Proceedings of SALT 35: 1–21, 2025

The presuppositions of 'forget'*

Will Williams
University of Toronto

Abstract The propositional attitude verb *forget* has received relatively little attention in the formal linguistics literature, though its properties present interesting problems for formal semantics. White (2014) argues that a uniform account of *forget* as a factive verb is possible. On this view, *forget* presupposes the truth of its clausal argument (See also Kiparsky & Kiparsky (1970)). But in order to do so, he claims that a covert modal operator is obligatorily present in the infinitival complements of *forget*, deriving modalized factive presuppositions. In this paper, I present data showing that the distribution of this covert modal operator is even more restricted. I argue that modalization of the complement is separate from the clause-type, and that it is instead the pre-existence presupposition (Bondarenko 2020), that is part of *forget*'s meaning, that is responsible for the distribution of this covert operator.

Keywords: presuppositions, attitude verbs, factive-implicatives, covert modality

1 Introduction

We begin this paper with the observation that a two-way meaning distinction is present with root sentences formed with the epistemic verb *forget*:

(1) John forgot that he stopped by the flower shop
Presupposes that John stopped by the flower shop

(2) John forgot to stop by the flower shop
Does not presuppose that John stopped by the flower shop

On one hand, *forget* forms sentences in which the action in the complement clause (complement) is *presupposed to have occurred*, as in (1). On the other hand, in complementary contexts, *forget* forms sentences in which the action in the complement

* I would like to thank Alexandre Cremers, Tanya Bondarenko, Robert Henderson, Ray Jackendoff, Osamu Sawada, Bernhard Schwarz, Naomi Francis, Laurestine Bradford, and the anonymous reviewers of SALT35 and TOM17 for their comments. I would also like to thank Guillaume Thomas, Michela Ippolito, Keir Moulton, Daphna Heller, Dave Kush, and all of the attendees of the Semprag research group at the University of Toronto for their comments. I would also like to thank Angelika Kiss, Alba Jorquera Jiménez de Aberásturi, Virgilio Partida-Peñalva, Ana Tona, and Costanza Vallicelli for their assistance on this project. All errors are my own.

is *entailed* to have *not occurred* as a result of the forgetting, as in (2). Kiparsky & Kiparsky (1970) claim that *forget* presupposes the truth of its complement. This raises the question of why (2) does not presuppose that John stopped by the flower shop. In this paper, I argue that we can maintain the intuition in Kiparsky & Kiparsky (1970) by adopting a revision of the Modalized Complement Analysis presented in White (2014).[1] The basic idea is that the complement in (2) is presupposed, but that the complement is about a modal proposition rather than the completion of an event.

1.1 Roadmap

In Section 3, I present existing analyses and consider the pros and cons of adopting such views. In Section 4, I overview the pre-existence condition developed in Bondarenko (2019, 2020), and show that this condition applies to *forget*. In Section 5, I present my proposal to account for the presupposition facts with *forget*.

2 Background

The term *factivity* is used to describe the phenomenon in which a verb presupposes the truth of its complement. Generally, this is shown with sentences in which the verb is the central predicate, and a finite CP is the complement. In that case, there is an inference (an entailment) that the event associated with the complement is realized in the actual world.

(3) John forgot that he stopped by the flower shop.
⇝ John stopped by the flower shop

Moreover, this inference remains in a number of embedded contexts, a test for presuppositions (Chierchia & McConnell-Ginet 2000). We call verbs that meet this criteria *factive verbs*, and we refer to the maximal proposition associated with the complement of these verbs as the *factive presupposition* (Kiparsky & Kiparsky 1970).

Factive verbs are a well-studied class of verbs in English. What we know about them is largely due to the work of Kiparsky & Kiparsky (1970), and to subsequent investigations into the syntax and semantics of sentences in which these verbs play a central role (Karttunen 1971b,a; Horn 1972; Hooper & Thompson 1973; Klein 1975; Cattell 1978; Karttunen & Peters 1979; Hegarty 1992; Van der Sandt 1992; Kadmon 2001; Schulz 2003; Abrusán 2011; Anand & Hacquard 2014; Kastner 2015; Dahlman 2016; White & Rawlins 2018; Djarv 2019; Jarvis 2021). All of these

1 I will ignore the implicative entailment component of *forget*'s meaning in (2), and focus solely on the *presuppositions* of *forget*

studies contribute to the vast linguistic detail concerning factive verbs, however, none so far has provided a definitive characterization of factive verbs, their truth/felicity conditions, and their syntax. There still remain many open issues in this regard, most of which this paper cannot hope to address.

