is derived by moving just *est* above the modal verb, leaving *little* in place, where it negates the base adjective *high*, as represented in (9a). Composing (9a) with the definition of *est* in (2) yields the formula in (9b), which is true if there is a degree such that Kyle needs to climb a mountain that is not that high (this is a degree above the maximum height Kyle is allowed to climb), and no one else needs to climb a mountain that it not that high (their maximums are higher). Assuming that *least* can be decomposed into *est* and *little* in the syntax in this manner, the DP-external analysis seems well equipped to deal with both upstairs de dicto readings and the subtle ‘at least’ vs. ‘at most’ distinction

that they manifest.

- (9) a. Kyle *est* [1 [2 [x_2 needs to climb a not- d_1 -high mountain]]]
 b. $\exists d$ Kyle needs to climb a not- d -high mountain & $\forall y[y \neq \text{Kyle} \ \& \ y \in C \rightarrow \neg y$ needs to climb a not- d -high mountain]

This empirical coverage might be worth the cost of the inexplicable conversion of the definite article into an indefinite on DP-external readings. However, Sharvit and Stateva (2002) describe considerations (which they attribute to a personal communication from Irene Heim) that again favor the DP-internal analysis of relative readings. The considerations revolve around the interpretation of *least* in contexts they refer to as ‘sandwich scenarios’, here again in ordinary extensional environments. Suppose that as before, Kyle climbed a 1000m mountain, Parker a 1500m mountain, and Alex a 2000m mountain, but also that in addition to the 1000m mountain that Kyle climbed, she also climbed a 2500m mountain. Sharvit and Stateva (2002) refer to this as a ‘sandwich scenario’, since the heights of everyone else’s mountains are sandwiched between the heights of the two mountains Kyle climbed. Intuitively, (10a) is true in this scenario, since no one climbed a shorter mountain than the shortest mountain Kyle climbed. Yet, the formula in (10c), derived from the DP-external LF in (10b) (parallel to (4) for *est*), is false in this situation.

- (10) a. Kyle climbed the least high mountain.
 b. Kyle *least* [1 [2 [x_2 climbed a d_1 -high mountain]]]
 c. $\exists d \neg$ Kyle climbed a d -high mountain & $\forall y [y \neq \text{Kyle} \ \& \ y \in C \rightarrow y$ climbed a d -high mountain]

The reason (10c) is false in the sandwich scenario is that in that scenario, every degree up to 2500 is a degree such that Kyle climbed one or another mountain that high. Consequently, it is not the case that there is a degree such that Kyle didn’t climb a mountain that high (say, 2501m) but everyone else did (no one else climbed a 2501m mountain either). The DP-external analysis, which attributes the interpretation in (10c) to (10a), therefore predicts that (10a) should be false in the sandwich scenario, precisely because it is not comparing mountains but mountain climbers. As Sharvit and Stateva clarify (pp. 475-478),

decomposing *least* into *est* and *little* does not help here because even if *least* is decomposable in principle, nothing prevents its components from both having wide scope, corresponding to the LF in (10b). It seems, then, that the DP-internal analysis is a better fit for these observations than the DP-external analysis. On the DP-internal analysis, the contrast set C includes all the mountains climbed by the various participants, and in the sandwich scenario the least of these in height is the lower of the two mountains Kyle climbed, as desired.

Judgments in sandwich scenarios therefore support the DP-internal approach to the derivation of relative readings, and warrant revisiting the question of whether the DP-internal approach can be adjusted to accommodate the upstairs de dicto readings that Heim claims are problematic for the DP-internal approach. Sharvit and Stateva (2002) propose such an analysis. They derive the upstairs de dicto reading of sentences like (7), repeated in (11a) below, from the LF in (11b), where *least* occurs at the NP edge and the covert operator IDENT'-W* applies to the whole NP. The numerals, again, are abstraction indices (they discuss a parallel example with *est* on pp. 479-481; I have modified their example slightly to be directly pertinent to the sandwich scenario described above).

- (11) a. Kyle needs to climb the least high mountain.
 b. Kyle needs [1 [PRO to climb-w₁ [the- \mathcal{J} [IDENT'-W* [2 [least [high mountain-w₂]]]]]]-w₁]]

The constituent [least [high mountain-w₂]] denotes the property of being the least high mountain (in world 2). The abstraction index '2' intensionalizes this property, deriving a relation between worlds and the property of being the least high mountain in that world. IDENT'-W* combines with such an intensionalized property P and derives the set of intensionalized properties that have the same extension as P in every world in a relevant set of worlds W^* . The worlds relevant to the interpretation of (11a) are worlds in which everyone's relevant needs are minimally satisfied. If we have a need-oriented sandwich scenario in which Kyle needs to climb a 1000m mountain and a 2500m mountain, Parker a 1500m mountain and Alex a 2000m mountain, then W^* contains all the worlds in which Kyle climbs

one mountain that is exactly 1000m high and another that is exactly 2500m, Parker climbs an exactly 1500m mountain and Alex an exactly 2000m mountain, and there are no other mountains. The constituent [IDENT'-W* [2 [least [high mountain-w₂]]]] in (11b) denotes the set of properties extensionally equivalent to the property of being the least high mountain in every world in W*. The worlds in W* might differ in various details. Kyle might have climbed the Hocheck in one such world and the Taubenbühel in another, and it might have been raining in one such world and snowing in another, for example. In some of the worlds in W*, then, the property *be the least high mountain* is extensionally equivalent to the property *be the Hocheck*, in others to *be the Taubenbühel*, in others to *be covered in snow*, etc. But the only property that is extensionally equivalent to *be the least high mountain* in *every* world in W* is the property *be a 1000m mountain*, since W* is defined as the set of worlds in which everyone minimally meets their needs and Kyle needs to climb a 1000m mountain and everyone else needs to climb a mountain higher than that and there are no other mountains. Consequently, [IDENT'-W* [2 [least [high mountain-w₂]]]] denotes the set containing the property *be a 1000m mountain*.

The definite article then applies to this constituent, denoting in this case not its usual function from sets of individuals to individuals but a lifted function from sets of properties to properties. The article also carries a domain restriction \mathcal{J} denoting a salient set of properties.³ The lifted article maps a set of properties \mathcal{P} to the unique property that is in both \mathcal{P} and \mathcal{J} . In example (11b) in the sandwich scenario, \mathcal{P} is the denotation of [IDENT'-W* [2 [least [high mountain-w₂]]]], which, again, is the set containing the property *be a 1000m mountain*, and \mathcal{J} is the set of properties determined by the contextually salient heights {*be a 1000m mountain, be a 1500m mountain, be a 2000m mountain, be a 2500m mountain*}.

³Sharvit and Stateva ultimately expand this analysis to include extraction of the superlative DP from the clause it occurs in in the surface structure, so that focus alternatives of that clause can be used to restrict the content of \mathcal{J} . As a result, \mathcal{J} in (11b) includes only properties such that someone needs to climb an entity with that property (*be a 1000m mountain, be a 1500m mountain, etc.*). Focus movement also plays a role in preventing IDENT'-W* from occurring in extensional contexts. The superlative DP does not receive a wide scope reading because it is ultimately reconstructed by lambda reduction. See pp. 481-488 of their article for details.

The constituent [the- \mathcal{J} [IDENT'-W* [2 [least [high mountain-w₂]]]]] then denotes the unique property in the set {*be a 1000m mountain, be a 1500m mountain, be a 2000m mountain, be a 2500m mountain*} (the denotation of \mathcal{J}) that is also in the set {*be a 1000m mountain*} (the denotation of [IDENT'-W* [2 [least [high mountain-w₂]]]]), which is of course the property *be a 1000m mountain*. Consequently, the object of *climb* in (11b) denotes a property, not an individual, and like indefinites is interpreted as a restriction on the internal argument of *climb*, so that (11a) is true just when Kyle needs to climb a 1000m mountain. This correctly predicts that (11a) is true in the sandwich scenario, without movement of *est* out of the NP it is base generated in.

