Gradation in modified AdjPs *

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Abstract The goal of this paper is to gain a better understanding of the composition processes underlying DegPs headed by *how* that include an adjective that is in turn modified. These include *how extremely high, how politically incorrect* and *how damn important*. The focus here is on adverbs such as *extremely*, which have been used in the literature on exclamatives as a test of exclamativity, but which have not been given to this date a compositional semantics. I argue that, even if this has been challenged in the literature for Remarkably adverbs such as *surprisingly*, *extremely* is a degree predicate, where degrees are not construed as positive numbers on a scale, but rather as equivalence classes of individuals (Cresswell 1976). This research has interesting ramifications for the analysis of degree expressions (*how* and *so* vs. *very* and *enough*) and for the distinction between interrogative and exclamative clauses.

Keywords: modification, gradability, adverbs, adjectives, *wh*-interrogatives, *wh*-exclamatives, *so*, *how*, extremely

1 Introduction

This paper is concerned with DegPs (degree phrases) such as *extremely high*, *politically incorrect*, *beautifully phrased* and *damn important*, as illustrated in (1).

(1) a. I can't believe how *extremely* high this building is.

　　b. I know how *politically* incorrect this decision is.

　　c. How *beautifully* phrased these lyrics are!

　　d. She never realized how *damn* important this book was to me.

　　All these DegPs are headed by the degree word *how*, which contains an adjective that is in turn modified. In the domain of the semantics of stative predicates

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(Maienborn 2005; Rothstein 2005; Katz 2003), the modification of adjectives by adverbs has been rarely looked at in depth (but see Ernst 2011). Mostly, whether or not a predicate can be modified by a (manner) adverb has been used as a test of eventivity. An exception to this would be the research on degree semantics, where some work has been conducted on adverbs such as *surprisingly*, which are construed as degree modifiers (Katz 2005; Nouwen 2005, 2011; Morzycki 2008; de Vries 2010), and to which we return in section 2. DegPs headed by *how* whose adjectives are modified by *extremely* have received some attention in the literature on exclamatives (Elliott 1974; Zanuttini & Portner 2003; Rett 2008). For instance, the occurrence of *extremely* suggests that the *wh*-clause in (1a) conveys that the degree to which the building is high exceeds a standard of height. Even some recent literature (D'Avis 2002; Abels 2004, 2010; Castroviejo 2008; Chernilovskaya 2011) has attempted to account for the contribution of such adverbs appealing to notions such as presupposition and conventional implicature, but to this date, there is no compositional semantics of the DegP headed by *how*. My purpose here is twofold: First, I want to devote some time to discussing the semantic composition of these DegPs to show that their different interpretation depends on their different syntax. Second, I would like to concentrate on examples such as (1a) to understand what underlies the exclamative component that *extremely* contributes to *wh*-clauses.

Below are the claims that are argued for in this paper:

i. The DegPs illustrated in (1) can be classified according to how composition proceeds: *extremely* and *beautifully* pattern together in being directly modified by the degree head *how*; *politically* combines first with the adjective and then the entire adjective phrase (AdjP) is the complement of *how*; *damn* is an expressive. As such, it undergoes a separate composition and does not contribute to the main assertion.

ii. Extremely adverbs (e.g., *extremely*) share with Remarkably adverbs (e.g., *surprisingly*) a number of features, including that their core adjective is evaluative in the sense of Bierwisch (1989). However, Extremely adverbs are not propositional. They are degree predicates, where degrees are interpreted as equivalence classes of individuals (Cresswell 1976).

iii. *How* and *so* pattern together in not imposing any truth-conditional meaning constraints based on the choice of a reference point that involves an evaluation (Neeleman, van de Koot & Doetjes 2004).

iv. The infelicity of *how*-interrogatives with Extremely adverbs follows from the incompatibility of the semantics of Extremely adverbs with the pragmatics of questioning (Abels 2004).

This paper is organized as follows: I start by sketching a few background assumptions and previous literature. In section 3, I propose a classification of the different types of DegPs according to their mode of composition, and explain how their different properties are derived. In section 4, the focus is placed on Extremely adverbs such as *extremely*.[1] Essentially, a comparison is established with Remarkably adverbs such as *surprisingly*, which leads us to the controversial issue of whether we can describe a degree as surprising or extreme. In section 5, *how* and *so* are compared to other degree words such as *very*. Section 6 raises the question of how and why *extremely* is a test for exclamativity. Section 7 wraps up and suggests future research.

2 Background

Throughout this paper I will assume that gradable adjectives denote relations between individuals and degrees, as shown in (2) following relatively common practice (see a.o. Seuren 1973; Cresswell 1976; von Stechow 1984; Heim 1985; Kennedy & McNally 2005).

(2) $[[\text{tall}]] = \lambda w \lambda d \lambda x [\textbf{height}_w(x) = d]$

Above, the gradable predicate *tall* invokes a measure function *height*, which is applied to an object of type *e* and returns the degree to which it is tall (i.e., its height).

