The Internal Structure of Degree-Achievements: Evidence from *again*-Ambiguities

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1. Introduction

In the late 1960s and early 1970s, researchers in the Generative Semantics tradition proposed that certain ambiguities and entailments should be handled by positing deep structures in which what appear to be morphologically simple predicates are 'decomposed' into various meaningful constituents. Perhaps the most famous example of this type is the proposal that the deep-structure of the verb-phrase *kill John* is [CAUSE [BECOME [John dead]]]; such a decomposition was proposed in order to account for the fact that, for example, *John was killed* entails *John is dead* (McCawley 1968).

In addition to handling entailments of this kind, syntactic decomposition was proposed to account for certain attested ambiguities, among them ambiguities introduced into certain sentences by the modifier *again* (Morgan 1969, McCawley 1973, Dowty 1979, von Stechow 1996). An example of an ambiguous '*again*-sentence' is the following.

(1) The door opened again.

This sentence has two readings, a *repetitive* reading and a *non-repetitive* (or *restitutive*) reading. In the repetitive reading, it is understood that the door opened and that it had opened before. The non-repetitive reading is weaker; in this reading, it is understood that the door opened and that it had been open before, though it need not ever have *opened* before. Note that, intuitively, a repetitive reading of (1) entails a non-repetitive reading; if the door opened before, it follows that the door was open before. This entailment will be important in what follows.

A standard decompositional analysis of the above-described ambiguity assumes that a verb like *open* can be decomposed into a BECOME operator and a small-clause containing a stative predicate, providing two different attachment sites for *again*. The ambiguity is then explained in terms of the scope *again* takes with respect to the BECOME operator.

(2) a. [again [BECOME [the door open]] *repetitive*
b. [BECOME [again [the door open]] *non-repetitive*

Such a decompositional analysis of *again*-ambiguities has been proposed more recently by von Stechow (1996), who translated the generative semanticists' proposal into a more modern framework and applied it to German data.

Importantly, the above-mentioned entailment from the repetitive to the non-repetitive reading is a direct consequence of any 'BECOME-*again*' analysis, as will be demonstrated in §2. However, as this paper shows, there is a class of non-stative predicates – Degree Achievements – that give rise to an *again*-ambiguity, but one that differs from the ambiguity in (1) in that a repetitive reading does *not* entail a non-repetitive reading. Consider the following sentence.

(3) The river widened again.

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Like (1), this sentence has a repetitive and non-repetitive reading. The repetitive reading expresses that the river widened twice; the non-repetitive reading expresses that the river narrowed prior to widening. Unlike (1), the repetitive reading of (3) does not entail the non-repetitive reading; whereas it is impossible for there to be two successive openings of a door without a closing in between, it is possible for there to be two successive widenings of a river without a narrowing in between.

This being the case, it will be argued that the ambiguity found in sentences like (3) cannot possibly be explained by the scope of *again* with respect to a BECOME operator. In fact, something stronger will be asserted: that the lack of an entailment between readings shows us that degree-achievement predicates do not in fact contain a BECOME operator in their decomposition. Instead, it will be proposed that degree-achievements are best analyzed as being decomposed into a comparative structure that does not contain BECOME. It will then be shown that the *again*-ambiguity they give rise to can be properly explained by the scope of *again* with respect to the Degree Phrase (DegP) in the decomposed predicate.

2. BECOME and *again*

In this section, it will be shown that any analysis of *again*-ambiguities that derives the two readings in terms of the scope of *again* with respect to a BECOME operator will derive a repetitive reading that entails a non-repetitive one.

It is now customary (since von Stechow 1996) to describe the formal contribution that *again* makes to a sentence in terms of a presupposition about the existence of an earlier event(uality)[2]. According to von Stechow, *again* is a sentential operator that introduces a definedness condition as shown in (4); note that *again* does not change the assertion made by a sentence. For a property of events P and an event e_0 (where '<' is temporal ordering),

(4) $\|again\| = [\lambda P.\ \lambda e.\ \exists e' \mid e' < e\ \&\ P(e') = 1: P(e)]$

(5) The door is open again.
$\|again\|$ (λe: the door is open for e) (e_0)

Assertion: The door is open for e_0
Presupposition: $\exists e' \mid e' < e_0$ & The door was open for e'

Von Stechow points out that the event whose existence is presupposed must be wholly distinct from the event that the assertion is about[3]. In §5 we shall have occasion to make this requirement more explicit, but until then we shall just stipulate that the two events are distinct.

