

Doxastic Diversity and Covert Temporal Operators*

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Abstract

The purpose of this paper is relatively modest. Firstly, I propose that the presuppositions of certain attitude predicates such as *expect*, *hope* and *want* can predictably constrain the temporal orientation of their infinitival complements. Secondly, I attempt to defend the position that future oriented infinitivals feature a covert temporal operator.

Keywords: Infinitival Tense, doxastic diversity presuppositions, *de se*, ordering predicates, covert temporal operators

1 Introduction

Propositional attitude verbs which select infinitival complements are often divided into two classes. Those which give rise to a future oriented reading, and those which give rise to a simultaneous reading.

- (1) a. John {wanted/hoped/expected Mary} to be at the party. *future oriented*
b. John {claimed/believed Mary} to be at the party. *simultaneous*

While the infinitival complements in (1) have different temporal interpretations, on the surface they appear identical. There are two schools of thought concerning how to handle this disparity between interpretation on the one hand, and the surface form on the other. The first group of proposals I will refer to as *syntactic* accounts. These accounts assume that, while these complements look identical, there is in fact covert material present in the future oriented complement which is absent in the simultaneous complement. Early proponents of this account treat this extra material as a form of covert *irrealis* Tense (Stowell, 1982; Martin, 2001 *inter alia*), while more recent accounts propose a covert future operator (Abusch, 2004; Wurmbrand, 2014; Grano, 2015). In order to prevent overgeneration of future oriented infinitives, syntactic accounts often make an appeal (either explicit or implicit) to the lexical semantics of the selecting verb in order to limit the distribution, or interpretation, of the covert future operator (Stowell, 1982; Landau, 2000; Abusch, 2004; Wurmbrand, 2014; Grano, 2015). However, they rarely attempt to provide an explicit semantics which can derive this distribution.

In contrast, accounts which I will call *semantic* accounts maintain that the infinitival complements in (1) do not differ in structure or meaning. Rather, it is the lexical semantics of the selecting verb which determine the temporality of the embedded infinitival. These accounts build the posteriority of the future orientated infinitivals in (1a) directly into the selecting verb itself (Katz, 2001; Pearson, 2016, 2017).

In this paper, I will suggest that a syntactic account is to be preferred. But we must rely on the lexical semantics of the selecting verb in order to correctly predict the distribution of

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the covert future operator. In section 2, I will address instances in which the future oriented predicates in (1a) can have complements which have a simultaneous reading. I argue that the distribution of simultaneous complements is restricted in a principled manner by the lexical semantics of the verb. I show that *expect* can license simultaneous reading with an ECM complement, as well as certain control complements provided its *doxastic uncertainty requirement* is satisfied (Anand & Hacquard, 2013). The verb *hope* receives a similar treatment to *expect*. Conversely, *want* is argued to lack such a requirement, and as such, it can license simultaneous readings more generally.

In section 3 of this paper, I will offer some reasons to think a syntactic account which posits a covert temporal operator in future oriented infinitives is preferable to a semantic account. In addition, problems will be noted for two specific semantic accounts (Katz, 2001; Pearson, 2016). Finally, some of the seemingly less attractive aspects of a syntactic account will be shown to be tolerable given some reasonable assumptions.

2 Doxastic Diversity and Temporal Orientation

It has been observed by Abusch (2004) that certain predicates can license future oriented and simultaneous infinitival complements, while others cannot. Among those which can is the verb *expect*.¹ Pesetsky (1992) notes that ECM complements to *expect* can receive a simultaneous reading akin to *believe* provided the complement concerns something “unknown to the speaker” (p.29). I will suggest that this requirement takes the form of a *doxastic uncertainty requirement* (Anand & Hacquard, 2013), a diversity condition on the Modal Base of predicates which rank doxastic alternatives according to an Ordering Source (Kratzer, 1977, 1981, 2012; von Stechow, 1999). This observation for *expect* will be shown to extend to the emotive doxastic *hope* which has also been argued to have such a requirement. Finally, it will be shown that the non-doxastic *want* is not subject to the same requirement and is thus more flexible in its possible temporal orientation.

2.1 *Expect*

Pesetsky (1992) observed that ECM complements to *expect* can receive a simultaneous belief-type reading.²

- (2) I expect there to be flowers on the table.

Pesetsky also noted that such a sentence is inappropriate if the attitude holder knows that there are flowers on the table. He proposes that *expect* expresses a belief about something unknown to the attitude holder. While this characterization is intuitive, we will instead pursue the proposal that *expect* expresses that the attitude holder finds the prejacent likely but presupposes that the attitude holder is not certain with respect to the truth of the complement. Specifically, we adopt the proposal of von Stechow (1999) that, for certain predicates, worlds

¹ Abusch discusses the verb *predict* (i) which can have either a future oriented or simultaneous reading. While I do not discuss this verb here, I believe it can be given more or less the same semantics as *expect*. I concentrate on *expect* because it can take part in both control and ECM constructions.

(i) Monique is predicted to be pregnant {already/by next week}.

² Pesetsky’s main concern is comparing the propositional uses of *expect* discussed here with those that have a bouletic flavour (Bresnan, 1972). I will have nothing to say about those other uses here.

supplied by a Modal Base (MB) are ranked according to an Ordering Source (OS) (Kratzer, 1977, 1981, 2012). In what follows, I assume a centered worlds semantics wherein an attitude holder's set of doxastic alternatives, for example, is not a set of worlds, but rather a set of world-time-individual triples, or *centered worlds*.³

$$(3) \quad \text{Dox}_{x,t,w} = \left\{ \langle w', t', y \rangle \left[\begin{array}{l} \text{it is compatible with what} \\ \text{x believes in w at t for :} \\ \bullet \text{ w to be } w' \\ \bullet \text{ t to be } t' \text{ in } w' \\ \bullet \text{ x to be } y \text{ in } w' \text{ at } t' \end{array} \right] \right\}$$

To rank the doxastic alternatives of the attitude holder, we define an operator Max_{OS} which picks out the set of best worlds according to a partial ordering relation \prec_{OS} .

