

SUPERLATIVE EXPRESSIONS, CONTEXT, AND FOCUS

What do we compare when we say that John is taller than Bill or that John is the tallest person? It seems plausible to say that we compare heights of individuals. And what do we compare when we say that John climbed a higher mountain than Bill climbed, or that John climbed the highest mountain? 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? Or, more generally, do we get different meanings if we say that the morpheme of comparison (i.e., the superlative *most/-est* or the comparative *more/-er*) compares entities corresponding to the DP in which it appears as opposed to entities corresponding to some phrase outside this DP (say, the subject phrase)? If a semantic argument can be constructed that these two modes of comparison are different, i.e., that they give rise to different sets of truth conditions, we have to ask whether syntax allows for the possibility that the relevant morpheme of comparison is interpreted in a position different from its surface position.

In this paper we argue, contra Heim (1994, 1999) and with Farkas and Kiss (2000), that superlative morphemes cannot be interpreted DP-externally, regardless of the mode of comparison. We develop a DP-internal account of the interpretation of superlative expressions. The proposal is extended to cover comparative expressions as well.

1. MORPHEMES OF COMPARISON IN EXTENSIONAL AND
INTENSIONAL ENVIRONMENTS

Consider the following sentences:

- (1)a. John climbed the highest mountain.
- b. Mary climbed the least high mountain.

- (2)a. John needs to climb the highest mountain.
- b. Mary needs to climb the least high mountain.



- (3)a. John climbed a higher mountain than Bill climbed.
 b. Bill climbed a less high mountain than John climbed.
- (4)a. John needs to climb a higher mountain than Bill needs to climb.
 b. Bill needs to climb a less high mountain than John needs to climb.

The sentences in (1) contain superlative expressions – *highest mountain* and *least high mountain* – which appear in an extensional environment. The sentences in (2) contain the same superlative expressions, but here they appear in an intensional environment. The sentences in (3) and (4) contain comparative expressions – *higher mountain than ...* and *less high mountain than ...* – which appear in an extensional and an intensional environment respectively. There is no easy way in which a simple semantics for superlatives and comparatives, which works well in extensional environments, can be extended to intensional environments. While one might argue that in (1) and (3) it is mountains that are being compared (i.e., entities corresponding to the host DP of the morpheme of comparison), it is not so clear that the same is true of every reading of (2) and (4). Some readings of these sentences seem to involve comparison of potential mountain climbers (i.e., entities corresponding to elements outside the host DP of the morpheme of comparison).

Let us begin with superlatives in extensional environments. (1a) can be uttered felicitously in two types of situations (Ross 1964; Szabolcsi 1986). The first type is one where John climbs a mountain that is the highest among the relevant mountains (for example, a situation where he climbs Mount Everest, which is, to our knowledge, the highest mountain in the world). The reading corresponding to this situation is referred to as ‘the absolute reading’. The second situation type is one where John climbs a mountain that is the highest among all mountains climbed by some individual (for example, a situation where John climbs a 6000 ft mountain, Bill – a 5000 ft mountain and Mary – a 4000 ft mountain). The reading corresponding to this situation is referred to as ‘the comparative reading’. While it is clear that in the first situation type we compare mountains, in the second situation type we may want to ask whether we compare mountains or mountain climbers. In other words, while the absolute reading suggests an analysis of the superlative morpheme *-est* according to which, in (1a), it selects the highest among the set of relevant mountains, the comparative reading suggests that another analysis of *-est* is also possible, namely, one where it selects the best achiever among the set of mountain climbers. If the second analysis is possible, this suggests that at LF, the superlative

morpheme may be interpreted outside the DP it originates in (similar two possibilities arise with the negative superlative *least*). Since both analyses would do justice to our intuitions regarding (1a) in the second situation-type, the fact that (1a) is true in that situation does not, in and of itself, argue for the second analysis.

When we shift our attention to intensional environments, it becomes more evident that the second analysis of *-est* is not only possible, but perhaps necessary. Consider (2a), *John needs to climb the highest mountain*. It has two expected *de re* readings (absolute and comparative) and two expected *de dicto* readings:

- (5) *De re* (absolute reading (5a); comparative reading (5b)):
- a. For all worlds *w* compatible with John's needs in the actual world, he climbs in *w* the actual mountain that is higher than any other relevant actual mountain.
 - b. For all worlds *w* compatible with John's needs in the actual world, he climbs in *w* the actual mountain that is higher than any other actual mountain that anybody else needs to climb.
- (6) *De dicto* (absolute reading (6a); comparative reading (6b)):
- a. For all worlds *w* compatible with John's needs in the actual world, he climbs the mountain in *w* that is higher in *w* than any other relevant mountain in *w*.
 - b. For all worlds *w* compatible with John's needs in the actual world, he is the best mountain-climber in *w*.

As was the case with (1a), we may say that all four readings of (2a) involve comparing mountains (actual or non-actual). Alternatively, we may say that in the comparative readings in (5b) and (6b), *-est* selects the best "needer" and the best (non-actual) climber respectively.

Somewhat unexpectedly, (2a) has a fifth reading (Szabolcsi 1986; Heim 1994, 1999) – one which from now on we will refer to as the 'upstairs *de dicto*' reading. This reading seems to unambiguously involve comparison of "needers" rather than mountains. Suppose a trainer of mountain climbers just conducted a survey among his trainees about the mountains they need to climb in order to improve their personal rankings. (7) lists the results of the survey:

(7) Scenario I

Mary needs to climb a 3000 ft mountain (or higher) to improve her ranking.

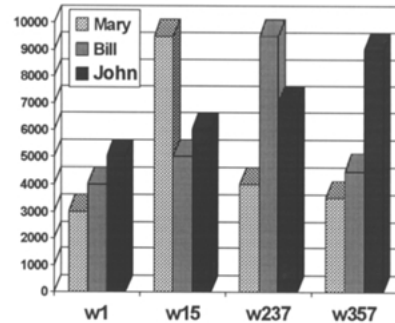
Bill needs to climb a 4000 ft mountain (or higher) to improve his ranking.

John needs to climb a 5000 ft mountain (or higher) to improve his ranking.

(8) shows what goes on in the worlds compatible with the needs of each one: in each of the worlds that satisfy her needs (her “need” worlds), Mary climbs a mountain not lower than 3000 ft; in each of his “need” worlds Bill climbs a mountain not lower than 4000 ft; and in each of his “need” worlds John climbs a mountain not lower than 5000 ft. Obviously, John’s needs are the most demanding:

(8)

Climber	“Need” worlds/mountains		
Mary	<u>w1</u>	<u>w2</u>	<u>w15</u>
	3000	4000	... 9500 ...
Bill	<u>w225</u>	<u>w226</u>	<u>w237</u>
	4000	5000	... 9500 ...
John	<u>w339</u>	<u>w340</u>	<u>w357</u>
	5000	6000	... 9000 ...



(2a) can be uttered felicitously in this scenario. Notice, however, that neither one of the *de re* readings of (2a) ((5a, b)) and neither one of the *de dicto* readings of (2a) ((6a, b)) are true in this state of affairs. On the one hand, there is no particular mountain that John needs to climb; this excludes the *de re* readings. On the other hand, John’s needs could be satisfied, for example, in a world where he climbs a 6000 ft mountain, and Mary climbs a 9000 ft mountain (i.e., in a world where “his” mountain is not the highest among all the mountains climbed). This excludes the *de dicto* readings. According to this ‘upstairs *de dicto*’ reading, John’s needs are satisfied as long as he climbs at least one mountain whose height is 5000 ft or higher. What we are comparing here are the minimal heights that would satisfy the needs of the different climbers. Sentence (2b), with a negative superlative, has a similar ‘upstairs *de dicto*’ reading (and is true in the same scenario). It is much less clear that the superlative morpheme, in these cases, is interpreted inside its host DP.

Sentences (3a) (*John climbed a higher mountain than Bill climbed*) and (4a) (*John needs to climb a higher mountain than Bill needs to climb*) pose a similar problem. In (3a), it doesn't seem to matter whether we say that the comparative morpheme "compares" a mountain climbed by Bill with a mountain climbed by John, or that it compares the climbers' achievements. But in (4a), at least on one of its readings, the relevant comparison seems not to be a comparison of mountains. The reading we attribute to this sentence in Scenario I is neither *de re* ("there is a mountain that Bill needs to climb, and there is a mountain that John needs to climb, and the latter is higher than the former"), nor *de dicto* ("in all of John's need worlds *w*, he climbs a mountain higher than the minimal height that would satisfy Bill's climbing needs"). This reading says that the minimal height that would satisfy John's needs is higher than the minimal height that would satisfy Bill's needs. The comparative morpheme here seems to compare mountain-climbers' needs, not mountains climbed.

This paper is concerned with deciding whether 'upstairs *de dicto*' readings provide conclusive evidence for the claim that morphemes of comparison may be interpreted outside the DP which hosts them on the surface. The structure of the paper is as follows. In Section 2 we present an analysis of sentences with morphemes of comparison which is based precisely on this claim. In Section 3 we discuss some arguments against this analysis. In Section 4 we present an analysis of superlative constructions with *-est*, according to which *-est* is always interpreted DP-internally, even in 'upstairs *de dicto*' sentences. Section 5 extends the analysis to the negative superlative morpheme *least*, and Section 6 extends it to the comparative morphemes *-er* and *less*.

Throughout the paper, we assume that superlative and comparative expressions involve quantification over degrees (points). It has recently been proposed (Kennedy 2000; Schwarzschild and Wilkinson to appear) that such expressions are more adequately treated as involving intervals. The point we make here is independent of this debate.

2. 'LONG' MOVEMENT OF THE MORPHEME OF COMPARISON

2.1. *The DP-External View*

For Heim (1985, 1994, 1998, 1999), sentences with 'upstairs *de dicto*' readings provide evidence for the claim that both morphemes of comparison can move at LF and be interpreted outside their host DP. The idea is that in the 'upstairs *de dicto*' reading of (2a, b) and (4a, b) the morpheme of comparison moves to a position above the intensional verb. This movement

guarantees that the relevant comparison is of “needers”, not mountains. We now examine this proposal. For ease of reference, let us call the part of the theory that allows the superlative morpheme to be interpreted DP-externally ‘the DP-external-superlative theory’, and the part of the theory that allows the comparative morpheme to be interpreted DP-externally – ‘the DP-external-comparative theory’.

2.1.1. *The DP-external superlative theory*

The DP-external-superlative theory (essentially Heim 1999) assumes that a gradable adjective denotes a function from degrees to $\langle e, t \rangle$ -functions (Seuren 1973; Cresswell 1976, and others). For example, the semantics of **high** is the following:

- (9) For any degree d and individual x , $\llbracket \mathbf{high} \rrbracket(d)(x) = 1$ iff x is high to degree d (i.e., iff x 's maximal height includes d).

Modified nominal expressions such as **high mountain**, where the modifier is a gradable adjective, are also of type $\langle d, \langle e, t \rangle \rangle$ (where d is the type of a degree).

According to the semantics given in (9), each function R in the **high**-class (e.g., **high**, **high mountain**, **tall man**, etc.) is monotone, in the sense that the following holds of R :

- (10) For all individuals x and degrees d and d' , if $R(d)(x) = 1$ and $d' < d$, then $R(d')(x)$.

For example, *John is four feet tall* entails that John is three feet tall.

The superlative morphemes **-est** and **least** are degree operators, and take three arguments: a comparison set, a $\langle d, \langle e, t \rangle \rangle$ -function, and an individual. For example, the semantics of **-est** is the following, where K is a restriction on the domain of the superlative morpheme (the comparison set), R is a $\langle d, \langle e, t \rangle \rangle$ -function, and x – an individual:

- (11) $\llbracket \mathbf{-est} \rrbracket(K)(R)(x)$ is defined only if $x \in K$ and for all y in K there is a degree d such that $R(d)(y) = 1$. Whenever defined, $\llbracket \mathbf{-est} \rrbracket(K)(R)(x) = 1$ iff there is a degree d such that $\{z \in K : R(d)(z) = 1\} = \{x\}$.

A crucial assumption of this analysis is that **-est** may either be interpreted DP-internally, or move out of its host DP to be interpreted DP-externally, yielding two possibilities for interpreting (1a):

- (12) DP-internal interpretation:
- a. LF: **John climbed [the [K-est [high mountain]]]**
 - b. John climbed the unique x such that there is a degree d such that $\{z \in K : z \text{ is a } d\text{-high mountain}\} = \{x\}$.
 - c. $K = \{x : x \text{ is a (relevant) mountain}\}$
- DP-external interpretation:¹
- a. LF: **John [K-est [1 [climbed ~~the~~ d_1 -high mountain]]]**
 - b. There is a degree d such that $\{z \in K : z \text{ climbed a } d\text{-high mountain}\} = \{\text{John}\}$
 - c. $K = \{x : x \text{ is a (relevant) person \& there is a degree } d \text{ s.t. } x \text{ climbed a } d\text{-high mountain}\}$

K is a phonetically null pronominal variable which denotes the comparison set.²

The DP-internal interpretation in (12) is obtained by applying **K-est** to the $\langle d, \langle e, t \rangle \rangle$ -function *high mountain*. The comparison set K is a set of mountains. If Mount A is 4000 ft high, Mount B – 3000 ft and Mount C – 2000 ft, then Mount A is the highest mountain among these, because there is a degree d (by the assumption that **high mountain** is monotone, any degree above 3000 ft but not above 4000) such that Mount A is high to degree d and the others are not.

