ATTITUDES TOWARD DEGREES *

Graham Katz
University of Osnabrück

gkatz@uos.de

Abstract

Degree modifiers of the type exemplified in the sentence *"She was frustratingly late"* are analyzed. These modifiers, which indicate that a propositional attitude – here frustration – holds with respect to the degree associated with the predicate – here lateness, are shown to have certain monotonicity entailments which are absent from simple adverbial attitude reports such as *"Frustratingly, she was 10 minutes late."* These entailments account for an interesting puzzle concerning the semantics of the degree modifiers which arises when standard analyses of attitude predicates are combined with standard accounts of degree modification.

1   Introduction

It has long been known that scalar predicates can be modified by adverbs that indicate the degree to which the predicate holds, as in (1) (Bolinger 1972, Kamp 1975).

(1)   a. John is completely in love with Mary.
         b. Maria is somewhat sick.
         c. Peter is very convinced that he is right.

The analysis of these kinds of scalar modifiers was an early domain of formal semantics research (cf. Cresswell (1976), Klein (1980), von Stechow (1984)), and remains an active area today (Kennedy (1999, 2001), Kennedy & McNally (2004)).

My focus here will be directed to a particular kind of such degree modification: degree modifiers that specify the degree to which the predicate holds indirectly by specifying a propositional attitude that is held toward this fact. Examples of this sort of modifier are given in (2).

(2)   a. Peter is surprisingly tall.
         b. We were frustratingly close.

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c. The answer was painfully obvious.

In such sentences the degree to which the predicate holds evokes a particular mental attitude. So in (2a) it is Peter's size that is somehow surprising, in (2b) it is our closeness (to something) that is frustrating and in (2c) it is the degree of obviousness of the answer that is frustrating. There is a parenthetic reading of these modifiers, in which they are interpreted as attitudes toward a simple proposition, that is NOT of interest to us here. On this reading, (2a) is synonymous with (3).

(3)   It is surprising that Peter is tall.

Rather, we are concerned with the reading which Cresswell suggested might be paraphrased as in (4), where the attitude is taken to be directed toward the degree itself.

(4)   a. The degree to which Peter is tall is surprising.
        b. The degree to which we are close is frustrating.
        c. The degree to which the question was obvious was painful.

We will call these modifiers **attitude toward degree** modifiers. Some of these modifier-predicate constructions, such as *painfully obvious* in (2c), appear to have acquired an almost idiomatic meaning, with the attitude verb bleached of its content and the resulting collocation having only a hyperbolic meaning (here: *overly obvious*). This is not generally the case, however, and our goal here is to give an account of attitude toward degree modifiers in their true compositional sense (as suggested by the paraphrases in (4)).

In the course of providing such an account, we will see that an interesting puzzle arises. This puzzle results from combining standard accounts of propositional attitude predicates with standard accounts of degree modification. Put briefly, on standard accounts being tall to a certain degree corresponds to being short to a certain degree – there is a necessary inverse relationship between degrees of tallness and degrees of shortness. Standard accounts of attitude predicates treat them as essentially quantifiers over possible worlds. Now, since the worlds in which John is tall to a particular degree are all worlds in which he is short to a particular degree, (5a) should be true exactly when (5b) is.

(5)   a. John is surprisingly tall.
        b. John is surprisingly short.

Our semantic intuitions tell us, of course, that (5a) and (5b) are not synonymous. Our central goal will be to address the difference in interpretation between them in such a way that we can account for this "polar predicate selection puzzle."

2   Simple degree modifiers

It will be useful to first sketch an analysis of simple degree modification. In analyses going back to that of Cresswell (1976), degree modifiers have been taken to provide

information about the value (or degree) that an individual has on the scale associated with the modified predicate. In (6a), for example, *six feet* specifies exactly the degree to which Peter is tall. In (6b), on the other hand, the vague modifier *very* specifies this less precisely, telling us something like that Peter's size is significantly above the average degree of tallness (Klein 1980).

(6)   a. Peter is six feet tall.
        b. Peter is very tall

Formally gradable adjectives can be analyzed as denoting relations between individuals and degrees on a scale appropriate for the predicate (Cresswell 1976, von Stechow 1984, Kennedy 1999, Kennedy & McNally 2004). This is illustrated for *tall* in (7), where the appropriate scale is the **size** scale.

