

Event plurality & quantifier scope across clause boundaries*

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Abstract Legend has it that quantifiers cannot scope out of finite clauses. But while islands for quantifier raising might exist, finite clauses are not that: We identify a novel environment which productively facilitates scoping universal quantifiers out of embedded clauses, involving the manipulation of event structure. With the help of the perfect on an embedding verb and certain adverbials that presuppose a buildup towards a result state (*by noon, eventually, at long last*), embedded universal quantifiers can more readily take *extrawide* scope. We describe, account for, and discuss restrictions to this effect, and conclude that scoping quantifiers out of finite clauses is not banned by syntactic constraints, although context or processing might favor narrow scope readings.

Keywords: quantifier scope, embedded clauses, event structure, the perfect, time adverbs

1 Introduction

Does the grammar permit universal quantifiers to scope out of tensed clauses? The traditional claim that it does not finds motivation in English examples such as (1), which are said to lack an inverse scope reading (Chomsky 1975; May 1977; a.o.).

(1) Some student claimed that every professor had a ride. $*\forall > \exists$

But the traditional ban has proven to be porous, even in English. Many environments have been identified which do seem to allow an *extrawide scope* (EWS) reading, i.e., one in which a quantifier scopes out of a finite clause. Farkas & Giannakidou (1996), in particular, argue that *lexical choice* matters, as EWS is possible across predicates like *ensure*, whose subjects bring about the truth of the embedded clause.

(2) Some student ensured that every professor had a ride. $\checkmark \forall > \exists$

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Thus, a theory of quantifier scope must reconcile the apparent unavailability of EWS in cases like (1) with its easy availability in those like (2). There are three ways out. One is to maintain the ban on EWS and to explain away apparent counterexamples as illusory. This is what Fox & Sauerland (1996) do by attributing some instances of EWS to an effect of genericity. A second is to weaken the ban and allow EWS only in certain environments (Farkas & Giannakidou 1996). A third option is to locate the source of contrast between (1) and (2) outside the syntax. On this approach, EWS readings are always possible in principle, but difficult to access for reasons related to context or sentence processing (Anderson 2004; Syrett 2015; Wurmbrand 2018).

In this paper, we advocate for a version of this third perspective in which a default dispreference for EWS can be overcome in certain event structure configurations. On the basis of novel data such as (3), we show that even with matrix predicates which are ordinarily inhospitable to EWS, like *claim*, EWS is possible when the matrix event is construed as including a *buildup process*.

(3) By 8pm, some student had claimed that every professor had a ride. $\checkmark \forall > \exists$

We argue that in such cases, EWS is more easily available because it allows the buildup process to be supplied semantically, while a surface scope reading would require the buildup process to be accommodated externally.

2 The empirical picture: EWS is facilitated by meaning, not just structure

In this section, we argue that the availability of EWS depends on meaning, not only on syntax. In previous work, EWS-enabling environments have often been characterized in structural terms, which invite structural explanations.¹ But we have already seen one example demonstrating that there is more to the story, namely (2). This example, from Farkas & Giannakidou (1996), shows that the lexical semantics of a matrix verb can enable EWS even in the absence of other syntactic differences. We extend the argument for a meaning based explanation based on novel data showing that EWS is also enabled by *buildupical adverbials* and perfect aspect, especially when together. In what follows, we focus on buildupical adverbials and suggest what they might have in common with the perfect and *ensure*-type predicates.

2.1 Buildupical adverbials

Consider the contrast in (4). Since Farkas & Giannakidou (1996) give the verb *claim* as one that resists EWS as a matrix predicate, one might expect neither of these

¹ For instance, previously identified EWS-enabling environments include comparatives (von Stechow 1984; Larson 1988), subjunctive clauses (Farkas & Giannakidou 1996; Wurmbrand 2013), and antecedent-contained deletion (Wilder 1997; Syrett 2015).

examples to have an EWS reading. However, though EWS is indeed impossible in the second of these examples, it is in fact the preferred reading of (4a).

- (4) a. **Eventually**, some student had claimed that every professor had left. $\checkmark\forall>\exists$
 b. **At exactly 8pm**, some student had claimed that every professor had left. $*\forall>\exists$

This contrast cannot be driven by syntax alone, since the examples are syntactically analogous. Rather, semantic properties of the adverbial seem to be playing a crucial role—while *eventually* requires increasing expectation over a period of time that a certain result state will come about, *at exactly 8pm* lacks any such requirement. And indeed this generalization is borne out by further examples such as (5) and (6).

- (5) a. **By noon**, some mechanic will have checked if every car is safe. $\checkmark\forall>\exists$
 b. **Around noon**, some mechanic will have checked if every car is safe. $*\forall>\exists$
- (6) a. **At long last**, some mathematician had proven that all of these theorems were false. $\checkmark\forall>\exists$
 b. **On December 3rd**, some mathematician had proven that all of these theorems were false. $*\forall>\exists$

We call adverbials like *eventually* ‘buildupicals’, as their hallmark property is to trigger the inference that the eventuality described by their prejacent is in some intuitive sense ‘built up to’. We examine their properties more closely in Section 3.