The starting point of this paper concerns the presuppositional status of the proposition associated with the complement in sentences in which *forget* is the main predicate. There is in fact a broader pattern observed with such sentences apart from the status of the complement as a presupposition. The most prominent differences appear to arise just in the case when *forget* embeds infinitives.

(4) **Cognition**
John forgot that he stopped by the flower shop.

a. John stopped by the flower shop

(5) **Psych-action**
John forgot to stop by the flower shop.

a. John was supposed to stop by the flower shop

b. If John stopped by the flowershop, it is because he remembered to do it.

I will borrow some terms introduced in Van Valin Jr & Wilkins (1992) to label each variant of meaning in the alternation.[2] I will call the meaning associated with (4) the *cognition* reading, and the meaning associated with (5) the *psych-action* reading. While the cognition readings are fairly straightforward in terms of their presuppositions (4a), the psych-action readings require some adornment of the surface representation of the complement in order to construct the presupposed propositions. I call the presupposition in (5a) the *modalized presupposition*, as it seems the obligation meaning can be captured straightforwardly by a root modal operator whose scope property is saturated by the event associated with the complement. I call the presupposition in (5b) the *necessity and sufficiency presupposition* (Karttunen 1971a). This too seems to be restricted to the psych-action readings with infinitives, in English.

How best to account for this alternation is unclear. The most straightforward analysis is that *forget* is ambiguous between factive and non-factive denotations that are arbitrarily selected (by the verb), along with the complement type. In a way, this is the null hypothesis. Implicit in this assumption is that there is no systematic

2 Van Valin Jr & Wilkins (1992) use these terms to label the meanings of sentences with *remember*, which similarly vary according to which complement clause *remember* embeds.

relation between (4) and (5). White (2014) presents a number of arguments based on syntactic tests which suggest that the ambiguity approach is not on the right track. While I agree with White, I will approach the repudiation of the ambiguity of *forget* in a different manner. My argument relies on cross-linguistic data. Based on a brief survey of 5 languages, some from completely unrelated language families, we observe that the same alternation arises with *forget* and its kin cross-linguistically: it forms sentences that convey cognition readings with some complement clauses, and, with other complement clauses, it forms sentences that convey psych-action readings. This is the case with Italian *dimenticarsi*, German *vergessen*, and Hungarian (a Finno-Ugric language) *felejt*. That an accident can occur in many different languages, some of which are completely unrelated to one another, I think is highly unlikely, and argues at the very least against the ambiguity view. It seems that languages allow *forget* and its kin to take part in sentences that express a variety of meanings, and this should be reflected in the verb's truth conditions. We will call this the Uniformity Hypothesis for *forget*.

In this paper, I will focus on just the standard factive presupposition associated with cognition readings, and on the modalized presupposition of the psych-action readings, and leave an account of the necessity and sufficiency presupposition to future work. To account for this asymmetry, I maintain the core of the argument in White (2014), which are as follows: 1) *forget* is canonically factive, independent of the complement type and 2) the presuppositions associated with the cognition (non-modal) and psych-action (modal) readings are alternative realizations of the same factive presupposition encoded in the denotation of *forget*.

One of the central contributions of this paper is that the following two notions must be distinguished in order to render a uniform account of *forget*: 1) the proposition denoted by the complement and 2) the action/event associated with the complement. Across complement types, only the former is presupposed. And while the latter notion is sometimes a target of the verb's representation, this is not always the case.

3 Existing Theory: Modalized Complement Analysis

The central idea behind the Modalized Complement Analysis is that there is a factive presupposition when *forget* embeds to-infinitives, but that this presupposition is *modalized* (White 2014). This modalized presupposition corresponds to the presupposition of obligation pointed out in Karttunen (1971a), Horn (1972), and Jackendoff (1985). Horn (1972) and Jackendoff (1985) propose that whenever *forget* combines with a to-infinitive, there is some addition of an obligation meaning to the

complement, allowing the verb to remain uniformly factive[3]. White's innovation was to say that this obligation meaning is reflected at the syntactic level in terms of a clause that is headed by a covert root modal operator. This is shown in the example (6) below.

(6) a. Mary forgot that she watered the plants.
LF: [$_{TP}$ Mary [$_{VP}$ forgot [$_{CP}$ that [$_{TP}$ she [$_{VP}$ watered the plants]]]]]
Factive presupposition: Mary watered the plants.

b. Mary forgot to water the plants.
LF: [$_{TP}$ Mary [$_{VP}$ forgot [$_{CP}$ C$_{Mod}$ [$_{VP}$ to water the plants]]]]
Factive presupposition: Mary had to water the plants.