$$(4) \quad \begin{array}{l} \text{a. } \text{Max}_{\text{OS}}(\text{MB}) = \{ \langle w, t, x \rangle \in \text{MB} : \neg \exists \langle w', t', y \rangle \in \text{MB} : \langle w', t', y \rangle \prec_{\text{OS}} \langle w, t, x \rangle \} \\ \text{b. } \text{where } \langle w', t', y \rangle \prec_{\text{OS}} \langle w, t, x \rangle \text{ iff} \\ \quad \{ P \in \text{OS} : P(x)(t)(w) \} \subset \{ P \in \text{OS} : P(y)(t')(w') \} \end{array}$$

Taken together, this machinery will give us a semantics such as the following for *expect*.⁴

$$(5) \quad \begin{array}{l} \text{a. } \llbracket \text{expect} \rrbracket = \lambda w \lambda t \lambda P \lambda x. \forall \langle w', t', y \rangle \in \text{Max}_{\text{PROB}_{x,t,w}}(\text{Dox}_{x,t,w}) : P(y)(t')(w') \\ \text{b. } \text{presupposes } \exists \langle w'', t'', z \rangle \in \text{Dox}_{x,t,w} : P(z)(t'')(w'') = 1 \\ \quad \wedge \exists \langle w'', t'', z \rangle \in \text{Dox}_{x,t,w} : P(z)(t'')(w'') = 0 \\ \text{c. } \text{where } \text{PROB}_{x,t,w} = \{ P_{\langle e, \langle i, st \rangle \rangle} : x \text{ finds it likely at } t \text{ in } w \text{ to have property } P \} \end{array}$$

This semantics universally quantifies over the most likely doxastic alternatives of the attitude holder, while presupposing that the doxastic modal base is diverse with respect to the truth of the complement. Since it is generally the case that an attitude holder can be uncertain about whether a given property holds of another individual at the attitude holder's candidate for NOW, it is not surprising that ECM complements can have a simultaneous reading. Nor is it surprising that *expect* can have future oriented control complements, as it is typically the case that one can be uncertain with respect to whether a given property will hold of one's SELF at some future time.

$$(6) \quad \text{John expected to see a bunch of dead flowers on the table when returned home.}$$

What is decidedly less common is that one can be uncertain with respect to whether a property simultaneously holds of one's SELF. This is the state of affairs which would have to

³ The motivation for centered worlds is well-documented and will not be rehearsed here (see e.g., Lewis, 1979; Chierchia, 1989; Abusch, 1998; Stephenson, 2007; Uegaki, 2011; Pearson, 2016 *inter alia*). The individual coordinate represents attitude holder's candidates for his/her SELF. Pronouns which are coindexed with the individual coordinate, such as PRO, receive an interpretation *de se* (Chierchia, 1989). The time coordinate represents the attitude holder's candidates for NOW, temporal pronouns coindexed with the time coordinate receive an interpretation *de nunc* (Abusch, 1998; Schlenker 1999).

⁴ We can propose a similar semantics for *predict* (see fn.1) perhaps with the amendment that the ordering source for *predict* is based on more objective information than that of *expect*.

obtain in order for a control complement to have a simultaneous reading. Given the right scenario, however, such examples can be constructed.⁵

- (7) SCENARIO: *John is taking part in the UK election to become prime minister. His assistant asks him how he thinks he is currently doing in the polls. Confident, but having not watched any of the coverage, John replies as in (7a-c).*
- a. I expect to probably be ahead in the polls.
 - b. In fact, I expect to be winning by now.
 - c. Hell, I expect to have been elected already!

In the above example, John is uncertain with respect to whether he is winning or has already won. As such he can assert that his most likely doxastic alternatives are ones in which he is winning/has won, while nonetheless believing it to be possible that he has not won.

2.2 Interlude: Epistemic Uncertainty?

I have suggested that an ordering semantics for *expect* in combination with a diversity condition on its modal base can constrain the distribution of simultaneous infinitival complements to this verb. However, for the sake of completeness, can we find a reason to prefer our semantics over the informal suggestion of Pesetsky (1992)? Recall that Pesetsky suggested that an expectation is a belief about something which is unknown to the attitude holder. We could reasonably formalize this in a number of ways.⁶ We could even modify the semantics adopted above to quantify over doxastic alternatives and presuppose *epistemic* diversity. Both semantics would universally quantify over a set of worlds X and presuppose diversity in a (proper) superset of X.⁷ One crucial difference, however, is that for Pesetsky *expect* entails *believe*. With this in mind, consider the contrast between (8) and (9).⁸

- (8) a. I believe that it might be raining, #but I believe it isn't.
b. I believe that John might be alive, #but I believe he's dead.

⁵ For independent reasons, simultaneous complements cannot contain eventive predicates with an episodic reading (see especially Wurmbrand, 2014). As such, all the examples used will contain stative predicates, the progressive *be+ing*, or the perfect *have*. It should also be noted that the perfect marker *have* can behave more akin to a genuine past marker in infinitives (Landau, 2000; Stowell, 2007; Grano, 2015), in which case (7c) may be more appropriately called a past oriented infinitive.

⁶ For example, any of the following could be considered reasonable formalisations of Pesetsky's suggestion. What they have in common is that they all universally quantify over doxastic alternatives.

- (i) $\llbracket \mathbf{expect}_{\text{Pesetsky1}} \rrbracket = \lambda w \lambda t \lambda P \lambda x. \forall \langle w', t', y \rangle \in \text{Dox}_{x,t,w} : P(y)(t')(w') = 1 \wedge \neg \forall \langle w'', t'', z \rangle \in \text{Epist}_{x,t,w} : P(z)(t'')(w'') = 1$
- (ii) a. $\llbracket \mathbf{expect}_{\text{Pesetsky2}} \rrbracket = \lambda w \lambda t \lambda P \lambda x. \forall \langle w', t', y \rangle \in \text{Dox}_{x,t,w} : P(y)(t')(w') = 1$
b. presupposes $\neg \forall \langle w'', t'', z \rangle \in \text{Epist}_{x,t,w} : P(z)(t'')(w'') = 1$
- (iii) a. $\llbracket \mathbf{expect}_{\text{Pesetsky3}} \rrbracket = \lambda w \lambda t \lambda P \lambda x. \forall \langle w', t', y \rangle \in \text{Dox}_{x,t,w} : P(y)(t')(w') = 1$
b. presupposes $\exists \langle w'', t'', z \rangle \in \text{Epist}_{x,t,w} : P(z)(t'')(w'') = 1 \wedge \exists \langle w''', t''', z \rangle \in \text{Epist}_{x,t,w} : P(z)(t''')(w''') = 0$

⁷ For any individual x, time t, and world w, the most likely doxastic alternatives are a subset of the doxastic alternatives. And the doxastic alternatives are a subset of epistemic alternatives (Hegarty, 2016).

