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UNIVERSITY OF CALIFORNIA
SANTA CRUZ

**HOW TO MAKE BELIEVE: INQUISITIVITY, VERIDICALITY, AND
EVIDENTIALITY IN BELIEF REPORTS**

A dissertation submitted in partial satisfaction
of the requirements for the degree of

DOCTOR OF PHILOSOPHY

in

LINGUISTICS

by

Thomas de Haven Roberts

September 2021

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List of Abbreviations

1	first person
2	second person
3	third person
A	Set A (Mayan agreement morphology)
ABE	abessive
ABL	ablative
ACC	accusative
ALL	allative
C	complementizer
COM	comitative
COMP	complementizer
COND	conditional
CONTEM	contemplation state
DAT	dative
DOX	doxastic state
ELA	elative
GEN	genitive
ILL	illative
IMAG	imagination space
IMP	imperfective

IMPERS	impersonal
IND	indicative
INESS	inessive
INF	infinitive
LOC	locative
NEG	negative particle/negative morpheme
NMZ	nominalizer
NOM	nominative
OM	object marker
PART	partitive
PERF	perfective
PAST	past
PL	plural
PRES	present
PROG	progressive
Q	interrogative particle
REFL	reflexive
RM	relative marker
RP	recent past
SG	singular
SPKR	speaker
SS	same subject
SUBJ	subjunctive
TOP	topic
TRANS	translative

Abstract

How to Make Believe: Inquisitiveness, Veridicality, and Evidentiality in Belief Reports

by

Thomas de Haven Roberts

This dissertation explores, through three case studies, the relationship between the lexical semantics of clausal embedding (CE) predicates, and the syntactic and pragmatic restrictions on their complements, such as the (in)ability of certain predicates to embed declarative clauses or nominal expressions. I propose that these restrictions arise from interactions between fine-grained aspects of predicate meaning and the linguistic environment in which those predicates occur, rather than being stipulated into predicates' lexical entries via restrictions on permissible semantic types or semantic categories of their arguments (e.g. Grimshaw 1979, Pesetsky 1982, 1991) or resulting from polysemy or ambiguity of CE predicates (e.g. George 2011).

First, I examine the Estonian verb *mõtlema*, which has a *believe*-like interpretation with an embedded declarative, and a *wonder*-like interpretation with embedded declaratives. I show that this behavior can be derived straightforwardly only if declaratives and interrogatives are typewise identical, i.e. sets of sets of worlds (Hamblin 1973, Ciardelli et al. 2013), and *mõtlema* denotes an ontologically primitive attitude of 'contemplation'.

Second, I analyze the behavior of English *believe*, which cannot embed interrogatives except under a combination of modal and nonveridical operators, such as *can't*. I propose that the apparent 'lifting' of selectional restrictions of *believe* in some contexts, as well as other unexpected properties of the *can't believe* construction, can be understood compositionally: *believe* can in fact compose with interrogative clauses in principle, but doing so normally results in systematically trivial meanings (Theiler et al. 2019). By placing *believe* under the right combination of operators, this triviality can be obviated (see Mayr 2019).

Finally, I develop a semantic account of verbs like *believe* and *trust*, which can embed variety of nominal expressions alongside clauses, posing a compositional puzzle (Djäv 2019).

I propose that these predicates are a kind of weak response-stance predicates (Cattell 1978), in that they presuppose an evidential source of the relevant attitude, which can be spelled out as a direct object. I take this to suggest a tight link between argument structure of belief predicates and their external syntactic distribution.

Acknowledgments

They say that you only write a pandemic dissertation once. While dissertating is a challenging task in the best of times, it is only possible in a time of extreme isolation and palpable Zoom fatigue with a robust network of support, both professional and personal, which I was very fortunate to have. In reality, this dissertation is the product of many different people, no matter whose name is on the front.

The seeds of this dissertation were planted in my time as a (young, naive) Baggett Fellow for a year at the University of Maryland. My nascent interest in attitudes was nurtured by my advisor, Valentine Hacquard, for which I am grateful. Valentine possesses all of the best qualities of a mentor—thoughtful, patient, giving, imaginative—and inspired me to think about semantics as something deeply revealing about cognition. I’m forever grateful for her saving me from staring down the infinite abyss of a lifetime of studying nothing but Aktionsart.

When I moved to UCSC, I was lucky to be able to dive headfirst into the minutiae of lexical semantics (tongue firmly out of cheek here!) with Pranav Anand, who is perhaps one of the only people I never had to convince that that was something worth doing in the first place. We had many spirited discussions and debates over the years, reflected in the shifting sands of his office chalkboard. There is something deeply gratifying about sessions writing chaotic stream-of-consciousness scrawls on that board followed by rediscovering them months later, untouched and sphinxlike, only to then suddenly figure out what the hell we were on about. Pranav always pushed me to be precise, be formal, and be daring, and I hope I’ve been able to do that here.

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Chapter 1

Introduction

There is a famous ancient story, originating in the Indian subcontinent some millennia ago, which goes something like this: A group of blind men encounter an elephant for the first time, each of them knowing nothing about elephants. They each inspect a different part of the animal to learn more, but come to radically different conclusions about the nature of the beast: one man touches the elephant's leg, and concludes the animal is like a tree; another feels its tusk, describing it as spear-like; yet another figures the elephant is like a snake, having touched its trunk. In some versions of the story, the blind men end up squabbling over the true nature of the creature.

This parable serves to illustrate that we cannot always form a full picture of something by examining its proper subparts in isolation, among other things (like the challenge of reaching group consensus when everyone has different information states). This phenomenon is painfully familiar to lexical semanticists (and children learning languages), who aim to understand the meaning of individual words, since words exist not in isolation, but in the context of sentences, discourses, and societies which can influence their interpretation. Instead of directly accessing the ur-meaning of a word, we often must make inferences about meaning based on indirect observations about the use of the word in context.

So any lexical semanticist has to answer the question of when they've seen enough of

the word-elephant to be confident that they're accurately describing the whole thing. To make matters more difficult, the problem is much more difficult than simply seeing all the parts of the elephant: we must also know how those parts are strung together. The creature would be very different indeed if its trunk were attached to its side instead of its face.

The question of how individual lexical items combine together to make larger meanings—i.e. *compositionality*—has been a principle focus for linguistic semanticists since Frege. In particular, we've been interested on what rules and principles govern which expressions can be put together and which cannot.

This question has dogged linguistic studies of **clausal-embedding (CE) predicates** for decades. CE predicates are those predicates which take clausal complements. They fall essentially into two groups: attitudes, which describe an individual's cognitive state and represent the lion's share of CE predicates, and speech acts. Given the extent to which the mind is not well-understood, it is perhaps no surprise that words which describe mental states are similarly enigmatic. The class of CE predicates includes verbs like *believe*, *hope*, and *wonder*, as well as adjectives like *happy* and *surprising*. Several examples of sentences containing CE predicates are given in (1).

- (1) a. Kira **believes** that the aliens are prophets.
b. Ben **hopes** to protect the wormhole.
c. Jadzia **wonders** whether they will succeed.

An **attitude report** is a sentence consisting principally of an CE predicate (including verbs like *believe* and *hope*, as well as some adjectives, like *happy*), a nominal argument of that predicate corresponding to the 'holder' of the attitude, and often a clausal complement.

The reason CE predicates are interesting from the perspective of compositional semantics is that, to put it mildly, all clausal embedders are not created equal. Some, like *wonder*, require their complement to be interrogative, though *think* generally prefers declarative com-

plements, and *know* happily takes either:

- (2) a. Maureen $\left\{ \begin{array}{l} \text{thought} \\ *wondered \\ \text{knew} \end{array} \right\}$ that the barber was sweating profusely.
- b. Maureen $\left\{ \begin{array}{l} *thought \\ wondered \\ \text{knew} \end{array} \right\}$ why the barber was sweating profusely.

Data like (2) raises two particularly interesting questions: what is it that causes these verbs to differ in this way, and is this cause the same in all languages?

1.1 Attitudinal meaning and clausal embedding

It is clear that languages vary in the relationship between attitude predicates and possible embedded clauses, depending on the grammatical tools in their inventory. For instance, it has been argued that the space of attitude verbs can be broadly cleaved into two semantic categories: ‘representational’ verbs, which express judgments of truth, like *think* and *believe*, and ‘preferential’ verbs, which express preferences, like *want* and *wish* (Bolinger 1968).

The contrast between representational and preferential verbs tracks contrasts in the types of complements they permit: representational verbs take finite clausal complements, and preferential nonfinite clausal complements. While other languages do not exhibit this pattern, it is cross-linguistically common to distinguish between complements of representational and preferential verbs (Bolinger 1968). However, different languages accomplish this distinction in different ways. In Romance languages like French, these classes are distinguished by the mood of their complement: indicative for representational verbs, subjunctive for preferential (Farkas 1985, Giannakidou 1997, Villalta 2000; a.o.). In German, complements of representational verbs can exhibit V2 word-order, but preferentials cannot (Truckenbrodt 2006, Scheffler 2009).

(3) a. Dukat **thinks/*wants** that he is the hero.

b. Dukat ***thinks/wants** to be the hero.

(4) **French**

a. Dukat **pense/*veut** qu'il est le héros.
Dukat thinks/wants that.he is.IND the hero

b. Dukat ***pense/veut** qu'il soit le héros.
Dukat thinks/wants that.he is.SUBJ the hero

(5) **German**

a. Ich **glaube**, Peter ist nach Hause gegangen.
I believe Peter is to home gone
'I believe that Peter has gone home.'

(Scheffler 2009: 183)

b. *Ich **möchte**, Peter geht nach Hause.
I want Peter goes to home
Intended: 'I want Peter to go home.'

(Scheffler 2009: 183)

The representational/preferential divide demonstrates that the morphosyntax of embedded clauses is sensitive to properties of the lexical semantics of the embedding predicate. But it remains a topic of considerable debate whether this reasoning can be extended to the differences in potential *types* of clauses a predicate can embed. In other words, can we chalk up the difference between verbs like *think* which embed declaratives and not interrogatives, versus those like *wonder* for which the opposite holds true, or *know* which can embed either?

Historically, the answer to this question emerged in the form of s(ematic)-selection, the hypothesis that the kinds of arguments that heads permit is determined not only by restrictions on their syntactic category ('c-selection'), but also their semantic type (Grimshaw 1979, Pesetsky 1982; 1991). S-selection can explain distributional restrictions on arguments which have the same syntactic label, but different semantic types. This exact distinction has been used to explain differential selectional properties of attitude predicates. Although declarative and interrogative clauses are typically assumed to be of the same syntactic category (CP), **anti-**

rogative¹ verbs like *think* can embed declaratives and not interrogatives, though the opposite holds for **rogative** verbs like *wonder*.

It is commonly assumed that declarative clauses denote propositions (sets of worlds) and interrogatives denote questions, or sets of propositions. Under this view, the contrast in (refbasic) is understood as being a (potentially arbitrary) s-selectional property of different types of verbs: rogative verbs s-select propositions, and anti-rogative verbs s-select questions.

S-selection is, at its core, a compositional explanation for the distribution of arguments: heads cannot compose with arguments which they do not s-select without inducing a type mismatch. Intuitively, the particular choice of argument a lexical item demands must relate in some principled way to that item's conceptual meaning. If s-selectional restrictions were instead arbitrary diacritics on heads, we would be hard-pressed to understand independent generalizations which track argument-taking behavior. For example, cross-linguistically, nonfactive doxastic verbs, such as *think*, tend to be anti-rogative (Egré 2008, Spector & Egré 2015). If we simply stipulate the selectional properties of verbs into their lexical entries, we have no deeper explanation for these robust correlations.

Semantic theory is then left with a question: can we derive selectional restrictions from independent semantic properties of verbs? The answer to this question which this dissertation will advance is a resounding *yes*. I will demonstrate that not only should we aim to derive selectional restrictions rather than stipulating them on grounds of theoretical parsimony, but that the stipulating declarative/interrogative complement restrictions into lexical entries is insufficient to capture a range of properties of attitude predicates, including variable interpretation of attitudes with different complement types, changing selectional restrictions of some predicates in the scope of certain operators, and the ability of some attitudes to compose with non-content nominals. Taken together, I will argue that these facts motivate a view of attitude predicates as having highly articulated lexical semantics, and a relatively small role for s-selection in determining their distribution.

¹Terminology from Lahiri (2002).

1.2 Structure of the dissertation

Following this chapter, the dissertation will proceed as follows. In Chapter 2, I present some theoretical background on existing semantic theories of clausal embedding, and lay out the fundamental assumptions of the dissertation. Importantly, I will present the formal assumptions regarding the denotations of declarative and interrogative clauses, chiefly, that they both denote semantic objects of the same type: sets of sets of worlds.

In Chapter 3, I discuss the interpretations of the Estonian predicate *mõtlema*, an attitude verb whose interpretation varies depending on whether its complement is declarative or interrogative. I show that the range of meanings *mõtlema* exhibits is compatible only with an analysis in which it embeds questions, and not propositions, but that the full range of meanings of *mõtlema* can be derived without resorting to positing polysemy if we assume it instantiates an ontologically primitive attitude of *contemplation*.

Chapter 4 presents an analysis of the English *can't believe* construction, which both has a veridical-like interpretation and allows for embedded interrogatives, unlike *believe* on its own. I propose that *can't believe* can and should be understood compositionally: *believe* can in principle embed interrogatives, but ordinarily doing so results in trivial meanings, and therefore unacceptability. When under a certain combination of operators, such as *can't*, this triviality disappears, and thus *can't believe* becomes acceptable. I further show that this is not an idiosyncratic property of *can't believe*, as counterparts of *believe* in other languages behave similarly to English.

Chapter 5 extends this analysis of *believe* to the nominal domain, and presents a compositional analysis for sentences in which *believe* takes both a direct object and an embedded clause. I propose that the optional direct object argument of *believe* instantiates an evidential 'source' for the relevant belief, and that it is this subtle extra complexity in argument structure that differentiates *believe* from its close counterpart *think*. I further show that although *believe* does not ordinarily appear to require an evidential source in contexts where it occurs without a

direct object, there are subtle semantic and pragmatic effects of evidentiality on *believe*-reports which can be explained by the covert presence of this source argument.

Chapter 6 concludes the dissertation and presents several avenues for future research.

Chapter 2

Theoretical Background

2.1 Formal framework

The formal framework in which this dissertation is couched is, broadly, that of the semantics developed in relation to generative grammar (see, e.g., Heim & Kratzer 1998). The specific nuts and bolts will be abundantly familiar to readers who are acquainted with the H&K system, who can safely skip §2.1 for this reason. In this framework, expressions of natural language with (narrow) syntactic representations (i.e., a *logical form*, or LF) are translated into expressions in a strictly-typed logical metalanguage. I will present a minimal version of this metalanguage which will be adequate for the purposes of the dissertation; I will also not define the entire lexicon of the meta-language here, though formal definitions will be provided for important expressions throughout.¹

2.1.1 Semantics

(6) **Definition 1: Model**

A model M is a tuple $M = \langle D_e, W, [\cdot] \rangle$, where

- D_e is the nonempty set of entities

¹The presentation of these formalizations is inspired in part by (Elliott 2017).

- W is the nonempty set of possible worlds, and
- $\llbracket \cdot \rrbracket$ is the interpretation function

The sets D_e and W provide potential referents for entity-denoting and world-denoting terms. The interpretation function $\llbracket \cdot \rrbracket$ maps natural language expressions, both atomic and complex, to metalanguage expressions.

2.1.1.1 Semantic Types

Every metalanguage expression has a characteristic type. The semantic metalanguage contains four primitive types: the type of entities e , the type of contentful entities c , the type of truth values t , and the type of possible worlds s . The notion of ‘contentful entity’ assumed here is an entity whose content can be identified with a unique proposition, such as an idea, a rumor, or a claim. The metalanguage function CON maps contentful entities to their propositional content. Note that this differs somewhat from the notion of content of Hacquard (2006; 2010), which is a *set* of propositions.

(7) **Definition 2: Primitive Semantic Types**

- e , the type of *entities*, with domain D_e
- c , the type of *contentful entities*, with domain D_c ($D_c \subseteq D_e$)
- t , the type of *truth values*, with domain $\{0, 1\}$
- s , the type of *possible worlds*, with domain W

Furthermore, I assume that the metalanguage also includes all higher-order types which can be generated according to the following procedure:

(8) **Definition 3: Complex Semantic Types**

- If τ_1 and τ_2 are types, then $\langle \tau_1, \tau_2 \rangle$ is the type of a function with domain D_{τ_1} and range D_{τ_2} . $\langle \tau_1, \tau_2 \rangle$ may be abbreviated as $\tau_1 \tau_2$ if doing so does not result in ambiguity of type.

The type of variable will be notated using subscripts: for example, a variable x of type e will be written as x_e . I will also assign particular notational shorthands for certain complex semantic types which will be referred to repeatedly throughout this dissertation:

(9) **Definition 4: Shorthands for complex semantic types**

- Type T** : The type $\langle st, t \rangle$
- Proposition**: An object of type st .
- Question or Issue**: An object of type T

In particular, note that the use of the word *question* is restricted to objects of type T , and is not inherently linked to interrogative clauses or questioning speech acts. Generic propositions will be referred to with a lowercase p , and generic questions will be referred to with a lowercase q throughout the dissertation.

2.1.1.2 Rules of composition

The principal rule of semantic composition I assume is the standard **Function Application** (FA), and I will also assume it works in the ordinary fashion: for two nodes which are sisters, the semantic value of their mother is equivalent to the output of feeding one sister as the input to the other.

(10) **Definition 5: Function Application (FA)**

For node γ whose only daughters are α and β , where $\llbracket \alpha \rrbracket \in D_\sigma$ and $\llbracket \beta \rrbracket \in D_{\sigma\tau}$,

$$\llbracket \gamma \rrbracket = \llbracket \beta \rrbracket(\llbracket \alpha \rrbracket)$$

Recursive applications of FA can result in **derivations** of the meanings of complex expressions (i.e., non-terminal nodes) given the meanings of lexical items (i.e., terminal nodes) and their syntactic configuration.

2.2 Clausal meaning and the responsiveness puzzle

Because this dissertation is interested in the meanings of clausal-embedding predicates, we must also establish a working definition of what type of object is denoted by embedded clauses themselves. A major hurdle for the task of linking lexical semantics to selectional behavior is **responsive** predicates like *know* and *say*, which permit both declarative and interrogative complements (11).

$$(11) \quad \text{Prudence} \left\{ \begin{array}{c} \text{knows} \\ \text{said} \end{array} \right\} \left\{ \begin{array}{c} \text{why} \\ \text{that} \end{array} \right\} \text{wombats are herbivores.}$$

Clearly, this is problematic for s-selection if declaratives and interrogatives denote semantic objects of different types, since we shouldn't be able to combine a single verb with objects of different types.

Various solutions have been proposed for this puzzle which maintain the central insight of the s-selectional hypothesis. These approaches generally occupy one of four camps. In the POLYSEMOUS view, declarative- and interrogative-embedding uses of responsive predicates have non-identical lexical entries (George 2011). REDUCTIVE analyses shift the meaning of one clause type to the other: either reducing interrogative meaning to declarative meaning (P-TO-Q REDUCTION; Karttunen 1977, Groenendijk & Stokhof 1982, Heim 1994, Dayal 1996, Lahiri 2002, Egré 2008, Spector & Egré 2015), or vice versa (Q-TO-P REDUCTION; Uegaki 2016, Elliott et al. 2017). UNIFIED analyses dispense with the assumption that declaratives and interrogatives are differently-typed in the first place; given this approach, responsive predicates pose no threat to standard views of s-selection (Elliott 2017, Theiler et al. 2018).

