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ADVERBS OF COMPLETION IN AN EVENT SEMANTICS

Abstract. Adverbs of completion such as *completely*, *partly*, and *half* assert to what extent a given situation type is realized, where the situation type at issue may be either a state type (in the case of adjectives, e.g., *completely empty*) or an event type (in the case of many verbs, e.g., *completely eat the cereal*). After introducing the basic data and critically reviewing two previous analyses, I propose a new approach to adverbs of completion. The hallmark of the new approach is to provide as uniform a semantics as possible for adverbs of completion in both of their uses, taking seriously the intuition that their meanings make reference to events and degrees. The analyses are cast in an event semantics supplemented by a degree semantics familiar from treatments of gradable adjectives.

Keywords. Adverbs of completion, event semantics, events, degrees, aspect.

1. INTRODUCTION

There is a class of adverbs that say something about how much of a given situation type is realized:

- (1)
 - a. Stanley completely ate his Wheaties (Jackendoff 1972:53).
 - b. Rebecca partly solved the problem.
 - c. Mary opened the door halfway.

The effect of *completely* in (1a) is to remove any doubt that any of Stanley's Wheaties were left uneaten, the use of *partly* in (1b) implicates that not all of the problem was solved, and the role of *halfway* in (1c) is to assert that the door traversed half of its spatial arc to being closed. I will refer to such adverbs as 'adverbs of completion' (though 'adverbs of extent' would also be appropriate).

Other adverbs of completion comparable to those in (1) are *entirely*, *fully*, *totally*, *wholly* (for *completely*), *partially* and *partway* (for *partly*), and *half* (for *halfway*):

- (2)
 - a. Stanley ate his Wheaties entirely.
 - b. Rebecca partially solved the problem.
 - c. Mary half opened the door.

Clearly, the sentences in (2) are very similar in meaning to, even if not always entirely equivalent to, the corresponding ones in (1). One difference is that the meaning of *partway* and *halfway* seems to be necessarily spatial, whereas that of

partly and *half* may be nonspatial as well. This is seen by the difference in acceptability between (1b) and #*Rebecca solved the problem partway* (cf. *Mary opened the door partway*), on the one hand, and between *Stanley half ate his Wheaties* and ?#*Stanley ate his Wheaties halfway*, on the other. In other cases, e.g., *partly* vs. *partially*, the difference (if there is a salient one) is less palpable.

There are also adverbials of completion, namely, PPs that function similarly to adverbs of completion:

- (3) a. Mary read the book to the penultimate chapter.
- b. He sang the aria from the first cadenza. (Thomason and Stalnaker 1973:218)
- c. Rebecca solved the problem to some extent.

For example, just as *half* in (2c) qualifies the extent to which Mary opened the door, *to the penultimate chapter* in (3a) specifies the extent to which she read the book. Observe that adverbs of completion can modify gradable adjectives as well:

- (4) a. Stanley's bowl was completely empty.
- b. The problem was partly solved.
- c. The door was halfway open.

Intuitively, the role of adverbs of completion as adjective modifiers is the same as their role as verb modifiers. Thus, just as *completely* in (1a) entails that Stanley's eating of his Wheaties was realized to the maximal degree, *completely* in (4a) implies that his bowl's emptiness was realized to the maximal degree. I assume that any account of adverbs of completion should be general enough to cover both their use as verb modifiers and their use as adjective modifiers.

The aim of this paper is to sketch a new approach to adverbs of completion, focusing on *completely*, *partly*, and *half*.

2. THREE PROPERTIES

In this section I discuss three properties of adverbs of completion that form the empirical basis for my analysis in section 4.

2.1. Basic Distribution

It is an old discovery that adverbs of completion are very restricted with respect to the variety of positions that they may appear in, as observed, for example, in Jackendoff (1972) and Jacobson (1978). Essentially, they are restricted to immediate

preverbal position and postverbal (postobject) position, where the ‘verbal position’ in question is that of the main verb:¹

- (5) a. Stanley will have (completely, partly) eaten his Wheaties
(completely, partly).
b. (*Completely, *Partly) Stanley (*completely, *partly) will
(*completely, *partly) have eaten his Wheaties.

At first glance, *partly* seems to defy this generalization, given that it can appear in clause-initial position:

- (6) (What did you do today?)
Well, partly I went shopping, partly I cleaned my room, and partly I worked on my paper.

However, it is not difficult to see that this use of *partly* is not the same as its use as an adverb of completion (though the two uses are no doubt related). In fact, *partly* is a sentence modifier in (6) and has the function of asserting different activities for different parts of today. If *partly* were an adverb of completion in (6), then the three clauses in (6) should be equivalent to the following three sentences, respectively, and yet they are not:²

- (7) a. #I partly went shopping. (#I went shopping partly.)
(cannot mean: ‘I did part of the shopping’)
b. I partly cleaned my room. (I cleaned my room partly.)
c. #I partly worked on my paper. (#I worked on my paper partly.)
(cannot mean: ‘I worked on part of my paper’)

For instance, the second clause in (6) asserts that I cleaned my room during some part of today and not that I cleaned part of my room, as the sentence in (7b) entails. Similarly, the third clause in (6) states that I worked on my paper during some part of today, whereas the sentence in (7c) is not even acceptable with *partly* as an adverb of completion. Given that the equivalence between the respective clauses in (6) and the sentences in (7) does not hold, we can conclude that *partly* is not an adverb of completion in the former.

Another feature of adverbs of completion is that they take narrow scope with respect to negation and other adverbials:

¹ The adverb *half* (cf. (2c)) is doubtlessly a prefix, even if English orthography does not always reflect this, and so it can only immediately precede the main verb: *Mary half closed the door* (**half*).

