Question agnosticism and change of state[1]

Aaron Steven WHITE — *Johns Hopkins University*
Kyle RAWLINS — *Johns Hopkins University*

Abstract. We give an account of the selectional behavior of cognitive change-of-state verbs, such as *decide*, that attempts to reduce this behavior to their change-of-state event structure. In particular, we argue that, if a cognitive verb is change-of-state, it is *Q-agnostic*—i.e. it selects both declarative and interrogative clauses. This augments previous accounts of Q-agnosticism, which have tied the distribution of declarative and interrogative clauses to semanticopragmatic notions like factivity and veridicality but which fail on nonveridical predicates like *decide*.

Keywords: lexical aspect, clause embedding, change of state, factivity, veridicality

1. Introduction

A verb's syntactic distribution is sensitive to properties of the class of events that that verb characterizes. However, not all conceivable event properties correlate with syntactic distribution. A major question in the lexical semantics literature is therefore: which event properties impact argument distribution and by what mechanisms (Gruber, 1965; Fillmore, 1970; Zwicky, 1971; Jackendoff, 1972; Grimshaw, 1979, 1990; Pesetsky, 1982, 1991; Pinker, 1989; Levin, 1993)?

For 'action verbs'—e.g. *hit* and *break*—most proposals converge on event properties such as dynamicity, telicity, change of state, and causation (see Levin and Rappaport Hovav 2005 for a review). This set differs radically from the set of properties often proposed to be relevant in determining the distribution of embedded clauses—e.g. representationality (Bolinger, 1968; Stalnaker, 1984; Farkas, 1985; Villalta, 2000, 2008; Scheffler, 2009; Anand and Hacquard, 2013), factivity (Hintikka, 1975), veridicality (Egré, 2008; Spector and Egré, 2015), and a range of other intentional (Moulton, 2009; Rawlins, 2013) and discourse-related properties (Hooper, 1975; Portner and Rubinstein, 2013; Anand and Hacquard, 2014).

In this paper, we give an account of the selectional behavior of cognitive change-of-state predicates, like *decide*. Our main claims are (i) that it is the change-of-state nature of *decide* that determines its selectional behavior and (ii) that our analysis of *decide* can be straightforwardly extended to cover a large range of what we term *Q(uestion)-agnostic* verbs—verbs which take both interrogative and declarative clauses (often termed *responsives* following Lahiri 2002).

In making this proposal, we are responding to prior approaches that attempt to reduce Q-agnosticism to properties such as factivity and veridicality (Egré 2008; cf. Hintikka 1975; Spector and Egré 2015). Verbs like *decide* are well-known counterexamples to these existing proposals, since *decide* is neither factive nor veridical in examples like (1)—decisions may be rescinded or simply not realized—yet it is Q-agnostic.

[1]We'd like to thank audiences at Sinn und Bedeutung 21, the JHU Semantics Lab, and the factivity MINSIM workshop at UMD in December 2016 as well as Valentine Hacquard and Pranav Anand for helpful discussion.

(1) Jo decided (whether) {to leave, she would leave}.

These verbs' status as counter-examples (we argue) has yet to be explained. Indeed, we suggest that the correlation between factivity/veridicality and Q-agnosticism actually obscures the fact that change-of-state is a key property for determining Q-agnosticism.

To carry this argument out, we develop a detailed account of the lexical semantics of *decide*. Our analysis is that deciding characterizes a change from a *pre-state*—which can involve either a set of alternative intentions that the agent is deciding between or a single fixed intention—to a *post-state* where some intention has been fixed on the part of the agent. Declarative complements always characterize the post-state intention, while interrogative complements characterize pre-state intentions involving multiple alternatives.

Much of the technical effort lies in deriving these facts from a core meaning for *decide* in a neo-Davidsonian event semantics with a Hacquardian (2010) approach to eventuality *content*. We suggest that this effort is worth it, since the pattern observed for *decide* generalizes to other cognitive change-of-state-verbs: interrogative clauses consistently characterize pre-state alternatives and declarative clauses consistently characterize post-state propositions.

In a wider context, our aim is to demonstrate that action verbs and clause-embedding verbs might not be so different in the properties that determine the distribution of arguments: properties like change-of-state are relevant to both. This proposal helps to reveal formal similarities between entailments that arise as a consequence of event structure and entailments related to the intentional properties of propositional attitudes. We believe these formal similarities will be useful in unifying theories that rely on event structural properties to explain syntactic distribution and those that rely on intentional properties.

We begin in Section 2 with a discussion of previous proposals that relate Q-agnosticism and veridicality. In Section 3, we apply those previous proposals to nonveridical predicates, showing some further necessary refinements to handle the particular data for *decide*. In Section 4, we present our proposal for *decide* and other change-of-state nonveridicals, as well as a compositional implementation. In Section 5, we conclude with prospects for generalizing our approach to other subclasses of Q-agnostic predicates, including epistemics and communicatives.

2. Veridicality, distribution, and interpretation

To begin, we discuss the generalizations that decision verbs are exceptions to, introducing two ways that veridicality and Q-agnosticism are believed to be related: in determining (i) the distribution of interrogatives and declaratives; and (ii) the interpretation of interrogatives.

2.1. Veridicality and embedded clause distribution

It has long been known that the distributions of interrogative and declarative embedded clauses are independent. Some clause-embedding predicates only take interrogative complements, such

as *wonder* (2a); some predicates only take declarative complements, such as *believe* (2b); and some predicates take both interrogative and declarative complements, such as *know* (2c).

(2) a. Jo didn't wonder {*that, whether} Bo was smart. *Q-accepting*
b. Jo didn't believe {that, *whether} Bo was smart. *Q-rejecting*
c. Jo didn't know {that, whether} Bo was smart. *Q-agnostic*

The Q-agnostic predicates in particular have been of interest in the syntax and semantics literature, in large part because they bear on a variety of important topics, including the interpretation of questions and the treatment of polysemy (Karttunen, 1977; Groenendijk and Stokhof, 1984; Heim, 1994; Ginzburg, 1995; Lahiri, 2002; George, 2011; Uegaki, 2015); but they are also interesting because a verb's Q-agnosticism appears to be predictable from the sorts of inferences that verb triggers about its embedded clause (cf. Hintikka, 1975).

Specifically, among the well-studied clause-embedding verbs there is a relatively strong correlation between whether a predicate is veridical—i.e. whether it entails the content of its embedded clause—and whether it is Q-agnostic (Egré, 2008). Veridical predicates, like *know*, *realize*, and *prove*, tend to be Q-agnostic (3a), and nonveridical predicates, like *believe*, *think*, and *hope*, tend not to be (3b).

(3) a. Jo {knows, realized, proved} that Bo is home. $\rightarrow$ Bo is home.
b. Jo {believes, thinks, hopes} that Bo is home. $\not\rightarrow$ Bo is home.

