Semantics & Pragmatics Volume 17, Article 2, 2024
https://doi.org/10.3765/sp.17.2

The semantics and probabilistic pragmatics of deadjectival intensifiers*

Rick Nouwen
Institute for Language Sciences, Utrecht University

Abstract Intensifiers (e.g. *horribly* in *horribly warm*) are usually deadjectival adverbs. I show that the lexical content of the adjectival base, and in particular its evaluative meaning, is directly relevant for the degree intensifying function of these adverbs. In particular, I highlight two generalisations that have remained unaccounted for so far. First, evaluative adjectives with a negative evaluative meaning tend to turn into deadjectival intensifiers expressing high degree, while adjectives with a positive meaning make intensifiers of medium degree. Second, negative modal adjectives can form deadjectival intensifiers, but positive ones cannot. I will argue that a relatively simple intersective semantics for evaluative and modal adverbs accounts for these observations, but that we can only show this if we supplement that semantic analysis with a probabilistic pragmatic component.

Keywords: intensifiers, degree semantics, vagueness, bleaching, rational speech act

1 Introduction

The bare, unmodified form of an adjective is often called its *positive form*. In the literature on the semantics of vagueness and degree, one of the goals is to understand how positive form adjectives are interpreted and why some unmodified adjectives give rise to vagueness while others do not (Kennedy 2007, a.m.o.). Positive forms express comparison to a *standard*. In the case of relative adjectives, like *tall*, this standard is underspecified: *John is tall* is true whenever John's height exceeds whatever we may think is the appropriate contextual standard for what counts as being tall, given the contextual set of individuals we are comparing John to.

In this work, I discuss cases where interpretation similarly relies on a contextual standard, but where the adjective is not in its positive form. Specifically, I will discuss combinations of intensifying adverbs and relative adjectives. A common example

* This research was funded by the Dutch Research Council (NWO), grant VC.GW17.112, which I gratefully acknowledge. Thanks to Elena Castroviejo, Berit Gehrke, Dan Lassiter, Takanobu Nakamura, Hazel Pearson, Ciyang Qing and Stephanie Solt for numerous comments that helped me improve this paper. Thanks to Johannes Korbmacher for help with German data.

of intensification is the use of *very* in English. The truth-conditions for *John is very tall* rely on a contextual standard just as those for *John is tall* do; it's just that the standard for the sentence with *very* is higher than the standard for the sentence with the positive form. This observation was reason for Wheeler (1972) and Klein (1980) to assume that *very* reduplicates the semantics of the positive form: while *John is tall* means that John counts as tall among his comparison class, *John is very tall* means that John counts as tall among the tall individuals in the comparison class.

As Wheeler observes, an analysis along these lines cannot be extended to adverbs that contribute more than just intensification to the sentence. For instance, *John is worryingly tall* does not just express a vague classification of how tall John is; it also clearly communicates that John's height is a cause of worry for the speaker. The key goal of this paper is to do justice to the fact that the intensifying function of deadjectival adverbs like *worryingly* is intricately linked to the evaluation expressed by the base of those adverbs. So, to understand how intensification works, we would need to understand how the degree semantics of some deadjectival adverbs is derived from the semantics of the adjectival base. In particular, we're interested in what I will loosely call the *degree function* of an intensifier: the effect the intensifier has on the degree to which the accompanying adjective is said to hold. For some intensifiers this function is to express that a property holds to a high degree, for others the degree function involves less high degrees. We need to understand how an adverb's degree function relates to properties of the adjectival base of the adverb. I will provide a formal semantics for intensifiers that is explicit about this relation.

I will restrict my attention in this work to English adverbs, with occasional glances at nearby languages like Dutch and German. This admittedly conservative focus is practical in nature: the landscape of intensifiers is vast and, while there is a considerable body of descriptive literature,[1] there is very little theoretical semantic work that addresses the adjectival base of deadjectival intensifiers. Some exceptions are discussed below, but none of these provide a systematic analysis of the role of the adjectival content in the degree adverb.

The plan for the article is as follows. I start in the next section with a descriptive overview of deadjectival intensifiers in English. After that, I introduce existing analyses and I explain where I think they miss the mark. Next, I introduce my own analysis.

2 The landscape of intensifiers

I will start by characterising the varied landscape of intensifiers. By doing so, I will introduce a set of notions, observations and generalisations that will prove crucial in

1 See, for instance, Stoffel (1901), Borst (1902), Biedermann (1969), Bolinger (1972), Bäcklund (1973), Van Os (1989).

what follows. In particular, I will set out here the various ways in which deadjectival degree adverbs rely on their adjectival base for their intensifying function.

2.1 Defining "intensifiers"

	completely absolutely	**almost nearly**	**extremely**	**very awfully**	**rather pretty**	**a bit slightly**
Stoffel 1901	intensive	-	intensive		downtoner	
Borst 1902	intensive	downtoner	intensive		downtoner	
Biedermann 1969	absolute	-	high		moderate	weak
Bolinger 1972	booster	-	booster		compromiser	minimizer
Bäcklund 1973	highest	absence	high		moderate	low
Gary 1979	completive	approximater	booster		compromiser	diminisher
Van Os 1989	absolute	approximative	extreme	high	moderate	diminishing
Klein 1998	absolute	approximative	extreme	high	moderate	minimal
Paradis 1998	maximizer	approximator	boosters		moderators	diminishers
this paper			H-adverbs		M-adverbs	L-adverbs

Figure 1 The landscape of degree modifiers, adapted from Klein 1998. The highlighted part marks what is meant with the term *intensifier* in this paper.

Figure 1, adapted from Klein (1998), illustrates the landscape of adverbs of degree. As is clear from the table, while there is lots of variability in terminology, there is some regularity in how such adverbs are divided up in meaningful subclasses. Most of the time, these classifications are based on intuitive functions that the adverb performs when modifying an adjective. Often, but not always, these intuitions can be made precise by relating them to notions familiar from formal degree semantics. For instance, the left-most column is for adverbs that express that the adjective it combines with holds to the maximum degree. As a result, such adjectives are only compatible with adjectives that have a fully closed scale or a half-open scale with a maximum (Kennedy & McNally 2005b).

(1) The rod is completely straight. — half open scale with a maximum

(2) #The rod is completely bent. — half open scale without a maximum

(3) #The rod is completely wide. — open scale

(Here and in what follows I indicate unacceptable sentences using the hashtag, which is intended to leave unexpressed what the source of the unacceptability is.)

Similarly, approximatives also target the maximum of a closed scale (Rotstein & Winter 2004) and therefore have a similar distribution to adverbs like *absolutely*, *totally* and *completely*:

(4) The rod is almost straight. half open scale with a maximum

(5) #The rod is almost bent. half open scale without a maximum

(6) #The rod is almost wide. open scale

On the other end of the table we find what I call *L-adverbs* (for *low degree adverbs*, Nouwen 2013), adverbs expressing that the adjective they combine with holds to a degree that is just above the minimum end-point of the scale. These adverbs rely on the presence of a minimum and have the corresponding distributions, as can be seen by the following examples:

(7) #The rod is a bit straight. half open scale without a minimum

(8) The rod is a bit bent. half open scale with a minimum

(9) #The rod is a bit wide. open scale

This leaves the class of adverbs of degree that does not target scalar end-points.[2] It is this class that I will call the class of *intensifiers* in this work. Intensifiers are scale insensitive:[3]

(10) The rod is extremely / pretty straight.

(11) The rod is extremely / pretty bent.

(12) The rod is extremely / pretty wide.

I will use the term *H-adverbs* for intensifiers of high degree (*extremely*, *terribly*, *very*, *insanely*, etc.) and *M-adverbs* for intensifiers of moderate degree (*pretty*, *fairly*, *rather*, *quite*, etc.). It is important to note, though, that while this is a distinction found broadly in the literature, it is sometimes unclear how we decide whether an intensifier expresses high or moderate degree and, consequently, there are plenty of intensifiers that do not clearly fall under either of these classes. For instance, whether

2 This may turn out to not be the most accurate characterisation of this remaining class. For instance, Solt (2012) shows that L-adverbs are not so much sensitive to scale structure but rather to the availability of non-arbitrary standards of comparison. Qing (2021) argues that the class of adjectives usually considered to have a minimum standard is more accurately described as having a zero, potentially non-minimal standard. The class of adverbs I am referring to here could thus perhaps be more accurately described as not involving the kind of standards identified in these works.

3 As pointed out by an anonymous reviewer, Kennedy & McNally (2005a) dispute this claim and judge combinations of intensifiers and bounded adjectives unacceptable, unless they are reinterpreted as relative adjectives. This complicates things empirically, since it is hard to see in a given example whether reinterpretation has taken place. Given this, one could say that intensifiers are adverbs that do not require there to be a scalar end-point, while they may or may not require the absence of such an end-point. All of this is immaterial to my claims below, since I will restrict my attention to adjectives with open-ended scales, leaving the intensification of absolute adjectives for further research.

disappointingly intensifies to a high or moderate degree in a sentence like *The queue was disappointingly long* seems quite hard to say. (See below for more discussion of this point; see also Solt & Wilson 2021, Nouwen 2018).

2.2 Bleached versus unbleached

There is one other feature that sets intensifiers apart from other degree adverbs. Intensifiers are an open class. As Morzycki (2004) explains, it is quite easy to accept novel intensifiers based on adjectives. He gives the following example:

(13) How can you wear those shoes? They look foot-shatteringly uncomfortable.

In fact, often if someone makes up a new adjective, as in *That ice cream is fabulicious!*, then automatically they will have made up a corresponding deadjectival intensifier, as in *It's fabuliciously sweet!*. This stresses a point that is crucial for the current paper: intensifiers tend to be deadjectival adverbs. Since the class of adjectives is an open class, so is the class of intensifiers.

Having said that, there are important differences within the class of intensifiers as to how the adverbial intensifying function relates to the meaning of the adjectival base. In some intensifiers the meaning of the base is transparent within that of the intensifier. Take *disappointingly* for instance. A sentence like *The soup is disappointingly tasty* does not just express that the soup is tasty to some contextually-determined (and subjective) degree, it also expresses that the soup's tastiness disappoints the speaker. In other words, the semantics of the adjectival base is an active component in the semantics of the derived adverb. This is different for an adverb like *terribly*. Saying that *the soup is terribly tasty* does not entail that the speaker thinks there's anything terrible about the soup. Similarly, compare (14) and (15). Both judgements of disappointment and of something being terrible clash with the assertion of happiness in these sentences. But while that clash is clearly present in (14), it is much less an issue for (15). (Some of my native English informants find (15) slightly marked, but acknowledge that (14) is clearly more odd).[4]

(14) #I'm happy, because my new neighbour is disappointingly nice.

(15) I'm happy, because my new neighbour is terribly nice.

Intensifiers like *terribly* are *bleached*, meaning that by some diachronic process the meaning of the adjectival base has disappeared from the meaning of the adverb, leaving only the intensifying function behind. The prime example of bleaching is *very*. First examples of intensifier *verray* stem from the 16th century. Before that

4 Also, this use of *terribly* seems to be marked in American English.

it is an adjective meaning *true* or *real*, stemming from the old French adjective *verrai* (Mustanoja 1960, pp.326/327). The existence of bleaching has often been acknowledged in the descriptive literature,[5] but its relevance to semantics has remained largely unexplored.

Bleaching doesn't happen overnight. Hence, it is unlikely that a crisp classification will be possible of on the one hand intensifiers whose adjectival content has been bleached and on the other hand those intensifiers that express the content of their adjectival base. In the remainder of this work, I will nevertheless use terminology that distinguishes *bleached* and what I propose to call *unbleached* adverbs, using the latter term for adverbs, like *disappointingly*, that clearly contribute the adjectival content in tandem with their intensifying degree function. The reader should bear in mind, though, that there will be adverbs that are perhaps neither clearly bleached, nor clearly unbleached.