Building on the work of Dowty (1979), decompositional analyses often assume that non-stative properties are derived from stative properties using BECOME[4]. The denotation for BECOME adopted here is from von Stechow (1996), which builds on the work of Dowty (1979)[5]. For a stative property of events P and an event e_0,

(6) $\|$BECOME$\|$ =
$[\lambda P.\ \lambda e.\ \exists e \mid P(e) = 1$: P is false at the beginning of e but is true at the end of $e]$

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[2] In what follows, we shall use the term 'event' to refer to both stative and non-stative eventualities.
[3] Von Stechow ensures that this is the case by incorporating an event-maximality operator into his semantics.
[4] A stative property is one which (i) can be true of an event that lasts a single moment, and (ii) if true of an event is true of all subevents of that event; a non-stative property is one for which one of these conditions fails (adapted from Dowty 1979).
[5] Note that BECOME must allow *again*-presuppositions to project to the entire sentence; this is accomplished with the definedness condition in (6).

(7) The door opened.
$\|$ [BECOME [the door open]] $\|$ $(e_0) = 1$ iff
the door is closed at the beginning of e_0 and open at the end of e_0

Assuming these definitions for *again* and BECOME, it can now be shown that for any stative property P and event e,

(8) $\|again\|(\text{BECOME}(P))(e)$ entails $\text{BECOME}(\|again\|(P))(e)$

That is, it can be shown that a repetitive reading entails a non-repetitive one, regardless of what stative property is present in the small clause. To see that this is case, consider the repetitive and non-repetitive readings for an arbitrary stative property P and event e_0.

(9) *Repetitive Reading*
$\|again\|$ $(\text{BECOME}(P))(e_0)$
Assertion: P is false of the beginning of e_0 but is true of the end of e_0
Presupposition: $\exists e' < e_0 \mid P$ is false of the beginning of e' but is true of the end of e'

(10) *Non-repetitive Reading*
$\text{BECOME}\ (\|again\|(P))(e_0)$
Assertion: P is false of the beginning of e_0 but is true of the end of e_0
Presupposition: $\exists e' < e_0 \mid P(e') = 1$

Since *again* serves only to introduce a presupposition, both the repetitive and non-repetitive readings make the same assertion, namely $\text{BECOME}(P)(e_0)$. In order to show that a repetitive reading entails a non-repetitive one, it needs to be shown that this assertion together with the repetitive presupposition entail the non-repetitive presupposition. That is, what needs to be shown is the following:

(11) $\forall e'$ such that $e' < e_0$
$\text{BECOME}(P)(e_0) = \text{BECOME}(P)(e') = 1 \rightarrow \exists e''\ (e'' < e_0\ \&\ (P(e'') = 1)$

The antecedent of the above conditional contains the material from the assertion and the presupposition of the repetitive reading; the consequent contains the non-repetitive presupposition. Here is a short proof of the above claim:

1. Let e_1 be an arbitrarily chosen event such that $e_1 < e_0$ and $\text{BECOME}(P)(e_0) = \text{BECOME}(P)(e_1) = 1$.
2. It follows that P is false at the beginning of e_0 and true at the end of e_0
3. It follows that P is false at the beginning of e_1 and true at the end of e_1
4. It follows that there is some P-event – call it e_2 – which includes the end of e_1 but not the beginning of e_0
5. Then $e_2 < e_0\ \&\ P(e_2) = 1$

It was remarked in §1 that if the door had opened previously it must have been open previously; this consequent open state is what serves to make the non-repetitive reading of *the door opened again* true whenever the repetitive reading is. The above proof shows that this entailment does not depend at all on the specific stative property in the small-clause, but only on the meanings of BECOME and *again*. Hence, any proposal that explains the ambiguity in terms of the scope of *again* and BECOME will predict such an entailment between readings.