In this dissertation I adopt a version of the proposal by Theiler et al. (2018), that embedded declarative and interrogative clauses alike denote sets of propositions (that is, clauses of type *T*). In what follows, I will motivate that choice and preview how this problem relates to the specific chapters of this dissertation.

2.3 A uniform ‘question’ semantics of clausal-embedding

Responsive predicates pose no challenge to *s*-selection if one makes the assumption that declarative and interrogative clauses denote objects of the same type, which is the foundational assumption of both Alternative Semantics (AS; Hamblin 1973) and Inquisitive Semantics (InqSem; Ciardelli et al. 2013, Roelofsen 2017, Theiler et al. 2018, Roelofsen et al. 2019).

In both of these frameworks, declarative and interrogative clauses both denote *sets of alternatives*, where the relevant kinds of alternatives are propositions. Propositions themselves denote sets of possible worlds, namely precisely those worlds in which that proposition is true. A declarative sentence like *Rom drank root beer* denotes a singleton set containing only the proposition that Rom drank root beer. By contrast, an interrogative sentence like *What did Rom drink?* denotes a set of propositions of the form *Rom drank x* , where x ranges over Rom’s potential choices of beverage.

- (12) a. $\llbracket \text{Rom drank root beer} \rrbracket = \{\text{Rom drank root beer}\}$
b. $\llbracket \text{What did Rom drink?} \rrbracket = \{\text{Rom drank root beer, Rom drank snail juice, Rom drank cognac...}\}$

Typewise, both of these clauses denote sets of sets of worlds, aka **questions** (type T). In the case of an interrogative, its semantic value is a set of propositions corresponding to answers (‘alternatives’) to that question; a declarative denotes a singleton set containing only one alternative. The principal difference between AS and InqSem is that in the latter, clauses denote a *downward-closed* set of alternatives, i.e., the set consisting of maximal alternatives and every proper subset of those alternatives. This analytical choice will primarily play a role in Chapter 4; the central assumption of this dissertation is simply that the two clauses can both be treated as type T , and that clausal-embedding predicates uniformly select objects of that type.

The primary challenge for a unified semantics for clausal embedding is in understand-

ing why, if declaratives and interrogatives are typewise identical, that there are predicates which can embed one and not the other; i.e., it predicts that *all* clausal-embedding predicates should be responsive. By comparison, reduction can explain the behavior of anti-rogatives and rogatives as a reflex of s-selection, but given a uniform view, we would expect any predicate which takes declaratives *or* interrogatives to take both in principle, since they are typewise identical.

This problem has been discussed extensively, notably by Theiler et al. (2018), who propose that (anti-)rogative predicates are incompatible with certain kinds of clauses in virtue of their lexical semantics, not their selectional properties *per se*. For example, similar to Uegaki (2016), Theiler et al. suggest that rogative verbs like *wonder* cannot embed declaratives because they presuppose that the subject's information state does not resolve the issue raised by their complement, and the subject desiring to enter a state in which the issue is resolved. This presupposition yields a contradiction when applied to the meaning of a declarative clause.

Anti-rogative verbs like *believe*, on the other hand, are incompatible with embedded interrogatives because doing so results in systematically trivial meanings. Theiler et al. propose that the inability of anti-rogatives to take interrogative complements can be derived from independent properties of their semantics, such as being neg-raising, (i.e. those predicates *V* such that *x does not V that p* licenses the inference that *x V's that not p*) or being systematically insensitive to inquisitive content (these points will be revisited in much more depth in Chapter 4).

The specific details of the account are less important here than is the general approach: the *lexical meanings* of rogative verbs are responsible for their restricted distribution of clausal complements, rather than semantic selection. However, this is not to say that semantic selection does not play a role in composition in general; rather, it is simply that s-selection does not explain why there are different distributional properties for different attitude predicates.

2.4 Alternative approaches to the responsive puzzle

2.4.1 Polysemy

One potential solution to the responsivity puzzle is to posit that responsive predicates are systematically polysemous: that is, they have semantically distinct declarative-embedding and interrogative-embedding ‘versions’, the choice of which corresponds to different embedding behaviors. Non-responsive attitude predicates are simply those which don’t exhibit this polysemy.

A problem which accounts of this type must contend with is the intuitive semantic relatedness of the interrogative-embedding and declarative-embedding uses of responsive predicates. That is, a responsive predicate like *know* intuitively expresses the same kind of attitude regardless of the type of clause it embeds, which is perhaps surprising if *know* comes in two distinct flavors. A major challenge for the polysemy view, then, is reconciling this clear pattern of relatedness between the two senses of a responsive predicate with distinct selectional profiles.

Furthermore, Uegaki (2019) additionally points out that responsive predicates can be gapped in coordinate structures involving different kinds of complements. This is unexpected if these predicates are polysemous given the kinds of strict semantic identity conditions typically assumed of these elliptical constructions:

- (13) Alice knows/realized/reported that Ann left and Bill ~~knows/realized/reported~~ which other girls left.

In the polysemous Twin Relations theory of George (2011), these issues are handled by positing general schemas which generate question- and proposition-taking versions of each responsive predicate. A common semantic core underlies both flavors, but neither is reducible to the other. Thus, we do not have completely independent entries for each use of the predicate, but rather these uses are derived systematically from ‘twin’ entries in the lexicon.

Concretely, George proposes that lexical entries for responsiveness like *know* conjoin existential and universal quantification over propositions. The lexicon records both of these relations separately, and there are generalized rules for deriving question-taking and proposition-taking uses of each predicate.

In the cases of *know*, for instance, the lexicon contains entries for the following existential and universal relations (George 2011: p. 159). I omit the factive presupposition for *know* as that is irrelevant to the main theoretical consideration here.

- (14) a. $know_{\exists} = \lambda w. \lambda p. \lambda x. (\mathbf{know}(w)(p)(x))$
 b. $know_{\forall} = \lambda w. \lambda p. \lambda x. (\mathbf{believe}(w)(p)(x) \rightarrow p(w))$

Each responsive predicate R is associated with two such lexical entries, and the proposition-embedding use of this predicate R_p and the question-embedding use R_q are derived by the following rules (p. 160):²

- (15) a. $R_p = \lambda w_s. \lambda p_{st}. \lambda x_e. (R_{\exists}(w)(p)(x) \wedge R_{\forall}(w)(p)(x))$
 b. $R_q = \lambda w_s. \lambda q_{\langle st, t \rangle}. \lambda x_e. (\forall p \in q[p(w) \rightarrow R_{\forall}(w)(p)(x)] \wedge \exists p' \in q[p'(w) \wedge R_{\exists}(w)(p')(x)])$

R_p says that both R_{\exists} and R_{\forall} hold of p , and R_q says that R_{\exists} holds of some true answer to q and R_{\forall} holds of all true answers to q .

The Twin Relations theory allows for the responsive predicates to flexibly compose with questions and propositions without positing multiple lexical entries *per se*. However, each responsive predicate must still be associated with two lexical ‘pieces’ which can be transformed by lexical rules. This is still problematic for cases where declaratives and interrogatives are conjoined under a single overt use of a responsive predicate, which seems incompatible with a polysemy viewpoint.

²Edited slightly for denotational consistency.

Additionally, an ambiguity- or polysemy-based view of responsiveness generates the typological prediction that for any predicate which is responsive in one language or another, there could exist in principle a language in which the two senses of that word are instantiated with non-homophonous lexemes. We might expect to find a language with lexical pairs like *know* and *shnow*, where one verb means roughly what English *know* means with a declarative complement, and the other means roughly what *know* means with an interrogative complement, though neither is responsive. To my knowledge, this typological prediction is not borne out for correspondents of English responsiveness in any other language, although the question does merit further scrutiny.

2.4.2 Embedded clauses as modifiers

A fundamental assumption in the views presented thus far is that an embedded clause saturates an argument of the embedding predicate. Much recent work, disputes this notion, proposing instead that embedded clauses (particularly, embedded *that*-clauses) can at least in some cases be modifiers, rather than arguments, of embedding predicates (Kratzer 2006, Moulton 2009; 2015, Elliott 2017, Özyıldız 2020).

These accounts vary in their precise implementation, but all assume some flavor of a ‘neo-Davidsonian’ semantics of verbs. The basic assumptions of this framework is twofold: one, sentences are existential statements about eventualities (eventualities being a primitive type of object corresponding to events and states) (Davidson 1967, Bach 1986), and two, verbs denote predicates of eventualities, and (at least some) participants in such eventualities are introduced by functional heads (Castañeda 1967). This framework has proven particularly profitable at explaining differences between embedding behavior between nominal and verbal forms of attitudinal roots (see Moulton 2015).

A neo-Davidsonian semantics in and of itself does not necessarily say much about the distribution of embedded declaratives/interrogatives, absent some ancillary assumptions about what kinds of arguments can be severed from the verb. For instance, Kratzer (2006) proposes

that attitude verbs select for ‘content’ arguments, which can be specified by embedded clauses. On the other hand, Elliott (2017) supposes that attitude verbs are purely functions of eventualities, and assumes, following Kratzer and Moulton, that embedded clauses—be they declarative or interrogative—can denote *predicates of contentful individuals* through a process of type-shifting. Crucially, for Elliott, both contentful individuals and eventualities denote individuals (of type *e*), so attitude verbs can compose with clauses via Predicate Modification, which can conjunctively compose two functions which take the same type of argument.

While this is a substantial departure from the influential Hintikka (1962, 1969)-style template for attitudes, in which attitude predicates denote quantifiers over possible worlds, it is appealingly elegant. It supposes that in terms of compositional mechanics, attitude predicates are really no different from other verbs. Restrictions in the types of clausal modifiers a verb can combine with are instead derived from properties of the semantics of those verbs: for instance, Elliott proposes anti-rogative verbs carry presuppositions that the content of the eventuality they specify are strictly informative, which rules out their combination with embedded interrogatives. This is a very similar approach to other unified treatments of embedded clauses.

As I will argue, particularly in Chapter 4, deriving the clausal-embedding restriction of all anti-rogative verbs from such presuppositions is insufficient to account for predicates which exhibit variable embedding behavior in the scope of operators, such as the fact that *be certain* embeds interrogatives only under negation (Mayr 2019). However, this is a general problem about any account which derives embedding behavior purely from lexical semantics of the embedding predicate, rather than a particular flaw of Elliott’s proposal or any neo-Davidsonian account. This problem could also be rectified by deriving the incompatibility between (for instance) *be certain* and embedded interrogatives by means of general semantic or pragmatic conditions on acceptability, such as L-analyticity (Gajewski 2002), as Mayr (2019) and Theiler et al. (2019) do.

That being said, one other issue with which a strictly neo-Davidsonian account must contend is with verbs which seem to carry presuppositions that make reference to the embedded

clause, such as factive verbs, which presuppose their complement is true (Kiparsky & Kiparsky 1970, *et seq.*) or response-stance verbs (Cattell 1978, Kastner 2015), which presuppose that their complement was uttered by someone besides the attitude holder. Presumably, one would need to spell out precisely how composition with embedded clauses works with presuppositions in order to yield the correct meanings. This task becomes particularly challenging when one considers predicates which appear to carry presuppositions that involve reference to multiple distinct constituents (the subject of Chapter 5 of this dissertation), though I leave the exploration of this possibility to future work.

Ultimately, while I will not pursue an account couched in the language of event semantics, I believe it is possible (with some work) to reconcile the observations made in the chapters of this dissertation with Elliott's proposal, since they both rely on the key notion that embedded clauses combine with embedding predicates in a uniform way.

2.4.3 Reductive approaches

2.4.3.1 Reduction from q to p

A longstanding tradition of responsive predicate analysis treats their complements as fundamentally propositional: that is to say, the denotations of all clausal complements are reduced to declarative denotations (Karttunen 1977, Groenendijk & Stokhof 1984, Heim 1994, Dayal 1996, Lahiri 2002, Egré 2008, Spector & Egré 2015). The key motivation for this approach is that for many responsive predicates, such as *know*, an interrogative complement seems to receive a propositional interpretation.

In the case of English *know*, for example, an embedded interrogative is interpreted as the true *answer* to that interrogative. In a context where it is true that the handmaiden stole the chalice, (16a) entails (16b). The Estonian counterpart of *know*, *teadma*, exhibits similar behavior; (17) entails that for some particular kind of coffee, Estonians know that that coffee is Latin American.³

³This sentence, like its English translation, is ambiguous between at least a weakly exhaustive reading, in which

- (16) a. Gertrude knows who stole the chalice.
 b. Gertrude knows that the handmaiden stole the chalice.
- (17) Eestlased teavad, mis kohv on Ladina-Ameerikast.
 Estonians know what coffee is Latin-America.ELA
 ‘Estonians know what coffee is Latin American.’
 $\rightarrow \exists p[p = \text{‘x coffee is Latin American’ and know}(\text{Estonians, } p)]$

This behavior of *know* and *teadma* contrasts with the interrogative complements of rogative verbs like *ask*, which have no such propositional reduction. This is particularly evident by the fact that rogatives don’t allow declarative complements:

- (18) a. Agatha asked what Vlad added to the tripe.
 b. *Agatha asked that Vlad added paprika to the tripe.

While *q-to-p* reduction succeeds in ensuring that responsive predicates can embed both declaratives and interrogatives without a type mismatch, it faces two hurdles. First, there must be a mechanism or operator which ensures that interrogatives are interpreted propositionally. This is a relatively straightforward problem to surmount if we posit a type-shifting operator or coercion process. A much larger problem for *q-to-p* reduction is that it does not explain on its own the unacceptability of sentences like (19), where an anti-rogative verb appears with an embedded interrogative:

- (19) *Shirley thinks whether she will win the lottery.

If type-shifting of embedded interrogatives is an available option for complements of responses, we must rule out (19) on independent grounds. One solution to this puzzle compatible is

Estonians know some coffee is Latin American, but maybe don’t know all Latin American coffees, and a strongly exhaustive one, in which Estonians know, for all coffees, whether or not that coffee is Latin American. This ambiguity is orthogonal to the matter at hand, which is that *teadma q* systematically entails some *teadma p*. The interpretative complexity does suggest we may ultimately want a more nuanced semantics for embedded questions (e.g. Beck & Rullmann 1999).

that of Groenendijk & Stokhof (1984), who argue that embedded interrogatives inherently denote two kinds of semantic objects: a question *intension* and a propositional *extension*. *Know*, a responsive predicate, then selects for the extension of an embedded interrogative, whereas *wonder* selects for its intension.

However, this solution still does not handle the anti-rogative problem, since if *know* can select for interrogative extensions, any proposition-taking predicate should be able to do the same. It seems, then, that the lexical semantics of anti-rogatives must be leveraged in building a generalization about their behavior and what distinguishes them from responsives. Aside from their definitional property, though, there is not a clear unifying semantic property of anti-rogatives that could explain their inability to take interrogatives.

Finally, it is worth pointing out that reducing interrogative denotations to declarative ones can still run into this problem even if we assume that interrogatives can denote more than just questions. The reductive analysis of some responsives proposed by Ginzburg (1995) is similar in many ways to propositional reduction. He makes an ontological distinction between propositions and ‘facts,’ which prove propositions and resolve questions (see also Ginzburg & Sag 2001). Factive responsive predicates like *know* select for facts, whereas anti-rogatives like *believe* select for propositions.

Crucial to the G&S account is the notion that there is a many-to-many mapping between sentence types and semantic objects: propositions can be denoted only by declarative clauses and questions only by interrogative clauses, but facts can be denoted by either. This argument could explain why factive responsive predicates have the distribution that they do, but does not explain the behavior of non-factive responsives, like *say* and *care* (Elliott et al. 2017), or, as we will see in Chapter 3, Estonian *mõtlema*.

2.4.3.2 Reduction from p to q

The inverse tack from the ‘standard’ approach of the previous section is to derive question denotations from embedded declaratives, a position adopted by Uegaki (2016) (though see also

Elliott et al. 2017). Uegaki's primary motivation for this approach comes from contrasts between anti-roatives and responsives with regards to their entailment patterns with content DP complements like *the rumor*. While attitude reports with anti-roatives like *believe the rumor* entail *believe p*, where *p* corresponds to the content of the rumor, similar reports with responsives like *know the rumor* bear no such entailment:

- (20) a. John believes the rumor that Mary left.
 \models John believes that Mary left.
- b. John knows the rumor that Mary left.
 $\not\models$ John knows that Mary left. (Uegaki 2016: 626)

While this issue will rear its head again in Chapter 5, for now it is sufficient to say that Uegaki argues that only a propositional-embedding predicate can yield the entailment in (20a), and if *know* were also embedding propositions, the distinction between (20a) and (20b) could not be derived. There is no way, he claims, for *the rumor that Mary left* to denote a proposition without yielding the entailment of (20b).

Instead, Uegaki proposes that responsives, including *know*, are question-embedding. He assumes questions to denote sets of propositions which comprise complete answers to that question, following Hamblin (1973), and employs a range of (independently motivated) type-shifters to ensure the internal argument of a responsive predicate is always a question. The reader is referred to Uegaki's work for a formal implementation of this idea.

The primary challenge to reductive accounts writ large is in explaining why clauses seem to be flexible about whether they are interpreted as questions or propositions in the absence of any overt linguistic material that clearly serves a reductive function. In order to prevent a type mismatch between responsives and embedded declaratives, Uegaki uses the silent type-shifting operator ID, first proposed by Partee (1986), which takes a proposition and returns the singleton set containing that proposition:

$$(21) \quad \llbracket \text{ID} \rrbracket = \lambda p[\lambda q.q = p]$$

Thus, the LF of a sentence with a responsive predicate and a declarative complement obligatorily includes ID.

$$(22) \quad \text{John knows [ID [that Mary left]].}$$

Like other reductive analyses, Uegaki's account requires additional lexical stipulations for non-responsive clausal-embedding verbs: a story is needed for why rogatives like *wonder* cannot embed declaratives. Uegaki proposes that verbs come packaged with a presupposition that their complement is a non-singleton set of propositions. There is no type-mismatch in this account, but **wonder that* is derived from the inability of a proposition to denote a set of propositions with cardinality greater than 1. In particular, he claims rogative verbs have the following presupposition:

$$(23) \quad \llbracket \text{wonder/ask/inquire} \rrbracket^w(Q)(x) \text{ is defined only if the following proposition is compatible with } x\text{'s beliefs: } \lambda w.\exists p \in Q[p(w)] \wedge \exists p \in Q[\neg p(w)] \quad (\text{Uegaki 647: 51})$$

By this definition, a *wonder*-report, is only defined if there is some p that is an answer to q such that both p and $\neg p$ are compatible with the attitude holder's beliefs. Other rogative predicates can be presumed to have a similar presupposition.⁴

⁴I note here that the intuition behind this presupposition is appealing—it does not make sense to 'wonder' a question to which there are not multiple epistemically possible answers, from the perspective of the wonderer—the letter of the definition is not fully generalizable for rogatives. There are uses of *ask*, for instance, where the asker is merely uttering a particular speech act, to say nothing of their own beliefs (an objection noted by Theiler et al. 2018):

$$(24) \quad \text{The teacher asked what the capital of East Timor was.}$$

It's perfectly natural to utter (24) to describe an ordinary pedagogical scenario, where the teacher knows the answer to the question which they pose to the class. Taking Uegaki's definition at its word, (24) is incorrectly predicted to induce a presupposition failure. We could remedy this by modifying the presupposition in (23) to state that q must be compatible with what the attitude holder *presents as* their beliefs.