2.3 The Goldilocks effect

Although I won't have anything deep to say about the diachronic process of bleaching, it seems evident to me that at least some part of that process is simply that bleached adverbs end up being associated to the degree function their initial unbleached version was regularly associated with. If an unbleached adverb, through the lexical content of its adjectival base, ends up typically expressing high degree, then the pure expression of high degree is a natural candidate for the meaning of a bleached version of this adverb. That is, I take it that the deadjectival nature of intensifiers is not an accident, but that their degree semantics is derived from the semantics of the adjectival base and that only subsequently this semantic link between adjective and adverb can be severed.

Evidence for this comes from a systematicity in the relation between the intensifying function of a deadjectival adverb and the *valence* of the adjective base. English deadjectival H-adverbs, i.e. intensifiers expressing high degree, tend to be derived from negative valence adjectives, while English M-adverbs, i.e. intensifiers

5 For instance, Stoffel (1901) humorously illustrates this with a quote by Lord Chesterfield: "Not contented with enriching our language by words absolutely new, my fair country-women have gone still farther, and improved it by the application and extension of old ones to various and very different significations. They take a word and change it, like a guinea into shillings for pocket-money [...] For instance, the adjective *vast*, and its adverb *vastly*, mean any thing, and are the fashionable words of the most fashionable people. [...] I had lately the pleasure to hear a fine woman pronounce, by a happy metonymy, a very small gold snuff-box that was produced in company, to be *vastly* pretty, because it was *vastly* little. Mr. Johnson [RN: i.e. Samuel Johnson, editor of "a dictionary of the English language"] will do well to consider seriously to what degree he will restrain the various and extensive significations of this great word." (Philip Dormer Stanhope, 4th Earl of Chesterfield, December 5th, 1754, The World).

expressing moderate degree, tend to be derived from positive valence adjectives. For instance, the negative *terribly*, *horribly*, *ridiculously* typically express higher degrees than the positive *pretty*, or *fairly*.

As far as I know this observation has not received any serious attention in the literature. (Rissanen 2008 is the most explicit statement of the observation that I know, but offers no account.) I think there is a straightforward explanation for this systematicity, which involves regularities in how we evaluate different parts of a scale. Typically, extreme values of a scale are evaluated negatively because they involve excess. A nice day is when it is warm but not too warm. Nice food is well seasoned but not too salty and not too bland. I call this the Goldilocks effect of evaluation: good things are typically things that are void of excess; the extremes of a scale typically do involve excess and, as such, they (again, typically) are associated with negative evaluation.

The systematicity seen in English is also seen in Dutch and German. Bleached adverbs of moderate and high degree include the following:

(16) Dutch

a. Moderate degree: *aardig* 'nice', *redelijk* 'reasonable', *best* 'best', *tamelijk* 'fitting', *vrij* 'free'

b. High degree: *zeer* 'sore', *verschrikkelijk* 'terrible', *erg* 'bad', *ontzettend* 'disrupting'

(17) German

a. Moderate degree: *leidlich* 'tolerable', *ziemlich* 'fitting'

b. High degree: *sehr* (etymologically related to Dutch *zeer* and English *sore*), *furchtbar* 'terrible', *fürchterlich* 'terrible'

These are all relatively bleached adverbs. As such, the Goldilocks effect shows the lasting impact of the content of the adjectival base on the deadjectival intensifier. The ensuing picture has consequences for theories of the semantics and pragmatics of bleached intensifiers. One prominent idea in the literature is that intensifiers manipulate the contextual theshold of the adjective (e.g. Katz 2005, Sæbø 2010). For instance, if *Scarlett is tall* is true whenever Scarlett's height exceeds some threshold θ, then *Scarlett is terribly tall* is true whenever her height exceeds $\theta + d$, where d is some boosting value contributed by the intensifier. Opposed to this view is the view supported by Bennett & Goodman (2018), that intensification by bleached intensifiers is the result of a manner implicature. That is, the bleached adverb of degree is void of semantic content, but its very presence in the sentence leads to the implicature that the intended meaning is narrower than that of the unmodified variant. The effect is that the presence of an intensifier leads to an interpretation that concerns a more specific part of the scale. The Goldilocks effect shows that intensifier meaning

cannot be a purely pragmatic affair. If it was, then the intensifier's degree function would be severed from its original evaluative meaning. Yet, the Goldilocks effect shows that the boosting function of intensifiers is semantic in nature and that it needs to be connected to the adjectival base of the adverb.

The above suggests a rather straightforward diachronic process. Initially, these adverbs express positive or negative evaluation, which is (typically) associated to respectively medium or high regions of the adjective's scale. Once the evaluative meaning is bleached away, the association to medium or high degree remains and becomes the functional semantics of the intensifier.

Although I think that the Goldilocks generalisation is quite a clear tendency in the English language, I should hasten to add that it is merely a tendency. There are other considerations that steer the intensifying function of an adverb. These include mechanisms that trigger manner implicatures. For instance, adjectives expressing extreme evaluations (*tremendously*, *amazingly*, *marvellously*), but also adjectives expressing taboo content (*damned*, *bloody*, *fucking*) tend to form degree adverbs that express high degree, without necessarily expressing a negative judgement. For instance, the evaluation added by the taboo word in (18) is positive in nature, but it still expresses high degree.

(18) That pie is fucking delicious.

I presume the high degree function of *fucking* is due to the markedness of its expressive nature. The markedness of the taboo utterance is left unexplained if (18) were intended to communicate that the pie in question were just reasonably delicious.

It is often hard, though, to get good intuitions about the degree function of individual intensifiers. This is why I conducted a small survey to add some extra empirical support to the Goldilocks effect. I hand-selected 24 deadjectival evaluative adverbs. I used Amazon Mechanical Turk to ask 61 participants to associate modifications of the adjective *warm* to temperatures. Particpants saw sentences of the form in (19) and were asked to indicate what temperature they thought it was, given that this sentence was produced on a spring day in New York City. All participants were self-reported native speakers of English, with United States IP addresses.

(19) It's ADVERB warm today.

Participants had to provide the temperature they associated to the stimuli in degrees Fahrenheit by moving a slider to the desired position. The slider scale ranged from -10 to +110 degrees Fahrenheit. The aforementioned 24 adverbs took the place of ADVERB in (19) and there was an additional condition in which the adjective was

left unmodified.[6] The setup of the survey was entirely transparent to the participants. All participants saw all 50 stimuli (corresponding to 50 conditions, presented in randomised order) and there were no fillers. (The setup of this study was largely inspired by the study in Bennett & Goodman 2018.)

The responses were normalised per participant. These responses are taken to correspond to the degree function of these adverbs.[7] Next, I compared these responses to the valence of the adjectival bases of the adverbs. For this, I used the NRC valence-arousal-dominance lexicon (Mohammad 2018) to obtain estimates of evaluative connotations associated to the adjectival base of the adverbs used in the Mechanical Turk survey. In the NRC lexicon, valence is quantified on a 0 to 1 scale: 0 corresponding to extreme negative evaluation and 1 to extreme positive evalation. The NRC VAD lexicon[8] was built by asking annotators to rank four adjectives according to the relevant property (e.g. valence). The result is a reliably consistent annotation. See Mohammad (2018) for details on the methodology and the resulting reliability.

The results of the comparison are shown in Figure 2, which plots the mean normalized temperature response from the Mechanical Turk survey against the NRC VAD valence score of the adverbs. As can be seen, there is a clear negative correlation between the two (Spearman's rank correlation: $\rho = -0.73$, $p < 0.0001$). The higher the valence of the underlying adjectival predicate of an adverb, the lower the scalar extent that this adverb tends to express.

What is also clear from this plot is that the adverbs form two groups. In fact, what drives the correlation seems to be the fact that most adverbs have a valence close to either 1 or 0. The former tend to express relatively low degrees, the latter relatively high degrees. And, so, we see the adverbs of high degree on the left and the adverbs of medium degree on the right. This shows that scalar extent is to a large part determined by evaluative polarity, as would be expected from the Goldilocks connection between valence and excess.

6 Another manipulation was that the 25 sentences that are thus constructed were also offered to the participants with a negation added into them: *It isn't ADVERB warm today*. These stimuli, however, concerned research unrelated to the topic of this paper, and these conditions as well as the observations recorded for them will be subsequently ignored.

7 There are some obvious limitations to this way of measuring degree function. It is quite likely, for instance, that the responses depend in part on the adjective the adverb is modifying. So, only using *warm* in the stimuli may not be completely representative of how these intensifiers are used in general. Nevertheless, even if there is variation in the degree functions of intensifiers, this snapshot still serves as an neat illustration of the Goldilocks effect in action.

8 The lexicon is available at: https://saifmohammad.com/WebPages/nrc-vad.html.

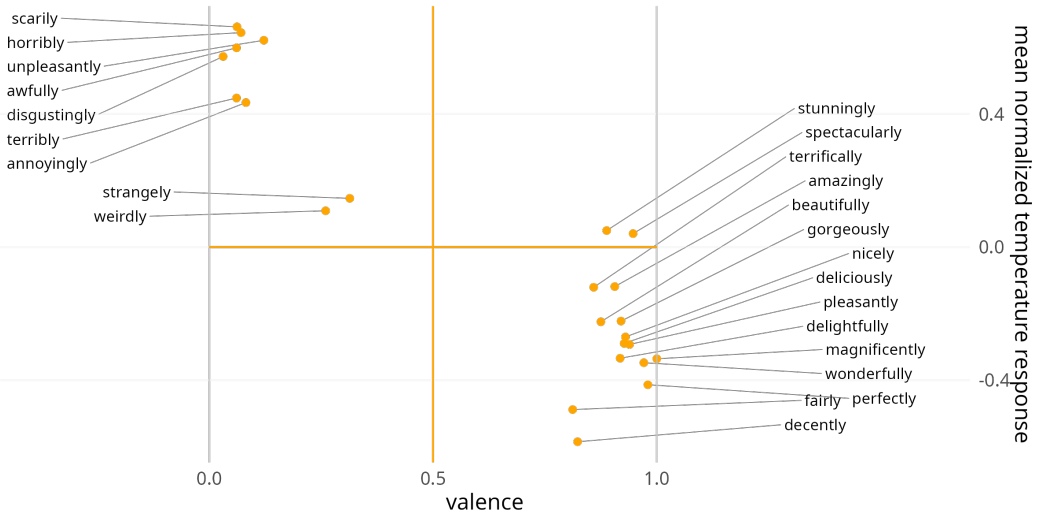

Figure 2 Mean (normalised) response in the survey, compared to the valence of the adjectival base of the adverb, as given by the NRC VAD lexicon.

2.4 Kinds of adjectival bases

Since intensifiers are deadjectival, the question arises which adjective bases we find in this class. Here, I will discuss two major sub-classes of intensifiers, namely *evaluative* and *modal* intensifiers. This is probably not an exhaustive list, but it covers most of the cases I know of, and these categories will prove useful as we proceed later to the semantics.

2.4.1 Evaluative intensifiers

Most examples I've given so far were evaluative adverbs. Because evaluative adjectives form an open class, adverbs derived from such adjectives constitute what is probably the largest subclass of intensifiers.

I will call an adjective *evaluative* when it expresses some kind of positive or negative value judgement. Above, I referred to the polarity of this judgement as the adjective's *valence*. So, *good* and *bad* are the prototypical evaluative adjectives, with positive and negative valence, respectively. Other examples include *disappointing*, *pretty*, *beautiful*, *terrible*, *remarkable*, *amazing*, *impressive*, *shocking*, *wonderful*, *tasty*, *nasty*, *nice*, *pleasant*, *worrying* etc. Evaluative adjectives are *ordering subjective*, meaning that the denotation of their comparative form is subjective. Whether A is more pretty, disappointing, beautiful, etc. than B differs from person to person.