Sharvit and Stateva claim that the contrast between ‘at most’ and ‘at least’ upstairs de dicto readings involves different construals of W*. For the ‘at least’ reading, it includes only worlds containing, for each mountain climber, the lowest mountain allowed by that climber’s needs and no other mountains. For the ‘at most’ reading, it includes worlds containing a mountain that is at most as high as the ‘least’ climber’s needs allow, and for each other climber, a mountain that is no higher than their needs allow and, crucially, no lower than the next lowest mountain, and no other mountains. We choose these worlds, Sharvit and Stateva claim, because it constitutes a suitable model of the relevant needs.

In summary, according to the DP-external analysis, the absolute, relative and ‘at least’ and ‘at most’ upstairs de dicto readings are composed with the same lexical components in different scopal configurations. However, this approach requires the definite article to go uninterpreted as such in the relative configuration and falls victim to the sandwich problem. The DP-internal analysis, on the other hand, does not require DP-external movement of the superlative morpheme and makes the correct predictions in sandwich scenarios. However, it requires additional lexical components for the upstairs de dicto readings (IDENT'-W* and the lift of the definite article involved there) that are not present in extensional contexts and do not appear to be lexicalized in any language.⁴

⁴I mention here two analyses that do not fit neatly into the DP-internal/DP-external dichotomy, namely Krasikova (2012) and Bumford (2017). They both claim that *est* forms a constituent with the determiner

Further, the DP-internal analysis rests on an important premise which I claim points the way to a fruitful reformulation of the DP-external analysis. It is the premise that the worlds that comprise W^* in the analysis of (11a) do not contain any mountains other than the mountains that the mountain climbers in question climbed. Suppose one of these worlds contained an additional mountain that was less high than the least high mountain that any of the climbers climbed, say an 800m mountain. Then there would be no unique (maximal) height shared by the least high mountains in all the worlds in W^* .⁵ The worlds admissible as members of W^* must therefore lack irrelevant mountains. In this point, these worlds bear a resemblance to partial worlds familiar from situation theory. According to situation theory, sentences describe situations—parts of possible worlds that include the entities and relations mentioned in the sentence (Lewis 1975, Barwise and Perry 1983, Berman 1987, Kratzer 1989, von Stechow 1994, Kratzer 1998, 2008, and others). From this perspective, superlative sentences like (1), (10a) and (11a) describe situations. I claim that incorporating situations into the meaning of the superlative allows the DP-external theory to make the correct predictions in sandwich scenarios, removing one counterargument to the DP-external theory.⁶ In the following section I spell out this analysis in detail, and in section 4 extend it to intensional, i.e. upstairs de dicto contexts.

the, and *the est* is interpreted in a wide scope position (by movement in Krasikova’s analysis and ‘delayed interpretation’ in Bumford’s). The fact that *the est* has wide scope gives these analyses a closer resemblance to DP-external analyses, but in neither case does *est* cross over *the*. In Krasikova’s analysis, *the est* picks out the largest degree set determined by its scope, and shares the sandwich problem with traditional DP-external analyses. Bumford’s analysis makes *the est* a restriction on assignments determined by its scope, and shares DP-internal analyses’ difficulty generating upstairs de dicto readings.

⁵If we dispense with maximality then the property extensionally equivalent to being the least high mountain in every world in W^* is *be an at least 800m high mountain*, which is still not what we are aiming for, since we want the height of the least high mountain climbed by someone, which is 1000m in the context given.

⁶This analysis is still accountable to the ‘definiteness problem’. It requires the definite article to be interpreted as an existential quantifier in the context of relative readings. See Sharvit (2015) for a theory of the interpretation of the definite article in superlatives, which makes it a kind of scope marker for the superlative. Sharvit links the use of *the* in superlatives to its use in *the only*, which, she claims, also displays scope variation. That is, the unusual interpretation of *the* in superlatives is not an isolated phenomenon.

3 Degrees and situations

Since an important contribution of the DP-external analysis is its potential to derive ‘at least’ and ‘at most’ upstairs de dicto readings in purely structural terms, I develop an analysis of the superlative that takes *least* to be composed of the component parts *little* and *est*, even though this decomposition is logically independent of the situation-theoretic treatment of the superlative developed here. Extending Heim’s (2006) analysis of comparative *less* as *little+er*, and incorporating a situation argument, I define *est* as in (12). This operator combines with a relation R (between a degree, an entity and a situation), an entity x , and a situation s . This relation between R , x and s holds when the set of degrees to which x bears R in s properly includes all the degrees to which any alternative individual bears R in any alternative situation. I give situations the variable name s and the type s , reflecting their status as parts of possible worlds.

$$(12) \quad \llbracket \text{est} \rrbracket = \lambda R_{\langle d, \langle e, \langle s, t \rangle \rangle \rangle} \lambda x_e \lambda s_s . \{d \mid R(d)(x)(s)\} \supset \{d \mid \exists x' \neq x \exists s' \neq s R(d)(x')(s')\}$$

To derive *least*, *est* combines with the quantity adjective *little*. Heim (2006), Buring (2007b, 2009) and Solt (2015) characterize *little* as the degree-predicate negator $\lambda d_d \lambda D_{\langle d, t \rangle} . \neg D(d)$. It combines with a degree and a degree predicate, and asserts that the degree predicate does not hold of that degree. However, this definition does not accommodate the fact that *little* does not exclude the value d . Although *little* cannot combine with a measure phrase (cf. **Ida weighs 55kg little*), it can combine with *that*, which appears to function referentially, as in Beck’s (2012) example (13a). If *that* refers to the degree 55 kg, then (13a) asserts that Ida weighs 55 kg. But the characterization of *little* mentioned above generates the truth condition in (13b), which requires her weight to be strictly less than 55 kg. Beck claims that (13a) imposes the truth condition in (13c)—that her weight is less than or equal to the degree that *that* refers to.

- (13) a. Ida weighs that little.
 b. $\neg \text{weight}(\text{Ida}) \geq \llbracket \text{that} \rrbracket$

- c. $\text{weight}(\text{Ida}) \leq \llbracket \text{that} \rrbracket$

These considerations implicate a definition for *little* that generates the truth condition in (13c), not (13b). I define *little* accordingly in (14), incorporating a situation argument as in the case of *est* above. For a degree interval D extending to a maximal element d in a situation s , *Little* D denotes an interval that starts at d and extends upward indefinitely in s . It is the complement of D plus d itself.⁷

$$(14) \quad \llbracket \text{little} \rrbracket = \lambda d_d \lambda D_{\langle d, \langle s, t \rangle \rangle} \lambda s_s . \max(\lambda d' D(d')(s)) \leq d$$

In terms of the meanings for *est* and *little* spelled out above, *least* consists of the base quantificational adjective *little* with *est* in its degree argument position. In a sentence like (15a), the complex *est+little* is base generated in the degree argument position of the gradable term whose degree argument it ultimately binds, here the adjective *high*, as sketched in (15b).