2.4.3.3 The issues with reduction

Analytically, reductive accounts have in common a stipulation that objects of one semantic kind are turned into objects of a different semantic kind under responsive predicates. Some restrictions are necessary to prevent this kind of type-shifting from running amok; for Uegaki, propositions can always be in principle shifted into questions, but the lexical semantics of anti-rogatives is incompatible with the semantics of singleton questions.

As a final note, when it comes to treatment of responsive predicates, the assumption that all embedded clauses denote questions is essentially identical to the analysis of Uegaki (2016) discussed above. The only real difference is the internal composition of embedded declaratives: Uegaki posits a type-shifter whereas this dissertation assumes none is necessary. (Uegaki himself notes this alternative analytical possibility.)

Where the two theories diverge is in the semantics of anti-rogative predicates; for Uegaki they select for propositions, and therefore do not permit interrogative complements because there is no mechanism to extract propositions from questions. On the present account, the inability of anti-rogatives to take interrogatives is a reflex of their lexical semantics, for instance, because interrogatives in that position would result in systematically trivial interpretations (Theiler et al. 2018). As I will argue throughout the dissertation, this is both an empirically motivated and more theoretically explanatory analysis of anti-rogativity than stipulating it into lexical entries through s-selection.

Chapter 3

The curious case of Estonian *mõtlema*

3.1 Introduction

A central consideration in adjudicating between theories of responsive predicates is understanding how their meaning combines with the meaning of an embedded clause. In other words, does responsive predicate *meaning* appear more plausibly compatible with propositional meaning, question meaning, both, or neither?

Responsive predicates are generally assumed to convey the same kind of attitude regardless of their complement: *say*, for instance, describes a particular kind of speech act whose content is propositional; *know* describes an attitude holder's beliefs and presupposes truth of a particular proposition. This is generally taken as evidence in favor of a reductive treatment of responsives (as opposed to one in which responsives are polysemous or ambiguous), since it suggests both 'flavors' of a responsive share the same basic lexical core. Consequently, reductive analyses of responsives have been far and away the most prevalent in the literature.

3.1.1 A new kind of responsive predicate

The Estonian verb *mõtlema* is extremely puzzling because it bucks this trend: the attitude it conveys appears to shift dramatically depending on the type of its complement. *Mõtlema* is

canonically interpreted as doxastic with a declarative complement, like English *think* (25a), and inquisitive with an interrogative complement, like English *wonder* (25b).

- (25) a. Liis mõtleb, et sajab vihma.
 Liis MÕTLEMA that falls rain
 ‘Liis thinks that it’s raining.’ DOXASTIC
- b. Liis mõtleb, kas sajab vihma.
 Liis MÕTLEMA Q falls rain
 ‘Liis wonders whether it’s raining.’ INQUISITIVE

Although *mõtlemata* is often translated in dictionaries as English *think*, it is unlike *think* in that it can embed interrogatives. This is also no lexical idiosyncrasy, as other Estonian predicates exhibit a similar doxastic-inquisitive alternation, including *huvitav* ‘interesting’ (26), *mõtisklema* ‘ponder’ (27), *kaalutlema* ‘consider’ (28), and *juurdlema* ‘ponder’ (29).¹ Naturally-occurring examples of each predicate with declarative and interrogative complements are given below.² In each of the (a) sentences, the predicate is paired with a declarative complement, and indicates belief on the part of the matrix subject in the truth of an embedded proposition. In the (b) sentences, by contrast, the subject is not settled about the true answer to an embedded interrogative.

- (26) a. **Huvitav**, et ma siis neid just paralleelselt lugema asusin.
 interesting that I then them.PART just in.parallel read.INF began
 ‘Interestingly, I just began reading them in parallel.’³
- b. **Huvitav**, milline oleks see sari koos Seth Rogeniga olnud?
 interesting which be.COND this series together Seth Rogen.COM been
 ‘I wonder what this series would have been like with Seth Rogan?’⁴

- (27) a. Hetkel **mõtisklen**, et 7 käsku peaks kontori seinale
 moment.ADE consider.1SG that 7 command.PART should office.GEN wall.ALL

¹I gloss these verbs here with approximate English translations, though acknowledging selectional differences between the Estonian verbs and their purported English counterparts.

²Some examples edited for length.

³<http://www.eksperimentaarium.ee/kirjutised/kuidas-elevant-omale-londi-sai>

⁴<https://www.kava.ee/kanal/kanal-12/06-06-2018>

riputama.
hang.INF
'At the moment, I'm thinking that the 7 commandments should hang on the office wall.'⁵

- b. Võib-olla peaksime korraks peatuma ja **mõtisklema** mis asi see
maybe should.1PL time.TRANS stop and consider what thing this
teadus on?
knowledge is
'Maybe we should stop for a moment and think about what this knowledge really is?'⁶

- (28) a. Soomlased **kaalutlesid**, et Balti riike ähvardab Venemaa poolt palju suurem
Finns considered that Baltic states threatens Russia by much greater
oht kui Soomet...
danger than Finland
'The Finns considered Russia to pose a much greater danger to the Baltic states than Finland.'⁷

- b. Tuleb hoolikalt **kaalutleda**, mis kasu oleks loobumisest.
come.3SG carefully consider.INF what benefit be.COND giving.up.ELA
'(One) must carefully consider what the benefits would be of giving up.'⁸

- (29) a. Kergelt **juurdlen**, et äkki aitaks ka poolest tunnist.
slightly ponder.1SG that maybe help.COND also half.ELA hour.ELA
'I'm thinking a bit that maybe half an hour would also help...'⁹

- b. Maailma liidrid **juurdlevad**, miks ei ole Lähis-Idas rahu.
world.GEN leaders ponder why NEG be.NEG Middle-East.INESS peace
'World leaders wonder why there isn't peace in the Middle East...'¹⁰

Impressionistically, these predicates all share some degree of meaning: they describe cognitive acts of self-reflection or consideration of alternatives. In (27a) and (29a), for example, the speaker describes their attitude towards a particular potential resolution of a decision-

⁵<http://thela-thela.blogspot.com/2011/02/voib-mitte-meeldida.html>

⁶<http://www.ekspress.ee/news/paevauudised/eestiudised/olleralli-2010-kus-leidub-tallinna-odavaim-olu.d?id=32457689&com=1>

⁷http://www.loodusajakiri.ee/eesti_loodus/artikkel1538_1508.html

⁸<http://www.eestikirik.ee/?p=7545>

⁹<https://sinitihane.wordpress.com/2010/06/01/leivakupsetamismaania/>

¹⁰<http://usumaaailm.harta.ee/loe.php?tuup=opituba&id=10>

making process, such as how to decorate an office. I will collectively refer to these predicates, including *mõtlema*, as *contemplatives*. Estonian contemplatives are systematically chimerical: they convey doxastic attitudes with embedded declaratives, and inquisitive ones with embedded interrogatives.¹¹ This is unlike other responsive predicates we've seen, which tend to express the same basic attitude regardless of the type of their complement.

In this chapter, I argue that despite their superficially chimerical behavior, a unified treatment for contemplative verbs is not only possible, but desirable. Rather, following Uegaki (2016) and Elliott et al. (2017), I propose we treat these verbs as fundamentally *inquisitive*, in the sense that they underlyingly select for questions. Moreover, I propose that *mõtlema* is a paradigmatic example of a predicate which expresses an attitude of contemplation, an ontologically primitive sort of 'inquisitive imagination' where one considers questions in the abstract, which is distinct from better-studied attitudes like belief. The divergent interpretations of *mõtlema* with declarative and interrogative complements will be derived not by complex semantic machinery, but by the pragmatic reasoning associated with contemplating singleton vs. non-singleton sets of propositions.

The structure of the chapter is as follows: in §3.2, I discuss the empirical properties of *mõtlema*, a case study for contemplation. In §3.3 I propose a question-embedding semantics for contemplation, and show how it accounts for certain entailment patterns for *mõtlema*-reports. In §3.4 I detail how the pragmatics of contemplation yields different interpretations of *mõtlema* in different contexts. In §3.5, I compare my question-embedding account to other plausible treatments of responsive predicates, and demonstrate that only if *mõtlema* selects for a set of propositions can we account for the full range of data. Section 6 concludes.

¹¹It is worth noting that predicates which receive radically different interpretations depending on properties of their complement are far from unique to Estonian or contemplatives. Recent work on a number of typologically diverse languages has revealed a number of verbs which are similarly chimerical (see Bogal-Allbritten 2016 on Navajo; Özyıldız 2017 on Turkish; Bondarenko 2020 on Buryat). Any comprehensive theory of clausal embedding should be flexible enough to account for the existence of chimerical predicates.

3.2 Basic properties of *mõtlema*

We have seen that in at least some cases, *mõtlema* has a doxastic interpretation with an embedded declarative (*'mõtlema p'* utterances), and an inquisitive interpretation with an embedded interrogative (*'mõtlema q'*). While I believe this same basic property to hold of other contemplative verbs, this chapter will focus primarily on *mõtlema* because it is easily the most common contemplative lexical item, and intuitions about its use are therefore more readily accessible to native speakers. The data in this section comes from three sources: naturally occurring on-line speech, a parallel corpus of George Orwell's English-language novel *1984* and its Estonian translation (MULTEXT-East; Erjavec 2012), and fieldwork with 7 native Estonian speaker consultants in Washington, DC; Stockholm, Sweden; and Tallinn, Tartu, and Haapsalu, Estonia, between 2015 and 2020. Unless otherwise specified, examples are constructed; in examples from the MULTEXT-East corpus, English translations are the aligned parallel text from the English-language version of the novel.

3.2.1 *Mõtlema* with declarative complements

3.2.1.1 Doxastic interpretation

As *mõtlema* is often translated as English *think*, it seems reasonable at first brush to compare it to other doxastic predicates, such as *arvama* 'think', and *uskuma* 'believe'. When the attitude holder (corresponding to the grammatical subject of the verb) has a belief in some proposition *p*, all three verbs can express the subject's belief in *p* with an embedded declarative:

- (30) Inimesed {mõtlevad/arvavad/usuvad}, et olla tugev tähendab mitte kunagi
people MÕTLEMA/think/believe that be.INF strong means NEG never
tunda valu.
feel.INF pain
'People think that being strong means never feeling pain.'

Like *think* and *believe* in English, these three verbs are non-factive. Although all three verbs

can ascribe belief in the embedded proposition to the subject, none of them require that same belief of the speaker. This is exemplified by examples like (31), in which the speaker indicates their disagreement with a third party's belief.

- (31) Aarne {*mõtleb*/*arvab*/*usub*}, et Helsingi on Rootsis. Ta on nii loll!
Aarne MÖTLEMA/thinks/believes that Helsinki is Sweden.INESS he is so dumb
'Aarne thinks that Helsinki is in Sweden. He's so dumb!'

Additionally, *arvama* (and to a lesser extent, *uskuma*) can be used to embed expressions with predicates of personal taste, using *mõtlemata* in the same context gives rise to the anomalous interpretation that the attitude holder believes the taste predicate to be an objective truth.

- (32) Mu õde {*arvab*/*#mõtleb*}, et šokolaad on maitsev.
my sister thinks/MÖTLEMA that chocolate is delicious
'My sister thinks that chocolate is delicious.'

Based on the evidence we have seen so far, we could explain the contrast between *mõtlemata* and the other doxastic attitudes as about the degree of commitment: *mõtlemata* is weak, and *arvama* and *uskuma* are strong. This would straightforwardly explain the observation in (32). Because *maitsev* 'delicious' is a predicate of personal taste, the evaluator of deliciousness (here, the speaker's sister) has supreme epistemic authority over the truth of the embedded proposition. (I will return to the question of how beliefs verbs interact with predicates of personal taste in Chapter 5.)

This approach also seems promising when we consider contexts where the subject is not fully certain about the truth of *p*. Simons (2007) points out that in English, verbs like *think* can be used as not-at-issue matrix verbs ('parentheticals') in cases where speakers wish to distance themselves from commitment to an embedded *p* or indicate the weakness of their evidence for *p*. Should this be true, *mõtlemata* is predicted to be preferred to *arvama* in cases where speakers intend to hedge. This is borne out, as we see in (33).

- (33) *Context: My coworker asks where Mary is. I heard a rumor that she was on vacation in Boston, but I don't really know her well enough to be really sure.*

Ma {mõtlen/?arvan}, et Mary on Bostonis.
 I MÖTLEMA/think that Mary is Boston.INESS
 'I think that Mary is in Boston.'

A speaker who uses *arvama* in (33) indicates that they have good evidence for knowing Mary's whereabouts, rather than mere hearsay or conjecture. Because the context does not license a confident assertion, *arvama* is judged degraded compared to *mõtlema*, which indicates a lesser degree of certainty.

3.2.1.2 Imaginative interpretation

Very roughly, the three verbs in a straightforward belief ascription like (30) can be used interchangeably. However, *mõtlema* cannot be freely substituted for these close counterparts in all contexts. While *arvama p* and *uskuma p* entail that the subject believes *p* in the actual world, *mõtlema p* differs in that it is felicitous in some contexts where the speaker believes the attitude holder is acting in a way that merely suggests they believe *p*, or even if they outright believe $\neg p$.

For instance, consider the sentence in (34), in a scene from *1984*, in which the protagonist, Winston, is being tortured by O'Brien, an agent of the authoritarian government. Winston suggests to O'Brien that the government's actions will eventually lead to its downfall because people will be outraged by its atrocities. O'Brien brushes off the suggestion, telling Winston that human nature does not exist:

- (34) Te mõtlete, et on olemas midagi niisugust, mille nimi on
 2PL MÖTLEMA that is be.INF.INESS something this.kind.of what.GEN name is
 inimloomus [...] human.nature
 'You are imagining that there is something called human nature [...]'

[MULTEXT-East: Oet.3.4.48.2]

Let p be the proposition *there is something called human nature*. In the context preceding (34), Winston does not explicitly claim p , but implicates it by suggesting that people will revolt against the government. O’Brien, in uttering (34), indicates that Winston is acting in a way that suggests he believes p , and goes on to refute p . What is important here is that the belief O’Brien ascribes to Winston here is inferred, rather than explicitly known. In a similar context, use of *arvama* ‘think’ instead of *mõtlema* in a similar context is reportedly ‘presumptuous’ about Winston’s beliefs.

While *mõtlema* can be used to attribute weak beliefs to a party beyond the speaker, *mõtlema p* can also strikingly be used in contexts where the attitude holder believes $\neg p$. For instance, a speaker might use *mõtlema* to describe a context in which they are explicitly imagining that a particular proposition is true, even while grounding themselves in a reality where p is false.¹²

(35) *Context: I am discussing with my friend what life would be like if an asteroid had not collided with the earth at the end of the late Cretaceous period.*

Ma {mõtlen/#arvan/#usun}, et dinosaurused on ikka elus, kuigi ma tean, et
 I MÖTLEMA/think/believe that dinosaurs are still alive although I know that
 ei ole.
 NEG be.NEG
 ‘I’m thinking about dinosaurs still being alive, even though I know that [they] aren’t.’

In this case, the speaker asserts that they *mõtlema p* even though they know p to be false in actuality. Note that the embedded clause here does not contain any overt modalization or conditional morphology. Rather than making a claim about their beliefs regarding the actual world, the speaker uses *mõtlema* to introduce a situation they are imagining or provisionally entertaining. The speaker’s friend can understand that *mõtlema* is not an assertion that the speaker incorrectly believes that dinosaurs are still alive because it is already clear in the conversational

¹²The judgment in (34) is admittedly difficult for some speakers; many prefer a modal in the subordinate clause. Nevertheless, (35) is felicitous with *mõtlema* for many speakers if the context is tightly controlled.

Speaker's assumption	$\text{DOX}_x^w \subseteq p$	$\text{DOX}_x^w \not\subseteq p$
Interpretation of x <i>mōtlema</i> p	' x believes p '	' x imagines p '

Table 3.1: English paraphrases of x *mōtlema* p given different doxastic states of x

context that the speaker has no such beliefs. On the other hand, had the speaker used *arvama* in lieu of *mōtlema* in (35), their denial of p would be deemed contradictory. If it is abundantly clear in context that the subject of *mōtlema* does not in fact believe p , then *mōtlema* p is still felicitously, but it does not mean something like *believe* p .

3.2.1.3 Summary

As we have seen, sentences of the form x *mōtlema* p can be truthfully uttered in a variety of contexts. Strikingly, these utterances are flexibly interpreted depending on what the speaker assumes about x 's beliefs. If the speaker believes that the subject x can reasonably be assumed to believe p (either because they know that to be the case or x 's belief in p is presumed to be in the common ground), then *mōtlema* receives a doxastic interpretation. However, it does not entail that x believes p ; importantly, the inference of belief is defeasible.

On the other hand, if the speaker has good reason to believe that x does not believe p (either because there is insufficient evidence to think this is the case, or because x is presumed to believe $\neg p$), *mōtlema* can receive an *imagine*-like interpretation. This is the case both in situations where the speaker thinks p is compatible with x 's beliefs, and situations where they believe it is not compatible.

This pattern is schematized in 3.1, where DOX_x^w is x 's doxastic state in w , formally, the set of worlds compatible with x 's beliefs in w .

3.2.2 Mõtlema with interrogative complements

3.2.2.1 Inquisitive interpretation

The canonical use of *mõtlema q* is in situations where the subject does not know the answer to *q*, but is curious about it. For instance, (36) would be a fairly natural use of this construction:

(36) *Context: An unexpected knock occurs at the front door.*

Ma mõtlen, kes ukse taga on.
I MÕTLEMA.1SG who door.GEN behind is
'I wonder who is at the door.'

First-person *mõtlema* with an embedded interrogative is licit in contexts where the speaker doesn't know the answer to that interrogative, but is nevertheless inquisitive about what that answer might be. We can show that subject-ignorance of the true answer to the embedded interrogative is compatible with *mõtlema*: the sentence in (37) can be uttered following (36) without generating a contradiction.

(37) Ma ei tea, kes ukse taga on.

I NEG know.NEG who door.GEN behind is
'I don't know who is at the door.'

In fact, (37) is judged by many speakers to be quite redundant as a follow-up to (36), which suggests that (37) is part of the meaning communicated by (36). This inquisitiveness is also observed with interrogative complements of other contemplative verbs, such as *mõtisklema* (38):

(38) *Context: A Facebook comment to a business suggesting that its attempt to work in many different countries and deal with labor laws might prevent it from scaling up.*

Mõtisklen, et kuidas teie ärimudel skaleeruvale startupile
contemplate.1SG that how your business.model scalable.ALL startup.ALL

vastab?
responds.3SG
'I'm wondering how your business model responds as a scalable startup.'¹³

In context, the writer of (38) appears to challenge the presupposition of the embedded question—namely that the business in question succeeds as a scalable startup, by presenting themselves as agnostic as to the true answer to the embedded question (perhaps because, in their view, the business model does not succeed in scalarity).

3.2.2.2 Pontificating interpretation

Just as the doxastic inference of *mõtlemä p* can disappear in the right context, so too can the ignorance inference disappear with *mõtlemä q*. A statement of the form *mõtlemä q* can be conjoined with an explicit commitment to one answer or another to *q*, as in (39):

(39) Liis mõtleb, kas sajab vihma, kuigi ta teab, et sajab.
Liis MÕTLEMA.3SG Q falls rain although she knows that falls
'Liis is thinking about whether it's raining (and what it might be like in situations where it is or isn't), even though she knows that it is.'