Indeed, Egré (2008) argues that this correlation is perfect: a predicate is Q-agnostic if and only if it is veridical. Defending this claim requires him to explain the apparent Q-agnosticism of two kinds of counterexamples: nonveridical communicative predicates, like *tell* (4a) and *agree* (4b); and nonveridical cognitive predicates, like our key example *decide* (4c), as well as adjectival predicates like *be certain* (4d).[2]

(4) a. Jo told Mo {that, whether} Bo was home.
b. Jo agreed with Mo {that, about whether} Bo was home.
c. Jo decided {that, whether} she should leave.
d. Jo wasn't certain {that, whether} she should leave.

Egré argues that (except for *tell*) none of the predicates in (4) are truly Q-agnostic. Rather, when they take a question, there is really a (sometimes silent) preposition mediating the relationship. Thus, Egré's revised generalization is that only veridicals can take both declaratives and interrogatives *directly*—i.e. without mediation by a preposition. As evidence for this position, he notes that predicates like *agree*, *decide*, and *be certain* all at least can mediate the syntactic relationship between a predicate and an interrogative via a preposition.

(5) a. Jo agreed with Mo about whether Bo was home.
b. Jo decided (about) whether she should leave.

[2]These are counterexamples to the *only if* direction. Egré also discusses counterexamples to the *if* direction, such as *be true* and *be right*. These are not relevant for current purposes.

c. Jo wasn't certain (about) whether she should leave.

This position is useful for integrating nonveridicals into the standard treatment of embedded interrogatives, which has that embedded interrogatives denote a true answer (Karttunen 1977; Groenendijk and Stokhof 1984; though see Hamblin 1973). We turn to this assumption next.

2.2. Veridicality, true answers, and possible answers

Veridicality has also played a key role in explaining the interpretation of embedded interrogatives, in the form of what we will call the *true-answers assumption*—the assumption that embedded interrogatives denote a set of true answers to the question. The true-answers assumption works well for predicates like *know*, which do indeed seem to relate individuals to true answers, and it would seem to connect directly to the above selectional hypothesis. Suppose, by the true-answers assumption, that (6) is true for all Q-agnostics V.

(6) **A true-answerhood constraint for Q-agnostics**
$\forall x, Q, w : [\![\mathrm{V}_{int}]\!]^w(Q)(x) \leftrightarrow \exists p \in \mathrm{ANS}_{w@}(Q) : [\![\mathrm{V}_{decl}]\!]^w(p)(x)$
where $\mathrm{ANS}_w(Q) = \{p \in Q : p(w)\}$ (cf. Dayal, 1996)

Then, we correctly predict (7) to be infelicitous: what Jo knows cannot fail to be wrong, since what she knows is, by definition, true—and in this case, uniquely true.

(7) Jo knew whether Bo was home, #but she was wrong.

Just as the veridical selectional hypothesis hits problems for nonveridicals, so of course does the true-answers assumption; these problems have been discussed for predicates like *agree* (8a) and of course *decide* (8b). Intuitively, such verbs do not seem to relate individuals to true answers (Beck and Rullmann, 1999; Lahiri, 2002); people might agree on a falsehood, or decide to do something impossible. If (6) were true for all Q-agnostics, then (8a) and (8b), like (7), should be infelicitous.

(8) a. Jo and Mo agreed about whether Bo was home, but they were both wrong.
b. Jo finally decided whether she would leave, but then she changed her mind.

Rather, these predicates seem to relate an individual to something like a *possible answer* (or set thereof): (8a) and (8b) are roughly paraphrasable as (9a) and (9b), respectively.

(9) a. Jo and Mo agree either that Bo is home or that he isn't.
b. Jo decided either that she would go or that she wouldn't.

But supposing that the denotation of, e.g., *about* (or its purported silent variant) acts to convert true answers to possible answers, then—on Egré's account—it makes sense that, insofar as a predicate does not relate an individual to true answers, it requires mediation by a preposition. On this view, then, *decide* (etc.) might not be exceptional in either its selectional behavior or

interpretive behavior, and so might be consistent with a version of the true-answers assumption.

We provide two arguments against this treatment of the purportedly exceptional Q-agnostic/Q-selecting verbs. One reason to be doubtful of this story is that at least some nonveridical predicates do not allow mediation by any preposition. For instance, *estimate* is not veridical (10a), and *about* cannot mediate its relationship to a question (10b). Thus, an account such as Egré's needs to stipulate that certain verbs only take silent prepositions, which seems undesirable. We will avoid the assumption of lexically-specific silent pronouns here.

(10) a. Jo estimated that they would have enough money, but she was wrong.
b. Jo was trying to estimate (*about) whether they would have enough money.

A second problem is that the preposition that overtly mediates such cases most often is *about*; yet there is extensive evidence that *about*-phrases are modifiers of the verbs they combine with—not directly interacting with argument structure at all (Rawlins, 2013). In fact, Rawlins shows that the distribution of *about* is orthogonal to the selection of embedded interrogatives.

This leaves the question of what the interpretation is of the exceptional cases, like *decide* and *estimate*. One tack is to retain the standard approach to embedded questions and assume that, e.g., the predicate itself converts true answers to possible answers (cf. Beck and Rullmann, 1999; Lahiri, 2002). Another option is to say, instead, that all embedded questions denote possible answers and that, e.g., a predicate itself can convert possible answers to true answers (Spector and Egré, 2015). We will start from this second approach here.

Under the assumption that questions denote sets of complete possible answers—i.e. partitions on D_s—this second approach has the nice consequence that it correctly predicts veridical predicates to always relate individuals to true answers—the true-answerhood property follows from the veridicality entailment or presupposition.[3] To see this, suppose we define *(p-)veridicality* and *q-veridicality* as in (11) and that we replace the true-answerhood constraint in (6) with (12), which implements the possible-answers assumption for Q-agnostics V.

(11) a. $\textsc{p-veridical}(V) \leftrightarrow \forall x, p, w : [\![\mathrm{V}_{decl}]\!]^w(p)(x) \rightarrow p(w_@)$
b. $\textsc{q-veridical}(V) \leftrightarrow \forall x, Q, w : [\![\mathrm{V}_{int}]\!]^w(Q)(x) \leftrightarrow [\![\mathrm{V}_{decl}]\!]^w(\textsc{ans}_{w_@}(Q))(x)$

(12) **A possible-answerhood constraint for Q-agnostics**
$\forall x, Q, w : [\![\mathrm{V}_{int}]\!]^w(Q)(x) \leftrightarrow \exists p \in Q : [\![\mathrm{V}_{decl}]\!]^w(p)(x)$

From this constraint, one can prove that a verb is q-veridical if it is p-veridical; see (13).