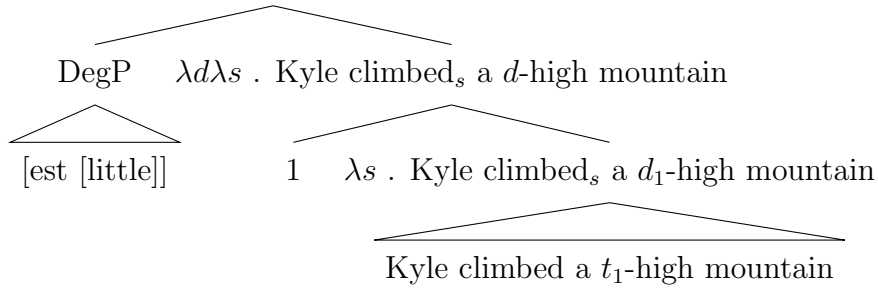
- (15) a. Kyle climbed the least high mountain.
 b. Kyle climbed the $\llbracket \llbracket \text{est} \rrbracket \llbracket \text{little} \rrbracket \text{high} \rrbracket$ mountain]

The derivation of the LF of (15a) then proceeds as follows. First, $\llbracket \text{est} \rrbracket \llbracket \text{little} \rrbracket$ moves to a left peripheral position above the base position of the target of comparison *Kyle*, as shown in (16); this is where *little* will ultimately have scope. The remnant of movement—the clause *Kyle climbed a t_1 -high mountain*, with t_1 the trace of $\llbracket \text{est} \rrbracket \llbracket \text{little} \rrbracket$ —denotes a situation description. I take its situation argument to be projected from the verbal head of the sentence describing that situation (*climbed* below), as an eventuality argument would be, and notate it as a subscript of that verb. Movement of $\llbracket \text{est} \rrbracket \llbracket \text{little} \rrbracket$ is accompanied by abstraction over the degree-denoting trace t_1 , deriving a relation between a degree and a situation at the level at which $\llbracket \text{est} \rrbracket \llbracket \text{little} \rrbracket$ adjoins. Recall that the definite article in (15b) is interpreted as indefinite in the derived structure.

⁷Analogously, the meaning of *much* is as below, along the lines of what Rett (2006, 2008), Solt (2015), Wilson (2021) and others claim, but with a situation argument.

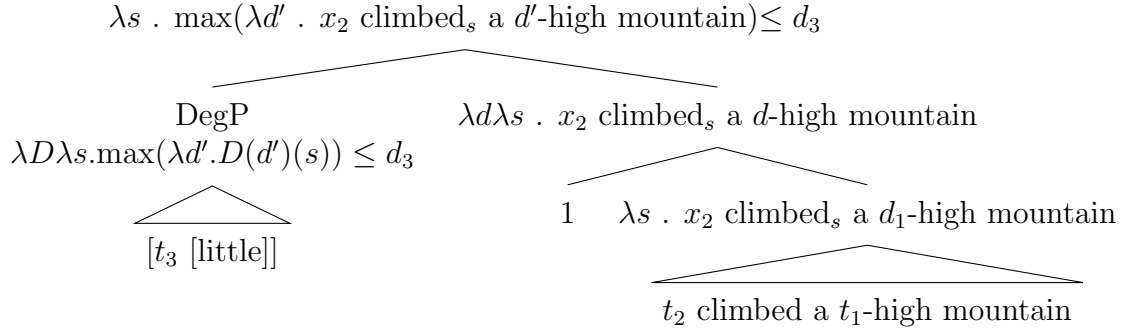
(i) $\llbracket \text{much} \rrbracket = \lambda d_d \lambda D_{\langle d, \langle s, t \rangle \rangle} \lambda s_s . \max(\lambda d' D(d')(s)) \geq d$

(16)

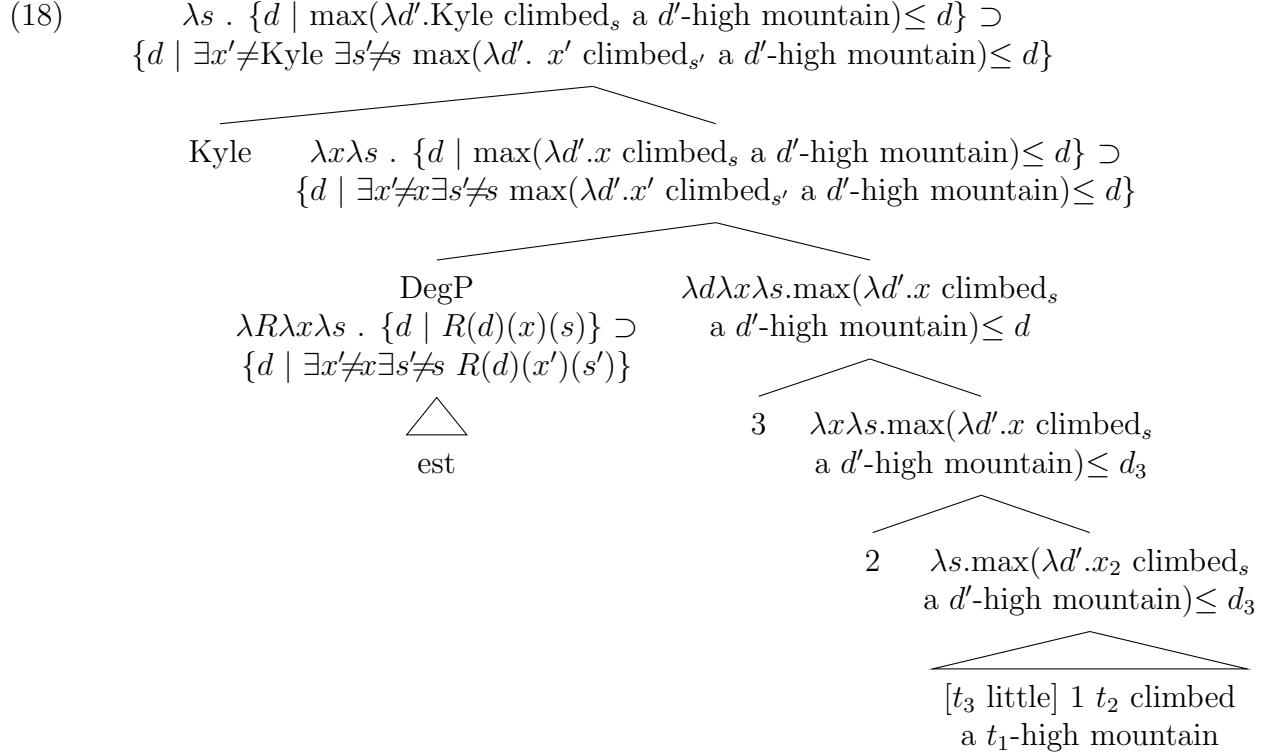


Subsequently, the target of comparison *Kyle* and the superlative morpheme *est* move to higher positions, leaving the individual- and degree-denoting traces t_2 and t_3 . This substructure composes as in (17) based on the definition of *little* in (14).

(17)



The moved target of comparison *Kyle* then merges with the tree formed in (17), accompanied by abstraction over its trace t_2 . Subsequently, *est* merges with the tree so formed. However, *est* does not merge in a manner that extends the tree in Chomsky's (1995) sense. Rather, *est* and its abstraction index '3' are interpolated between the target of comparison *Kyle* and its abstraction index '2', as shown in (18). This last step represents what Barker (2007) calls a 'parasitic scope' configuration: movement of the target creates the environment that movement of *est* needs, so the second step is parasitic on the first. Barker discusses the interpretation of the quantificational adjective *same*. See also Bhatt and Takahashi (2007) and Lechner (2017) for the role of parasitic scope in 'phrasal' comparatives, which require a similar compositional step, and Heim (1999) on superlatives. These two steps derive a tree that is fully composable, as shown in (18).



It is important for the situation argument of *climb* to ultimately be projected above the superlative (rather than being existentially closed by the superlative) since adverbial quantifiers that bind this situation argument have scope above the superlative, as when you say *When Kyle climbs the highest mountain, no one is surprised*.⁸ Closing this argument by a covert default unselective existential quantifier (‘existential closure’ per Heim 1983), derives the statement in (19).