2.2 The perfect

The astute reader will have noticed that the examples above have, in addition to a buildupical adverbial, a predicate in the perfect. A natural question is then whether the perfect alone plays a role in facilitating EWS. The answer is: partly. In (7), in the absence of a buildupical, the perfect somewhat improves the EWS reading, but the contrast is not nearly as stark as in (4). While EWS is unavailable with a simple past matrix predicate, it is still only marginally available with a predicate in the perfect.

- (7) a. Some student **claimed** that every professor had left. $*\forall>\exists$
 b. Some student **had claimed** that every professor had left. $?\forall>\exists$

On the other hand, (7) shows that in the absence of the perfect, the buildupical still facilitates EWS, but the contrast is again not as stark as in (4).

- (8) a. **Eventually**, some student **claimed** that every professor left. $\checkmark\forall>\exists$

- b. **Eventually**, some student **had claimed** that every professor had left.

✓✓✓>∃

Thus, while the perfect has a part to play in EWS, it is neither sufficient (seen in the relative difficulty of (7b)) nor necessary (seen in the relative ease of (8a)). Rather, we observe a graded effect—EWS is weakly facilitated by the perfect, strongly facilitated by buildupicals, but the combination of the two is really the secret sauce.

3 The proposal: a bird’s-eye view of buildups

We have seen that while EWS is dispreferred in many contexts, it is less restricted than previously thought. Even in otherwise inhospitable environments, EWS can be enabled by buildupical adverbials and the perfect. Strikingly, both buildupicals and the perfect seem to be concerned, in some way, with the notion of result states, suggesting that aspect plays a role in EWS. In this section, we argue that these environments, along with *ensure*-type predicates, tip the scales in favor of EWS because of the event-structural requirements they place on the surrounding context.

On the one hand, buildupical adverbials and *ensure*-type predicates both trigger a **buildupical inference**, which we model as a presupposition that the culmination of a particular event (usually the matrix event) is in an intuitive sense gradually anticipated. This inference can either be satisfied ‘internally’ (with elements from the semantics of the sentence itself) or accommodated ‘externally.’ We will show that, crucially, interpreters prefer readings with an internal buildup to those where buildup must be accommodated externally. We propose that this preference is responsible for the EWS-facilitating effects of buildupical expressions in cases where inverse scope readings, but not surface scope readings, supply internal buildup.

On the other hand, as we saw in §2.2, the facilitatory effect of the perfect on EWS is difficult to disentangle from the effect of buildupicals. For concreteness, we suggest that the perfect helps to the extent that it requires events to culminate in a result state. The anticipation of that culmination corresponds to a buildup that is consonant with the inference introduced by buildupical adverbials.

In what follows, we will make use of examples with both buildupicals and perfect marking, since it is that potent brew that brings out EWS most reliably. In this section we will take a general view of the semantic structure of build-ups, leaving the compositional details for the next section.

3.1 The anatomy of a build-up process

Intuitively, something is built up to when it is preceded by a period of incremental anticipation. Thus, we can think of a **build-up process** as consisting of two parts:

(i) an interval over which there is increasing expectation that a particular result state will hold at some point t in the future, and (ii) the result state itself. The structure of a buildup process is illustrated in Figure 1, where the rising arrow indicates rising levels of expectation.

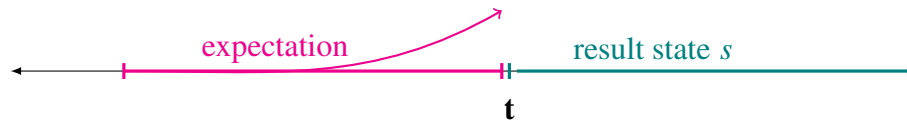


Figure 1 The anatomy of a buildup process

As we have seen, the lexical semantics of linguistic expressions can make reference to buildup processes. For instance, *eventually* introduces a buildup process. Other buildup processes can place additional requirements—for instance, *by*-phrases additionally specify that the result state will hold before a deadline t' (Thomas & Michaelis 2009; Altshuler & Michaelis 2020). However, what buildup processes have in common is that they trigger an inference that such a buildup exists.

Buildup processes are not alone in carrying such an inference—*ensure*-type predicates do as well. For instance, consider example (9) below.

(9) Barbara ensured that Sophia had a ride.

This sentence entails that Sophia ended up having a ride after a period in which Barbara took steps to make it happen (this is the way in which *ensure*-type predicates differ from other telic predicates, which culminate and might also be associated with a process). As suggested by Farkas & Giannakidou (1996), Barbara's ensuring can take many forms (she can call a cab, buy Sophia a bus ticket, or drive her herself), but whatever actions she initiates are expected to give rise to a result state in which Sophia has a ride. We propose that the lexical semantics of *ensure* encodes this buildup process in a manner analogous to buildup processes—a result state preceded by a period of increasing expectation.

3.2 Aktionsart and types of buildups

When an expression carries a buildup process, the buildup stage can either coincide with some aspect of the event expressed by the prejacent or it can be accommodated externally. For instance, consider the contrast in (10).

- (10) a. Eventually, Barbara had written her essay. (internal buildup)
 b. Eventually, Barbara had arrived. (external buildup)

These examples both carry a buildup inference triggered by *eventually*. However, the different Aktionsarten lead to differences in how the buildup is identified. With the accomplishment *write her essay* in (10a), the buildup is most naturally construed as coinciding with the interval during which Barbara was making progress towards the completion of her essay—potentially in multiple writing sessions. It seems that with accomplishments, the expectation of completion tracks the predicate’s process stage: the more we write, the more likely it is that we’ll finish a draft.