⁸ One speaker I asked did not completely reject the continuations in (8). This could be because they were accessing the less preferred 'objective' reading of the embedded epistemic (Lyons, 1977; Papafragou, 2006; Portner, 2009 *inter alia*). Crucially, however, if the other speakers were accessing this reading for the *expect* continuations, then they should have been able to do so for the *believe* continuations. The fact that they perceived a clear contrast suggests they were not accessing this reading.

- (9) a. I believe that it might be raining, but I expect it isn't.
 b. I believe that John might be alive, but I expect he's dead.

Given a traditional analysis of epistemic modals as quantifiers over epistemic alternatives, we do not expect the examples in (8) to be contradictory. Nonetheless, they appear to be. To capture this, Yalcin (2007) proposes to treat embedded epistemics as quantifiers over an information state provided by the superordinate predicate. This can be captured in an extensional system, like the one adopted here, by proposing that epistemic modals establish a relation between sets of (centered) worlds in the simplest sense.

- (10) a. $\llbracket \mathbf{might} \rrbracket = \lambda P_{\langle e, \langle i, st \rangle \rangle} \lambda Q_{\langle e, \langle i, st \rangle \rangle}. \exists \langle w, t, x \rangle \in P : Q(x)(t)(w)$
 b. $\llbracket \mathbf{must} \rrbracket = \lambda P_{\langle e, \langle i, st \rangle \rangle} \lambda Q_{\langle e, \langle i, st \rangle \rangle}. \forall \langle w, t, x \rangle \in P : Q(x)(t)(w)$

The restrictor argument is a propositional variable which is abstracted over at the periphery of the clause. Furthermore, we modify the semantics of *believe* to take a complement \mathcal{P} of type $\langle \langle e, \langle i, st \rangle \rangle, \langle e, \langle i, st \rangle \rangle \rangle$.⁹

- (11) $\llbracket \mathbf{believe} \rrbracket = \lambda w \lambda t \lambda \mathcal{P} \lambda x. \forall \langle w', t', y \rangle \in \text{Dox}_{x,t,w} : \mathcal{P}(\text{Dox}_{x,t,w})(y)(t')(w')$

Given the semantics for epistemic modals in (10), and *believe* in (11), the universal quantification of *believe* in (8) is vacuous. Because the embedded epistemic quantifies over the same set of worlds, the first conjunct in (8a) asserts that it is compatible with the speaker's beliefs that it is raining. The second conjunct thus contradicts the first.

- (12) $\llbracket (8a) \rrbracket(\text{speaker})(t^*)(w^*) = 1$ iff
 $\forall \langle w', t', y \rangle \in \text{Dox}_{\text{speaker}, t^*, w^*} : \exists \langle w'', t'', z \rangle \in \text{Dox}_{\text{speaker}, t^*, w^*} : \llbracket \mathbf{rain} \rrbracket(z)(t'')(w'') = 1$
 $\wedge \forall \langle w', t', y \rangle \in \text{Dox}_{\text{speaker}, t^*, w^*} : \llbracket \mathbf{rain} \rrbracket(y)(t')(w') = 0$

As for (9a), we predict it will be defined iff there are raining and not raining worlds among the doxastic alternatives of the speaker, if it is defined it will be true iff some doxastic alternatives are raining worlds but the most likely doxastic alternatives are all non-raining worlds.

- (13) $\llbracket (9a) \rrbracket(\text{speaker})(t^*)(w^*)$ is defined iff
 $\exists \langle w'', t'', z \rangle \in \text{Dox}_{\text{speaker}, t^*, w^*} : \llbracket \mathbf{rain} \rrbracket(z)(t'')(w'') = 1$
 $\wedge \exists \langle w'', t'', z \rangle \in \text{Dox}_{\text{speaker}, t^*, w^*} : \llbracket \mathbf{rain} \rrbracket(z)(t'')(w'') = 0$
 if defined, = 1 iff
 $\forall \langle w', t', y \rangle \in \text{Dox}_{\text{speaker}, t^*, w^*} : \exists \langle w'', t'', z \rangle \in \text{Dox}_{\text{speaker}, t^*, w^*} : \llbracket \mathbf{rain} \rrbracket(z)(t'')(w'') = 1$
 $\wedge \forall \langle w', t', y \rangle \in \text{Max}_{\text{PROB}_{x,t,w}}(\text{Dox}_{\text{speaker}, t^*, w^*}) : \llbracket \mathbf{rain} \rrbracket(y)(t')(w') = 0$

This does not involve a contradiction, and the fact that the continuations in (9) are consistent while those in (8) are contradictory is expected. On the proposal that an expectation is a belief

⁹ A comparable semantics for *expect* might look as follows (although see fn.11).

- (i) a. $\llbracket \mathbf{expect} \rrbracket = \lambda w \lambda t \lambda \mathcal{P} \lambda x. \forall \langle w', t', y \rangle \in \text{Max}_{\text{BOUL}_{x,t,w}}(\text{Dox}_{x,t,w}) : \mathcal{P}(\text{Dox}_{x,t,w})(y)(t')(w')$
 b. presupposes $\exists \langle w'', t'', z \rangle \in \text{Dox} : \mathcal{P}(\text{Dox}_{x,t,w})(z)(t'')(w'') = 1$
 $\wedge \exists \langle w'', t'', z \rangle \in \text{Dox}_{x,t,w} : \mathcal{P}(D')(z)(t'')(w'') = 0$

about something unknown, we would predict the continuations in (9) to be as bad as those in (8). If we find this reasoning convincing, then this data point seems to tip the scale in favor of the semantics assumed here.