This view benefits from its economy: we can account for two different phenomena via general assumptions about the embedding verb and the structure of the complement. But there are some questions that are left unanswered with this approach. One thing that we can ask is what conditions the alternation. Is it finiteness? Is it the type of complement (proposition-like, or property-like)? Or is it something else having to do with the temporal orientation? Putting these issues aside for the moment, we can focus on the predictions the theory *does* make. In the next section, I will show this proposal actually overgenerates. In any case, I believe that it is ultimately on the right track, and with some revision has the potential to capture the full range of facts.

3.1 Arguing against the theory

In this section, I provide some counter-evidence showing that the Modalized Complement Analysis as stated in White (2014) does not account for the full range of facts. I focus on English and Spanish but examples in other languages are present.

3.1.1 English PRO-ing gerunds

First, I note that English PRO-ing gerunds can combine with *forget*. And when they do, the resulting sentence is never associated with a modal presupposition. Specifically, we can continue these sentences with a denial of the existence of a plan or obligation to perfom the action in the complement.

3 Jackendoff (1985) writes: 'it is clear what form a solution must take: the factive presupposition must be encoded in such a way that, when an Action argument is substituted for the State/Event argument, the new presupposition surfaces automatically. The puzzle here is why, under this substitution, a simple fact should turn into a fact about some sort of obligation.'(pg 459)

(7) a. John forgot stopping by the flowershop
...but he did not have to stop by the flowershop.[4]

Does not presuppose that John had to stop by the flowershop.

In addition, when we include the perfect operator in the structure of the gerund, this does not alter the judgement.

(8) John forgot having stopped by the flower shop

a. ...but he did not have to stop by the flower shop

Does not presuppose that John had to stop by the flowershop.

Instead, what is derived is a *non-modal* factive presupposition.

(9) John forgot stopping by the flower shop

a. ...#but he didn't stop by the flower shop

Presupposes that John stopped by the flower shop.

This holds whenever there is a perfect operator in the gerund clause.

(10) John forgot having stopped by the flower shop

a. ...#but he didn't stop by the flower shop

Presupposes that John stopped by the flower shop.

To sum up, in this subsection, I presented new data in which *forget* embeds PRO-ing gerund complements, showing that these sentences pattern like forget-sentences with that-clauses as complements, rather than the case with to-infinitives. This suggests that the presence of a modalized complement does not depend on the finiteness of the complement, as PRO-ing gerund complements are non-finite. Moreover, the Modalized Complement Analysis cannot be applied broadly to infinitives, as the evidence in the following subsection suggests.

3.1.2 Spanish infinitives

On the surface, Spanish sentences in which *olvidar* (forget) embeds clausal complements behave just as their counterparts do in English (Pérez-Leroux & Schulz 1999;

4 Only the contradiction test is shown for brevity. This test was paired with the P-Family test (Chierchia & McConnell-Ginet 2000) to verify that a proposition was presupposed. I also used rich contexts & storyboards, following Bochnak & Matthewson (2020), where it is made clear no obligation holds.

Schulz 2003). For example, whenever *olvidar* combines with finite CPs, no modal factive presupposition obtains.

(11) *Juan olvidó que pasó por la floristería*
Juan forgot that he.passed by the flowershop
'John forgot that he stopped by the flowershop'

a. *... pero no tenía por qué pasar por la floristería*
... but NEG have.to for that to.pass by the flowershop
'... but he didn't have to stop by the flowershop'

Does not presuppose that Juan had to stop by the flower shop

And whenever *olvidar* combines with a plain infinitive, the sentence is associated with a *modal* factive presupposition.

(12) Juan olvidó pasar por la floristería

a. ...#pero no tenía por qué pasar por la floristería

Presupposes Juan had to stop by the flower shop

The interesting data in Spanish arises from the fact that Spanish allows for infinitival complements of *olvidar* to be marked with the perfect aspect[5], and in that case there is no modal factive presupposition, counter to expectation of the Modalized Complement Analysis.

(13) Juan olvidó haber pasado por la floristería

a. ...pero no tenía por qué pasar por la floristería

Does not presuppose Juan had to stop by the flower shop

Instead, whenever a perfect infinitive is the complement of *olvidar*, a non-modal factive presupposition obtains at sentence-level.

(14) Juan olvidó haber pasado por la floristería

a. ...#pero no pasó por la floristería

Presupposes Juan stopped by the flower shop

5 English bans perfect infinitives with *forget*. To the extent it's permissible, there is no modal inference.
(i) John {*forgot/claimed} to have stopped by the flower shop.

3.1.3 Discussion

This asymmetry, which, to my knowledge, has not been documented in the literature, is observed in all of the five languages that have been surveyed in this paper. A summary of the cross-linguistic facts is presented in the following table.