By contrast, the achievement *arrive* in (10b) does not itself provide a process interval to be identified with the buildup, so it must be accommodated externally. This is apparent from the fact that this example easily allows a buildup which is not tied to events involving Barbara herself. For instance, it is natural to construe the buildup as consisting of the speaker waiting for Barbara, regardless of whether she has even departed yet. This difference is shown schematically in Figure 2 below.

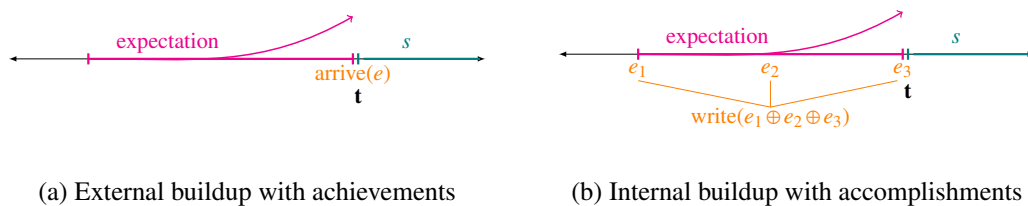


Figure 2 Types of buildup processes with *eventually*

It is not surprising that achievements require external buildups, since their lexical semantics does not specify what an alternative, internal buildup would be (see also Rothstein 2004). However, it is striking that with accomplishments, interpreters seem to have a strong preference for an internal buildup even though an external buildup would also be possible. We will propose that this preference is in fact strong enough to tip the scales in favor of EWS in sentences with embedded universal quantifiers.

Further evidence that buildupicals require a culmination comes from sentences with atelic predicates (activities and states). These predicates do not describe changes into or out of a state. When combined with a buildupical, we should then expect that they be odd, or coerced into describing a change of state (Moens & Steedman 1988). This does appear to be the case: Activity and stative predicates receive inchoative interpretations in which the start of the eventuality is the object of anticipation.²

(11) a. Eventually, Mary jumped up and down. \rightsquigarrow started jumping

² We note that (11a) does not describe a change into a result *state*. The correct description for buildupicals might be that they simply require a result *eventuality*, or alternatively, the relevant result state could be that of something having started. We will continue to talk about result states.

- b. ?Eventually, Mary owned a Subaru. ~> started owning

Because these predicates are not semantically change of state, the buildup stage in (11) must be accommodated externally. In contrast, when the examples above are in the perfect, as in (12), instead of getting an inchoative, we get an interpretation where the buildup process and, somehow, state, culminates into the result state contributed by the perfect. In this case, the buildup stage is provided internally by the eventuality predicate, and the change of state component is a transition out of that stage.

- (12) a. Eventually, Mary had jumped up and down. ~> stopped jumping
 b. ?Eventually, Mary had owned a Subaru. ~> stopped owning a Subaru

While a more careful examination of these coerced atelic predicates is left for a further occasion, these examples therefore show that buildupical adverbials like *eventually* interact with the perfect: in these cases the eventuality predicate supplies the build-up stage, and the perfect, a result state. We will return to this observation in Section 3.5.

3.3 Quantifiers and buildup processes

Quantificational force also impacts whether buildupical sentences require buildup to be supplied contextually, as we can see in (13).

- (13) a. Eventually, every professor had arrived. (internal buildup)
 b. Eventually, some professor had arrived. (external buildup)

The most natural reading of (13a) is one in which the expectation of all professors arriving was gradually fulfilled as individual professors trickled in.³ By contrast, the existential in (13b) requires that the buildup be external to the arriving event itself—an interpreter might imagine the speaker waiting anxiously.

We propose that the source of this contrast is that universal quantifiers introduce subevents corresponding to the events that each individual in the relevant domain is involved in. The presence of these subevents allows the semantics of a universally quantified sentence to provide an internal buildup, at least when the universal takes sufficiently wide scope.

In the case of (13a), these subevents will be the arrivals of each individual professor, as illustrated in Figure 3(b). In the case of (13b), the semantics of the sentence provides only a single arriving event, so there are no subevents to be identified with the buildup. Since arriving is an instantaneous event, the buildup must be accommodated externally.

³ Note that here, the universal enables an internal buildup even though the predicate is an achievement.

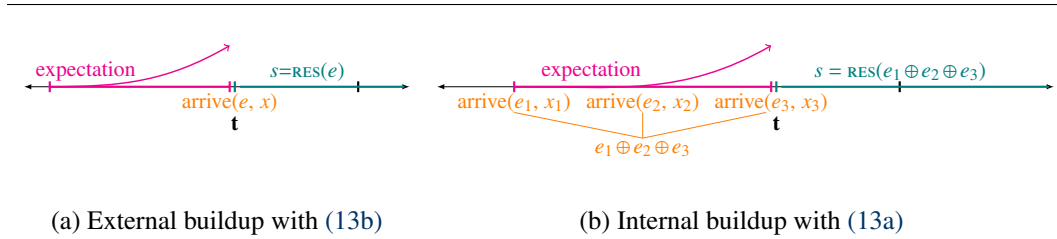


Figure 3 Surface and Extrawide scope readings for (14)

3.4 Buildup processes and scope

At this point, we have seen that there might be a preference for construing buildups internally when possible, and that the nature of the quantifier phrases in a sentence can affect when that is possible. This leads to the prediction that when a sentence with a quantifier phrase is ambiguous between a reading that provides an internal buildup and another reading which does not, a buildupical adverbial should favor the reading which provides an internal buildup.