(19) $\exists s \{d \mid \max(\lambda d'. \text{Kyle climbed}_s \text{ a } d'\text{-high mountain}) \leq d\} \supset \{d \mid \exists x' \neq \text{Kyle} \exists s' \neq s \max(\lambda d'. x' \text{ climbed}_{s'} \text{ a } d'\text{-high mountain}) \leq d\}$

This statement is true if there is a situation in which all the degrees greater than or equal to the maximal degree such that Kyle climbed a mountain that high in that situation contain all the degrees greater than or equal to the maximal degree such that there is someone else who climbed a mountain that high in some other situation. Suppose again that Kyle climbed both a 1000m mountain and a 2500m mountain, Parker a 1500m mountain, and Alex a 2000m mountain. There is a situation in which Kyle climbed a mountain whose

⁸I am grateful to an anonymous reviewer for bringing this point to my attention.

maximum height is 1000m, namely the situation in which she climbed the lower of the two mountains she climbed. The set of degrees greater than or equal to 1000 is the set $\{1000, 1001, \dots \infty\}$, i.e., the interval $(1000, \infty)$. For (19) to be true, this set must properly contain the set of degrees d for which there is someone such that d is greater than or equal to the maximal degree such that that person climbed a mountain that high in some other situation. The relevant individual for this calculation is Parker. The maximum degree such that she climbed a mountain that high is 1500m. The set of degrees greater than or equal to that comprise the interval $(1500, \infty)$. Since Kyle's interval $(1000, \infty)$ is indeed a superset of Parker's interval $(1500, \infty)$, (19) comes out true, as desired.

Before turning to upstairs de dicto contexts, I pause to comment on the role of existential closure in (19). Suppose that Kyle climbs a 1000m mountain (call it 'Mount 1000') and, in addition, a smaller mountain, say 800m ('Mount 800'). As before, Parker and Alex climb a 1500m mountain and a 2000m mountain respectively. The definition in (19) correctly predicts that Kyle climbed the least high mountain in this situation. However, as a reviewer of this article points out, the assertion of (15a) in this scenario is intuitively 'about' the situation in which she climbs Mount 800m. Empirically speaking, we would prefer to follow up (15a) with the continuation *namely Mount 800*, not *namely Mount 1000*. But the existential claim in (19) communicates merely that there is a verifying situation; it does not give preference to one of the two verifying situations in this scenario.

I suggest that the analysis proposed here can accommodate this intuition in the following way. Instead of existential closure, the formula derived in (18) can be applied to a topic situation. The notion that sentences can be asserted 'about' specific situations is an idea developed by Austin (1950) that is a cornerstone of situation theory (Barwise and Perry 1983). This does not alone tell us which of the two situations is a more appropriate topic situation in this context. I suggest that what accomplishes this is Grice's (1975) Maxim of Quantity, which requires interlocutors to make the more informative of two true statements. Though the situation description in (18) is true of Kyle's climbing of both Mount 800 and

Mount 1000, the degree set generated by the first situation $(800, \infty)$ contains all the degrees in the set generated by the second $(1000, \infty)$ but not vice versa, and by that criterion is more informative. This, I claim, makes the Mount 800 situation a more appropriate topic situation for the assertion of (15a) in this scenario than the Mount 1000 situation, though both verify the description in (18).

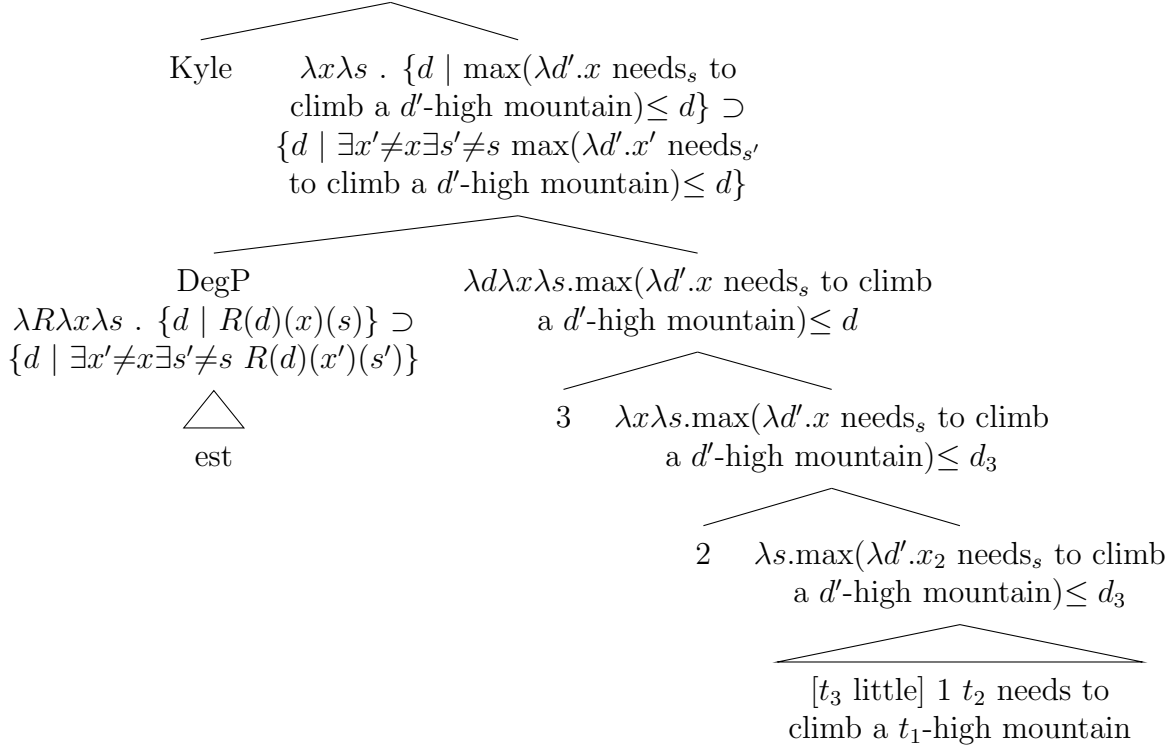
The discussion so far has focused on superlatives in ordinary extensional contexts. The following section turns to the question of whether this analysis extends to intensional contexts, where upstairs de dicto readings arise.

4 Upstairs de dicto configurations

As mentioned in section 1, the main empirical motivation for the DP-external approach to the absolute/relative contrast is found in upstairs de dicto contexts like (20a). (20a) has a reading that describes the results of a survey we have taken of a group of mountain climbers, who have each named the height such that they need to climb a mountain that high, for example to qualify for membership in different mountaineering clubs, without having any particular mountain in mind, and Kyle named the smallest height. In this case, we are not describing the least high mountain in some contrast set, since (20a) does not assert the existence of any particular mountains. But LF movement of *least*, here again in the form [est [little]], over the modal verb *need* as depicted in (20b) derives the reading of (20a) in which we are comparing Kyle with others in terms of their mountain climbing needs, as desired. The steps involved in the derivation are the same as those for (18) except that [est [little]] moves over a modal verb.

- (20) a. Kyle needs to climb the least high mountain.

- b. $\lambda s . \{d \mid \max(\lambda d'. \text{Kyle needs}_s \text{ to climb a } d'\text{-high mountain}) \leq d\} \supset$
 $\{d \mid \exists x' \neq \text{Kyle} \exists s' \neq s \max(\lambda d'. x' \text{ needs}_{s'} \text{ to climb a } d'\text{-high mountain}) \leq d\}$



Suppose that to fulfil the requirements for membership in a mountain climbing club, Alex needs to climb some mountain that is at least 2000m. Parker wants to join a different club that only requires her to climb a 1500m mountain. Kyle wants to join yet a different club that has a more complex membership requirement: she needs to climb a 1000m mountain in the winter and a 2500m mountain in the summer distinct from the mountain she climbed in the winter. No one is required to climb any particular mountain; the requirements pertain only to heights and everyone is allowed to exceed their requirements, but it is part of Kyle's requirements that she climb two distinct mountains. In my judgment, (20a) is true in this situation, meaning that the fact that Kyle needs to climb a higher mountain in addition to the less high mountain she needs to climb is not relevant to the judgment of (20a); only the lesser height seems to matter.