Compare this to non-evaluative multi-dimensional adjectives like *happy* and *healthy*: whether Sue is happier or healthier now than she was ten years ago is not up to the speaker.[9]

2.4.2 Mirative and (other) modal intensifiers

Mirative adjectives are adjectives expressing some deviation from expectation or the norm. Mirative adjectives are ordering subjective, just like evaluative intensifiers. They are not evaluative, however, since they do not offer a value judgement. Some example of intensifying miratives:

(20) The soup was surprisingly / unusually / unexpectedly / abnormally / atypically / uncommonly warm.

Like mirative adjectives, modal adjectives are ordering subjective (except for cases of objective modality) and they do not provide a value judgement.[10] Here, too, we find that some deadjectival adverbs receive an intensifying interpretation:

(21) The soup was impossibly / unnecessarily / improbably / unbelievably warm

The reader may have noticed that the adverbs in (20) and (21), with the exception of *surprisingly*, are all morphologically negative. I return to this in 2.5 below.

2.4.3 Other intensifiers

Both evaluative and mirative/modal intensifiers are *intensional* in nature, in the sense that the adjectival base can predicate over a proposition. (For instance, *It is fair / terrible / disappointing / surprising / impossible that they fired Sue*). These are the two types of intensifiers that I will account for in the remainder of this article. There is one class of deadjectival intensifiers, however, that falls squarely outside of this intensional category. Some intensifiers are derived from dimensional adjectives:

(22) 'The Jam' was hugely / enormously / immensely / massively influential.

(23) Portobello mushrooms are widely available in the UK.

(24) Fritz was deeply / greatly / highly troubled by the affair.

9 However, see Solt (2018) for evidence that the difference is more nuanced.

10 An anonymous reviewer points out that some of these adverbs will automatically lead to value judgements. For instance, if something is unnecessary, then it may be judged to be redundant and, as such, bad. I agree this blurs the lines somewhat, but this won't be in the way, given the clearly modal adjectival base.

My impression is that this class is the least discussed of all degree adverbs. Their distribution is somewhat more restricted. For instance, *widely* is incompatible with most adjectives.

(25) #Sue was widely tall / smart / young / rich.

I will not have much to say about dimensional intensifiers, but I will return to them briefly at the end of the paper.

My conviction is that the above three categories (evaluative, mirative/modal, dimensional) are the most prominent kinds of deadjectival adverbial intensifiers to be found in English. That is not to say that there are no others, but just that these are less clearly part of a productive mechanism of deriving intensifiers from adjectives. Let me discuss a few outliers. First of all, adjectives expressing some kind of maximality do productively form adverbs of degree. However, they typically end up as maximisers, referencing the end-point of a scale. As such, they do not qualify as intensifiers. (See above.) Examples include: *totally*, *maximally*, *wholly*, *entirely*, *fully*, *completely*, etc. While some of these maximizers have uses as intensifiers (Beltrama & Staum Casasanto 2017), as in *this is totally sad*, I will leave them out of the picture in the remainder of this work.[11]

Another kind of deadjectival adverbs excluded from the above three groups are adjectives that express scalar sufficiency or excess, such as *sufficiently*, *excessively*. Given that they directly encode their degree-semantic operation, I will leave such adverbs out of the discussion below.

Finally, I will not discuss *very*. This is because it is not entirely clear to me how to classify its adjectival base, but also because its distribution is somewhat different from the intensifiers that I focus on in what follows. For instance, *very* can modify (non-gradable) nouns, as in *the very day you were born*. Also, there is some evidence (Bardenstein & Ariel 2022: e.g.) that truth-related adverbs like *very*, *truly* and *really* have taken a slightly different diachronic route than other intensifiers.

2.5 Zwicky's generalisation

Zwicky (1970) offers a striking observation about mirative/modal intensifiers: only adverbs with the negative antonym as the base gain an intensifying function. (See Nouwen 2010, Katz 2005, Nouwen 2005, for discussion). While the examples in (26) lack degree-intensifying readings, the examples in (27) show that the corresponding negative adverbs *do* act as intensifiers. I'll refer to this observation as *Zwicky's generalisation* and one of my aims below will be to account for it.

11 Presumably, some of these maximisers, like *totally*, are in the diachronic process of attaining a more general semantics (Pertejo & Martínez 2014). Other maximisers are left behind. Compare, for instance, *#this is fully sad*.

(26) a. It was usually / typically warm, last year.
b. The speech was expectedly / possibly / necessarily long.

(27) a. It was unusually / atypically warm, last year.
b. The speech was surprisingly / impossibly / unnecessarily long.

Note that Zwicky's generalisation is not about morphological negativity, but appears to involve a more semantic notion. This is illustrated by the fact that *surprisingly* can act as a degree modifier, while *expectedly* can't.

Zwicky's generalisation does *not* extend to the evaluative domain. There are clear cases of adverb pairs involving antonyms.

(28) The weather was pleasantly / unpleasantly warm.

(29) The ditch was unimpressively / impressively deep.

(30) He was pretty successful / hideously successful.

This said, there are some gaps. For instance, while *dangerously* is a degree adverb, it is harder to come up with examples in which *safely* is a degree adverb. It will sometimes be difficult to assess which of these observations about evaluatives are part of some generalisation and which are just accidents of diachronic development.

2.6 Summary of desiderata

In the remainder of this work, my goal will be to account for the following:

Base-aware semantics The semantics of deadjectival intensifiers, or at least the semantics of unbleached such adverbs, should provide an explanatory link between the semantics of the base and the degree function of the adverb.

Goldilocks This base-aware semantics of deadjectival intensifiers should then immediately explain why moderate degree tends to be expressed by positive evaluation, while high degree tends to be expressed by negative evaluation and (sometimes) extreme positive evaluation.

Zwicky The semantics of deadjectival intensifiers should explain why only a subset of mirative and modal antonyms form deadjectival intensifiers and why no such restriction is observed with evaluative intensifiers.

3 The semantics of unbleached intensification

I will develop an account in two steps. I will start by discussing the semantics involved in intensification. To meet my goals, however, I will also need to discuss the pragmatic mechanisms of vagueness.

3.1 Existing approaches to intensifier semantics

Wheeler (1972) proposes that unbleached evaluative degree modifiers are best analyzed as factive propositional operators. On his analysis, (31) is interpreted as *it is horrible that it is as warm as it is*, which I will formalise as in (32).[12]

(31) The weather today is horribly warm.

(32) $\text{horrible}(\lambda w.\mu_{warm}(\text{t})(w) = \mu_{warm}(\text{t})(@))$

Morzycki (2008) argues against such an analysis on the basis that it would wrongly predict that the weather can be described as *horribly warm* also when it is very cold. On a freezingly cold day, most people would agree that it is indeed horrible that the temperature is what it is, but no-one would agree that it is *horribly warm*.

Another example: consider a typical Dutch city canal frequented with tourist boats. These canals are quite narrow, potentially leading to dangerous situations when oversized vessels have to manoeuvre alongside each other. This situation can be expressed using the sentence *The canal is dangerously narrow*, but not using *The canal is dangerously wide*. On Wheeler's account, however, both should be possible. In fact, both should express the same proposition, since both *narrow* and *wide* are associated with the same measure function.

Morzycki solves this by stipulating that evaluative intensifiers express extreme degrees: *horribly warm* means that it is horrible how extremely warm it is; *dangerously wide* means that it is dangerous how extremely wide the subject in question is. While this analysis solves the issues with Wheeler's semantics, it in turn predicts that evaluative adverbs always express high degree. This, however, is not the case. A case in point is *pleasantly warm*, which is associated with a temperature that is warm enough to be pleasant but not too warm. We could of course stipulate that in this case extreme degree is replaced by moderate degree, but pursuing this line of analysis we would lose hope of deriving the intensifying function of an adverb from its adjectival base - which is exactly my goal here. My assumption is that *horribly* is associated with extreme degree, in virtue of the content of the adjective base. So even though Morzycki's proposal may be on the right track in the sense that it provides the right truth-conditions, it does not yet provide us with a rationale of how such meanings come about in the deadjectival derivation process.

Mirative adverbs are also problematic for Morzycki. If something is *surprisingly warm* it means that the temperature is higher than what was expected, but there is no

12 I adopt the standard assumption that adjectives are associated with measure functions (notation: μ) that map entities to a point on the scale. Antonyms share the same measure function, but the ordering on the scale is reversed. In what follows, the @ symbol refers to the actual world. In this example, "t" corresponds to the weather today.

entailment that this temperature is extreme. Imagine a cup of hot soup that has been left to cool for an hour. You dip your finger in it, expecting it to feel cold, but the soup still feels a little bit warm. In this case, it would be fine to say the soup is still *surprisingly warm*. But you'd probably hesitate calling the soup *warm*.

Nouwen (2010) proposes an alternative approach designed to avoid the above problems, but it also suffers shortcomings. (See also Katz 2005, Piñón 2005, Nouwen 2005, Castroviejo-Miró 2012). The idea in that proposal is that (31) is to be analysed as (33).

(33) $\exists d[\mu_{warm}(t)(@) \geq d \wedge \text{horrible}(\lambda w.\mu_{warm}(t)(w) \geq d)]$

This solves Morzycki's problem. Say that the temperature is some very cold degree c. It is now the case that $\mu_{warm}(t)(@) = c$ and so that $\mu_{warm}(t)(@) \geq c$. But the proposition horrible$(\lambda w.\mu_{warm}(t)(w) \geq c)$ is probably false. This is because $\lambda w.\mu_{warm}(t)(w) \geq c$ is the proposition that the temperature is at least c. So this proposition encompasses both horrible weather situations (for instance, when the temperature is c) and pleasant weather situations (for instance, when the temperature is higher than c, but not too high). As a result, horrible$(\lambda w.\mu_{warm}(t)(w) \geq d)$ will only be true for degrees d that are higher than what is pleasant, not lower than what is pleasant.

Similarly, for the Dutch canal sentence *The canal is dangerously wide*, we'd get:

(34) $\exists d[\mu_{wide}(c)(@) \geq d \wedge \text{dangerous}(\lambda w.\mu_{wide}(c)(w) \geq d)]$

Here $\mu_{wide}(c)$ is the width of the canal. In the actual world, the width d is considered dangerous because it is so little. But that doesn't make dangerous$(\lambda w.\mu_{wide}(c)(w) \geq d)$ true. This is because the proposition $\lambda w.\mu_{wide}(c)(w) \geq d$ is very inclusive. It contains widths ranging from d upwards. Consequently, assuming we believe there to be canals that are so wide that they are safe, it is unlikely that we'd find the fact that the canal is at least d wide dangerous. As a result, (34) correctly predicts that *The canal is dangerously wide* cannot be used to describe a canal that is *dangerously narrow*.

Despite the fact that (34) successfully accounts for the truth-conditions of adverbs like *dangerously* or *horribly*, this same analysis runs into problems with M-adverbs like *pleasantly*, just like Morzycki's analysis did. On the account of Nouwen 2010, *The soup is pleasantly warm* will now receive the analysis in (35). But this is much too weak. Say that p is a degree of temperature that is pleasant (for soup) and that $h > p$ is a degree that is horrible. If the soup is indeed this horrible temperature $(\mu_{warm}(s)(@) = h)$ then it is also true that the temperature is at least the pleasant temperature p $(\mu_{warm}(s)(@) \geq p)$ and, so, we wrongly predict that the soup is pleasantly warm whenever it is too warm to eat.

(35) $\exists d[\mu_{warm}(s)(@) \geq d \wedge \text{pleasant}(\lambda w.\mu_{warm}(s)(w) \geq d)]$.