To see that this prediction is borne out, consider (14). This sentence is most naturally given an EWS reading rather than a surface scope one, analogous to the examples we already saw in Section 2.1.

(14) By the end of the night, some student had claimed that every professor left.

For this sentence, an internal buildup would consist of sub-events of claiming—one for each professor. As shown in Figure 4, an EWS reading provides such sub-events while a surface scope reading does not. Rather, the surface scope gives distinct sub-events of leaving which cannot provide a buildup to the result state required by the adverbial.

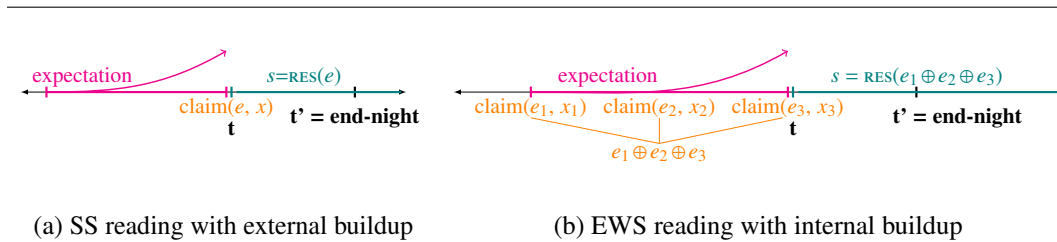


Figure 4 Surface and Extrawide scope readings for (14)

If an internal buildup merely requires the availability of multiple events of claiming, one wonders about a third scope configuration for (14), in addition to

interpreting the universal in situ and giving it widest scope. Giving *every professor* intermediate scope, between *some student* and *claim*, gives rise to truth conditions that are satisfied if some student makes, for every professor, a possibly distinct claim. This configuration is also a case where a quantifier scopes out of a tensed clause, so its existence would not jeopardize our main point. However, we do not currently have evidence that the intermediate scope configuration corresponds to a distinct reading of the sentence, and we do not discuss it further. The reason is that a context where one student makes a different claim per professor also satisfies the truth conditions of the sentence when the universal takes widest scope (for every professor there is a student and a claim). If we assume that claiming *p* and claiming *q* entails claiming *p and q*, the intermediate scope context also makes the sentence true under its reading where the universal is left in situ.

Finally, readings where an embedded quantifier phrase seems to distribute over matrix material are not limited to sentences where the matrix verb has a quantificational subject. Even in the absence of a quantifier phrase in the matrix clause, buildupicals bring out a distributive interpretation of embedded universals:

- (15) a. **By the end of her PhD**, Bertha had claimed that every theory of scope was wrong.
 b. **In Chapter 6 of her dissertation**, Bertha claimed that every theory of scope was wrong.

The most natural reading of (15a) is one where Bertha made several distinct claiming events, each one about a different theory of scope. But, in contrast, (15b) is most naturally interpreted as describing a single, bulk claiming event. While we cannot unambiguously attribute the contrast to distinct scope configurations in this particular case, it is corroborating evidence for the crucial role that buildupical adverbials play in the availability of EWS readings, and furthermore suggests that the availability of EWS does not depend on subject existential quantifier phrases in the matrix clause.

We conclude here that the preference for an internal buildup is what allows buildupicals to facilitate EWS. This preference is sufficiently strong to override a default preference for universals to take scope within the clause where they originate.

3.5 The intuitive contribution of the perfect

Let us finally turn to the presence or absence of the perfect in conjunction with the presence of a universal quantifier phrase. Consider the contrast in (16):

- (16) a. Eventually, everyone jumped up and down.
 b. Eventually, everyone had jumped up and down.

The example in (16a) has a reading where there is a building expectation to a certain point in time at which, perhaps after some hesitancy, everyone jumps up and down simultaneously. More precisely, for (16a) the result state required by the buildupical will start holding at the very moment that all the jumping subevents start overlapping in time, as illustrated in Figure 5(a). For (16b), the only possible reading is one where people not necessarily jump simultaneously, but they simply do so, perhaps one-by-one, until a state is reached in which it is true that everyone has jumped up and down at least once. This result state will start holding as soon as the last person stops jumping up and down. As illustrated in Figure 5(b), there does not have to be any temporal overlap among the individual jumping subevents in this latter case.

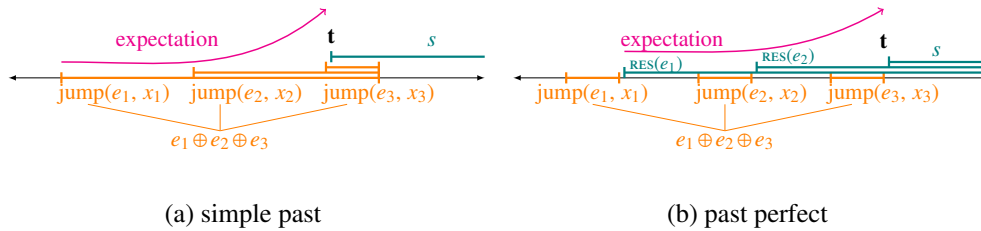


Figure 5 *Eventually* with a universal quantifier

To recap, we have seen that buildupical adverbials like *eventually* always seem to require a buildup towards a change of state. When these occur with a predicate in the perfect, the state that is built up to is supplied by the perfect itself and corresponds to the termination of a buildup stage that is provided internally for durative predicates (accomplishments, activities and states), and externally for punctual predicates (achievements).