² An interfering factor that should be controlled for in assessing whether the said equivalence holds is that *partly* can also appear after the subject as a sentence modifier, e.g., (*What did you do today?*) *Well, I partly went shopping, I partly cleaned my room, and I partly worked on my paper*, but it does sound more natural in clause-initial position. As a sentence modifier, *partly* can at best occur with a pause in clause-final position.

- (8) a. Stanley didn't (completely) eat his Wheaties (completely).
 b. Stanley (*completely) didn't eat his Wheaties.
- (9) a. Stanley rarely (completely) ate his Wheaties (completely).
 b. Stanley (*completely) rarely ate his Wheaties.
- (10) a. Stanley probably (completely) ate his Wheaties (completely).
 b. Stanley (*completely) probably ate his Wheaties.

In certain select cases, however, adverbs of completion appear to be able to take scope over negation:

- (11) a. ?I completely (partly) don't understand the problem.
 b. ?She completely (partly) doesn't agree with me.

Insofar as the examples in (11) are really acceptable (and if are, they are certainly colloquial), I suggest that the negation and the verb semantically form a kind of 'negative verb' that the adverb of completion has scope over. More specifically, not understanding something can be construed as *failing* to understand something (after having tried) and not agreeing with someone can be construed as *disagreeing* with someone (after having considered the issues). This phenomenon occurs naturally with many attitude verbs, which even when negated tend to imply (positive) mental effort on the part of subject. In contrast, the negation of action verbs, e.g., *eat* in (8), does not usually imply (positive) physical effort on the part of the subject. If these observations are correct, then examples like those in (11) do not constitute a real exception to the generalization that adverbs of completion take narrow scope with respect to normal (sentence) negation.

A final point about the distribution of adverbs of completion is that they take narrow scope with respect to both readings of *again*:

- (12) a. Mary opened the door again.
 (repetitive: what happened again was that Mary opened the door,
 restitutive: Mary opened the door and so it was again the case that
 the door was open)
- b. Mary opened the door halfway again.
 (repetitive: what happened again was that Mary opened the door
 halfway,
 restitutive: Mary opened the door halfway and so it was again the
 case that the door was halfway open)

Whereas the repetitive interpretation of (12a) requires Mary to have opened the door before, its restitutive interpretation merely presupposes that the door was open before, but not necessarily that it had been opened by Mary (or anyone else, for that matter). The point about (12b) is that *halfway* must take narrow scope with respect

to *again*: (12b) cannot mean either that what happened again was that Mary opened the door but this time she opened it (only) halfway (repetitive, with wide scope of *halfway*) or that Mary opened the door halfway and so it was again the case that the door was open but this time (only) halfway (restitutive, with wide scope of *halfway*). In other words, however we construe *again*, *halfway* is in its scope. In fact, the only modifiers ‘closer’ to the verb than adverbs of completion are verb particles:

- (13) a. Stanley completely (partly, half) ate up his Wheaties.
b. He ate them completely (partly, half) up.

The word order in (13b), in particular, reveals rather transparently how adverbs of completion take scope over verb particles. In sum, the distributional evidence suggests that adverbs of completion are verb modifiers, meaning that they basically appear internal and not external to the VP. This conclusion is in fact compatible with the views of both Jackendoff (1972:74-75) and Jacobson (1978:137) on the syntax of *completely*.³

2.2. *Not (Always) Extensional*

Adverbs of completion are not extensional in the sense that the truth of the sentences in which they appear is not (always) preserved if they are dropped:

- (14) a. Rebecca completely solved the problem → Rebecca solved the problem
(the dropping of *completely* preserves truth)
b. Rebecca partly (half) solved the problem ↯ Rebecca solved the problem
(the dropping of *partly (half)* does not preserve truth)

Thomason and Stalnaker (1973:218) were originally troubled by examples comparable to (14b) (cf. (3b)), because they wanted to entertain the hypothesis that ‘predicate modifiers’ (to use their term) generally preserve truth when dropped. Since adverbs of completion are clearly predicate modifiers, their exceptional behavior in this regard suggests that Thomason and Stalnaker’s hypothesis does not extend to the full class of predicate modifiers.⁴ Of course, *completely* differs from

³ At the same time, this conclusion is not so obviously compatible with the views of Alexiadou (1997, sects. 5.2.4, 5.6) and Cinque (1999, sects. 4.2.3, 4.2, 4.2.9) on the syntax of *completely*. The difficulty is that Alexiadou and Cinque both place *completely* in the specifier position of a functional projection (Cinque even offers a choice of two different functional projections) that is relatively low in the hierarchy but still above the VP. However, since Alexiadou and Cinque are not clear about how they envision the semantic composition, their views may turn out to be compatible with the verb modifier approach that I am advocating—it is simply hard for me to tell.

⁴ Thomason and Stalnaker conclude with the suggestion that meaning postulates will be necessary to distinguish those predicate modifiers that preserve truth when dropped from those that do not.

partly and *half* in preserving truth when dropped (see (14a)), but this seems to be due to the fact that the meaning of *completely* (as a special case among adverbs of completion) already asserts maximal realization of the situation type in question.

Observe that the non-extensionality of *partly* and *half* (in contrast to *completely*) naturally applies to their use as adjective modifiers as well:

- (15) a. The problem was completely solved → The problem was solved
(the dropping of *completely* preserves truth)
b. The problem was partly (half) solved ↯ The problem was solved
(the dropping of *partly* (*half*) does not preserve truth)

However, even if adverbs of completion are not (always) extensional, they are also not intensional in the way that more familiar intensional expressions are, given that they do not create opaque contexts. For instance, if Stanley intentionally ate his Wheaties but did not realize that his Wheaties was his lunch, it does not follow that he intentionally ate his lunch. In contrast, if Stanley partly ate his Wheaties but did not realize that his Wheaties was his lunch, it nevertheless does follow that he partly ate his lunch. In short, adverbs of completion do not involve an attitude on the part of the subject, in contrast to more familiar intensional expressions.