	English	Spanish	Italian	German	Hungarian
forget					
- plain infinitive	✓	✓	✓	✓	✓
- perfect infinitive	–	×	×	×	–
- clausal gerund	×	–	–	–	–

Table 1 Modalization of factive presupposition with non-finite complements

These facts leave unanswered questions for the application of White's theory. Why is it that a modalized factive presupposition obtains just in the case where we combine plain infinitive complements? What is it about these structures, or the particular mode of combination these structures enter into with the matrix verb that sets them apart from the other complement clause types?

One answer is that to explain the paradigm in Table 1, we need to abandon the Modalized Complement Analysis. However, in doing so, we lose the parsimony provided by the analysis: the modal factive presupposition derives from a root modal being present in a clause that was already flagged to be presupposed. In this paper, I maintain the core of the Modalized Complement Analysis, and instead propose that the covert modal is inserted only in plain infinitive complements. This move comes with its own problems. For one, we need an explanatory account for why and when modal insertion occurs in non-finite clauses. I refer to this problem as the *Selectivity of Modal Insertion in Non-finite Contexts* (SMINC).

(15) **Selectivity of Modal Insertion in Non-finite Contexts**
Whenever a non-finite clause is the complement of *forget*:

a. Mod heads the complement clause if the embedded lexical verb is a plain infinitive

b. Mod is banned elsewhere

In this section, I have shown that White's Modalized Complement Analysis does not capture the full range of facts, especially when Spanish infinitive complements are considered. I believe that this is because the Modalized Complement Analysis remains silent on the temporal properties of verbs like *forget*, and the temporal

constituency of the complement. These two features of *forget*-sentences, will be explored in the remainder of this paper.

4 Pre-existence

A pivotal thesis in this paper is that if our goal is to enumerate the various presuppositions of a complex attitude report, we must consider the temporal constituency of the target sentence (See also Abrusán (2011)). Consider the following example:

(16) John forgot that he rowed across the river at dawn

Intuitively, the above sentence relates that the lower eventuality (*John's rowing across the river*) is temporally bounded and its time of evalutation *precedes* the time of evaluation of the forgetting. Additionally, the lower eventuality is *presupposed* to have occurred. On the other hand, we have examples like with *hope* below:

(17) John hoped to row across the river at dawn

Here, the time of evaluation of the lower eventuality *follows* the time of evaluation of the attitude verb (hope). Moreover, *hope* is not a factive verb, because the lower eventuality is not presupposed to have occurred in the actual world.

One question we may ask is whether these facts, taken together, form part of a more global correspondence between temporal reference (time) and factivity. One account of this correspondence might go like this: whenever the lower eventuality is not presupposed to have occurred, there is no precedence relationship between the internal time of the attitude verb (the subjective now of the attitude holder) and the start time of the lower eventuality; but when the lower eventuality is presupposed to have occurred, the start time of this lower eventuality must precede the internal time of the attitude verb.

4.1 Factivity from pre-existence

A similar idea has been explored recently in Bondarenko (2019, 2020). In her study, she examines the verb *hanaxa* in Buryat, which alternates between a factive (*remember*) and non-factive (*think*) reading depending on the type of the complement clause. According to Bondarenko, when *hanaxa* joins with a finite CP it is interpreted non-factively as *think*, and when *hanaxa* combines with a nominalized clause its meaning is interpreted as *remember*. But crucially, there is another presupposition that arises with the factive readings, but is absent with the non-factive reading. This presupposition states that the lower event must have started before the onset of the

attitude in the world of evaluation.

One may wonder why there should be any temporal restrictions on the lower eventuality with the factive reading. In her account, Bondarenko argues that the temporal restrictions, what she calls the pre-existence condition, is in fact what generates the factive presupposition. She refers to this account as *factivity from pre-existence*.

Zooming out, we observe that the pre-existence condition applies to English *forget* independently of the complement it combines with. Combining finite complements as in (18), PRO-ing gerund clauses as in (19), and perfect infinitives in Spanish as in (20) all lead to the inference that the eventuality associated with the complement started before the forgetting.

(18) **Pre-existence with *forget* + finite CP**
On Tuesday, Mary forgot that she called back her twin.

a. On Monday, Mary began to call back her twin.
b. #On Wednesday, Mary began to call back her twin.

(19) **Pre-existence with *forget* + gerund clause**
On Tuesday, Mary forgot calling back her twin.

a. On Monday, Mary began to call back her twin.
b. #On Wednesday, Mary began to call back her twin.

(20) **Pre-existence with *forget* + perfect infinitive**
María olvidó haber devuelto la llamada a su gemela.

a. El lunes, María comenzó a devolverle la llamada a su gemela.
b. #El miércoles, María comenzó a devolverle la llamada a su gemela.