(7) $[[tall]] = \lambda d\, \lambda x\, [size(x) = d]$

A scale such as **size** is an appropriately ordered set of degrees, which, intuitively, can be taken to correspond to a dimension, such as height, width, weight, brightness, loudness, on which entities can be measured. Predicates that are in polar opposition, such as *tall/short* and *full/empty*, take their values from the same scale. This provides a straightforward account of the semantic relationship between such pairs and underlies the fact that (8a) and (8b) are contradictory.

(8)   a. John is tall.
        b. John is short.

To be tall is to be above some standard on the size scale and to be short is to be below some lesser standard on the same scale, and so, given the structure of scales, one individual cannot be both tall and short. Kennedy (2001) has explored this extensively.

As we saw above, degree modifiers either specify the exact degree on the scale that an individual has, as in (9), or shift the relationship of the scale to the standard, as in (10).

(9)   a.   John is six feet tall.
        b. $[size(j) = 6ft]$

(10)   a.   John is very tall.
        b. $\exists d\, [size(j) = d\, \&\, d$ is extreme with respect to $d_{tall}]$

Here the constant d_{tall} is the contextually specified standard for tallness, and what *very* does is to specify that the actual degree of tallness lies well above this standard. Formally, then, *very* can be interpreted as predicate of relations, as indicated in (11), which acts to further specify where on the scale the given individuals size is with respect to this standard.

(11) $[[very]] = \lambda P\, \lambda x\, \exists d\, [P(x)(d)\, \&\, d$ is extreme with respect to $d_P]$

In the absence of degree modification, of course, a scalar predicate must be provided with a simple positive meaning. The idea, on this approach, is that to be tall is to have a size d that is larger than the standard for tallness d_{tall}.[1] So the simple positive sentence (12a) is given the logical analysis in (12b).

(12)　a.　John is tall.
　　　b.　$\exists d \ [size(j) = d \ \& \ d > d_{tall}]$

A parallel analysis is given for the polar opposite predicate *short* in (13).

(13)　a.　John is short.
　　　b.　$\exists d \ [size(j) = d \ \& \ d < d_{short}]$

Note that predicates bring with them not only a scale and a standard of comparison, but also a polarity, which cashes itself out as the direction of comparison. The predicate *tall* indicates that the value on the size scale must be <u>above</u> the standard d_{tall}, while the predicate *short* indicates that it must be <u>below</u> the standard d_{short}.

Since, formally, gradable predicates are taken to be relations between individuals and degrees, we need a type-shifting mechanism to generate the appropriate-type predicate meaning. Stechow (1984) proposed that in simple positive predications, a null morpheme *pos* applies to introduce the standard for the predicate into the logical form (other options, such as existential closure (Kennedy 2001) have been explored). The interpretation of *pos* is given in (14):

(14)　$[[pos]] = \lambda P \ \lambda \ x \ \exists d \ [P(x) = d \ \& \ d \ R_P \ d_P]$

Note that the *pos* morpheme introduces the direction of comparison into the logical analysis as well. In simple positive uses, then, the meaning of a scalar predicate combines a standard of comparison d_P with an ordering relation R_P and it tells us that the degree to which the predicate holds of the subject stands in the R_p relation to the standard d_p.

It is clear, of course, that the ordering relation must play a role in degree modification as well, as (15a) is not synonymous with (15b).

(15)　a. John is very tall.
　　　b. John is very short.

The interpretation of *very* must be sensitive to the direction of comparison associated with the predicate it modifies, to be very short is to be much <u>lower</u> on the size scale than what would count for shortness and to be very tall is to be much <u>higher</u> on the size scale than what would count for tallness. Revising the analysis of *very* accordingly gives us

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[1] We are adopting a simple point-based account of degrees here. On extent-based accounts, we would be talking about "maximal degrees".

the interpretation in (16), where we use the locution "is distant from" to gloss the relevant metric notion.

(16) $[[very]] = \lambda P\, \lambda x\, \exists d\, [P(x)(d)\, \&\, d\, R_P\, d_P\, \&\, d \text{ is distant from } d_P]$

The direction in which the degree is distant from the standard is that given by the ordering relation associated with the predicate – higher for *tall*, lower for *short*. This will play an important role in our semantics for attitude toward degree modifiers below.