An additional preliminary note has to do with the semantics of *how*-clauses. I adopt a semantics for *wh*-interrogatives *à la* Hamblin (1973); i.e., they denote a set of possible answers of the shape in (3).

(3)   a. Bill wonders [how high this building is].

        b. $\lambda p.\exists d \ [p = \lambda w [\textbf{height}_w(\textbf{this-building}) = d]]$

Although not much has been said about Extremely adverbs such as *extremely*, some literature has focused on so-called *Remarkably adverbs* (Nouwen 2005, 2011; Katz 2005; Morzycki 2008; de Vries 2010).[2]

Morzycki (2008) notes that Remarkably adverbs such as *surprisingly, incredibly* or *remarkably* participate in complex syntactic constructions where they modify gradable adjectives, but they can also be modified, as shown in (4).

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1 These do not correspond to Morzycki's (2010) *Extreme degree modifiers* like *down-right, flat-out* or *full-on*. I focus on deadjectival adverbs like *extremely*, which are themselves gradable. A few more are listed in section 4.

2 I follow Morzycki in calling them *Remarkably* adverbs instead of *Evaluative* adverbs as Nouwen and De Vries do, to avoid confusion with other notions of evaluativity such as the ones employed by Bierwisch (1989) and Rett (2008).

(4)   *more remarkably tall, pretty insanely crazy, fairly embarrasingly angry*

These examples deliver at least the two possible structures in (5).

(5)   a. Clyde is [[more remarkably] tall].

        b. Clyde is [more [remarkably tall]].

Morzycki (2008: 4) argues that, while interpretively (5a) and (5b) do not make much of a difference, there are convincing syntactic motivations to rule out (5b). First, if the syntax were as in (5b), we would expect to obtain the ill-formed *taller remarkably*, as shown in (6).

(6)   *Clyde is [tall-er [remarkably *t*]].

Second, if we assume that degree modifiers are heads of a DegP and propose a structure like (5b), then we should assume too that DegPs can select in turn a DegP, which does not seem desirable, as argued by de Vries (2010). She points out that this assumption makes the wrong prediction that the sentences in (7) should be well-formed, contrary to fact.

(7)   a. *Vernon is too six feet tall.

        b. *How six feet tall is Vernon?

Regarding the semantics of Remarkably adverbs, the *naive* idea that degrees can be described as surprising, incredible or remarkable has been convincingly ruled out. In other words, to claim that (8a) can be paraphrased as (8b) or (8c) is too simplistic and yields undesired results.

(8)   From Morzycki (2008: 5)

        a. Clyde is remarkably tall.

        b. It's remarkable that Clyde is as tall as he is.

        c. It's remarkable to be as tall as Clyde is.

Imagine Clyde is 1.30 meters tall and he is a 40-year old male (i.e., he is quite short for his age). If what we mean by (8a) is that Clyde has a degree of tallness that is remarkable, as suggested by (8b) and (8c), then we expect that (8a) should be a good description of the imagined scenario. However, this is not the case. A more extreme case would be one where Clyde's degree of tallness coincides with the number of goals scored at the Champions League Final in 2008 (what Morzycki calls a 'freakish height'). This degree would, again, be remarkable, and yet (8a) would not be a proper way to describe this situation.

Furthermore, if we understand that degrees are positive numbers on an ordered scale, to say that a degree is remarkable or surprising or incredible makes actually no sense, as is illustrated in (9).

(9)   ???12 is remarkable.

As claimed by Katz (2005), in sentences like (8a) there is an *at least* entailment, whereby it is remarkable that Clyde is *at least* as tall as he is. Imagine he is 2 meters tall. What (8a) expresses is that if Clyde had been any taller, this would also have counted as remarkable. Nouwen (2005) (and also Nouwen (2011) and de Vries (2010)) attributes this particular behavior to the monotonicity of both gradable adjectives and Remarkably adverbs. Monotonicity is defined as in (10).

(10)   From Heim 2001
A function f of type $\langle d, \langle e, t \rangle \rangle$ is monotone iff
$\forall x \forall d \forall d'[f(d)(x) = 1 \ \& \ d' \prec d \rightarrow f(d')(x) = 1]$

Gradable adjectives like *tall* are monotone in the sense that if Clyde is 2 meters tall, he is also tall to any degree below 2 meters. Nouwen points out that Remarkably adverbs construed as sentential operators (O) are downward monotone (MON↓), as defined in (11).

(11)   O is MON↓ iff $p \models p' \Rightarrow O(p') \models O(p)$

The monotonicity of gradable adjectives and the one — in the opposite direction — of Remarkably adverbs yield Katz's *at least* entailment. As shown in (12), *remarkably* behaves as a MON↓ O.

(12)   **remarkable**($^\wedge$**height**$(x) = d'$) $\models$ **remarkable** ($^\wedge$**height**$(x) = (d \succeq d')$)

That is, for any individual x and degrees d and d' such that d equals or exceeds d', if it is remarkable that x is high to degree d', this entails that it is also remarkable that x is high to degree d. This elegantly accounts for the fact that we cannot employ (8a) to express that Clyde's freakish degree of tallness is remarkable. *Remarkably* in this approach is a propositional operator — not a degree predicate — and its monotonicity entailments enable the expression of remarkability towards any degree starting at the actual degree of height.