3. Degree-Achievements and BECOME

As was remarked in §1, certain predicates – what will be referred to here as Degree Achievements (DAs)[6] – give rise to *again*-ambiguities in which there is no entailment between readings. From the discussion in §2, it follows that a BECOME-*again* analysis cannot explain the ambiguities we find in sentences with such predicates.

Let us look at the readings for (3) – *The river widened again* – in more detail, consulting the situations in the table below.

Table 1.

	Sit. 1	**Sit. 2**	**Sit. 3**
April 1st	12m	10m	10m
May 1st	12m	11m	12m
June 1st	10m	11m	10m
July 1st	12m	12m	12m

Recall that the repetitive reading of (3) expresses that the river widened before the asserted widening, whereas the non-repetitive[7] reading expresses that the river narrowed before the asserted widening. In Situation 1, the river narrows between May 1st and June 1st, and widens between June 1st and July 1st; in such a situation the non-repetitive, but not the repetitive, reading is true. In Situation 2, the river widens between May 1st and June 1st, keeps a constant width for the month of June, and then widens between June 1st and July 1st; in such a situation, only the repetitive reading is true. These two situations suffice to show that the two readings have distinct truth-conditions. Note that we can, however, have a situation in which both readings are true; Situation 3 is such a case.

Degree-achievement predicates such as *widen* have been discussed in connection with *again*-ambiguities previously, most notably by Fabricius-Hansen and von Stechow (1996). Von Stechow discusses work by Fabricius-Hansen (1983), who claims that such predicates present a problem for the standard scopal account of *again*-ambiguities. Von Stechow (1996) responds by claiming that the two readings of (3) can in fact be captured with a BECOME-*again* analysis. However, as was just proven, a BECOME-*again* analysis cannot possibly produce two readings that have independent truth-conditions, as the two readings of (3) do. And indeed, the proposal that von Stechow provides does not take into account situations like Situation 2 in table 1; that is, von Stechow does not consider situations in which there are successive widenings with no narrowing in between. As a result, he predicts that (3) cannot be uttered felicitously in such a situation, counter to intuitions. It is worth, however, taking a moment to look into his analysis in greater detail.

Von Stechow (1996:122-130) provides an analysis in which degree-achievements are decomposed into BECOME and a comparative small-clause. His analysis is non-compositional, and is somewhat simplified here, but what follows captures the essential features. In effect, his small clause denotes the following property of events, where e_0 is the topical event:

(12) [λe: the river is wider for e than at $beg(e_0)$]

Adding BECOME produces the following property of events:

(13) $\|$ BECOME$\|$ ([λe: the river is wider for e than at $beg(e_0)$]) =
[λe: the river is not wider at $beg(e)$ than at $beg(e_0)$ & the river is wider at $end(e)$ than at $beg(e_0)$]

[6] This term is used here to refer to the class of predicates, like *widen*, whose readings in an ambiguous *again*-sentence have independent truth-conditions. While this class definitely overlaps with the class of predicates called Degree Achievements by other researchers (e.g. Kennedy & Levin 2008), it is likely not identical. Further work is needed to see precisely what the similarities and differences are.

[7] or 'counter-directional' in the terminology of Fabricius-Hansen (1983)

The event argument of the property (13) is then saturated by the topical event e_0, resulting in the following truth-conditions for the sentence *The river widened*.

(14) $\|$ BECOME$\|$ ([λe: the river is wider for *i* than at *beg*(e_0)]) (e_0) = 1 iff
the river is not wider at *beg*(e_0) than at *beg*(e_0) &
the river is wider at *end*(e_0) than at *beg*(e_0)

Given this decompositional analysis, von Stechow attempts to derive the repetitive / non-repetitive ambiguity for degree achievements in the same way as he does for result-state predicates: by scoping *again* above or below BECOME. He thus derives the following truth-conditions for the two readings.