(13) $\forall x, Q : ([\![\mathrm{V}_{int}]\!]^w(Q)(x) \;\&\; \textsc{p-veridical}(V)) \rightarrow \exists p \in Q : [\![\mathrm{V}_{decl}]\!]^w(p)(x) \;\&\; p(w_@)$
$\equiv \exists p \in \textsc{ans}_{w_@}(Q) : [\![\mathrm{V}_{decl}]\!]^w(p)(x)$
$\equiv [\![\mathrm{V}_{int}]\!]^w(\textsc{ans}_{w_@}(Q))(x)$

[3] It falters, however, on many communicative predicates like *tell*, which appear to relate individuals to true answers but which are not veridical (though see discussion in Baker, 1968). There are various ways these predicates might be dealt with (Egré, 2008; Anand and Hacquard, 2014; Spector and Egré, 2015).

We follow Spector and Egré 2015 in suggesting that this situation is an improvement over the standard approach, since there are fewer stipulations (*modulo* some that Spector and Egré address), and so for the remainder of the paper, we assume the possible answers interpretation for questions. The next focus is to apply this hypothesis specifically to *decide*: if an interrogative embedded by *decide* denotes a set of possible answers, what does the lexical semantics of *decide* do with them?

3. Overgeneration for nonveridicals

We now show how to instantiate the possible-answers assumption into a particular lexical entry for *decide*. We first show that decisions involve the firming of intentions, and then discuss two key kinds of contexts where intentions can change with decisions, involving selection of intentions and changes of intentions; these lead to different selectional behaviors. In this process we make one further, final refinement to the possible-answers constraint.

3.1. Selecting and alternating contexts

First, note that (14) entails (15a) and (15b).

(14) At 3pm, Jo decided to leave at 5pm.

(15) a. It's false that, before 3pm, Jo intended to leave at 5pm.
b. It's true that, after 3pm, Jo did intend to leave at 5pm.

Given this evidence, (16) seems to be a good first approximation to the denotation of *decide to*. That is, the decider changes state from not having an intention to having one.

(16) $[\![\text{decide}_{decl}]\!]^t = \lambda p.\lambda x.\neg\text{INTEND}(x,p,\{t' : t' < t\})$ & $\text{INTEND}(x,p,\{t' : t' > t\})$
where $\text{INTEND}(x,p,T) \leftrightarrow x$ intends p over interval T

The possible-answers assumption allows us to infer from (16) to an interrogative embedding case; assuming the possible-answers constraint in (12), (17) must hold. The prediction is then that *decide whether to VP* entails either that the decider changed from not intending to VP to intending to VP, or they changed from not intending not to VP to intending not to VP.

(17) **Deciding WH** *version 1*
$[\![\text{decide}_{int}]\!]^t(Q)(x) \leftrightarrow \exists p \in Q : \neg\text{INTEND}(x,p,T_{<t})$ & $\text{INTEND}(x,p,T_{>t})$
where $T_{<t} \equiv \{t' : t' < t\}$ and $T_{>t} \equiv \{t' : t' > t\}$

This prediction is borne out: (18) does have an entailment of that form.

(18) At 3pm, Jo decided whether to leave at 5pm.

Despite this positive prediction, (17) needs one further refinement.

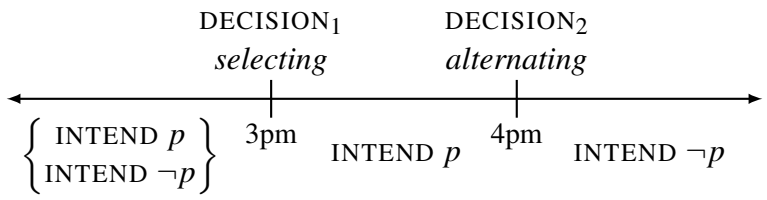

Figure 1: Schematization of selecting and alternating contexts

Note that *decide to VP* can describe two kinds of context: *selecting contexts* and *alternating contexts*. In a *selecting context*, a decider selects an intention from a set of possible intentions. For instance, suppose that, before 3pm, Jo neither intends to leave at 5pm nor intends not to leave at 5pm (schematized in Figure 1). (19) is felicitous in this context.

(19) At 3pm, Jo decided to leave at 5pm.

In an *alternating context*, a decider changes intention from a mutually exclusive intention. For instance, suppose that (19) is true, and thus before 4pm, Jo intends to leave at 5pm. (20) is both felicitous and true in this context.

(20) At 4pm, Jo decided not to leave at 5pm.

Contrast this pattern with *decide whether to*. Like (19), (21a) is a true description of DECISION$_1$. But unlike (20), (21b) is infelicitous in the alternating context. Intuitively it implies that Jo hadn't made a decision before 4pm.

(21) a. At 3pm, Jo decided whether to leave at 5pm.
b. #At 4pm, Jo decided whether to leave at 5pm.

The pattern seen with *decide* in selecting/alternating contexts is surprising if (17) exhausts the relevant set of entailments—and in particular, if the first conjunct is presupposed—since (17) predicts that (21b) should be true in this context. Indeed, (17) predicts that (20) entails (21b).

This infelicity appears to arise as a consequence of a presupposition failure similar to those found for, e.g., aspectual change-of-state verbs, such as *start* and *stop* (cf. Simons, 2001; Abusch, 2002; Abbott, 2006). For instance, *start p* presupposes $\neg p$, but this presupposition can be filtered in ignorance contexts, such as (22).

(22) I don't know if Jo used to smoke, but if she starts smoking, she'll get lung cancer.

We observe a similar pattern for *decide whether to VP* in ignorance contexts. If the speaker is not sure whether Jo already had an intention, (21b) is felicitous, suggesting that there is a similar presupposition being filtered; (23) illustrates such a filtering context.

(23) I don't know if, before 4pm, Jo already either intended to leave at 5pm or intended not to, but if, at 4pm, she decided whether to leave at 5pm, she'll follow through on it.

Thus, just like the aspectuals, it appears that the description of the state prior to the decision (the *pre-state*) is presupposed, and in the case of (21b), this presupposition is not satisfied. This is bolstered by the fact that *not decide to VP* is infelicitous in the context of DECISION_1.

(24) #At 3:30pm, John didn't decide to leave at 5pm.

Going forward, we thus assume that entailments about the pre-state are presupposed, though for presentational purposes, we write them as conjuncts on par with other predicates of events.

3.2. Taking change-of-state seriously

The issue with alternating contexts has a straightforward solution. *Decide whether to VP* does not involve just forming some intention towards an alternative where that was previously lacking, but rather moving from a state where the agent has no intentions towards a set of alternatives, to one where they do have intentions towards some alternative. At a technical level, this amounts to introducing a narrow-scoping existential quantifier into (17). This has the consequence that we now predict (21b) to be a false description of DECISION_2, since the first conjunct in (25) is false in a context where the decider already has an intention.