Finally, we want to make sure that the entailment in (13) also holds, to avoid mapping (8a) to the first scenario depicted, where Clyde is remarkably short.

(13)   remarkably tall $\models$ tall

Below I adapt de Vries's (2010) final analysis for (8a).

(14) $\exists d[$**height**$(\mathbf{c}) = d \wedge d \succeq$ **stnd$_{\text{tall}}$** $\wedge$ **remarkable**($^\wedge$**height**$(\mathbf{c}) = d)]$

In prose, (14) states that there is a degree d such that Clyde is tall to degree d, this degree meets or exceeds the standard of tallness, and it is remarkable that

Clyde is tall to degree *d*. As shown in (12), this by itself entails that it is remarkable that Clyde is *at least* as tall as he is. This proposal is able to explain the semantic idiosyncrasies of Remarkably adverbs in a simple way. In section 4, I will evaluate to what extent these ideas can be applied to Extremely adverbs.

3   Classification of DegPs

In this section, a classification is proposed for the examples in (1) based on the mode of composition between the degree head *how*, the adjective and its modifier.[3] The data are classified in the three groups below:

(15)   a. Class I: [how [Adverb Adjective]]

       b. Class II: [how Adjective 2] • [Adjective 1 Adjective 2]

       c. Class III: [[how Adverb] Adjective]

In Class I, the adverb is a predicate modifier that combines first with the adjective, and the resulting gradable expression is the argument of *how*. Class II contains an expressive item in terms of Potts (2005, 2007). Following Potts, I assume that a parallel composition process takes place, whereby Adjective 2 (the non-expressive one) is used twice in the derivation; on the one hand, it is the argument of *how* and in the other hand, it is modified by Adjective 1 (the expressive item). In Class III, there is intensification of the adverb, which is gradable. In what follows, I provide a more detailed characterization of each one of the classes of composition processes.

3.1   Class I

The example of Class I DegPs in (1) is *how politically incorrect*. The main motivation for this mode of composition is that *politically* is not gradable, which follows from it being a domain adverb. When *politically* combines with *correct* — a gradable adjective — then the adverb-adjective combination becomes a gradable AdjP that is the argument of *how*. (16b) is the proposed translation of (16a).

(16)   a. how politically incorrect this decision is

       b. $\lambda p.\exists d[p = \lambda w.\exists e[\mathbf{incorrectness}_w(e) = d \land \mathbf{th}(e, \mathbf{this\text{-}decision}) \land \mathbf{under}(e, c*) \land \mathbf{cr}(\mathbf{political}, c*)]]$

The *how*-clause denotes a set of propositions that vary according to the value of *d*, which corresponds to the degree of incorrectness of an event whose theme is the

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3 In this paper, I do not deal with the fine grained syntax of these constructions. I refer the interested reader to Morzycki 2008 and de Vries 2010 for two different proposals.

decision; importantly, this event is restricted to occur in a political domain. In (16b), I roughly adapt Ernst's (2002) analysis for domain adverbials (see also Bartsch 1987; Moltmann 1997 and Ernst 2004), where **under** is a covert predicate that identifies a subset of the events denoted by the main predicate, and **cr** is a contextual restriction on conditions $c*$ in terms of the domain made explicit by the adverb. Here, the decision can be politically incorrect, but not necessarily incorrect in other respects (for instance, the decision may be ethically correct).

3.2   Class II

Class II are DegPs that contain two adjectives, one being a so-called *expressive* (Potts 2005, 2007) such as *damn, frigging* or *fucking*, and the other, a gradable adjective. I follow Potts in considering that at-issue content and conventionally implicated content (here instantiated by expressive meaning) run parallel computations (which is represented by the separation of a bullet ●). Characteristically, expressive items take as argument at-issue content and return a propositional content that does not contribute to the main assertion. (17b) is the proposed translation of (17a).

(17)   a. how damn important this book is

b. $\lambda p.\exists d[p = \lambda w[\textbf{importance}_w(\textbf{this-book}) = d]] \bullet [\![\text{damn}]\!]([\![\text{important}]\!])$

What (17b) means to convey is that, on the one hand, the speaker utters *She never realized how important this book was to me* and, as a side comment, the speaker adds *damn important*. Every proposition in the set, thus, varies in the value d corresponding to the importance of the book.

It is not my purpose here to delve into the semantics of expressives. In examples such as *The damn machine is not working*, Potts proposes that the paraphrase would be something like *The speaker has a negative attitude towards the machine*. When *damn* is modifying an adjective, it is not so clear towards what exactly the speaker is experiencing this negative attitude.[4]

What matters for our purposes is that the proposed composition for Class II DegPs explains why the second adjective needs to be gradable (cf. (18)) and why the expressive item follows *how* even if it is not gradable (cf. (19)).