2.3. Two Restrictions

The first restriction is that adverbs of completion, as verb modifiers, require the internal argument of the verb to be expressed but at the same time prohibit it from being expressed as a bare plural (or bare mass) NP:⁵

- (16) a. #Stanley completely ate (sandwiches).
b. #Rebecca partly solved problems.
c. #Mary closed doors halfway.
(17) a. #Stanley completely ate (cereal).
b. #The university partly recycled paper.
c. #Rebecca half burned wood.

Another way of describing this restriction is that adverbs of completion are incompatible with aspectually durative expressions of change. If the object NPs in (16) and (17) had an overt determiner, then the corresponding sentences would be acceptable. Intuitively, what goes wrong in (16) and (17) is that the choice of a bare plural (or bare mass) NP does not yield a situation type for which it makes sense to say that it was completely (partly, half) realized.

⁵ Schmitt (1996, chap. 2) observes this phenomenon for *half* and draws some useful crosslinguistic comparisons.

The second restriction is that adverbs of completion, as adjective modifiers, do not combine with all gradable adjectives (cf. (4)):

- (18) a. #Stanley's bowl is completely big.
 b. #The (whole) problem is partly difficult.⁶
 c. #The door is half heavy.

Intuitively, the difference between those gradable adjectives that are compatible with adverbs of completion and those that are not is that the former are associated with a scale having a maximal degree, whereas the latter are associated with a scale lacking a maximal degree.⁷

One of the aims of the analysis that I present in section 4 is to show that these two restrictions are essentially the same.

3. TWO PREVIOUS APPROACHES

Adverbs of completion have not been the focus of many analyses in the past. Here I will briefly critically review two approaches that I am aware of, the first being due to Parsons (1990) and the second, to Moltmann (1997).

Parsons (1990:122) analyzes *partway* as a predicate operator that applies to a predicate of states, yielding a new predicate of states. Basically, Parsons claims (p. 15) that *partway* and other adverbs of completion are really only adjective modifiers and not verb modifiers at all. Ignoring irrelevant details, his analysis of *x closes the door partway* is as follows (*e* and *e'* are variables for events, and *s* and *s'* are variables for states):

- (19) a. $\text{partway} + \text{closed}_{\text{adj}} = \lambda s'[\text{partway}(\lambda s[\text{closed}(s)])(s')]$
 b. $x \text{ closes the door partway} =$
 $\exists e[\text{agent}(e, x) \wedge \exists e'[\text{theme}(e', \text{door}) \wedge \text{cause}(e, e') \wedge$
 $\exists s[\text{partway}(\text{closed})(s) \wedge \text{theme}(s, \text{door}) \wedge \text{become}(e', s)]]]$

Parsons points out that the meaning represented in (19b) does not entail that the door is closed but only that it is partway closed (the non-extensionality of *partway* is taken care of in this way).

Tenny (2000:304-306) adopts Parsons's analysis of *partway* (also to be used for *partly*) and applies it to other sentences, including the following one:

- (20) $x \text{ eats the sandwich partway} (= x \text{ partly eats the sandwich}) =$
 $\exists e[\text{agent}(e, x) \wedge \exists e'[\text{theme}(e', \text{sandwich}) \wedge \text{cause}(e, e') \wedge$
 $\exists s[\text{partway}(\text{consumed})(s) \wedge \text{theme}(s, \text{sandwich}) \wedge \text{become}(e', s)]]]$

⁶ Naturally, *The problem is partly difficult* is fine, but this means that part of the problem is difficult and not that the (whole) problem's degree of difficulty falls somewhere on the (positive) scale of difficulty.

⁷ A similar point is made in Kennedy and McNally (1999, sect. 3.2).

Parsons's analysis of *partway* (and his implied account of adverbs of completion) is unsatisfactory for at least two reasons. First, no definition of *partway* is given, nor (in the absence of a definition) are any meaning postulates for *partway* offered. Second, no compositional semantic analysis is presented. In this regard, it is quite unclear how *partway* can apply to the predicate of states buried in the semantic decomposition of certain verbs. (Or does Parsons intend for his semantic decomposition of verbs to be mirrored as decomposition in the syntax?) Until such issues are addressed, it is hard to regard his analysis as a serious contender.

In what she calls a 'part-quantificational account' of adverbs of completion, Moltmann (1997:184) claims that "[a]dverbs of completion specify to which extent the parts of a concrete event instantiate the parts of a given abstract event." Taken literally, this expresses a different intuition from the one that I espouse, namely, that adverbs of completion specify to what extent a given situation type is realized, but taken loosely it could amount to the same thing. However, Moltmann intends it quite literally. In connection with *John completely agreed*, she writes that *completely* "specifies that each part of the abstract event of agreement expressed by John agreed is instantiated by some part of John's concrete act of agreement." The meaning that Moltmann assigns (p. 192) to *completely* is basically the two-place relation shown in (21), where e, e' are variables for concrete events, E, E' are variables for abstract events, \subseteq is a part relation, and I stands for a relation of instantiation between concrete events and abstract events.

$$(21) \quad \text{completely} \Rightarrow \lambda E \lambda e [\forall E' [E' \subseteq E \rightarrow \exists e' [e' \subseteq e \wedge e' I E']]]$$

Although not evident in (21), this analysis presupposes a function h that maps relations between concrete events e and n participants to a relation between abstract events e and n participants just in case e instantiates E .