While (39) is undoubtedly strange out of the blue, it is felicitous in a situation where the speaker makes abundantly clear that Liis is mentally evaluating what the world *could* have been like in situations where it was not raining, such as evaluating the viability of contingency plans for a picnic. In other words, she can consider both worlds compatible with what she knows to be true and counterfactual worlds side by side. This is in stark contrast with an English paraphrase of (39) with *wonder*, which sounds contradictory:

(40) #Liis is wondering whether it's raining, even though she knows that it's raining.

This suggests that *mõtlemä q* contrasts with *wonder q* in that only the latter requires that the sub-

¹³Anonymized for privacy.

ject be unsettled with respect to q . Contrived though (39) may be, it nonetheless demonstrates that ignorance with respect to the answer to q is not entailed by $m\tilde{o}t\tilde{l}e\tilde{m}a\ q$, and must arise from other means. That being said, all else being equal, the ignorance implicature is generally quite strong. In order for (39) to be felicitous, the conversational context must be extremely rich: Liis must be musing about counterfactual situations in which it is not raining, and comparing their properties to situations in which it is raining. Absent contextual understanding that Liis is unsettled about the weather, a statement that she $m\tilde{o}t\tilde{l}e\tilde{m}a$ whether it is raining is extremely likely to be interpreted as indicating she is ignorant about the rain.

The use of $m\tilde{o}t\tilde{l}e\tilde{m}a$ here can be thought of as idle pondering, similar to the ‘musing questions’ of Northrup (2014). In such cases, the subject considers possible answers to question, independently of whether the question is settled in the actual world. The attitude holder instead situates herself in a world in which the question is not settled, one in which she can consider the merits and characteristics of the various outcomes. Such ‘imagination’ cases don’t entail anything one way or the other about how the speaker feels about the question in the actual world. Just as with declarative complements, $m\tilde{o}t\tilde{l}e\tilde{m}a\ q$ seems to variably implicate ignorance depending on the speaker’s estimation of doxastic state of the attitude holder: only if the speaker believes that the attitude holder has a belief about the answer to q does the ignorance inference disappear. These distinct interpretations of $m\tilde{o}t\tilde{l}e\tilde{m}a\ q$ can be summarized as below:

Speaker’s assumption	$\exists p_n \in q[\text{DOX}_x^w \subseteq p_n]$	$\nexists p_n \in q[\text{DOX}_x^w \subseteq p_n]$
Interpretation of $x\ m\tilde{o}t\tilde{l}e\tilde{m}a\ q$	‘ x thinks about q ’	‘ x wonders q ’

Table 3.2: English paraphrases of $x\ m\tilde{o}t\tilde{l}e\tilde{m}a\ q$ given different doxastic states of x

3.2.3 Summary

On the surface, the kinds of attitudes that $m\tilde{o}t\tilde{l}e\tilde{m}a$ can express are multifarious: it can convey a doxastic attitude towards a proposition or an inquisitive one towards a question, though neither of these are part and parcel of an utterance of $m\tilde{o}t\tilde{l}e\tilde{m}a\ p$ or $m\tilde{o}t\tilde{l}e\tilde{m}a\ q$. Though these two

guises of *mōtlema* seem to be in some way ‘canonical’, both the doxastic meaning of *mōtlema p* and the inquisitive meaning of *mōtlema q* are cancelable, strongly suggesting that they are not strictly part of the lexical meaning of *mōtlema*. Crucially, both *mōtlema p* and *mōtlema q* can convey quite different attitudes toward the embedded clause depending on the speaker’s assumptions about the attitude holder’s beliefs.

This is not to say that *mōtlema* expresses a constellation of totally unrelated meanings. Indeed, there is still a common core of meaning in all of the above cases. In what follows, I will attempt to precisify what this core of meaning is, and demonstrate that from it one can derive the kaleidoscope of *mōtlema*-interpretations.

3.3 The logic of contemplation

However we characterize the meaning of *mōtlema*, it should be flexible enough to accommodate its various interpretations. In this section, I will propose a unified lexical entry for *mōtlema* (and, by extension, other contemplative predicates) and show that it captures the facts outlined in §3.2, and makes good empirical predictions for other entailments of *mōtlema*-reports. The two main claims here are 1) that only an interrogative denotation (i.e., a set of propositions) for contemplative complements can derive the full range of interpretations of *mōtlema*, and 2) the verb crucially relates an agent to their *contemplation state*, an ontologically primitive mental workspace which consists of a set of questions which restrict the attitude holder’s imagination in particular ways.

3.3.1 Contemplation states

One commonality *mōtlema* sentences all seem to share is that the attitude holder has a particular (potentially singleton) set of alternatives under some kind of active mental consideration. These alternatives may or may not overlap with their beliefs. In this simplistic view, contemplation is an (ontologically primitive) attitude that bears no formal relationship to other attitudinal states

an agent might possess, such as a doxastic state or bouletic state. In this section, I will flesh out a formal notion of ‘contemplation’ which importantly characterizes it as an attitude towards questions, and show that this analysis can help us account for inferences which *mōtlema*-statements allow us to draw.

3.3.1.1 The ontology of contemplation

As a first pass, we can treat contemplation as an attitude toward questions of which an agent is consciously aware. Call the collection of such questions that agent’s *contemplation state*. Given that in most mainstream views of formal semantics sets of questions don’t themselves straightforwardly correspond to any particular sort of linguistic object, a contemplation state should be thought of strictly as something attitudinal, rather than mind-external (as in the ‘attitudinal objects’ of Moltmann 2003; *et seq.*). Questions can end up in a contemplation state for all kinds of reasons: A contemplater can mull things over in their mind to muse on other possible realities, to evaluate outcomes when making a decision, or to daydream, to name a few possibilities. This bears a certain kinship to the idea of *imagining*—evoking alternate states of affairs in the mind.

A substantive body of philosophical work considers the act of imagining as a mental state which consist of representing some state of affairs in the mind which may or may not overlap reality (e.g. Chalmers 2002, Byrne 2005). Imagination is often treated as a propositional attitude, much like belief. But while contemplation as defined here certainly has a representational flavor, treating contemplation as a propositional attitude has unwelcome consequences.

Suppose that instead of a contemplation state consisting of questions, it is a set of propositions, and *mōtlema* denotes a relation between agents and propositions. Because when *mōtlema* takes an interrogative complement the resulting sentence has a flavor of inquisitiveness, we might take this to mean that *mōtlema q* is contributing universal quantification over propositions in the set denoted by its complement, and predicating of each proposition that it is in the subject’s contemplation state. This would seem to capture the intuition that *mōtlema q* requires one, at some level, to be thinking about the various possible answers to *q*.

Putting type-related compositional issues aside for the moment, we could also suppose that *mõtlema p* is taken to mean that the attitude holder has *p* in their contemplation state, which would again capture the intuition that the subject of *mõtlema p* is devoting their mental attention to *p*. A consequence of this approach is that it follows that a sentence of the form *x mõtlema q* entails *x mõtlema p* for every *p* which is an answer to *q*. This is however an unwelcome consequence, as in actuality, none of these entailments are valid:

- (41) Liis mõtleb, kas sajab vihma.
 ‘Liis *mõtlema* whether it is raining.’
 ≠Liis mõtleb, et sajab vihma.
 ‘Liis *mõtlema* that it is raining.’
 ≠Liis mõtleb, et vihma ei saja.
 ‘Liis *mõtlema* that it is not raining.’

For instance, a natural context in which to utter (41) is one in which Liis is deciding whether to bring an umbrella or not when going out, a choice which is dependent on which answer to the question of whether it is raining is true. Intuitively, this involves entertaining two separate propositions, *p = it is raining* and $\neg p = it is not raining$, *qua* answer to the question of whether it is raining. The question, then, is what exactly this relation between agents and propositions is, and how it relates to contemplation.

If we had assumed that instead of universal quantification over propositions *mõtlema* contributed existential quantification, we would expect the reverse entailment pattern to hold; it would necessarily be true that *mõtlema p* entailed any *mõtlema q* given that *p* is a complete answer to *q*. Unfortunately, this is again not a valid inference:

- (42) Liis mõtleb, et sajab vihma.
 ≠Liis mõtleb, kas sajab vihma.

These observations in (41) and (42) spell trouble for the notion that *mōtlema* can be conceived of as propositional attitude, as it seems we cannot simply reduce *mōtlema q* to any *mōtlema p*. Instead, *mōtlema* seems to relate an individual to some set of propositions directly, without explicit reference to the content of that set. What if instead *mōtlema* was an **inquisitive** attitude in the sense of Friedman (2013), which fundamentally has a question as its content? A ‘contemplation state’ could then be construed as a set of questions.

Much philosophical literature on clause-taking predicates assumes a decomposition of inquisitiveness into a combination of desire and belief: *wonder q* is commonly paraphrased as *want to know the answer p to q*. This is an intuitive and analytically attractive reduction, since it suggests that the content of these attitudes could be handled with the familiar tools of propositional logics. However, there is no reason *prime facie* that we should expect that agents can’t relate to sets of propositions without having some relation to individual propositions, just as I might not fear any one particular wasp on its own, but would certainly run for cover if presented with a swarm of them. This view is not without precedent. Notably, Friedman (2013) argues that attitudes like *wonder*, *inquire*, and *investigate* have questions as their content, but crucially, not in a way that is reducible to propositional content. Questions are an ontologically primitive component of mental attitudes.¹⁴¹⁵

The attitudes which Friedman examines to motivate this view are all rogative predicates—they embed interrogatives and not declaratives. So if *mōtlema* is similarly an interrogative attitude, we will need an account for how, both conceptually and formally, it can take declarative complements and communicate a doxastic meaning. I will revisit this question in §3.4 and §3.5.

¹⁴Friedman explicitly does not take a side on whether questions are sets of partial answers (Hamblin 1973) or complete ones (Groenendijk & Stokhof 1982) since it is not relevant for her purposes. What is important here is that questions do not have a meaning which is propositional.

¹⁵See Carruthers (2018) and references therein for arguments beyond language that inquisitiveness is a fundamental mental capacity.

3.3.1.2 Contemplation and inquiry

Assuming that *mōtlema* is expressing an attitude towards questions, we need to formalize what the nature of that attitude is, what logical properties it has, and how it maps onto the observed interpretations of *mōtlema* across contexts. The crux of my proposal is that contemplation is an inquisitive attitude analogous to imagination for propositions. It is relativized to individuals—being a mental object—in a particular world. A contemplative attitude interacts with an agent’s contemplation state, loosely characterized as follows:

(43) CONTEMPLATION STATE (informal version)

A **contemplation state** of an agent x in world w , CONTEM_x^w , is the set of all questions q such that x contemplates q .

It’s not terribly useful to define contemplation in terms of itself, so we need to specify what it means for x to contemplate q . While contemplation is not itself propositional, we could still profitably analogize it to propositional attitudes. Believing a proposition p , for instance, means, under most accounts, being in a state such that exactly the worlds which are p -worlds are candidates for the actual world. Similarly, to want p can be thought of as being in such a state as to prefer p -worlds to other worlds in some way. Whatever the specific attitude, having an attitude towards p means having a judgment about what it is that p -worlds have in common. Along the same lines, we might imagine treating an attitude towards q as a judgment about the commonalities of q -propositions.

Friedman (2013; 2017; 2019) proposes that inquisitive attitudes share two components: an element of ‘suspended judgment’, in which the subject lacks a belief on some issue, and a teleological state of ‘inquiry’, or aiming to answer some particular question. Crucially, these ingredients manifest sequentially: in the process of trying to resolve some question q , an agent first checks their memory to see if they know q or not. If not, and they intend to go ahead with resolving the question, they will enter a state of inquiry about q , which might motivate them to

ask a question, conduct an investigation, and so on. Informally, to inquire about q is to not know the answer to q but aim to—very similar to the want-to-know’ paraphrase. Indeed, this seems like a useful place to start for *mõtlema*, since it closely matches the intuitions with examples with embedded interrogatives like (44):

(44) *Context: A forum thread seeking advice about pets and dog-breeding.*

Mõtlen, kas paaritada või mitte.
MÕTLEMA.1SG Q pair.INF or not
‘I’m wondering whether to breed [my dog] or not.’¹⁶

Assuming that the embedded nonfinite clause here can be paraphrased as something like ‘whether I should breed my dog or not’, the speaker of this first-person example is indicating that she doesn’t have an opinion about the right answer to this question (suspension of judgment). Upon realizing this, the speaker decides she wants to know the answer to the question (inquiry), evident by the fact that she explicitly made the request for information on a web forum.

But *mõtlema* is not *wonder*, so if a *mõtlema* attitude necessarily involves suspended judgment about some question, we would be at a loss to explain the basic *mõtlema p* cases in which the subject is taken to believe p , to say nothing of the fact that it would be surprising *mõtlema* could take declarative complements at all. There is not much for the subject to inquire about in these cases, since *mõtlema p* only seems to involve a single proposition. However, there is a way out, if we assume that *mõtlema* does not combine with a proposition directly, but rather can take a proposition which has been turned into a question in some way, such as through a silent type-shifting operator. The cognitive act that the two uses of the verb share is this evaluation of a particular kind of mental object—a question.

I note here that we must take care in thinking of these contemplated objects as "questions", as they do not necessarily have anything to do with interrogative illocutionary force.

¹⁶Adapted from <https://naistekas.delfi.ee/foorum/read.php?24,10015511> and extraneous material modified for space.

Formally, I simply mean that they are sets of propositions. While it is true that there is an unmistakable inquisitive flavor associated with many *mõtlemä*-attitude reports, that can in some cases be plausibly attributed to the fact that the attitude holder's contemplation state contains a non-singleton question. Depending on the complement of *mõtlemä*, this inquisitiveness may manifest as making a decision between concrete alternatives, as in (44), or merely considering an indeterminate number of counterfactual realities (45):

- (45) Mõnikord mõtlen, mis oleks siis, kui võru keelest oleks saanud
 sometimes MÖTLEMA.1SG what be.COND then if Võro language be.COND became
 kirjakeel.
 written.language
 'Sometimes I wonder what it would be like if Võro were a written language?'

This attitude report describes an active mental process of the attitude holder (here, the speaker) involving the consideration of a set of alternatives all at once. This is the essence of contemplation: it involves the active imagination of structured sets of propositions. What follows is a sketch of how this cognitive act could be defined, and what some of its formal logical properties are.

3.3.1.3 Contemplation as 'inquisitive imagination'

In logics which treat imagination as a propositional attitude, it is fundamentally agentive: the act of imagining requires the attitude holder's intentional attention to some particular proposition or situation (e.g. Niiniluoto 1985, Costa-Leite 2010). But what does it mean to 'imagine' a question or set of propositions?

Suppose that imagining a question is the same as imagining every answer to that question. If imagination is closed under conjunction, imagining p and $\neg p$ would be equivalent to imagining $p \wedge \neg p$. This treatment would mean contemplating any Hamblin-question results in imagining a contradiction, since for a Hamblin-question q , $\cap q = \emptyset$. While there is substantive debate on whether imagining contradictions is possible, this approach also does not capture

the intuition that the attitude holder in a sentence like (44), where *mõtlema* takes an embedded polar interrogative, is understood to be considering two situations at once: in this case, one corresponding to each outcome of the question of whether to breed or not. This example cannot, however, be used to describe imagining a situation in which she both breeds and does not breed her dog.¹⁷ A similar argument can be made for closure under disjunction.

Rather, the intuition we want to capture is that the attitude holder of *mõtlema* is taking a ‘bird’s-eye view’ of the question as a whole—they situate themselves in a situation in which multiple resolutions to the question are possible. Conceptually, this is similar to the *perceptual imagination* of Chalmers (2002; p. 151). As Chalmers puts it:

Perceptually imagining that *p* differs from supposing that *p*, or from entertaining the proposition that *p*, in that it involves an attitude not just toward *p*, but toward some specific situation that stands in a certain relationship to *p*. [...] More generally, one can say that when one perceptually imagines that *p*, one perceptually imagines a situation that verifies *p*.

The idea here is that imagining a proposition *p* entails conceiving of a particular situation which would make *p* true, in the sense of situation semantics (Barwise 1981, Barwise & Perry 1983). I assume that situations are partial worlds, which can be partially ordered in the sense of Kratzer 1989—and possible worlds are maximal situations. Imagining that it is raining today in Santa Cruz, for instance, involves the mental act of picturing what effects rain would have in Santa Cruz: perhaps what it would look like on Pacific Avenue, how the air would smell, how it would sound, and so on. Note that this is quite different from imagining a *world* in which it is raining in Santa Cruz, since worlds are specified for much more than that, such as whether Alpha Centauri is about to implode or how many hairs are on the head of the Icelandic prime minister. In other words, we do not imagine worlds because we want to allow for imagining acts to be indeterminate with respect to parts of the world that do not directly bear on what is being imagined.

¹⁷This situation is of course metaphysically impossible, but that does not necessarily mean it is unimaginable. See discussions in Niiniluoto (1985) and Wansing (2017) for discussions to this effect.

The use of situations here does not completely avoid this problem, since imagined situations also need not be completely specified either (imagining that it's raining doesn't require one to be committed to imagining a particular number of raindrops in that storm, even if that arguably bears on the notion of whether it's raining). One thus needs to assume some kind of contextual domain restriction on situations (e.g. Recanati 2004) or the incorporation of agent attention (Westera 2017) to account for this indeterminacy. This is a very general problem with situations, and fully solving it here will take us too far afield. For now, I will assume that imagined situations can be somehow restricted to precisely those components which bear on the truth of a particular proposition, and leave the question of how exactly that restriction occurs to future work.

Although imagination is generally conceived of as counterfactual, this imagined situation is not likely to differ much from the agent's conception of reality. Imagined situations tend to adhere to an internal logic, in that some things follow and others don't, in a way that largely mirrors the imaginer's real-world experiences (Byrne 2005). All else being equal, this logic is close to what we take reality to be: If I imagine a situation in which it rains today, I will get wet in that situation if I go outside without an umbrella. On the other hand, if I am wondering *whether* it will rain, I am imagining both raining-situations and non-raining-situations side by side, perhaps even comparing them against one another.

So what sort of situations are imagined when contemplating a question q ? I assume that it is possible to imagine multiple distinct situations in what I will collectively term an individual's *imagination space*. Formally, an imagination space is a set of situations which an agent is in some sense actively attending to.¹⁸ The intuition here is that if an agent contemplates of q is in some sense 'entertaining' the various answers to q as a restriction on their imagination space: namely, for every answer to q , the contemplater is imagining at least one situation in which that answer is true.¹⁹

¹⁸This is not to say that an 'imagination space' in the sense here necessarily has any relationship to the English verb *imagine*.

¹⁹There is the additional question of whether these imagination space situations must be 'counterfactual' in that

This is a good start to capturing the intuition of contemplation, but it is still not quite enough to say that contemplation is simply saying one’s imagination space contains situations compatible with each answer. Simply put, the act of contemplating q requires one’s attention to be fixated on q , so the imagination space should not contain a bunch of extraneous worlds irrelevant to answering q . I formalize this as a constraint on the imagination space: it must not contain situations which don’t settle q . Empirically, this requirement is also needed to handle contemplating singleton sets of propositions. Contemplating a question with only one answer (as in *mōtlema p* cases) intuitively means imagining only situations in which p is true.