It is not possible to conceive of the lower event in the above examples as starting at, during, or after the event of forgetting. Root negation does not cancel this inference either. Therefore I suspect that, like in Buryat with *hanaxa + NP*, English *forget* encodes the pre-existence condition whenever it combines with the above complements.

The remaining question is whether this is true generally of *forget*. Can we say that the denotation of the verb unambiguously presupposes the pre-existence of the complement? Considering the case where *forget* embeds infinitives in English, arguing that the target of the verb, and by extension the pre-existence condition, is the content of the infinitival VP alone, is problematic because this would presuppose that the VP event precedes the forgetting. However, by all intuitive account the

infinitival VP event (or at least the occasion for the event) is *simultaneous* (or future oriented) with respect to the governing attitude. This problem is solved if we allow an obligation to be the target of the attitude verb, as in White (2014). In that case, it is the left bound of the time of evaluation of the obligation that must precede the forgetting. This nicely aligns with our intuitive judgments, as demonstrated below:

(21) ***Pre-existence* with *forget* + plain infinitive**
On Tuesday, Mary forgot to call back her twin.

a. On Monday, Mary_1's twin_2 told her_1 to call her_2 back.
b. #On Wednesday, Mary_1's twin_2 told her_1 to call her_2 back.

In the above example, the only possible reading available is one where the obligation is contracted before the forgetting. To explain this, I argue that insertion of a modal satisfies the pre-existence condition by letting the obligation be the target of the memory. In other words, it is the evaluation time of the modal that precedes the event of forgetting and not the evaluation time of the infinitival VP event. An added benefit of this proposal is that it allows us to maintain that it is the complement that is presupposed, since it is the syntactic representation of the root modal proposition and not the infinitival VP that is the complement of *forget*.

5 Proposal

In this section, I submit a theory to address the selectivity of modal insertion in non-finite complements of the attitude verb *forget*. Broadly, the goal is to capture the intuition that a covert modal operator is inserted in the non-finite complements of *forget* just in the case that not doing so would result in presupposition failure.

I argue that the presupposition responsible for the distribution of this covert modal operator is the pre-existence condition, which is folded into the lexical semantics of *forget*. However, in order to build the pre-existence condition in the lexical semantics of *forget*, *forget* needs to be able to access the event argument of the embedded verb. The aim would be to say that the evaluation time of this embedded event starts before the forgetting. But how should we accomplish this? At first glance, this is not clear.

One approach involves positing that all complement clauses are effectively predicates of events. One way this could look follows the assumption that the verb, the verb phrase, and functional heads in the extended projection of the clause are all predicates of events. Further, following Krifka (1989), we could assume that somewhere in the CP layer, a *sentence mood operator* is present to ensure existential closure of the event variable in main sentences. Assuming that this sentence mood operator is

absent in embedded clauses, we obtain the desirable result that the embedding verb can have access to the lower event. I sketch a potential implementation of this below.

(22) $[\![\text{TP}]\!] = \lambda e.\lambda w.\lambda t.$ e is an event of stopping by the flower shop in w at t

Though attractive for its simplicity, Champollion (2015) argues this makes incorrect scopal predictions when we factor in negation (and other scope-taking elements):

(23) No boy laughed (Sentence mood operator approach)

a. $\exists e[\ \neg\exists x[\ \text{boy}(x) \wedge \text{laugh}(e) \wedge \text{ag}(e) = x\ ]\ ]$
($^*\exists e >> \neg\exists x$; Champollion (2015))

The translation of (23) is literally 'there is an event that is not a laughing by a boy'. But this is not what the sentence expresses. Instead, translations where the event variable scopes low are preferred (See Champollion (2015) for other examples):

(24) No boy laughed.

a. $\neg\exists x[\ \text{boy}(x) \wedge \exists e\ [\ \text{laugh}(e) \wedge \text{ag}(e) = x\ ]\ ]$
($\neg\exists x >> \exists e$; Champollion (2015))

To solve this problem, I will use Champollion (2015)'s interpretation of event semantics which builds on Barker & Shan (2014)'s continuation semantics (See also Barker (2001, 2002)). In this framework, it is the verb representation that introduces existential quantification of an event variable. Further, the verb, the verb phrase, and extended projections in the clause denote predicates of sets of events. I provide a short demonstration of this below.