(15) *Repetitive Reading*
$\|$*again*$\|$ ($\|$ BECOME$\|$ ([λe: the river is wider for *i* than at *beg*(e_0)])) (e_0)
a. *assertion:* the river is wider at *end*(e_0) than at *beg*(e_0)
b. *presupp:* $\exists e' \mid e' < e_0$ &
the river is not wider at *beg*(e') than at *beg*(e_0)
the river is wider at *end*(e') than at *beg*(e_0)

(16) *Non-repetitive Reading*
$\|$ BECOME$\|$ ($\|$*again*$\|$ ([λe: the river is wider for *i* than at *beg*(e_0)])) (e_0)
a. *assertion:* the river is wider at *end*(e_0) than at *beg*(e_0)
b. *presupp:* $\exists e' \mid e' < e_0$ & the river is wider for e' than at *beg*(e_0)

Von Stechow's account does derive the correct presupposition for the non-repetitive reading. When *again* scopes between BECOME and the comparative, the presupposition entails the existence of an event in which the river narrowed, an event that occurred between *end*(e') and *beg*(e_0).

The presupposition for the repetitive reading, however, is incorrect. When *again* scopes above BECOME, the sentence presupposes a prior event in which the river widened (the event e'), and entails the existence of an event in which the river narrowed (between *end*(e') and *beg*(e_0)); von Stechow's repetitive reading thus entails his non-repetitive reading. However, his presupposition for the repetitive reading is incorrect, as it rules out situations like Situation 2 in Table 1.

Rather than conclude that counter-directional readings provide evidence against scopal accounts of *again*-ambiguities in general, we shall attempt to provide a scopal account that can derive such readings. Necessarily, such an account will involve positing, for predicates like *widen*, a decomposition that does not include a BECOME operator.

4. Decomposition of Degree-Achievements

The decomposition of DA predicates proposed by von Stechow (1996) contains both a BECOME operator and a comparative structure; here we shall follow him in the latter, but not the former, respect. The proposed decomposition for (17a) is shown in (17b) below.

(17) a. The river widened.
b. at END [the river is [more than [at BEG it is *wh* wide]] wide]
"The river is wider at the end of the event than at the beginning of the event"

In order to aid the exposition of what follows, we shall adopt a semantic framework where denotations are relativized to event indices. For example, the denotation of the adjective *open* relativized to the index *e* is shown in (18).

(18) $\|$ open$_{\text{ADJ}}$ $\|^{g,e}$ = [λx: *e* is an event in which *x* is open]

An 'at least' semantics for gradable adjectives (Gawron 1995, Heim 2000) and a maximality semantics for the comparative morpheme (von Stechow 1984, Rullman 1995, Heim 2000) are also assumed.

(19) $\|$ wide $\|^{g,e} = [\lambda d.\lambda x$: e is an event in which x is at least d wide]

(20) $\|$ *more* $\|^{g,e} = [\lambda f_{<d<et>>}.\lambda g_{<d<et>>}$: $max\{d \mid g(d) = 1\} > max\ \{d \mid f(d) = 1\}$]

It will be noticed that the decomposition in (17) contains two sentential operators, BEG and END. The semantic effect of these operators is 'shift' the event index to the beginning and end of the topical event, as shown below.

(21) a. $\|$at BEG [S] $\|^{g,e} = \|S\|^{g,\ beg(e)}$
b. $\|$at END [S] $\|^{g,e} = \|S\|^{g,\ end(e)}$

(22) $\|$at BEG [the door is open]$\|^{g,e} = 1$ iff the door is open at *beg*(e)

The structure in (17) is uninterpretable as is, since $\|$*more*$\|$ requires two predicates of degrees as input. However, following Heim's (2000) movement account of comparatives, if we assume that a DegP – like an object quantifier – raises at LF, the structure becomes interpretable[8].

(23) a. more than [*wh* 2 at BEG it is d_2 wide] [1 at END the river is d_1 wide]
b. $\|$ (23) $\|^{g,e} = 1$ iff
$max\{d \mid$ river is d-wide at $end(e)\} > max\{d \mid$ river is d-wide at $beg(e)\}$

These truth conditions require that the river be wider at the end of the event than at the beginning, which seems to adequately capture the meaning of (17a). Note that (23b) can only be true of an event that lasts for more than one moment, since it requires distinct beginning and end points; thus, under the proposed decomposition DAs are indeed achievement-type predicates.