Before we spell out the details of contemplation states, one more formal assumption is required: namely, the relationship between a situation and a proposition. I assume that parts of a world w (i.e., situations) form a complete join semilattice with maximal element w (Bach 1986, Lasersohn 1990), and that a situation s ‘entails’ a proposition p iff the following holds:

(46) **Situational entailment of propositions**

If s is a possible situation and p a proposition, then s entails p ($s \models p$) iff either of the following conditions hold:

1. For all w such that $p(w) = 1$, $s \leq_p w$, i.e., s is a subpart of w , and there is a w' such that $p(w') = 0$ and $s \not\leq_p w'$, i.e., s is not a subpart of w' . If this holds, we say that s exemplifies p .
2. There is a situation $s' \leq_p s$ such that $s' \models p$.

In other words, a situation entails a proposition p if either 1) that situation holds in all worlds in which p is true, and moreover, that situation is non-trivial (it is no so small as to be a subpart of all possible worlds), or 2) it has subparts which entail p . The intuition this is intended to capture that what it means for a situation to entail a proposition is either contain only things which are

they are minimally different from an actual situation. This might be empirically justified, since in general, imagined situations still have laws and properties which align with the imaginer’s perception of reality (Byrne 2005). I do not take a firm stand here on the issue, but a counterfactual restriction on imagination spaces could be easily implemented without impinging on the core of this proposal.

relevant to making that proposition true (‘exemplify’ p in the sense of Kratzer 1998), as well as situations which elaborate upon exemplificational situations.²⁰ With this in mind, I will turn now to the formal definition of the contemplation state:

(47) CONTEMPLATION STATE (final)

A **contemplation state** of an agent x in world w , CONTEM_x^w , is the set of all questions q such that x has an imagination space IMAG_x^w with the two following properties:

•**Live-answerhood**: $\forall p \in q [\exists s \in \text{IMAG}_x^w [s \models p]]$

•**Imaginative exhaustivity**: $\forall s \in \text{IMAG}_x^w [\exists p \in q [s \models p]]$

Breaking the contemplation state down, what it means for an agent to contemplate a question q is to imagine a set of situations, each entail some answer to q (live-answerhood), and that moreover that the imagination state contains only situations in which q is settled in this way (imaginative exhaustivity). Notably, there are no semantic restrictions on the relationship agent’s imagination state and their beliefs. However, this is not to say contemplation and belief are unrelated; far from it. But as I will argue, this connection is mediated largely by pragmatics, not semantics.

3.3.2 A lexical entry for *mōtlema*

With a precise notion of contemplation in hand, I turn now to the semantics of ‘contemplative’ verbs, of which *mōtlema* is a prototypical example. The definition of contemplation states does the heavy lifting here: I propose that *mōtlema* denotes a function from questions to a property of individuals such that those individuals hold those questions in their contemplation state. This denotation captures *mōtlema*’s intuitive range of meanings combined with relatively

²⁰A curious reader might wonder whether a simpler way to achieve this same end would be to treat propositions as sets of situations, rather than sets of worlds. They would be right: one could do away with making any assumptions about the mereology of worlds by assuming this, and defining entailment in terms of set membership. This would be a perfectly plausible (and isomorphic) formalism; I retain the assumption that propositions denote sets of worlds for continuity with the rest of the dissertation, where situations result in some unnecessary messiness.

fundamental pragmatic principles, which will be outlined in §3.4.

$$(48) \quad \llbracket \mathbf{m\ddot{o}tlema} \rrbracket^w = \lambda q_{\langle (s,t), t \rangle} \cdot \lambda x_e \cdot q \in \text{CONTEM}_x^w$$

This denotation states that one of the elements in x 's contemplation state includes the question defined by the embedded clause. To see how this works with embedded interrogatives and declaratives, first consider the vanilla question-embedding *m\ddot{o}tlema* case of the unknown visitor at the door in an out-of-the-blue context, reprinted below as (49).

$$(49) \quad \begin{array}{l} \text{Ma m\ddot{o}tlen,} \quad \text{kes ukse} \quad \text{taga} \quad \text{on.} \\ \text{I} \quad \text{M\ddot{O}TLEMA.1SG} \quad \text{who door.GEN} \quad \text{behind is} \\ \text{'I wonder who is at the door.'} \end{array}$$

I assume that interrogative clauses denote the exhaustive set of mutually exclusive possible answers to the question instantiated by that clause, à la Hamblin (1958). It is important to note here that nothing crucial rests upon this particular choice of question denotations; As we will see in the following section, the only crucial property of the denotation for question q for our purposes is that every possible world is in some answer to q , i.e., $\cup q = W$, which is also satisfied by the treatment of questions as sets of weakly exhaustive answers (Karttunen 1977). Thus, the embedded clause *kes ukse taga on* denotes a set of propositions consisting of strongly exhaustive answers to the question of who came to the door.²¹

$$(50) \quad \llbracket (49) \rrbracket^w = 1 \text{ iff } q_{\text{SPKR}} \in \text{CONTEM}_{\text{SPKR}}^w, \text{ where } q_{\text{SPKR}} = \{\text{Only A is at the door, Only B is at the door, Only A and B are at the door, Only C at the door, ..., No one is at the door}\}, \text{ i.e., the speaker's imagination state } \text{IMAG}_{\text{SPKR}}^w \text{ is such that:}$$

- a. $\forall p \in q_{\text{SPKR}} [\exists s \in \text{IMAG}_{\text{SPKR}}^w [s \models p]]$ (Live-answerhood)
- b. $\forall s \in \text{IMAG}_{\text{SPKR}}^w [\exists p \in q_{\text{SPKR}} [s \models p]]$ (Imaginative exhaustivity)

²¹Appropriate contextual domain restriction also assumed.

In this example, the speaker is considering alternatives in which varying individuals are at the door. Crucially, the speaker need not have any particular attitude towards any specific answer to the question; however, (49) is still *compatible* with a situation in which the speaker has a concrete belief about the identity of their visitor, unlike the English paraphrase, since their imagination space is logically independent from their doxastic state.

Now, consider when *mõtlema* appears with a declarative complement. I assume that, following Hamblin (1973), an embedded declarative denotes the set containing a unique proposition. Thus, (51a) has the LF (51b):

- (51) a. Ma mõtlen, et Jaan ukse taga on.
 I MÖTLEMA.1SG that Jaan door.GEN behind is
 ‘I think that Jaan is at the door.’
- b. ma mõtlen [et Jaan ukse taga on]

The denotation of the complement is the singleton set {‘Jaan is at the door.’}. We then yield, straightforwardly, truth conditions for (51a) in which the speaker is contemplating a singleton question whose only answer is the proposition that Jaan is at the door:

$$(52) \quad \llbracket (51a) \rrbracket^w = 1 \text{ iff } \{\text{Jaan is at the door}\} \in \text{CONTEM}_{\text{SPKR}}^w$$

With this denotation for *mõtlema* in mind, I will turn now to how contemplation, as we have construed it, can help us better understand some of the logical properties of *mõtlema*-sentences.

3.3.3 Logical properties of contemplation

Contemplation appears to be logically weak; contemplating some q does not necessarily license one to believe any subset of q , for instance. However, this is not to say that there are no valid inferences we can draw from a statement of *mõtlema* q : importantly, contemplation is closed under what I will call ‘proper subquestions’, which we will see makes welcome predictions for empirical behavior of *mõtlema*. The notion of proper subquestion builds on the definition of

subquestion from Sharvit & Beck (2001): q' is a subquestion of q if any strongly exhaustive answer to q' is a partial answer to q . I additionally define a q' as a *proper* subquestion of q if q' is a subquestion of q and q' denotes a non-singleton set of propositions.

The denotation of a declarative clause is a singleton question, but as we will see, *mõtlemä q* does not entail any particular *mõtlemä p*. But by the Sharvit & Beck definition of subquestions, $\{p\}$ would be a subquestion of q if p is a partial answer to q , so it's not quite correct to say that contemplation is closed under *all* subquestions. For reasons we will see shortly, it turns out that both q' and q have to be genuinely interrogative (non-singleton sets) for the inference “*mõtlemä q*, therefore *mõtlemä q'*” to be valid.

In contexts with appropriately constrained domains of *wh*-referents, a single-*wh* question has subquestions which are polar questions about each answer to the superquestion, and a multiple-*wh* question has subquestions in which some of the *wh*-referents are fixed (as well as the subquestions of those questions). This is relevant for our purposes because, as it turns out, *mõtlemä q* entails all *mõtlemä q'*, where q' is a subquestion of q : (53a) entails (53b), (54a) entails (54b), and (54a) and (54b) both entail (54c).

- (53) a. Ma mõtlen, kes peole tulid.
I MÕTLEMA who party-ALL came.3PL
'I wonder who came to the party.'
- b. Ma mõtlen, kas Aloysius peole tuli.
I MÕTLEMA Q Aloysius party-ALL came.3PL
'I wonder whether Aloysius came to the party.'
- (54) a. Ma mõtlen, kes mida sõi.
I MÕTLEMA who what ate
'I wonder who ate what.'
- b. Ma mõtlen, kes maasikaid sõi.
I MÕTLEMA who strawberries ate
'I wonder who ate strawberries.'
- c. Ma mõtlen, kas Aloysius maasikaid sõi.
I MÕTLEMA Q Aloysius strawberries ate
'I wonder whether Aloysius ate strawberries.'

Our semantics for contemplation helps us capture this empirical pattern. To see why, consider first the relationship between (53a), which I will call **who-came** for ease of reference, and (53b), which I will call **whether-A-came**. Let's suppose that the domain is contextually restricted such that there are two potential party attendees, **Aloysius** and **Bernadette**, and assume a minimal model M which contains four possible worlds: w_{AB} , the world where both A and B attend, w_A , the world where A attends and B does not, w_B , the world where B attends and A does not, and w_\emptyset , the world where neither of them attend.

These worlds exhibit some mereological overlap; for instance, w_A and w_{AB} both contain subsituations in which A came, and w_A and w_\emptyset both contain subsituations in which B did not come. Let s_{A+} denote a (generic) situation which exemplifies the proposition *Aloysius came*, s_{A-} the proposition that *it is not the case that Aloysius came*, and s_{B+} and s_{B-} situations which maximally exemplify *Bernadette came* and *it is not the case that Bernadette came*, respectively. We can also define other generic situations s_A , s_{AB} , and so on, which exemplify propositions that exhaustively specify for each individual whether that individual came in a way that corresponds to the possible worlds defined above. The resultant mereological relationship among these situations is illustrated in Figure 3.1.

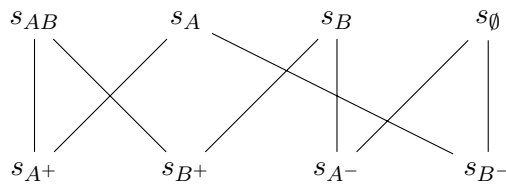


Figure 3.1: Example partial semilattice for situations in M

For example, s_{AB} , a situation that exemplifies the proposition that both A and B came, necessarily contains proper subsituations s_{A+} and s_{B+} , corresponding to situations in which A came and B came, respectively. Keeping this in mind, consider now that the denotation of the embedded question *kes tuli peole* is the mutually exclusive set of answers to this question: (only) A came, (only) B came, A and B both came, no one came. Evaluating this question with

respect to our model, we get:

$$(55) \quad \llbracket \text{kes tuli peole} \rrbracket^M = \{\{w_A\}, \{w_B\}, \{w_{AB}\}, \{w_\emptyset\}\}$$

In order for **who-came** to be true, the subject has to be imagining a set of situations in which we can find at least one situation entailing each proposition in (55) (live-answerhood), and each of those imagination-situations must entail one of those same propositions (imaginative exhaustivity):

$$(56) \quad \begin{array}{l} \text{a. } \forall p \in \{\{w_A\}, \{w_B\}, \{w_{AB}\}, \{w_\emptyset\}\} [\exists s \in \text{IMAG}_{\text{SPKR}}^w [s \models p]] \\ \text{b. } \forall s \in \text{IMAG}_{\text{SPKR}}^w [\exists p \in \{\{w_A\}, \{w_B\}, \{w_{AB}\}, \{w_\emptyset\}\} [s \models p]] \end{array}$$

What must be true about an imagination space that satisfies live-answerhood? Because the answers to q are completely disjoint, a minimum of four situations are required: one per possible answer (an s_{AB} , an s_A , an s_B , and an s_\emptyset). Imaginative exhaustivity militates that $\text{IMAG}_{\text{SPKR}}^w$ does not contain any situation that is not of one of those four types. The truth conditions of **who-came** reduce to (57), where s_A refers to any situation which exemplifies the proposition that A came, and so on:

$$(57) \quad \llbracket \text{ma mõtlen, kes tuli peole} \rrbracket^{M,w} = 1 \text{ iff } \text{IMAG}_{\text{SPKR}}^w = \{s_A, s_B, s_{AB}, s_\emptyset, \dots\}$$

In order for **who-came** to be true, the speaker's contemplation state must contain situations that entail complete answer to the question *who came to the party*, and these situations must be distinct. However, *who came to the party* can be reduced to a set of polar subquestions about whether each individual came to the party. In other words, if I know whether or not Aloysius came, and whether or not Bernadette came, then I will also know (exhaustively) who came. As it turns out, the *mõtleva*-report in (53a) entails contemplating both of these subquestions, independently of the specific facts of the world. For instance, consider the subquestion of whether Aloysius came to the party under *mõtleva* (53b). With respect to M , this question has

the denotation in (58a). Putting this clause under *mõtlema* yields truth conditions which boil down to (58b):

- (58) a. $\llbracket \text{kas Aloysius peole tuli} \rrbracket^M = \{\{w_A, w_{AB}\}, \{w_B, w_\emptyset\}\}$
 b. (i) $\forall p \in \{\{w_A, w_{AB}\}, \{w_B, w_\emptyset\}\} [\exists s \in \text{IMAG}_{\text{SPKR}}^w [s \models p]]$
 (Live-answerhood)
 (ii) $\forall s \in \text{IMAG}_{\text{SPKR}}^w [\exists p \in \{\{w_A, w_{AB}\}, \{w_B, w_\emptyset\}\} [s \models p]]$
 (Imaginative exhaustivity)

Any imagination state that verifies **who-came** with respect to M also verifies **whether-A-came**. To see why, consider that a polar question definitionally denotes a set of two propositions: p and $\neg p$. In order for the speaker of **whether-A-came** to contemplate (58), the live-answerhood condition says that their imagination space must contain at least one situation entailing A coming, and at least one situation exemplifying A not coming. These conditions are both satisfied: s_{A+} is a situation which entails that A is coming, and any s_{AB} and s_A both also entail that A is coming, as they both have s_{A+} as a subpart. Along the same lines, any s_B and s_\emptyset both entail that A is not coming. Imaginative exhaustivity will also be satisfied for **whether-A-came**, since we have just established that any s_{AB} , s_A , s_B , or s_\emptyset will entail one answer or the other to the question in (58a), and we know that any imagination space which verifies **who-came** will only contain situations in those four classes.

This is revealing of a more general fact, which is that contemplating a superquestion entails contemplating any of its proper subquestions. We can prove that any imagination space which satisfies the conditions of contemplation for the superquestion also satisfies those conditions for any subquestion. In the case of the live-answerhood condition, contemplating a question imposes a constraint on IMAG_x^w that for each answer to that question, there is a situation in IMAG_x^w which entails that answer. Both a superquestion and a subquestion range over the same set of possible worlds—namely W . The subquestion in (58) is also a partition over

W , but one which will always respect the cells of the partition in the superquestion—it cannot divide partitions of the super question, only combine them. So any situations which entail an answer to the superquestion will also entail an answer to the (more general) superquestion. A situation which entails that Aloysius came and Bernadette did not, for example, will also entail that Aloysius came.

The second condition, imaginative exhaustivity, is also satisfied by any imagination space which satisfies live-answerhood for a q which partitions W . Because questions partition the space of all possible worlds, every non-tautological situation (that is, a situation is a subpart of some but not all worlds in W) will entail some answer or other to q . Every situation which satisfies live-answerhood will also satisfy this condition, so imaginative exhaustivity in this case amounts to a requirement that the imagination space not contain any tautological situations. Because subquestions of q still partition W , we can also be certain that any IMAG_x^w which satisfies imaginative exhaustivity for q also satisfies it for q' . Having established that both criteria for contemplation are closed for proper subquestions, we can conclude that contemplation as a whole is also closed under proper subquestionhood.

3.3.3.1 Contemplating answers

We have already seen that it is not the case that *mõtlem* q entails any *mõtlem* p . Under our definition for contemplation, this is reflected by the fact that contemplating a question does not entail contemplating its answers. The key insight here is that contemplation of (non-singleton) questions does not entail contemplation of answers to those questions because each answer contains only a proper subset of the worlds which the question partitions.

For instance, consider the sentence in (59a), which has the embedded clause with denotation in (59b).

- (59) a. Ma mõtlen, et Aloysius peole tuli.
 ‘I think that Aloysius came to the party.’

$$\text{b. } \llbracket \text{et Aloysius peole tuli} \rrbracket^M = \{\{w_{AB}, w_A\}\}$$

Here, the proposition *that Aloysius came* contains only worlds in which A came, although there are other worlds in M . Recall that any imagination space which supports **who-came** in M is one which contains at least one situation of each of the kind in $\{s_{AB}, s_A, s_B, s_\emptyset\}$, and does not contain situations not of that kind. This imagination space also satisfies live-answerhood for (59a), because (59b) contains only the proposition that A came, and there are situations in $\text{IMAG}_{\text{SPKR}}^w$ which entail that A came, namely s_A - and s_{AB} -type situations.

Where $\text{IMAG}_{\text{SPKR}}^w$ fails to support (59b) is imaginative exhaustivity. The imaginative exhaustivity condition only holds of (59b) for imagination spaces which contain only situations that entail that A came. However, our imagination space also contains situations that entail that A did not come, namely s_B and s_\emptyset . Since this imagination space supports **who-came** but not (59a), we can conclude that **who-came** does not entail (59a), matching the intuitions of speakers.

More generally, for any singleton question $q = \{p\}$, imaginative exhaustivity is satisfied only by imagination spaces which contain only situations that entail p . This is because if the cardinality of q is 1, imaginative exhaustivity of q (60a) reduces to (60b):

$$(60) \quad \begin{array}{l} \text{a. } \forall s \in \text{IMAG}_x^w [\exists p \in q [[s \models p]] \\ \text{b. } \forall s \in \text{IMAG}_x^w [s \models p] \end{array}$$

The constraint in (60b) is only satisfied by imagination spaces which contain exclusively p -entailing situations. That same imagination space does not satisfy another question q' which contains p in addition to any proposition p' with at least one non- p world, since we cannot guarantee that a situation that entails p' . This is exactly the situation we face with any genuine interrogative: it denotes a question which consists of a mutually exclusive set of propositions. In this way, it will never be possible to satisfy imaginative exhaustivity for a question q as well as the singleton set containing a propositional answer to q .

3.3.3.2 Do we need strongly exhaustive answers?

Importantly, even if we were to use a different sort of possible-answer semantics for questions, subquestion closure still holds. For instance, in Hamblin-Karttunen semantics, a question q denotes the weakly exhaustive set of possible answers to q (i.e., the positive possible answers), so the embedded interrogative of **who-came** would have the denotation (61):

$$(61) \quad \llbracket \text{kes tuli peole} \rrbracket^M = \{ \{w_A, w_{AB}\}, \{w_B, w_{AB}\}, \{w_{AB}\}, \{w_\emptyset\} \}$$

Consider all potential imagination spaces of the speaker which would verify **who-came**. The live-answerhood constraint requires that s_{AB} and s_\emptyset be in IMAG_x^w , since only situations of those kinds will satisfy live-answerhood for the singleton-set answers to q . However, because s_{AB} also entails the remaining two answers to q , no additional situations are required in the imagination space to satisfy live-answerhood. An imagination space containing only s_{AB} and s_\emptyset also satisfies the imaginative exhaustivity constraint. We see that this This gives us a slightly different picture than the exhaustive answer semantics assumes: a IMAG_x^w which contains both s_{AB} and s_\emptyset is sufficient to verify **who-came**.