While it would take me too far afield to address all the details of Moltmann's analysis, I should like to mention the following four problematic points. First, many notions (abstract events, the relation I , the function h) are introduced just for the analysis of adverbs of completion. They do not seem to be independently motivated in her framework. Second, even if we (reluctantly) grant the existence of abstract events, it seems dubious that they both need not have occurred and yet still may have concrete participants and be located in time and space, as Moltmann claims (p. 185). (How can something that has not occurred be located in space and time?) Third, although Moltmann treats adverbs of completion as verb modifiers (which is welcome), her other assumptions require her to postulate (p. 186) a special and somewhat cumbersome semantic rule in order to be able to combine them with verbs. Fourth and finally, her analysis does not account for the two restrictions mentioned in section 2.3, although in connection with the first restriction she mentions (p. 192) "the dependence of the part structure on the description." Even so, she does not make this "dependence" explicit in her analysis.

In sum, I conclude that there is still room for improvement regarding how adverbs of completion should be analyzed.

4. A NEW APPROACH

The guiding intuition behind the analysis that I will sketch is that the semantics of adverbs of completion makes reference to the degree to which a situation type is realized. For example, in the case of *completely* the degree of realization of the situation type in question is maximal, whereas in the case of *partly* it is partial. In working out this intuition, I will pursue a fairly modular approach to the semantics of adverbs of completion: basically, adverbs of completion have a common semantic interface with adjectives and verbs, and independent differences between adjectives and verbs are handled by independent mechanisms.

4.1. Preliminaries

I will adopt an event semantic framework that presupposes three (pairwise disjoint) sorts of objects in the domain of discourse: *ordinary objects* (x, y, \dots), *events* (e, e', \dots), and *degrees* (d, d', \dots). The domain of events should be understood in the broad sense, as including processes and states as well. For present purposes, it is appropriate to model degrees as *real numbers* in the closed interval bounded by 0 and 1 (i.e., $[0,1]$). In addition, I will make use of a *proper part* relation (\subset) on each of the domains of ordinary objects and events and a *greater-than* relation ($>$) as well as a *greater-than-or-equal* relation (\geq) on the domain of degrees, the latter two relations being interdefinable in the usual way. Finally, I will assume the dual notions of (metaphysical) *possibility* (\diamond) and *necessity* (\square), these also being interdefinable. Since various kinds of predicate variables will appear in the semantic representations, it is useful to specify in advance the types of variables that will play a role:

- (22) a. two-place relations between events and ordinary objects: R, R', \dots
 b. three-place relations between events and two ordinary objects: S, S', \dots
 c. three-place relations between events, ordinary objects, and degrees: T, T', \dots
 d. four-place relations between events, two ordinary objects, and degrees: U, U', \dots
 e. two-place functions from events and ordinary objects to degrees: f, f', \dots
 f. two-place relations between events and (two-place) relations between events and ordinary objects (a.k.a. generalized quantifiers): Q, Q', \dots
 (of type $\langle\langle e_O, \langle e_E, t \rangle \rangle, \langle e_E, t \rangle \rangle$)

In connection with (22f) I point out that the notion of a generalized quantifier in an event semantics differs in two respects from the usual one familiar from non-event semantic frameworks: first, it applies to a relation between events and ordinary objects (as opposed to a predicate of ordinary objects), and second, it yields a predicate of events (as opposed to a formula denoting a truth value). These two differences take into account both that verbs are generally analyzed as having an event argument and that (non-tensed) sentences should be analyzable as predicates of events. The usual notion of a generalized quantifier does not take these two factors into account.

With these prerequisites in place, I am in a position to propose an analysis for the adverbs of completion *completely*, *partly*, and *half*. Syntactically, there are two cases to distinguish, depending on whether the adverb of completion takes a verb or an adjective as its argument. Since the case of adjective modification is more straightforward, I will begin with it.

4.2. Adjective Modification

I analyze the three adverbs of completion in their use as adjective modifiers as follows:

- (23) a. $[_{\text{Adj}'} \text{completely } [_{\text{Adj}} \alpha]];$
 $\text{completely} \Rightarrow \lambda T \lambda x \lambda e [T(e, x, 1) \wedge \diamond \exists e' \exists x' [T(e', x', 1)]]$
 $=_{\text{def}} \text{completely_a}$
- b. $[_{\text{Adj}'} \text{partly } [_{\text{Adj}} \alpha]];$
 $\text{partly} \Rightarrow \lambda T \lambda x \lambda e [\exists d [T(e, x, d) \wedge d > 0] \wedge \diamond \exists e' \exists x' [T(e', x', 1)]]$
 $=_{\text{def}} \text{partly_a}$
- c. $[_{\text{Adj}'} \text{half } [_{\text{Adj}} \alpha]];$
 $\text{half} \Rightarrow \lambda T \lambda x \lambda e [\exists d [T(e, x, d) \wedge d \geq 0.5] \wedge \diamond \exists e' \exists x' [T(e', x', 1)]]$
 $=_{\text{def}} \text{half_a}$

As seen in (23), each adverb combines with an adjective whose meaning is represented by a three-place relation T between events, ordinary objects, and degrees.⁸ This has the effect of restricting the value of the degree argument in a certain way: whereas *completely* and *half* set its value to 1 and to at least 0.5, respectively, *partly* merely requires it to be greater than 0. Furthermore, each adverb also carries the presupposition that the maximal degree of 1 is attainable with respect to T for some event e' and ordinary object x' .⁹ Note also that the syntactic

⁸ Note that the event argument of adjectives should be thought of as a state argument—recall that I am not officially distinguishing events in the narrow sense from states.

⁹ Technically, I treat this condition as part of the assertion and not as a presupposition, given that I am not assuming a framework that can handle presuppositions properly. Even so, I will continue to speak informally of presuppositions.

result of modification is an Adj' in the case of *completely* and *partly* and a new adjective in the case of *half*.¹⁰

Recall from (4) and (18) that adverbs of completion can modify many but not all gradable adjectives. As mentioned in section 2.3, the idea is that gradable adjectives differ as to whether they are associated with a scale allowing for a maximal degree or not. For example, adjectives such as *empty*, *solved*, and *open* are associated with scales having a maximal degree, whereas *big*, *difficult*, and *heavy* are not. (Another way of putting this is that some scales are closed at the top, whereas others are open at the top.)