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4 A. Beltrama (p.c.) points out to me that whenever an expressive is modifying an adjective, the entailment is that the degree to which the property holds is high. See for instance (1).

(1)   Bill is fucking tall, # but he's not very tall / # he's only 1.65 meters tall.

How this high degree inference is brought about is an interesting issue that deserves further research.

(18)   #how damn weekly this magazine is

(19)   a. #very damn machine

      b. # quite frigging keys

In (18), *how* cannot take as argument the relational adjective *weekly*, because relational adjectives are typically not gradable; and (19) shows that the degree modifiers *very* and *quite* cannot intensify the expressive items *damn* and *frigging* because they are not gradable, either. Therefore, in Class II DegPs, the second adjective needs to be gradable, because this is the one that *how* takes as its argument.

3.3   Class III

Class III involves all the cases where *how* targets the gradability of the adverb. These include combinations of manner adverb plus participle such as *beautifully phrased*, Remarkably adverbs + gradable adjective combinations such as *remarkably tall* and Extremely adverbs + gradable adjective combinations such as *extremely high*.

Example (1c), repeated in (20a) for convenience, is given the analysis in (20b).

(20)   a. how beautifully phrased these lyrics are

      b. $\lambda p. \exists d[p = \lambda w. \exists e, s[\textbf{phrase}_w(e) \wedge \text{BECOME}(s)(e) \wedge \textbf{phrased}_w(\textbf{these-} \textbf{lyrics})(s) \wedge \textbf{beauty}_w(s) = d]]$

The set of propositions above vary according to the value of the degree of beauty. In each proposition there is an event *e* and a state *s* such that *e* is an event of phrasing that turns into a state *s*; *s* is a state of the lyrics being phrased, and this state is beautiful to degree *d*.

Other examples include the ones in (21).

(21)   *genuinely disappointed, pleasantly surprised, intensely scrutinized, highly recommended*

The existence of such examples, where only the adverb is gradable, make a good case for the [[how Adverb] Adjective] composition.

Another test for this mode of composition is found in examples where both the adverb and the adjective are gradable, but it is clearly the adverb that gets intensified, as in (22a), or in examples where the adverb can hardly be coerced into a gradable property and the adjective being gradable does not make the expression acceptable, as in (22b).

(22)   a. how minimally invasive

      b. #how sufficiently different

Recall that in Class I, it was enough for the adjective to be gradable to make the DegP [how [Adverb Adjective]] acceptable. However, here *sufficiently* is not a domain adverb, so it does not pattern with *politically* or *ethically* from Class I.

4 Extremely vs. Remarkably Adverbs

In this section we move on to the differences and similarities between Remarkably adverbs and Extremely adverbs, that is, between examples such as (23) and examples like (24), all of which belong to Class III.

(23)   *crashingly bad, ridiculously expensive, insanely hot, annoyingly obsessive, unexpectedly awesome, extraordinarily depressed, surprisingly thought-provoking, awfully needy*

(24)   *utterly unique, absolutely fabulous, acutely aware, deeply asleep, seriously fast, really unsuitable, glaringly obvious, highly dubious, radically simple*

Throughout this section, I will consider *extremely* vs. *surprisingly* as instances of Extremely and Remarkably adverbs respectively, and I will propose a denotation for *extremely*. An analysis of each of the members of the list in 24 is beyond the scope of this paper.

To begin with, if we look at the core adjectives of these adverbs, we find that they share important properties. Both *extreme* and *surprising* are evaluative adjectives, in the sense of Bierwisch (1989). As such, they are norm-related. This means that any use of these adjectives implies that the subject meets or exceeds the standard of Adjective-ness. This is evident in two environments: equative comparatives and *how*-interrogatives, as shown in (25).

(25)   a. The drought in Arkansas is as extreme as in Arizona $\models$ The drought in Arkansas is extreme.

   b. How extreme is the drought in Arkansas? $\models$ The drought in Arkansas is extreme.

These implications do not hold with dimensional adjectives like *tall*. *Peter is as tall as Maria* and *How tall is Peter?* are compatible with scenarios where Peter does not meet or exceed the standard of tallness.

I will follow Sassoon (2011) in treating norm-related implications of evaluative adjectives as *zero-related implications*. I assume with her that the domain of degrees includes a zero point, which represents the set of entities whose degree of Adjective-ness is in zero, i.e., $\{x \in D_e |$ Adjective-ness$_w(x) = 0\}$. She claims that the zero point can be either semantically or contextually determined, just like the cut-off point of dimensional adjectives. Evaluative adjectives are claimed to have a contextually-determined zero. This amounts to saying that its value varies across indices. She

calls this a *relative zero*. To have zero-related implications in the case of *surprising* and *extreme* means that there is a cut-off point that teases apart what counts as surprising or extreme and what does not, and this degree is not somewhere in the middle of the scale, it is a zero degree, and one that differs in the various worlds of evaluation. We can thus state that evaluative adjectives have a minimum standard. Unlike closed-scale adjectives with a lower bound, such as *empty*, though, the lower bound for *extreme* and *surprising* is not encoded in the semantics of the lexical item.