The accounts above have in common that they do not analyse the adjective in an intensifier-adjective combination as a positive form. This is natural in a way, given the fact that we are dealing with modified occurrences of adjectives. However, intensified adjectives share key properties with the positive form. Most importantly, they are vague. *John is worryingly tall* is vague just like *John is tall* is. In both cases, there is a context-dependent, implicit, unknown standard of comparison and in both cases there exist borderline cases. In fact, intensified absolute adjectives are vague even when their unmodified positive form is not. Compare *The glass is empty* with *The glass is disappointingly empty*.[13]

Another assumption made in both Morzycki (2004) and Nouwen (2010) is that the adverb meaning is a simple crisp predicate. But adverbs have positive forms, just like adjectives. In fact, in the simple combination of a deadjectival adverb and an adjective, the adverb has a positive form interpretation. In *John is worryingly tall* there is a context-dependent, implicit, unknown standard of comparison for the speaker's worry and there are borderline cases of where John's height may not be definitely worrying nor definitely not worrying. It should not be surprising that deadjectival adverbs have positive forms, for they themselves can undergo degree modification, albeit not easily when modifying an adjective:

(36) ?This rod is more disappointingly short than that one.

(37) The team played very disappointingly.

What we see then is that the semantics of combinations of deadjectival intensifiers and adjectives involve two positive form-like interpretations. That is, they involve two separate standards of comparison, one for the adverb and one for the adjective. I will now show the consequences of assuming that the semantics of intensified adjectives is largely that of a positive form.

13 Another property intensified adjectives share with unmodified adjectives is that they take PPs that affect the standard of comparison:

(i) a. This is { surprisingly / ridiculously / shockingly / ∅ } tasty for something you made.
b. He is { disappointingly / amazingly / fantastically / ∅ } short for a basketball player.

These kinds of PPs are also found with markers of excess and sufficiency, like *too* and *enough*. For instance, *Sue is too short for basketball*, *that rod is long enough for our purposes*. These are clearly *not* positive forms and the *for* PPs are appear to provide more a goal than a comparison class. Such examples show, however, that we shouldn't take the presence of a PP as evidence of the presence of a positive form.

3.2 Intersecting positive forms

There is some consensus that (39) is a good approximation of the truth-conditions of (38):

(38) John is tall.

(39) $height(john) \geq \theta$

That is, the interpretation of the positive form of relative adjectives involves comparison to some contextually determined threshold θ. More generally, if μ is the measure function associated with the adjective and x is the referent of the subject of the adjective, then in general the positive form combination of that subject and adjective will be interpreted as:

(40) $\mu(x) \geq \theta$

While semanticists may disagree about how (40) comes about, there is general agreement that something akin to (40) is the interpretation of a positive form relative adjective. There are two other aspects of (40) that I take to be non-controversial. First of all, the value of θ is not provided in the compositional interpretation process. Rather, it is treated like a free variable whose value needs to be resolved by reasoning about the context and information that *is* provided by composition, such as the comparison class, the subject etc. Secondly, in order to account for the vagueness of the positive form, there has to be some indeterminism about the value of θ and / or about what it means for a measure to meet this threshold. (See e.g. Égré 2017 for discussion.) So, for a more complete understanding of what (40) amounts to as a *meaning*, we need not just degree semantics (e.g. Kennedy 2007), but also some kind of pragmatic theory of how under-specified standards of comparison are used (e.g. Lassiter & Goodman 2017).

As I explained above, the combination of an intensifier and a relative adjective is no less vague than the adjective by itself. For that reason, I am proposing that (40) is a core part of the meaning of intensified adjectives. Alongside (40), however, there is a second positive form interpretation that corresponds to the adverb. For instance, for *the weather today is pleasantly warm* we have two parallel vague interpretations, one saying that it is warm and one that it is pleasant. To a first tentative approximation, my proposal is that a combination of a deadjectival adverb D and a gradable adjective A is interpreted using the two positive form meanings in (41).

(41) Let D be a deadjectival adverb and A be a gradable adjective, $[\![[DA]]\!]$ is the conjunction of (42a) and (42b). *(to be amended)*

a. $\mu_A(x) \geq \theta_i$

b. $\mu_D(x) \geq \theta_j$

For *the weather today is pleasantly/horribly warm*, we would then for instance get:

(42) a. $\mu_{warm}(t) \geq \theta_i$
b. $\mu_{pleasant}(t) \geq \theta_j$

(43) a. $\mu_{warm}(t) \geq \theta_k$
b. $\mu_{horrible}(t) \geq \theta_l$

Here t stands for *the weather today*. As I will explain below, (41) is too rough, but it will do for now to illustrate the benefits of looking at intensification like this. One clear advantage of (41) is that it straightforwardly accounts for why intensified adjectives are vague (providing we have a proper theory of what makes these positive form interpretations vague - see below). But how promising is this idea with respect to my two main goals: the Goldilocks effect and Zwicky's generalisation?

Let me start by setting out how I intend to explain the Goldilocks effect using (41). Because the two positive form interpretations in (41) are interpreted conjunctively, an intersective meaning emerges. So, while *the weather today is warm* may be compatible with a broad range of degrees of temperature, including say at least the interval $[d, d']$, *the weather today is pleasantly warm* is compatible only with those degrees in that interval which make (42b) true. Typically, positive evaluations like *pleasant* are reserved for the middle of a scale and, hence, this positive evaluation results in intensification to a medium degree. Negative evaluative adverbs like *horribly* are compatible only with those degrees in $[d, d']$ that make $\mu_{horrible}(t) \geq \theta_{horrible}$ true. Typically, negative evaluations are associated to extreme ends of the scale and, so, *horribly warm* will end up being compatible only with the higher degrees in this range. Note that extremely low temperatures are also horrible, but they are not in the interval $[d, d']$, because we arrived at that interval using the positive form of the adjective.[14]

This explanation of the Goldilocks effect is not yet perfect, however. The problem is that I assumed that the subject of the adverb in (42b) and (43b) is *the weather today*. However, that means that (43) is compatible with the weather being just moderately warm, but horrible in some other way (perhaps it is raining non-stop). The sentence *the weather today is horribly warm*, however is not compatible with such states of affairs. It doesn't just say that the weather is both warm and horrible, it says that the weather is warm and that it is horrible *that it is so warm*.

14 As I explained above, the Goldilocks effect is only a tendency. For instance, an expressive taboo positive evaluation may result in an upper range of degrees, since the expressive taboo signals that something out of the ordinary is the case. The moderate part of $[d, d']$ is not compatible with the use of such inflammatory language.

To remedy this, we need to incorporate Wheeler's original semantics in the current proposal for a double positive form. So, instead of (41), we get:

(44) Let D be a deadjectival adverb and A be a gradable adjective, $[\![[DA]]\!]$ is the conjunction of (45a) and (45b).
   a. $\lambda w.\mu_A(x)(w) \geq \theta_i$
   b. $\lambda w.\mu_D(\lambda w'.\mu_A(x)(@) = \mu_A(x)(w'))(w) \geq \theta_j$

To keep things simple, I simplify (44) by keeping the world variables implicit where possible:

(45) a. $\mu_A(x) \geq \theta_i$
   b. $\mu_D(\lambda w.\mu_A(x)(@) = \mu_A(x)(w)) \geq \theta_j$

Applying this to the *horribly warm* example, we get (46):

(46) a. $\mu_{warm}(t) \geq \theta_i$
   b. $\mu_{horrible}(\lambda w.\mu_{warm}(t)(@) = \mu_{warm}(t)(w)) \geq \theta_j$

Now, for a day to be horribly warm it needs to be warm and the fact that it is as warm as it is needs to be evaluated as being horrible. The explanation of the Goldilocks effect runs as before.

What about Zwicky's generalisation? Nouwen (2010) attempts to explain Zwicky's generalisation by showing that modal adverbs that lack an intensifying function would be drastically under-informative if they did have such a function. Take the antonymic pair *usual* - *unusual* of which only the latter is the base of an intensifier. While the adverb in (47a) is interpreted as a sentence adverb, the adverb in (47b) receives an intensifying interpretation.

(47) a. Sue is usually tall.
   b. Sue is unusually tall.

For Nouwen (2010) these would be interpreted as (48a) and (48b) if the adverbs in both sentences were intensifiers:

(48) a. $\exists d[\mu_{tall}(s)(@) \geq d \wedge usual[\lambda w.\mu_{tall}(s)(w) \geq d]]$
   b. $\exists d[\mu_{tall}(s)(@) \geq d \wedge \neg usual[\lambda w.\mu_{tall}(s)(w) \geq d]]$

The truth-conditions in (48b) are very exclusive: this proposition is only true if Sue's height is such that it is judged to be unusual. In contrast to that, (48a) is entirely uninformative. Just take the lowest degree on the scale. It will be true that Sue's height in the actual world exceeds that degree and (trivially) it will also be usual for

Sue to exceed that height. As such, I concluded that the reason that positive modals lack intensifier uses is simply because they wouldn't be informative as intensifiers.

Could we construct a similar explanation from my current proposal? For (47b), the positive form of *tall* selects a range of situations where Sue has some height h. Some (in fact, lots) of these situations are situations in which Sue is tall, but where her height is not deemed unusual. What height would Sue need to have so that her having that height is evaluated as being unusual? Well, the unusual cases are those where Sue's height is extreme, either so tall it is (or seems to be) rare for a human to be so tall or so short that it seems rare. The interpretation of the positive form of *tall*, however, make sure that only the former can be the case and in this way *unusually tall* ends up entailing that Sue is very tall.

Turning now to (47a), we once more know from the positive form of *tall* that Sue has some height h that stands out. The second condition is that h is such that it is usual that Sue is so tall. This excludes all cases where Sue is so tall that her height is unusual. As a result, *usual* is expected to have an intensifier meaning. It would be relatively uninformative, but not entirely, in contrast to (48a). In other words, the account seems to so far wrongly predict that *usually tall* means the same as *tall but not unusually tall*.

So far, then, the analysis fails on one of my desiderata. Importantly, there is no easy fix for this. We could try to create a meaning that is more in line with the analysis in Nouwen 2010 by adopting a semantics relying on a $\geq$ comparison in the scope of the propositional expression. But this would have dire consequences for M-adverbs, which require an upper as well as a lower bound. While the explanation in Nouwen (2010) works for modal intensifiers, it wrongly predicts that positive evaluatives are compatible with high degrees. Because of the at least semantics in that account, *pleasantly warm* ends up meaning *at least pleasantly warm*. So, the lower bound that is so important in deriving Zwicky's generalisation creates problems for the account of evaluatives. The current proposal seems even worse off, though, since its semantic component does not even come close to an explanation. As I will show below, once we turn to the pragmatics of deadjectival intensifiers, an explanation does present itself.

4 The probabilistic pragmatics of deadjectival intensifiers

How do interlocutors use meanings like $\mu(x) \geq \theta$? To answer this, we need a theory of how interlocutors reason about how values for θ affect the reaching of certain communicative goals. Here, I will adopt the Bayesian game theoretical approach of Lassiter & Goodman (2017). The key thought behind this approach is that meanings like $\mu(x) \geq \theta$ are extremely uninformative for low values of θ, while for high values of θ, they end up so informative that they are hardly ever usable. Lassiter

and Goodman model a hearer who probabilistically reasons about θ, given these considerations of informativity.[15]

I will explain my take on Lassiter and Goodman's framework in more detail now. I say my 'take' because I will introduce some minor differences with the original proposal. All of these will still be well within the spirit of that proposal, but they will help me make my point more easily. The first of these differences is that I make explicit the assumption that each utterance comes with a question under discussion (QUD) that directly determines a partitioning of the belief space relevant for interpreting that utterance. In particular, I will assume that the use of an adjective can be associated to a corresponding question under discussion that asks a corresponding degree question of the subject. For instance, *John is tall* is associated to the question of how tall John is.