Let's demonstrate how the three adverbs of completion can successfully combine with *empty* (cf. (4a)). I assume that gradable adjectives basically denote two-place measure functions from events and ordinary objects to degrees, as shown in (24a) for *empty* (in prose, the degree to which x in e is empty). In addition, an accompanying axiom guarantees that the property of being empty can be realized to the maximal degree of 1 (intuitively, there is a limit to how empty things can be). In (24b), I give the analysis of a (phonologically null) degree morpheme *deg-a* that combines with a gradable adjective and makes its degree argument available for modification. Finally, the result of applying *deg-a* to *empty* is a three-place relation between events, ordinary objects, and degrees, as seen in (24c).¹¹

- (24) a. $[\text{Adj}' \text{ empty}] \Rightarrow \lambda x \lambda e [\text{empty}(e, x)]$ (of type $\langle e_O, \langle e_E, e_D \rangle \rangle$)
Axiom. $\diamond \exists e \exists x [\text{empty}(e, x) = 1]$
 b. $[\text{Adj}' \text{ deg-a } [\text{Adj}' \alpha]];$
 $\text{deg-a} \Rightarrow \lambda f \lambda d \lambda x \lambda e [f(e, x) = d]$
 c. $[\text{Adj}' \text{ deg-a } [\text{Adj}' \text{ empty}]] \Rightarrow \lambda d \lambda x \lambda e [\text{empty}(e, x) = d]$

Clearly, the relation in (24c) is an appropriate argument for the adverbs of completion (see (23)), and in (25) I provide the results of applying each adverb to this relation.

- (25) a. $[\text{Adj}' \text{ completely } [\text{Adj}' \text{ deg-a } [\text{Adj}' \text{ empty}]]] \Rightarrow$
 $\text{completely_a}(\lambda d \lambda x \lambda e [\text{empty}(e, x) = d]) =$
 $\lambda x \lambda e [\text{empty}(e, x) = 1 \wedge \diamond \exists e' \exists x' [\text{empty}(e', x') = 1]]$
 b. $[\text{Adj}' \text{ partly } [\text{Adj}' \text{ deg-a } [\text{Adj}' \text{ empty}]]] \Rightarrow$
 $\text{partly_a}(\lambda d \lambda x \lambda e [\text{empty}(e, x) = d]) =$
 $\lambda x \lambda e [\exists d [\text{empty}(e, x) = d \wedge d > 0] \wedge \diamond \exists e' \exists x' [\text{empty}(e', x') = 1]]$

¹⁰ Recall that *half* is a prefix. When speaking of categories such as Adj' (also V'), I mean to remain as neutral as possible regarding the precise phrasal categories in question. For example, I gather that Kennedy (1999, sect. 2.2) would consider my Adj' in (23) to be a DegP (a degree phrase), though he does not explicitly discuss modification of adjectives by adverbs of completion.

¹¹ Here I am more or less following Kennedy's (chap. 2, 1999) conception. The two main differences are that he does not assume an event argument for adjectives and does assume a more elaborate syntax for them (adjectives are embedded in a DegP). Moreover, he does not state axioms such as the one in (24a).

$$\begin{aligned} \text{c. } & [\text{Adj } \text{half } [\text{Adj } \text{deg-}a [\text{Adj } \text{empty}]]] \Rightarrow \\ & \text{half_}a(\lambda d \lambda x \lambda e [\text{empty}(e, x) = d]) = \\ & \lambda x \lambda e [\exists d [\text{empty}(e, x) = d \wedge d \geq 0.5] \wedge \diamond \exists e' \exists x' [\text{empty}(e', x') = 1]] \end{aligned}$$

Since the meaning of *empty* satisfies the requirement that the maximal degree of 1 be attainable (see (24a)), the resulting combinations are semantically coherent. For instance, the predicate of events corresponding to the sentence in (4a) (ignoring tense) can be concisely represented as follows (in prose, the set of events in which Stanley's bowl is empty to the maximal degree):

$$\begin{aligned} (26) \quad & \text{Stanley's bowl be completely empty} \Rightarrow \\ & \lambda e [\text{completely_}a(e, \text{stanley's_bowl}, \lambda d \lambda x \lambda e' [\text{empty}(e', x) = d])] \\ & = \lambda e [\text{empty}(e, \text{stanley's_bowl}) = 1 \wedge \diamond \exists e' \exists x' [\text{empty}(e', x') = 1]] \end{aligned}$$

Turning to those gradable adjectives that are incompatible with adverbs of completion, let's illustrate with *big* (cf. (18a)) how this incompatibility arises. The analysis of *big* parallels that of *empty* (see (24)) with the crucial exception that the corresponding axiom asserts that the property of being big cannot be realized to the maximal degree of 1. Intuitively, this axiom encodes that there is no limit to how big things can be, or, to put it another way, that the interval of degrees serving as the range of *big* is open on the right.

$$\begin{aligned} (27) \quad \text{a. } & [\text{Adj } \text{big}] \Rightarrow \lambda x \lambda e [\text{big}(e, x)] \text{ (of type } \langle e_O, \langle e_E, e_D \rangle \rangle) \\ & \text{Axiom. } \neg \diamond \exists e \exists x [\text{big}(e, x) = 1] \\ \text{b. } & [\text{Adj } \text{deg-}a [\text{Adj } \text{big}]] \Rightarrow \lambda d \lambda x \lambda e [\text{big}(e, x) = d] \end{aligned}$$