The DP-external interpretation in (12) is obtained by moving **K-est** to a position above **climb** and below the subject, replacing the definite determiner with the indefinite determiner (represented as **the**), and abstracting over the degree-denoting trace of **K-est** (obtaining a function from degrees d to sets of individuals who climbed a d -high mountain as the internal argument of **K-est**). The external argument of **K-est** is **John**, and K is a set of mountain climbers. If John climbed a 4000 ft mountain, Mary – a 3000 ft mountain and Bill – a 2000 ft mountain, there is a degree d (by the assumption that **high mountain** is monotone, any degree above 3000 ft

¹ Our LFs contain abstraction indices, in the spirit of Heim and Kratzer (1998). These are interpreted according to the rule in (i). Traces and pronouns receive their values from the assignment function supplied by the context.

(i) Let α be a branching node with daughters β and γ , where β dominates only an index i . Then, for any variable assignment g , $\llbracket \alpha \rrbracket^g =$ the function f such that $\text{Dom}(f) = \{x : \llbracket \gamma \rrbracket^{g[i \rightarrow x]}$ is defined $\}$, and for all x in $\text{Dom}(f)$, $f(x) = \llbracket \gamma \rrbracket^{g[i \rightarrow x]}$.

² We sometimes use ‘ K ’ to talk about the value of **K**, ‘ J ’ for the value of **J**, etc.

and not above 4000 ft) such that John climbed a d -high mountain and the others didn't.

The prediction that (1a) receives two interpretations is, according to Heim, a welcome result, because they correspond to the absolute and comparative readings (see Section 1). The absolute reading is the DP-internal one, and the comparative reading is the DP-external one. In Section 3.1 we will ask whether deriving such an ambiguity is indeed justified.

As for (2a), according to this DP-external view it receives two *de re* interpretations (absolute, which corresponds to (5a), and comparative, which corresponds to (5b)) and two *de dicto* interpretations (absolute, which corresponds to (6a), and comparative, which corresponds to (6b)). This is because on the one hand, the DP that hosts the superlative can be interpreted "above" or "below" the intensional verb, and independently of that, the superlative morpheme may move out of the DP itself. We assume that lexical predicates take overt pronominal world arguments (for example, **high** is in fact of type $\langle s, \langle d, \langle e, t \rangle \rangle \rangle$). In the absolute *de re* reading, the world-argument of **high mountain** is the same as that of **need** (i.e., @ – which denotes the actual world). The comparison set K is a set of actual mountains. In the comparative *de re* reading, **-est** is scoped out of the definite description, the description becomes indefinite and is scoped out of the intensional environment (and once again the world-argument of **high mountain** is the actual world). The comparison set K is a set of individuals who need to climb actual mountains:

- (13) Absolute *de re*
John needs-@ [1 [PRO climb- w_1 [the [K-est [high-mountain-@]]]]]
 $K = \{x: x \text{ is a relevant mountain}\}$
 For all worlds w compatible with John's actual needs, he climbs in w the unique x such that there is a degree d such that $\{z \in K: z \text{ is a } d\text{-high mountain in the actual world}\} = \{x\}$.
- Comparative *de re*
John [K-est [1 [5 [[the d_1 -high-mountain-@] [3[t₅ needs-@ [2[PRO climb- w_2 t₃]]]]]]]]]
 $K = \{x: \text{there is a degree } d \text{ such that } x \text{ needs to climb an actual mountain that is } d\text{-high}\}$
 There is a degree d such that $\{z \in K: \text{there is an } x \text{ such that } x \text{ is a } d\text{-high mountain in the actual world and for all worlds } w \text{ compatible with } z\text{'s actual needs, } z \text{ climbs } x \text{ in } w\} = \{\text{John}\}$.

The two *de dicto* interpretations require relativizing the comparison set to “need” worlds. The superlative morpheme stays inside the superlative expression in the absolute reading, and moves outside it in the comparative reading, but it doesn’t scope above **need**. In both cases, the world argument of **high mountain** is the same as that of **climb**:

(14) Absolute *de dicto*

John needs-@ [1 [PRO climb- w_1 [the [f_{w_1} -est [high-mountain- w_1]]]]]

For all worlds w compatible with John’s actual needs, John climbs in w the unique x such that there is a degree d such that $\{z \in f(w): z \text{ is a } d\text{-high mountain in } w\} = \{x\}$.

Comparative *de dicto*

John needs-@ [1 [PRO [f_{w_1} -est [2 [climb- w_1 ~~the~~ d_2 -high-mountain- w_1]]]]]

For all worlds w compatible with John’s actual needs, there is a degree d such that $\{z \in f(w): z \text{ climbs in } w \text{ a } d\text{-high mountain in } w\} = \{\text{John}\}$.

The more interesting prediction of the theory is the existence of yet a fifth reading, one where **-est** is scoped above the intensional verb, but the description stays in the scope of **need** and is evaluated relative to the world-argument of **climb**. This is the ‘upstairs *de dicto*’ reading:

(15) **John [K-est [1 [needs-@ [2 [PRO climb- w_2 ~~the~~ d_1 -high-mountain- w_2]]]]]**

Abstracting over the degree denoting trace of **K-est** and replacing **the** with ~~**the**~~ yields a function from degrees d to sets of individuals who need to climb a d -high mountain, as the internal argument of **K-est**; its external argument is **John**. The resulting interpretation is the following:

- (16)a. There is a degree d such that $\{z \in K: \text{for all worlds } w \text{ compatible with } z\text{'s actual needs, } z \text{ climbs in } w \text{ some } d\text{-high mountain in } w\} = \{\text{John}\}$.
- b. $K = \{z: \text{there is a degree } d \text{ such that } z \text{ needs to climb a } d\text{-high mountain}\}$

(16) reflects the state of affairs in Scenario I (see (7)). One of the degrees which verify it is 5000 ft. All of John’s need worlds are such that he climbs

a 5000 ft mountain in them (since **high mountain** is monotone, even if in some worlds John climbs a mountain whose maximal height is higher than 5000 ft, it is still true that he climbs a 5000 ft mountain in those worlds). Yet this is not true of Bill and Mary: they climb mountains lower than 5000 ft in some of their need worlds.

Notice that the main reason for replacing the definite determiner **the** with the indefinite determiner (represented here as **the**) is semantic. If we leave the definite determiner in (15), for example, we get a function from degrees d to sets of individuals who need to climb the unique d -high mountain (and consequently, the sentence is predicted to mean that there is a degree d such that John is the only one who needs to climb the unique d -high mountain). The ‘upstairs *de dicto*’ reading of (2a) does not have this meaning. There is also a syntactic motivation for positing the replacement, which we address in Section 4.5.

The remarkable thing about the DP-external-superlative theory is that the existence of the ‘upstairs *de dicto*’ reading comes as no surprise. It is predicted just like any of the other four readings is, because the superlative morpheme has the freedom to move out of its host DP and position itself above either the matrix or the embedded verb.

2.1.2. *The DP-external-comparative theory*

Our discussion of the DP-external-comparative theory is based on Bresnan (1973), von Stechow (1984), Rullmann (1995), Heim (1985), and Kennedy (1997), without being entirely faithful to them.³ In comparative constructions, the **than**-phrase seems to function as a restrictor, much like **K** in superlative constructions. But while **K** denotes a set of individuals, the **than**-phrase does not. For current purposes, we will make the (not uncontroversial) assumptions that all **than**-phrases denote sets of degrees, and that all **than**-phrases contain ellipsis sites. Under these assumptions, both *John climbed a higher mountain than Bill* and *John climbed a higher mountain than Bill climbed* are, underlyingly, “John climbed a higher mountain than Bill climbed a d -high mountain”.

We analyze the comparative morpheme **-er** as taking two $\langle d, t \rangle$ -functions as arguments (again, we are assuming that gradable adjectives are monotone $\langle d, \langle e, t \rangle \rangle$ -functions):

³ We remind the reader that our goal is to decide whether ‘upstairs *de dicto*’ sentences provide evidence for a DP-external analysis. We ignore many issues relating to comparative constructions discussed in the literature.

- (17) $\llbracket\text{-er}\rrbracket(P)(P')$ is defined only if $\{d : P(d) = 1\}$ and $\{d : P'(d) = 1\}$ are non-empty.

Whenever defined, $\llbracket\text{-er}\rrbracket(P)(P') = 1$ iff $\{d : P(d) = 1\} \subset \{d : P'(d) = 1\}$.

As for the syntax of comparative constructions, we follow Rullmann (1995) (who follows Chomsky (1977)) and assume that *wh*-movement takes place inside the **than**-clause, creating a gap. **-er** and the **than**-clause form a constituent, generated as a sister of the adjective (e.g., **John is taller than Bill is**), or of the constituent formed by combining the adjective with a noun (e.g., **John climbed a higher mountain than Bill climbed**). The **-er + than**-clause constituent is QR-ed at LF, leaving behind a degree denoting trace. The gap in the **than**-clause is filled by copying a phrase containing the trace, in an ACD-like manner. (18a) is the LF of (3a) according to these assumptions (**than** is left out, since it is semantically vacuous). The underlined phrase is the copied material:

- (18)a. **[-er [1 [Bill climbed a d₁-high mountain]]] [2 [John climbed a d₂-high mountain]]**
 b. $\{d : \text{Bill climbed a } d\text{-high mountain}\} \subset \{d : \text{John climbed a } d\text{-high mountain}\}$

If Bill climbed a 3000 ft mountain and John a 4000 ft mountain, the set of degrees d such that Bill climbed a d -high mountain (namely, $\{\dots, 10, 100, \dots, 3000\}$) is indeed a proper subset of the set of degrees d such that John climbed a d -high mountain (namely, $\{\dots, 10, 100, \dots, 3000, \dots, 4000\}$).

Applying the same analysis to (4a) we derive three readings: *de re* (by moving **-er** and the **than**-clause to a pre-clausal position, and adjoining the indefinite to the matrix VP), *de dicto* (by moving **-er** and the **than**-clause above **climb**, but below **need**, and leaving the indefinite in the scope of **need**) and ‘upstairs *de dicto*’ (by moving **-er** and the **than**-clause outside the scope of **need** and leaving the indefinite in the scope of **need**):

- (19) *de re*:
 a. **[-er [1 [Bill [[a d₁-high mountain] [2 [needs to climb t₂]]]]] [3 [John [[a d₃-high mountain] [2 [needs to climb t₂]]]]]**
 b. $\{d : \text{there is a } d\text{-high mountain that Bill needs to climb}\} \subset \{d : \text{there is a } d\text{-high mountain that John needs to climb}\}$

This comes out true, for example, in a situation where there is a 3000 ft mountain that Bill needs to climb, and a 4000 ft mountain that John needs to climb.

- (20) *de dicto*:
- a. **John needs-@ 1 [[-er [2 [Bill needs-w₁ [3 [PRO climb-w₃ a d₂-high-mountain-w₃]]]]] [2 [PRO climb-w₁ a d₂-high-mountain-w₁]]]**
 - b. In all of John's need worlds w $\{d: \text{Bill needs in } w \text{ to climb a } d\text{-high mountain}\} \subset \{d: \text{John climbs a } d\text{-high mountain in } w\}$ ⁴

This comes out true when John's actual needs are fulfilled only in worlds where he climbs a mountain whose maximal height is higher than the minimal height that would satisfy Bill's needs.

- (21) *Upstairs de dicto*:
- a. **[-er [1 [Bill needs-@ [2 [PRO climb-w₂ a d₁-high-mountain-w₂]]]]] [1 [John needs-@ [3 [PRO climb-w₃ a d₁-high-mountain-w₃]]]]]**
 - b. $\{d: \text{in all of Bill's need worlds } w \text{ he climbs a } d\text{-high mountain in } w\} \subset \{d: \text{in all of John's need worlds } w \text{ he climbs a } d\text{-high mountain in } w\}$

This comes out true in Scenario I (described in (7)), where the minimal height that would satisfy John's actual needs is higher than the minimal height that would satisfy Bill's actual needs.

In all four cases, the comparative morpheme is interpreted DP-externally. In (18) we compare climbers' achievements, and in (19)–(21) – climbers' needs. Let us postpone the question of whether the comparative morpheme can be interpreted DP-internally to Section 6. For now, it suffices to note that the DP-external interpretation yields the desired readings.