In the simple past, the buildup and result stages of atelic predicates are flipped, and buildupical adverbials require building up to a transition *into* the eventuality described by the predicate. A crucial interaction occurs between buildupicals, the perfect and a universal quantifier phrase: The universal and the perfect are able to provide multiple result states, and buildupicals like *eventually* describe a buildup towards an omnibus state that starts holding as soon as all of its component substates start holding.

4 Proposal: the compositional details

Having now sketched the account in broad strokes, we now provide the full compositional details. To implement the effect of buildupicals and their interaction with quantifiers, we follow Schein (1993) and Kratzer (2000) in assuming that the

lexical entries of quantifiers themselves crucially make reference to events. We then formalize the ameliorating effect of buildupicals by assuming that they presuppose a build-up stage over which the expectation of a result state monotonically increases. Finally, we argue that this presupposition is satisfied under an EWS reading, while surface scope readings with buildupical adverbials become difficult to access because they require additional accommodation.

4.1 Quantifying over events

In order to capture the relationship between event structure and scope, we first need to understand how quantifiers and events relate to one another. We assume that universally quantified sentences like (17) describe complex events.

(17) Myrna read every book.

Following Schein (1993), we propose that quantifiers introduce two event variables, corresponding to: (i) An *ensemble event* (the event of every book being read); and (ii) *Sub-events* of that ensemble event (the events of each individual book being read). Ultimately, we want (17) to have a denotation like (18).

(18) $[[(17)]] = \exists e_v [\forall x_e [\mathbf{book}(x) \rightarrow \exists e' \sqsubseteq e [\mathbf{read}(\mathbf{m}, x, e')]]]$

To implement this, a type distinction is needed between the restrictor of a quantifier and its nuclear scope so that quantification over subevents only occurs in the latter.⁴

(19) **Eventified Quantifier Denotations:**

- a. $[[\mathbf{every}]] = \lambda P_{\langle e, t \rangle} . \lambda Q_{\langle e, \langle v, t \rangle \rangle} . \lambda e_v . \forall x_e [P(x) \rightarrow \exists e' \sqsubseteq e [Q(x)(e')]]$
- b. $[[\mathbf{some}]] = \lambda P_{\langle e, t \rangle} . \lambda Q_{\langle e, \langle v, t \rangle \rangle} . \lambda e . \exists x_e [P(x) \wedge Q(x)(e)]$

In sentences with multiple quantifiers, we assume that the inverse scope reading is

⁴ Note that these entries also allow us to account for the Scope Domain Principle in Landman (1996), which states that only non-quantificational NPs can be interpreted in situ.

For example, the sentence in (i) is not ambiguous between the two readings in (ia) and (ib).

- (i) $[[\text{John kissed every girl}]]$
 - a. $\forall x_e [\mathbf{girl}(x) \rightarrow \exists e_v [\mathbf{kiss}(e) \wedge \mathbf{AG}(\mathbf{j})(e) \wedge \mathbf{TH}(x)(e)]]$ possible reading
 - b. $\exists e_v [\mathbf{kiss}(e) \wedge \mathbf{AG}(\mathbf{j})(e) \wedge \forall x_e [\mathbf{girl}(x) \rightarrow \mathbf{TH}(x)(e)]]$ impossible reading

Only the first reading in (ia) represents the fact that the sentence entails that for every girl, there is a separate event in which John kissed that girl. The alternative translation in which the event quantifier takes wide scope, as in (ib), expresses that there is a single event which was an event of John kissing every girl. This is not a possible reading of (i), because it does not make the individual kissing events available (Champollion 2015). Our proposal accounts for this intuition as well, because the entry for *every* makes both the distinct subevents as well as their fusion automatically available.

derived via Quantifier Raising. So the example in (20) will have two readings:

- (20) Some student read every book.
- a. **Surface scope reading:**
 $\exists e_v [\exists y_e [\mathbf{student}(y) \wedge \forall x_e [\mathbf{book}(x) \rightarrow \exists e' \sqsubseteq e [\mathbf{read}(y, x, e')]]]]]$
 - b. **Inverse scope reading:**
 $\exists e_v [\forall x_e [\mathbf{book}(x) \rightarrow \exists e'_v \sqsubseteq e [\exists y_e [\mathbf{student}(y) \wedge \mathbf{read}(y, x, e')]]]]]$

On the surface scope reading this sentence entails that there is a student y , and that for each book there is a reading subevent of which y is the agent. On the inverse scope reading this sentence again entails that for each book there is a reading subevent, but now the students who are the agents of these subevents can vary with the books. Note that we also assume default existential closure over the matrix event argument.

4.2 Quantification in embedded clauses

If embedded clauses are not scope islands, a quantifier in an embedded clause has the option of taking scope within the main clause, or of scoping out. In particular, the universal in (21) may then take scope below the matrix existential, or above it.

- (21) Some student claimed that every professor left.