Since the semantics of adverbs of completion presupposes that the maximal degree of 1 is attainable, there is an evident presupposition failure if an adverb of completion combines with *big*. For example, the result of applying *completely* to *big* is shown in (28), where the requirement that the property of being big be realizable to the maximal degree of 1 clashes with the axiom associated with *big*, which asserts that it cannot be (see (27a)).

$$\begin{aligned} (28) \quad & \#[\text{Adj}' \text{completely } [\text{Adj } \text{deg-}a [\text{Adj } \text{big}]]] \Rightarrow \\ & \text{completely_}a(\lambda d \lambda x \lambda e [\text{big}(e, x) = d]) = \\ & \lambda x \lambda e [\text{big}(e, x) = 1 \wedge \diamond \exists e' \exists x' [\text{big}(e', x') = 1]] \end{aligned}$$

Before closing this section, I will indicate how the non-extensionality of *partly* and *half* (in contrast to *completely*) as adjective modifiers is accounted for (see sect. 2.2). For example, if Stanley's bowl is partly (half) empty, it does not follow that it is empty. This is because the unmodified, positive form of a gradable adjective makes implicit reference to a *standard degree* (d_{std}) of comparison that is fixed by the context for the property in question. Technically, I treat the standard degree as a

free variable that is introduced by a degree morpheme *pos-a* which is applied to the basic adjective, as illustrated in (29) for *empty*.¹² Note also that *deg-a* (see (24b)) contrasts with *pos-a* in this respect, because *deg-a* makes the degree argument available for modification and does not restrict its value in any way.

$$(29) \quad \begin{aligned} & [\text{Adj } pos-a \text{ } [\text{Adj } \alpha]]; \\ & pos-a \Rightarrow \lambda f \lambda x \lambda e [f(e, x) \geq d_{std}] \\ & [\text{Adj } pos-a \text{ } [\text{Adj } empty]] \Rightarrow \lambda x \lambda e [empty(e, x) \geq d_{std}] \end{aligned}$$

In the case of *empty*, the standard degree would define the threshold that ordinary objects (e.g., cereal bowls) must meet in order to count as empty—in general, it seems reasonable to think that it will fall somewhere between 0.9 and 1, taking the value of 1 to correspond to complete emptiness. Now, the simple observation is that since *completely* restricts the value of the degree argument to be 1, this will always be at least as high as the standard, but the matter is very different for *partly* and *half*, which both allow for a value of the degree argument that may be less than the standard degree. Consequently, the semantics of *partly* and *half* in combination with an adjective does not generally entail the meaning of the unmodified, positive form of the adjective.

4.3. Verb Modification

How do adverbs of completion modify verbs? If the strategy is to keep the semantics of adverbs of completion in their two uses maximally similar (and this is the strategy), then we have two immediate problems to contend with: first, most verbs presumably do not have a degree argument to begin with, and second, it is not terribly clear at first glance what it should mean for an event type to be realizable to the maximal degree of 1. In what follows, I will propose a semantics for adverbs of completion as verb modifiers with an eye to these two issues.

Concentrating on the case in which adverbs of completion combine with a transitive verb, I suggest the following analyses for *completely*, *partly*, and *half*, respectively:

$$(30) \quad \begin{aligned} \text{a. } & [\text{V } completely \text{ } [\text{V } \alpha]]; \\ & completely \Rightarrow \lambda U \lambda Q \lambda x \lambda e [Q(e, \lambda y \lambda e' [U(e', x, y, 1)]) \wedge \\ & \quad \diamond \exists e_1 \exists x_1 [Q(e_1, \lambda y \lambda e' [U(e', x_1, y, 1)])] \wedge \\ & \quad \square \forall e_2 \forall x_2 [Q(e_2, \lambda y \lambda e' [U(e', x_2, y, 1)])] \rightarrow \\ & \quad \neg \exists e_3 [Q(e_3, \lambda y \lambda e' [U(e', x_2, y, 1)]) \wedge e_3 \subset e_2]]] \\ & =_{\text{def}} \text{completely}_{-v} \end{aligned}$$

¹² Strictly speaking, the standard degree is probably best thought of as the value of a certain function that is for simplicity not explicitly represented in (29). See Kennedy (1999, sect. 2.3.2) for discussion.

- b. $[_v \text{ partly } [_v \alpha]]$;
 $\text{partly} \Rightarrow \lambda U \lambda Q \lambda x \lambda e [\exists d [Q(e, \lambda y \lambda e' [U(e', x, y, d)]) \wedge d > 0] \wedge$
 $\diamond \exists e_1 \exists x_1 [Q(e_1, \lambda y \lambda e' [U(e', x_1, y, 1)])] \wedge$
 $\square \forall e_2 \forall x_2 [Q(e_2, \lambda y \lambda e' [U(e', x_2, y, 1)]) \rightarrow$
 $\neg \exists e_3 [Q(e_3, \lambda y \lambda e' [U(e', x_2, y, 1)]) \wedge e_3 \subset e_2]]]$
 $=_{\text{def}} \text{partly}_{-v}$
- c. $[_v \text{ half } [_v \alpha]]$;
 $\text{half} \Rightarrow \lambda U \lambda Q \lambda x \lambda e [\exists d [Q(e, \lambda y \lambda e' [U(e', x, y, d)]) \wedge d \geq 0.5] \wedge$
 $\diamond \exists e_1 \exists x_1 [Q(e_1, \lambda y \lambda e' [U(e', x_1, y, 1)])] \wedge$
 $\square \forall e_2 \forall x_2 [Q(e_2, \lambda y \lambda e' [U(e', x_2, y, 1)]) \rightarrow$
 $\neg \exists e_3 [Q(e_3, \lambda y \lambda e' [U(e', x_2, y, 1)]) \wedge e_3 \subset e_2]]]$
 $=_{\text{def}} \text{half}_{-v}$

All three adverbs combine with a verb whose meaning is represented by a four-place relation U between events, two ordinary objects, and degrees, and they yield a V' (in the case of *half*, a new verb) whose meaning is represented by a three-place relation between events, ordinary objects, and generalized quantifiers. Thus, the effect of each adverb is twofold. On the one hand, it restricts the value of the degree argument just like in (23): whereas *completely* and *half* set its value to 1 and 0.5, respectively, *partly* forces it to be greater than 0. On the other hand, each adverb raises the logical type of the verb's internal argument to that of a generalized quantifier.