From Heim's (2000) point of view, 'upstairs *de dicto*' sentences with comparatives constitute counter-examples to what she calls Kennedy's Generalization. Kennedy (1997) observes that comparative expressions cannot scope above scope-bearing elements such as quantified noun

⁴ We ignore the other potential *de re* reading (where there is an actual mountain that John needs to climb and that mountain is higher than the minimal height that would satisfy Bill's actual needs); and the other potential *de dicto* reading (where John's needs are satisfied in worlds where he climbs a mountain higher than the minimal height that would satisfy Bill's actual needs).

phrases, as illustrated by (22). The semantics assumed for **less** is given in (23):

- (22) Every girl is less tall than John is.
- a. Every \gg less: For all girls x , $\{d: \text{John is } d\text{-tall}\} \supset \{d: x \text{ is } d\text{-tall}\}$
 - b. **##Less** \gg every: $\{d: \text{John is } d\text{-tall}\} \supset \{d: \text{every girl is } d\text{-tall}\}$
- (23) $\llbracket \text{less} \rrbracket(P)(P')$ is defined only if $\{d : P(d) = 1\}$ and $\{d : P'(d) = 1\}$ are non-empty.
Whenever defined, $\llbracket \text{less} \rrbracket(P)(P') = 1$ iff $\{d : P(d) = 1\} \supset \{d : P'(d) = 1\}$

The reading in (22a) is the only attested reading. The reading in (22b), which amounts to saying that the shortest girl is shorter than John, is not attested, and must be excluded by a syntactic constraint that prohibits scoping the comparative phrase above **every girl**.⁵ Heim argues, based on ‘upstairs *de dicto*’ cases, that Kennedy’s Generalization does not cover all scope bearing elements. The reason is this. As is evident from (22), quantified DP’s indeed behave as syntactic interveners (in the sense of Beck (1996)), and do not allow comparatives to scope above them. But intensional predicates do not, as evidenced by (4b), repeated and analyzed below (Heim uses other kinds of *less*-phrases, but the point is the same):

- (24) Bill needs to climb a less high mountain than John needs to climb.
- a. Need \gg less: In every world w which meets Bill’s actual needs, $\{d: \text{John needs in } w \text{ to climb a } d\text{-high mountain}\} \supset \{d: \text{Bill climbs a } d\text{-high mountain in } w\}$
 - b. Less \gg need: $\{d: \text{in every world } w \text{ which meets John’s actual needs, John climbs a } d\text{-high mountain in } w\} \supset \{d: \text{in every world } w \text{ which meets Bill’s actual needs, Bill climbs a } d\text{-high mountain in } w\}$

This example fully parallels (4a), analyzed above in (19)–(21). (24a) is the ‘plain’ *de dicto* reading, and (24b) is the ‘upstairs *de dicto*’ reading,

⁵ Not all examples constructed this way make this point. In some cases the two syntactic scope relations yield identical truth conditions, and in some cases a non-existent reading can be ruled out on semantic grounds. However, based on examples such as (22), Kennedy concludes that UG forces the comparative morpheme to take narrowest syntactic scope (see Kennedy (1997) and Heim (2000) for discussion).

which amounts to saying that Bill's minimal need is lower than John's minimal need. Both readings are attested.

Anna Szabolcsi points out to us that intensional verbs often do not exhibit the same intervening behavior as other scope bearing element (this is consistent with Heim's observation). For example, when a quantifier is separated on the surface from its restriction by another quantifier the result is grammatical only if at LF, the intervening quantifier scopes above the quantifier separated from its restriction (see de Swart (1992), Beck (1996), Honcoop (1998)):

- (25)a. *Q₁ Q₂ [DP t₁ [PP N]]
 b. Q₂ Q₁ t₂ [DP t₁ [PP N]]

But intensional verbs do not conform to (25). Consider German *wen-von* constructions (from Beck 1996). The *wh*-operator (*wen*) and its restriction (*von den Musikern*) can be separated after overt movement of *wen*:

- (26)a. Wen von den Musikern hat Luise getroffen?
 whom of the musicians has Luise met?
 'Which of the musicians did Luise meet?'
 b. Wen hat Luise von den Musikern getroffen?
 whom has Luise of the musicians met?

Example (27) exemplifies (25). (27a) is ungrammatical (cf. (25a)) because *kein* cannot take wide scope in questions. (27b) is grammatical (cf. (25b)) under its distributive reading, where *jeder* takes wide scope:

- (27)a. ??Wen hat keine Studentin von den Musikern getroffen?
 whom has no student of the musicians met
 b. Wen hat jede Studentin von den Musikern getroffen?
 whom has every student of the musicians met

However, as (28) shows, the intensional verb *wollen* does not create an intervention effect:

- (28) Wen willst du von den Musikern treffen?
 whom want you of the musicians meet
 'Which of the musicians do you want to meet?'

In short, intensional verbs are not good interveners in general. Below we argue for a DP-internal analysis of morphemes of comparison, and derive

truth conditions analogous to those in (24b) without scoping **less** above the intensional verb. Both this analysis and Heim's are compatible with the behavior of intensional verbs in *wh*-constructions.

2.2. 'At Least' and 'Exactly' Interpretations of Gradable Predicates

One crucial assumption of the DP-external theory, of superlative and comparative constructions alike, is that gradable adjectives are monotone $\langle d, \langle e, t \rangle \rangle$ -functions – they obey the Monotonicity Principle in (10). This assumption is not uncontroversial, and requires some discussion.

Recall the semantics for **high** that we have been assuming:

$$(29) \quad \llbracket \mathbf{high} \rrbracket(d)(x) = 1 \text{ iff } x\text{'s maximal height includes } d.$$

This means that *Mount A is 3000 ft high* does not entail that Mount A is exactly 3000 ft high, but rather that it is at least 3000 ft high.

There are other views. Some authors (von Stechow 1984; Rullmann 1995 and others) take gradable adjectives to be non-monotonic. The semantics they attribute to *high* is this:

$$(30) \quad \llbracket \mathbf{high} \rrbracket(d)(x) = 1 \text{ iff } x\text{'s maximal height is } d.$$

Accordingly, *Mount A is 3000 ft high* entails that Mount A is exactly 3000 ft high.

The question is which of these views does more justice to our intuitions. Speakers are inclined to infer that Mount A is exactly 3000 ft high from *Mount A is 3000 ft high*. According to the 'exactly'-view (i.e., the view that gradable adjectives are not monotonic), this fact is explained automatically. The 'at-least' view (i.e., the view that gradable adjectives are monotonic) resorts to Gricean implicatures in order to explain speakers' judgments (see Horn (1972, 1989, 1992) and Gazdar (1979) for some discussion). Gricean implicatures are probably at play in the evaluation of *John has a thousand dollars*. We are inclined to infer that John has exactly one thousand dollars, but we have no problem rejecting this inference if the context so requires. It is less clear that this is the case with gradable adjectives. Thus, (31a) sounds coherent, but (31b) is odd:

- (31)a. Of course he has a thousand dollars. In fact, he has ten thousand.
 b. #Of course he is three feet tall. In fact, he is four feet tall.

If we rely on Gricean implicatures for 'exactly'-inferences induced by gradable adjectives, we have to claim that, for some reason, the implicature in this case is much stronger than the one obtained when no gradable

adjectives are involved (as in (31a)). Therefore, if one wants to defend the ‘at least’ view, one has to come up with an independent argument for it. Heim (1998) relies on ‘upstairs *de dicto*’ sentences with comparative constructions to defend the ‘at least’ view, but ‘upstairs *de dicto*’ sentences with superlative expressions make exactly the same point. Consider again sentence (2a), repeated below, evaluated against Scenario I ((7)).

- (32)a. John needs to climb the highest mountain.
 b. **John [K-est [1 [needs to climb the d_1 -high mountain]]]**

Suppose we revise the semantics of **-est**, and assume that gradable adjectives are non-monotonic:

- (33) $\llbracket\text{-est}\rrbracket(K)(R)(x) = 1$ iff there is a degree d such that $R(d)(x) = 1$ and for all $y \in K$, for all d' , if $y \neq x$ and $R(d')(y) = 1$, then $d' < d$.

Accordingly, (32a) receives the following interpretation:

- (34) There is a degree d such that for all w compatible with John’s actual needs, John climbs in w an exactly d -high mountain; and for all others y , for all d' , if for all w compatible with y ’s actual needs y climbs in w an exactly d' -high mountain in w , then $d' < d$.

These truth conditions do not capture the ‘upstairs *de dicto*’ reading of (32a). For one thing, they require John to climb a mountain of the same height in all his “need” worlds. This is not the state of affairs described in (7). In addition, consider (32a) in a situation where John needs to climb a mountain which is exactly 5000 ft high, and Mary needs to climb a mountain which is between 6000 ft and 7000 ft. Intuitively, the sentence is false, but (34) predicts it to be true. On the other hand, if we assume that gradable adjectives are monotone functions (and assume the semantics in (11) for **-est**), we predict the right truth conditions for (32a) in this state of affairs:

- (35) There is a degree d such that in all of John’s need worlds he climbs a mountain whose height contains d , and for all others y , it is not the case that in all of y ’s need worlds y climbs a mountain whose height contains d .

(32a) is correctly predicted to be false. But does this mean that gradable adjectives are unambiguously monotonic? An L&P reviewer points out

that it is easy to think of a scenario where (34) would be a good interpretation of (32). Suppose John's needs can be satisfied only if he climbs a mountain which is exactly 5000 ft (if he climbs a mountain lower than that, he won't improve his ranking; but if he climbs a mountain higher than that, he will risk his health). Bill needs to climb a mountain which is exactly 4000 ft high, and Mary – 3000 ft high. (32a) is a good report of this, and both (34) and (35) render it true, only the truth conditions in (35) are weaker.

Does this mean that there is a systematic ambiguity in the semantics of gradable adjectives, and that they can, depending on the context, receive either an 'exactly' interpretation or an 'at least' interpretation? If we endorse the DP-external view, we cannot endorse this ambiguity theory. Consider (32a) again in a scenario where John needs to climb a 5000 ft mountain, and Mary and Bill – a mountain which is between 6000 ft and 7000 ft high. The sentence is judged to be false, but under the ambiguity theory it should have at least one true reading (corresponding to (34)), and we should be able to judge it as true in this scenario. This shows that the DP-external theory is consistent only with the assumption that gradable adjectives are unambiguously monotonic (and that the semantics for **-est** is as in (11); the semantics for **-er** is as in (17)).

We have seen that 'upstairs *de dicto*' sentences receive a simple account within the DP-external theory. This theory forces the conclusion that gradable adjectives denote monotone functions. In Section 4 we will propose a DP-internal analysis of morphemes of comparison. Such an analysis can be worked out either with the assumption that gradable adjectives are monotonic, or with the assumption that they are systematically ambiguous. We will assume that they *are* monotonic, but this is NOT a necessary assumption. Before we turn to the DP-internal analysis, let us discuss some problems which arise within the DP-external view, and which will lead us to the conclusion that we are forced to look for an alternative.

3. ANOTHER LOOK AT THE DP-EXTERNAL VIEW

3.1. *The Nature of Comparative Readings*

As noted above, one consequence of the DP-external-superlative view is that it assigns (1a) – *John climbed the highest mountain* – two LFs, one corresponding to an absolute reading and the other to a comparative reading. Two questions arise: (a) is there empirical motivation to support positing two distinct readings (corresponding to two distinct LF's); and (b) if so, is

the LF with the DP-external superlative morpheme a faithful representation of the comparative reading.

Consider (1a) in a situation where John and Bill both climbed the same mountain, which happens to be the highest mountain. The DP-internal LF in (12) renders the sentence true, and the DP-external LF renders it false. As Heim notes, speakers' judgments are neither clear nor uniform. Our own take on (1a), based on the judgments we gathered, is that it isn't false in this scenario; at best, it is misleading. If it is indeed only misleading, there is no reason to derive a difference in truth conditions between an absolute and a comparative "reading". Rather, this fact favors a view where the superlative morpheme is always interpreted DP-internally, and the value assigned to **K** by the context determines whether the comparison set contains climbed mountains, or just "plain" mountains (climbed or unclimbed). According to this DP-internal-superlative theory, the absolute and comparative "readings" are not truly two readings (even though we refer to them as such), but rather reflect a difference in strategy for fixing the comparison set (cf. Heim 1999):

- (36)a. LF: **John climbed [the [K-est [high mountain]]]**
- b. John climbed the unique x such that there is a degree d such that $\{z \in K : z \text{ is a } d\text{-high mountain}\} = \{x\}$.
- c. "Absolute" strategy for determining the value of **K**
 $K = \{x : \text{there is a degree } d \text{ such that } x \text{ is a (relevant) } d\text{-high mountain}\}$
- d. "Comparative" strategy for determining the value of **K**
 $K = \{x : \text{there is a degree } d \text{ and an individual } y \text{ such that } x \text{ is a (relevant) } d\text{-high mountain \& } y \text{ climbed } x\}$

If the superlative expression appears in an intensional environment, the comparison set is relativized to worlds and the same two strategies are employed. Thus we still have two strategies for fixing the comparison set, and we still get two *de re* "readings" for (2a) (absolute and comparative) and two *de dicto* "readings" (absolute and comparative). How to derive the 'upstairs *de dicto*' reading is less obvious, and we will come back to this issue in Section 4.

Now, going back to the issue of evaluating (1a) in a scenario where John and Bill climb the same mountain. The analysis in (36) allows for the possibility that (1a) comes with an implicature that John is the only one that climbed the mountain that is the highest among all relevant mountains. This implicature is certainly apparent when the subject is stressed:

- (37) JOHN climbed the highest mountain.

The stressed subject invokes (in the terminology used in the literature on Focus; Rooth (1992)), a set of contextually relevant alternatives – {John climbed the highest mountain, Bill climbed the highest mountain, ...}. As is often the case when such alternatives are invoked, and without any information to the contrary, this set triggers the implicature that the other propositions in the set are false. That this is merely an implicature is supported by the fact that it can be cancelled:

- (38) John/JOHN climbed the highest mountain. In fact, Bill climbed it too.

Likewise, speakers' judgments are not clear concerning (1a) in a situation where John climbs two 5000 ft mountains (Bill – one 4000 ft mountain and Mary – one 3000 ft mountain). The DP-internal analysis predicts the sentences to be neither true nor false (because there is no mountain which is the highest), and the DP-external analysis predicts the sentence to have a true reading (because there is a degree d such that John climbed a d -high mountain and no one else did). If the DP-external analysis were correct, speakers should have no trouble judging (1a) as true in this situation. But many speakers hesitate. According to the DP-internal analysis those speakers who hesitate choose *all* the mountains climbed as the value of **K**. Those who judge (1a) as true ignore one of John's mountains when fixing the value of **K**. The conditions under which one can ignore a mountain when there is another one of the same height have to be specified.