(25) **Deciding WH** *version 2*
$[\![\text{decide}_{int}]\!]^t(Q)(x) \leftrightarrow \neg\exists p \in Q : \text{INTEND}(x, p, T_{<t})\ \&\ \exists p \in Q : \text{INTEND}(x, p, T_{>t})$

The point of (25) is not just to fix a data problem, though. Like (16), it takes the general form of a change-of-state predicate—i.e. there is some particular state R that does not hold of an individual x prior to the change characterized by the predicate that holds after the change. In the case of *decide p*, $R_p = \lambda x.\text{INTEND}(x, p)$; and in the case of, *decide Q*, $R_Q = \lambda x.\exists p \in Q : \text{INTEND}(x, p)$. (We suppress time parameters from now on, as they do not matter to our point.)

To summarize, in the interrogative-embedding case, a decision involves a presupposed pre-state entailment with a lack of intention relative to some set of alternatives and a post-state with an intention relative to those alternatives. In the declarative-embedding case, only the post-state is characterized, and the pre-state entailments fall out from there.

4. Our proposal

In this section, we present a compositional analysis that captures the interpretive facts presented in Section 3, while also capturing the argument selectional behavior of *decide*.

4.1. Generalization

We propose the following generalization: a predicate is Q-agnostic if (a) it is change-of-state and (b) the change it characterizes involves states associated with propositional content. Assuming Egré's generalization is correct, this is corroborated trivially by veridical change-of-

	Finite		**Control**		**AcI**	
	decl.	*interr.*	*decl.*	*interr.*	*decl.*	*interr.*
decide	✓	✓	✓	✓	✓	*
judge	✓	✓	*	✓	✓	*
infer	✓	✓	*	✓	✓	*
determine	✓	✓	*	✓	✓	*
estimate	✓	✓	*	✓	✓	*
diagnose	?	✓	*	✓	✓	*
conclude	✓	?	*	?	?	*
resolve	*	✓	?	✓	*	*
evaluate	?	✓	*	?	✓	*
appraise	?	✓	*	?	✓	*
rate	?	✓	*	?	✓	*
assess	✓	✓	*	?	?	*
choose	*	?	✓	✓	?	*
select	*	?	✓	✓	?	*
opt	*	*	✓	?	*	*
elect	*	*	✓	?	*	*

Table 1: The syntactic distribution of nonveridical change-of-state verbs

state predicates like *realize*, *discover*, *find out*, *figure out*, and *prove*; but it is also true of a host of nonveridical change-of-state predicates, such as those listed in Table 1.[4]

Beyond these positive examples, we also find negative examples, like *intend*. *Intend* is neither veridical nor change-of-state, and is not Q-agnostic.

(26) Jo intended (*whether) to leave.

Such negative examples are not critical for our generalization, but they are interesting for relating our proposal to Egré's (2008) veridicality generalization, discussed in Section 2. Many Q-agnostic predicates, both veridical and nonveridical, are change-of-state, but if one were to focus only on change-of-state predicates that involve changes in epistemic state—e.g. *realize*, *discover*, *find out*, *figure out*, etc.—it would at least be reasonable to say that those 'inherit' their Q-agnosticism from the fact that *know* is Q-agnostic. This would in turn explain the correlation between veridicality and Q-agnosticism. But because we do not have similar recourse here—*intend* is not veridical—we must say something else.

What binds the predicates in Table 1 together—to the exclusion of *intend*—is that they all involve selection from a set of mutually exclusive options: deciding involves selecting from a set of possible decisions; a judgment involves selecting from a set of possible judgments; and so

[4]Note that this assumes that the Q-agnostic predicates include all predicates that take both a question and an interrogative, regardless of other syntactic differences between the relevant declarative and interrogative—e.g. tense. For instance, predicates of evaluation like *evaluate*, *appraise*, and *rate* take AcI declaratives but not finite declaratives, despite taking both finite and control interrogatives.

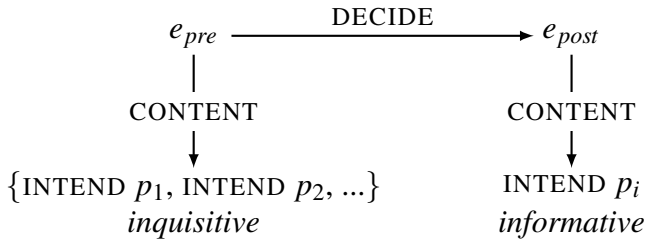

Figure 2: A schematization of decisions in selecting contexts

on. The intuition behind our generalization is that, when taking an interrogative, the predicates in Table 1 use the question denoted by that interrogative to characterize the set of options from which the judger, decider, etc. selects. But when taking a declarative, these predicates use the propositions denoted by that declarative to characterize the selected option.

Figure 2 schematizes this idea for *decide*. We model decisions as three-place relations on eventualities: a *pre-state* (e.g. the decider's intentional state prior to the decision), the decision itself, and a *post-state* (e.g. the decider's intentional state after the decision). Then, embedded interrogatives characterize the *inquisitive content* of the pre-state, and embedded declaratives characterize the *informative content* of the post-state (cf. Hacquard, 2010; Rawlins, 2013).

We implement this idea compositionally by combining two recent approaches to verb meaning: (i) Champollion's (2015) verb-as-event-quantifier approach and (ii) Hacquard's (2010) neo-Davidsonian event content approach to propositional attitude verbs (cf. Kratzer, 2006; Moulton, 2009; Bogal-Allbritten, 2016).

4.2. Verbs as event quantifiers

In Champollion's approach, verbs are existential quantifiers over eventualities. For instance, (27) gives his denotation for *kiss* (p. 42, fig. 2).

(27) $[\![\text{kiss}]\!] = \lambda f_{\langle vt\rangle}.\exists e : f(e)\ \&\ \textsc{kiss}(e)$

Note that this approach assumes that all arguments are severed from the verb (cf. Kratzer, 1996; Borer, 2005; Pietroski, 2005). The denotations of adjuncts as well as the denotations of heads that introduce thematic roles (after combining with their argument) are then treated as (partial) functions from $D_{(vt)t}$ to $D_{(vt)t}$. For example, the THEME role would be introduced via a *th* head.

(28) $[\![\text{[th Jo]}]\!] = \lambda V_{\langle\langle vt\rangle t\rangle}.\lambda f_{\langle vt\rangle}.V(\lambda e.f(e)\ \&\ \textsc{theme}(e) = j)$

Important for our purposes is how change-of-state verbs work in this system. Champollion does not treat change-of-state verbs directly, though his denotation for the adverb *alternately* (p. 58, ex. 62), which incorporates change-of-state semantics, contains all the relevant components. We do not repeat his denotation here, since it involves more machinery than we need, rather extracting the relevant pieces to define a basic change-of-state verb *break* in (29).