A comparison of (30) with (23) makes it clear that the semantics assigned to the adverbs in their two uses is very similar, the main difference being in the additional presupposition (beginning on the third line of each formula) that the adverbs carry in their use as verb modifiers. Intuitively, the rationale for raising the logical type of the verb's internal argument to that of a generalized quantifier is to have access to how it is described (in other words, to have scope over the NP that realizes it). The information provided by the generalized quantifier is incorporated into the description of the event type, which the two presuppositions make vital use of. In a nutshell, the first presupposition (second line) requires that the event type be realizable to the maximal degree of 1 with respect to an event e_1 and the second presupposition (third/fourth line) asserts that it is necessarily the case that if the event type is realized to the maximal degree of 1 with respect to an event e_2 , then there is no proper subevent e_3 of e_2 with respect to which the event type is realized to the maximal degree of 1. Essentially, the role of the second presupposition is to place a constraint on what it means for an event type to be realized to the maximal degree of 1. It has the consequence that the internal argument of the verb cannot be expressed as a bare plural or bare mass NP (see section 2.3), as discussed below.

The first immediate problem mentioned above is that adverbs of completion apply to verbs with a degree argument, and yet most verbs arguably do not start out with a degree argument. Now, if verbs do not have a degree argument to begin with, then they have to acquire one along the way. To this end, I introduce a *degree*

function δ from events, ordinary objects, and two-place relations between events and ordinary objects to degrees.¹³ Basically, δ is a kind of measure function—it measures the extent to which an ordinary object x is affected (or effected, for that matter) in an event e with respect to a relation R . For example, if R is the relation of eating between events and objects that are eaten (i.e., the internal argument relation of *eat*), e is an eating event, and x is an apple, then the value of δ as applied to e , x , and R represents how much of the apple is eaten in e , where the value of 1 indicates that the apple is fully eaten in e , the value of 0 means that the apple is not at all eaten in e , and a value greater than 0 entails that a part of the apple is eaten in e . For the purposes of this paper, I will not attempt to lay down the axioms for δ but will simply remark that its value should increase in the course of an event with respect to an ordinary object and the chosen relation.

In order to make the degree argument introduced by δ modifiable, I propose that a degree morpheme *deg-v* having the essential content of δ is applied to the basic verb, as shown in (31) for *eat*.

- (31) a. $[_V \text{ eat}] \Rightarrow \lambda y \lambda x \lambda e [\text{eat}(e, x, y)]$
 b. $[_V \text{ deg-v } [_V \alpha]];$
 $\text{deg-v} \Rightarrow \lambda S \lambda d \lambda y \lambda x \lambda e [\delta(e, y, \lambda y' \lambda e' [S(e', x, y')]) = d]$
 c. $[_V \text{ deg-v } [_V \text{ eat}]] \Rightarrow \lambda d \lambda y \lambda x \lambda e [\delta(e, y, \lambda y' \lambda e' [\text{eat}(e', x, y')]) = d]$

Observe the parallel between *deg-v* in (31b) and *deg-a* in (24b), the crucial difference being that *deg-v* serves both to add a degree argument to the verb and to make it modifiable, whereas *deg-a* merely makes the (already existing) degree argument of the gradable adjective modifiable. As illustrated in (31c), the result of applying *deg-v* to a transitive verb is a four-place relation between events, two ordinary objects, and degrees. Recall from (30) that this is precisely the kind of input that the adverbs of completion require. By way of illustration, let's consider the result of combining *completely* with *eat*:

- (32) $[_V \text{ completely } [_V \text{ deg-v } [_V \text{ eat}]]] \Rightarrow$
 $\text{completely_v}(\lambda d \lambda y \lambda x \lambda e [\delta(e, y, \lambda y' \lambda e' [\text{eat}(e', x, y')]) = d] =$
 $\lambda Q \lambda x \lambda e [Q(e, \lambda y \lambda e' [\delta(e', y, \lambda y' \lambda e'' [\text{eat}(e'', x, y'')]) = 1]) \wedge$
 $\diamond \exists e_1 \exists x_1 [Q(e_1, \lambda y \lambda e' [\delta(e', y, \lambda y' \lambda e'' [\text{eat}(e'', x_1, y'')]) = 1])] \wedge$
 $\square \forall e_2 \forall x_2 [Q(e_2, \lambda y \lambda e' [\delta(e', y, \lambda y' \lambda e'' [\text{eat}(e'', x_2, y'')]) = 1]) \rightarrow$
 $\neg \exists e_3 [Q(e_3, \lambda y \lambda e' [\delta(e', y, \lambda y' \lambda e'' [\text{eat}(e'', x_2, y'')]) = 1]) \wedge$
 $e_3 \subset e_2]]]$

It is perhaps easier to appreciate the force of this formula once it is fed both a generalized quantifier argument and a subject argument. If we aim to derive the sentence in (1a), the respective arguments are the following:

¹³ I made use of a similar degree function for the semantics of *gradually* in Piñón (2000).