In the upstairs de dicto configuration illustrated in (20b), we not comparing mountain

climbing situations but situations of needing to climb a mountain. I claim that augmenting the standard approach to the meaning of modal verbs like *need* with a situation argument differentiates need situations in the way they need to be for the DP-external structure in (20b) to resist the sandwich problem. Consider a denotation for *need* as in (21) on the model of the analysis of necessity modals in Kratzer 1981, 1991, 2012. *Need* contributes universal quantification over possible worlds compatible with a modal base. It holds of an individual-situation relation P , an individual x , and a situation, if and only if every world compatible with what x needs in that (need) situation has a subpart (itself a situation) in which x has property P . Recall that situations are parts of possible worlds.

$$(21) \quad \llbracket \text{need} \rrbracket = \lambda P_{\langle e, \langle s, t \rangle \rangle} \lambda x_e \lambda s_s . \forall w \text{ if } w \text{ conforms to what } x \text{ needs in } s, \text{ then } \exists s' s' \sqsubseteq w \text{ \& } P(s')(x)$$

Plugging the individual-situation relation *climb a d -high mountain* into the P -slot in (21) yields (22).

$$(22) \quad \llbracket \text{need to climb a } d\text{-high mountain} \rrbracket = \lambda x_e \lambda s_s . \forall w \text{ if } w \text{ conforms to what } x \text{ needs in } s, \text{ then } \exists s' s' \sqsubseteq w \text{ \& } x \text{ climbs}_{s'} \text{ a } d\text{-high mountain}$$

Worlds that are compatible with Kyle's need to climb a 1000m mountain in the situation described above are not all worlds in which she climbs a 2500m mountain (though some are). Consequently, the set of worlds compatible with her need to climb a 1000m mountain is distinct from the set of worlds compatible with her need to climb a 2500m mountain. These two sets of worlds delineate two different need situations. As long as the need situation representing Kyle's need to climb a 1000m mountain is distinct from the need situation representing Kyle's need to climb a 2500m mountain, the situation theoretic analysis of (20a) presented here will pick out the 'lower' need situation. I expand on the reasons for this below.

Before proceeding, I point to evidence supporting the premise that Kyle's need to climb a 1000m mountain is construable as a distinct need situation from her need to climb a 2500m mountain. Kratzer (1989) observes that the connective *also* cannot connect two sentences

that describe situations that stand in the part-whole relation. If I painted a still life painting yesterday with apples and bananas in it, I can describe that situation as in (23) and continue with the description in (23a) of several other situations that transpired yesterday, but not with the continuation in (23b), which describes parts of the still life painting situation referred to in the previous discourse (pp. 608-609). The expression S_1 (*and*) *also* S_2 presupposes that S_2 describes a distinct situation from S_1 .

- (23) Yesterday I painted that still life over there.
 a. I also made a cup of tea and ate a piece of bread. . .
 b. #I also painted those apples and I also painted those bananas. . .

In light of the pattern in (23), the felicitousness of (24) is relevant for the analysis of (20a). (24) is a felicitous description of Kyle's needs in the sandwich scenario outlined above. The fact that the two situation descriptions in (24) can be connected with *also* means that the situations they respectively describe are construable as distinct situations, in the sense that neither is a part of the other, though the needs obtain co-synchronously.

- (24) Kyle needs to climb a 1000m mountain. She also needs to climb a 2500m mountain.

That Kyle's two needs comprise distinct need situations is all that is necessary for the structure in (20b) to give the right result in the sandwich scenario where she needs to climb two different mountains. If we replace all the occurrence of the string *x needs to climb a d-high mountain* in (20b) with what follows the period in (22), we get the denotation represented in (25) for (20a), corresponding to the formula at the top node of (20b) with the relevant adjustments.

- (25) $\exists s \{d \mid \max(\lambda d' . \forall w \text{ if } w \text{ conforms to what Kyle needs in } s, \text{ then } \exists s'' s'' \sqsubseteq w \ \& \text{ Kyle climbs}_{s''} \text{ a } d'\text{-high mountain}) \leq d\} \supset$
 $\{d \mid \exists x' \neq \text{Kyle } \exists s' \neq s \max(\lambda d' . \forall w \text{ if } w \text{ conforms to what } x' \text{ needs in } s', \text{ then } \exists s'' s'' \sqsubseteq w \ \& \ x' \text{ climbs}_{s''} \text{ a } d'\text{-high mountain}) \leq d\}$

Given a need-situation s , the first set of braces represents the set of degrees greater than or equal to the maximal degree d such that Kyle climbs a d -high mountain in all the worlds

conforming to that need. The maximal degree such that she climbs that high a mountain in *all* the worlds that fulfil her need is 1000m; in some of these worlds she might have climbed a higher mountain, but in no such world did she climb a less high mountain than that. So this set is the set of degrees containing 1000m and all higher degrees, i.e. the interval $(1000, \infty)$. The second set is the set of degrees d such that there is someone else in some other need-situation such that d is greater than or equal to the maximal degree such that that person climbs that high a mountain in all the worlds conforming to that need. In the scenario outlined above, Parker is the relevant individual. The maximal degree such that she climbs that high a mountain in *all* the worlds conforming to her need is 1500m (though she may climb a higher mountain in some of those worlds). The degrees greater than or equal to this degree include 1500 and all higher degrees, i.e. the interval $(1500, \infty)$. Since $(1000, \infty)$ is a proper superset of $(1500, \infty)$, the sentence in (20a) is correctly predicted to be true in the sandwich situation outlined above.

The DP-external analysis does not fall victim to the sandwich problem once the superlative is able to bind a situation argument within its domain. The required differentiation of needs is built into the meaning of *need* itself in (21), rather than into a null operator at work only in upstairs de dicto contexts, as in Sharvit and Stateva’s DP-internal analysis. The denotation for *need* in (21) works in concert with an analysis of *little* and superlative *est* that incorporates situations, to generate the correct readings of superlatives in sandwich scenarios in the framework of a DP-external analysis of relative readings of the superlative. At the very least, this approach shows that a DP-external analysis of the superlative is not inherently afflicted with the sandwich problem, whatever other advantages or disadvantages it may have. In the following section, I address some related issues and in section 5.3 specifically, show that this analysis has one more advantage over a DP-internal analysis, when it comes to comparative constructions.

5 Some clarifications and extensions

5.1 Remarks on the contrast set

A reviewer of this article mentions that in the sandwich scenario under consideration here, where Kyle climbed both a 1000m and a 2500m mountain, Parker a 1500m mountain and Alex a 2000m mountain, we might under certain circumstances judge (26a) as true. The circumstances are when what is of interest is each climber’s maximum achievement, as when we need to pick a climber to represent us at an upcoming competition. The reviewer expresses some uncertainty about whether the reading is available, but I think it is, and is brought out by (26b), where ‘manage’ puts emphasis on the climbers maximum achievements.

- (26) a. Parker climbed the least high mountain.
 b. Parker managed to climb the least high mountain.

The DP-internal analysis is well equipped to manage this ambiguity, since the contrast set contains mountains and is determined contextually. It is therefore possible to exclude the lowest mountain Kyle climbed from the context set on the basis of its irrelevance to the question under discussion, which leaves Parker’s mountain as the least high. For the situation theoretic analysis to capture this judgment in an analogous way, it is necessary to equip the definition of the superlative with a contextually determined contrast set ranging over situations, as shown in (27).

$$(27) \quad \llbracket \text{est} \rrbracket^C = \lambda R_{\langle d, \langle e, \langle s, t \rangle \rangle \rangle} \lambda x_e \lambda s_s . \{d \mid R(d)(x)(s)\} \supset \{d \mid \exists x' \neq x \exists s' \neq s [s' \in C \ \& \ R(d)(x')(s')]\}$$

Here, *est* is interpreted with respect to a context set C containing situations. The *est*-relation then holds of a degree relation, an entity and a situation if in that situation, the entity bears the degree relation to a greater degree than any entity does in any other situation among the relevant situations, those in C . With this definition in hand, we are able to contextually exclude the situation of Kyle climbing the lower of the two mountains she climbed in the evaluation of (26a).