2.2 Hope

The ordering semantics we have adopted for *expect* is based on von Stechow's semantics for bouletic predicates such as *want* and *hope*. Since Heim (1992), bouletic predicates have been typically taken to compare doxastic alternatives according to the desires of the attitude holder.¹⁰

- (14) a. $\llbracket \text{hope} \rrbracket = \lambda w \lambda t \lambda P \lambda x. \forall \langle w', t', y \rangle \in \text{Max}_{\text{BOUL}_{x,t,w}}(\text{Dox}_{x,t,w}) : P(y)(t')(w')$
 b. presupposes $\exists \langle w'', t'', z \rangle \in \text{Dox}_{x,t,w} : P(z)(t'')(w'') = 1$
 $\quad \quad \quad \wedge \exists \langle w'', t'', z \rangle \in \text{Dox}_{x,t,w} : P(z)(t'')(w'') = 0$
 c. where $\text{BOUL}_{x,t,w} = \{P_{\langle e, \{i, st\} \rangle} : \text{it is desired by } x \text{ at } t \text{ in } w \text{ to have property } P\}$

Without the diversity condition on the modal base in (14b), our denotation for *hope* would entail that if x believes p , then x hopes p . This would be an obviously undesirable prediction.

Anand and Hacquard (2013) argue that a semantics such as the one adopted above can be used to account for their experimental data showing that speakers find embedded universal epistemics notably marked under *hope*, while existential epistemics are significantly better. Roughly, the intuition underlying their account is that while *hope*'s doxastic component licenses the use of an embedded epistemic, universal epistemics express certainty and thus conflict with *hope*'s presupposition. Existential epistemics, on the other hand, merely express possibility, and are therefore compatible with *hope*'s uncertainty requirement.¹¹ They note that *expect* exhibits a similar asymmetry (fn.27).

Predictably then, examples in which the control complement of *hope* receives a simultaneous reading can be constructed provided the attitude holder is uncertain with respect to whether the property denoted by that complement clause is true of her SELF at her NOW.

¹⁰ In many Romance languages, the meanings of English *hope* and *expect* are expressed by one and the same verb (e.g., *esperar* in Spanish). This could be captured by fixing the modal base, while letting the ordering source be partially determined by a conversational background g .

- (i) a. $\llbracket \text{esperar} \rrbracket^g = \lambda w \lambda t \lambda P \lambda x. \forall \langle w', t', y \rangle \in \text{Max}_{g(x)(t)(w)}(\text{Dox}_{x,t,w}) : P(y)(t')(w')$
 b. presupposes i. $\exists \langle w'', t'', z \rangle \in \text{Dox} : P(z)(t'')(w'') = 1 \wedge \exists \langle w'', t'', z \rangle \in \text{Dox}_{x,t,w} : P(z)(t'')(w'') = 0$
 ii. $g(x)(t)(w) = \text{PROB}_{x,t,w} \vee g(x)(t)(w) = \text{BOUL}_{x,t,w}$

This affinity between *hope* and *expect* is lost on accounts which treat expectations as simple belief about the future (e.g., Katz, 2001; Pearson, 2016).

¹¹ As is stands, we do not derive this asymmetry. To do so, we again adopt our semantics for epistemic modals given in (10). Secondly, we slightly modify our entry for *hope* (and *expect*).

- (i) a. $\llbracket \text{hope} \rrbracket = \lambda w \lambda t \lambda \mathcal{P} \lambda x. \forall \langle w', t', y \rangle \in \text{Max}_{\text{BOUL}_{x,t,w}}(\text{Dox}_{x,t,w}) : \forall M' \subseteq \text{Max}_{\text{BOUL}_{x,t,w}}(\text{Dox}_{x,t,w}) : \mathcal{P}(M')(y)(t')(w')$
 b. presupposes $\exists \langle w'', t'', z \rangle \in \text{Dox} : \mathcal{P}(\text{Dox}_{x,t,w})(z)(t'')(w'') = 1$
 $\quad \quad \quad \wedge \exists \langle w'', t'', z \rangle \in \text{Dox}_{x,t,w} : \exists D' \subseteq \text{Dox}_{x,t,w} : \mathcal{P}(D')(z)(t'')(w'') = 0$

The result of these changes is that sentences without an embedded epistemic will be equivalent to before. A sentence with an embedded epistemic possibility modal will end up with the same truth conditions as a sentence without an embedded modal. Conversely, when an epistemic necessity modal is embedded, the presupposition will lead to a contradiction. I leave it up to the reader to verify these claims.

- (15) SCENARIO: *Mary is on her boat in a storm. She is attempting to tune the radio to the coastguard's frequency. She is unable to hear anything other than white noise and faint voices. Uncertain whether she has tuned her radio correctly, she begins to recite her coordinates.*
- a. Mary hopes to be talking to the coastguard.
 - b. Mary hopes to have tuned her radio to the right frequency.

Note that the minimally different (16) only has a future oriented reading. This is because it is only due to her ignorance with respect to her interlocutor in (15a) that Mary can have a simultaneous hope about herself.

- (16) Mary {hopes/expects} to be talking {next week/*already}.

In fact, it is not strictly the case that Mary cannot be uncertain with respect to whether she is talking at her candidates for NOW. She may be uncertain with respect to whether she is talking *de re*. In which case, an ECM example like (17a) is acceptable.

- (17) SCENARIO: *Mary, a radio host, is eager to find a radio to listen to a program about archaeology. Upon looking at her watch, she realizes that the program has already begun, and she is missing it. She expects the host to be talking already. What Mary does not realize, is that the scheduled program is a repeat of one she recorded a few years earlier, and the host is in fact herself.*
- a. (Unbeknown to her,) Mary_i expects herself_i to be talking already.
 - b. *(Unbeknown to her,) Mary_i expects PRO_i to be talking already.

It is a property of the silent subject PRO, that it is always interpreted *de se* in complements to attitude predicates (Chierchia, 1989). A belief *de se* is a belief about one's SELF. Due to the implausibility of being uncertain with respect to whether a property such as talking holds of one's SELF at NOW, the only reasonable interpretation of the infinitive would be future oriented. As a consequence, the adverb *already* in (16,17b) results in unacceptability.¹²

2.3 Non-doxastic *want*

We have seen above that *hope* and *expect* can license simultaneous infinitival complements, provided their doxastic uncertainty requirement is satisfied. Heim (1992) suggested that *want* too ranks doxastic alternatives according to the attitude holder's bouletic preferences. However, she notes that restricting the comparison worlds to doxastic alternatives might be too strong in some cases. Specifically, she observes that one can utter (18) without being committed to the idea that such a state of affairs is possible.