(25) $[\![\text{VP}]\!]^{g,c} = \lambda f_{<vt>}.\lambda w_s.\exists e_v.\ \text{laugh}(e)(w)\ \&\ f(e)$

(26) $[\![\text{Asp}]\!]^{g,c}([\![\text{VP}]\!]^{g,c}) = \lambda f_{<vt>}.\lambda t_i.\lambda w_s.\ [\![\text{VP}]\!]^{g,c}(\lambda e'.[f(e')\ \&\ \tau(e') \subseteq t])(w)$
$= \lambda f_{<vt>}.\lambda t_i.\lambda w_s.\ \exists e_v.\ \text{laugh}(e)(w)\ \&\ f(e)\ \&\ \tau(e) \subseteq t$

In addition, we use Krifka (1989)'s sentence mood operator to introduce closure at sentence level.

(27) $[\![[\text{closure}]]\!] = \lambda V_{<vt,st>}.\ V(\lambda e.\text{T})$

Going back to our original problem, in this section, we say that the absence of this sentential mood operator in embedded clauses is what allows an embedding verb like *forget* to target the event associated with the complement. This is precisely what

we will be required to do to represent the pre-existence presupposition of *forget*, which will restrict the time of evaluation of the complement.

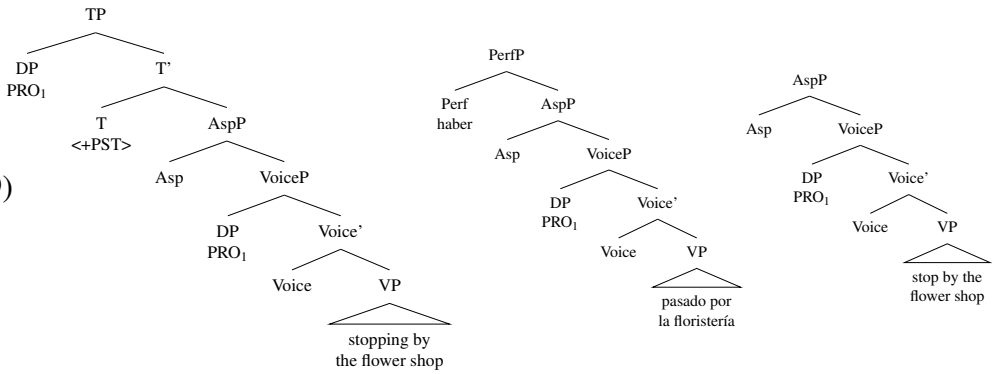
Consider now the case in which the main predicate is an attitude verb: *forget*, *remember*, etc. As our first move, we will consider that such attitude verbs quantify over world-time pairs (Lewis 1979; Stechow 2009) of a doxastic modal base (Cremers 2018), as in (28)

(28) a. $[\![\text{forget}]\!]^{g,c} = \lambda Q_{<vt,<i,st>>}.\ \lambda f_{<vt>}.\ \lambda w_s.\ \exists e_v\text{: } \underline{\text{PreEx}(Q)(e)(w)}\ .$
$[\neg\forall(w',t) \in \text{Dox}(e)(w) \rightarrow Q(\lambda e'.\text{T})(t)(w')]\ \&\ f(e)$

b. PreEx = $\lambda Q_{<vt,<i,st>>}.\ \lambda e_v.\ \lambda w_s\text{: } \exists(e'',t)[Q(\lambda e'.e'{=}e'')(t)(w)$
$\&\ \text{LB}(\tau(e'')) < \text{LB}(\tau(e))]$

For ease of exposition, I provide the representation of *forget* combining with declarative non-finite complement clauses of *forget* only, and assume that they are of the same type: functions from sets of events to propositions. To do so I will assume bare to-infinitives are AspP projections. I leave a uniform representation of *forget* combining with (non-)finite declarative complements (See Moulton (2009, 2015)), and embedded questions (See Theiler, Roelofsen & Aloni (2018)) to future work.

(29)



(30) a. $[\![\text{TP}]\!]^{g,c} = \lambda f_{<vt>}.\lambda t_i.\lambda w_s.\exists t'_i.\ t' < t\ \&\ \exists e_v.\ \text{stop-by-FS}(e)(w)\ \&\ f(e)$
$\&\ \tau(e) \subseteq t'\ \&\ ag{=}g(1)$

b. $[\![\text{PerfP}]\!]^{g,c} = \lambda f_{<vt>}.\lambda t_i.\lambda w_s.\exists t'_i.\ t' < t\ \&\ \exists e_v.\ \text{stop-by-FS}(e)(w)\ \&\ f(e)$
$\&\ \tau(e) \subseteq t'\ \&\ ag{=}g(1)$

c. $[\![\text{AspP}]\!]^{g,c} = \lambda f_{<vt>}.\lambda t_i.\lambda w_s.\exists e_v.\ \text{stop-by-FS}(e)(w)\ \&\ f(e)\ \&\ \tau(e) \subseteq t$
$\&\ ag{=}g(1)$

Additionally, PRO-ing gerund complements of *forget* are assumed to be implicitly past oriented on account of a ϕ-defective (past) Tense feature (Pires 2007) (See also Martin (2001)). I also make the assumption that there is no tense feature present in (to-) infinitive complements of *forget*. For plain to-infinitives in English, this is because these clauses do not allow a temporal interpretation that is distinct from the matrix clause (Wurmbrand 2001, 2014; Grano 2015).[6] While perfect infinitives do allow a distinct temporal interpretation (precedes matrix reference time), this is already accounted for with the perfect operator.