5.2 Remarks on quantity superlatives

As a reviewer of this article points out, quantity superlatives, in which the superlative modifies a plural or mass noun directly without a mediating adjective, do not readily support the contextual circumscription of situations required to support sandwich scenarios. For illustration, consider a sports team that has played three games this week. Kyle scored one goal in the first game, two in the second and ten in the third. Parker and Alex each scored two goals per game. In this case, we cannot say (28a). We are required to base this assertion on the total number of goals she scored this week, which exceeds the total number of goals the others scored; we cannot zoom in on the individual games. To do so, we must explicitly add the modifier *in a single game*, as in (28b). Adding this qualification makes the individual games available as situations that we can then compare with each other in terms of how many goals the players scored in each such situation.

- (28) a. This week, Kyle scored the fewest goals.
b. This week, Kyle scored the fewest goals in a single game.

Something prevents us from taking the first game, where Kyle scored one point and the other players two, as a verifying situation for (28a), even though precisely that situation verifies (28b). Similarly, we cannot felicitously say (29a) if Kyle has \$20 in one bank account and \$500 in another, while Parker and Alex have \$50 in one account each. Explicitly mentioning bank accounts, as in (29b), makes the smaller account relevant.

- (29) a. Kyle has the least money.
b. Kyle has the least money in a single bank account.

It is true that quantity superlative constructions behave differently from ‘quality’ superlatives based on a gradable adjective, such as *high* in the examples discussed previously. A significant difference is that quantity superlatives tend to not support absolute readings. Hackl (2009) demonstrates that for *least*, an ostensible absolute reading would be contradictory. For example, the absolute least number of goals you can score is one, but no single

goal is any less than any other single goal, so none of these goals qualifies as the absolute ‘fewest’ goals.

Hackl claims that English *most*, unlike *least*, does have an absolute reading that takes a plural noun and picks out a subpart of plurality it denotes that is greater in cardinality than any non-overlapping subpart, meaning that subpart must be more than half of the totality, which correctly captures what *most* means. However, Coppock et al. (2020) report the results of a substantial cross-linguistic survey that show that when a language is able to build a superlative form of *many* (corresponding to English *most*), that form always has a relative reading but rarely the proportional reading that Hackl identifies with an absolute interpretation. They claim that quantity superlatives do not support absolute readings and when *most* has a proportional reading, it has been reanalyzed as a generalized quantifier.

It might therefore seem like the inability of the first game to verify (28a) has to do with the impossibility of an absolute reading. That is, only the absolute reading of the superlative is compatible with sandwich scenarios and quantity superlatives do not support an absolute reading. However, the examples in (28b) and (29b) are compatible with the respective sandwich scenario even though the superlative DPs there do not refer to the absolute smallest number of goals or the absolute smallest amount of money, which as Hackl claims would not be coherent. That is, they do not display an absolute reading. The relevant factor making them compatible with a sandwich scenario is the additional descriptive material in those examples, which narrows the situation description. I suggest that the inability of the quantity superlatives in (28a) and (29a) to differentiate the relevant situations in sandwich scenarios manifests itself their non-superlative counterparts as well, shown in (30), in the form of a typical Gricean quantity implicature. Both of these sentences are underinformative in the contexts described for (28) and (29). In the context described for (28), the first game resists serving as a verifying situation for (30a). I claim that this underinformativeness carries over to (28a) and (29a), and is perhaps exacerbated there by the complexity of the additional superlative meaning.

- (30) a. This week, Kyle scored one goal.
b. Kyle has \$20.

I suggest therefore that whatever prevents us from zooming in on the first game in the evaluation of non-superlative (30a) and on Kyle's nearly empty bank account in (30b) also prevents this in the evaluation of superlative (28a) and (29a). Although the puzzle that (28) and (29) illustrate is an important puzzle for situation theory, I maintain that it is not directly related to the meaning of the superlative.

5.3 Remarks on comparatives

Sharvit and Stateva (2002) attribute a more standard semantics to comparative *er* and *less* than they do to superlative *est* and *least*, one in which we compare degree sets. According to them, *Parker climbed a less high mountain than Alex* is true if the set of degrees such that Parker climbed that high a mountain is a subset of the set of degrees such that Alex climbed that high a mountain. In principle, this definition invites the sandwich problem: if Kyle climbed both a higher and a lower mountain than Parker, the higher mountain cannot be ignored in the determination of the degrees such that Kyle climbed that high a mountain. This predicts that the sentence *Parker climbed a less high mountain than Kyle* is true in the sandwich scenario.

Sharvit and Stateva claim that the judgments in such cases are not decisive, and so they do not hold comparative constructions accountable to the sandwich problem. Buring (2007a) disagrees on the basis of a scenario like the following. Suppose Mary knows one very cheap and one very expensive method for producing a certain product, and Bob knows a method intermediate in cost. Since I would normally want to know the cheapest way of producing the product, I would feel misinformed if you told me *Ask Bob, he knows a less expensive method than Mary* (31), since Mary knows a still less expensive method. But again, the standard degree-semantic characterization of *less* predicts that (31) is true in this sandwich scenario, since the method Bob knows is less expensive than the more expensive of the two

methods that Mary knows.

(31) Bob knows a less expensive method than Mary.

Büring (2007a) considers applying a version of Sharvit and Stateva’s analysis of superlatives to comparatives, where we compare not degree sets but sets of entities, and the *than*-clause *than Mary* denotes the set of methods that Mary knows. If (31) means that Bob knows a method which is less expensive than any entity in the set of methods that Mary knows, we correctly predict this assertion to be false in the sandwich scenario just described. But Büring shows that this approach makes the wrong predictions about modal contexts like (32), which is predicted to mean that you bought a house which is more expensive than any of the houses I thought you would buy, parallel to the interpretation of (31) that asserts that Bob knows a method that is less expensive than any of the methods Mary knows. But (32) does not require me have thought you would buy any particular houses. Büring ends with the conclusion that the Heim/Szabolcsi style DP-external approach has more generality than Sharvit and Stateva’s system all told, but does not seem to be able to shake off the sandwich problem.

(32) You bought a more expensive house than I thought you would.

The situation argument attributed to *little* in (14) plays a role both in its superlative derivative *least* and its comparative derivative *less*. Like superlative *est*, comparative *er* must be defined in a way that is compatible with the situation argument that *little* brings with it, and if this situation argument resolves the sandwich problem in superlatives, it should have the same effect in comparatives. I claim that this is so, on the basis of the definition for comparative *er* in (33), which relates two degree descriptions (based on Heim 2006, p. 9) with situation arguments (based on the considerations above).