- (18) I want this weekend to last forever.

Compare this to the corresponding sentence with *hope*, which seems straightforwardly infelicitous.

- (19) #I hope this weekend lasts forever.

¹² Of course, even if (17b) were grammatical, it would nonetheless be false in the scenario given.

Anand & Hacquard (2013) cite further evidence that *hope* carries a doxastic uncertainty requirement, while *want* does not. The following examples, which have been modified slightly, are based on Scheffler (2008).

- (20) A: It's raining.
 B: I want it to be / that is what I want.
 C₁: #I hope it is / that is what I hope.
 C₂: #I expect it to be / that is what I expect.

In this exchange, provided that A's assertion is accepted by A's interlocutors, and thus forms part of the *common ground* (Stalnaker, 1978), the proposition *it is raining* will be true throughout B and C_{1,2}'s doxastic alternatives. C₁'s use of *hope* and C₂'s use of *expect* is thus infelicitous as the doxastic uncertainty requirement of the respective verb is not satisfied. Consider also (21).

- (21) A: It isn't raining.
 B: I want it to be raining / that is not what I want.
 C₁: #I hope it is raining / that is not what I hope
 C₂: #I expect it to be raining / that is what I expect.

The proposition *it isn't raining* forms part of the common ground. The proposition *it is raining* is incompatible with C_{1,2}'s beliefs, and the doxastic uncertainty requirement of *hope* and *expect* is not met. That *want* is nonetheless felicitous seems to support the claim that it does not always compare doxastic alternatives. An accurate characterization of which worlds make up *want*'s modal base would take us too far afield here. What is important for our purposes is simply that, while *want* may have a diversity condition on its modal base, it does not have a doxastic uncertainty requirement. For concreteness, we assume that the modal base is determined by a conversational background *f*, and we drop the requirement that the modal base always be identified with the doxastic alternatives of the attitude holder (Rubinstein, 2012), although in certain contexts it may be.

- (22) a. $[[\text{want}]]^f = \lambda w \lambda t \lambda P \lambda x. \forall \langle w', t', y \rangle \in \text{Max}_{\text{BOUL}_{x,t,w}}(\cap f(x)(t)(w)) : P(y)(t')(w')$
 b. presupposes $\exists \langle w'', t'', z \rangle \in \cap f(x)(t)(w) : P(z)(t'')(w'') = 1$
 $\wedge \exists \langle w'', t'', z \rangle \in \cap f(x)(t)(w) : P(z)(t'')(w'') = 0$

This proposal predicts that infinitival complements to *want* should be acceptable with a simultaneous interpretation regardless of whether the attitude holder is ignorant of the truth of the complement or not (*modulo* the constraint on episodic eventive predicates noted in fn.5). We can already see that this is the case for ECM complements (20B, 21B), and indeed this prediction appears to borne out for control complements too.

- (23) a. John wants to be talking already (but the first speaker has overrun).
 b. John wanted to be running outside (instead of being cramped behind his desk).
 c. John wants to be sat on a beach right now (but Mary won't give him a holiday).
 d. Mary still wants to be in charge (so she's not resigning yet).
 e. Mary wants to have convinced John of her genius (but she doesn't hold out much hope).

While the most readily available reading of a simultaneous complement to *want* is a counterfactual one, it should be noted that an attitude holder can want to have a property

which she already has, and which she knows she has. This seems to be corroborated with the fact that *want p*, but not *hope p*, is compatible with a continuation of *wish p* or *be glad p*.

- (24) John wants to be in charge.
 a. So, he's glad that he is.
 b. Every day, he wishes he were.
- (25) John hopes to be in charge.
 a. #So, he's glad that he {is/will be}.
 b. #Every day, he wishes he {were/would be}.

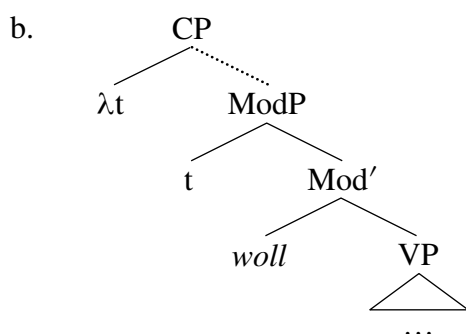
In summary, we have seen that proposing a doxastic uncertainty requirement can account for the observation of Pesetsky (1992) that *expect* can have a simultaneous ECM complement, provided the attitude holder is uncertain with respect to the truth of the complement. We have shown further that both *hope* and *expect* can take a simultaneous control complement provided the same condition is met, although this is decidedly more uncommon given PRO's interpretation *de se*. Lastly, we saw that the distribution of simultaneous infinitival complements to *want* is not constrained by a doxastic uncertainty requirement. To the extent that the above reasoning is correct, this further motivates the proposal that *want* does not simply compare doxastic alternatives, while *hope* does.

3 In Defense of Covert Operators

Given the data above, there are two reasonable ways to derive the optional futurity noted above. We could posit an optional covert temporal operator which shifts the reference time to a future time, which, for concreteness, we could identify as the abstract auxiliary *woll* which is realized as *will* in the present tense and *would* in the past (see Wurmbrand, 2014; Grano, 2015).¹³ Alternatively, we could treat the verbs in question as quantifiers over non-past times. In the introduction, I called proposals of the first type *syntactic* accounts, and proposals of the second type *semantic* accounts.

Proposal 1. Syntactic Accounts

- (26) a. $\llbracket \textit{woll} \rrbracket = \lambda P_{\langle i,t \rangle} \lambda t. \exists t' > t : P(t')$



¹³ We could also propose an obligatory covert operator which quantifies over non-past times. This proposal is equally as viable as the one suggested here. The focus of this section is simply to argue in favor of dissociating the introduction of posteriority from the verb itself.

Proposal 2. Semantic Accounts

$$(27) \quad \llbracket \mathbf{Pred}_{\text{future oriented}} \rrbracket = \lambda w \lambda t \lambda P_{\langle e, \langle i, st \rangle \rangle} \lambda x. \forall \langle w', t', y \rangle \dots : \exists t'' \geq t' : P(y)(t'')(w')$$

In this section, I aim to provide a number of considerations which, taken together, suggest that Proposal 1, in combination with the semantics provided above, should be preferred to Proposal 2. In comparing these approaches, we should consider a number of factors. Among these are the empirical predictions of each proposal, the number of assumptions needed to make each work, and their general plausibility.