While this is a formally different result, subquestion closure still holds of contemplation for single-*wh* questions with H-K semantics. Strongly exhaustive and weakly exhaustive denotations of polar questions are identical, so the denotation of a subquestion like *kas Aloysius peole tuli* ‘whether A came’ remains the same: $\{ \{w_{AB}, w_A\}, \{w_B, w_\emptyset\} \}$. The minimal imagination space which verifies **who-came** in H-K semantics is $\text{IMAG}_x^w = \{s_{AB}, s_\emptyset\}$. This imagination space will also verify *kas Aloysius peole tuli*, since it contains a situation entailing in which A came and a situation entailing that A did not come (satisfying live-answerhood), and also doesn’t contain any situations which don’t entail an answer to this subquestion, as before (satisfying imaginative exhaustivity). It does not matter whether IMAG_x^w contains any other additional situations; contemplation of both the question will still entail contemplation of its subquestions.

In our example, the question of who came to the party has two subquestions: ‘Did A come?’ and ‘Did B come?’. The set of weakly exhaustive answers to q therefore includes a proposition *A and B came* which affirmatively answers both subquestions, as well as the proposition *No one came*, which affirmatively answers neither subquestion. In fact, given any q at all, the set of H-K answers to q is going to contain at least two propositions: one in which every proper subquestion of q is true (for every individual x , x came to the party) and one in which every proper subquestion of q is false (no one came to the party).

Consequently, any imagination space IMAG_x^w which verifies $q \in \text{CONTEM}_x^w$ is going to be one which contains, at the minimum, one situation $s_{\forall T}$ which entails the positive alternative of every proper polar subquestion, and one situation $s_{\forall F}$ which entails the corresponding negative alternative, as well as potentially some additional situations in which neither is the case. This means that IMAG_x^w will also verify all $q' \in \text{CONTEM}_x^w$, where q' is a proper subquestion of q . Any q' will satisfy live-answerhood, since $s_{\forall T}$ and $s_{\forall F}$ are in IMAG_x^w , and IMAG_x^w will satisfy imaginative exhaustivity, since $\bigcup q' = \bigcup q = W$, as before.

3.3.4 Comparison with Rawlins (2013)

Contemplatives, in the present account, fundamentally select for content which is question-like. An inescapable conclusion of this proposal is the need for enriched notion of attitudinal content which is more than just propositional. An account which shares many similarities with my proposal is that of Rawlins (2013). Rawlins aims primarily to explain how *about*-PPs compose with nominals and attitude predicates. He assumes, following Hacquard (2006), a neo-Davidsonian analysis of attitude verbs, whereby they denote predicates of eventualities (type v). Hacquardian content is a property of attitudinal eventualities: the content of a *believe* eventuality, for instance, is the set of all of the propositions that the relevant individual believes—the intersection of which is that individual’s doxastic state.²²

Rawlins’ notion of content differs slightly from Hacquard’s. He assumes that content

²²This contrasts with the ‘object’ of *believe*, the specific proposition expressed by its complement.

is a curried equivalence relation on worlds, which partitions the set of all possible worlds \mathbb{W} into sets of worlds which satisfy this equivalence relation. Formally, the content of a content-bearing entity can be treated as a set of sets of worlds. In the previous sections we motivated the idea that the content of an act of contemplation is question-like, which seems compatible with Rawlins’s approach.

In an attitude report, the content of the attitudinal eventuality can be determined, by an embedded clause. For example, Rawlins proposes that *think* is a predicate of events with content that has two properties: the Agent’s(subject’s) beliefs are a subset of the domain of that content (in our terms, the content is entailed by the Agent’s beliefs), every alternative in the content is contemplated by that Agent. His lexical entry for *think* (62), then, ‘involves contemplating possibilities that are compatible with an agent’s doxastic alternatives.’:²³

$$(62) \quad \llbracket \mathbf{think} \rrbracket = \lambda e_v. \lambda w_s. \text{Dom}(\text{CON}(e)) \supseteq \text{Dox}_w(\text{Agent}(e)) \wedge \\ \forall p_{st} \in \text{Alts}(\text{CON}(e)) : \text{Agent}(e) \text{ contemplates } p \quad (\text{Rawlins 2013: 352})$$

The second conjunct here is reminiscent of our contemplation states. So we might ask whether this lexical entry, or one similar to it, can capture the full range of facts about *mōtlema*. When *think* takes a declarative complement p , the content of the thinking event is the trivial set of alternatives $\{p\}$. So in such cases, we get that the Agent believes p , because her doxastic state is a subset of the domain of the content of the thinking event, and moreover that she is ‘contemplating’ p . Given that we have established *mōtlema*-sentences don’t strictly depend on any particular doxastic commitments on the part of the attitude holder (i.e. they aren’t belief-entailing), we would have to discard the conjunct requiring that the alternatives the Agent contemplates are compatible with her doxastic alternatives.

While conceptually promising, this view runs into two major problems. The first is in handling the selectional differences between *think* and *mōtlema*. While *mōtlema* is responsive,

²³*Alts* is a function which converts from a partition semantics to a Hamblin set of alternatives. See Rawlins (2013: 352) for details.

think cannot compose with an interrogative clause on its own (63b), a fact which we will see again in Chapter 5. The content of a *thinking* event can be specified by an embedded clause, and it is a set of alternatives. This set need not be a singleton, since *think about q* is allowed (63a).

- (63) a. Vanessa thought about whether it was raining.
 b. *Vanessa thought whether it was raining.

Under Rawlins’s denotation for *think*, there is no reason for (63b) to be ill-formed. In order for (63a) to be true, Vanessa only needs to contemplate two propositions: one in which it is raining and one in which it is not.²⁴ Vanessa’s doxastic state is always going to be a subset of the domain of the content of a question, since questions denote a partition over possible worlds. We also can’t attribute the ungrammaticality of (63b) to the inability to ‘contemplate’ contradictory choices of *p*, either, since that is exactly what Rawlins proposes for (63a). On the other hand, the ungrammaticality of (63b) can be easily explained if we assume that *think* selects for propositions as in a standard Hintikkan account.²⁵

But while this lexical entry might overgenerate for *think*, it seems well-suited for *mōtlema*, since capturing the ability to embed interrogatives is an important desideratum, so it is worth exploring what a Rawlins-style analysis could look like. It would be easy enough to modify Rawlins’ entry to account for the non-doxastic nature of *mōtlema* by simply removing the doxastic restriction on the domain of the attitudinal event (i.e., the left conjunct in (63)). The resultant toy denotation is given in (64).²⁶

- (64) $\llbracket \mathbf{m\ddot{o}tlema} \rrbracket = \lambda e_v. \lambda w_s. \forall p_{st} \in \text{Alts}(\text{CON}(e)) : \text{Agent}(e) \text{ contemplates } p$

Indeed, this looks very close to a neo-Davidsonian version of our lexical entry for

²⁴Setting aside any complications associated with the embedded tense.

²⁵This simplistic treatment of s-selection would unfortunately leave open the question of how *about*-clauses compose with attitude predicates, which is the primary focus of Rawlins’s analysis.

²⁶The domain could in principle be restricted in other ways, but this is orthogonal to the main argument here.

mõtlema in (48). However, unlike the version of contemplation motivated above, Rawlins treats the object of contemplation as propositions, not as questions. As argued in §3.1.1, this makes the unwelcome prediction that *mõtlema* q entails certain *mõtlema* p . This can be easily seen in the simplest case by comparing *mõtlema* p' and *mõtlema* *whether-p'*, where *whether-p'* is the polar question with denotation $\{p', \neg p'\}$:

- (65) a. $\llbracket \mathbf{mõtlema\ p'} \rrbracket = \lambda e_v. \lambda w_s. \forall p_{st} \in \text{Alts}(\{p'\}) : \text{Agent}(e) \text{ contemplates } p$
 b. $\llbracket \mathbf{mõtlema\ whether-p'} \rrbracket = \lambda e_v. \lambda w_s. \forall p_{st} \in \text{Alts}(\{p', \neg p'\}) : \text{Agent}(e) \text{ contemplates } p$

Here the fact that content can be question-like is undercut by the treatment of *mõtlema* as a quantifier over propositions. In order to fix this problem, we would have to make ‘contemplation’ a relation between $\text{Agent}(e)$ and a proposition; however, in the absence of any elaboration of the exact nature of contemplation, this essentially amounts to a version of the account presented above, though in the language of neo-Davidsonian event semantics:

- (66) $\llbracket \mathbf{mõtlema} \rrbracket = \lambda e_v. \lambda w_s. q = \text{Con}(e) \wedge \text{Agent}(e) \text{ contemplates } q$

There is no reason why one could not adopt the notion of contemplation from the present work in this way, but I do not believe that it is necessarily motivated (or de-motivated) by the data discussed here. It should be noted, however, that the Estonian equivalent of *about*-PPs can also occur under *mõtlema*. Objects marked with allative case in Estonian are also permissible as complements of *mõtlema*, in which case, *mõtlema* receives a *think about*-like interpretation. A nominal complement with ordinary object-case marking (partitive, in this case) is not acceptable in the same context:

- (67) a. Ta mõtles Suurele Vennale.
 he MÕTLEMA.PAST big.ALL brother.ALL
 ‘He thought about Big Brother.’ [MULTEXT-East: Oet.3.5.23.6]

- b. *Ta mōtles Suurt Venda.
he MÖTLEMA.PAST big.PART brother.PART

It would not be immediately clear, if *mōtlema* selects for a question how it composes with the allative-case marked object *Suurele Vennale*. A first-pass approximation could be to give allative case a denotation similar to English *about*. Rawlins, for instance, treats *about* as an operator which coerces DPs into 2-alternative ‘subject matters’ related to some salient property of the referent of the DP. However, we have seen that the allative case marking is not licensed in clausal complements of *mōtlema*, nor does this observation help us understand why *mōtlema* can embed declaratives but *about* cannot. But the connection certainly merits further investigation.

Rawlins’s treatment of the content of *think* and my contemplation states share broad empirical similarities. In particular, in both views, there is a clear need for predicates which select for inquisitive content. Crucially, the accounts differ on whether contemplation is a relation between individuals and propositions or individuals and questions, and I argue that the empirical facts about *mōtlema* suggest we should favor the latter. This narrow claim does not invalidate a Rawlins-style approach to content, or indeed even contradict it; however, we should not assume that inquisitive content can always be reduced to propositional content. While there may be inquisitive attitudes which could be fruitfully treated as quantifiers over propositions, *mōtlema* is not among them.

3.4 Pragmatic inferences in contemplation

Having established the meaning of *mōtlema* in terms of contemplation states, one big question remains to be answered: why does *mōtlema* receive the divergent interpretations it does? We want to know when inferences of ignorance arise when *mōtlema* takes an interrogative, and inferences of belief with an embedded declarative.

We’ve also seen that the interpretive ‘flavor’ of *mōtlema* appears to change depending on the speaker’s assumptions about the attitude holder’s beliefs, which suggests we need some

understanding of the link between contemplation and belief. I propose that the interpretations of *mōtlema* across contexts are governed by a general principle which links contemplation and belief, specified in (68):

(68) **Contemplation-belief linking principle:**

All else being equal, speakers should assume that for an agent x in world w with doxastic state DOX_x^w and imagination space IMAG_x^w , for all s in IMAG_x^w , s is a subpart of some w in DOX_x^w , unless the common ground entails otherwise.

This proposal amounts to a default preference for interpreting a contemplation-report as a statement about the attitude holder's beliefs in w in the absence of evidence to the contrary. Specifically, one presented with an utterance of the form x *mōtlema* q should only void the assumption that x 's imagined situations are incompatible with their beliefs if it is known to all conversational participants there is some answer to q that is incompatible with x 's beliefs. Unless we have good reason to believe that our denotation for q contains some answer p that x does not believe, we should take a contemplation report as a statement about x 's doxastic state.

Attitude reports generally convey information about the attitude holder's mental state. Taken on its semantic face, *mōtlema* tells us purely about the attitude holder's imagination space. Imagination in this sense is *attentive*, and we can make reasonable inferences about someone's mental state if we know how they're spending their mental energy. As I will show in this section, in a conversational context where it is clear the attitude holder is settled with respect to q , the imagination-situations associated with contemplation are easily understood as differing from the actual world.

3.4.1 Interpretations of *mōtlema* + interrogative

The basic fact of *mōtlema* q sentences is that they generally convey subject ignorance about the true answer to q . Recall that the semantics here involves an agent weighing a set of alternatives–

different possible resolutions to a question—against one another. Thus, the familiar example (25a), presented with additional context as (69), would have the denotation in (70).

(69) *Context: A is telling me about Liis, who is locked in her windowless basement office with no access to outside information. A reports:*

Liis mõtleb, kas sajab vihma.
 Liis MÖTLEMA Q falls rain
 ‘Liis wonders whether it’s raining.’

(70) $\{\{w|\mathbf{rain}(w)\}, \{w|\neg\mathbf{rain}(w)\}\} \in \text{CONTEM}_l^w$

In order to fulfill live-answerhood, Liis’s imagination space IMAG_l^w must contain both rain-situations and non-rain-situations, i.e., it is unsettled with respect to the question of whether it is raining. In this context, it is clear that it is not in the common ground that Liis has an opinion about whether or not it’s raining, since it is established that she has no way of knowing. By the linking principle, we are then licensed to believe that DOX_l^w contains both worlds which contain rain-situations as a proper subpart, and worlds containing non-rain-situations as a proper subpart, thus giving us the desired interpretation: Liis’s beliefs are also unsettled with respect to the same question of rain. That is to say, it follows that she doesn’t know whether it is raining or not.

The example in (69) exemplifies a context in which Liis’s doxastic state with respect to the embedded question is fully specified: we know from the given context that her doxastic state is unsettled on the question of rain. However, according to our linking principle, the assumption that the situations attitude holder’s imagination space are all compatible with their doxastic state also holds in cases where the common ground doesn’t entail that this compatibility. Rather, the linking principle only fails to hold if the common ground entails that the imagination space and doxastic state are incompatible. For instance, if A uttered (70) out of the blue, their interlocutor would be reasonably licensed to believe that Liis does not know whether or not it is raining, since her being settled on the matter is not in the common ground.

3.4.1.1 When the ignorance inference is not licensed

While *mõtlema q* sometimes licenses ignorance inferences, this implication is sometimes not present even when *mõtlema* embeds an interrogative. Per our linking principle, this occurs when it is in the common ground that the speaker is settled with respect to *q*, as in (71):

(71) *Context: Liis and Tiit know that Siim just read a book about Estonian history which describes all the reasons Estonia lost the 16th-century Livonian War. Liis finds him deep in thought about this, and says to Tiit:*

Siim mõtleb, miks Eesti kaotas sõja.
Siim thinks why Estonia lost war
'Siim is thinking about why Estonia lost the war.'

Liis's assertion indicates that Siim's contemplation state contains the question *why Estonia lost the war*, itself a set consisting of answers to that question:

(72) $\text{CONTEM}_s = \{\{\text{Russian invasions lost Estonia the war, Swedish military aggression lost Estonia the war, ...}\}$

In this context, Liis and Tiit both know that Siim is fully informed about the war in question, so he is presumed knowledgeable about why Estonia lost. In this case, the topic sparked his imagination, and all of those reasons—as well as possible alternatives—are under active consideration. While in the context of the preceding discussion it might seem a bit strange to imagine situations incompatible with one's beliefs, it is perfectly natural in some contexts. For instance, if Siim was a writer of alternative history fiction, he might think about various plausible outcomes for the war and their hypothetical consequences. He might also simply be daydreaming about other realities in the way we all do. None of this requires that he be ignorant as to why the war was lost in the actual world.

The crucial ingredient in cases where *mõtlema q* does not generate the ignorance infer-

ence is the presence of a common-ground entailment that the speaker’s doxastic state is settled about q . This can be seen both in contexts where interlocutors know about the attitude holder’s beliefs in particular (like (72)), but also when the answer to q is obvious or taken to be a matter of common knowledge. For instance, in a context where it is assumed as a matter of basic competence that everyone knows the identity of the Estonian president²⁷, we might take (73) to not be a statement about Siim’s audacious lack of world knowledge, but rather his consideration of counterfactual possibilities:

- (73) Siim mõtleb, kes Eesti president on.
 Siim MÕTLEMA who Estonia.GEN president is
 ‘Siim is thinking about who the president of Estonia is.’

That being said, speakers tend to agree the default preference for taking *mõtlemata* q to mean ignorance is very strong, even in these kinds of general-knowledge situations: often, the ignorance inference will arise without extremely explicit evidence that the attitude holder is settled about q . Thus, it appears that the bar is quite high for what kind of evidence would license someone to override their default bias about the relationship between IMAG_x^w and DOX_x^w .

In this way, the ignorance inference with *mõtlemata* q differs from the ignorance associated with *rogatives* like *wonder* in that the former is pragmatically derived, and the latter is plausible lexically specified. Uegaki (2016), for instance, analyzes the true-answer ignorance associated with *wonder* (and anti-rogatives more generally) as a presupposition that the cardinality of their complement is at least 2. Since *wonder* can only take questions as complements, this requires that the subject is ‘wondering’ about at least two possible alternatives. Even if the type-shifted version of an embedded interrogative is available to *wonder*, a question-version of a declarative sentence is a singleton set.

²⁷Kersti Kaljulaid, at the time of writing.

3.4.2 Interpretations of *mõtlema* + declarative

The same linking principle that explains the differential behavior of *mõtlema q* can also be used to derive the variable interpretations of *mõtlema p*. Consider the sentence in (74a), which is used to (anthropomorphically) indicate that the subject has the contemplation state in (74b):

(74) *Context: My cat is observing how I wait by the door for the pizza boy to arrive, who gives me food.*

- a. Mu kass mõtleb, et pitsapoiss on mu omanik.
my cat thinks that pizza.boy is my owner
'My cat thinks that the pizza boy is my owner.'
- b. $\text{CONTEM}_{cat} = \{\{\{w | \text{pizza boy is SPKR's owner in } w\}\}\}$

Under the current account, the denotation of a declarative complement of *mõtlema* is a singleton question. When this singleton question is in an agent's contemplation state, this amounts to an assertion that agent is imagining p .

When an agent contemplates $\{p\}$, their imagination space must contain only situations that p , as required by the live-answerhood. Once again, our linking principle easily bridges the gap between imagining p and believing p : we assume IMAG_x^w contains only DOX_x^w -compatible situations unless we think there is an 'answer' to $\{p\}$ which doesn't overlap with x 's doxastic state.

Because $\{p\}$ is a singleton set, the default assumption that *mõtlema p* generates the inference that IMAG_x^w contains only situations compatible with DOX_x^w is only voided when $\text{DOX}_x^w \cap p = \emptyset$. This is exactly the circumstance where the speaker believes that x doesn't believe p . On the other hand, if the speaker has no reason to believe that x doesn't believe p , they will go ahead and assume that x 's imagination space is equivalent to their doxastic state. And because IMAG_x^w entails p , so too does DOX_x^w .