(33) $\llbracket \text{er} \rrbracket = \lambda P_{\langle d, \langle s, t \rangle \rangle} \lambda Q_{\langle d, \langle s, t \rangle \rangle} \lambda s_s. \{d \mid Q(d)(s)\} \supset \{d \mid \exists s' \neq s P(d)(s')\}$

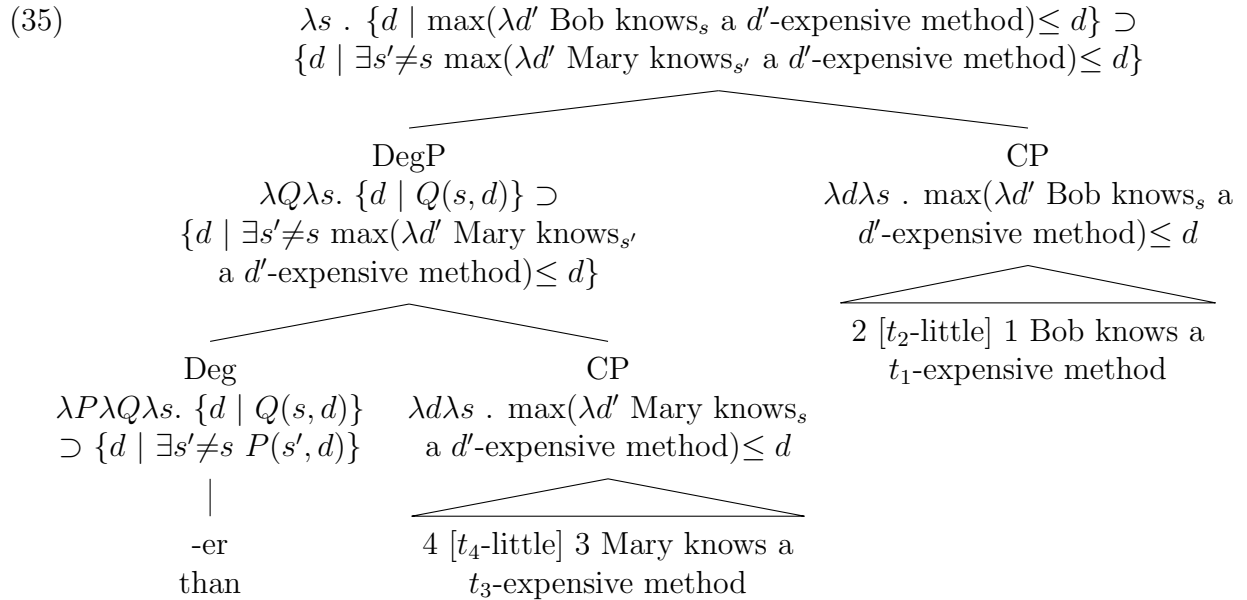
This definition corresponds to the ‘clausal’ or ‘indirect’ analysis of the comparative,

according to which *er* relates two degree descriptions P and Q (with situation arguments), corresponding to the *than*-clause and the main clause respectively. The main clause is construed as a degree description by virtue of movement of the degree phrase headed by *er*. The *than*-clause is a full clause according to this approach, in which the phonological material that it shares with the main clause has been elided, and is construed as a degree description by virtue of movement of a null operator (Op in (34)).

The base structure of (31) looks like (34) from this perspective, where the entire comparative phrase [er than Mary knows a [[Op-little]-expensive method]] sits in the degree argument slot of the quantity adjective *little*, which in turn sits in the degree argument slot of the quality adjective *expensive* that occurs in the main clause.

(34) Bob knows a [[DegP er than Mary knows a [[Op-little]-expensive method]]-little]-expensive method

Movement of both constituents headed by *little*, both instances of Op , and the DegP headed by *-er* yields the tree in (35).



With existential closure over the situation argument of the denotation generated in (35), it asserts that there is a situation such that the set of degrees greater than or equal to the maximum degree such that Bob knows that expensive a method in that situation is a

superset of the set of degrees d such that there is a situation in which d is greater than or equal to the maximum degree such that Mary knows that expensive a method in that situation.

If the two methods Mary knows cost \$2 and \$10 respectively and Bob's costs \$5, then the first set is the set $(5, \infty)$. If, as before, a situation of knowing a certain method x is a distinct knowing-situation from the situation of knowing a certain method y distinct from x (since one could know one of these methods without knowing the other), then the second set starts at two, since two is a degree such that there is a situation (the situation in which she knows the less expensive of the two methods she knows) in which that degree (i.e., two) is greater than or equal to the maximum degree such that she knows a method that expensive in that situation (which is two). This set also includes three, four, etc. Since Bob's set $(5, \infty)$ is not a superset of Mary's set $(2, \infty)$, (31) is predicted to be false in the sandwich scenario, which accords with the sense that (31) is underinformative in the sandwich scenario if we are invested in finding the cheapest method. The situation theoretic analysis of the DP-external superlative therefore extends naturally to comparative constructions.

5.4 Beyond superlatives and comparatives

The analysis of the superlative and comparative spelled out above attributes a degree argument to these and to the quantificational adjectives *little/few* and *much/many* (see footnote 7). We might expect other degree terms to also bear a situation argument, such as *very*, *too*, *enough...to...*, *so...that...*, equative *as...as...*, and interrogative *how*. Some of these terms may combine with *little* and might therefore in principle be expected to show the same effects as superlatives and comparatives in sandwich scenarios. However, *little* does not fuse morphologically with any of these terms, like it does with *est* and *er*, and in its freestanding form it resists being combined with an adjective in English (cf. **a little expensive bicycle* vs. *an inexpensive bicycle*) (Jackendoff 1977, Corver 1997, Heim 2006). In so far as *inexpensive* is a spellout of *little expensive* (Rullmann 1995, Büring 2007b, 2009), the fact that (36a)

is felicitous in the appropriate sandwich scenario supports the idea that the equative, too, has a situation argument. Building on Büring’s context for the comparative discussed in section 5.3, if both Bob and Mary know an equally inexpensive method for producing their product, in addition to more expensive methods they may know, we can felicitously utter (36a). Heim (2006, 2008) is sceptical of the equivalence of adjectives and their counterparts of the form ‘*little*+antonym’, but the relevant point can be made with quantity equative constructions where a plural noun hosts *few* (= *little* for count nouns), as in (36b), as long as enough descriptive material is present to differentiate situations in the relevant way, as described in section 5.2. That example means that the number of goals that Alex scored in a single game is at least as small as the number of goals that Parker scored in a single, possibly different, game, even if both scored more goals in other games.

- (36) a. Bob knows as inexpensive a method as Mary.
b. Alex scored as few goals in a single game as Parker did.

I tentatively conclude that situation arguments permeate the language of degree, while recognizing that this may have ramifications for other constructions that are not fully appreciated at the present time.

6 Conclusion

In this article, I have claimed that attributing a situation argument to the superlative and the quantity adjective *little* rescues the DP-external analysis of relative readings of the superlative from the sandwich problem that otherwise arises. This analysis draws only on an already-established theoretical apparatus including covert movement in the derivation of logical form and situation theory. This approach extends naturally to modal contexts and comparatives and its behavior in quantity constructions is as expected given pragmatic forces at work in the corresponding non-superlative constructions. This approach does not in itself ameliorate the mystery surrounding the cancelation of definiteness in relative readings of the

superlative. If it is correct, it conversely supports those analyses of definiteness cancellation compatible with a DP-external interpretation of the superlative, such as Sharvit (2015).

References

- Abney, Steven. 1987. The English noun phrase in its sentential aspect. Doctoral Dissertation, Massachusetts Institute of Technology.
- Austin, John. 1950. Truth. *Proceedings of the Aristotelian Society* Supplementary vol. 24:111–128.
- Barker, Chris. 2007. Parasitic scope. *Linguistics and Philosophy* 30:407–444.
- Barwise, Jon, and John Perry. 1983. *Situations and attitudes*. Cambridge, Mass.: MIT Press.
- Beck, Sigrid. 2012. DegP scope revisited. *Natural Language Semantics* 20:227–272.
- Berman, Stephen. 1987. Situation-based semantics for adverbs of quantification. In *University of Massachusetts occasional papers vol. 12*, ed. by Jim Blevins and Ann Vainikka, 8–23. University of Massachusetts at Amherst.
- Bhatt, Rajesh, and Shoichi Takahashi. 2007. Direct comparisons: Resurrecting the direct analysis of phrasal comparatives. In *Proceedings of SALT XVII*, ed. by T. Friedman and M. Gibson, 19–36. Ithaca, NY: Cornell University.
- Bumford, Dylan. 2017. Split-scope definites: Relative superlatives and Haddock descriptions. *Linguistics and Philosophy* 40:549–593.
- Büring, Daniel. 2007a. Comparative sandwichology. In *Proceedings of WECOL 18*, ed. by Rebecca Colavin, Kathryn Cooke, Kathryn Davidson, Shin Fukuda, and Alex Del Guidice, 17–28. San Diego: UC San Diego.