A different kind of problem for the DP-external-superlative view is the one discussed by Farkas and Kiss (2000). It is observed there that sentences such as the following, where the denotation of the noun is constrained by an overt PP, does not have a comparative reading at all:

- (39) John visited the largest city in Europe.

The DP-external-superlative view assigns this sentence an LF which it does not have:

- (40)a. **John [K-est [1 [visited ~~the~~ d_1 -large city in Europe]]]**
 b. There is a degree d such that John visited a d -large city in Europe and no one else visited a d -large city in Europe.

There are perhaps ways to avoid this problem within the DP-external view. In any event, the absence of a comparative reading is more easily explained

within a DP-internal theory, because according to this theory the overt PP directly constrains the choice of the comparison set.⁶

The next section discusses a more serious challenge for the DP-external theory.

3.2. Negative Superlatives in Extensional Environments

We now show that the DP-external-superlative theory makes wrong predictions for a set of data that involves negative superlatives in extensional environments. For current purposes, we adopt the semantics for **least** given in (41) (based on Stateva (2000)). This semantics is modeled after the semantics for **-est** that we used above, and is built on the assumption that gradable adjectives denote monotone functions:

- (41) $[[\text{least}]](K)(R)(x)$ is defined only if $x \in k$ and for all y in K , there is a degree d such that $R(d)(y) = 1$. Whenever defined, $[[\text{least}]](K)(R)(x) = 1$ iff there is a degree d such that $\{z \in K : R(d)(z) = 1\} = K - \{x\}$.

Least, like **-est**, gives rise to an absolute and a comparative reading. For example, (42) can be appropriate if the relevant mountains are Mount Everest, Mount Kilimanjaro and Mount Sinai and Mary climbed Mount Sinai (the lowest of the bunch), or if she climbed a mountain lower than what every other relevant person climbed (Scenario II in (45)):

- (42) Mary climbed the least high mountain.

Within the DP-external-superlative theory, and given our semantics in (41), (42) has two LF's. The LF in (43a) represents the absolute reading:

- (43)a. **Mary climbed [the [K-least [high mountain]]]**
 b. Mary climbed the unique x such that there is a degree d such that $\{z \in K : z \text{ is a } d\text{-high mountain}\} = K - \{x\}$
 c. $K = \{\text{Mount Everest, Mount Kilimanjaro, Mount Sinai}\}$

The LF (44a) represents the comparative reading, appropriate, for example, in Scenario II in (45):

- (44)a. **Mary [K-least [1 [climbed ~~the~~ d_1 -high mountain]]]**
 b. There is a degree d such that $\{z \in K : z \text{ climbed a } d\text{-high mountain}\} = K - \{\text{Mary}\}$
 c. $K = \{\text{John, Mary, Bill}\}$

⁶ Farkas and Kiss propose their own DP-internal-superlative analysis for sentences such as *John climbed the highest mountain*, which differs from (36) in several respects. See Section 4 for a very brief discussion.

(45) Scenario II:

Mary climbed one mountain – a 2000 ft mountain;
 Bill climbed one mountain – a 3000 ft mountain;
 John climbed one mountain – a 4000 ft mountain.

In (44), **least** and its restriction **K** are scoped above **climb**, to a position which ensures that its external argument is outside the host DP.⁷

For some extensional environments the movement analysis makes wrong predictions (Irene Heim (p.c.)). Consider a scenario in which one individual is paired with more than one mountain as in (46). Notice that we come across a discrepancy between our intuitions and the truth conditions derived from the LF in (44a) when we evaluate (42) with respect to Scenario III.

(46) Scenario III:

Mary climbed one mountain – a 3000 ft mountain.
 Bill climbed two mountains – a 2500 ft mountain and a 3500 ft mountain.
 John climbed one mountain – a 4000 ft mountain.

Here, one individual is associated with two mountains, one of which is the lowest of all, and the other is higher than at least one mountain that some other individual climbed. Let us call such scenarios “sandwich” scenarios. In the “sandwich” Scenario III, Bill is the person who climbed a 2500 ft mountain – the lowest of the climbed mountains, and speakers judge (42) as false (provided that the context makes it clear that none of the climbed

⁷ As pointed out to us by Gidi Avrahami, the lexical entry for **least** (see (41)) may make wrong predictions when the comparison set K is an infinite set. For example, consider (i):

- (i) Zero is the least high non-negative rational number.

According to (41), for (i) to come out true there must be a degree d such that zero is not d -high and all other non-negative rational numbers are. However, given that the set of non-negative rational numbers is dense near zero, these truth conditions cannot be met (i.e., there is no rational number that is “nearest” to zero from above). One way to solve the problem is to adopt a maximality-based lexical entry for **least**:

- (ii) $[[\text{least}]](K)(R)(x) = 1$ iff for all $y \neq x$, if y is in K , then $\text{Max}(\{d : R(d)(y)\}) > \text{Max}(\{d : R(d)(x)\})$.

For our purposes, however, (41) will do, since all our examples involve finite comparison sets.

mountains may be ignored). But according to (44b), for the sentence to be true it is enough to find one degree d such that Mary didn't climb a mountain that is d -high but everyone else did. This is indeed the case, because all the degrees that are higher than 3000 ft and lower than or equal to 3500 ft meet this condition.

Unlike the DP-external-superlative theory, the DP-internal-theory (see (43a–b) which represent the two “readings” under this theory, with different values for \mathbf{K}) does not run into this problem. (43b), where K consists of mountains rather than mountain climbers, correctly predicts (42) to be false in Scenario III. It seems then that here, the theory that bans a DP-external interpretation has a clear advantage. However, before deciding to reject the DP-external-superlative analysis, let us try to save it by revising the semantics for the superlative morphemes. The proposed revised semantics are given in (47) and (48) (for simplicity, K is left out):

(47) $\llbracket\text{-est}\rrbracket(R)(x)$ iff there is a degree d such that $R(d)(x) = 1$ and for all $y \neq x$, for all d' , if $R(d')(y) = 1$ then $d > d'$.

(48) $\llbracket\text{least}\rrbracket(R)(x)$ iff there is a degree d such that $R(d)(x) = 1$ and for all $y \neq x$, for all d' , if $R(d')(y) = 1$ then $d < d'$.

If we hold on to the view that gradable adjectives are monotonic, what we achieve by modifying the semantics for the superlative morphemes is obviously not satisfactory. In keeping with the movement analysis, *least* scopes above **climb**, yielding the LF and interpretation in (49) for (42):

(49)a. **Mary [least [1 [climbed the d_1 -high mountain]]]**

b. There is a degree d such that Mary climbed a mountain whose height contains d and for all others y , for all d' , if y climbed a mountain whose height contains d' , then $d < d'$.

(42) is correctly predicted to be false under Scenario III, but we run into a more fundamental problem. For every situation which can be described with a sentence containing a superlative expression with **least** (and where our domain contains at least two individuals) our semantics assigns that sentence truth conditions that could not be met. For example, our intuitions require that in Scenario III (50) be true, but (49b) predicts it to be false:

(50) Bill climbed the least high mountain.

Similarly, in Scenario II (42) should come out true, but according to (49b), (42) comes out false since for any degree d contained in the height of the

mountain climbed by Mary (1500 ft, 1700 ft, etc.), there is at least one degree contained in the heights of the mountains climbed by John or Bill that is not higher than d . These are monotonicity effects. If our semantics allowed us to consider only the degrees corresponding to the respective maximal height of each relevant mountain, all the “offending” degrees would conveniently be excluded from the evaluation of (49b). If we interpret the “new” semantics in (47) and (48) under the assumption that gradable adjectives are non-monotonic, we get the following interpretation for (42) with respect to Scenarios II and III:

- (51) There is a degree d such that Mary climbed an exactly d -high mountain and for all y , $y \neq$ Mary, for all degrees d' , if y climbed an exactly d' -high mountain, then $d < d'$.

Recall that we need (42) to come out true in Scenario II, and false in Scenario III. In the former, all the exact heights of the mountains that the others climbed satisfy the condition of being higher than the exact height of “Mary’s” mountain. In the latter scenario, however, not all the exact heights of the mountains that the others climbed satisfy the condition of being higher than the exact height of Mary’s mountain. In particular, the 2500 ft mountain that Bill climbed does not.

However, in Section 2.2 we saw that assigning gradable adjectives a non-monotonic interpretation cannot go hand in hand with the DP-external theory, because this interpretation yields wrong truth conditions for some ‘upstairs *de dicto*’ sentences. We cannot rely on non-monotonicity (in either its strong or weak version) to solve the problem of “sandwich” scenarios.⁸

Before concluding that an alternative, DP-internal, theory of ‘upstairs *de dicto*’ sentences has to be sought, let us, for the sake of completeness, consider yet another attempt to salvage the DP-external view (the reader may skip to Section 4 without missing crucial steps). This attempt relies on an observed ambiguity of ‘upstairs *de dicto*’ sentences with negative superlatives.

3.3. Negative Superlatives in Intensional Environments

Negative superlatives have been shown to give rise to two kinds of ‘upstairs *de dicto*’ readings (Stateva 2000). Consider (52):

- (52) Mary needs to climb the least high mountain.

⁸ Meier (2001) proposes an alternative analysis of degree operators in intensional contexts. Because of space limitations, we cannot explain the problems posed for this analysis by superlative expressions in “sandwich” scenarios.

The first reading becomes available in Scenario I (see (7)), where the results of the survey can be reported by (52). We call this reading the ‘at least upstairs *de dicto*’ reading. To derive it under the DP-external-superlative hypothesis, Stateva uses Heim’s (1999) strategy of raising the superlative morpheme to a position where it takes scope over the intensional verb (the underlying assumption is that gradable adjectives are monotonic, and that the semantics for **least** is the one in (41)):

- (53)a. **Mary [K-least [1 [needs-@ [2 [PRO to climb- w_2 ~~the~~ d_1 -high-mountain- w_2]]]]]**
 b. There is a degree d such that $\{z \in K: \text{in all } w \text{ compatible with } z\text{'s actual needs, } z \text{ climbs in } w \text{ a } d\text{-high-mountain in } w\} = K - \{\text{Mary}\}$

The second ‘upstairs *de dicto*’ reading of (52) comes up in a different scenario. Consider Scenario IV below. Suppose that Mary, Bill and John are each trained to climb mountains of a certain height, and none of them would risk climbing what is “too high” for their training. In such a scenario, there could be restrictions on the maximal height of the mountains that each individual needs to climb. These restrictions are summarized below:

- (54) Scenario IV
 Mary needs to climb a mountain that is not higher than 3000 ft.
 Bill needs to climb a mountain that is not higher than 4000 ft.
 John needs to climb a mountain that is not higher than 5000 ft.

(52) is a good report of what goes on in Scenario IV. We call this reading the ‘at most upstairs *de dicto*’ reading. The movement hypothesis combined with an assumption about the morphological make-up of **least** accounts for that reading too. Stateva assumes that **least** is morphologically complex. She bases her assumption on Heim’s (1998) analysis of similar readings that arise in sentences with comparative expressions (cf. Rullmann (1995)). Heim assumes that the degree operator **less** can be decomposed in the syntax into the operator **-er** and a negation operator.⁹ The negation operator turns any member of the **high**-class into its antonym. For example, if X is a not- d -high-mountain, then the maximal height of X does not contain d (in other words, that it is lower than d). One consequence of this proposal is that the morpheme of comparison and negation become

⁹ The mechanism in Heim (1998) is not of decomposing, strictly speaking: only **-er** is a lexical item.

movable independently of each other and can be interpreted in different positions.

Stateva (2000) assumes that **least** can be decomposed into the morpheme **-est** and negation. Accordingly, there are at least two possibilities to derive ‘upstairs *de dicto*’ readings: (i) **-est** is raised above the intensional verb, and so is negation; (ii) **-est** is raised above the intensional verb but negation is interpreted in its base position. The first option derives the ‘at least’ reading of (52) (for simplicity, we represent this reading by combining negation with **-est** and producing the compound **least**). The second option derives the ‘at most’ reading of (52), as in (55):

- (55)a. **Mary [K-est [1 [needs-@ [2 [PRO to climb-w₂ a not-d₁-high-mountain-w₂]]]]]**
 b. There is a degree d such that $\{z \in K: \text{in all } w' \text{ compatible with } z\text{'s actual needs, } z \text{ climbs in } w' \text{ a not-}d\text{-high-mountain in } w'\} = \{\text{Mary}\}$

This is the desired interpretation: One degree which verifies (55b) is 3100 ft. In all her “need” worlds Mary climbs a mountain whose maximal height does not contain the degree 3100 ft (i.e., it is below 3100 ft); the others don’t climb mountains that are below 3100 ft in all of their “need” worlds (though they may climb mountains below 3100 ft in some of their “need” worlds).