With respect to the empirical predictions of these proposals, it should be noted that if a temporal argument within an infinitival clause can be bound by λt , this would constitute potential evidence in favor of Proposal 1. Binding of a temporal pronoun in this manner would result in the pronoun being interpreted as the attitude holder's NOW. Proposal 2, as it stands, makes the attitude holder's subjective NOW inaccessible for binding variables in this way. While Proposal 1 is widely assumed in the literature, there is only one attempt that I am aware of to provide an empirical argument in favor of it, namely the argument given in Abusch (2004).¹⁴ Rather than rehearsing her argument here, I simply refer the reader to the source material. Instead, I would like to offer a novel argument from temporal adverbials which seems to support the syntactic representation of the attitude holder's NOW in the form of a λ -operator.

3.1 Representing the Attitude Holder's NOW

Schlenker (1999) describes three different classes of temporal adverbials: *all-purpose indexical* adverbs, *matrix indexical* adverbs, and *anaphoric* adverbs. An example of each class is given below.

(28)

Indexical devices		Anaphoric devices
All-purpose	Matrix	
<i>in two days</i>	<i>the day after tomorrow</i>	<i>two days later</i>

Matrix indexical devices are those which are indexical in the traditional sense. These include pronominal items such as English 1st and 2nd person pronouns, tenses such as the English present, and temporal adverbs such as *today*, *tomorrow*, and *the day after tomorrow*. Anaphoric devices include pronouns such as the English 3rd person, and adverbs like *two days later*. The items of interest for us here are the all-purpose indexical devices. These are indexical items which can be shifted when embedded under attitude predicates. Perhaps the most famous of these is the Amharic 1st person pronoun which denotes the speaker in a matrix context, but can be shifted in attitude reports, thereby referring to the subject of the verb *say* in (29) below (Schlenker, 2003).

- (29) a. $\check{y}on$ $\check{y}\acute{o}gna$ $n\acute{a}-\check{n}\check{n}$ $y\check{i}l$ -all
 b. John hero be-PF-1SO 3M.say-AUX.3M
 c. ‘John says that {he, is/I am} a hero’

¹⁴ Wurmbrand (2014) provides an argument from restructuring which she claims favors Proposal 1. Her data is suggestive and her conclusion natural. However, proponents of Proposal 2 could perhaps object that the data simply shows that future oriented infinitival complements are structurally more complex than restructuring infinitives, not that this structure has any semantic import.

We capture this by proposing that the Amharic 1st person pronoun is bound by either the matrix lambda operator λx or the lambda operator λy introduced by the verb *say*.

- (30) a. $[\lambda x [\text{John say } [\lambda y [x \text{ be hero}]]]]$ (Amharic, English)
 b. $[\lambda x [\text{John say } [\lambda y [y \text{ be hero}]]]]$ (Amharic, *English)

Returning to temporal adverbials, since each of the adverbs in question places the reference time two days after another time, we can give them more or less the same semantics.

- (31) $\left\| \left\{ \begin{array}{l} \text{in two days} \\ \text{the day after tomorrow} \\ \text{two days later} \end{array} \right\} \right\| = \lambda t \lambda p_{\langle i, t \rangle} \lambda t'. t = t' + 2 \text{ days} \wedge p(t')$

What differentiates these adverbials is the type of temporal pronoun each one can take as its first argument.

Schlenker (1999) suggests that, like Amharic 1st person pronouns, the temporal argument of *in two days* can be bound either by an operator in the matrix clause or by an embedded operator introduced by an attitude predicate. That is, the sentence in (32a) has a reading in which *in two days* is interpreted indexically. This reading is true iff John expected that he would receive a letter two days after the time at which (32a) is uttered. This is represented by the LF in (32b). However, (32a) also has a reading in which John expected that he will receive a letter two days after the time which he then believed it to be – his subjective NOW. This is represented in (32c).

- (32) a. On Friday, John expected to receive a letter in two days.
 b. $[\lambda t \text{ John expected (at } t' \text{ on Friday)}][\lambda t'' \text{ PRO to receive a letter (at } t + 2 \text{ days)}]]$
 c. $[\lambda t \text{ John expected (at } t' \text{ on Friday)}][\lambda t'' \text{ PRO to receive a letter (at } t'' + 2 \text{ days)}]]$

However, caution must be taken here. It could be the case that the temporal argument of *in two days* is taking the matrix reference time (t') as its antecedent. To control for this, we need to devise a scenario in which John is mistaken about what day it is, in which case his NOW will not correspond to the time at which his expectation holds. The scenario supplied in (33) does just this.

- (33) SCENARIO: *John has a habit of drinking heavily to forget embarrassing situations, which occur almost daily. During a particularly embarrassing week, John drinks on both Wednesday and Thursday. As a result, he forgets the entirety of both days. When he awakes on Friday, he believes it to still be Wednesday. He proceeds to utter (33a).*
 a. “I’m going to finally receive that letter on Sunday.”
 b. #On Friday, John expected to receive a letter in two days.
 c. * $[\lambda t \text{ John expected (at } t' \text{ on Friday)}][\lambda t'' \text{ PRO to receive a letter (at } t' + 2 \text{ days)}]]$

In the scenario in (33), it is true that John expects to receive a letter two days after the time of his expectation. The fact that (33b) cannot felicitously report John’s expectation demonstrates that the temporal argument of *in two days* cannot be coreferential with either the matrix reference or event time, which are both on Friday. Notice that the sentence in (34) can describe the above scenario.

- (34) SCENARIO: *Same as (33)*.
 a. On Friday, John expected to receive a letter in four days.

This is expected if the adverbial *in n days* can be interpreted as *n* days from the attitude holder's subjective NOW, which for John is Wednesday. Compare this to the anaphoric device *two days later* which can be interpreted with respect to the matrix reference time.

- (35) SCENARIO: *Same as (33)*.
 a. On Friday, John expected to receive a letter two days later.
 b. $[\lambda t$ John expected (at t' on Friday) $[\lambda t''$ PRO to receive a letter (at $t' + 2$ days)]]

The above has shown that the adverbial *in n days* can have a “matrix” indexical reading and a shifted, or “all-purpose”, indexical reading. In the former case, the adverb picks out the time two days after the utterance time, while in the latter case, it picks out the time two days after the attitude holder's subjective NOW.