- Büring, Daniel. 2007b. Cross-polar nomalies. In *Proceedings of semantics and linguistic theory 17*, ed. by Tova Friedman and Masayuki Gibson, 37–52. Washington, D.C.: Linguistic Society of America.
- Büring, Daniel. 2009. More or less. In *Proceeding from the annual meeting of the Chicago Linguistic Society*, ed. by Malcolm Elliott, James Kirby, Osamu Sawada, Eleni Staraki, and Suwon Yoon, volume 43, 3–17. Chicago: Chicago Linguistics Society.
- Chomsky, Noam. 1995. *The minimalist program*. Cambridge, Mass.: MIT Press.
- Cinque, Guglielmo. 2010. *The syntax of adjectives: A comparative study*. Cambridge, Mass.: MIT Press.
- Coppock, Elizabeth, and David Beaver. 2014. A superlative argument for a minimal theory of definiteness. In *Proceedings of SALT XIV*, ed. by Todd Snider, Sarah D’Antonio, and Mia Weigand, 177–196. Washington, D.C.: Linguistic Society of America.
- Coppock, Elizabeth, and David Beaver. 2015. Definiteness and determinacy. *Linguistics and Philosophy* 38:377–435.
- Coppock, Elizabeth, and Elizabeth Bogal-Allbritten, and Golsa Nouri-Housseini. 2020. Universals in superlative semantics. *Language* 96:471–506.
- Corver, Norbert. 1997. Much-support as a last resort. *Linguistic Inquiry* 28:119–164.
- Cresswell, Max. 1976. The semantics of degree. In *Montague grammar*, ed. by Barbara Partee, 261–292. New York: Academic Press.
- von Fintel, Kai. 1994. Restrictions on quantifier domains. Doctoral Dissertation, University of Massachusetts, Amherst.
- Grice, Paul. 1975. Logic and conversation. In *Syntax and semantics, vol. 3: Speech acts*, ed. by Peter Cole and Jerry Morgan, 41–58. New York: Academic Press.

- Hackl, Martin. 2000. Comparative quantifiers. Doctoral Dissertation, Massachusetts Institute of Technology.
- Hackl, Martin. 2009. On the grammar and processing of proportional quantifiers: *most* vs. *more than half*. *Natural Language Semantics* 17:63–98.
- Heim, Irene. 1983. File change semantics and the familiarity theory of definiteness. In *Meaning, use, and interpretation of language*, ed. by Rainer Bäuerle, Christoph Schwarze, and Arnim von Stechow, 164–189. Berlin: Walter de Gruyter.
- Heim, Irene. 1985. Notes on comparatives and related matters. Ms., University of Texas, Austin.
- Heim, Irene. 1999. Notes on superlatives. Ms., University of Texas, Austin.
- Heim, Irene. 2001. Degree operators and scope. In *Audiatur vox sapientiae. a festschrift for Arnim von Stechow*, ed. by Caroline Féry and Wolfgang Sternefeld, 214–239. Berlin: Akademie Verlag.
- Heim, Irene. 2006. *Little*. In *Proceedings of SALT 16*, ed. by Masayuki Gibson and Jonathan Howell, 35–58. Washington, D.C.: Linguistic Society of America.
- Heim, Irene. 2008. Decomposing antonyms? In *Proceedings of Sinn und Bedeutung 12*, ed. by Atle Grønn, 212–225. Oslo: ILOS.
- Heim, Irene, and Angelika Kratzer. 1998. *Semantics in generative grammar*. Malden, MA: Blackwell.
- Jackendoff, Ray. 1977. *X' syntax*. Cambridge, Massachusetts: MIT Press.
- Krasikova, Sveta. 2012. Definiteness in superlatives. In *Logic, language and meaning*, ed. by Maria Aloni, Vadim Kimmelman, Floris Roelofsen, Galit Sassoon, Katrin Schulz, and Matthijs Westera, 411–420. Dordrecht: Springer.

- Kratzer, Angelika. 1981. The notional category of modality. In *Words, worlds, and contexts: new approaches in word semantics*, ed. by Hans-Jürgen Eikmeyer and Hannes Rieser, 38–74. Berlin: de Gruyter.
- Kratzer, Angelika. 1989. An investigation of the lumps of thought. *Linguistics and Philosophy* 12:607–653.
- Kratzer, Angelika. 1991. Modality. In *Semantics: An international handbook of contemporary research*, ed. by Arnim von Stechow and Dieter Wunderlich, 639–650. Berlin: De Gruyter.
- Kratzer, Angelika. 1998. Scope or pseudoscope? Are there wide-scope indefinites? In *Events and grammar*, ed. by Susan Rothstein, 163–196. Dordrecht: Kluwer Academic Publishers.
- Kratzer, Angelika. 2008. Situations in natural language semantics. In *The Stanford encyclopedia of philosophy*, ed. by Edward N. Zalta. Stanford, California: CLSI. URL <http://plato.stanford.edu/archives/sum2008/entries/situations-semantics/>.
- Kratzer, Angelika. 2012. The notional category of modality. In *Modals and conditionals*, ed. by Angelika Kratzer, 27–69. Oxford: Oxford University Press.
- Lechner, Winfried. 2017. Phrasal comparatives and parasitic scope. *Wiener Linguistische Gazette* 82:181–191.
- Lewis, David. 1975. Adverbs of quantification. In *Formal semantics of natural language*, ed. by E. L. Kennan. Cambridge: Cambridge University Press.
- Matushansky, Ora. 2008. On the attributive nature of superlatives. *Syntax* 11:26–90.
- Rett, Jessica. 2006. How *many* maximizes in the Balkan sprachbund. In *Proceedings of SALT XVI*, ed. by Masayuki Gibson and Jonathan Howell, 190–207. Ithaca, NY: Cornell University.
- Rett, Jessica. 2008. Degree modification in natural language. Doctoral Dissertation, Rutgers University, New Brunswick, N.J.

- Ross, John Robert. 1964. A partial grammar of English superlatives. Master's thesis, University of Pennsylvania.
- Rullmann, Hotze. 1995. Maximality in the semantics of *wh*-constructions. Doctoral Dissertation, University of Massachusetts at Amherst.
- Sharvit, Yael. 2015. The onliest NP: Non-definite definites. In *Proceedings of the 32nd west coast conference on formal linguistics*, ed. by Ulrike Steindl, Thomas Borer, Huillin Fang, Alfredo Garcia Pardo, Peter Guekguezian, Brian Hsu, Charlie O'Hara, and Iris Chuoying Ouyang, 171–190. Somerville, Mass.: Cascadilla Proceedings Project.
- Sharvit, Yael, and Penka Stateva. 2002. Superlative expressions, context, and focus. *Linguistics and Philosophy* 25:453–504.
- Solt, Stephanie. 2015. Q-adjectives and the semantics of quantity. *Journal of Semantics* 32:221–273.
- Stateva, Penka. 2000. In defense of the movement theory of superlatives. In *Proceedings of the Eastern States Conference on Linguistics (ESCOL) 1999*, ed. by Rebecca Daly and Anastasia Riehl, 215–266. Ithaca, NY: CLC Publications.
- Szabolcsi, Anna. 1986. Comparative superlatives. In *MIT working papers in linguistics, vol. 8*, ed. by Naoki Fukui, 245–265. Cambridge, Mass.: MIT Press.
- Wilson, Cameron E. 2021. *The most, the fewest and the least*: On the relative readings of quantity superlatives. *Semantics and Pragmatics* 14:1–46.