Now, does the assumption regarding the decomposability of **least** provide a solution to the “sandwich” problem we encountered in Section 3.2? We think that the answer is No. Indeed, the assumption that **least** is decomposable and that negation can move independently predicts the following to be a possible LF of **Mary climbed the least high mountain**:

- (56) **Mary [K-est [1 [climbed a not-d₁-high-mountain]]]**

In Scenario II ((45) above), (56) comes out true, as it should. 2100 ft is one degree that verifies it: Mary climbed a mountain that is not a 2100 ft mountain (namely, lower than 2100 ft), and the others didn’t climb a mountain that is not a 2100 ft mountain. In Scenario III ((46)), (56) comes out false, as it should. The problem is that nothing blocks the alternative LF, where **-est** and negation move together. But this is precisely the LF that was shown to be problematic:

- (57) **Mary [K-least [1 [climbs a d₁-high-mountain]]]**

The only way to block this LF would be to block the simultaneous movement of **-est** and negation out of an extensional environment. There is no independent motivation for such a strange rule.

With this we conclude that the DP-external analysis of morphemes of comparison has to be replaced with a DP-internal analysis. One immediate consequence of such a move is that the absolute and comparative readings of, say, (1a), are to be analyzed as in (36) (see Section 3.1). We think this is desirable, given that the evidence that supports the analysis provided by the DP-external view is, as we saw, quite weak. Another consequence is that we no longer need to assume that gradable adjectives are unambiguously monotonic (even though we will continue to do so). In Sections 4 and 5 we propose a DP-internal analysis of ‘upstairs *de dicto*’ sentences with superlative expressions. In Section 6 we extend the proposal to comparative expressions.

4. A DP-INTERNAL ANALYSIS OF ‘UPSTAIRS *de dicto*’ SENTENCES

4.1. A First Attempt

A first attempt to analyze ‘upstairs *de dicto*’ sentences with superlative expressions without moving **-est** to a DP-external position is offered in Heim (1999). Let us briefly review this attempt and the reasons why Heim ultimately abandons it. Consider (2a) again, repeated below as (58):

(58) John needs to climb the highest mountain.

Heim considers and rejects two analyses that do not involve ‘long’ movement, as shown in (59). The idea here is to try to exploit the variable which denotes the comparison set (for simplicity, let us assume that the definite determiner optionally deletes):

- (59)a. **John needs-@ [1 [PRO to climb- w_1 [(the) [K-est [high-mountain- w_1]]]]]**
 b. **John needs-@ [1 [PRO to climb- w_1 [(the) [H- w_1 -est [high-mountain- w_1]]]]]**

Which mountains does *K* contain in (59a)? Suppose *K* contains all the mountains that either John, Bill, or Mary climbed in all the worlds compatible with their needs. Clearly, this would not give us the meaning we are after because intuitively, any world where John climbs a 5000 ft mountain in Scenario I is a world which meets his needs. But (59a) excludes some of these worlds – worlds where he climbs a 5000 ft mountain and other members of *K* are higher mountains.

Relativizing the comparison set to worlds, as implied by (59b), would not help matters much. If we require that in each of John’s ‘need’ worlds

he climbs a mountain higher than Mary or Bill climb, we obtain the regular *de dicto* reading, and as we have already said, in Scenario I it does not matter whether in his needs worlds, John's mountain is higher or lower than the mountains climbed by the others. Another option is to have the function **H** collect, in each of the worlds compatible with John's needs, mountains that are of exactly the lowest degree possible for each individual in the set {John, Bill, Mary}. This will not reflect the right meaning either, because the survey only indicates the lower limit of everybody's needs. So among the worlds compatible with John's needs there are bound to be worlds where he climbs mountains higher than 5000 ft.

It seems very hard, if not impossible, to analyze 'upstairs *de dicto*' sentences making standard assumptions about the interpretation of DP's in intensional environments. Our proposal relies on some non-standard assumptions about the interpretation of DP's in these environments.

4.2. *The Proposal - Basic 'Upstairs de dicto' Cases*

The version of the DP-internal view that we present here assumes that gradable adjectives are monotonic. The semantics assumed for **-est** and **least** are as in (11) and (41) respectively.

We propose that the superlative morpheme never moves out of its host DP. Rather, it may be interpreted as a property of individuals. For example, in (2a), *the highest mountain* has the option of being interpreted as an individual (giving rise to the familiar *de re* and *de dicto* readings), or as a property (giving rise to an 'upstairs *de dicto*' reading), in which case the following LF is the relevant one (for simplicity, we omit the domain restriction of **-est**):

- (60) **John needs-@ [1 [PRO to climb-w₁ [the-J [IDENT'-W*[2 [est [high mountain-w₂]]]]]-w₁]]**

The definite NP **[the-J [IDENT'-W*[2 [est [high mountain_{w₂]]]]]-w₁}** is of type $\langle e, t \rangle$. Therefore, **climb-w₁** undergoes a type-shifting process which converts it into a function of type $\langle \langle e, t \rangle, \langle e, t \rangle \rangle$, and takes the definite description as its argument. This is done in the spirit of *in-situ* theories of narrow-scope indefinites (as in *John saw a boy*, where *a boy* is of type $\langle e, t \rangle$).¹⁰

The $\langle s, \langle e, t \rangle \rangle$ -interpretation of **[the-J [IDENT'-W*[2[est[high mountain_{w₂]]]]]}** proceeds like this. We assume that **the** is cross-categorical (see Jacobson (1994)), and that it may apply to a set of properties to

¹⁰ See, for example, Van Geenhoven (1996). Alternatively, *the highest mountain* could move like an indefinite. We choose not to move it here just to keep the LFs simple.

yield a unique property. Like any determiner, it comes with a variable **J** that restricts its domain (as is commonly assumed – e.g., von Stechow (1994)). We also assume the existence of the operator **IDENT'-W***, which functions as a type-shifter, and has the following semantics:

- (61) For any properties P and P' , and any set of worlds A ,
 $\llbracket \mathbf{IDENT}' \rrbracket(A)(P)(P') = 1$ iff for all worlds w in A , $P(w) = P'(w)$.

IDENT'-W* takes two properties and yields True just in case these properties have the same extension in all the worlds belonging to the contextually supplied set denoted by W^* . We view this operation as an extension of Partee's (1987) type-shifting operation **IDENT**.¹¹ **IDENT'** applies to $\llbracket 2[\mathbf{est}[\mathbf{high\ mountain}_{w_2}]] \rrbracket$ (which denotes the property of being highest mountain):

- (62) $\llbracket \mathbf{IDENT}'\text{-}W^* \rrbracket^g(\llbracket \llbracket 2[\mathbf{est}[\mathbf{high\ mountain}_{w_2}]] \rrbracket \rrbracket^g)$

This is a set of properties to which **the** applies, yielding a unique contextually relevant property:

- (63) $\llbracket \mathbf{the}\text{-}\mathbf{J} \rrbracket^g(\llbracket \llbracket \mathbf{IDENT}'\text{-}W^* \rrbracket^g(\llbracket \llbracket 2[\mathbf{est}[\mathbf{high\ mountain}_{w_2}]] \rrbracket \rrbracket^g) \rrbracket^g)$
 “the unique property P which is a member of J and which in each world in W^* has the same value as the property of being highest mountain”

J is the set of properties {‘be a 3000 ft mountain’, ‘be a 4000 ft mountain’, ‘be a 5000 ft mountain’} made salient by the context (Scenario I, (7) above). W^* is a salient set of worlds where the properties ‘be a 5000 ft mountain’ and ‘be highest mountain’ have the same value. Given the results of our survey, we can characterize W^* as the set in (64):

- (64) $\{w: \text{for all } x \in \{\text{John, Bill, Mary}\}, x \text{ climbs in } w \text{ one mountain only, of the lowest possible height according to } x\text{'s needs in the actual world, and the mountains that John, Bill, and Mary climb in } w \text{ are the only mountains in } w\}$

Based on Scenario I, W^* contains worlds where the needs of everyone are minimally satisfied (ignoring any other needs they may or may not have). John's mountain comes out highest in all these worlds. Given these

¹¹ The original **IDENT** applies to an individual to yield the property of being that individual.

values for **J** and **W***, *the highest mountain* (in its property-interpretation) is precisely the property of being a 5000 ft mountain. **Climb** combines with this property via the appropriate type-adjusting operation, and we get the following interpretation:

- (65) In all worlds w compatible with John's actual needs, there is an x such that x is a member of $\llbracket \text{the-} \mathbf{J} \rrbracket^g (\llbracket \text{IDENT}'\text{-} \mathbf{W}^* \rrbracket^g (\llbracket \text{est} [\text{high mountain}_{w_2}] \rrbracket^g)) (w)$, and John climbs x in w .

So given the context resulting from our survey (i.e., given that the property in (63) denotes in this context the 'be a 5000 ft mountain' property), *John needs to climb the highest mountain* and *John needs to climb a 5000 ft mountain* amount to the same statement.

How is the value of **W*** determined? Presumably, the context makes this value "salient". Let us try to think about what constrains the choice of a particular value. In Scenario I we know what the minimal height imposed on each individual is. We construct W^* in such a way that it comprises a model of the worlds where everybody's needs are minimally satisfied. It is hard to formalize the "guidelines" we follow to construct such a suitable model. Intuitively, it feels right in this case to let W^* contain worlds where everybody climbs one mountain only, and it is of the lowest possible height. We will have more to say about this in Section 5.

Notice an important consequence of our proposal: the relevant comparison is *always* of entities that correspond to the DP in which the morpheme of comparison appears. That is to say, mountains are being compared in *all* readings of (1) (absolute and comparative) and all readings of (2) (the *de re* readings, the *de dicto* readings, and the 'upstairs *de dicto*' reading).

A potential objection to the DP-internal theory is that it is too powerful. Aren't we predicting that the properties based on **W*** can appear in any environment, extensional as well as intensional? In the next section we discuss the constraints on the distribution of **W***-based properties. We show that these constraints are deducible from the theory of Focus.

4.3. *Superlatives and Focus*

We argue that the 'upstairs *de dicto*' readings always depend on some focused element in the sentence. Focusing constrains the possible values of **J** – the restriction of the determiner – in such a way that it prevents the **W***-based property from appearing in an extensional environment.

To see how the restriction of the determiner may be constrained by focus, let us first look at our familiar 'upstairs *de dicto*' example, only this time let us stress the subject, as follows:

- (66) JOHN needs to climb the highest mountain.

The fact that *John* is focused is crucial in determining whose needs are compared with whose:

- (67) JOHN's sister needs to climb the highest mountain.

In (66), John is being compared to other mountain climbers (who may or may not be sisters), and in (67), John's sister is being compared to mountain climbers who are sisters. This suggests that the superlative morpheme is focus-sensitive. It is a well known fact that focus can have a truth conditional effect on sentence interpretation. For example:

- (68)a. In St. Petersburg, officers always escorted ballerinas.
 "Whenever officers escorted somebody, they escorted ballerinas."
 b. In St. Petersburg, Officers always escorted ballerinas.
 "Whenever ballerinas were escorted by somebody, they were escorted by officers."

Within the framework of Alternative Semantics (Rooth 1992; von Stechow 1994), this contrast is accounted for by the assumption that the restriction of the focus-sensitive **always** is the union of some set, whose value is determined, to some extent, by the structure of the sentence, as follows (suppose that *t* is a variable over times):

- (61)a. $\text{always}_{\cup C} [1 [\text{officers escorted-}t_1 [\text{ballerinas}]_F] \sim C]$
 $C \subseteq \{P : \text{there is an } x \text{ such that } P = \lambda t[\text{officers escorted } x \text{ at } t]\}$
 b. $\text{always}_{\cup C} [1 [[\text{officers}]_F \text{ escorted-}t_1 \text{ ballerinas}] \sim C]$
 $C \subseteq \{P : \text{there is an } x \text{ such that } P = \lambda t[x \text{ escorted ballerinas at } t]\}$

The focus operator ' \sim ' introduces an anaphor which denotes a subset of the focus semantic value of the sister of $\sim C$ (the λ -abstract). This focus semantic value is the set constructed by replacing the focused constituent with a type-identical alternative. The value of **C** is fixed partly by the context and partly by the structure of the phrase which embeds the focused constituent.

With this in mind, let us look at sentences with superlative expressions in extensional environments, where some NP other than the superlative is focused. Such focusing has a truth conditional effect on the comparative reading:

- (70)a. JOHN gave Mary the hardest exam.
 b. John gave MARY the hardest exam.

In the (comparative reading) of (70a) the comparison set contains exam givers and not exam takers, whereas in the (comparative reading) of (70b) the comparison set contains exam takers and not exam givers. Heim accounts for this contrast by assuming that **-est** associates with focus, and this association constrains the value of its restrictor. She proposes the following LF's for (70a) and (70b), in the spirit of Rooth (1992) and von Stechow (1994):

- (71)a. [**the** [**UK-est** [**hard exam**]]] [[1 [[**John**]_F gave **t₁** to **Mary**]]~**K**]
- b. [**the** [**UK-est** [**hard exam**]]] [[1 [**John** gave **t₁** to **Mary**]_F]]~**K**]

The superlative phrase is moved above the subject. This movement creates a λ -abstract to which the focus operator is adjoined. The focus operator introduces an anaphor which denotes a subset of the focus semantic value of the sister of $\sim\mathbf{K}$ (the λ -abstract) which is given in (72a–b):

- (72)a. $\{Y : \text{there is a } y \text{ such that } Y = \lambda x[y \text{ gave } x \text{ to Mary}]\}$
- b. $\{Y : \text{there is a } y \text{ such that } Y = \lambda x[\text{John gave } x \text{ to } y]\}$

The anaphor **K** has an antecedent in the domain restriction of the superlative operator. That domain was previously assumed to be a set of individuals, while **K** here denotes a set of sets of individuals. To resolve this mismatch, the argument of **-est** in this case is assumed to be the union of **K** (just like the restriction of **always** in (69)). (71a), then, requires that all sets of relevant hard exams are also sets of things given by somebody to Mary, and (71b) requires that all sets of relevant hard exams are also sets of things given by John to somebody.