(29) $[\![\text{break}]\!] = \lambda f_{\langle vt\rangle}.\exists e : f(e)$ & $\text{COS}(e, \text{BREAK}, \text{BROKEN})$
where $\text{COS}(e,g,h) \equiv \exists e_1, e_2 : e_1 \supset\subset e \supset\subset e_2$ & $g(e,e_1,e_2)$ & $\neg h(e_1)$ & $h(e_2)$
$e_1 \supset\subset e_2 \equiv \sup \tau(e_1) = \inf \tau(e_2)$ (assuming time is dense)

For the remainder of the paper, we assume that change-of-state verbs have a form parallel to (29). Effectively, to know the denotation for a change-of-state verb, we need to know two things: (i) the eventuality predicate that characterizes the change (e.g. BREAK); and (ii) the eventuality predicate that characterizes the state that changes (e.g. BROKEN). We assume that (i) carries any entailments that are idiosyncratic to a particular kind of state change—e.g. that the holder of the states characterized by (ii) is the same as the patient/theme of the state change.

In certain cases (including *decide* and other Q-agnostic change-of-state predicates), the second component may be supplied by external material. For instance, at least for aspectual verbs like *start* and *stop*, the state that changes appears to be characterized by the embedded clause.

(30) Jo started to run at 5pm. → Jo was not running before 5pm and was running after 5pm.

Thus, it appears that we need some way of feeding the embedded clause content to the first argument of COS. One way to do this is to assume that *start* maps from event quantifiers to event quantifiers, instead of being an event quantifier itself. This route, the analogue of which we employ for *decide*, is taken in (31a). Assuming for the moment that the infinitival *to* is the identity on event quantifiers (31b), the denotation of the VP headed by *start* in (30) is (31c).

(31) a. $[\![\text{start}]\!] = \lambda V_{\langle\langle vt\rangle t\rangle}.\lambda f_{\langle vt\rangle}.\exists e : f(e)$ & $\text{COS}(e, \text{START}, \lambda e_1.V(\lambda e_2.e_1 = e_2))$

b. $[\![\text{to run}]\!] = [\![\text{run}]\!] = \lambda f_{\langle vt\rangle}.\exists e : f(e)$ & $\text{RUN}(e)$

c. $[\![\text{start to run}]\!] = \lambda f_{\langle vt\rangle}.\exists e : f(e)$ & $\text{COS}(e, \text{START}, \lambda e_1.\exists e_2 : e_1 = e_2$ & $\text{RUN}(e_2))$
$= \lambda f_{\langle vt\rangle}.\exists e : f(e)$ & $\text{COS}(e, \text{START}, \text{RUN})$

In this case, the predicate that characterizes the state change, START, might enforce identity between the agent of the starting and the agent of the running—insofar as aspectuals are control verbs (see Perlmutter, 1970; Landau, 2001; Wurmbrand, 2001; Grano, 2012).

4.3. Quantification over eventuality contents

In Hacquard's approach, propositional attitude verb denotations have three components: (i) an experiencer thematic role, (ii) a predicate of eventualities, and (iii) a universal quantification over the (intersection of the) contents of the attitude eventuality (cf. Hintikka, 1962). For instance, (32) gives a slightly modified version of her denotation for *believe* (p. 101, ex. 41).

(32) $[\![\text{believe}]\!] = \lambda e.\lambda p.\lambda x.\text{EXP}(e) = x$ & $\text{BELIEF}(e)$ & $\forall w \in \cap\, \text{CON}(e) : p(w)$
where $\forall e : \text{CON}(e) = \{p : p$ is compatible with the contents of $e\}$ &
$\forall e : \text{BELIEF}(e) \rightarrow [\text{CON}(e) \equiv \text{DOX}(\text{EXP}(e))]$

Importantly, CON must be defined as a partial function from events to quantifiers over worlds—

i.e. questions—in order to ensure that non-information state events do not end up with contents.

We say that an eventuality *e has (propositional) content* if $\textsc{con}(e)$ is defined. We say that the content of an eventuality is *informative* with respect to a question Q iff $\exists p \in Q : \cap\textsc{con}(e) \subseteq p$; otherwise, it is *non-informative*. In the case where it is non-informative, the question Q can be viewed as *inquisitive* relative to the content.[5] Since the last conjunct in (32) continues to arise for the change-of-state verbs we are interested in, it is useful to give it the shorthand in (33).

(33) $\forall e, p : \textsc{con}(e) \text{ is defined} \rightarrow \left[e \overset{\textsc{con}}{\Longrightarrow} p \leftrightarrow \forall w \in \cap\, \textsc{con}(e) : p(w) \right]$

We refer to the relation $\overset{\textsc{con}}{\Longrightarrow}$ as *content entailment* and say that *e content-entails p*.

4.4. Merging the approaches

To merge these two approaches, we propose the form in (34a) for a basic stative propositional attitude verb such as *believe* or *intend*.

(34) a. $[\![\text{believe}]\!] = \lambda p.\lambda f_{\langle vt\rangle}.\exists e : f(e) \,\&\, \textsc{belief}(e) \,\&\, e \overset{\textsc{con}}{\Longrightarrow} p$

b. $[\![\text{intend}]\!] = \lambda p.\lambda f_{\langle vt\rangle}.\exists e : f(e) \,\&\, \textsc{intention}(e) \,\&\, e \overset{\textsc{con}}{\Longrightarrow} p$

The main difference between this denotation and Hacquard's is the sublexical quantification over eventualities and the lack of an experiencer thematic role. The main difference between this denotation and Champollion's is that propositional attitude verbs take a proposition in addition to an eventuality predicate, which is already plausibly necessary for aspectuals.[6]

Next, we define what it means for an event to content-entail a question. The definition in (35) is effectively a reencoding of the rule in (12) from Section 2. An eventuality content-entails a question just in case that eventuality content-entails some answer to that question—i.e. the content is informative relative to the question.[7]

[5] A different strategy, following Rawlins (2013), would be to allow contents themselves to be of a type that is rich enough to define inquisitivity (see, e.g., Ciardelli et al. 2013; Rawlins 2013). Here we stick with Hacquard's treatment, where it is always propositional.

[6] Another possible approach is to retain the event quantifier analysis even for propositional attitude verbs and aspectuals and assume, e.g., that complementizers selected by propositional attitude verbs have the form in (i), where p is contributed by the denotation of the constituent that combines with the complementizer (cf. Kratzer, 2006; Moulton, 2009; White, 2014; Bogal-Allbritten, 2016).

(i) $[\![\text{C}_p]\!] = \lambda p.\lambda V_{\langle\langle vt\rangle t\rangle}.\lambda f_{\langle vt\rangle}.V\left(\lambda e.f(e) \,\&\, e \overset{\textsc{con}}{\Longrightarrow} p\right)$

Aspectuals would then need some complementizer that amounts to existential disclosure (Dekker, 1993).

This denotation is analogous to Champollion's thematic role denotations, differing in that Champollion's thematic role takes entity quantifiers whereas ours takes propositions. To make ours fully analogous, we could assume (ii) instead, where $\mathscr{Q}$ is some first order quantifier.