And just as in §3.4.1, the inference of the linking principle is defeasible. Our decision

to avoid encoding doxasticity in the lexical entry of *mõtlema* in the first place came from cases where *mõtlema* takes a declarative complement that is explicitly stated to be incompatible with the attitude holder’s actual beliefs, as in the case of sentences like (35), reprinted below:

- (35) Ma mõtlen, et dinosaurused on ikka elus, kuigi ma tean, et ei ole.
 I MÖTLEMA that dinosaurs are still alive although I know that NEG be.NEG
 ‘I’m thinking about dinosaurs still being alive, even though I know that [they] aren’t.’

Given the (hopefully) reasonable assumption that it is considered common knowledge that dinosaurs are no longer alive, for any competent agent x , there is a default common-ground expectation that DOX_x does not contain any worlds in which dinosaurs are alive. According to the linking principle in (68), we should then not take the speaker’s utterance in (74) as an indication they believe dinosaurs to be alive, but are instead merely imagining situations in which that is the case, consistent with the facts about interpreting sentences like (74).

In total, the interpretation of *mõtlema p* rests largely on the plausibility that the subject of *mõtlema* believes p or not: if it is plausible enough, we take *mõtlema* to be an expression of the subject’s doxastic state; otherwise, it describes the subject’s imagination.

3.4.2.1 Imagination and weak belief

There still remains the matter of why *mõtlema p* utterances, when receiving doxastic interpretations, nevertheless express a kind of *weak* belief. In the picture painted by our linking principle, the inference arises naturally from the pragmatics of assertion in conjunction with the ontological properties of the contemplation state. Contemplation states are not populated arbitrarily. The idea is that people tend to contemplate either questions they want to know the answer to, or things they already believe.

Because this method of belief ascription is indirect—as belief is implicated but not entailed—we might expect *mõtlema p* to be associated with a kind of weak belief, especially when considering that while describing beliefs with *mõtlema* is possible, other verbs like *ar-*

vama ‘think’, *uskuma* ‘believe’, and *teadma* ‘know’ which specify doxastic commitment out-right.

It does seem to be the case that *mõtlema*-beliefs are generally weak to some extent, and it is accordingly odd to embed *p* under *mõtlema* if the attitude holder is known to be strongly committed to the truth of *p*. For instance, we have seen that predicates of personal taste such as *maitsev* ‘delicious’ are infelicitous in declarative *mõtlema*-complements if the subject of *mõtlema* is third-person:

- (75) Mu õde {arvab/#mõtleb}, et šokolaad on maitsev.
my sister thinks/MÕTLEMA that chocolate is delicious
‘My sister thinks that chocolate is delicious.’

The truth of the proposition *šokolaad on maitsev* is completely dependent on the attitude holder’s beliefs; an agent cannot have weak commitment to her own tastes. It is therefore unsurprising that *mõtlema* is infelicitous here, given that the Estonian speaker has access to a commitment-entailing verb (*arvama*) in the lexicon. Ascribing a belief about taste predicates to an individual should require the use of such a verb rather than a weaker, commitment-implicating verb like *mõtlema*.

Note that we can coerce *mõtlema* to be felicitous in a case like (75) is if the arbiter of tastiness is construed as someone other than the speaker’s sister. Out of the blue, speakers are likely to interpret (75) as describing a (somewhat anomalous) situation in which the speaker’s sister is contemplating some kind of prototypical view of chocolate or general consensus that it is delicious. This coercion is natural: if the truth of the complement clause is no longer dependent on the attitude holder’s beliefs, using *mõtlema* is felicitous.

The equivalent of (35) in English with *imagine*, for instance, is only felicitous if the matrix verb is in the progressive form:

- (76) a. I’m imagining that dinosaurs are still alive, even though I know that they aren’t.
b. #I imagine that dinosaurs are still alive, even though I know that they aren’t.

While *imagine* and *mõtlema* are obviously not identical (*imagine*, arguably, does not embed interrogatives), the contrast in (76) is nevertheless enlightening. Only eventive predicates, not statives, can felicitously occur in the progressive in English, whereas the bare present form appears primarily on statives or habitual events (Dowty 1979). The verb *imagine* can occur in either form, and while the habitual reading is available for (76b), bare present *imagine* is not obligatorily habitual. In other words, *imagine* can describe either an event or a state. While the unambiguously eventive *imagine* in (76a) is licit, (76b) is infelicitous on a non-habitual reading. The reverse holds of cases where *imagine* is ultimately a belief ascription, like in (77):

- (77) A: Where's Lourdes?
 B: I imagine that she's stuck in traffic.
 B': ??I'm imagining that she's stuck in traffic.

Based on this comparison, the difference between belief-*imagine* and imagination-*imagine* might be rooted in aspect, instead of (only) the plausibility that the subject believes the embedded proposition. This is not to say that the variable interpretation of *imagine*—or *mõtlema*—is *because* of some aspectual distinction. In Estonian, the bare present can be used for both stative and non-habitual eventive verbs, so we cannot tell whether the same polysemy occurs in *mõtlema p* sentences on the basis of the given examples alone. However, a listener who hears a *mõtlema* report also lacks explicit cues to the aspect of the verb. Rather, it seems that their interpretation of *mõtlema* is guided by their assumptions about the subject's beliefs independently of the question of aspect. Nevertheless, the connection between interpretations of *mõtlema* and aspect remains an interesting avenue for potential further study.

3.5 Alternative theories of responsive predicates

Having proposed a semantics for contemplativity which is flexible enough to explain the range of interpretations of *mõtlema*, we must now consider the theoretical consequences of the pro-

positional for clausal embedding. In particular, *mõtlema* is an inquisitive sort of responsive predicate—it selects for questions. In this section, I will argue that this in fact the only plausible treatment of *mõtlema*'s selectional properties. I delineate the main hypotheses for the proper treatment of responsive predicates in the literature: that they are systematically polysemous, that they take propositional arguments, and that they take question arguments, and demonstrate that indeed only the third of these possibilities, the question-embedding analysis, is compatible with the *mõtlema* facts.

3.5.1 Polysemy

In Chapter 2, we saw that a major problem for the polysemous view of responsive predicates was that a declarative clause and an interrogative clause could be conjoined under a single use of a responsive predicate. This is also true of *mõtlema*. In these cases, the different clauses receive the divergent interpretations we expect of *mõtlema* complements:

- (78) *Context: Your computer won't turn on. You think the problem is the hard drive, but you aren't completely sure, so you take it to a computer repair shop. You also don't know if your computer is beyond the point of saving. Later, you tell your friend:*

Ma mõtlen, et mu kõvaketas on katki ja kas nad saavad selle korda.
 I MÕTLEMA.1SG that my hard.disk is broken and Q they can.3PL it.GEN fix.INF
 'I think [that my HDD is broken]_{DEC} and I wonder [if they can fix it]_{INT}.'

While this is problematic for the polysemous view on its own, it also bears reiterating that given a polysemous view of responsiveness, we might expect for any predicate which is responsive in one language or another, there could exist in principle a language in which the two senses of that word are instantiated with non-homophonous lexemes.

However, there is evidence that verbs with contemplative meaning are also responsive across languages, and no examples (to my knowledge) of verbs which are contemplative and (anti-)rogative. First, responsive contemplative predicates also exist in Finnish, a close relative

of Estonian, among them the apparent *mõtlema* cognate *mieltä* ‘think, ponder’:

- (79) a. Mietin, olisi=ko nyt hyvä hetki myydä.
 think.1SG would.be=Q now good moment sell.INF
 ‘I wonder whether now would be a good time to sell.’ **Finnish**
- b. Mietin, että nyt voisi olla hyvä hetki myydä.
 think.1SG that now might be.INF good moment sell.INF
 ‘I think that now might be a good time to sell.’²⁸ **Finnish**

The Yucatec Maya verb *tuklik* ‘think, believe’ also exhibits similar semantic and distributional characteristics to *mõtlema*. AnderBois (2016) points out that *tuklik* is canonically used to express belief in an embedded declarative clause (80), but as Verhoeven (2007) notes, it can also be used to report the cognitive act of imagining a counterfactual situation (81). AnderBois (p.c.) also indicates that use of *tuklik* with a *wonder*-like meaning is attested in online speech, though further investigation is needed.

- (80) K-in tukl-ik yan u k’áax-al ja’.
 IMP-A1 think-SS will A3 fall-SS water
 ‘I think it’s going to rain.’ **Yucatec Maya** (AnderBois 2016: 6)
- (81) K-in tukl-ik-e’ túun tàal.
 IMP-A1 think-SS-TOP PROG.A3 come
 ‘I imagine that he comes.’ **Yucatec Maya** (Verhoeven 2007: 303)

While it’s true that the existence of semantically similar responsive predicates in multiple language doesn’t preclude that these predicates are systematically polysemous, it does suggest the necessity to investigate the link between lexical semantics and the embedding behavior of a predicate. If these predicates are polysemous across languages, we should seek an explanation for the systematicity of polysemy in any case. On my account, the embedding behavior of contemplatives follows from their lexical semantics. Merely treating these predicates as polysemous does not provide a compelling answer in and of itself to the question of **why** they are

²⁸Thank you to an anonymous reviewer for these examples.

responsive.

3.5.2 Reduction

Turning now to reductive accounts, the clear problem for *q*-to-*p* reduction, which I have argued extensively in this chapter, is that there is no available paraphrase of *mõtlema q* sentences of the form *mõtlema p*; this is clearly fatal, since for any *q* embedded by *mõtlema* there is no corresponding *p* we could substitute *q* for while preserving meaning.

As for *p*-to-*q* reduction, such an account would deliver equivalent results, in principle, to the present account, since it would treat all complements of *mõtlema* as questions. However, there is no clear reason to do so in this particular case, since it offers no additional empirical coverage and requires an additional stipulation in the form of a type-shifting operation.

This may seem like a trivial choice, but further evidence against the idea that there is a type-shifter in the LF embedded declarative clauses of Estonian responsive predicates comes from complementizers. A distinguishing feature of embedded interrogatives in Estonian is their ability to appear optionally with the complementizer *et* (82), which is also used to introduced embedded declaratives (though, interestingly, not relative clauses).²⁹ Such constructions are also possible with Estonian's close relative, Finnish *että* (83):

(82) Maarja küsis, (et) kas Arvo tuleb.
Maarja asked (that) Q Arvo comes
'Maarja asked whether Arvo would come.'

(83) Kysyin, (että) olisiko nyt hyvä hetki myydä.
asked.1SG (that) would.be-Q now good moment sell.INF
'I asked whether now would be a good time to sell.'

In the case of sentences like (82) and (83), the versions with and without the complementizer are judged to be quite close in meaning, if not completely identical. Their compositional meaning contribution is, therefore, minimal. Since *et(tä)* appears on the left periphery of an embedded

²⁹Thanks to an anonymous reviewer for this line of thinking, as well as the Finnish data.

question, it seems quite likely that it should compose with the embedded question itself. Therefore, the meaning of *et(tä)* is something close to identity in these cases, analogous to the English complementizer *that* which can also be admitted in a great many subordinate clauses. To spell it out further: *et(tä)* selects questions and outputs questions.

Assuming the string-identical relationship between the *et* or *että* is non-accidental, we have a conundrum. As mentioned, these complementizers are also utilized to introduce ordinary declarative embedded clauses, as exemplified by their use with anti-rogative predicates. In such cases, the complementizer is obligatory in standard Finnish and virtually all dialects of Estonian as in (84).

- (84) Ma loodan, *(et) põrgus on õlut.
 I hope *(that) hell.INESS is beer.PART
 ‘I hope there is beer in hell.’³⁰

This is, plainly, incompatible with a single *et* which selects questions, without some true compositional gymnastics: the embedded declarative would need to be type-shifted into an interrogative, and moreover, the lexical semantics of *loodan* would need to be adjusted to maintain its status as anti-rogative, and reject other question complements.

The most obvious solution is that there are two lexical entries for *et* (and, by extension, *että*): one which takes propositional arguments, and one which takes declarative arguments. While I hesitate to posit two separate lexemes for homophones when their shared meaning is apparent, to do otherwise would require a serious re-evaluation of assumptions about the nature of semantic selection.

The fact that Finnish and Estonian both employ embedded questions with these sorts of templates provides a piece of evidence in support of a question-embedding account of Re-sPs, because of the apparent requirement that complementizers occur at the very left edge of a clause—and in particular, above the landing site for *wh*-words.

³⁰The translated Estonian title of the Tucker Max bestseller *I Hope They Serve Beer in Hell*.

Assume, for a moment, that Estonian ResPs did admit only declarative complements by virtue of selecting propositional arguments. In order for embedded questions to be type-shifted correctly, the type-shifting operator (whatever that may be) must occur to the left of the *wh*-word, and below the complementizer. In this case, the *et* that appears with superficially embedded questions must be the *declarative-selecting* lexical item, because it is forced to combine with a propositionally-typeshifted embedded interrogative. However, in other embedded questions, such as those that appear with anti-rogatives, there is no type-shifting occurring, and we get the other *et*: the question selector.

This predicts coordinate structures where one conjunct contains a ResP and the other an anti-rogative to be ungrammatical, when they are in fact possible:

- (85) Jaan teab, ja Maarja küsib, et kas sajab vihma.
 Jaan knows and Maarja asks that Q falls rain
 ‘Jaan knows, and Maarja is asking, whether it is raining.’

On the other hand, if ResPs do embed questions, there is nothing objectionable about these structures to begin with.

3.5.3 Summary

The primary alternative treatments for the semantics of responsive predicates: polysemy and *q-to-p* reduction, both fare poorly with respect to capture the facts about *mõtlema*.³¹ On the other hand, an AS-like uniform analysis of embedded clauses is straightforwardly compatible

³¹While predicates with the same selectional properties tend to share many semantic similarities, it is entirely possible that we might want to posit different routes to responsivity. For instance, a predicate like *doubt* may embed *whether*-interrogatives but is quite deprecated with constituent interrogatives for many speakers, whereas *know* is free to embed either:

- (86) a. Hortense {doubts/knows} {that/whether} Millie will win the bake sale.
 b. Hortense {??doubts/knows} who will win the bake sale.

Other objections to uniform treatment come from predicates which are responsive only in certain syntactic-semantic contexts, just as *be certain* (Mayr 2017; 2019) or *believe* (Roberts 2019).

with both the inability of *mõtlemma q* to be paraphrased as *mõtlemma p*, as well as its ability to occur in coordinate structures. One issue which I did not address, however, is whether there are relevant differences between AS and InqSem treatments of clauses embedded under *mõtlemma* (i.e., the absence or presence of downward closure of clausal denotations). In the following chapter, I will revisit the question of how well InqSem can account for other clausal-embedding phenomena, though I leave the relative merits of InqSem with respect to contemplatives in particular for future work.

3.6 Conclusion

In this chapter, I investigated a novel puzzle of contemplative predicates like *mõtlemma* in Estonian, which permit both declarative and interrogative complements, but are ‘chimerical’: they apparently yield radically different interpretations with each complement type. I argued that verbs of this kind all share a semantic core of being *contemplative*: they are fundamentally inquisitive acts which involve imagining situations corresponding to alternative answers to an embedded question. A corollary of this proposal is that contemplative predicates are best analyzed as question-embedding, because there is no clear and systematic way to reduce an utterance like *mõtlemma q* to *mõtlemma p*. This contrasts with a substantive body of work which treats interrogative complements of responsivenesses as uniformly reducible to propositions.

Because contemplatives display radically different meanings with declarative and interrogative complements, they are an ideal candidate to investigate these hypotheses. This approach is particularly fruitful in light of the observation that the meanings of clausal-embedding verbs are tightly linked to the syntactic frames in which they appear (White et al. 2014, Anand & Hacquard 2014, White & Rawlins 2018a; *inter alia*). Additionally, the lion’s share of the investigation of properties of responsivenesses in the literature has primarily concerned English, so it is natural to ask about the typological landscape of clausal embedding cross-linguistically. Going forward, detailed and attentive work on a large variety of predicates across languages

is paramount. Chimerical predicates in particular prove interesting test cases for theories of clausal embedding, since they raise natural questions about how embedded clauses compose with attitude predicates. In the current account, the two ‘flavors’ of meaning *mōtlema* may exhibit arise not from special semantic features of the verb or different compositional mechanisms, but general pragmatic inferences applied to particular types of clausal meaning.

It is also worth noting that chimeras also need not differ along the declarative-interrogative dimension. For instance, Bogal-Allbritten (2016) argues that the Navajo verb *nisin* can be used to report doxastic or bouletic attitudes depending on morphosyntactic properties of its complement. Other predicates that seem to encode multiple attitudinal flavors may also prove revealing for how clausal complements may compose with attitude verbs. Anand & Hacquard (2013) provide an account of chimerical ‘emotive doxastic’ predicates like *hope*, which encode both desire and the requirement that their complement be epistemically available to the attitude holder (i.e., a doxastic component), and subsequently has both belief-like and desire-like subcategorization frames. This analysis, too, may prove fruitful for understanding the contemplatives, which have flavors of both belief (typically declarative-embedding) and inquisitiveness (typically interrogative-embedding). If *mōtlema* somehow lexicalizes both of these flavors, we may be able to get a better grasp on the relationship between a predicate’s lexical semantics and the clauses it may embed.

Many outstanding questions remain to be answered, including how to treat non-responsive predicates: if declarative clauses can in principle be type-shifted, why are there verbs which nevertheless forbid declarative complements? A finer-toothed comb should be applied to examining question-embedding behavior more generally. One might ask how contemplatives behave with other kinds of complements which semantically or morphosyntactically resemble questions, including concealed questions, free relatives, and exclamatives.

Finally, there remains the question of whether responsive predicates *should* be treated uniformly at all. While *mōtlema* may resist a proposition-taking semantics, Spector & Egré (2015) provide compelling evidence to treat factive responsives as reducible to proposition-

embedding predicates. There is no reason in principle why these analyses cannot coexist—perhaps there are multiple paths to responsivity. If responsive predicates are indeed heterogeneous in their underlying selectional behavior, inquisitive chimerical predicates like *mõtlema* are a powerful lens for investigating the full range of variation in responsives, and can play an important role in understanding the compositional nature of clausal complementation.

Chapter 4

Building a question-embedder: The case of *can't believe*

If selectional restrictions are lexically specified, it follows that selection is context-insensitive; that is, the selectional properties of a lexical item should not vary when that item occurs in different linguistic environments. Recent work has raised empirical challenges for this view by bringing new data to light (see White 2021). For instance, Mayr (2017; 2019) points out that while (*be*) *certain* ordinarily accepts declarative complements but not interrogative ones, it may license either kind of complement under negation:

- (87) a. Flo is(n't) certain that it's raining.
b. *Flo is certain where it's raining.
c. Flo isn't certain where it's raining.

The contrast between (87a) and (87b) is easily understood if declarative clauses denote propositions and interrogatives do not, and *certain* selects for propositions. However, we cannot straightforwardly maintain this hypothesis in the face of the well-formed (87c), since in this case *certain* appears to compose with *where it's raining*.

There is a way out of this predicament if we dispense with the assumption that the

internal argument of *certain* is propositional, and assume instead that *certain* can select for the denotation of a declarative clause or an interrogative, i.e., it is **responsive**. We might be able then to treat *certain* as we do other responsive predicates like *know* and *say*.

But it cannot be the whole story that *be certain* is simply responsive, because we would not expect the ungrammaticality of (87b). Mayr argues that (87b) is in fact grammatical, but its semantics is systematically tautologous. Because tautologies are informationally vacuous, systematically tautologous structures are generally judged unacceptable (see Gajewski 2007).

This chapter concerns another problem for context-insensitive views of selection. Namely, when the English verb *believe* occurs under a combination of sentential negation and *can* or select other operators, it may take an interrogative complement. Crucially, in the absence of negation or modality, *believe* is severely degraded with the same complement.