Second, *extremely* and *surprisingly* share the norm-relatedness of the [Adverb Adjective] combinations. That is, the implications in (26) hold.

(26)   a. surprisingly tall $\models$ tall

       b. extremely high $\models$ high

In the third place, the intensification of the adverb amounts to intensifying the adjective. In other words, the more surprising Bill's tallness is, the taller Bill is; and likewise, the more extreme the height of the building is, the higher the building is.

By contrast, *surprisingly* and *extremely* differ in non-trivial respects. For starters, Extremely adverbs do not modify propositions ((27)) or make propositional attitude predicates ((28)).

(27)   a. Surprisingly, Bill is tall.

       b. *Extremely, this building is high.

(28)   a. It's surprising how tall Bill is / that Bill is so tall.

       b. *It's extreme how high this building is / that this building is so high.

Furthermore, the adverb's core adjective is not always predicated of *ordinary* individuals in the case of Extremely adverbs, while this is possible for Remarkably adverbs, as shown in (29).

(29)   a. Bill is surprising.

       b. #Bill is extreme.

What is then *extreme* predicated of? A simple google search returns the outcome in (30). Leaving aside the first set of examples, which are not exportable to our cases, the second set of examples shows that we can predicate extremeness of a measure function that is applied to some individual.

(30)   *extreme weather, exercise, diet, sports, situation* but also *extreme poverty, height, price, drought, idiocy of* ...

Note that this boils down to saying that what counts as extreme is a degree. This can be represented as in (31). *Extremely* takes a gradable adjective, a degree d and an

individual x, and the outcome is true iff there is a degree d' such that x is G to degree d', which meets or exceeds the standard of G-ness, and d' is extreme to degree d. That is, I am proposing that *extreme* is a gradable adjective that characterizes a degree.

(31) $[\![$extremely$]\!] = \lambda G \lambda d \lambda x. \exists d'[G(d')(x) \wedge d' \succeq \mathbf{stnd}_G \wedge \mathbf{extremeness}(d') = d]$

The denotation of (32a) is proposed to be the one in (32b).

(32) a. how extremely high this building is

b. $\lambda p. \exists d[p = \lambda w. \exists d'[\mathbf{height}_w(\mathbf{this\text{-}building}) = d' \wedge d' \succeq \mathbf{stnd}_{\mathbf{high}} \wedge \mathbf{ex\text{-}tremeness}_w(d') = d]]$

In (32b), the alternative propositions in the set denoted by the *wh*-clause range over the degree d of extremeness of d', construed as the building's height. Note that this proposal differs from (14), repeated below for convenience, in not treating *extremely* as a propositional operator, but as a degree predicate.

(33) $\exists d[\mathbf{height}(\mathbf{c}) = d \wedge d \succeq \mathbf{stnd}_{\mathbf{tall}} \wedge \mathbf{remarkable}(^{\wedge}\mathbf{height}(\mathbf{c}) = d)]$

But can this be done? Recall from section 2 that it has been convincingly argued that degrees cannot be remarkable or surprising or incredible. Can they be extreme? In the previous paragraphs I have attempted to show that this seems the only way out, since they are clearly not propositional and they do not always take as argument ordinary individuals. If we look a little bit closer to the problems raised by degrees being surprising, we will realize that they have to do with our ontology. If degrees are defined as positive numbers on a scale, then we run into trouble.

What I am going to do, then, is assume an alternative definition of what a degree is. Specifically, I will follow Cresswell (1976) in treating degrees as equivalence classes of individuals, and Kaufmann in Schwager 2009, who highlights the one-to-one correspondence between degrees (positive numbers or intervals) and properties (equivalence classes of individuals). Kaufmann's denotation of *the height of this building* is both the degree to which the building is high and the property of being as high as the building, as shown in (34).

(34) $[\![$The height of this building$]\!]_w =$

a. e: . . . the maximal degree of height d s.t. $\mathbf{height}(\mathbf{this\text{-}building}) = d$

b. $\langle s, et \rangle$: . . . $\lambda w \lambda x. x$ is in w at least as high as this building is in w.

The idea that degrees are equivalence classes of individuals is illustrated in Table 1 (from Schwager 2009: 504).

$d_{1.80m}$:	$\langle w1, g.w.bush \rangle$, $\langle w2, s.holmes \rangle$, $\langle w3, g.w.bush \rangle$, $\langle w2, g.w.bush \rangle$, $\langle w3, s.holmes \rangle$, $\langle w4, g.w.bush \rangle$, $\langle w1, commerzbank-tower \rangle$, $\langle w2, empire-state \rangle$, ...
$d_{1.90m}$:	$\langle w2, g.w.bush \rangle$, $\langle w3, s.holmes \rangle$, $\langle w4, g.w.bush \rangle$, $\langle w1, commerzbank-tower \rangle$, $\langle w2, empire-state \rangle$, ...
...	...
$d_{2.59m}$:	$\langle w1, commerzbank-tower \rangle$, $\langle w2, empire-state \rangle$, ...
...	...