A summary of the proposal follows. First we have the familiar notion that the subject does not believe the content of the complement (Cremers 2018). In more technical language, this means that there are some worlds compatible with the subject's beliefs where the complement does not hold. The new contribution is in integrating the pre-existence presupposition into the meaning of *forget*. What this presupposition states is that the highest event/situation in the complement starts before the forgetting. What remains to be seen is how this works out in practice, and whether it supports our hypothesis that a modal is inserted in non-finite complements just in the case that this pre-existence presupposition is not immediately met.

6 Application of theory

In this section, I apply the new uniform analysis of *forget* to cases in which it combines with non-finite complements. In doing so, I attempt to capture and explain the distribution of the covert operator Mod in non-finite complements.

Let us examine first the case in which *forget* composes with a PRO-ing gerund complement clause. We'll go back to our Flower Shop example, reprinted below.

(31) John forgot stopping by the flower shop.

How events and situations are ordered on a timeline is the business of the temporal semantics of a sentence. I will not propose anything terribly exciting in this respect. Instead, I will assume that the gerund clause has a particular temporal orientation that is built compositionally with temporal operators like aspect and tense. I argue that it proceeds in the following way. First, embedded aspect locates the runtime of the event (EmbET) within the embedded reference time (EmbRT). This is the meaning contributed by the perfective aspect. With the introduction of the tense feature, the

6 Wurmbrand (2014) proposes there are *tenseless simultaneous infinitives* which 'form a single temporal domain with the matrix clause in that their reference time corresponds to the reference time of the matrix predicate'(pg 435). I argue plain to-infinitive complements of *forget* are of this type.

embedded reference time is given a value, however, because it is a relative tense, this value is always in relation to the time argument for the entire gerund clause. The time argument for the gerund is given by the world-time pairs that the attitude verb, in this case *forget*, is said to quantify over.

(32) Temporal relations between gerund complement and *forget* in (31)

Embedded Asp locates the runtime of the event (EmbET) within the embedded reference time (EmbRT).

(EmbET $\subseteq$ EmbRT) (i)

Embedded reference time is interpreted as BEFORE the subjective now (SN) of the attitude holder.

(EmbRT < SN) (ii)

The pre-existence condition requires the time of the embedded event precede the subjective now of attitude holder (at time of forgetting). (i) & (ii) $\Rightarrow$ (iii)

(Presupp: ✓EmbET < SN) (iii)

As the above demonstration shows, the semantics of the gerund clause guarantee that the pre-existence presupposition is satisfied. This is because these gerund clauses are implicitly past oriented with respect to the subjective now of the attitude holder.

Next we move onto the case with perfect infinitives complements. We'll examine the Spanish Flower Shop sentence.

(33) Juan olvidó haber pasado por la floristería.

Following Klein (1994), I assume that the perfect aspect asserts that the event is over by the reference time. I use the formal implementation of this provided in Kratzer (1998). Again, we build up the temporal relations of the perfect infinitive complement beginning with the lowest temporal operator in the clausal architecture. This would be aspect. Embedded (perfective) aspect locates the evaluation time of the VP event in some interval of time. This interval is asserted to precede the Embedded Reference Time (τ(PerfP)); this is the meaning contributed by the perfect.

(34) Temporal relations between perfect infinitive complement and *forget* in (33)

Embedded Asp locates the runtime of the event (EmbET) within the interval that ends before the embedded reference time.

(EmbET $<$ EmbRT) (i)

Embedded reference time is simultaneous with the subjective now (SN) of the attitude holder.

(EmbRT = SN) (ii)

The pre-existence condition requires the time of the embedded event precede the subjective now of the attitude holder (at the time of forgetting). (i) & (ii) $\Rightarrow$ (iii)

(Presupp: ✓EmbET < SN) (iii)

Since we assume there is no embedded tense, the time of evaluation of the perfect infinitive clause will be directly given by the time in the world time pairs quantified over by *forget*. This will be the attitude holder's subjective now. Putting it all together, the evaluation time of the infinitival VP event will be located within some interval that is before the subjective now. This satisfies the pre-existence condition.