Kennedy and McNally (2004) note that gradable predicates can be categorized on the basis of the kinds of scales they are associated with. They distinguish two types of scales, the open scales, in which there is no maximum degree, and the closed scales, in which there is. Predicates such as *tall* and *rich*, which are associated with scales which rise without limit, are contrasted with predicates such as *dry* and *flat*, in which this is not the case. The open-scale predicates are distinguished grammatically from the closed-scale predicates by their acceptability with the adverbial modifier *completely*, as illustrated in (17).

(17)   a. The paint is completely dry.
        b. *The man is completely tall.

Kennedy and McNally also distinguish predicates on the basis of the kinds of standards that they are associated with. Predicates such as *tall* have contextually based standards that can be shifted. In a given context of use, different standards for tallness or shortness may be being used. If we are talking about basketball, we might have standards that are radically shifted as compared to a normal context. While John might have a size which we might usually consider tall, it certainly is possible that in a context in which we are talking about basketball or basketball players, we might not consider John tall at all.

Other predicate have standards that are not shiftable, however. They are said to have absolute standards. These come in two sorts: minimal standards and maximal standards. So the predicates *wet* and *late* have minimal standards, because to be wet is be minimally wet and to be late is to be minimally late, while the predicates *dry* and *full* have maximal standards, since to be dry is to be maximally dry and too be full is to be maximally full. It turns out that what kind of standard a predicate has tells us quite a lot about the entailment patterns that it participates in. To be somewhat wet is to be wet, but to be somewhat full is not to be full. Likewise, when used in the comparative, predicates with minimal standards always have entailments to the positive, while predicates with maximal standards do not. (18a) entails that at least the towel is wet, but (18b) doesn't entail that towel or the shorts are wet.

(18)   a. My towel is wetter than my shorts.
        b. My towel is drier than my shorts.

Clearly the notions of scales and standards combine to do much of the semantic work needed for the analysis of scalar predicates and their modifiers.

Let us complete this sketch of degree modification by briefly discussing comparative expressions. In the comparative form, a predicate relates the degrees on a particular

scale that two individuals have, using the direction of comparison associated with the predicate. We illustrate this with *taller* and *shorter* below:

(19)   a. John is taller than Mary.
         b. $\exists$ d [size(j) = d & $\exists$ d'[size(m) = d'] & d > d']

(20)   a. Mary is shorter than John.
         b. $\exists$ d [size(m) = d & $\exists$ d'[size(j) = d'] & d < d']

So the comparative *taller* in (19a) tells us that the degree to which John is tall is above the degree to which Mary is tall. This doesn't entail that either degree is above d_{tall}, and, of course, (19a) doesn't entail either that John is tall or that Mary is. Furthermore, the fact that (19a) and (20a) are synonymous follows from the relationships between the scales and the ordering relation associated with the scalar predicate involved. Both sentences tell us that **size(j)** is above **size(m)**.

The comparative morpheme itself can be taken to relate two individuals and a predicate via the scale and ordering relation associated with the predicate, as indicated below:

(21) $[[\text{-}er]] = \lambda P \, \lambda x \, \lambda y \, \exists d \, \exists d' \, [P(y) = d \, \& \, P(x) = d' \, \& \, d \, R_P \, d']$

The kinds of entailments we discussed in connection with (18a) and (18b) follow from this analysis. Since any comparative sentence predicates that one degree is above another, for gradable predicates with minimal standards, such as *wet*, this will entail that at least one of the degrees is above the standard, while for gradable predicates with maximal standards, such as *dry*, it does not entail that either of them are.

Before turning to attitude toward degree modification, let us note that the degrees which play such a central role here, but are entirely implicit in the logical analysis, can be referred to directly by nominal expressions. In examples such as (22a) and (22b) we see that nominalized scalar predicates such as *John's height*, which would appear to denote the degree that John has on the size scale, can act as syntactic arguments. The predicates that take these NPs as arguments are exactly those that would be appropriate for degrees, such as *being 6ft* in (22a) or *exceeding Mary's height* in (22b).

(22)   a. John's height is 6ft.
         b. John's height exceeds Mary's height.