This suggests that, at the very least, we need to represent the NOW of the attitude holder syntactically in future oriented infinitives. However, it does not necessarily show that the infinitival needs to contain a covert operator *per se*.¹⁵ In the following section, I briefly review two specific accounts which attempt to do away with covert future operators by treating the selecting predicates as quantifiers over times.

3.2 Accounts *sans* Operators

3.2.1 *Katz (2001)*. In order to avoid wrongly generating future readings in SOT complements to *expect*, Katz (2001) suggests that *expect* not only controls the top most time variable, but also lexically specifies precedence between the attitude holder's NOW and the embedded reference time (36).

- (36) $[\mathbf{expect}_{Katz}] = \lambda w \lambda t \lambda P_{\langle e, \langle i, \langle i, st \rangle \rangle \rangle} \lambda x. \forall \langle w', t', y \rangle \in \text{Do}_{x,t,w} : \exists t'' > t' : P(y)(t')(t'')(w')$

Katz maintains that *expect* can never take a non-future complement. For him, simultaneous finite complements are highly marginal.¹⁶ He suggests that, for those speakers who allow it, the verb *expect* is ambiguous and when it takes a simultaneous complement it means something akin to “strongly believe” (fn.1). Let us grant that for some speakers *expect* may always be future oriented. If so, we still need to propose covert operators in infinitival complements to *hope*. To see why, consider the fact that *hope* can embed present tense, SOT, and past tense finite complements (37a,b,c) as well as future oriented infinitives (37d).

- (37) a. We hope you're feeling better now.
 b. John hoped that Mary was still alive. (SOT)
 c. I hope you arrived home safely last night.
 d. John hopes to receive a letter in two days.

¹⁵ In response to an earlier version of this work, Pearson (2017) includes an additional lambda-abstractor corresponding to the attitude holder's NOW in the embedded clause. This proposal is also adopted by Katz (2001) for independent reasons. In the following two subsections (3.2.1, 3.2.2.), it will be shown that, even with this assumption, these proposals face a number of problems.

¹⁶ This judgement does not appear to be widely shared in the literature or among the speakers I consulted.

If we were to build posteriority into the lexical semantics of *hope* to account for (37d), then the finite clauses (most notably the past tense complement in (37c)) will be unaccounted for. Ideally, we would refrain from appealing to lexical ambiguity here also. The present proposal provides a straightforward means of covering these uses of *hope* with one lexical entry.

3.2.2 *Pearson (2016)*. Pearson, like Katz, takes the locus of posteriority to be within the selecting verb itself. Unlike Katz, Pearson treats future orientation as part of a more general grammatical phenomenon. She argues that propositional attitude predicates may introduce *extensions*. The impetus behind Pearson's analysis is accounting for a non-canonical control relation called *partial control* (Landau, 2000, 2013). This control relation is only licensed by a subset of control predicates and is characterized by the infinitival subject PRO being interpreted as a group which properly contains the individual denoted by the controller. The presence of the collective predicate *gather* in (38a), and the modifier *together* in (38b), ensures that PRO is interpreted as semantically plural. The minimally different sentences with so-called *exhaustive control* predicates (38c,d) are unacceptable.¹⁷

- (38) a. John_i {asked/promised} PRO_{i+} to gather in the hall.
 b. Mary_i {wanted/hoped} PRO_{i+} to live together.
 c. *John_i {tried/managed} PRO_{i+} to gather in the hall.
 d. *Mary_i {claimed/pretended} PRO_{i+} to live together.

Since some of the earliest work to recognize the importance of partial control (Landau, 2000), it has been suggested that control verbs can license partial control iff they permit temporal displacement. This is typically diagnosed by the possibility of mismatching temporal adverbials in the matrix and embedded clauses. The following examples, taken from Pearson (2016), show that the simultaneous predicates *claim* and *pretend* do not license mismatching temporal adverbials (39a,b), while future oriented and past oriented predicates do (39c,d).

- (39) a. *Yesterday, John {claimed/pretended} to go to the cinema tomorrow.
 b. *Today, John {claimed/pretended} to go to the cinema last week.
 c. Yesterday, John {hoped/expected} to go to the movies tomorrow.
 d. John will {remember/regret} going to the movies yesterday.

Pearson proposes that control clauses are unspecified for temporal orientation, and PRO for semantic number. Instead, she employs the notion of *extension* to account for the covariation between partial control and temporal displacement.

- (40) *Extension*
 For any pair of world-time-individual triples $\langle w, t, x \rangle$ and $\langle w', t', y \rangle$, $\langle w', t', y \rangle$ is an extension of $\langle w, t, x \rangle$ iff for every α, β such that α is a coordinate of $\langle w, t, x \rangle$ and β is a coordinate of $\langle w', t', y \rangle$ of the same type as α , either:
 (i) $\alpha < \beta$;
 (ii) $\beta < \alpha$ or
 (iii) $\alpha \leq \beta$ ¹⁸

¹⁷ The verbs *claim* and *pretend* are not typically treated as exhaustive control predicates in the literature as they can license partial control in some instances which will be discussed below.

¹⁸ The precedence relation $<$ is only defined for D_i , while the 'part of' relation \leq is defined for D_e and D_i , but not D_s . For any two individuals $a, b \in D_e$, $a \leq b$ iff $a + b = b$, and for any two times $t, t' \in D_i$, $t \leq t'$ iff $t \subseteq t'$.

The partial control relation and temporal displacement of the embedded clause are possible only if the verb is able to shift the coordinates of the centered world triple.

While aspects of this account are appealing, there is reason to believe that the notion of *extension* is not a lexical one after all. Firstly, the simultaneous predicates *claim* and *pretend* can license non-simultaneous readings when overt temporal markers such as perfect *have*, or the progressive occur in the embedded clause. Crucially, as Pearson herself notes (pp.713-4), the presence of these markers can also license partial control, as demonstrated by the acceptability of the collective predicate *gather* in (41a) and the adverb *together* in (41b).