While both representations are available in principle, factors that are not strictly semantic (perhaps pragmatic or processing-related) may favor one over the other (see Section 5). Note that, because quantifier phrases return predicates of events, they must scope below matrix existential closure over events (cf. Champollion 2015).

We assume the following (simplified) way of putting together verbs and clauses:

- (22) $[[\mathbf{claim}]] = \lambda P_{\langle vt \rangle} . \lambda x_e . \lambda e_v . \mathbf{claim}(x, e) \wedge \mathbf{con}(e) = P$

Here, the function \mathbf{con} specifies the propositional content of the claiming event (Hacquard 2006, a.m.o.). For expository purposes, we assume that embedded clauses denote sets of eventualities, and that embedded clause denotations are selected by the attitude verb (cf. Elliott 2017, a.m.o.). With our eventified quantifier denotations, these readings are as shown in (23a) and (23b).

- (23) a. **Surface scope reading:**
Some student is such that they claimed that every prof left.
 $\exists e [\exists y [\mathbf{student}(y) \wedge \mathbf{claim}(y, e) \wedge \mathbf{con}(e) = \lambda e' . \forall x [\mathbf{prof}(x) \rightarrow \exists e'' \sqsubseteq e' [\mathbf{leave}(x, e'')]]]]]$
- b. **Inverse (extrawide) scope reading:**
*Every prof_{*i*} is such that there is a student who claimed that they_{*i*} left.*

$$\exists e[\forall x[\mathbf{prof}(x) \rightarrow \exists e' \sqsubseteq e[\exists y[\mathbf{student}(y) \wedge \mathbf{claim}(y, e') \wedge \mathbf{CON}(e') = \lambda e''. \mathbf{leave}(x, e'')]]]]]$$

Crucially, the two readings differ not only in the relations between individuals, but also in event structure: Under the surface scope reading there is a simple claiming event and a complex leaving event, with sub-events for each professor; under the EWS reading, there is a complex claiming event with sub-events for each professor.

4.3 Formalizing build-up stages

Recall that buildup stages involve intervals over which there is an increasing expectation that some result state s will hold. We assume that this expectation is attributed to a ‘perspectival center’—by default, the speaker. For simplicity, $\mathbf{EXP}(s, t)$ will refer to the level of expectation at t that s will eventually hold:

- (24) $\mathbf{EXP}(s, t)$: a perspectival center’s expectation at time t that a state s will hold at some time $t' > t$.

Buildupicals such as *eventually* and *by the end of the night* crucially make reference to this expectation.

We assume here that this expectation is presupposed, because it seems to be the case that the sense of an expectation that the result state s becomes true associated with *by*-phrases projects in the scope of a question operator and high negation. That is, the sentences in (25) seem to presuppose that Barbara was expected to write her paper by midnight. This expectation could come from the speaker or a normative expectation, like a teacher-imposed deadline.

- (25) a. Did Barbara finish her paper by midnight?
b. It is not true that, by midnight, Barbara had finished her paper.

In other words, *By midnight, Barbara had finished her paper* presupposes that at some time before midnight, some event e' is expected to culminate into the result state of writing her paper.

More concretely, we assume that *eventually* presupposes the existence of an interval of time over which this expectation is weakly monotonically increasing.⁵

- (26) $[[\mathbf{Eventually}]] = \lambda R_{vt} . \lambda e_v : \exists i, s [i \supset c s \wedge \forall t', t'' \subseteq i [t' < t'' \rightarrow \mathbf{EXP}(t', s) \leq \mathbf{EXP}(t'', s)]] . R(e)$

We make a similar assumption for *by*-phrases: Their entry is the same as the

⁵ Here, and hereafter: “ $i \supset c s$ ” is understood as “the right edge of i is contiguous with the left edge of the runtime of s ”.

one for *eventually*, except that *by*-phrases come with an additional presupposition that the presupposed interval precedes a certain deadline. For instance, *by the end of the night* presupposes an interval preceding the end of the night over which an expectation that some result state will become true builds up over time.

$$(27) \quad \llbracket \text{By the end of the night} \rrbracket = \lambda R_{vt} . \lambda e_v : \exists i, s [\boxed{i < \text{end-night}} \wedge i \supset C s \wedge \forall t', t'' \subseteq i [t' < t'' \rightarrow \text{EXP}(t', s) \leq \text{EXP}(t'', s)]]. R(e)$$

Before moving on to discuss how our entries allow us to account for the observed contrasts, we must return to our observation that the perfect ameliorates EWS too.

4.4 Formalizing the contribution of the perfect

For simplicity, we collapse the semantics of the perfect and tense into a single entry for the past perfect in (28). This definition incorporates past tense (t_{past}), situates an R event in time, and introduces a result state (Altshuler & Michaelis 2020).

$$(28) \quad \llbracket \text{PAST PERF} \rrbracket = \lambda R_{vt} . \lambda e_v [R(e) \wedge \exists s, t [t < t_{past} \wedge t \supset C s \wedge \text{RES}(e) = s]]$$

We thus assume that the past perfect (i) introduces a state s , which is the consequent state of the eventuality e that is expressed by its prejacent, and that it (ii) ensures that at some time t there is a transition between e and s (Comrie 1976; Kamp & Reyle 1993; de Swart 1998; Nishiyama & Koenig 2010).