As in the case of underlying events (Davidson 1967; Parsons 1990), this might be taken to be evidence that degrees really are first class individuals in the domain of discourse. This is a point that will be left for another occasion.

We can now return to attitude toward degree modification, and ask, in the context of this scales-and-standards-based theory, what the analysis of the degree modification in such sentences as (2) should be.

3   Attitude toward degree modification

One might expect that, as in the case of standard degree modification, the modifiers in (2), repeated here as (23), would simply provide more information about the degree argument of the scalar predicate they modify.

(23)   a. Svetlana is frustratingly late.
        b. The answer was painfully obvious.
        c. The pool is surprisingly empty.

In fact, paraphrases such as those in (24) and (25) would seem to argue for an analysis on which the attitude predicate applies directly to the degree argument.

(24)   a. The degree to which Svetlana is late is frustrating.
        b. The degree to which the answer was obvious was painful.
        c. The degree to which the pool is empty is surprising.

(25)   a. Svetlana's lateness is frustrating.
        b. The obviousness of the answer was painful.
        c. The emptiness of the pool was surprising.

Let us try this approach. In an example such as (23c) the gradable predicate *empty* indicates a degree on the scale from empty to full that the pool has, and this degree might be taken to have the property of being surprising. An overly naive interpretation would be that given in (26), in which the degree itself is taken to be the object of the predicate **surprising**[2], but this is clearly incoherent, as degrees, being individuals, are of the wrong semantic type to be the objects a propositional attitude predicate.

(26) $\exists$ d [emptiness(pool)=d & surprising(d)]

As Zucchi (1991) has noted, attitude verbs which have apparent entity denoting subjects, as in (27a), typically induce a shift in interpretation in their subjects into propositional meaning. So (27a) will be interpreted as in (27b), although here there is no overt *have* predicate in (27a)

(27)   a. Her false teeth surprised me.
        b. It surprised me that she had false teeth.

In fact, the range of interpretation for such examples as (27a) is fairly broad. In context, any number of predicates might be taken to be implicitly applied to the teeth, such as their color – where (27a) might mean that it surprised me that the false teeth were white – or their makeup – in which (27a) might mean that it surprised me that the false teeth were wooden.

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[2] We will abstract away from the agent of the attitude throughout. Whether this is the speaker or a general PRO$_{arb}$ agent will not be of interest here.

In the case of degree nominalization, it is clear that we also have such a shift, with the attitude predicate not being applied to a degree, but the proposition that the subject has this property to the degree that he does on the given scale. We might analyze (23c), then, as indicated in (28), where I have used the Montagovian '^'-notation to indicate abstraction over the (implicit) world argument carried by all predicates (Montague, 1973).

(28)   ∃d [emptiness(pool)=d & surprising(^[emptiness(pool)=d])]

Adopting a traditional analysis of attitude verbs (of the type proposed by Hintikka (1969)), in which they are taken quantify over possible worlds, we see that what (28) says is that the pool is empty to degree d and all worlds in which the pool is empty to degree d are worlds that are surprising. The interpretation of *surprisingly* can be then given as that in (29).

(29)   [[surprisingly]] = λP λx ∃d [P(x) = d & surprising(^[P(x) = d])]

Like degree modifiers such as *very*, *surprisingly* simply takes a gradable predicate as complement and predicates something additional of the degree to which this predicate holds of the subject and existentially binds the degree variable. The difference is merely that what it predicates is that the proposition that the subject has the property to the given degree is surprising. I will simply assume that the intentional predicate **surprising**, of type $<<s t> t>$, is interpreted as in (30).

(30) **surprising(*P*)** is true iff for ∀w∈W if *P* is true in w, then w a surprising world

This is clearly not adequate (as discussed by Heim (1992), Zimmermann (1993), and many others), but will serve our purposes here. It may be clear already that the naive approach to the semantics of degree modifiers outlined above is problematic. Let us expand upon what the problem is.

On the analysis given above (and certainly on any reasonable analysis) predicates which are polar opposites are related in a complementary way. To be absolutely full, for example, is to be not empty at all and to be half full is to be half empty. Whatever degree a given individual has of fullness determines exactly what degree it has of emptiness. This is a good thing, because it allows us to derive the fact that (31a) and (31b) entail each other.