(ii) $[\![\text{C}_{\mathscr{Q}}]\!] = \lambda Q.\lambda V_{\langle\langle vt\rangle t\rangle}.\lambda f_{\langle vt\rangle}.V\left(\lambda e.f(e) \,\&\, \mathscr{Q}p \in Q : e \overset{\textsc{con}}{\Longrightarrow} p\right)$

This would imply that complementizers are type-identical to thematic roles, except that they take quantifiers over worlds—i.e. questions—instead of quantifiers over events.

[7] The notion of content-entailment in (35) may or may not be relevant for predicates that only take questions—

(35) $\forall e, Q : \textsc{con}(e)$ is defined $\rightarrow \left[e \overset{\textsc{con}}{\Longrightarrow} Q \leftrightarrow \exists p \in Q : e \overset{\textsc{con}}{\Longrightarrow} p \right]$

We use this overloaded version of $\overset{\textsc{con}}{\Longrightarrow}$ to give a straightforward denotation for *decide* with *ad hoc polymorphism*—i.e. $[\![\text{decide}]\!]$ is agnostic about the type of its first argument R.

(36) $[\![\text{decide}]\!] = \lambda R_{\tau}.\lambda f_{\langle vt \rangle}.\exists e : f(e)$ & $\textsc{cos}(e, \textsc{decide}, \lambda e'.e' \overset{\textsc{con}}{\Longrightarrow} R)$
where $\tau \in \{\langle st \rangle, \langle \langle st \rangle t \rangle)\}$

The relation $\textsc{decide}(e, e_1, e_2)$ must entail at least two things of the eventualities it relates. First, it must entail that e_1 and e_2 are states with intentional contents, i.e. whose contents are sets of propositions characterizing some experiencer's intentions. Second, it must entail that the experiencer of those intentions is the agent/experiencer of the decision e.

To ensure that $[\![\text{decide}]\!]$ combines with a proposition or question, we assume that $[\![\text{to VP}]\!] = \lambda w.[\![\text{VP}]\!](\lambda e.e \in D_v^w)$, where D_v^w is the set of events in world w (cf. White, 2014). Then, when *decide* takes a declarative, we obtain a denotation of the form in (37).

(37) $[\![\text{decide to leave}]\!] = \lambda f_{\langle vt \rangle}.\exists e : f(e)$ & $\textsc{cos}(e, \textsc{decide}, \lambda e'.e' \overset{\textsc{con}}{\Longrightarrow} R)$
where $R = \lambda w.\exists e' \in D_v^w : \textsc{leave}(e')$

Assuming that the introduction of a subject merely contributes a conjunct $\textsc{exp}(e) = c$ for some constant c (and ignoring tense), $[\![(37)]\!]$ entails (39), which is consistent with the pattern of entailments discussed in Section 3. Keep in mind that for *decide* CON contains propositions describing intentions, so the intersection is the set of worlds compatible with the agent's intentions during that eventuality. The pre-state content does not entail the proposition R (it may be compatible with it in selecting contexts, or entirely inconsistent in alternating contexts). The post-state's content does entail R.

(38) Jo decided to leave.

(39) $\exists e, e_1, e_2 : e_1 \supset\subset e \supset\subset e_2$ & $\textsc{decide}(e, e_1, e_2)$
& $\neg \forall w \in \cap\, \textsc{con}(e_1) : \exists e_3 \in D_v^w : \textsc{leave}(e_3)$
& $\forall w \in \cap\, \textsc{con}(e_2) : \exists e_4 \in D_v^w : \textsc{leave}(e_4)$

When *decide* takes an interrogative, we obtain a denotation of the form in (40).

(40) $[\![\text{decide whether to leave}]\!] = \lambda f_{\langle vt \rangle}.\exists e : f(e)$ & $\textsc{cos}(e, \textsc{decide}, \lambda e'.e' \overset{\textsc{con}}{\Longrightarrow} R)$
where $R = \{\lambda w.\exists e'' \in D_v^w : \textsc{leave}(e''), \lambda w.\neg \exists e'' \in D_v^w : \textsc{leave}(e'')\}$

Under the same assumption (and again ignoring tense), $[\![(40)]\!]$ entails (42), which is consistent with the pattern of entailments discussed in Section 3.

e.g. *wonder* and *ask*. We remain agnostic about this possibility, since we only intend to treat Q-agnostics here.

(41) Jo decided whether to leave.

(42) $\exists e, e_1, e_2 : e_1 \supset\subset e \supset\subset e_2$ & $\textsc{decide}(e, e_1, e_2)$
& $\neg\exists p \in R : \forall w \in \cap\, \textsc{con}(e_1) : p(w)$
& $\exists p \in R : \forall w \in \cap\, \textsc{con}(e_2) : p(w)$
where $R = \{\lambda w.\exists e'' \in D_v^w : \textsc{leave}(e''), \lambda w.\neg\exists e'' \in D_v^w : \textsc{leave}(e'')\}$

That is, the pre-state does not content-entail the question, and thus the question R is inquisitive relative to the pre-state's content (and therefore the agent's intentions at that time); this isn't compatible with an alternating context, but is compatible with a selecting context. The post-state, on the other hand, is informative relative to the question; in other words, the agent's intentions during that state resolve the question completely. We thus capture the full pattern of intuitions for *decide*.

5. Conclusion

In this paper, we have given an account of the selectional behavior of cognitive change-of-state verbs, such as *decide*, that attempts to reduce their selectional behavior to their change-of-state event structure. In particular, we argued that, if a cognitive verb is change-of-state, it is *Q-agnostic*—i.e. it selects both declarative and interrogative clauses. This augments previous accounts of Q-agnosticism, which have tied the distribution of declarative and interrogative clauses to semanticopragmatic notions like factivity and veridicality but which run aground on nonveridical predicates like *decide*.

In the remainder of the paper, we briefly consider the prospect of generalizing this approach to other kinds of nonveridical Q-agnostic predicates—e.g. communication predicates like *tell* and *agree*—and relating it to previous theories of Q-agnosticism for veridical predicates.

5.1. Nonveridical communicatives

We noted in Section 2 that communication verbs, like *tell* and *agree*, are Q-agnostic but not veridical. There are two fruitful routes for explaining these verbs on our proposal, both of which use Anand and Hacquard's (2014) neo-Davidsonian account of communicative predicates. On their account, communicatives characterize future states of some common ground (cf. Farkas and Bruce, 2009). For instance, (43) gives a modified version of their entry for *claim*.

(43) $[\![\text{claim}]\!] = \lambda p.\lambda f_{\langle vt\rangle}.\exists e : f(e)$ & $\textsc{claim}(e)$ & $e \overset{\textsc{con}}{\Longrightarrow} \lambda w.[\forall w' \in \textsc{cg}(w) : p(w')]$
where $\forall e : \textsc{claim}(e) \rightarrow [\textsc{con}(e) \equiv \textsc{goal}(e)]$

One possibility, raised by Valentine Hacquard (p.c.), is that a subset of communicative predicates—*tell* but not *claim*—characterize not only future states of the common ground but also the Question Under Discussion of the reported discourse. Then, when such a communicative verb takes a question, that question characterizes that Question Under Discussion.