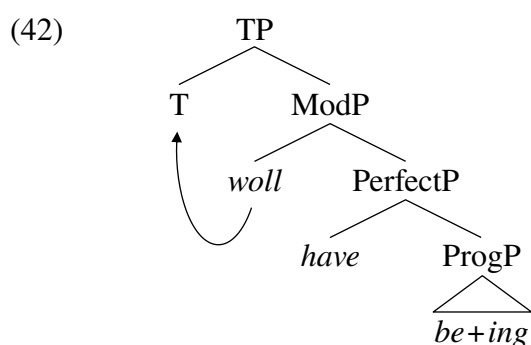
- (41) a. The chair pretended to have gathered last week.
 b. (Mary said that) John claimed to be living together.

These facts are put to the side in Pearson's exposition. However, there is a serious tension between these facts and the proposal that *extensions* are lexical. The verbs in (41) are the same as those in (38d). What has changed is the presence of temporal operators. If we were so inclined, we might even suggest that partial control in future oriented infinitives is somehow licensed by the presence of a covert temporal operator. The fact that overt temporal operators in (41) can license partial control could perhaps be taken as evidence supporting this conclusion (!).

We have covered some of the advantages of positing a covert temporal operator in infinitives. In the next two subsections, I will address two of, what I take to be, the less attractive aspects of such an account. The goal of this discussion is to show that the perceived weaknesses of this account are by no means fatal.

3.3 Why is *woll* Covert?

I have proposed that infinitives can embed a covert form of the future operator *woll*. However, one might ask why this operator is invariably silent in infinitives, while other temporal operators, such as perfect *have* or progressive *be+ing* are phonologically overt. A plausible explanation for this rests on the fact that future operators such as the modal auxiliaries *will* and *would* must be realised at T in a finite clause (Stowell, 2004; Iatridou & Zeijlstra, 2013).



As such, *will* and *would* are always the highest auxiliary in any potential chain of auxiliaries (43a,b), they cannot occur with other modals (43c,d), and they cannot be iterated (43e).

- (43) a. John {will/would} have been suffering.
 b. *Mary has {will/would} be drunk.
 c. *Bill will must go home.
 d. *John might will watch the football.
 e. *Mary {will will/would would} eat some biscuits.

Taken together, these facts entail that, in a finite clause, they will always be the verbal element bearing finiteness. Perhaps for this reason, modal auxiliaries lack an overt non-finite form (**to will/would/woll*). Conversely, *have* and *be+ing* frequently occur inside auxiliary chains and thus have readily available non-finite forms. It would not be unreasonable then to propose that the future operator *woll* can, and indeed does, occur in infinitives. However, it cannot be spelled out there because it lacks an appropriate non-finite form.¹⁹

3.4 Transitive Constructions

Another *prima facie* advantage of a semantic account (Proposal 2) over a syntactic account (Proposal 1) is that verbs such as *expect* are future oriented even in transitive constructions. For instance, there appears to be no clausal complement to *expect* in (44) yet the expectation still seems concerned with a future event (i.e., getting a cheque).

(44) John is expecting a cheque.

There is a long tradition of analyzing Intensional Transitive Verbs (ITVs) in construction such as this as selecting a covert clausal complement which features a covert predicate $\emptyset_{have/get}$ (Ross, 1976; Dikken et al., 1996; Larson et al., 1997; Harley, 2004 *inter alia*).

(45) John_i is expecting [$\text{PRO}_i \emptyset_{have/get}$ a cheque].

The motivation for this type of analysis is extensive and well-documented (see references above). But we can consider just two of the more straightforward pieces of evidence. Firstly, (46) shows that transitive *expect* can license two mismatching temporal adverbials (McCawley, 1979), typically taken to be indicative of bi-clausal structure.

(46) Yesterday, John_i was expecting [$\text{PRO}_i \emptyset_{have/get}$ a cheque next week].

The frame adverbial *yesterday* restricts the time of the expectation, while *next week* is modifying some covert event which can be paraphrased by *to get a cheque*.

The second piece of evidence exploits a scope ambiguity which arises with the adverb *again*. Consider the following scenario.

(47) SCENARIO: *John is being sued for a second time. The first time he got sued, it was a surprise, as he was not expecting it. This time, however, he is not surprised.*
 a. John was expecting a law suit again.

The reading on which *again* modifies the matrix verb is false in this scenario because at no point before did John expect a lawsuit. The felicitous reading is one on which *again* modifies the covert predicate $\emptyset_{have/get}$.

Provided we take these arguments to be convincing, we have good reason to propose a covert clause in ITV constructions. This is equally true for both Proposal 1 and Proposal 2. The only further assumption that we need to make is that this covert clause can host a covert future operator. If so, then, contrary to appearances, transitive constructions do not necessarily favor a semantic account (Proposal 2) over a syntactic account (Proposal 1).

¹⁹ There are a number of instances in which infinitives receive a clearly modal interpretation, while nonetheless lacking an overt modal element (see for instance Bhatt, 2006 and White, 2014). It remains to be seen whether these instances of covert modality might receive a similar explanation.

4 Discussion and Conclusion

Portner (to appear) rightly observes that semantic research into the temporal orientation of infinitives is still only fragmentary. And it is certainly true that the majority of work on infinitival tense is primarily concerned with the status of the infinitival subject (i.e., PRO, trace, or ECM subject), with only secondary interest in temporality (e.g., Stowell, 1982; Pesetsky, 1992; Landau, 2000; Martin, 2001; Grano, 2015; Pearson, 2016). In the ideal scenario, we would posit as little as possible (e.g., one future operator), with the temporal readings following from other independently motivated principles. I have tried to show how this might look in the case of a few verbs which license both a future and simultaneous reading. However, there are several predicates which are obligatorily future oriented (e.g., *promise*, *decide*), and others which select infinitives with obligatorily simultaneous readings (e.g., *claim*, *pretend*, *be glad*). The point of this paper has been to suggest that what dictates the temporal orientation of infinitival complements is not temporal semantics of the selecting verb *per se*, but rather other independently motivated aspects of the verb's lexical semantics plus an optional future operator. This logic would suggest that there is some feature of the lexical semantics of obligatorily simultaneous predicates which rules out the embedding of the future operator, while the lexical semantics of obligatorily future oriented predicates necessitates the presence of a future operator. I believe that such an approach could prove to be promising in future research on this matter.

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