(31)   a. The pool is half full.
       b. The pool is half empty.

But this is a problem for the simple treatment of attitude toward degree adverbs we just outlined. Because of the direct relation between the degree to which a given pool is full, and the degree to which it is empty, the simple account predicts that (32a) and (32b) should be equivalent.

(32)   a. The pool is surprisingly empty.
        b. The pool is surprisingly full.

Any world in which the pool is p% full is one in which the pool is 100-p% empty and so if being p% full is surprising so should being 100-p% empty (assuming that degrees of fullness and emptiness are just percentages). In fact using simple degree arithmetic we can derive the equivalence. Given the above account, (32a) is interpreted as in (33a), and (32b) as in (33b):

(33)   a. $\exists$ d [emptiness(pool)=d & surprising($^\wedge$[emptiness(pool)=d])]
       b. $\exists$ d [fullness(pool)=d & surprising($^\wedge$[fullness(pool)=d])]

But since **emptiness(pool) = 100-fullness(pool)** we can rewrite (33a) as:

(34) $\exists$ d [fullness(pool)=100-d & surprising($^\wedge$[fullness(pool)=100-d])]

But of course **100-d** is simply a degree, so (34) is logically equivalent to (33b).

It is fairly clear, however, that (32a) and (32b) or not synonymous. This difference is brought out quite distinctively when one considers the following scenario. Assume that we expect that the pool will be 60% full. It is a moderately warm mid-summer day, but not one crying out for swimming. If we get to the pool and find that it is only 40% full, then we would be justified in uttering (32a), but not (32b). On the other hand, if we get to the pool and find it 80% full, then we would be perfectly justified in uttering (32b), but not (32a). While the fact of the matter – the degree to which the pool is full or empty – can be described using either polar predicate,[3] the particular polar predicate used in the attitude toward degree sentence indicates the direction in which the deviation from expectation lies.

Before we draw the over-hasty conclusion that it is the relationship between the actual degree and the expected degree that is crucial to determining which polar predicate is appropriate, we should note that the same problems arise in connection with such attitude toward degree modifiers as *frustratingly* and *uncomfortably*, which don't have associated implicit standard. It is clear, for example, that (35a) and (35b) do not have the same meaning, despite the fact that to be small to a certain degree is just to be large to an inversely related degree

(35)   a. The apartment is uncomfortably small.
       b. The apartment is uncomfortably large.

We might also come to the erroneous conclusion that entailment to the positive is crucial. (36a) would seem, after all, to entail that the apartment is small, while (36b) appears to entail that the apartment is large. It is clear, however, that this cannot be the

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[3] We use the two closed-scale predicates *full* and *empty* because they both are naturally used with degree modifiers, as indicated in (32). For predicate pairs such as *tall* and *short*, in which only the positive pair appears naturally with such modifiers, the semantic point about degrees goes through nevertheless. To be d-tall is to be d'-short, although we can't talk that way.

story either, as in the case of (32) we know that there is no entailment to the positive. (32a) doesn't entail that the pool is full, nor does (32b) entail that it is empty.

4   Accounting for polar predicate selection

We need, then, to account for the fact that in a situation such as that illustrated below, when the pool is d1-full we use (36a), while in a situation in which it is d2-full we use (36b).

Fullness Scale: EMPTY------------d1----------$d_{expected}$----------d2-----------FULL

(36)   a. The pool is surprisingly full.
           b. The pool is surprisingly empty.

My central claim is that this contrast is a consequence of the fact that that attitude toward degree modification involves an implicit "at least" entailment. (36a), for example, appears to entails that if the pool were even more full than it is, this would be surprising too, while (36b) appears to entail that if the pool were even emptier than it is, that would be surprising. The attitude in attitude toward degree modifiers, then, isn't directed toward a particular degree, but rather toward a whole range of degrees – those degrees that are at least as far up (or down) on the scale as the actual degree.

This contrasts distinctly with adjectival attitude predicates or even adverbial attitude predicates that are in sentence initial position. Such attitude predicate can indicate an attitude with respect to a particular degree, and do not appear to have such monotonicity entailments. So, for example, while the discourse in (37) is incoherent, the parallel discourses in (38a) and (38b) are perfectly normal.