I implement this as follows. Let W be the space of possible worlds. Let A be an adjective, μ_A its measure function, X the subject and x the referent of the subject. Whenever A is predicated of X, there is a QUD, Q^A_X, defined as in (49). In words, Q^A_X partitions the space of worlds in such a way that each cell of worlds agrees on the value of $\mu_A(x)$.

(49) Let $w \sim^A_X w'$ whenever $\mu_A(x)(w) \approx \mu_A(x)(w')$, where $\approx$ indicates that the measures are identical taking into account some level of granularity.
$Q^A_X = \{[w]_{\sim^A_X} \mid w \in W\}$

Pragmatic interpretation involves probabilistic inferences of where in the space Q^A_X the actual world lies, given the speaker's utterance (Goodman & Frank 2016, Lassiter & Goodman 2017, Qing & Franke 2014). This is represented as a probability distribution $\rho(s|m,\ldots)$, where s is a cell in the partition and m the uttered sentence. This is the probability that the real world is in cell s, given that m was uttered. Instead of the actual sentence, I will represent m in what follows as a pair (φ, c) where φ is the set of truth-conditions for m and c is the cost of uttering m.

Lassiter and Goodman's proposal is built on the *rational speech act framework* (RSA, Goodman & Frank 2016). RSA starts by positing what a literal interpretation of an utterance looks like, given some prior expectations about the space of worlds, represented by P. This literal interpretation determines the utility of a message for a speaker: messages are better when there's a higher probability that the cell with the actual world is identified. The cost of the message is also factored in. The speaker model represents the likelihood of a speaker using an utterance with meaning φ and cost c, given the utility. Finally, the pragmatic listener model ρ is a simple

15 There are similar theories in the literature (e.g. Qing & Franke 2014) and there are perhaps also quite different routes to understanding the use of the vague positive form better. It will remain an open question whether these alternatives can provide similar explanation to what I offer below.

application of Bayes' law. Full definitions and discussion of details are given in the appendix. The main thing to grasp is that the framework allows us to predict how a hearer updates prior expectations P about the answer to the QUD on the basis of the meaning and cost of an uttered sentence. That is, the posterior distribution ρ represents how the interpretation of the utterance has shifted the expectations about the answer to the QUD.

Lassiter & Goodman (2017) adapt this rational speech act framework to derive ρ for positive form utterances. They assume that a positive form utterance of $(\mu(x) \geq \theta, c)$ (with $c > 0$) competes with a silent tautology. So, the set of messages $M = \{(\mu(x) \geq \theta, c), (\top, 0)\}$. In other words, the posterior distribution following the utterance of a positive form takes into consideration the cost of that utterance relative to the free alternative of not saying anything. Given the choice of the positive form over that alternative, the hearer can infer reasonable values for θ and, connected to that, he can come to a posterior distribution over the space that represents the QUD.[16]

As an illustration of how this proposal works, Figure 3 shows $\rho(s|(\mu_A(x) \geq \theta, c), Q^A_X)$ for a partition that groups together worlds where $\mu(x)$ is the same when rounded off to the nearest one decimal. The prior distribution $P(s)$ is a discrete approximation of the z-distribution. The x-axis shows the cells of the QUD partition where 0 stands for the cell that includes the case where $\mu_A(x)$ is the average expected measure. As can be seen from this figure, the posterior ρ, i.e. the probability distribution resulting from updating the prior on the basis of the utterance of the positive form, shifts the most probable cell in the partition to be one where the measure is higher than the average expected degree. This is of course exactly what we associate the positive form interpretation with.[17]

Let's now turn to intensified adjectives. We take the idea of using the RSA framework for the interpretation of vague predicates, but now use it to reason about two vague predicates simultaneously.[18] Importantly, when interpreting the combination of a deadjectival adverb and an adjective, it is still the adjective that determines the QUD and (thus) the partition of the space of possibilities. The measure function associated with the (adjectival base of the) adverb maps each cell in that partition to some degree.

16 One could have additional alternative messages, such as for instance one containing the corresponding antonym of the adjective. In what follows, I will stick with this relatively simple setup. As far as I can see, nothing hinges on this decision.

17 The code behind all simulations reported in this section is accessible via the following github repository: `https://github.com/rnouwen/deadjectivalintensifiers`.

18 See Nouwen 2024 for a similar use of this framework, where hyperbolic statements are interpreted as simultaneously updating two distributions, of which one is evaluative.

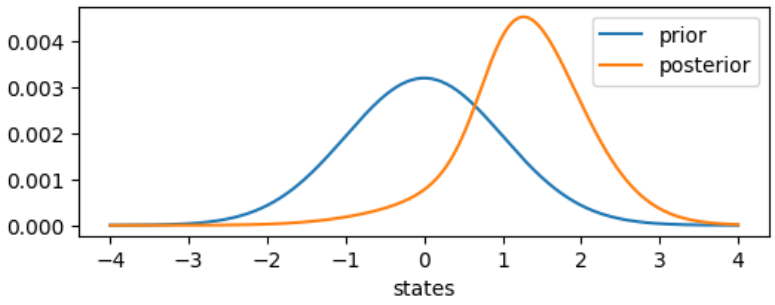

Figure 3 Illustration of the pragmatic effect of the positive form. Here, the posterior distribution is the effect of the positive form interpretation of the adjective. This is compared to the prior distribution. (For this plot, λ=4 and c=5.)

For instance, for the combination *horribly warm*, we have the following ingredients of the analysis. First of all, there is a partition Q such that $\forall s \in Q : \forall w, w' \in s : \mu_{warm}(x)(w) \approx \mu_{warm}(x)(w')$, where $\approx$ indicates the measures are equal taking into account some level of granularity. Additionally, for each $s \in Q$, $\mu_{horrible}(s)$ returns a degree of how horrible it would be if the actual world is in cell s. (For simplicity, I am assuming that the speaker's horribleness measure function is rigid across the space of possible worlds). As before, there is also a prior expectation as to how warm is it. That is, there is a prior expectation of where in Q_X^{warm}, the actual world is situated. Jointly, the measure function and this prior distribution translate to a prior expectation of how horrible the weather is. Each cell in the QUD has both a prior probability and a degree of horribleness. So, to obtain a prior for the negative evaluation, we only need to do the following: $P'(d|P, Q_X^{warm}) = \sum_{s \in \{s' \in Q_X^{warm} | \mu_{horrible}(s') = d\}} P(s)$. We won't use this prior P' explicitly, since the models will be expressed in terms of distributions over the partition triggered by the QUD. Nevertheless, it is good to realise P directly entails a prior distribution over degrees of evaluations (such as P').

The figure in 4 depicts a typical situation. Panel (a) shows the prior distribution over the state space created by the (QUD associated to the) adjective. Panel (b) shows a handcrafted function, simply $f(x) = x^2$, that maps moderate situations to low degrees of horribleness (close to 0) and extreme situations to high degrees of horribleness. The prior distribution in panel (c) displays the expected degree of horribleness, given our prior expectations about the state space, panel (a), and the measure function in panel (b).

We can now model the pragmatic effect of an intensified adjective by calculating $\rho(s|(\mu_A(x) \geq \theta_i \wedge \mu_D(s) \geq \theta_j, c), Q_X^A)$. (See the appendix for how I derive this posterior.) Figure 5 plots the effects of this for a (discrete approximation of a)

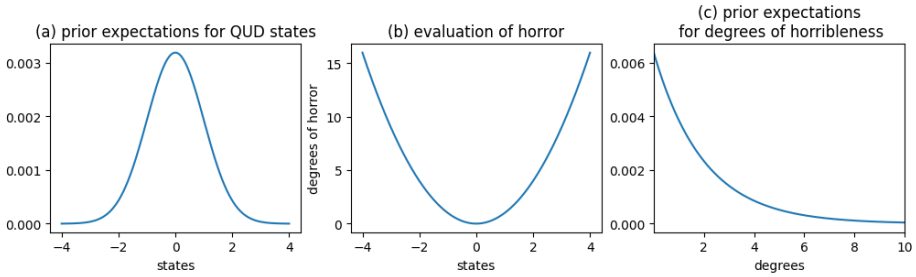

Figure 4 Illustration of the application of evaluative measure functions on the QUD partitioning, deriving a prior distribution over degrees on the evaluative scale.

z-distribution prior and the hand-crafted evaluation measure function used above (Figure 4). This could be seen as predicting the meaning of something like *The weather today is horribly warm*, where the x-axis represents temperature and the 0-point represents the average temperature. As is visible from the plot, the effect is one of intensification, but unfortunately, we end up in a situation that is not that unlike that of Wheeler (1972): horribly warm is not (entirely) incompatible with things being horribly cold.

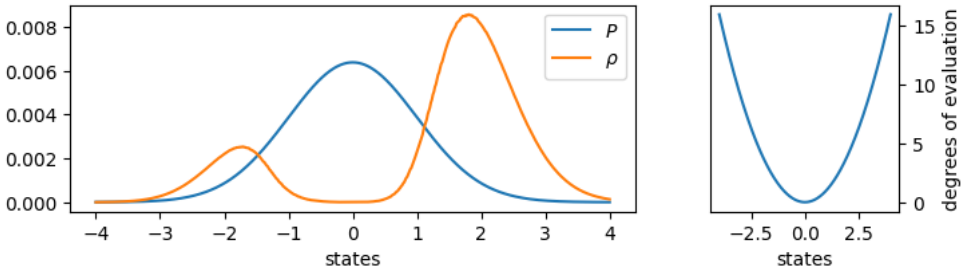

Figure 5 Model predictions of (72). The right panel shows the evaluative measure function used for this prediction, which is the same as shown in Figure 4. The left panel shows the update of the prior P, producing posterior ρ. (For this plot λ was set to 4, and c to 6.)

It turns out that the source of this problem lies in the simple conjunctive analysis I assume in (49). Basically, this model assumes that the two thresholds are resolved in tandem. The fact that states in which it is very cold are associated with particularly high degrees of horror make these states not entirely unattractive for using the adverb-adjective combination. On reflection I believe that the two positive forms that I assume to be part of an intensified adjective have a different status from one

another. In particular, I think that the positive form interpretation of the adverb is somehow *backgrounded* and that the positive form of the adjective is interpreted against that backgrounded information.

Why would the adverb's contribution have a different status from that of the adjective? In the literature, there are some similar suggestions that evaluative intensifiers are interpreted as expressive rather than descriptive predicates (e.g. Castroviejo & Gehrke 2019). Additionally, evaluative attributive adjectives tend to favour non-restrictive interpretations, and, conversely, non-restrictive readings of attributive adjectives tend to be evaluative in nature (e.g. Martin 2014, and references therein). Umbach (2012) suggests that this is due to the fact that restrictive interpretations cannot be achieved when the interpretation of the adjective rests on private subjective information. That is, whenever the hearer does not have access to the speaker's extension of the adjective, they favour to interpret the adjective's content as a non-restrictive (side) comment. In what follows, I adopt a similar idea here. The evaluation contributed by the deadjectival adverb is taken as backgrounded information for interpreting the rest of the sentence (viz. the adjective positive form). I should add, though, that I am not in a position to make any strong claims about this special status of the adverbs. As I will show, taking the respective thresholds for the interpretation of the adverb and the adjective to be separate processes makes correct predictions with regards to how deadjectival content translates to intensity. I will remain agnostic, however, what exactly is involved in the backgrounded nature of the adverb's interpretation.