Table 1   Degrees as equivalence classes of individuals

Every degree d, which is labeled with a positive number, corresponds to a cell in the table, which includes pairs of worlds and individuals who are at least as high as d. That is to say that the height of x in w returns d iff the pair $\langle w, x \rangle$ is in the set d (cf.(35)).

(35) $\textbf{height}_w(x) = d \leftrightarrow \langle w, x \rangle \in d$

To sum up, I adopt a definition of a degree as an equivalence class of individuals, and hence a property. I am thus allowed to say that extremeness is predicated of a degree d insofar as d is construed as the property of being as high as the building is.

Since (31) includes the statement that $d \succeq \textbf{stnd}_G$, the height of the building cannot be any random and freakish number, and since degrees correspond to properties, sentences such as *???12 is extreme* are not really an issue here.

5   *How* and *So*

One of the interesting repercussions the analysis of Extreme and Remarkably adverbs has concerns the semantics of the degree words that can take these adverbs as arguments. Note that if we replace *how* with intensifiers such as *very* or *enough*, the result is awkward. By contrast, *so* patterns with *how*, as shown in (36).

(36)   If this building is so/?very/?too extremely high, then the tourists won't be able to take a picture of it.

What do these degree words have in common? In what way are *very* and *enough* different from *so* and *how*?

Neeleman et al. (2004) propose a classification of different degree expressions based on their syntactic and semantic properties. From this work, it straightforwardly follows that *how* and *very/too/enough* have a different behavior. In their account, degree expressions can be classified as *evaluative* or *non-evaluative* depending on

whether the anchor point evoked "is related to the average degree to which a property holds of the adjective's subject", or is an "independently-specified, objective value on the adjective's scale" (Neeleman et al. 2004: 32). Examples of evaluative degree words are *very, too* and *enough*, which characteristically select for a reference point that involves an evaluation, and license *for* or infinitival satellites. The set of non-evaluative degree expressions includes the comparative and equative morphemes, which characteristically license *as* and *than* satellites, but also measure phrases, *this/that* and *how*.

Before focusing on (36), note that DegPs similar to the one above are allowed when instead of an Extremely adverb we have a Remarkably adverb, as is shown by de Vries (2010) and presented in (37).

(37)   *pretty insanely crazy, very remarkably tall, fairly embarrassingly angry*

This suggests that two factors play a role: the kind of adverb and the class of degree expression. In §4 it was pointed out that *extremely* is analyzed as a degree predicate. To say that a degree is very extreme requires considering a standard for extremeness applied to degrees that is contextually determined, and stating that this degree exceeds the standard to a large extent. Specifically, in *x is very extremely tall*, the extremeness of *x*'s tallness needs to exceed a norm based on a comparison class whose objects meet the standard for extremeness. This is probably a complicated operation that describes a scenario that speakers will hardly need to use.

However, *how* being non-evaluative and lacking a complex lexical content — as Neeleman et al. (2004) claim, it just asks the hearer to identify a value — the result is acceptable. Recall that in our semantics for *how*, the degree expression barely binds the adjective's degree argument, so each proposition has a different value for *d*.

Since *so* patterns with *how*, we are inclined to believe that *so*, too, is a non-evaluative degree expression. Interestingly, Neeleman et al. (2004) only bring up *so* as a syntactic test to identify possible syntactic structures, in examples such as *John is very fond of Mary. In fact, he is more so than Bill*, but they do not include it in their syntactic or semantic grouping of degree expressions. They treat *so* as a "categorically underspecified pro form" (Neeleman et al. 2004: 7). Nevertheless, since some of its uses are at least reminiscent of a demonstrative (see (38)) and *this/that* belong to the non-evaluative class, we have some motivation to group *so* and *how* together in the class of non-evaluative degree expressions.

(38)   Bill is so tall. [+pointing gesture]

This could in principle sound shocking, because intuitively *so* and *very* may seem semantically analogous in relying on an anchor point that exceeds the standard of the gradable property (cf. (39) and (40)).

(39)   Bill is so tall! / Bill is very tall. He could make a great basketball player.

(40)   Bill is so tall that he reaches the first shelf. $\models$ Bill and the shelf are tall.

I consider the data in (36) as further evidence that this high degree implication is not part of *so*'s truth-conditional semantics. Very tentatively, I will assume that demonstrative *so* (whose anchor is determined contextually by means of a pointing gesture, as in (38))[5] has evolved into having an additional use where a demonstration does not contribute the anchor anymore. This is the anaphoric use illustrated in (41), which might have evolved into uses like (40). I cannot deal with these other uses here for reasons of space. Castroviejo (2011) provides a few suggestions.

(41)   It's amazing that Bill is so tall.

My suggestion is that in the transition from demonstrative use to anaphoric use, the subject of the adjective needs to stand out as clearly displaying the gradable property for the matter of properly identifying the referent. I therefore consider this high degree implication a felicity condition or presupposition that has been added to the meaning of *so* via meaning change. That is, *so*, when not being employed as a demonstrative, is only felicitously used when the degree referred to is high.