We extend Heim's analysis, and propose that focus effects in 'upstairs *de dicto*' cases are obtained in a similar way, where the determiner's restrictor – namely, **J** – associates with focus. Here, the relevant λ -abstract is over properties. This is illustrated in (73)–(74), where **T₁** is the property-denoting trace of the moved definite NP, which takes a pronominal world-argument:¹²

¹² The use of complex traces that take pronominal arguments is borrowed from Chierchia (1993).

- (73)a. JOHN needs to climb the highest mountain.
- b. [**the-J** [**IDENT'**-**W*** [**2** [**est** [**high mountain-w₂**]]]]] [[**1** [**John**]_F **needs-**@ [**3** [**PRO** **climbs-w₃** **T₁-w₃**]]]]]~**J**
- c. $J \subseteq \{Q : \text{there is an } x \text{ such that } Q = \lambda P[x \text{ needs } \lambda w[\exists z[z \in P(w) \ \& \ x \text{ climbs } z \text{ in } w]]]\}$
- d. $J \subseteq \{\lambda P[\text{John needs } \lambda w[\exists z[z \in P(w) \ \& \ \text{John climbs } z \text{ in } w]]], \lambda P[\text{Bill needs } \lambda w[\exists z[z \in P(w) \ \& \ \text{Bill climbs } z \text{ in } w]]], \dots\}$
- e. $\cup J = \{\text{'be a 5000 ft mountain'}, \text{'be a 4000 ft mountain'}, \text{'be a 3000 ft mountain'}\}$ (in Scenario I)
- (74)a. JOHN's sister needs to climb the highest mountain.
- b. [**the-J** [**IDENT'**-**W*** [**2** [**est** [**high mountain-w₂**]]]]] [[**1** [**John**]_F **'s sister needs-**@ [**3** [**PRO** **climbs-w₃** **T₁-w₃**]]]]]~**J**
- c. $J \subseteq \{\lambda P[\text{John's sister needs } \lambda w[\exists z[z \in P(w) \ \& \ \text{John's sister climbs } z \text{ in } w]]], \lambda P[\text{Bill's sister needs } \lambda w[\exists z[z \in P(w) \ \& \ \text{Bill's sister climbs } z \text{ in } w]]], \dots\}$

The constraint on **J** as specified in (74) guarantees that John's sister is compared to other people's sisters (and not simply to other people, as in (73)). In other words, in (73)–(74), the determiner associates with focus, in a manner similar to the association of *always* with focus in (69), and to the association of **-est** with focus in (71).

There are cases where **the** cannot associate with focus. These are cases where no NP seems to bear any prosodic prominence, as in the following examples:

- (75)a. John needs to climb the highest mountain.
- b. the man who₁ t₁ needs to climb the highest mountain

The trace of the relative pronoun in (75b) corresponds to **John** in (7a), and the relative clause itself can have an 'upstairs *de dicto*' interpretation. We cannot claim that **the** associates with NP-focus in (75b) without making the problematic assumption that the trace itself is focused. One possibility is, of course, that **need** is focused, resulting in the association of **the** with focus:

- (76)a. John NEEDS to climb the highest mountain.
- b. [**the-J** [**IDENT'**-**W*** [**2** [**est** [**high mountain-w₂**]]]]] [[**1** [**John** **needs-**@]_F **3** [**PRO** **climbs-w₃** **T₁-w₃**]]]]]~**J**
- c. $J \subseteq \{\lambda P[\text{John needs } \lambda w[\exists z[z \in P(w) \ \& \ \text{John climbs } z \text{ in } w]]], \lambda P[\text{John wants } \lambda w[\exists z[z \in P(w) \ \& \ \text{John climbs } z \text{ in } w]]], \text{John hopes } \dots, \dots\}$

Accordingly, (76) would be appropriate in a context where needing, wanting and hoping to climb a mountain of some height are all relevant.

But **need** may not be focused at all in (75), and yet, an ‘upstairs *de dicto*’ reading would still be available. We argue that in fact no sentence with a superlative expression has a flat intonation (this is probably true of any sentence, but we limit our discussion to sentences with superlatives). We suggest that the default focus (at least in English) for a sentence containing a superlative expression is the superlative morpheme itself. When **-est** itself is focused, it does not function as a focus-sensitive operator, but it still invokes contextually relevant alternatives. Those are the alternatives that are relevant for the comparison we are making. For example:¹³

- (77)a. John climbed the high-EST mountain.
 b. Mary climbed the LEAST high mountain.

This default focus-pattern is appropriate for the absolute and comparative reading alike, as suggested by the following discourses:

- (78)a. There was a 3000 ft mountain, a 4000 ft mountain and a 5000 ft mountain. John climbed the high-EST mountain.
 b. Bill climbed a 2000 ft mountain and Mary climbed a 3000 ft mountain. John climbed the high-EST mountain.

Default focusing determines the value of the restriction, but it does so indirectly, because the ‘ \sim ’ operator is attached at the matrix sentence level, as in (79a). We assume that the definite determiner may always be replaced with the indefinite determiner, and the latter, too, is cross-categorical. We represent this optionality by putting **the** between parenthesis:

- (79)a. **[[John climbed (the) [K-est]_F [high mountain]] \sim C]**
 b. $C \subseteq \{\text{John climbed (the) } K\text{-est high mountain, John climbed (the) } K\text{-least high mountain, John climbed (the) 2000 ft high mountain, } \dots \}$
 c. $K = \{x : \text{there is a relevant property of individuals } P \text{ and } P(x)\}$

The value of **C** is determined the usual way, by replacing **K-est** with type-identical, contextually relevant, alternatives. We argue that not only **K-least** is a type-identical alternative to **K-est**, but also **2000 ft**, which we

¹³ Phonetically, in (77a) prominence seems to be on *high*. But the focussed element is *-est*, as suggested by the fact that in (77b) the stressed element is *least*, and not *high*, and also by the fact that in cases where the superlative morpheme is *most* (as in *most prominent*), it is the one that phonetically bears the stress.

assume, can be interpreted as $\lambda R \lambda z [2000\text{-ft}(R)(z)]$ (where R is a $\langle d, \langle e, t \rangle \rangle$ -function and z is an individual). So, for example, if before uttering *John climbed the highest mountain* we mentioned that Bill climbed a 2000 ft mountain, we made the property of being a 2000 ft mountain relevant. Thus, by virtue of this property being relevant, “John climbed (the) 2000 ft mountain” is a legitimate alternative to *John climbed the highest mountain*. The value of \mathbf{K} is determined indirectly, and depends on C . K contains mountains that satisfy those properties referred to by the members of C . For example, if Mount A is the 2000 ft mountain that Bill climbed, and *John climbed (the) 2000 ft mountain* is a member of C (via the relevance of the ‘be 2000 ft high’ property), Mount A is a relevant mountain, and thus a legitimate member of K . Since C is constrained by the focus on **-est**, and the members of K depend on the members of C , the focussing of **-est** constrains K indirectly.

It is clear why we need to assume that the definite determiner can be replaced by the indefinite determiner. K may contain more than one mountain of the same height. We suggest that the definite determiner may always be replaced by the indefinite determiner, and not just when **-est** is focused. In this we follow Szabolcsi (though see Section 4.5). We think this is unproblematic, since uniqueness is imposed by the semantics of **-est** anyway.

When default focus applies in ‘upstairs *de dicto*’ sentences, the result is that the restriction \mathbf{J} of the determiner (be it definite or indefinite) is constrained indirectly, in a very similar way:

- (80)a. **[[John needs-@ 1 [PRO climb-w₁(the-J) [[est]_F [high mountain]]]~C]**
- b. $C \subseteq \{\text{John needs } \lambda w [\text{PRO climb the/a highest mountain in } J \text{ in } w], \text{John needs } \lambda w [\text{PRO climb the/a least high mountain in } J \text{ in } w], \text{John needs } \lambda w [\text{PRO climb the/a 5000 ft mountain in } J \text{ in } w], \dots\}$
- c. $J = \{P : \text{there is a relevant property of properties } Q \text{ such that } Q(P)\}$

In Scenario I (see (7)), the relevant alternatives in C are invoked by the mere mention of Bill’s need to climb a 4000 ft mountain, and of Mary’s need to climb a 3000 ft mountain. The value of \mathbf{J} is constrained to be {‘be a 3000 ft mountain’, ‘be a 4000 ft mountain’, ‘be a 5000 ft mountain’}, because each of these properties satisfies a relevant property of properties (for example, ‘be a 3000 ft mountain’ satisfies the contextually relevant λP [Mary needs to climb a P -mountain]).

Notice that the claim that the determiner's restriction is always constrained via focus provides us with the means to explain the fact that W^* -based properties cannot appear in extensional environments. The explanation is simple: we cannot find a suitable value for J – the determiner's restriction – unless the W^* -property is in an intensional environment. To see this, suppose we utter *Mary climbed the highest mountain* right after we describe the facts in Scenario I. This sentence cannot mean that Mary climbed a 5000 ft mountain, even though the context supplied by Scenario I makes 'be a 5000 ft mountain' a likely referent of *the highest mountain*. The reason is this. The sentence may appear in various focus patterns, but none of them result in constraining the determiner in a way that licenses a property interpretation of *the highest mountain*: (81) has a subject-focus pattern, and (82) – a default focus pattern:

- (81)a. **[the-J[IDENT'-W*[2[est[high-mountain-w₂]]]]]-@**
[[1[[Mary]_F climbs-@ T₁]]~]]J]
- b. $J \subseteq \{Q : \text{there is an } x \text{ such that } Q = \lambda P \exists y [y \in P(@) \ \& \ x \text{ climbs } y \text{ in } @]\}$
- (82)a. **[[Mary climbed (the)-J high[est]_F mountain]~C]**
 $C \subseteq \{\text{Mary climbed (the) highest mountain, Mary climbed (the) least high mountain, ...}\}$
 $J = \{P : \text{there is a relevant property of properties } Q \text{ and a relevant individual } y \text{ such that } Q(P) \text{ and } y \text{ climbed a mountain that satisfies } P\}$

Nothing in the previous context (namely, Scenario I) provides a good antecedent for J according to the constraints imposed on it in (81) or (82). In both cases the constraints require that there be actual climbings of mountains by people, but nobody in Scenario I climbed an actual mountain. So *Mary climbed the highest mountain* can certainly mean that Mary climbed Mount Everest (the absolute reading), or that she climbed a mountain higher than anybody else (the regular comparative reading). In both cases *the highest mountain* is interpreted as an individual, and not as a property. The crucial point is that the sentence cannot imply that she climbed a 5000 ft mountain (unless, accidentally, she climbed a 5000 ft mountain and everybody else climbed a mountain lower than that).

To summarize, we argue that a sentence with a superlative expression always has some focused element. If the focused element is not the superlative morpheme itself, the relevant restriction (that of **-est** itself, or the determiner's restriction) is fixed via association with focus. If **-est** itself is

focused, the relevant restriction is fixed indirectly by the invoked alternatives.¹⁴ Both mechanisms explain why **W***-based properties cannot appear in extensional environments.

4.4. *The Comparative Reading in Hungarian*

Szabolcsi (1986) argues that the comparative reading is available only when the subject is focused, or in a *wh*-construction (a question or a relative clause):

- (83)a. JOHN climbed the highest mountain.
 b. Who climbed the highest mountain?
 c. the man who climbed the highest mountain

In point of fact, Szabolcsi observes that this is the case in Hungarian, and suggests that English behaves in the same way, even though subject focus may be harder to detect in English, due to the fact that the identification of focus in Hungarian is more straightforward compared to English.

In Farkas and Kiss's (2000) DP-internal theory (which is largely inspired by Szabolcsi (1986)), the availability of a comparative reading in these constructions is explained as follows. The comparative reading of *the highest mountain* is one where *mountain* is interpreted as bearing two indices – a function index **f** and an argument index **a**. The latter is a bound variable, which is co-valued with the variable created by the movement of **JOHN** (required by the theory of focus assumed by Farkas and Kiss), or by *wh*-movement:

- (84)a. **The highest mountain_f^a**
 The highest mountain x such that $x \in f_{\text{climb}}(a)$ & for all b for all y , if y is a mountain and $y \in f_{\text{climb}}(b)$ and $a \neq b$, $\text{HEIGHT}(x) > \text{HEIGHT}(y)$ (where f_{climb} is a salient function from individuals to the mountains climbed by them).

Crucially, Szabolcsi's claim, which Farkas and Kiss aim to account for, is that a sentence with no *wh*-movement, a sentence with a flat intonation,

¹⁴ Notice that the ' \sim ' operator may be attached at the matrix-sentence level even when some element other than the superlative morpheme is focused. In these cases the restriction is constrained indirectly. For example, [**JOHN climbed the K-est high mountain**] \sim C will have {John climbed (the) K-est high mountain, Bill climbed (the) K-est high mountain, Mary climbed ...} as the value of C, and the value of **K** will indirectly be constrained to be {(the) mountain John climbed, (the) mountain Bill climbed, (the) mountain Mary climbed}.

or a sentence where the whole superlative expression is focused, cannot receive a comparative reading. This is so because in these cases there is no subject variable with which the argument variable of **mountain** can be co-valued.