To implement the idea in the Bayesian framework I am assuming here, all we need to do is update the two positive forms successively rather than simultaneously.[19] Let's from now on make the prior explicit whenever we mention ρ. So we write $\rho(s|(\varphi, c), Q^A_X, \mathscr{P})$ for the probability that the actual world is in s, given that a message with meaning φ and cost c was uttered in a context with QUD Q^A_X and prior expectations $\mathscr{P}$. For a combination $D\,A$ of a deadjectival intensifier and adjective A we now get two updates. First, there is the update of the original prior P, resulting in the following posterior, which we will call Π:

19 As observed by an anonymous reviewer, this move breaks with the essential pragmatic character of Lassiter & Goodman's model and it would perhaps be more in line with a framework where the update to posterior distributions of threshold values is part of semantics and, so, where the posterior associated to the adverb is more easily seen as being compositionally fed as a prior to the positive form semantics of the adjective. See Qing (2020) for an example of such a framework.

Note at the same time that my use of the term 'backgrounding' suggests that the interaction between the adverb and the adjective is more pragmatic than semantic in nature. That is, one could see the contribution of the adverb to indicate what prior the speaker intends the hearer to update when pragmatically interpreting the positive form of the adjective. This is compatible with an entirely compositional approach where the at issue contribution of the adverb is vacuous but where it functions to signal background assumptions by the speaker.

(50) $\Pi = \lambda s.\rho(s|(\mu_D(\lambda w.\mu_A(x)(w) = \mu_A(x)(@)) \geq \theta_j, c'), Q^A_X, P)$

This distribution over cells in the QUD is subsequently updated with the positive form of the adjective, resulting in the following final posterior:

(51) $\rho(s|(\mu_A(x) \geq \theta_i, c), Q^A_X, \Pi)$

Let us first have a look at the prior Π within this final posterior, the backgrounded information that the threshold for the adverb is met. This prior can be compared to what happens when a QUD about A is answered by the evaluation D. For instance, if the QUD is something like (52a), this prior can be compared to what happens when this QUD is answered using (52b).

(52) a. How warm is it today?
b. It's horrible!
c. $\rho(s|(\mu_{horrible}(s) \geq \theta, c), Q^{warm}_X, P)$

The effect of (52b) in this context is modeled as (52c). Once more taking P to be the (discrete approximation of a) z distribution, (52c) (i.e. the prior for the ρ in (52)) results into Figure 6.

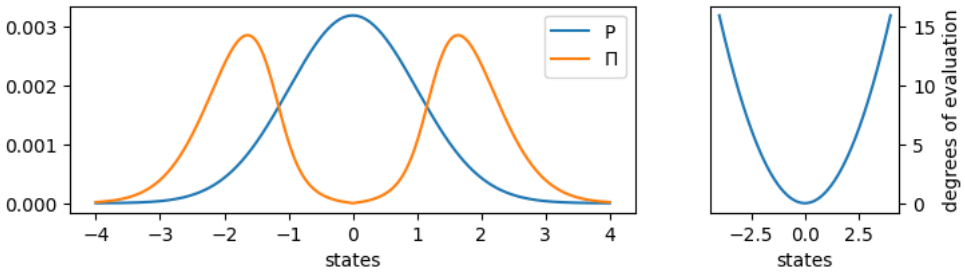

Figure 6 Model predictions of (52c). The right panel shows the evaluative measure function used for this prediction, which is the same as shown in Figure 4. The left panel shows the update of the prior P, producing the posterior ρ that we named Π above. (For this plot λ was set to 3, and c to 3.)

The predictions in Figure 6 are in line with intuitions. A simple evaluation of the temperature as *horrible* is compatible with either particularly low or particularly high degrees. The effect of now taking (52c) as background (i.e. prior) to a subsequent update of the adjective positive form is illustrated in Figure 7. The effect of backgrounding the evaluative information results in an intensified interpretation of the adjective positive form that is only compatible with high degree, as is desired. Also,

compare the interpretation of the bare adjective in Figure 3 to the final posterior in (51). As can be clearly seen, the effect of intensification with *horrible* is stronger than the effect of the simple unmodified positive form.

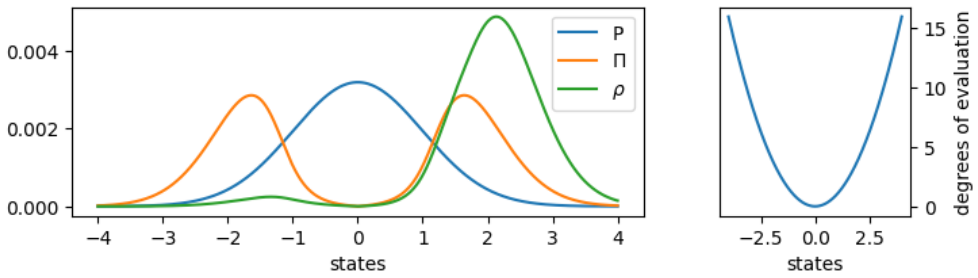

Figure 7 Model predictions of (51). The right panel shows the evaluative measure function used for this prediction, which is the same as shown in Figure 4. The left panel shows the update of the prior P (z-distribution), the intermediate prior Π resulting from updating P with the positive form of the adverb and the final posterior ρ resulting from updating *that* prior with the positive form of the adjective. (For this plot λ was set to 4, and costs to 5.)

What about a positive evaluation? To model something like *pleasantly* (or the evaluation made by intensifiers like *fairly*, *pretty* before they were bleached), I handcrafted a function[20] that assigns high degrees to moderate values and low degrees (closer to 0) to extreme values. The model predictions are in Figure 8. Note that the mean expected temperature for *pleasantly warm* in that figure is comparable to that of *warm* in Figure 3, but that the curve is much narrower. This, too, is largely in line with the desired effect of such an M-adverb.

I should stress immediately that the model predictions I have presented in figures 3-8 can only be seen as a *proof of concept*. They show that a pragmatic theory along the lines of (my adaptation of) Lassiter & Goodman (2017) makes predictions that go in the direction of what we observe. Explicit support for *this* particular theory of positive forms, however, would need to come from experimental data that links together evaluative judgements of particular situations (replacing the handcrafted functions used above) and judgements of interpretation of sentences with intensifiers.

20 This is the probability density function of a normal distribution with mean 0.2 and a standard deviation of 0.2.

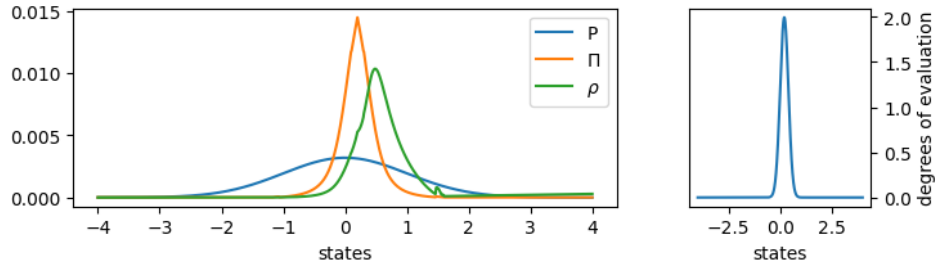

Figure 8 Model predictions for positive evaluation. (For this plot λ was set to 4 and costs to 5.)

5 Towards Zwicky's generalisation

The analysis above straightforwardly accounts for why the lexical semantics of the adjectival base of unbleached adverbs determines their degree of intensification. It also accounts for why the intensification of bleached adverbs is still partly linked to the semantics of their base. As such, the analysis accounts for the Goldilocks effect, which was one of my main goals. As we will see, the final of my desiderata, explaining Zwicky's generalisation, will be more challenging. In this section, I will offer a proposal which I think is intuitively appealing and is fully in line with the semantic and pragmatic framework I developed above. However, I will also discuss a number of pitfalls and complications.

5.1 An intuition: positive modals make vacuous intensifiers

Recall that in the proposal above the interpretation of adverb-adjective pairs involves two subsequent updates, first with the adverbial content, then with the adjectival content. So, the interpretation of such a pair provides an update from prior expectations about the QUD to a posterior, via an intermediate posterior corresponding to the information contributed by the adverb. Let's now assume, contrary to fact, that a positive modal adverb like *usually is* an intensifier. According to the above proposal, that would mean that the interpretation of something like *usually tall* would start with updating with the information that the probability distribution over the QUD partition is "usual". What would the effect of such an update be? The assumption is that before the hearer starts interpreting, the prior expectations are that things are usual, expected, normal etc., whatever the hearer may think normality looks like. So, the presumption that things are usual, as expressed by the adverb *usually*, fails to contribute anything new. The probability that the real world is in s, given that things are "usual" is exactly $P(s)$. In effect, this renders the contribution by the adverb

vacuous. This is the intuition, I propose, for why an adverb like *usually* is not an intensifier. For if it were an intensifier, its function would be vacuous in the sense that *usually tall* is indistinguishable from unmodified *tall*. The same line of argument can be used for *expectedly*, *normally*, etc.

To cast this intuition in terms of my proposal for evaluatives in section 4, recall first that my assumption was that the adverb and adjective are responsible for two consecutive Bayesian updates. The adverb makes sure that the adjective is interpreted with respect to a prior that takes the meaning of the adverb for granted. Normally, meanings trigger updates that constitute a shift in our subjective probabilistic beliefs about the space of possibilities. That is, something is meaningful if it results in a change with respect to the prior. The issue with positive modal adverbs like *usually* is that they convey the prior. As a result, whenever an adjective A is modified by a positive modal adverb U, there is no difference between an update of the prior with just A and an update of the prior with first U and then A.

Note that not all positive modal adverbs express normality. A case in point is a modal like *possibly*. But here the vacuity follows straightforwardly as well, if we assume that "possible" simply filters out states that are deemed impossible. This presumably leaves the states that have non-zero probability according to our prior expectations, which in effect means that the prior remains unaffected.

The intuition I'm appealing to also explains why negated modal adjectives *do* turn into intensifying adverbs. Saying that things are unusual, abnormal, atypical, etc. is informative w.r.t. the prior. In fact, it conveys a significant deviation from prior expectations. As a result, an adjective modified by such adverbs will be interpreted quite differently from the bare form of that adjective. What I am assuming here is that the lower the prior probability assigned to a state, the higher the degree of *unusualness* attributed to it. In other words, the corresponding measure function has a shape similar to that of negative evaluatives like *horribly*. As a result, intensifiers like *unusually* will therefore have an effect similar to that of negative evaluatives.

Finally, note that the vacuity account sketched here does not extend to positive evaluative adverbs. As I showed above, backgrounding that things are *pleasant* for instance, *is* informative and results in a (moderately) intensified meaning.

5.2 A closer look

As appealing as the above intuitions may be, we run into several complications once we try to precisify them. The main issue is that it is very hard to show that the update triggered by an intensifying positive modal adverb is indeed vacuous. To see this, consider the following question-answer pair.[21]

21 Thanks to Ciyang Qing for enlightening discussion of this point.

(53) a. How warm is it, today?
b. It's normal.

As an answer to (53a), (53b) is perfectly felicitous and informative. But this means that if we want to develop an account of Zwicky's generalisation along the lines explained above, the contribution made by a positive modal adverb modifying an adjective would need to be quite different from the bare positive modal adjective in (53b). The adjective *normal* is presumably in its positive form here, so the answer draws attention to worlds that stand out w.r.t. how normal they are (temperature-wise). This is not the prior, but a much more tight probability distribution favouring worlds that are particularly normal. This explains why the answer in (53b) is informative.

Given this observation, the account of Zwicky's generalisation sketched above can only work if there is some crucial difference between predicative bare adjectives like *normal* in (53b) and adverbs like *normally* in ad-adjectival positions. Furthermore, such adverbs would need to be different from adverbs in that position that do receive intensifying meanings, given that our analysis rests on the assumption that intensifying deadjectival adverbs have positive form meanings. If an adverb like *normally* can receive a positive form (*standing out*) interpretation in an intensifying position, then the vacuity argument will not be able to go through.