So has also been equated to *enough* by Meier (2003). Essentially, *enough* and *so* have modal sentential complements. The default modal in *so . . . that* constructions is the universal quantifier. When *so*'s *that*-clause has an overt existential modal, then the two constructions are equivalent. For instance, the ones in (42).

(42)   a. The jet flew fast enough to beat the speed record.

    b. The jet flew so fast that it could beat the speed record.

However, this account does not take into consideration the high degree implication of *so* illustrated in (40). It also does not explain the contrast in (43).

(43)   a. This building is so extremely high that visitors see it with difficulty.

    b. This building is (#extremely) high enough that visitors see it with difficulty.

If *so* and *enough* had an equivalent meaning, we would expect *enough* to be able to take *extremely* as its complement, contrary to fact.

I then conclude that *so* is not an evaluative degree expression (unlike *very* and *enough*) and shares with *how* a meager lexical meaning (they merely bind a degree or refer to a familiar degree).

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5 See Umbach & Ebert (2009) for an analysis of "intensifying *so*" in German, which is argued to be a demonstrative degree modifier whose threshold or anchor point is a silent demonstration.

6   Interrogatives and exclamatives

A second interesting extension of this research on *how*-DegPs followed by [Adverb Adjective] combinations concerns the semantics of *wh*-interrogatives and *wh*-exclamatives. Extreme and Remarkably adverbs occur in *wh*-clauses that are taken to be exclamative sentences. Is their occurrence enough to argue that these *how*-clauses are exclamatives? How can the properties described above explain the behavior of these adverbs in these sentences?

To begin with, our analysis of Extremely adverbs such as *extremely* in (1a) should account for why they can appear in exclamative environments, unlike adverbs such as *fairly, reasonably* or *slightly*, as first noted by Elliott (1974), exemplified in (44).

(44)   #How fairly/reasonably/slightly long he can stay under water!

The compatibility of *extremely* in sentences such as (44) has been used as an argument to relate exclamatives to extreme degree. Zanuttini & Portner (2003) propose that *wh*-exclamatives undergo so-called *domain widening*, from one domain including the set of standard possible answers in a Hamblin (1973)/Karttunen (1977) question semantics, to a bigger set including non-canonical answers. In uttering (44), the speaker is considering very high degrees of length, which is compatible with describing this extent as extreme. Rett (2008), on the other hand, treats *wh*-exclamatives as evaluative constructions that convey the speaker's surprise by the high degree of a property held by a certain individual. In her account, Extremely adverbs only occur in evaluative constructions, so, again, this is compatible with the data in (44).

What remains to be figured out in both accounts is the semantic composition of the DegP including *extremely*, which is one of the tasks that the present paper has undertaken. Recall that it has been proposed here that *how* binds the degree argument of *extremely*. Since *how* takes as argument a gradable adverb, *fairly, reasonably, slightly* are only acceptable if they are or can be coerced into gradable predicates. Probably, it is hard to imagine that a speaker has expected a degree of length to be more fair or reasonable than it is.[6] On the other hand, as has been shown in the recent literature (Rotstein & Winter 2004; Sassoon to appear; Solt to appear), *slightly* only modifies absolute (instead of relative) adjectives. So *slightly* cannot

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6 Although this is not impossible in other contexts, as shown in (1).

(1)   You might be surprised how reasonably priced this gift option is for something that is hand crafted and created just for you.
        <www.shopatabode.com/gifts>

modify *long*, but it can indeed modify predicates like *full, open, opaque*. Consider, for instance, (45), from Chernilovskaya (2011).

(45) I've recently re-watched Season 7 and was surprised how slightly disappointed I was.

From this we can conclude that the infelicity of (44) has motivations that are independent from the claim that exclamatives convey extreme degree.

A final and related issue, which has been a matter of discussion in the literature on exclamatives (Elliott 1974; Grimshaw 1979; D'Avis 2002; Zanuttini & Portner 2003; Abels 2004, 2010), is why *extremely* is infelicitous in questions, but it is felicitous in exclamatives and *wh*-clauses embedded in factive predicates, as shown in (46) and (47), respectively.

(46) #How extremely high was this building? / #I wonder how extremely high this building is.

(47) My son found out how extremely high this building was when we went downtown.

Grimshaw (1979) proposes that *wh*-exclamative clauses are factive, and Zanuttini & Portner (2003) go a bit further to argue that *wh*-exclamatives contain a factive morpheme that brings about domain widening when in combination with the semantics of the *wh*-component. Although Zanuttini & Portner (2003) analyze *very* instead of *extremely*, the idea would be that *extremely* is an exclamative-only (and hence, not interrogative) part of speech. This would explain (46). As for (47), since *extremely* is only compatible with exclamatives and the semantics of exclamatives is triggered by a factive morpheme, this friendly environment also includes *wh*-clauses embedded in factive predicates. The question that we may pose at this point is whether we can find a more principled reason as for why *extremely* is exclamative-only.