- (33) a. his Wheaties $\Rightarrow \lambda R \lambda e [R(e, \text{his_wheaties})]$
 b. Stanley $\Rightarrow \text{stanley}$

Applying the formula in (32) to these two arguments, we get the following predicate of events for the untensed sentence:

- (34) Stanley completely eat his Wheaties \Rightarrow
 $\lambda e [\delta (e, \text{his_wheaties}, \lambda y' \lambda e'' [\text{eat}(e'', \text{stanley}, y')]) = 1 \wedge$
 $\diamond \exists e_1 \exists x_1 [\delta (e_1, \text{his_wheaties}, \lambda y' \lambda e'' [\text{eat}(e'', x_1, y')]) = 1] \wedge$
 $\square \forall e_2 \forall x_2 [\delta (e_2, \text{his_wheaties}, \lambda y' \lambda e'' [\text{eat}(e'', x_2, y')]) = 1 \rightarrow$
 $\neg \exists e_3 [\delta (e_3, \text{his_wheaties}, \lambda y' \lambda e'' [\text{eat}(e'', x_2, y')]) = 1] \wedge$
 $e_3 \subset e_2]]]$

This predicate denotes the set of events in which Stanley eats his Wheaties to the maximal degree of 1 and presupposes both that it is possible for someone to eat his (i.e., Stanley's) Wheaties to the maximal degree of 1 (surely it is) and that it is necessary that if someone eats his Wheaties to the maximal degree of 1 in an event e_2 , then no proper part e_3 of e_2 is an event in which that person eats his Wheaties to the maximal degree of 1 (also true). Let's now contrast the previous semantically coherent sentence with the unacceptable one in (17a), which contains the bare mass NP *cereal* in place of *his Wheaties*. The analysis of *cereal* as a generalized quantifier is as follows:

- (35) cereal $\Rightarrow \lambda R \lambda e [\exists y [R(e, y) \wedge \text{cereal}(y)]]$

The application of the formula in (32) first to this generalized quantifier and then to the term for *Stanley* in (33b) yields the predicate of events representing the tenseless (and unacceptable) sentence in (17a):

- (36) #Stanley completely eat cereal \Rightarrow
 $\lambda e [\exists y [\delta (e, y, \lambda y' \lambda e'' [\text{eat}(e'', \text{stanley}, y')]) = 1 \wedge \text{cereal}(y)] \wedge$
 $\diamond \exists e_1 \exists x_1 \exists y_1 [\delta (e_1, y_1, \lambda y' \lambda e'' [\text{eat}(e'', x_1, y')]) = 1 \wedge$
 $\text{cereal}(y_1)] \wedge$
 $\square \forall e_2 \forall x_2 [\exists y_2 [\delta (e_2, y_2, \lambda y' \lambda e'' [\text{eat}(e'', x_2, y')]) = 1 \wedge$
 $\text{cereal}(y_2)] \rightarrow$
 $\neg \exists e_3 \exists y_3 [\delta (e_3, y_3, \lambda y' \lambda e'' [\text{eat}(e'', x_2, y')]) = 1 \wedge$
 $\text{cereal}(y_3) \wedge e_3 \subset e_2]]]$

This predicate denotes the set of events in which Stanley eats a quantity of cereal to the maximal degree of 1 and presupposes both that it is possible for someone to eat a quantity of cereal to the maximal degree of 1 (which seems true) and that it is

necessary that if someone eats a quantity of cereal to the maximal degree of 1 in an event e_2 , then no proper part e_3 of e_2 is an event in which that person eats a quantity of cereal to the maximal degree of 1, which is certainly false. For example, Stanley's complete eating of half a bowl of Wheaties may well be a proper part of his complete eating of a bowl of Wheaties. Since it is easy to see that this presupposition will fail with bare plural NPs as well (cf. (16)), we have an account of why all such 'bare object NPs' are unacceptable with adverbs of completion. (Although I do not provide derivations with *partly* and *half*, they are the same as *completely* in this respect.)

Notice that the failure of the second presupposition in (36) implies that the first presupposition fails as well, although it initially appeared to be satisfied. In other words, event types such as the one corresponding to *eat cereal* are not realizable to the maximal degree of 1 (just as the property of being big is not either; recall (27) - (28)). Of course, this does not mean that a person cannot eat a given quantity of cereal to the maximal degree of 1 (it happens all the time), but rather that there cannot be a largest event which realizes the event type corresponding to *eat cereal*.

As a final remark, I will return to the non-extensionality of *partly* and *half* (in contrast to *completely*) as verb modifiers discussed in section 2.2. Essentially, the idea is to adopt the same solution as was suggested for adjectives in (29), namely, that the unmodified, positive form of a verb makes implicit reference to a standard degree of comparison that is fixed by the context for the property in question. This standard degree is introduced by a degree morpheme *pos-v* that is applied to the basic verb, as exemplified in (37) for *eat*.

- (37) a. $[_V \textit{pos-v} [_V \alpha]]$;
 $\textit{pos-v} \Rightarrow \lambda S \lambda y \lambda x \lambda e [\delta(e, y, \lambda y' \lambda e' [S(e', x, y')]) \geq d_{\text{std}}]$
 b. $[_V \textit{pos-v} [_V \textit{eat}]] \Rightarrow \lambda y \lambda x \lambda e [\delta(e, y, \lambda y' \lambda e' [S(e', x, y')]) \geq d_{\text{std}}]$

If it is claimed that Stanley ate his Wheaties, then the truth of this claim is compatible with the possibility that some Wheaties were left in his bowl uneaten. However, if too many Wheaties remained, then the claim seems false. I assume that the context sets a standard degree that determines the threshold that events in which the kind of object at issue is eaten must meet in order to count as eatings of that kind of object. Turning to the adverbs of completion, it is clear that the maximal degree of 1 set by *completely* will always be at least as high as the standard, but this is not so for either *partly* or *half*, both of which allow for a value of the degree argument that may be less than the standard. Accordingly, there is no general entailment from the meaning of *partly* or *half* in combination with a verb to the meaning of the unmodified, positive form of the verb.

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