We now turn to our final case: combining a plain to-infinitive complement. Remember, we argue that the motivation for last resort insertion of a modal is a contradiction between the asserted temporal relations that hold between *forget* and the plain infinitive complement, and the presupposition of *forget*, namely the pre-existence condition. Specifically, with to-infinitive complements, without modal insertion there is a clash between the at-issue and not-at issue temporal relations of the clause.

As for a concrete example, we examine the English Flower Shop sentence below.

(35) John forgot to stop by the flower shop.

The interpretation of the sentence above is more straightforward than our other cases. Not the least of which because there is no tense feature, or perfect aspect operator to shift the evaluation time of the infinitival VP event into the past. Therefore, embedded aspect will locate the runtime of the infinitival VP event *within* the subjective now of the attitude holder.

(36) Temporal relations between plain infinitive complement and *forget* in (35)

Embedded Asp locates the runtime of the embedded event (EmbET) within the subjective now

(EmbET $\subseteq$ SN) (i)

The pre-existence condition requires the time of the embedded event precede the subjective now (at the time of forgetting).

(Presupp: EmbET < SN) (ii)

(**Contradiction!**) (i) & (ii)

However, this leads to contradiction and presupposition failure. So what is the solution? Again, I argue that a root modal operator is inserted. This modal has the following semantics.

(37) $[\![\text{Mod}]\!](Q)(f)(t)(w) = \exists s.\forall w'[w' \in \text{Plan}(s)(t)(w)] \rightarrow [\exists t'.t \leq t' \ \& \ \text{Q}(\lambda e'.\ \text{T})(w')(t')] \ \& \ f(s)$

(adapted after Copley (2002))

Moreover, it is the modal that satisfies the pre-existence condition.

(38) [John [T [Asp [forgot [**Mod** [Asp [stop by the flowershop]]]]]]]

(39) $[\![(38)]\!]^c$ is defined if the plan to stop by the flowershop holds in the actual world, and the plan starts existing before the forgetting; if defined, $[\![(38)]\!]^c$ = 1 iff it is not the case that in all worlds compatible with John's beliefs John planned to stop by the flower shop.

Now let us calculate the temporal relations of the modalized complement clause and its interaction with *forget*.

(40) Temporal relations between modalized complement and *forget* in (35)

Embedded Asp locates the runtime of the embedded event (EmbET) within the runtime of Mod.

(RB(PlanST) = EmbET) (i)

The subjective now is a time located within the run time of Mod, but the runtime of Mod begins before this.

(SN $\subset$ PlanST) (ii)

The pre-existence condition requires the start time of the embedded event or situation precede the subjective now of the attitude holder (at the time of forgetting). (i) & (ii) $\Rightarrow$ (iii)

(Presupp: ✓LB(PlanST) $<$ SN) (iii)

As shown above, when we allow the plan to be the target of the pre-existence presupposition, that presupposition is satisfied by the sentence. This I argue is the source of the modalization of the non-finite complement clause, and why we observe that the distribution of Mod is even further restricted than what is proposed in White (2014). White stipulates that Mod is a feature of infinitival complement clauses of *forget*, but this is premature and we show this by observing that forget sentences where the complement is a perfect infinitive display no evidence of a modal in the non-finite clause. Further, PRO-ing gerunds under *forget* show no evidence of a modal either. Evidence of a modal is detected only with plain infinitive complements. I argue that the presuppositions and truth-conditional semantics of *forget*, specifically those related to the temporal constituency of the sentence, restrict the distribution of Mod in the complement. With examples like (33), while it may be the case that the internal time of the matrix attitude verb serves as the reference time for the complement, the perfect operator in the complement shifts the evaluation time of the embedded event (stopping by the flower shop) to some time before the internal time of the attitude verb. Without Mod, (35) presupposes that the left bound of the evaluation time of the complement (= time of evaluation of the lower event) precedes the left bound of the evaluation time of the attitude, and asserts that the evaluation time of the complement is simultaneous with the evaluation time of the attitude verb. This leads to contradiction and presupposition failure, without a last-resort insertion of a modal to satisfy the pre-existence presupposition, by letting the time of evaluation of the modal be the target of the pre-existence condition.

7 Conclusion

In conclusion, I offer support for the original characterization of the presuppositional profile of *forget* introduced in Kiparsky & Kiparsky (1970) and for a revision of the Modalized Complement Analysis in White (2014). The contribution of this paper is to show that fine-grained descriptions of the temporal constituency of sentences are crucial to understanding some of the more complicated cases of presuppositions.

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Will Williams
Department of Linguistics
Sidney Smith Hall, 4th floor
100 St. George St
Toronto, ON M5S 3G3
w.williams@mail.utoronto.ca