5. Deriving the ambiguity

It was remarked in §2 that *again* must introduce a presupposition about an event that is wholly distinct from the topical event. To aid in the exposition of what follows, we shall make this requirement explicit by adopting the slightly more complex meaning for *again* found in (24); this meaning ensures that the presupposed and asserted events are distinct *P*-events by requiring the existence of an intermediary event in which the property *P* does *not* hold.

(24) $\|again\| = [\lambda P.\ \lambda e.\ \exists e', e'' \mid e'' < e' < e\ \&\ P(e'') = 1\ \&\ P(e') = 0: P(e)]$

(25) The door is open again.
$\|again\|$ (λe: the door is open for e) (e_0)

Assertion: The door is open for e_0
Presupposition: $\exists e', e'' \mid e'' < e' < e_0$ & the door was open for e'' and closed for e'

We may now turn to deriving the correct readings for a sentence like (3). The pre-movement structure for (26a) is found in (26b).

(26) a. The river widened again
b. <u>again</u> [at END the river is [more than at BEG it is *wh* wide] wide]

[8] Also assuming null-operator movement in the *than*-clause.

As was remarked in §4, the DegP must move for interpretation. Given this structure, there are two possible sites for DegP to move to: above *again*, or below it. If the DegP moves below *again*, the repetitive reading is derived; if it moves above *again*, the non-repetitive reading is derived. Let us consider the repetitive reading first; this reading can roughly be paraphrased as 'there is an event *e* such that the river was wider at the end of *e* than at the beginning of *e*, and there was another similar event before'.

(27) *repetitive reading*
again [more than [*wh* 2 at BEG it is d_2 wide] [1 at END the river is d_1 wide]]

(28) $\|$ (27) $\|^{g,e0}$
Assertion:
$max\{d \mid \text{river is d-wide at } end(e_0)\} > max\{d \mid \text{river is d-wide at } beg(e_0)\}$

Presupposition: $\exists e', e'' \mid e'' < e' < e_0$ &
$max\{d \mid \text{river is d-wide at } end(e')\} > max\{d \mid \text{river is d-wide at } beg(e')\}$
$max\{d \mid \text{river is d-wide at } end(e'')\} \leq max\{d \mid \text{river is d-wide at } beg(e'')\}$

The presupposition in (28) will be met in any situation which includes a widening event prior to the indexed event. Note that, unlike von Stechow's (1996) repetitive reading, the repetitive reading derived by the present account does not require that the river narrow between the two widening events; it may either narrow or stay the same width. Thus, the repetitive reading derived under this account will be true in Situations 2 and 3 in Table 1; this is intuitively the correct result.

The LF of the non-repetitive reading is shown in (29); this reading can be given the paraphrase 'at the end of the event, the river is once again wider than its width at the beginning of the event'.

(29) *non-repetitive reading*
more than [*wh* 2 at BEG it is d_2 wide] [1 again at END the river is d_1 wide]

In the non-repetitive LF, *again* scopes over a clause containing an unbound variable of degrees, i.e. over the trace d_1 left by DegP movement. Assuming predicate abstraction limits input degrees to ones that satisfy the presupposition (see Heim & Kratzer 1996:125), the denotation for the lambda-abstracted function is as follows.

(30) $\|$ 1 again [at END [river is d_1 wide]] $\|^{g,e0}$ is defined only for degrees *d* such that
$\exists e', e'' \mid e'' < e' < e_0$ &
(i) the river is *d*-wide at $end(e'')$
(ii) the river is not *d*-wide at $end(e')$.

where defined, is true of a degree *d* only if the river is *d*-wide at $end(e_0)$

From (i) and (ii) above, it follows that this function will only be defined in situations which include a narrowing prior to the indexed event *e*; that is, (i) and (ii) together entail the existence of a narrowing event between the end of *e''* and the end of *e'*. In the situations provided in Table 1, the function will only have a non-empty domain in Situations 1 and 3.