The literature contains suggestions that modal adverbs are quite different from modal adjectives, especially with respect to the subjectivity / objectivity of their interpretation. (See Yatsushiro et al. 2022 and references therein.) There are also indications that positive modal adverbs are more resistant to gradability than are modal adjectives.[22]

(54) She (*very) normally / usually takes a bus home.

(55) It is very normal / usual for her to take a bus home.

A possible account could now be as follows. Modal adverbs are not gradable, so they do not have positive forms. As a result, their contribution is not to convey that things have a relatively high degree of normality, but rather to convey a much more general meaning of normality. This is exactly the meaning that I argued above to be vacuous.

I think contrasts like (54)/(55) suggest that a direct comparison between (53) and sentences like *It is normally warm* shouldn't be taken to be indicative of much. At the same time, I should immediately confess that I have no deep understanding of why positive modal adverbs are non-gradable and what that means in detail for their interpretation. Also, as an anonymous reviewer helpfully points out, positive modal

22 The following discussion greatly benefited from input from 3 anonymous reviewers.

adverbs have further special and ill-understood properties beyond those that are part of Zwicky's generalisation. In particular, they function completely differently from their negative counterparts. While positive modal adverbs function as sentence modifiers, the negative ones lack similar functions. For instance, (56) and (57) do not express the same kind of meaning. While (56) conveys that the shining sun that morning was an unusual event, (57) can only be interpreted habitually. The parenthetical phrase is only felicitous if we interpret the sentence in a groundhog day-like scenario: typical versions of that particular morning are such that it was cloudy at 9am.

(56) Unusually, the sun was shining (that particular morning at 9am).

(57) Usually, it was cloudy (#that particular morning at 9am).

We saw that there is a promising route to explaining Zwicky's generalisation if we assume that positive modal adverbs contribute meanings that coincide with prior beliefs. This route cannot work though if these adverbs express the kind of "standing out" meanings associated to positive forms. Contrasts like (54)/(55) and (56)/(57), however, show that positive modal adjectives and adverbs have different properties that set them apart from their negative and evaluative counterparts. A definitive account of Zwicky's generalisation would need to take into account these differences and offer an understanding to what extent they can predict vacuous meanings when used as degree adverbs.[23]

5.3 Exceptions to Zwicky's generalisation

While I won't be able to offer a detailed account of the special status of positive model adverbs, we can get a glimpse of how this status interacts with the potential to have degree meanings by turning to an exception to Zwicky's generalisation. In German, sentences like (58) are fine and indicate that Fritz's height is normal.

(58) Fritz ist normal groß. (*German*)
Fritz is normal(ly) big.

Note that other positive modal adverbs in German behave just like in English:

23 Non-gradability is probably not directly connected to the habitual function of positive modal adverbs. As Stephanie Solt (p.c.) points out, *commonly* lacks an intensifier use, but is clearly gradable as a sentence adverb. Also, as a sentence adverb it is interpreted habitually.

(i) Sue very commonly takes a bus home.

(59) Fritz ist gewöhnlich groß. (*German*)
Fritz ist usually big.
Usually, Fritz is tall.
Not: *Fritz's height is usual*

(60) Sue is usually tall.
Cannot mean: *Sue's height is usual*

Interestingly, I have some indication that German *normal* is different from other positive modal adverbs in two respects that I touched upon above. First of all, there is a clear difference between (61) and (62). In the latter, the adverb behaves in similar ways to English *normally* and *usually* in that it triggers a habitual reading: usual training sessions were training sessions where Miedema joined. In contrast, (61) has a reading that is not habitual.

(61) Miedema hat normal mittrainiert.
M. has normally with-trained
Miedema joined the training, like normal

(62) Miedema hat gewöhnlich mittrainiert.
M. has normally with-trained
Usually, Miedema joined the training.

What's more, *normal* in (61) is gradable, while *gewöhnlich* in (62) is not:

(63) Miedema hat ganz normal mittrainiert.
M. has totally normally with-trained
Miedema jointed the training in a very normal way

(64) *Miedema hat ganz gewöhnlich mittrainiert.
M. has totally normally with-trained

In other words, the German exception seems to support the idea that there is something special about the positive modal adverbs in Zwicky's generalisation. My speculation is that this special status is responsible for the vacuity of the contributed meaning in intensifying position.

Given the fact that *gewöhnlich* behaves just like positive modals in English, I am inclined to think it is best to account for the behaviour of German *normal* as an individual exception, rather than trying to include this behaviour in the empirical scope of an account of deadjectival adverbs of degree. A reviewer of an earlier version of this article wondered whether apparent counterexamples could not be reason to revisit an approach akin to the intersective analysis I presented in section 3.2. An analysis along those lines may be able to account for (58), for it would simply entail that Fritz is both normal and tall. While I think the observations in (61)-(64)

(absent from the version seen by the reviewer in question) make a reasonable case that German *normal* is an outlier as far as positive modal adverbs go, I do think it is worthwhile to point out that individual exceptions do not make the intersective account in 3.2 more attractive. Most importantly, that analysis would predict readings such as those found for (58) across the board, including for examples like (59) and (60). In other words, the expectation would be that Zwicky's generalisation simply does not exist. This seems wrong to me. Examples like (58) are the exceptions; most other combinations of positive modals and adjectives lack degree readings. Another reason that this kind of approach is not very promising is that it is questionable whether it would accurately account for (58). According to the intersective account, this sentence should entail that Fritz is tall, but it is questionable whether it does, given that it only seems to convey that he has a normal height.

That said, cases like (58) and the observations in (61)-(64) highlight that my approach to Zwicky's generalisation comes with at least two demands for future research. We should try and understand how positive modal adverbs are different from negative modal adverbs (and non-modal adverbs more generally). At the same time, we should aim to better understand how exceptions to Zwicky's generalisation differ from those that are in line with that generalisation.

6 Conclusion and discussion

My aim in this work was to provide an account of how the intensifying meaning of some deadjectival adverbs is linked to the meaning of their adjectival base. I proposed that combinations of deadjectival intensifiers and adjectives comprise two positive form interpretations and that this combination explains the Goldilocks effect. Because the meanings involved in the proposal are vague, it is not always easy to generate more specific predictions. As I showed, a pragmatic theory of vagueness, such as that of Lassiter and Goodman, could (to some extent at least) help. I presented a proof of concept that shows that the probabilistic predictions are in line with our intuitions. More importantly, adopting the Bayesian pragmatic framework also offers an intuition for what is behind Zwicky's generalisation.

There are two serious limits to my proposal. First of all, everything I said here applies to English and may only have limited relevance to different languages. As I showed above, Dutch and German share the Goldilocks effect with English, but beyond those languages deadjectival intensifiers tend to be rarer and (thus) the Goldilocks effect is difficult to establish. (In particular, I found that positive valence evaluative intensifiers are much rarer outside of English, Dutch and German).

The other limit to my proposal is that I have only given an account of intensional deadjectival intensifiers. In particular, I have not said anything about intensifiers derived from dimensional adjectives. I will leave this class for further research, but

have two preliminary thoughts. First of all, it seems to me that dimensional adverbs are quite different from the intensional ones in the sense that they seem *iconic* in nature. That is, their use as intensifiers is only possible if the situation they describe could be conceptualised as having a considerable size. For instance, (65) is felicitous with *expensive* because we can conceptualise the expense as being huge. (You could for instance visualise the heap of money needed to pay for it.) We cannot do the same for *cheap*. If something is exceptionally cheap, then it doesn't come with something that can be (easily) conceptualised as being particularly big.

(65) This is hugely expensive / #cheap.

Another illustration of this is in (66) and (67). In (66), we can conceptualise how much time the event in question takes. If time passes slowly, then the event will take long and is conceptualised to be longer. Conversely, if time passes quickly, then the event will be perceived to be short and so conceptualising it as something gigantic is hard. In contrast to (66), things are reversed for (67), where the focus is more on Sue's speed. Here, high speed is easier to conceptualise as something big, for instance, because we can look at the speedometer and map the values on that speedometer to sizes.

(66) Time passed gigantically slowly / ??fast.

(67) Sue was going gigantically ??slow / fast.

All this is reminiscent of intensification by means of prosodic lengthening. Saying that a meeting was *loooong* expresses a higher degree of length than saying that it was simply *long*. As Fuchs et al. (2019) show, this type of intensification tends to be iconic. They found that adjectives like *long* contain letter reduplications (the written language counterpart of prosodic lengthening) significantly more often than adjectives like *short*, presumably since it is harder to conceptually link something particularly short to something long. They also found for instance that *slow* is more readily lengthened when compared to *fast*, again because slow things take more time and, as such, are longer.

If my intuitions are on the right track, then dimensional adverbs need an altogether different theory from the one I have been outlining above. Dimensional adverbs, I hypothesise, intensify iconically. As such, a theory for them should contain ideas of how iconicity enters into the semantics. Interestingly, however, it does seem to me that we see something quite similar to Zwicky's generalisation when we turn to dimensional adverbs. All examples of dimensional intensification that I've given concern just one adverb from a pair of antonym adverbs. In contrast to modal

adverbs, however, positive dimensional adverbs have intensifying functions while the corresponding negative antonyms do not turn into intensifiers:[24]

(68) ?Portobello mushrooms are narrowly available in the UK.

(69) #Fritz was shallowly / lowly troubled by the affair.

At this moment in time, I don't know whether this is just an accident or whether the observations in (68) and (69) need to be subsumed under Zwicky's generalisation.

7 Appendix: details of the models

The definitions for the basic setup of RSA models (Goodman & Frank 2016) are given in (70). Here $S(s,\varphi)$ is 1 whenever φ is true in every world in s (i.e. s entails φ) and 0 otherwise.

(70)
$$\begin{aligned}
\pi(s|(\varphi,c),Q,\ldots) &= \frac{P(s)S(s,\varphi)}{\sum_{s'\in Q}P(s')S(s',\varphi)}\\
U(s,(\varphi,c),Q) &= \ln(\pi(s|(\varphi,c),Q,\ldots)) - c\\
\sigma((\varphi,c)|s,Q,\ldots) &= \frac{e^{\lambda U(s,(\varphi,c),Q)}}{\sum_{(\varphi',c')\in M} e^{\lambda U(s,(\varphi',c'),Q)}}\\
\rho(s|(\varphi,c),Q,\ldots) &= \frac{P(s)\sigma((\varphi,c)|s,Q,\ldots)}{\sum_{s'\in Q}P(s')\sigma((\varphi,c)|s',Q,\ldots)}
\end{aligned}$$

Here, P is the prior probability distribution over cells in the QUD and π is the literal interpretation of a message with meaning φ. The function U calculates the utility of a messages with such meaning if it has cost c. Based on this, the speaker model σ applies the softmax function parametrised with a factor λ to regulate the extent to which the speaker maximises utility. Finally, ρ applies Bayes' law to arrive at a posterior distribution over the cells in the QUD.

The definitions in (71) provide the definitions for interpreting positive forms in a similar setup, following Lassiter & Goodman (2017). Note that contrary to Lassiter & Goodman, I am assuming that the QUD-induced space Q is discrete rather than dense. This seems to me to be reasonable, given the normal reliance of interlocutors on levels of granularity. The setup assumes two messages: the positive form and an alternative tautological message without cost. (Alternatively, the antonym of the message could also have been taken into account as an alternative message. Nothing hinges on the choice not to do this here.)