D'Avis (2002) rules out cases like (46), because these sentences presuppose their own answer (Question: *how high was the building?* Answer: *extremely high*), and this would clash with the pragmatic rules of questioning. Abels (2004, 2010) suggests that so-called wh-*clauses with intensifiers* carry presuppositions that are incompatible with questioning. Similarly, Sæbø (2010) and Chernilovskaya (2011) propose that *this building is extremely high* is a presupposition of (46), which clashes with the asserted meaning of the embedding predicate. Finally, Castroviejo (2008) claims that Extremely adverbs in these particular configurations behave like expressives in composing with the gradable adjective in a different domain of meaning. The latter account is rejected under the present proposal, where Extremely adverbs have been argued to contribute to the at-issue domain of meaning, unlike expressives such as *damn*. We can still wonder whether we need to assume that the meaning conveyed by them is presuppositional.

First, as shown in §4, Extreme and Remarkably adverbs are evaluative, hence they have a relative zero and a minimum standard. It follows that *how Adverb Adjective* **entails** *Adverb Adjective*. So, (48a) implies (48b).

(48)   a. I can't believe how extremely high this building is.

b. The building is extremely high.

Since these [Adverb Adjective] combinations are evaluative, we expect them to yield norm-related implications when they occur in *how*-interrogatives, as shown in (25) above. Also, according to the proposed denotation of *extremely* in (32b), predicating *extremely high* of *x* involves asserting that *x* meets or exceeds the standard of the adjective *high*. Therefore, when inquiring about the degree to which *x* is *extremely high* (cf. (46)), the speaker is asserting that *x* is high and is implying that *x* is extremely high. The claim here is that the conditions for the felicity of such a question are determined to be at least as constrained as the conditions for questions about norm-related adjectives, as is the case of *stupid* in (49).

(49)   #How stupid is John?

Abels (2004) shows that *wh*-clauses with intensifiers can appear under *wonder* predicates and matrix questions if they occur with a filter for presuppositions. (50) is one of his examples.

(50)   If it is already this hot down there on the main floor, how unbearably hot must there be up on the balcony?

For Abels, this is evidence in favor of saying that such *wh*-clauses come with presuppositions incompatible with questioning. In particular, the presupposition that is filtered out in (50) would be that it must be unbearably hot in the balcony. Since inquiring about evaluative adjectives seems to behave in the same way (see (51)) we may raise the question of whether we should treat norm-related implications as presuppositions that get filtered out, or whether these contexts pave the way to make *wh*-questions with intensifiers felicitous. Specifically, by creating a context where the base line is *this hot*, the oddity of asking a question that also asserts **hotness**(**the-balcony**) $\succeq$ **stnd**$_{hot}$ disappears. I leave this reflection for further study.

(51)   If John is this stupid and he's the smartest guy in his family, how stupid must his son be?

Since what is infelicitous is to **inquire** about norm-related adjectives and adverbs, we expect them to be acceptable in *wh*-clauses that are not used for this purpose. These include, on the one hand, *wh*-clauses embedded in factive predicates (recall (47)), because they presuppose that the subject knows the value of the *wh* variable. And on the other hand, *wh*-exclamatives like (52).

(52)   How extremely high this building is!

As argued for by Abels, then, rather than treating Extreme and Remarkably adverbs as exclamative-only, what they are is incompatible with questioning.

The evidence provided from Class III DegPs seems to reinforce the arguments in Abels 2004 for treating these *wh*-clauses as interrogatives. This, of course, need not (or cannot) extend to other *wh*-clauses that only make *wh*-exclamatives.

7   Conclusions and prospects

In this paper I have proposed that DegPs headed by *how* and containing modified adjectives come in three types depending on their compositional semantics. Also, I have claimed that Extremely adverbs are very similar to the more studied Remarkably adverbs, but the former cannot receive the same analysis because they are not propositional. I have argued that Extremely adverbs seem to be degree predicates. The data that has been presented is relevant to figure out the semantics of degree expressions like *how* and *so*, which pattern alike in being able to target the gradability of Extremely adverbs as opposed to other degree expressions like *very* and *enough*. I have argued that the former have little semantic content, and their high degree implication is not part of their truth-conditional meaning. As for the repercussions this research may have for the analysis of *wh*-exclamatives, it has been proposed that the norm-relatedness of Extreme and Remarkably Adverbs and the complexity of their meaning can derive their incompatibility in question environments. Thus, in principle, these adverbs identify *wh*-clauses that are not used as questions, rather than an exclamative clause type.

Among many future lines of research that derive from this paper, an interesting issue that needs to be looked at in depth is whether *very* in *how/so very high* can also be analyzed as an Extremely adverb. This would imply assuming that *very* in this particular configuration is a gradable predicate, because — even if only historically — it is related to an adjective with a *verum* reading, similar to *truly* and *really*. A story along these lines would explain why the corresponding German *sehr*, Spanish *muy*, French *très* or Catalan *molt*, which are not deadjectival, cannot occur in the place of *extremely*.

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