As it turns out, the situations in which the domain of the function in (30) is non-empty precisely match those situations in which the presupposition of the non-repetitive reading is intuitively satisfied. In order to have the presupposition project to the entire sentence, we can assume that the comparative morpheme has a definedness condition which requires that its two input <dt> functions also be defined. This condition is shown in (31)[9].

(31) $\|more\|(f)(g)$ is defined iff $\exists d \mid f(d)$ is defined & $\exists d \mid g(d)$ is defined

With the presupposition now able to project to the level of the entire sentence, the truth-conditions of the non-repetitive reading come out as follows.

(32) $\|(29)\|^{g,e0}$
Assertion:
$max\{d \mid \text{river is d-wide at } end(e_0)\} > max\{d \mid \text{river is d-wide at } beg(e_0)\}$

Presupposition:
$\exists e', e'' \mid e'' < e' < e_0$ &
(i) the river is d-wide at *end*(e'') &
(ii) the river is not d-wide at *end*(e')

The presupposition in (32) requires only that the river narrowed prior to the indexed event. The non-repetitive reading will thus be true in Situations 1 and 3, correctly matching speaker intuitions. The DegP scope account thus derives the correct presuppositions for both readings.

6. Conclusion

This paper has shown that while Degree Achievements do present a problem for a BECOME-*again* account of *again*-ambiguities, they do not rule out a scopal analysis in general. The particular readings found in sentences with Degree Achievements can be properly explained in terms of the position *again* takes with respect to a comparative Degree Phrase, once the predicate is decomposed into the appropriate comparative structure.

Again-ambiguities thus provide a valuable tool for probing the internal structure of various predicates. The fact that Degree Achievements give rise to an ambiguity whose readings have distinct truth-conditions has been taken here as evidence that their internal structure differs from that of 'result-state' predicates; while the latter may contain a BECOME operator, it has been argued that the former do not. *Again*-ambiguities can thus serve as a valuable tool not only for distinguishing stative predicates from non-stative ones, but also for reliably distinguishing different classes of non-stative predicates. It will be interesting to see whether the particular classes of predicates that *again* 'tests' pick out correspond to already well-known classes of predicates, or whether there are important differences.

References

Dowty, David R.: Word Meaning and Montague Grammar. Reidel, Dordecht (1979)

Fabricius-Hansen, Cathrine. Wieder Èin wieder? Zur Semantik von wieder'. In: Rainer Bauerle, Christoph Schwarze & Arnim von Stechow (eds.) Meaning, Use and Interpretation of Language, pp. 97-120. de Gruyter, Berlin (1983)

Gawron, Jean Mark: Comparatives, superlatives and resolution. Linguistics and Philosophy 18, 333-380 (1995)

Heim, Irene., Kratzer Angelika.: Semantics in Generative Grammar. Blackwell, Malden MA (1998)

Heim, Irene.: Degree Operators and Scope. Semantics and Linguistic Theory 10, 40-64 (2000)

[9] This condition seems to be independently needed, as (i) indicates.

(i) My boat is longer than your boat.
presupposes
I have a boat & you have a boat

Kennedy, Chris., Levin, Beth.: Measure of Change: The Adjectival Core of Degree Achievements. In: McNally, L., Kennedy, C. (eds.) Adjectives and Adverbs: Syntax, Semantics and Discourse, pp. 156-182. Oxford University Press, Oxford, UK (2008)

McCawley, James D.: Lexical insertion in transformational grammar without deep structure. In: Papers from the Fourth Regional Meeting, Chicago Linguistic Society, pp.71-80. (1968)

McCawley, James D.: Syntactic and Logical Arguments for Semantic Structures. In: Farjimura, O. (ed.) Three Dimensions in Linguistic Theory, pp. 259-376. TEC Corp., Tokyo (1973)

Morgan, Jerry: On arguing about semantics. Papers in Linguistics 1, 49-70. (1969)

Rullman, Hotze: Maximality in the semantics of wh-constructions. Doctoral dissertation, UMass Amherst (1995)

Stechow, Arnim von: The Different Readings of Wieder ‘Again’: A Structural Account. Journal of Semantics 13, 87-138 (1996)

Stechow, Arnim von: Comparing semantic theories of comparison. Journal of Semantics 3, 1-77 (1984)

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