24 Note that some such antonyms do play a role in L-adverbs like *a little bit*, *a tiny bit* etc. But these cases are clearly morphologically more complex and they are also not intensifiers.

$$
\begin{array}{lcl}
\pi(s|(\mu_A(x) \geq \theta, c), Q_X^A, \theta) & = & \frac{P(s)S(s,\mu_A(x)\geq\theta)}{\sum_{s' \in Q} P(s')S(s',\mu_A(x)\geq\theta)} \\
\sigma((\mu_A(x) \geq \theta, c)|s, Q_X^A, \theta) & \propto & e^{\lambda(\ln(\pi(s|(\mu_A(x)\geq\theta,c),Q_X^A))-c)} \\
\rho(s|(\mu_A(x) \geq \theta, c), Q_X^A, \theta) & = & \frac{P(s)\sigma((\mu_A(x)\geq\theta,c)|s,Q_X^A)}{\sum_{s' \in Q_X^A} P(s')\sigma((\mu_A(x)\geq\theta,c)|s',Q_X^A)} \\
\rho(s|(\mu_A(x) \geq \theta, c), Q_X^A) & = & \sum_\theta \frac{P(s)\sigma((\mu_A(x)\geq\theta,c)|s,Q_X^A)}{\sum_{s' \in Q_X^A} P(s')\sigma((\mu_A(x)\geq\theta,c)|s',Q_X^A)}
\end{array}
\tag{71}
$$

$$
\begin{array}{lcl}
\pi(s|(\top, 0), Q_X^A, \theta) & = & \frac{P(s)}{\sum_{s' \in Q} P(s')} = P(s) \\
\sigma((\top, 0)|s, Q_X^A, \theta) & \propto & e^{\lambda(\ln(P(s))} \\
\rho(s|(\top, 0), Q_X^A, \theta) & = & \frac{P(s)\sigma((\top,0)|s,Q_X^A)}{\sum_{s' \in Q_X^A} P(s')\sigma((\top,0)|s',Q_X^A)} \\
\rho(s|(\top, 0), Q_X^A) & = & \sum_\theta \frac{P(s)\sigma((\top,0)|s,Q_X^A)}{\sum_{s' \in Q_X^A} P(s')\sigma((\top,0)|s',Q_X^A)}
\end{array}
$$

For the interpretation of combinations of a deadjectival adverb and an adjective, the following represents the initial model where we simply take two positive forms into account, that of the adverb and that of the adjective.

$$
\begin{array}{l}
\rho(s|(\mu_A(x) \geq \theta_i \wedge \mu_D(\lambda w.\mu_A(x)(w) = \mu_A(x)(@)) \geq \theta_j, c), Q_X^A) \\
\propto \sum_{\theta_i} \sum_{\theta_j} \rho(s|(\mu_A(x) \geq \theta_i \wedge \mu_D(\lambda w.\mu_A(x)(w) = \mu_A(x)(@)) \geq \theta_j, c), Q_X^A, \theta_i, \theta_j)
\end{array}
\tag{72}
$$

In the final proposal, we have two subsequent updates.

$$
\begin{array}{lcl}
\Pi & = & \rho(s|(\mu_D(\lambda w.\mu_A(x)(w) = \mu_A(x)(@)) \geq \theta_j, c), Q_X^A, \theta_j, P) \\
 & \propto & \sum_{\theta_j} P(s)\sigma((\mu_D(\lambda w.\mu_A(x)(w) = \mu_A(x)(@)) \geq \theta_j, c)|s, Q_X^A, \theta_j, P)
\end{array}
\tag{73}
$$

$$
\begin{array}{l}
\rho(s|(\mu_A(x) \geq \theta_i, c), Q_X^A, \theta_i, \theta_j, \Pi) \\
\quad \propto \sum_{\theta_i} \Pi(s)\sigma((\mu_A(x) \geq \theta_i, c)|s, Q_X^A, \theta_i, \Pi)
\end{array}
$$

References

Bäcklund, Ulf. 1973. *The collocation of adverbs of degree in english*. Acta Universitatis Upsaliensis.

Bardenstein, Ruti & Mira Ariel. 2022. The missing link between truth and intensification. *Studies in Language* 46(2). 285–322.

Beltrama, Andrea & Laura Staum Casasanto. 2017. *Totally* tall sounds *totally* younger: Intensification at the socio-semantics interface. *Journal of Sociolinguistics* 21(2). 154–182. https://doi.org/10.1111/josl.12230. https://onlinelibrary.wiley.com/doi/10.1111/josl.12230.

Bennett, Erin & Noah Goodman. 2018. Extremely costly intensifiers are stronger than quite costly ones. *Cognition* 178. 147–161.

Biedermann, Reinhard. 1969. *Die deutschen gradadverbien*. Universität Heidelberg.

Bolinger, Dwight. 1972. *Degree words*. Den Haag: Mouton.

Borst, E. 1902. *Die gradadverbien im englischen*. Heidelberg: Anglistische Forschungen.

Castroviejo, Elena & Berit Gehrke. 2019. Intensification and secondary content: A case study of catalan good. In *Secondary content*, 107–142. Brill.

Castroviejo-Miró, Elena. 2012. Gradation in modified adjps. In *Semantics and linguistic theory*, vol. 22, 83–103.

Égré, Paul. 2017. Vague judgment: a probabilistic account. *Synthese* 194(10). 3837–3865.

Fuchs, Susanne, Egor Savin, Stephanie Solt, Cornelia Ebert & Manfred Krifka. 2019. Antonym adjective pairs and prosodic iconicity: Evidence from letter replications in an english blogger corpus. *Linguistics Vanguard* 5(1).

Gary, Edward. 1979. *Extent in English: A unified account of degree and quantity*: University of California, Los Angeles dissertation.

Goodman, Noah & Michael Frank. 2016. Pragmatic language interpretation as probabilistic inference. *Trends in Cognitive Sciences* 20(11). 818–829.

Katz, Graham. 2005. Attitudes toward degrees. In Maier, Bary & Huitink (eds.), *Proceedings of sub 9*, Nijmegen: Radboud Universiteit Nijmegen.

Kennedy, Christopher. 2007. Vagueness and grammar: the semantics of relative and absolute gradable adjectives. *Linguistics and Philosophy* 30(1). 1–45. https://doi.org/10.1007/s10988-006-9008-0. https://doi.org/10.1007/s10988-006-9008-0.

Kennedy, Christopher & Louise McNally. 2005a. Scale Structure, Degree Modification, and the Semantics of Gradable Predicates. *Language* 81(2). 345–381. https://www.jstor.org/stable/4489896.

Kennedy, Christopher & Louse McNally. 2005b. Scale structure, degree modification and the semantics of gradable predicates. *Language* 81(2). 345–381.

Klein, Ewan. 1980. A semantics for positive and comparative adjectives. *Linguistics and Philosophy* 4. 1–45.

Klein, Henny. 1998. *Adverbs of degree in dutch and related languages*: Rijksuniversiteit Groningen dissertation.

Lassiter, Daniel & Noah D. Goodman. 2017. Adjectival vagueness in a Bayesian model of interpretation. *Synthese* 194(10). 3801–3836. https://doi.org/10.1007/s11229-015-0786-1. https://doi.org/10.1007/s11229-015-0786-1.

Martin, Fabienne. 2014. Restrictive vs. nonrestrictive modification and evaluative predicates. *Lingua* 149. 34–54.

Mohammad, Saif M. 2018. Obtaining reliable human ratings of valence, arousal, and dominance for 20,000 english words. In *Proceedings of the annual conference of the association for computational linguistics (acl)*, Melbourne, Australia.

Morzycki, Marcin. 2004. Evaluative adverbial modification in the adjectival projection. Ms., Université du Quebec à Montréal.

Morzycki, Marcin. 2008. Adverbial modification of adjectives: Evaluatives and a little beyond. In Johannes Dölliing & Tatjana Heyde-Zybatow (eds.), *Event structures in linguistic form and interpretation*, Berlin: Mouton de Gruyter.

Mustanoja, Tauno F. 1960. *A middle english syntax: Parts of speech*. John Benjamins Publishing Company. Reissued 2016.

Nouwen, Rick. 2005. Monotone amazement. In Paul Dekker & Michael Franke (eds.), *Proceedings of the fifteenth Amsterdam Colloquium*, ILLC.

Nouwen, Rick. 2010. Degree modifiers and monotonicity. In Paul Egré & Nathan Klinedinst (eds.), *Vagueness and language use*, Palgrave McMillan.

Nouwen, Rick. 2013. Best nogal aardige middenmoters: de semantiek van graadadverbia van het middenbereik. *Nederlandse Taalkunde* .

Nouwen, Rick. 2018. A note on positive and negative evaluative adjectives. In Ceupens et al. (ed.), *A coat of many colours*, https://dj60.be/.

Nouwen, Rick. 2024. Meiosis and hyperbole as scalar phenomena. In Kristina Liefke, Daniel Gutzman, Renate Agans & Tatjana Scheffler (eds.), *Proceedings of sinn und bedeutung 28*, 1–15. Universitaet Konstanz.

Paradis, Carita. 1998. *Degree modifiers of adjectives in spoken British English* Lund Studies in English. Lund University Press.

Pertejo, Paloma Núñez & Ignacio M Palacios Martínez. 2014. That's absolutely crap, totally rubbish: The use of the intensifiers absolutely and totally in the spoken language of british adults and teenagers. *Functions of Language* 21(2). 210–237.

Piñón, Christopher. 2005. Comments on Morzycki and Katz. Presented on March 19, 2005 at the workshop on the semantics of adjectives and adverbs, Barcelona.

Qing, Ciyang. 2020. *Semantic underspecification and its contextual resolution in the domain of degrees.*: Stanford University dissertation.

Qing, Ciyang. 2021. Zero or minimum degree? Rethinking minimum gradable adjectives. *Proceedings of Sinn und Bedeutung* 25. 733–750. https://doi.org/10.18148/sub/2021.v25i0.964. https://ojs.ub.uni-konstanz.de/sub/index.php/sub/article/view/964.

Qing, Ciyang & Michael Franke. 2014. Gradable adjectives, vagueness, and optimal language use: A speaker-oriented model. In *Semantics and linguistic theory*, vol. 24, 23–41.

Rissanen, Matti. 2008. From 'quickly'to 'fairly': On the history of rather. *English Language & Linguistics* 12(2). 345–359.

Rotstein, Carmen & Yoad Winter. 2004. Total adjectives versus partial adjectives: scale structure and higher-order modifiers. *Natural Language Semantics* 12. 259–288.

Sæbø, Kjell Johan. 2010. On the semantics of "embedded exclamatives". *Studia linguistica* 64(1). 116–140.

Solt, Stephanie. 2012. Comparison to Arbitrary Standards. *Proceedings of Sinn und Bedeutung* 16(2). 557–570. https://ojs.ub.uni-konstanz.de/sub/index.php/sub/article/view/447.

Solt, Stephanie. 2018. Multidimensionality, subjectivity and scales: Experimental evidence. *The semantics of gradability, vagueness, and scale structure: Experimental perspectives* 59–91.

Solt, Stephanie & E Cameron Wilson. 2021. M-modifiers, attenuation and polarity sensitivity. In *Proceedings of sinn und bedeutung*, vol. 25, 787–804.

Stoffel, Johannes. 1901. *Intensives and down-toners*. Heidelberg: Carl Winter.

Umbach, Carla. 2012. Non-restrictive modification by evaluative predicates. Talk presented at the workshop Information, Discourse Structure and Levels of Meaning, Barcelona, October 25–26.

Van Os, Charles. 1989. *Aspekte der intensivierung im deutschen*. Narr Tübingen.

Wheeler, S.C. 1972. Attributives and their modifiers. *Nous* 6. 310–334.

Yatsushiro, Kazuko, Tue Trinh, Marzena Żygis, Stephanie Solt, Anton Benz & Manfred Krifka. 2022. Certainly but not certain: The expression of subjective and objective probability. *Glossa: a journal of general linguistics* 7(1).

Zwicky, Arnold. 1970. *Usually* and *unusually*. *Linguistic Inquiry* 1(1). 145.

Rick Nouwen
Trans 10
3512JK Utrecht
The Netherlands
r.w.f.nouwen@uu.nl