If this is true also for English (as Szabolcsi suggests), then our account of ‘upstairs *de dicto*’ sentences with superlatives cannot be satisfactory. Our analysis can explain why focusing the whole superlative expression does not give rise to the comparative reading. This is because the invoked alternatives to *John climbed THE HIGHEST MOUNTAIN* are {John climbed this wall, John climbed his bike, ...}. In such a context, it seems that *the highest mountain* is just another name for Mount Everest, and no other comparison is relevant. The problem is that our analysis does NOT explain why the comparative reading is absent when there is no focus at all.

We argued above that there are no English sentences with superlative expressions that have a flat intonation. The Hungarian intonation facts may indeed be different from the English ones. Although we do not know why the Hungarian facts are the way they are, we would like to point out that while Farkas & Kiss’s theory explains why the comparative reading arises in the presence of a variable, it does not really explain why this reading is absent when such a variable is missing (e.g., in sentences with a flat intonation). Consider the sentence *John climbed the highest mountain*, and imagine it has a flat intonation. The absolute reading for *the highest mountain* is, presumably, available here, where the comparison set is a set of mountains. But notice that these mountains could, accidentally, be mountains climbed by someone, in which case, a pseudo-comparative reading should be possible. We do not see how *any* theory, including ours, could rule out such a choice for the value of the comparison set (this is essentially the problem that Heim observes when she tries to tease apart the absolute and comparative readings of *John climbed the highest mountain*). So while we admit that we have no explanation for the Hungarian facts, we do not think that they are currently fully accounted for by any theory.

4.5. *Superlatives and Indefiniteness*

Szabolcsi argues that in the comparative reading of, say, (1a), the definite determiner is interpreted as indefinite. Heim relies on this claim to justify the replacement of **the** by **the** in her analysis of comparative superlatives. Szabolcsi makes several observations to support this claim, among which are the following: (a) *wh*-movement out of a superlative expression is allowed provided that the superlative expression is interpreted comparatively; (b) a superlative expression may appear in “relational” *have*

constructions provided that it is interpreted comparatively; (c) a superlative expression may appear in a *there*-insertion construction provided that it is interpreted comparatively. As is well known (see Chomsky (1973)), (a) *wh*-movement out of a “normal” definite noun phrase is disallowed; (b) only indefinites support relational *have* readings; and (c) definite expressions are normally not allowed in *there*-insertion constructions:

- (85)a. Who did you take the best picture of?
 ‘You took pictures of several people. Whose picture was the best?’
 b. Who did you take a picture of?
 c. *Who did you take the picture of?
- (86)a. John has the tallest sister.
 ‘Of those who are siblings of some female, John is a sibling of the tallest female’.
 b. John has a (tall) sister.
 c. ?/*John has the (tall) sister. (Good only in the “non-relational” reading)
- (87)a. There was the tallest student in this class LAST YEAR.
 ‘Of all the students in all the relevant years, last year this class had the tallest student’.
 b. There was a tall student in this class.
 c. #There was the tall student in this class.

Now, given our claim in Section 4.3 that a superlative expression may be interpreted as indefinite, our proposal is certainly compatible with Szabolcsi’s observations. However, Szabolcsi’s claim is much stronger than ours. She doesn’t merely claim that the superlative expressions in (85a), (86a), and (87a) are indefinite, but that they are interpreted comparatively. Since our own account relies on the assumption that the determiner can always be indefinite (and not only when the superlative is interpreted comparatively), we need to show either that absolute superlative expressions can, at least in some cases, be indefinite, or that in those cases where they cannot, there is an independent explanation for the obligatory emergence of the comparative reading.

Regarding *wh*-movement, notice that the reading of the derived question is not always comparative. If we replace *take the best picture of* in

(85) with *sell the most expensive picture of*, the result does not have a comparative reading (to the extent that it is grammatical at all):

(88) Who did you sell the most expensive picture of?

(88) cannot mean: “(you sold pictures of several people.) Whose picture was the most expensive?”, even though it should, according to Szabolcsi. We do not know why (88) does not have this reading, but the claim that *wh*-movement is allowed out of a superlative expression provided that it is interpreted comparatively is clearly too strong.

Regarding *have*-constructions, let us assume that **have**, in addition to an overt property-argument (denoted by its object NP), also takes a covert relation-argument (denoted by a phonetically null pronominal element, whose value is determined by the context), and has the following meaning (where P is of type $\langle e, t \rangle$, $R - \langle e, \langle e, t \rangle \rangle$, and x – of type $\langle e \rangle$):

(89) $[[\mathbf{have}]](R)(P)(x) = 1$ iff there is a y such that $P(y) = 1$ and $R(y)(x) = 1$.

A *have*-construction becomes “relational” if R is a relation such as ‘sister’ or ‘mother’. It becomes “non-relational” if R is, for example, the possession relation.

Going back to (86a), notice that both its “relational” (= comparative) meaning and its “non-relational” (= absolute) meaning are obtained via (89), depending on which value we assign to the covert ‘ R ’-argument (the determiner can be dropped altogether, see Section 4.6):

(90) There is a y : y is tallest sister and $R(y)$ (John).

“Relational” (= comparative) meaning:

$R = \lambda x \lambda y [x \text{ is } y\text{'s sister}]$

“Non-relational” (= absolute) meaning:

$R = \text{the possession relation (or some such relation)}$.

In sum, the absolute/comparative distinction here can be reduced to the “relational”/“non-relational” interpretation of **have**-constructions rather than to the definite/indefinite distinction.

Finally, regarding **there**-insertion, if we indeed interpret the superlative morpheme DP-internally, then K (the restriction of **-est**) should be as in (91a), and crucially not as in (91b), for the attested reading of (87a):

(91)a. there is a time t and a degree d such that x is a d -tall student at t

b. $K = \{x : x \text{ is a student}\}$

In other words, (87a) can never imply that this year's tallest student was in the class last year.

Musan (1995) observes that in **there**-insertion constructions, the noun phrase following the copula is temporally dependent on the main predicate in the coda. Thus, (92) has a contradictory reading, which implies that the time of being in jail overlaps the time of being fugitives:

(92) There are fugitives in jail.

In this respect, (92) contrasts with (93), which has a non-contradictory reading because the subject noun phrase is temporally independent of the main predicate (see Enç (1981)). Thus, it can mean that former fugitives are now in jail:

(93) The fugitives are in jail.

Assuming that Musan's observation is correct, we can now interpret the contrast between (91a) and (91b) as a contrast in temporal dependence. (91a) renders the noun phrase **the tallest student** temporally dependent on **be in the class last year**, because the time of being tallest student indeed overlaps the time of being in the class (focus on **last year** invokes the alternative relevant times). By contrast, (91b) renders **the tallest student** temporally independent of **be in the class last year**. We do not think that this is the whole story, and probably much more needs to be said about restrictions on noun phrases in **there**-insertion constructions, but the correlation between Szabolcsi's findings and Musan's is certainly suggestive.

Szabolcsi discusses other cases where superlative expressions behave as indefinites and have only a comparative reading. In view of what we said about *have*-constructions and *there* constructions, we speculate that in these cases too, there is an independent reason for that.

4.6. *Implicit Determiners*

Examples such as (86a) above and examples such as the following examples suggest that sometimes a superlative expression is interpreted without a determiner at all:

- (94)a. John ran fastest.
 b. Bill was involved the most.

In (94a) there is no determiner even on the surface. In (94b), the surface determiner is dropped entirely without being replaced by an indefinite determiner at LF. We suggest that the superlatives in (94) are interpreted

as follows. For current purposes, let us assume that *fast* takes a degree argument and an event argument (**run** combines with a property of events):

$$(95) \quad \llbracket \mathbf{K-est-fast} \rrbracket = \{e \in K : \llbracket \mathbf{est-fast} \rrbracket(e)\} \text{ (} K \text{ is a set of events)}$$

Involved also takes a degree argument, and is modified directly by **most**:

$$(96)a. \quad \llbracket \mathbf{involved-K-most} \rrbracket = \{x \in K : \llbracket \llbracket \mathbf{most [involved]} \rrbracket \rrbracket(x)\} \text{ (} K \text{ is a set of "normal" individuals)}$$

In order to interpret superlative expressions such as *fastest* in intensional environments, we have to assume that a determiner can be dropped or be implicit at LF. The suggestion that there can be an implicit determiner is based on the observation that (94a) has a variant with a surface determiner (e.g., *John ran the fastest*). Following are the relevant ‘upstairs *de dicto*’ sentences:

- (97)a. John needs to run fastest.
 b. Bill needs to be involved the most.

For (97) to receive an ‘upstairs *de dicto*’ interpretation, we need to assume that *fastest* is preceded by an implicit determiner. Following are the interpretations of the superlative expressions in (97a–b):

- (98)a. **the-J [IDENT'-W* [2 [est-fast-w₂]]]**
 b. **the-J [IDENT'-W* [2 [most-involved-w₂]]]**

We leave open the question of whether these implicit determiners are syntactically present, or whether they are there as a result of the application of type-adjusting rules.

To sum up Section 4, the DP-internal-superlative theory offers a real alternative to the DP-external view. In order to complete the picture, we have to explain how ‘upstairs *de dicto*’ sentences with **least** are accounted for, and how the theory accounts for ‘upstairs *de dicto*’ sentences with comparative expressions. These issues are taken up in Sections 5 and 6.

5. ‘UPSTAIRS *de dicto*’ READINGS WITH ‘LEAST’

5.1. ‘At Least’ Readings and ‘At Most’ Readings

We have to show that the DP-internal-superlative theory can cover at least all the cases covered by the DP-external-superlative theory. We begin with

negative superlatives (for simplicity, we ignore the effects of focus, and the related fact that the determiner may be definite or indefinite).

In Section 3.3 we showed how Stateva's DP-external-superlative analysis accounts for 'upstairs *de dicto*' readings with **least**. The relevant example is repeated below:

- (99)a. Mary needs to climb the least high mountain.
 b. 'At least' reading: Scenario I ((7)).
 c. 'At most' reading: Scenario IV ((54)).

As an alternative to Stateva's account, we propose to use one single LF to derive both readings and manipulate the choice of the contextually supplied W^* . (100) represents both the 'at least' and the 'at most' readings obtained from that LF:

- (100) **Mary needs-@ [1 [PRO to climb- w_1 [the-J [IDENT'- W^* [2 [least [high mountain- w_2]]]]]- w_1]]**

To obtain the 'at least' reading under which each of the three mountain-climbers needs to climb a mountain of a minimum height, W^* has to be this:

- (101) $\{w : \text{for all } x \text{ in } \{\text{John, Bill, Mary}\}, x \text{ climbs the lowest mountain allowed by } x\text{'s actual needs, and the mountains that John, Bill and Mary climb in } w \text{ are the only mountains in } w\}$

Since we only collect worlds that contain exactly three mountains – 3000 ft, 4000 ft and 5000 ft – the property denoted by *the least high mountain* in (99a) is a sub-property of the 'be a 3000 ft mountain' property, namely, $\lambda w \lambda x [x \text{ is a 3000 ft mountain in } w \ \& \ \text{if } w \text{ is in } W^*, x \text{ is an exactly 3000 ft mountain in } w]$.

To construct the W^* that would lead to the 'at most' reading, we choose worlds which contain three mountains only: one mountain climbed by Mary which is at most 3000 ft high, one mountain climbed by Bill which is above 3000 ft and at most 4000 ft high, and one mountain climbed by John which is above 3000 ft and at most 5000 ft. The property denoted by *the least high mountain* then, in this context, is $\lambda w \lambda x [x \text{ is an at most 3000 ft mountain in } w]$.

Why do we choose this W^* ? We choose a set that constitutes a suitable model of the relevant needs. As speakers, we have fairly good intuitions about what a suitable model looks like. In Section 4 we said that one of the guidelines that we follow when choosing a suitable set of worlds is

that this set represents minimal satisfaction of the needs of the relevant individuals. (99) shows that we actually choose a set of worlds which represents minimal satisfaction, while faithfully representing the different demands imposed on the relevant individuals. This is why in the ‘at most’ reading of (99), we can actually choose worlds where our individuals climb mountains higher than the minimum required of them (which is very low).

But given Scenario I, isn’t it more plausible to say that in the first case (the ‘at least’ reading), *the least high mountain* is the ‘be (exactly) 3000 ft mountain’ rather than ‘be an exactly 3000 ft mountain in the worlds of W^* and a 3000 ft mountain in all other worlds’ (the property we suggested)? It seems to us that while we have to follow strict “guidelines” to choose a suitable value for W^* (and for the determiner’s restriction, see Section 4), once we have selected these values, the choice of the reference of *the least high mountain* is restricted solely by whether we can obtain an interpretation that comes out true. Obviously, choosing ‘be a 3000 ft mountain’ as the value of this description does not yield a true result.

5.2. NPI *Brauchen*

As pointed out to us by an anonymous L&P reviewer, the following phenomenon may constitute an argument against the analysis just outlined.

The verb *brauchen* (‘need’) in German behaves like a negative polarity item when it takes an infinitival complement, as the following contrast shows:

(102) *Hans braucht zu kommen.
Hans needs to come

(103) Hans braucht nicht zu kommen.
Hans needs not to come
‘Hans doesn’t need to come’.