In our treatment of the perfect, we moreover assume that the universal quantifier takes scope over the past perfect. This provides a reading where for each individual, and each subevent associated with that individual, there is a corresponding consequent state, which may start holding at a different point in time per individual. In the next section, we will argue that, made salient by the past perfect, these staggered consequent states may then provide an internal buildup stage for builduplical for free.

4.5 Putting the pieces together

We have seen two distinct semantic sources that lead to a presupposed ‘buildup’: builduplical adverbials and ensure-type predicates. The crucial difference between these adverbials and ensure-type verbs is that the latter entail that the state expressed by the embedded clause becomes true, while the former do not. Above, we also argued that the presence of a buildup presupposition facilitates EWS. This is because this incremental expectation can be satisfied most easily by an interpretation in which the event itself incrementally builds over time. Builduplicals with universal quantifiers can give rise to readings where that increasing expectation corresponds to an incremental event buildup over the quantified argument. We also saw that this

is the case especially with perfects, which independently coerce the involved event to culminate into a consequent state.

We now put all of these pieces together, and formalize the above intuitions. Given our assumptions, we derive the following (slightly simplified) readings of the sentence in (29). (We set aside the intermediate scope configuration, see Section 3.4.)

- (29) **By the end of the night**, some student had claimed that every professor left.
- (30) **Surface scope reading:**
 $\lambda e'' : \exists i [i < \text{end-night} \wedge i \supset \supset s \wedge \forall t', t'' \sqsubseteq i [t' < t'' \rightarrow \text{EXP}(t', s) \leq \text{EXP}(t'', s)]]$
 $[\exists y_e [\text{student}(y) \wedge [\text{claim}(e'', y)] \wedge$
 $\text{CON}(e'') = [\lambda e_v. \forall x [\text{prof}(x) \rightarrow \exists e' \sqsubseteq e [\text{leave}(e', x)]]] \wedge$
 $\exists s, t [t < t_{\text{past}} \wedge t \supset \supset s \wedge \text{S}=\text{RES}(e'')]]]$
- (31) **Inverse (extrawide) scope reading:**
 $\lambda e'' : \exists i [i < \text{end-night} \wedge i \supset \supset s \wedge \forall t', t'' \sqsubseteq i [t' < t'' \rightarrow \text{EXP}(t', s) \leq \text{EXP}(t'', s)]]$
 $\forall y_e [\text{prof}(y) \rightarrow \exists e' \sqsubseteq e'' [\exists x [\text{student}(x) \wedge \text{claim}(e', x)] \wedge$
 $\text{CON}(e') = \lambda e [\text{leave}(e, y)] \wedge$
 $\exists s', t [t < t_{\text{past}} \wedge t \supset \supset s' \wedge \text{S}'=\text{RES}(e')]]]]]$

Note that under the surface scope reading, there is only a single claiming event e'' which takes place at time t , the onset of the result state s provided by the perfect. Contrast this with the EWS reading, in which there is a complex claiming event e'' , which consists of claiming subevents e' that culminate into result states s . The difference between these two readings is illustrated in Figure 6.

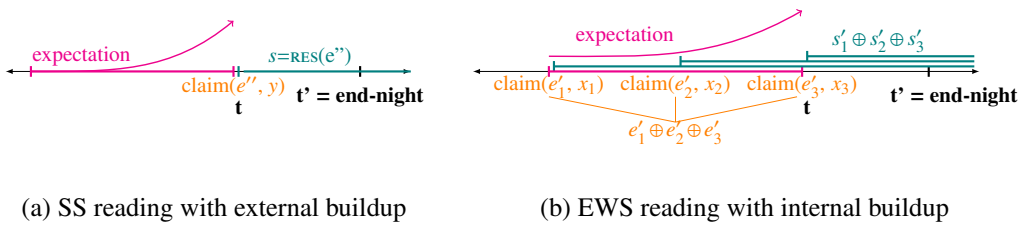


Figure 6 Surface and extrawide scope readings for (29)

The crucial difference between the two readings is therefore the existence of a complex claiming event (and corresponding state) which is entailed under the EWS reading but not under the surface scope reading. Because of this complex claiming event, it is easier to accommodate the increasing expectation introduced by the by-phrase since no external buildup has to be accommodated in this case.

5 Are there still restrictions on EWS?

Having established that EWS is much more available than previously thought, it is worth stepping back and whether EWS is still restricted in any way, and if so, how. Specifically, we will briefly examine whether there are still embedding verbs across which EWS is resisted, even with buildupicals, as well as whether EWS is possible with other embedded quantifier phrases.

5.1 Scoping above different matrix predicates

In our discussion, we have mostly only focused on the predicates *claim* and *ensure*. But if EWS is always available in principle, we clearly need to test this claim against a wider variety of predicates. In this section, we will briefly consider two lexical classes of semantic predicates, statives and factives, that do seem to resist EWS, and how that may be reconciled with our account.

Our discussion of Aktionsart in Section 3.2 raised the question of whether lexical aspectual properties of attitude verbs affect the availability of EWS. Consider (32):

- (32) a. By the end of the night, some student was **sure/confident/aware** that every professor had left. $?>\forall>\exists$
 b. By the end of the night, some student had **heard/found/become aware** that every professor had left. $\checkmark <\forall > \exists$

The examples with stative predicates in (32a) less readily receive an EWS reading (though one might still be possible) than the dynamic ones in (32b). While we do not yet understand the nature of this contrast, we have proposed that a hallmark property of buildupicals is requiring some kind of change of state. Notice that although the predicates in (32a) are stative, they seem to receive a change of state interpretation in this context (\approx *come to be sure/confident/aware*). One possible explanation for the degraded EWS reading, then, is that the layer of coercion required to turn statives into change of state predicates might make it more difficult to access EWS readings.