Another possibility is that, while all communicative predicates characterize future states of the common ground, only a subset characterize a change to that common ground. Insofar as a particular communicative predicate characterizes such a change, e.g. *agree*, our account predicts that those predicates are Q-agnostic.

5.2. Cognitive factives

As it stands, our account, in conjunction with Egré's (2008), redundantly predicts change-of-state factives to be Q-agnostic, since they are both veridical and change-of-state.

(44) $[\![\text{realize}]\!] = \lambda R_\tau.\lambda f_{\langle vt\rangle}.\exists e : f(e)$ & $\text{COS}(e, \text{REALIZE}, \lambda e'.e' \overset{\text{CON}}{\Longrightarrow} R)$
where $\tau \in \{\langle st\rangle, \langle\langle st\rangle t\rangle)\}$

This raises the possibility that one or the other property is actually relevant in determining their Q-agnosticism. Is it possible to reduce the Q-agnosticism of change-of-state cognitive factives to the fact that they are change-of-state? There are at least two challenges for such a theory. The first is that stative cognitive factives like *know* are Q-agnostic. This means that the theory cannot tie Q-agnosticism too closely to change-of-state. The second challenge is that change-of-state is independent of factivity or veridicality—e.g. compare the factive *find out* to the nonfactive, nonveridical *determine*.

We suggest a generalization of the change-of-state hypothesis—that Q-agnosticism is really a product of having a particular kind of bipartite lexical semantic structure, one relating two encapsulated eventualities. Being change-of-state is one way that a verb can come to have that structure, but not the only one. Kratzer (2002) suggests that factives express relations between entities and facts as well as some auxiliary relation describing, e.g., the entity's beliefs about the fact (*know*) or how the entity came to be related to the fact (*discover*, *realize*, etc.). This contrasts with a nonfactive stative, like *intend*, which does not have such a bipartite structure.

This idea might be implemented using George's (2011) Twin Relations Theory, which similarly treats Q-agnostic predicates like *know* using ad hoc polymorphism. In George's theory, Q-agnostic predicates are constructed from two abstract elementary relations $R_\forall$ and $R_\exists$. For instance, (45) gives a translation of the relevant relations for *know*, $\text{KNOW}_\forall$ and $\text{KNOW}_\exists$, into our neo-Davidsonian formalism, and (46) shows how denotations for the declarative-taking and interrogative-taking variants of *know* are built from these relations.

(45) a. $\text{KNOW}_\forall \equiv \lambda p.\lambda e.\lambda w.\text{BELIEF}(e)$ & $\left[e \overset{\text{CON}}{\Longrightarrow} p\right] \rightarrow p(w)$

b. $\text{KNOW}_\exists \equiv \lambda p.\lambda e.\text{KNOW}(e)$ & $e \overset{\text{CON}}{\Longrightarrow} p$

(46) a. $[\![\text{know}_{decl}]\!]^w = \lambda p.\lambda f.\exists e_1, e_2 : f(e)$ & $\text{KNOW}_\forall(p)(e_1)(w)$ & $\text{KNOW}_\exists(p)(e_2)$

b. $[\![\text{know}_{int}]\!]^w = \lambda Q.\lambda f.\exists e_1, e_2 : f(e)$ & $\forall p \in Q : \text{KNOW}_\forall(p)(e_1)(w)$
& $\exists p \in Q : \text{KNOW}_\exists(p)(e_2)$

Effectively, KNOW$_\forall$ characterizes the veridical entailments of *know*, while KNOW$_\exists$ characterizes the asserted content. This theory is straightforwardly portable to change-of-state predicates, such as *decide*.

(47) a. $\text{DECIDE}_\forall \equiv \lambda p.\lambda e.\lambda e'.e \supset\subset e' \;\&\; \neg\left[e \overset{\text{CON}}{\Longrightarrow} p\right]$

b. $\text{DECIDE}_\exists \equiv \lambda p.\lambda e.\lambda e'.e \supset\subset e' \;\&\; e \overset{\text{CON}}{\Longrightarrow} p$

(48) a. $[\![\text{decide}_{decl}]\!]^w = \lambda p.\lambda f.\exists e : f(e) \;\&\; \exists e_1, e_2 : \text{DECIDE}(e, e_1, e_2)$
$\;\&\; \text{DECIDE}_\forall(p)(e_1)(e)$
$\;\&\; \text{DECIDE}_\exists(p)(e)(e_2)$

b. $[\![\text{decide}_{int}]\!]^w = \lambda Q.\lambda f.\exists e : f(e) \;\&\; \exists e_1, e_2 : \text{DECIDE}(e, e_1, e_2)$
$\;\&\; \forall p \in Q : \text{DECIDE}_\forall(p)(e_1)(e)$
$\;\&\; \exists p \in Q : \text{DECIDE}_\exists(p)(e)(e_2)$

There are two potential upshots to such a reimplementation. First, (48) provides equivalent denotations to those given in Section 4. Second, for *know*, the conjunct containing KNOW$_\forall$ corresponds to the presupposed content and the conjunct containing KNOW$_\exists$ corresponds to the asserted content. This may suggest a more general pattern, wherein verbs with bipartite event structures always presuppose some universally quantified presupposition when they take an interrogative clause, be it a presupposition about facts or a presupposition about intentions.

References

Abbott, B. (2006). Where have some of the presuppositions gone? In G. L. Ward and B. J. Birner (Eds.), *Drawing the Boundaries of Meaning: Neo-Gricean Studies in Pragmatics and Semantics in Honor of Laurence R. Horn*, pp. 1–20. Amsterdam: John Benjamins.

Abusch, D. (2002). Lexical alternatives as a source of pragmatic presuppositions. In *Semantics and Linguistic Theory 12*, pp. 1–19.

Anand, P. and V. Hacquard (2013). Epistemics and attitudes. *Semantics and Pragmatics 6*(8), 1–59.

Anand, P. and V. Hacquard (2014). Factivity, belief and discourse. In L. Crnič and U. Sauerland (Eds.), *The Art and Craft of Semantics: A Festschrift for Irene Heim*, Volume 1, pp. 69–90. Cambridge, MA: MIT Working Papers in Linguistics.

Baker, C. L. (1968). *Indirect Questions in English*. Ph. D. thesis, University of Illinois.

Beck, S. and H. Rullmann (1999). A flexible approach to exhaustivity in questions. *Natural Language Semantics 7*(3), 249–298.

Bogal-Allbritten, E. A. (2016). *Building Meaning in Navajo*. Ph. D. thesis, University of Massachusetts, Amherst.

Bolinger, D. (1968). Postposed main phrases: an English rule for the Romance subjunctive. *Canadian Journal of Linguistics 14*(1), 3–30.

Borer, H. (2005). *Structuring Sense, Volume II: The Normal Course of Events*. Oxford: Oxford University Press.