The acceptability of the following example shows that an NPI-licensor has to scope above *brauchen* at LF:

(104) Hans braucht am wenigsten schnell zu fahren.
Hans needs at-the least fast to drive
‘Hans needs to drive the least fast’

The DP-external-superlative view, according to which the superlative morpheme scopes above the intensional verb, provides a simple explanation for the grammaticality of (104), and clearly poses a non-trivial challenge for the DP-internal-superlative theory.

While we do not know why (104) is grammatical, we doubt that an explanation as simple as the one offered by the DP-external-superlative view can be the whole story. If **least** is an NPI-licensor, then it should license NPIs in other languages in exactly the same environment, just like negation does in the following English example:

- (105) John doesn't need to recommend a 5000 ft mountain to any student.

But we think this is not so. In order to show it, we look for an English example where both an NPI and a negative superlative expression are embedded under an intensional verb. Scoping the superlative above the intensional verb should suffice to license the NPI.

Consider a scenario where John, Bill and Mary are climbing-instructors, and they each need to recommend to every student to climb a mountain of some height. The summary is given below:

- (106)a. Scenario V

John needs to recommend a 4000 ft mountain to every student.
 Bill needs to recommend a 3000 ft mountain to every student.
 Mary needs to recommend a 2500 ft mountain to every student.

(107) – in its 'upstairs *de dicto*' interpretation – is a good report of this state of affairs (to guarantee that *every student* is not interpreted outside the intensional environment, assume that John, Bill and Mary have different beliefs about who is a student and who is not):

- (107) Mary needs to recommend the least high mountain to every student.

If we were working within the DP-external view, we would take this as evidence that **least** can scope above the intensional verb and its complement. Now consider Scenario VI:

- (108) Scenario VI

John needs to recommend a 4000 ft mountain to some student.
 Bill needs to recommend a 3000 ft mountain to some student.
 Mary needs to recommend a 2500 ft mountain to some student.

(109) – in its 'upstairs *de dicto*' interpretation – is a good report of this state of affairs:

- (109) Mary needs to recommend the least high mountain to some student.

If **least** can scope above the intensional verb here too, then it should be able to scope above it in the following example, licensing NPI *any*, and (110) should have the same interpretation as (109), but it doesn't (in fact, the sentence is grammatical only if *any* receives a free-choice interpretation, and *the least high mountain* is interpreted either *de re* or *de dicto*):

- (110) *Mary needs to recommend the least high mountain to any student.

In sum, the behavior of NPI *brauchen* remains a mystery, even within the DP-external theory.¹⁵

6. THE DP-INTERNAL-COMPARATIVE THEORY

For the sake of uniformity, we extend our proposal to cover comparative expressions in intensional environments. However, while we were able to provide arguments against the DP-external-superlative theory, we do not have any arguments against the DP-external-comparative theory. In Section 6.2 we show that even “sandwich” scenarios do not provide such an argument.

6.1. Interpreting Comparatives DP-Internally

In order to extend our DP-internal analysis to sentences with comparatives, we assume that the comparative morpheme, **-er** or **less**, is a sister of the noun-adjective complex and that it takes three arguments: a $\langle d, \langle e, t \rangle \rangle$ -function (R), a $\langle d, t \rangle$ -function (P), and an individual:

- (111)a. $\llbracket \text{-er} \rrbracket (R)(P)(x) = 1$ iff there is a degree d such that $R(d)(x) = 1$ and $P(d) = 0$.
 b. $\llbracket \text{less} \rrbracket (R)(P)(x) = 1$ iff there is a degree d such that $R(d)(x) = 0$ and $P(d) = 1$.

Recall that we assume that gradable adjectives are monotonic.

¹⁵ Another argument raised in Heim (1999) in favor of the DP-external view concerns locality of movement. Heim observes that subject control verbs (such as *need*) easily allow ‘upstairs *de dicto*’ readings, while verbs that take finite complements do not (e.g., *John said that Mary climbed the highest mountain*). It is not clear to us that the second class of verbs never allow ‘upstairs *de dicto*’ readings. Moreover, it seems that not all subject-control verbs allow ‘upstairs *de dicto*’ readings with equal ease (e.g., *John is happy to climb the highest mountain*).

As for the LFs of (3a,b), we assume that there is **wh**-movement in the **than**-clause, but the clause itself does not move. The copied material is underlined:

- (112) **John climbed [a[[-er [1[d₁-high mountain]]] [2[Bill climbed a d₂-high mountain]]]]]**
- (113) **Bill climbed [a [[less [1[d₁-high mountain]]] [2[John climbed a d₂-high mountain]]]]]**

These LFs are inspired by Kennedy's (1997) DP-internal analysis, but do not attempt to be entirely faithful to it. The respective interpretations are the following:

- (114) John climbed some x such that there is a degree d such that x is a d -high mountain and Bill didn't climb a d -high mountain.
- (115) Bill climbed some x such that there is a degree d such that x is not a d -high mountain and John climbed a d -high mountain.

The LFs and interpretations we propose for the *de re*, *de dicto* and 'upstairs *de dicto*' readings of (4a) – *John needs to climb a higher mountain than Bill needs to climb* – are these:

- (116) *De re*:
[a [[er [1 [d₁-high mountain@]]] [4 [[a d₄-high-mountain-@] [2 [Bill needs-@ PRO climb t₂]]]]]]] [3 [John needs-@ PRO climb t₃]]]

There is an x and a degree d such that x is a d -high mountain and there is no y , y is a mountain that Bill needs to climb, such that y is d -high, and John needs to climb x .

- (117) *De dicto*:
John needs-@ [1 [PRO climb-w₁] [a [[er [3 [d₃-high-mountain-w₁]]] [4 [Bill needs-w₁ PRO climb a d₄-high mountain]]]]]]]

In all worlds w that satisfy John's actual needs, there is an individual x and a degree d such that x is a d -high mountain in w and Bill doesn't need in w to climb a d -high mountain, and John climbs x in w .

- (118) ‘Upstairs *de dicto*’ (**IDENT**’ is the type-shifter (which turns *higher mountain than Bill needs to climb* into a set of properties; cf. **IDENT**’ in (61)):

[a [**IDENT**’-**W*** [1 [[er [2 [**d**₂-**high mountain**-w₁]]] [4 [**Bill needs**-@ **PRO climb a d**₄-**high mountain**]]]]]] [3 [**John needs**-@ [5 [**PRO climb**-w₅ T₃w₅]]]]]

In (118), the indefinite [a [**IDENT**’-**W*** [1 [[er [2 [**d**₂-**high mountain**-w₁]]] [4 [**Bill needs**-@ **to climb a d**₄-**high mountain**]]]]]] is scoped above **need** leaving behind a property-denoting trace. This trace combines with **climb** via the appropriate type-shifting mechanism involved in the interpretation of narrow-scope indefinites. The scoped indefinite itself is interpreted as a generalized quantifier over properties. Accordingly, (118) is interpreted as in (119):

- (119) There is a property P in J such that for all worlds w' in W^* , $P(w') = \llbracket \llbracket \llbracket \llbracket \llbracket \text{er } [2 \text{ [d}_2\text{-high mountain-w}_1\text{]} \rrbracket [4 \text{ [Bill needs-@ PRO climb a d}_4\text{-high mountain]} \rrbracket]^g(w') \rrbracket \rrbracket \rrbracket \rrbracket (w')$, and in all worlds w compatible with John’s actual needs, there is a y s.t. $P(w)(y) = 1$ and John climbs y in w .

When evaluated against Scenario I, **W*** and **J** receive the following values:

- (120) $W^* = \{w : \text{John climbs in } w \text{ a mountain of the lowest possible height according to his actual needs and that is the only mountain in } w\}$
 $J = \{\text{‘be a 5000 ft mountain’}, \text{‘be a 4000 ft mountain’}, \dots\}$

Each world in this W^* is distinguished by the fact that John climbs in it a mountain whose height is higher than the minimal height that would satisfy Bill’s actual needs. (120) amounts to saying that John needs to climb a 5000 ft mountain, because the property referred to by the indefinite is the property which for each world in W^* yields a set of mountains whose height is higher than the minimal height that satisfies Bill’s needs. Similar assumptions yield the following interpretation for *Bill needs to climb a less high mountain than John needs to climb*:

- (121) There is a property P in J such that for all worlds w' in W^* , $P(w') = \llbracket \llbracket \llbracket \llbracket \llbracket \text{less } [2 \text{ [d}_2\text{-high mountain-w}_1\text{]} \rrbracket [4 \text{ [John needs-@ PRO climb a d}_4\text{-high mountain]} \rrbracket]^g(w') \rrbracket \rrbracket \rrbracket \rrbracket (w')$, and in all worlds w compatible with Bill’s actual needs, there is a y s.t. $P(w)(y) = 1$ and Bill climbs y in w .

The ‘at least’ interpretation (appropriate in Scenario I) of (121) is derived in a similar way, where the appropriate W^* is the following:

- (122) $W^* = \{w : \text{Bill climbs in } w \text{ a mountain of the lowest height allowed by his actual needs}\}$

Each of these worlds is distinguished by the fact that Bill climbs a mountain whose height is lower than the minimal height that would satisfy John’s actual needs.

The only way we see to derive the ‘at most’ interpretation (Scenario IV, where Bill needs to climb a mountain that is at most 4000 ft high, and John – a mountain whose height is at most 5000 ft) is to use the Heim/Rullmann/Stateva technique of decomposing **less** into **-er** + negation (but notice that here, as opposed to the **least** case discussed in section 3, this decomposition is unproblematic since it doesn’t involve ‘long’ movement of **-er**):

- (123) There is a property P in J such that for all worlds w' in W^* , $P(w') = \llbracket [\text{er } [2 \text{ [not-}d_2\text{-high mountain-}w_1]]] [4 \text{ [John needs-@ PRO climb a } d_4\text{-high mountain}}]] \rrbracket^s(w')$, and in all worlds w compatible with Bill’s actual needs, there is a y s.t. $P(w)(y) = 1$ and Bill climbs y in w .

- (124) $W^* = \{w : \text{Bill climbs in } w \text{ mountain(s) that are at most 4000 ft high}\}$

Each world in W^* is distinguished by the fact that Bill climbs in it a mountain that is lower than any of the degrees d such that John is required to climb a mountain lower than d .

As with sentences with superlative expressions, the default focus is on the comparative morpheme itself, but other elements can, of course, be focused.

6.2. “Sandwich” Scenarios and Comparative Morphemes

The DP-internal-comparative analysis was offered, as we said, for the sake of uniformity. We do not have a strong argument against the DP-external-comparative view. In particular, “sandwich” scenarios, which provided the strongest argument against the DP-external-superlative view, do not provide a similar argument against the DP-external-comparative view. While speakers’ intuitions regarding sentences of the (1b)-variety, evaluated against “sandwich” scenarios, are clear and uniform, this is not the

case with the corresponding sentences of the (3b)-variety. This is a puzzling fact, which we do not understand, but its theoretical significance is that only superlatives provide conclusive evidence against the DP-external view.

Consider the following scenario. Suppose that mountains can be ranked according to their slipperiness. Suppose further that Mount A is extremely slippery, Mount C – only slightly slippery, and Mount B is less slippery than Mount A but more slippery than Mount C. The relevant facts about the climbers are given below:

(125) Scenario VII

John climbed two mountains – Mount A and Mount C.

Mary climbed one mountain – Mount B.

Now let us evaluate the following sentences:

(126)a. Mary climbed the least slippery mountain.

b. John climbed the least slippery mountain.

c. Mary climbed a less slippery mountain than John climbed.

d. John climbed a less slippery mountain than Mary climbed.

e. John climbed a more slippery mountain than Mary climbed.

f. Mary climbed a more slippery mountain than John climbed.

All speakers judge (126a) as false and (126b) as true (this is consistent with the “sandwich” judgments in Section 3.2). As for (126c–f) – most speakers cannot make up their minds: some favor (126c) over (126d), or (126e) over (126f), but we also found speakers who had the opposite preferences.

The semantics in (111) does not predict this lack of uniformity. For example, (111) predicts (126d) to be true since the requirement is that one of John’s mountains be less slippery than one of Mary’s. These conditions are met in our scenario. Changing the semantics of **less** so that it would require *all* of John’s mountains to be less slippery than Mary’s would not help at all, since any such semantics would render (126d) false. But the judgments, as we saw, do not justify such a change. The same is true of **-er**, even though, admittedly, there is more uniformity among speakers regarding the positive comparatives: many accepted both (126e) and (126f).

There is definitely something odd about the semantics and pragmatics of the comparative morphemes which is, at this point, beyond our understanding. However, given the lack of uniformity among speakers regarding

(126c–f), which contrasts sharply with the uniformity of judgments regarding (126a, b), we conclude that “sandwich” scenarios cannot provide evidence either in favor or against the DP-external-comparative theory. Our only argument for a DP-internal-comparative analysis is uniformity: since superlatives must be interpreted DP-internally, comparatives are interpreted in the same way.

7. CONCLUSION

We have argued in favor of a DP-internal analysis for morphemes of comparison. As we saw, ‘upstairs *de dicto*’ readings pose a difficult challenge for such an analysis, and at a first glance seem to support a DP-external analysis. However, given the arguments we presented against the movement theory – especially the argument that negative superlatives in extensional environments are better analyzed without movement – we conclude that despite its problems, the DP-internal analysis is the right one. This means that sentences with morphemes of comparison always “talk about” comparisons of elements corresponding to the DP’s in which these morphemes appear.

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