A second relevant factor is factivity. In general, it seems harder to obtain EWS readings with the factive predicates in (33a) than with the non-factive ones in (33b).⁶

- (33) a. By the end of the trip, some archaeologist had **realized/remembered** that every mummy was missing. $?>\forall>\exists$

⁶ Robert Henderson (p.c.) points out that another reason that sentences with *realize* may resist EWS (in comparison with speech act verbs like *claim*), is that while claims are public, realizations are private—that is, perhaps distinct realizations cannot be summed together to make a complex realization in the same way that claims can. We suspect, on the basis of examples like (32), that the public vs. private nature of an attitude is not the factor driving the availability of EWS. Indeed, a predicate like *believe* describes a private attitude, but the sentence is compatible with an EWS reading.

- b. By the end of the trip, some archaeologist had **believed/come to believe** that every mummy was missing. $\checkmark \forall > \exists$

However, with rich enough contexts, EWS readings for factive predicates do seem to become more available. We illustrate with *realize* in (34).

- (34) Over the summer, a group of archaeologists were investigating whether mummies could still be found in burial sites across the world. Some went to Egypt, some to Chile, and some to Mexico. By the end of the summer, some archaeologist had **realized** that every mummy was missing. $? \forall > \exists$

So while factivity might disfavor EWS, it does not completely block it.

5.2 Scoping with other quantifiers

We have also mostly focused on the scope-taking properties of *every* in this paper, so we now ask whether EWS readings can be obtained with other embedded quantifier phrases. As it turns out, not every quantifier is equally capable of taking EWS:

- (35) By the end of the night, some student had claimed that. . .
- a. . . **both/all three** (of the) professors had left. $\checkmark \text{both/all three} > \exists$
 - b. . . **10** professors had left. $*10 > \exists$
 - c. . . **half/most/no** professor had left. $*\text{half/most/no} > \exists$

Indeed we see that in (35), EWS is possible when the embedded quantifier is universal (*both, all three*), and difficult or unavailable with intersective (*10, no*) and proportional quantifiers (*half, most*).

An initial suggestion as to why quantifiers might differ in their ability to give rise to EWS readings is that they might differ in the naturalness of the *result state* that they make available. Universal quantification is exhaustive: there is a clear state to build up to, which starts holding only once all of the individuals in the domain of quantification are accounted for.

We might then suspect that with other quantifiers, like bare numerals, such result states are harder to imagine: It is less clear that, having made claims about 10 professors having left is a natural end state. Then, we might expect EWS to become available in contexts where such result states *are* made relevant:

- (36) Context: The race will only take place if 10 (out of 18) athletes participate. Every athlete's coach has to declare whether their athlete will run.
- a. By noon, some coach had declared that 10 athletes would participate. $*10 > \exists$
 - b. By noon, some coach had declared that most athletes would participate.

*most > ∃

But, what we observe is that even when the context makes such a result state relevant, EWS readings remain unavailable. Then, pragmatics might not be enough to grease the wheels of an EWS reading; rather, syntactic and semantic properties of quantifiers are also a factor. This is in line with Barker's (2022) claim that some quantifiers, like *no* in particular, resist scoping high in general (see also Beghelli & Stowell 1997).

6 Conclusion

In this paper, we showed that EWS readings are systematically available with buildupical adverbs, which led us to conclude that EWS is generally possible, despite being dispreferred in many contexts. We argued that buildupicals have this effect because they presuppose a buildup stage during which the expectation that some result state comes about increases over time. This presupposition ameliorates EWS readings, because it is more easily satisfied on such readings.

Many questions remain. For instance, we proposed that EWS is possible when a *default dispreference* for surface scope is overridden. But where does this dispreference come from? A common suspicion, which we share, is that perhaps there is a role of processing difficulty in a default preference for surface scope reading, which is especially strong (though not impenetrable) when dealing with scopal configurations that span clause boundaries. This could be because covert movement in general is costly, especially across long distances (Tanaka 2015; Wurmbrand 2018). This would explain why inverse scope is generally dispreferred in mono-clausal sentences, and that this dispreference is yet stronger in the case of embedded quantifiers.

Alternatively, it may be that the online parser generally deals with scopal relationships—as well as its ramifications for the assumed event structure and availability of discourse referents—within the domain of a single (finite) clause. Since the default parse would generally be the surface scope interpretation (involving a subject denoting a single referent and the verb denoting a single event), such scopal information of the matrix quantifier would then have to be re-accessed when re-interpreting the embedded quantifier as taking scope over the matrix quantifier. Under such an account, too, we would expect that inverse scope would be harder for multiclausal sentences than for monoclausal sentences.

More broadly, we have argued that event structure matters for the availability of scope configurations. This suggests that in order to construct theories on scope taking, it is essential to take event structure into account and examine it systematically. And more generally, we have to interrogate the patterns of apparent "exceptions" to our theories much more closely.

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