(37)   (At 60% full) the pool is surprisingly full.
           ??We thought it'd be either totally full or empty.

(38)   a. It is surprising that the pool is 60% full.
               We thought it'd be either totally full or empty.
           b. Surprisingly, the pool is 60% full.
               We thought it'd be either totally full or empty.

The monotonicity, then, is not part of the meaning of the attitude predicate itself, but is part of the semantics of attitude toward degree modifiers, as such. My concrete proposal, then, is simply to build this monotonicity into the semantics of attitude toward degree adverbs by adding universal quantification over degrees to the lexical semantics of these adverbs.

The analysis of the attitude toward degree modifier *surprisingly* is given in (39), where, again, R_P is the ordering relation associated with the scalar predicate P.

(39) $[[\text{surprisingly}]] = \lambda P\,\lambda x\, \exists d\, [P(x) = d\ \&\ \forall d'\, [d'\, R_P\, d \to \text{surprising}(^{\wedge}[P(x) = d'])]]$

We can, of course, derive this meaning of the attitude toward degree adverb from the adjectival attitude predicate *surprising* by giving an appropriate semantics to the category changing morpheme –*ly*, as indicated in (40).

(40) $[[\text{-}ly]] = \lambda Q\, \lambda P\, \lambda x\, \exists d\, [P(x) = d\, \&\, \forall\, d'\, [[d'\, R_P\, d \vee d' = d] \rightarrow Q({}^{\wedge}[P(x) = d'])]]$

For an attitude toward degree modified sentence to be true, the attitude most be held not only toward the degree to which the modified predicate holds, but also to all degrees that are more extreme on the scale associated with the predicate. As in the case of the comparative, the direction of comparison is provided by the predicate that is modified.

We can now illustrate the semantic differences between (36a) and (36b) by giving their logical analyses. (36a) is interpreted as in (41a) and (36b) as in (41b):

(41)   a. $\exists d\, [\text{fullness(pool)} = d\, \&\, \forall d'\, [d' \geq d\, \rightarrow \text{surprising}({}^{\wedge}[\text{fullness(pool)} = d'])]]$
         b. $\exists d\, [\text{fullness(pool)} = d\, \&\, \forall d'\, [d' \leq d \rightarrow \text{surprising}({}^{\wedge}[\text{fullness(pool)} = d'])]]$

For (36a) to be true, all worlds in which the pool is as full or fuller than it is in the actual world must be surprising worlds, while for (36b) to be true, all worlds in which the pool is as full or less full then it is in the actual world must be surprising.

It is the fact that the ordering relation is sensitive to which of the polar predicates is being used that allows us make the crucial semantic distinction between polar pairs such as *full*/*empty*. In the situation described above, the reason we can't say (36b) in a situation in which the pool is d_2-full is that this would entail that worlds in which it the pool is d_{expected}-full are surprising (since d_{expected} is below d_2 on the scale and *empty* is associated with the less-than ordering), and this contradicts our assumption that worlds in which the pool is d_{expected}-full are not surprising.

Note that the ordering relation behaves in attitude toward degree modification much as it does in the comparative. We might restate the crucial fact that allows us to solve our puzzle as being the fact that, although to be d-full is just to be d'-empty, if something is fuller than something else, it is not emptier. In some sense, there is an implicit comparative in the attitude toward degree modifier. A natural paraphrase of (36a) then is, after all, (42):

(42)   It is surprising that the pool is as full as it is and it'd be surprising were it fuller.

There is some question about whether there is, in fact, a double comparision, that is, whether (36a) really means that it is surprising that the pool is as full as it is and it'd be **more** surprising were it fuller, but it is not clear that this is the case. Other paraphrases, such as those given in (44) are also revealing

(43)   a. It is surprising how full the pool is.
         b. The pool is so full that it is surprising.

In both cases, recent analyses have been given in which the relevant degree expressions – *how full* and *so full* – are implicitly associated with a range of degrees (d'Avis 2001; Meier 2003). In the case of d'Avis' analysis of such sentences as (43a), however, this is

part of the meaning of the embedded exclamative, whereas for Meier's analysis of such sentences as (43b) it is part of the (extent-based) meaning of the scalar predicate combined with minimality and maximality operators associated with *so...that*.