Champollion, L. (2015). The interaction of compositional semantics and event semantics.

Linguistics and Philosophy 38(1), 31–66.
Ciardelli, I., J. Groenendijk, and F. Roelofsen (2013). Inquisitive semantics: A new notion of meaning. *Language and Linguistics Compass 7*(9), 459–476.
Dayal, V. (1996). *Locality in WH Quantification: Questions and Relative Clauses in Hindi*. Dordrecht: Springer Science & Business Media.
Dekker, P. (1993). Existential disclosure. *Linguistics and Philosophy 16*(6), 561–587.
Egré, P. (2008). Question-embedding and factivity. *Grazer Philosophische Studien 77*(1), 85–125.
Farkas, D. (1985). *Intensional Descriptions and the Romance Subjunctive Mood*. New York: Garland Publishing.
Farkas, D. F. and K. B. Bruce (2009). On reacting to assertions and polar questions. *Journal of Semantics 27*, 81–118.
Fillmore, C. J. (1970). The grammar of hitting and breaking. In R. Jacobs and P. Rosenbaum (Eds.), *Readings in English Transformational Grammar*, pp. 120–133. Waltham, MA: Ginn.
George, B. R. (2011). *Question Embedding and the Semantics of Answers*. Ph. D. thesis, University of California Los Angeles.
Ginzburg, J. (1995). Resolving questions, II. *Linguistics and Philosophy 18*(6), 567–609.
Grano, T. A. (2012). *Control and Restructuring at the Syntax-Semantics Interface*. Ph. D. thesis, University of Chicago.
Grimshaw, J. (1979). Complement selection and the lexicon. *Linguistic Inquiry 10*(2), 279–326.
Grimshaw, J. (1990). *Argument Structure*. Cambridge, MA: MIT Press.
Groenendijk, J. and M. Stokhof (1984). *Studies on the Semantics of Questions and the Pragmatics of Answers*. Ph. D. thesis, University of Amsterdam.
Gruber, J. S. (1965). *Studies in Lexical Relations*. Ph. D. thesis, Massachusetts Institute of Technology.
Hacquard, V. (2006). *Aspects of Modality*. Ph. D. thesis, Massachusetts Institute of Technology.
Hacquard, V. (2010). On the event relativity of modal auxiliaries. *Natural Language Semantics 18*(1), 79–114.
Hamblin, C. L. (1973). Questions in Montague English. *Foundations of Language 10*(1), 41–53.
Heim, I. (1994). Interrogative semantics and Karttunen's semantics for *know*. In *Proceedings of Israel Association for Theoretical Linguistics*, Volume 1, pp. 128–144.
Hintikka, J. (1962). *Knowledge and Belief*. Ithaca, NY: Cornell University Press.
Hintikka, J. (1975). Different constructions in terms of the basic epistemological verbs: A survey of some problems and proposals. In *The Intentions of Intentionality and Other New Models for Modalities*, pp. 1–25. Dordrecht: D. Reidel.
Hooper, J. B. (1975). On assertive predicates. In J. P. Kimball (Ed.), *Syntax and Semantics*, Volume 4, pp. 91–124. New York: Academic Press.
Jackendoff, R. (1972). *Semantic Interpretation in Generative Grammar*. Cambridge, MA: MIT Press.
Karttunen, L. (1977). Syntax and semantics of questions. *Linguistics and Philosophy 1*(1), 3–44.
Kratzer, A. (1996). Severing the external argument from its verb. In J. Rooryck and L. Zaring (Eds.), *Phrase Structure and the Lexicon*, pp. 109–137. Dordrecht: Springer.

Kratzer, A. (2002). Facts: Particulars or information units? *Linguistics and Philosophy 25*(5), 655–670.

Kratzer, A. (2006). Decomposing attitude verbs.

Lahiri, U. (2002). *Questions and Answers in Embedded Contexts*. Oxford: Oxford University Press.

Landau, I. (2001). *Elements of Control: Structure and Meaning in Infinitival Constructions*. Dordrecht: Springer Science & Business Media.

Levin, B. (1993). *English Verb Classes and Alternations: A Preliminary Investigation*. Chicago: University of Chicago Press.

Levin, B. and M. Rappaport Hovav (2005). *Argument Realization*. Cambridge: Cambridge University Press.

Moulton, K. (2009). *Natural Selection and the Syntax of Clausal Complementation*. Ph. D. thesis, University of Massachusetts, Amherst.

Perlmutter, D. M. (1970). The two verbs *begin*. In P. Rosenbaum and R. Jacobs (Eds.), *Readings in English Transformational Grammar*, pp. 107–119. Waltham, MA: Ginn-Blaisdell.

Pesetsky, D. (1982). *Paths and Categories*. Ph. D. thesis, Massachusetts Institute of Technology.

Pesetsky, D. (1991). Zero syntax: vol. 2: Infinitives.

Pietroski, P. M. (2005). *Events and Semantic Architecture*. Oxford: Oxford University Press.

Pinker, S. (1989). *Learnability and Cognition: The Acquisition of Argument Structure*. Cambridge, MA: MIT Press.

Portner, P. and A. Rubinstein (2013). Mood and contextual commitment. In *Semantics and Linguistic Theory*, Volume 22, pp. 461–487.

Rawlins, K. (2013). About 'about'. In Todd Snider (Ed.), *Semantics and Linguistic Theory*, Volume 23, pp. 336–357.

Scheffler, T. (2009). Evidentiality and German attitude verbs. *University of Pennsylvania Working Papers in Linguistics 15*(1).

Simons, M. (2001). On the conversational basis of some presuppositions. In R. Hasting, B. Jackson, and Z. Zvolensky (Eds.), *Semantics and Linguistic Theory*, Volume 11, pp. 431–448.

Spector, B. and P. Egré (2015). A uniform semantics for embedded interrogatives: An answer, not necessarily the answer. *Synthese 192*(6), 1729–1784.

Stalnaker, R. (1984). *Inquiry*. Cambridge: Cambridge University Press.

Uegaki, W. (2015). *Interpreting Questions under Attitudes*. Ph. D. thesis, Massachusetts Institute of Technology.

Villalta, E. (2000). Spanish subjunctive clauses require ordered alternatives. In *Semantics and Linguistic Theory*, Volume 10, pp. 239–256.

Villalta, E. (2008). Mood and gradability: An investigation of the subjunctive mood in Spanish. *Linguistics and Philosophy 31*(4), 467–522.

White, A. S. (2014). Factive-implicatives and modalized complements. In Jyoti Iyer and Leland Kusmer (Eds.), *Proceedings of the 44th annual meeting of the North East Linguistic Society*, University of Connecticut, pp. 267–278.

Wurmbrand, S. (2001). *Infinitives: Restructuring and Clause Structure*. Berlin: Mouton de Gruyter.

Zwicky, A. M. (1971). In a manner of speaking. *Linguistic Inquiry 2*(2), 223–233.