In attitude toward degree sentences, as in the case of the comparative, whether there is entailment from the modified sentence to the simple positive sentence is determined by the type of standard associated with the predicate modified. If the predicate is associated with minimal trivial standards, then there is clearly entailment to the positive, as in (44a). If however, the predicate is associated with maximal trivial standards there is no entailment, as in (44b).

(44)   a. Svetlana was surprisingly late. -> Svetlana was late.
        b. The backpack is uncomfortably full. -/-> The backpack is full.

In cases in which the standards are contextual determined, as for *tall*, there frequently seems to be entailment, as (45a) seems to entail (45b)

(45)   a. Peter is surprisingly tall.
        b. Peter is tall.

If we look a little more deeply into the semantics, however, we see that the relation between (45a) and (45b) is not one of entailment, but rather one of conversational implicature. This we see from the fact that the implicature can be cancelled, as in (46).

(46)   Although he is quite short, Peter is surprisingly tall, given his background.

What appears to be going on here is that the contextual standard associated with the scalar predicate modified is typically taken to be the standard used to determine what is surprising – something like the value $d_{expected}$. In cases in which we are explicit about these two values being distinct, as in (46), we see that there is no entailment.

Finally, we might, note that attitude toward degree modifiers can themselves be modified by degree modifiers, as in (47).

(47)   a. The pool was very surprisingly full.
        b. Peter was more frustratingly late than Mary.

In fact, it even appears that attitude toward degree modifiers can be used to modify other attitude toward degree modifiers:

(48)   The apartment was surprisingly uncomfortably small.

This, of course, is not at all surprising. If the attitude predicates that are contained in the attitude toward degree modifiers themselves have degree arguments, then we would expect that they could be so-modified as well. The analysis of these kinds of constructions will be left for another occasion, however.

5   Conclusion

We have addressed the semantics of attitude toward degree sentences such as "*John is surprisingly tall.*" Although degree modification itself is now fairly well understood as involving degree scales and standards of comparison and direction of comparison, these sentences bring a slight twist with them. Given a simple account of propositional attitude adverbials, we might have expected that the interpretation of our sentence to be simply that the fact that John is as tall as he is is surprising. It turns out, however, that such an analysis would make polar opposites such as *surprisingly tall* and *surprisingly short* synonymous, which they are not. This puzzle was dissolved by noting that attitude toward degree modifiers bring with them a kind of monotonicity entailment. John is surprisingly tall not just if it surprising that he is as tall as he is, but also if it would be surprising were he taller. The reason polar opposite are not synonymous, then, is that the direction of comparison associated with these predicates is distinct and finds its way into the implicit comparative semantics of attitude toward degree modifiers.

There are a number of question which remain open, of course. Alongside the general question of what role in the syntax the degree arguments whose semantics we have discussed might play, we are faced with the more specific question of how to relate the attitude toward degree use of adverbial modifiers such as *surprisingly* to their simple proposition-modifying uses, as in "*Surprisingly, John is tall.*" In addition we might like to relate these adverbs to their derivationally related adjectives, particularly in such sentences as "*John's height is surprising*" and "*It is surprising how tall John is*" in which the adjective appears to have the same monontonicity entailments as the adverb. And, of course, the treatment degree nominalizations such as "*John's height*" remains open in this context as well. Here, however, it would appear that a straightforward application of the analysis sketched above would yield intuitive results.

It would, of course, be desirable to derive the monotonicity effects noted here from the semantics of the attitude predicate themselves, and this is certainly the central desideratum for future work. As Zimmerman (1993) and Heim (1992) have shown, however, this task is frequently less straightforward than one might hope. The analysis presented here should, however, be taken as a stand-in for a more complete and explanatory account. What is encouraging is that embedded exclamative expressions in sentences such as "*It is surprising how tall John is*" appear to have essentially the same semantics as that given here for scalar predicates, i.e. they interpreted as properties of degrees. This does suggest that general principles for combining attitude predicates with degree-predicates should be involved in deriving the crucial monotonicity effect. If this is the case, the differences between propositional modifiers and the attitude-toward-degree modifiers would be derivable from simple scope considerations, a result worth shooting for.

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