- (88) a. Ursula can't believe which candidate won the HOA election.
b. *Ursula believes which candidate won the HOA election.

To make matters more puzzling, *can't believe* has a veridical interpretation, in which it entails the truth of its complement. So while (89a) is most easily understood as reporting that Ursula does in fact believe that Rhonda won the election (but perhaps wasn't expecting that outcome). This contrasts with (89b), whose interpretation lacks a veridical component.

- (89) a. Ursula can't believe that Rhonda won the HOA election.
b. Ursula doesn't believe that Rhonda won the HOA election.

Predicates with variable factivity, a closely related notion, have been identified in a variety of languages. Investigations of such 'factive alternations' have typically focused on factivity which is conditioned on properties of the predicate's complement (Özyıldız 2017, Bondarenko 2020). Here, we are dealing with a different beast altogether: the variable veridicality of *believe* is sensitive to material outside the complement, not within it.

I will argue that *believe*, as well as its equivalents in other languages, must be underlyingly responsive: that is, they lexically select both declarative and interrogative complements, and that its veridical behavior under *can't* is derived compositionally, rather than being an inherent component of any of the construction's proper subparts. To achieve this, I adopt the uniform semantics for declaratives and interrogatives of Theiler et al. (2018; 2019), though crucially, I will argue that their semantics for *believe* is inadequate for capturing its sensitivity to linguistic context. Rather than being selectionally incompatible with an interrogative complement, *believe* on its own yields a trivial meaning with an embedded interrogative. The semantics of *believe* interacts with that of *can't* to do away with this triviality, and derive the desired interpretation.

A secondary claim of the chapter is that the notion of veridicality is derivable, at least in some cases, from a cluster of independent semantic properties of a predicate. Crucially, these ingredients need not all be packaged within a single lexical item, but can be at least partially offloaded to functional elements. Concretely, I propose a fully compositional account of *can't believe*, in which it carries an excluded middle presupposition that, under the proper circumstances, reduces to a presupposition of subject-certainty, which I suggest strongly correlates with veridicality in discourse contexts. However, *believe* only yields such a meaning without violating L-Analyticity (Gajewski 2002) when it occurs under a combination of an abilitative modal and negation. Under this view, veridicality need not be packaged with a particular lexical item, but arises from particular semantic 'ingredients' combining in the right way.

The structure of the chapter is as follows. In §2, I present the basic empirical properties of *can't believe* and why they pose challenges for traditional views of clausal selection. In §3 I delineate the necessary ingredients to license the veridical and interrogative-embedding uses of *believe*—an abilitative modal, a nonveridical operator. In §4 I propose that given an interrogative-embedding semantics for *believe* and certain assumptions about excluded middle presuppositions, modality and clause typing, a range of effects of *believe* under various kinds of operators can be derived. In §5 I discuss some unsolved problems for the account, and §6 concludes.

4.1 How *believe* is shaped by its environment

Intuitively, *can't believe* is used to describe an agent's difficulty in accepting a certain proposition's truth. It is commonly used with first person subjects (90), though other subjects are also possible (91):

(90) I couldn't believe that I had forgotten my umbrella.

(91) Lorna can't believe that her ferret ran away.

In this section, I will explore in greater detail the two key properties of *can't believe*: namely, that it generates an inference which strongly resembles veridicality (though is not in fact only veridical with embedded interrogatives, and not declaratives) and it can embed interrogatives.

4.1.1 (Faux-)veridicality

Veridicality, intuitively, is a property of operators that means they entail their complements. I adopt the following definition of veridicality with respect to declarative-embedding predicates:

(92) **Veridicality of CE predicates with embedded declaratives**

A clausal-embedding predicate V is veridical if V *that* p entails p (Giannakidou 1998).

Know entails (and in fact, presupposes) that its complement is true, so *know* is veridical (93a). *Believe* does not, evidenced by the fact that it can be used with adverbs like *incorrectly* to report a third party's beliefs (93b).

(93) a. Giovanni (#incorrectly) knows that trickle-down economics are good public policy.

⊨ Trickle-down economics are good public policy.

b. Giovanni (incorrectly) believes that trickle-down economics are good public pol-

icy.

≠ Trickle-down economics are good public policy.

Can't believe, on the other hand, seems to behave more like *know* with respect to the speaker's beliefs about the embedded clause. Uttering (94) out of the blue, for example, seems to commit the speaker to the proposition that it is raining:

(94) Sarah can't believe that Fred got her a present.

⊨ Fred got her a present.

What differentiates *can't believe* from *know* is that while *can't believe* generates an *inference* that its embedded clause is true, this inference is defeasible and therefore not entailed. So (94) can be interpreted to mean that Sarah is not capable of believing that Fred got her a present, and in this context, no inference that the embedded clause is true arises. On the other hand, replacing *can't believe* with *know* in the same context results in a sentence which is judged infelicitous, since *know* presupposes the truth of its complement (Kiparsky & Kiparsky 1970; *et seq.*):

(95) *Fred is known to be a liar. He tells Sarah that he got her a birthday present this year, but Sarah does not trust him at his word.*

a. Sarah can't believe that Fred got her a present.

≠ Fred got her a present.

b. #Sarah knows that Fred got her a present.

The veridical-like inference of *can't believe* in contexts like (94), which we could call *faux-veridicality*, is of theoretical interest for at least two reasons. First, it's not what we would expect compositionally, i.e. that a particular belief is somehow possible. Assuming reasonable meanings for *can*, *n't*, and *believe*, *can't believe* with a first-person subject should entail that the

speaker is not committed to the truth of p , which does not seem to be the case:

- (96) I can't believe that roads are melting in the Netherlands!
⊨ Roads are melting in the Netherlands.

Importantly, this faux-veridicality inference does not arise with uses of *believe* embedded under *can* or negation on their own; it is only when these two elements co-occur:

- (97) Lorna can/doesn't believe that her ferret ran away, but it didn't.

If faux-veridicality is a lexical property of clausal-embedding predicates, as is commonly assumed of regular veridicality, then we should not expect *believe* (or any attitude verb) to vary in their expression of faux-veridicality. Rather, the faux-veridicality seems to arise only in configurations with *can't believe*.

4.1.2 Interrogative-embedding

The second notable property of *can't believe* is that it is responsive: it can take either an interrogative complement or a declarative one, whereas *believe* on its own can take only declaratives. Veridicality and responsivity have been argued to be closely linked; Egré (2008) and Spector & Egré (2015) suggest that predicates are responsive iff they are veridical. While this cannot be quite the correct cut for *can't believe*—since while it carries the appearance of veridicality, it is not strictly veridical—this generalization may suggest that whatever it is that makes *can't believe* appear to be veridical also makes it responsive. On the other hand, White & Rawlins (2018b) provide experimental evidence that at the scale of the lexicon, veridicality and responsivity are only weakly correlated (and negatively at that).

In order to make something of the interrogative-embedding behavior of *can't believe*, we must first ask what kind of meaning *can't believe* with an embedded interrogative expresses, and what kinds of interrogatives are embeddable. It has been observed that responsive predi-

icates, when embedding interrogatives, encode a relation between an attitude holder and a proposition which comprises an answer to that question, though as we saw in Chapter 3, this is not always the case (see also Lahiri 2002, Egré 2008, Spector & Egré 2015). Nevertheless, *can't believe* with an embedded interrogative does indeed have this property:

(98) Luis can't believe who won the race.

∴ There is some individual x such that Luis can't believe that x won the race.

This raises the question of whether *can't believe* is also 'veridical-responsive' with respect to interrogative complements: i.e., whether it encodes a relationship to the *true* answer or merely *an* answer. The former does seem to be the case, evident by the fact that *can't believe q* cannot express a false belief of the attitude holder:

(99) *Context: Charlotte won the race.*

- a. Luis can't believe who won the race. #He thinks Morty is the winner.
- b. Luis thinks that Morty won the race. #He can't believe who won the race.

The infelicity of the follow-up in (99) suggests that *can't believe* is in fact obligatorily—or at least usually—veridical with respect to interrogative complements. In this way, the question-embedding behavior associated with *believe* patterns with factive predicates like *know*.

Finally, I note that a complication arises when considering embedded polar interrogatives. It has been long observed that some responsive predicates, notably emotive factives such as *be surprised*, can embed constituent but not polar interrogatives (Karttunen 1977, Grimshaw 1979; and much subsequent work). The same is true of *can't believe*:

- (100) a. *Luis can't believe whether Charlotte won the race.
b. *Charlotte can't believe if the stopwatch was accurate.

I will not provide an account of these cases, but I will return to them in §4.4.1; as it turns

out, observations like (100) are an instantiation of a much more general puzzle surrounding the embeddability of polar interrogatives.

4.1.3 The cross-linguistic picture

It might be tempting to account for the puzzles of *can't believe* by treating it as idiosyncratic: that is, its selectional behavior and veridicality are part and parcel of the *can't believe* construction, which cannot be decomposed.

There are several reasons to believe that a compositional account is necessary. For one, similar facts can be observed with *believe* in languages besides English. That is not to say that there are no important loci of cross-linguistic variation: for instance, some of these languages are like English in that they require a modal and negation to license a veridical reading of *believe* or allow it to embed interrogatives, whereas others need only the negation.

If *can't believe* licensing embedded interrogatives is a property of belief verbs across languages, then it stands to reason that English *can't believe* is not simply an idiom. If there is a degree of non-compositionality endemic to *can't believe*, it is systematic across languages in a way that cries out for explanation.

4.1.3.1 Other modal + negation + *believe* languages

A number of languages are similar to English in that an interrogative complement of *can't believe* is permitted, but negation or ability modals on their own are not enough to render *believe* an interrogative-embedder. Such verbs include French *croire* and Dutch *geloven*. Like *believe*, *croire* and *geloven* cannot license a question on their own (a), with the modal alone (b) or with negation alone (c), but with both negation and *can* can embed both declaratives (d) and *wh*-interrogatives (f). Finally, the equivalents *can't believe* also forbids polar interrogative complements (f):

(101) **French**

- a. *Je crois qui a gagné la course.
I believe who has won the race
- b. *Je peux croire qui a gagné la course.
I can believe who has won the race
- c. *Je (ne) crois pas qui a gagné la course.
I not believe not who has won the race
- d. Je (ne) peux pas croire qui a gagné la course.
I not can not believe who has won the race
- e. Je (ne) peux pas croire que Marie a gagné la course.
I not can not believe that Marie has won the race
- f. *Je (ne) peux pas croire si Marie a gagné la course.
I not can not believe if Marie has won the race

(102) **Dutch**¹

- a. *Ik geloof wie de race heeft gewonnen.
I believe who the race has won
- b. *Ik kan geloven wie de race heeft gewonnen.
I can believe who the race has won
- c. ??Ik geloof niet wie de race heeft gewonnen.
I believe not who the race has won
- d. Ik kan niet geloven wie de race heeft gewonnen.
I can not believe who the race has won
- e. Ik kan niet geloven dat Erlinde de race heeft gewonnen.
I can not believe that Erlinde the race has won
- f. *Ik kan niet geloven of Erlinde de race heeft gewonnen.
I can not believe if Erlinde the race has won

In languages which have a large inventory of possibility modals, there are additional restrictions on which modal can be used in *can't believe*. For instance, in Estonian, the construction only permits modals which can have an ability reading, such as *suutma* (103). I will revisit this observation in more detail in §3.

(103) **Estonian**

- a. *Ma usun, kes võidujooksu võitis.
I believe who race won

¹At least some Dutch speakers prefer the auxiliary-main verb complex in the embedded clauses here to be in the reverse order, i.e. *gewonnen heeft*. However, the pattern of grammaticality in these examples remains the same.

- b. *Ma suudan uskuda, kes võidujooksu võitis.
I can believe who race won
- c. *Ma ei usu, kes võidujooksu võitis.
I not believe who race won
- d. Ma ei suuda uskuda, kes võidujooksu võitis.
I not can believe who race won
- e. Ma ei suuda uskuda, et Marja võidujooksu võitis.
I not can believe that Marja race won
- f. *Ma ei suuda uskuda, kas Marja võidujooksu võitis.
I not can believe Q Marja race won

That there are languages both related and unrelated to English which have *can't believe* constructions that behave, at least at first brush, like English, is suggestive that seeking a more general explanation for the phenomenon is desirable, and that we cannot simply chalk up the behavior of *can't believe* to an English-specific idiom.

4.1.3.2 Negation + *believe* languages

In other languages, the equivalent of *believe* can be veridical in the scope of negation without the presence of an overt ability modal.²

Many of these *don't believe*-embedded clauses are treated as exclamative in typological work (e.g. Michaelis 2001), but preliminary investigation suggests that the full range of interpretations is essentially like English *can't believe*, and independent reasons to disprefer an exclamative-embedding analysis of *can't believe* are discussed at length in Appendix A. Two examples from unrelated languages are presented below.

(104) **Malay** (Michaelis 2001: 1043)

Saya tak percaya siapa yang bercakap.
I not believe who RM spoke.up

²It is reported that English *don't believe* does not license interrogative complements (Uegaki & Sudo 2019). However, a reviewer suggests that at least some varieties of English do allow *believe* to license interrogative complements under negation without a modal. It is plausible that there are different grammars for *believe* in different varieties of English: one which requires the modal to embed interrogatives, and one which does not. Whatever the case may be, a fully cross-linguistic generalization of this phenomenon must take languages which don't need the modal into account; I leave the exploration of interspeaker variation in English to future work.

‘I don’t believe who spoke up!’

(105) **Setswana** (Michaelis 2001: 1043)

Ga ke dumele se re se boneng.
NEG I believe RP we OM found
‘I don’t believe what we found!’

Ivy Sichel (p.c.) points that Hebrew behaves similarly to Malay and Botswana. Anvari et al. (2019) also demonstrate that the combination of the Spanish verb *creer* with a reflexive pronoun licenses veridical inferences and embeds interrogatives under negation. Interestingly, this reflexive *creer* normally has an antiveridical (and in their analysis, contrafactive) interpretation; when it embeds an interrogative, it conveys something like ‘falsely believes one of the true answers to the embedded question to be false’.

(106) **Spanish** (Anvari et al. 2019: 70)

Juan no se cree quién vino.
Juan NEG REFL believe who came
‘Juan can’t believe who came.’

It remains to be seen what factors separate these languages from ones which require a modal. One possibility is that the lexical semantics of *believe* in these languages is different from English *believe* in some important way, though more targeted cross-linguistic investigation is needed to explore this hypothesis. Whatever the reason, what unites languages of this kind with English-like languages is that *believe* must be in the scope of a nonveridical operator (such as negation) to embed interrogatives.

4.1.4 Summary

Believe behaves unusually in the scope of *can* and negation. On its face, *can’t believe* is paradoxical, since its compositional meaning seems most plausibly antiveridical, if anything. But

not only can *can't believe* embed *wh*-interrogatives, it is *veridical* with respect to those complements. Finally, *can't believe* with an embedded declarative has two apparent readings: one which resembles a veridical reading, and one which does not.

Preliminary evidence suggests that these properties of *can't believe* are cross-linguistically robust: I have found no language which lacks a way of allowing *believe* to become an interrogative-embedder, and in no language that I am aware of is *believe* veridical in the absence of negation. It appears to be the case in at least some languages at least some of the time *can* is not needed. While I will not address this particular locus of variation here, it is not altogether incompatible with the analysis I will propose, which allows for the possibility of cross-linguistic variation in verbal lexical semantics. In what follows, I will present the necessary ingredients for allowing *believe* to embed interrogatives in English, though additional work on other languages is sorely needed to better grasp the full picture.

4.2 The necessary ingredients

In this section, I will argue that the (faux-)veridical, interrogative-embedding use of *believe* requires three key ingredients: an ability modal, a nonveridical operator such as negation, and the verb *believe* itself. And as we have seen, the robustness of similar patterns across languages indicates these facts highlight an important underlying fact about natural language meaning in general, suggesting that an idiomatic approach to *can't believe* is not explanatory.

4.2.1 The modal

The range of modals which can license interrogatives under *believe* is limited. Most modals, including *must*, *should*, *may*, do not license veridical *believe* or allow it to embed an interrogative, even in the presence of negation (107).

(107) *I may/must/should not believe who came to the party.

What distinguishes *can* from other modals? One fact is that it arguably encodes **effort** of some kind (Karttunen 1971, Bhatt 1999), analogous to ‘implicative’ verbs like *manage* which indicate their prejacent requires significant effort to achieve.³ For instance, canonical uses of *can’t believe* indicate that the attitude holder has a very difficult time accepting some proposition or other. It cannot be felicitously used to describe a conclusion which was easy for a speaker to arrive at.

Suppose that Susan is a meteorologist in Hawaii, where the weather is generally predicted to be hot and humid year round. Assuming that today is such a hot and humid day, it would be odd to utter (109), because the state of affairs is precisely as Susan would have expected. On the other hand, if Susan is for whatever reason under the mistaken impression that Hawaii is located in the Arctic, (109) is quite reasonable.

(109) Susan can’t believe what the weather is like today.

While ability modals have often resisted straightforward analysis in the study of modality more generally, I will give a brief overview of the relevant properties here, and how they match the empirical facts about *can’t believe*.

In a Kratzerian view of modality (Kratzer 1981; 1991; 2012), there are two main classes of modal bases: epistemic (related to various sources of information), and circumstantial (related to whatever conditions result in a particular state of affairs coming about). Treatments of *can* typically fall in the latter camp, as in the famous example from Kratzer:

(110) Hydrangeas can grow here. (Kratzer 1981)

³It is not completely fair to single out *can*, as there is one other modal which appears to occur in a similar construction: *will*. This sort of construction appears frequently in ‘clickbait’-style headlines with second-person subjects, such as (108), which indicate the tantalizing possibility of learning something unusual, and have a similar veridical flavor to *can’t believe*:

(108) You’ll never believe which celebrity is pregnant.

While I cannot address all the nuances associated with *won’t believe* in this chapter, future work should examine the question of in what ways this construction is similar to, or different from, *can’t believe*.

Crucially, the modal in (110) cannot be interpreted epistemically; rather, it receives the interpretation that the conditions at the current location (sunlight, soil quality, rainfall, etc.) allow for the growth of hydrangeas. This non-epistemic interpretation of the modal is not available in the *can't believe* construction:

- (111) *Context: You and your friend are playing sardines⁴, and your friend is being loud. You want to avoid getting caught, so you hiss:*
??She can't believe that we're here!

Instead, what seems to be the case is that this use of *can* refers to **ability** in the sense of Hackl (1998). As Sæbø (2007) puts it, *can't believe* has a paraphrase like *unable to accept*. Note that this paraphrase is not a perfect match for *can't believe*, as *accept* under *can't* lacks a veridical component:

- (112) *Context: I am convinced that the race was rigged, and even though Charlotte was declared the winner, I am dubious about the validity of the results.*
I can't accept who won the race.

And indeed, while *can't believe* is perhaps the most 'canonical' instantiation of veridical *believe*, it is possible to substitute modal expressions of ability and negation outside the verbal domain and yield similar patterns of inference. In lieu of a modal auxiliary, the suffix *-able* may be used, or the roughly synonymous adjectives *able* or *capable*. If those three components are present, then embedded interrogatives are again grammatical and the veridical reading arises:

- (113) a. It's **unbelievable** who's lecturing us about fake news.⁵
b. My appetite fled as I sat rigidly in my seat, **unable to believe** who was next to

⁴A game which goes by many names, in which one player hides and all other players must find them. When a player finds the original hider, they hide with them, until everyone has found the hiding spot, a bit like reverse hide and seek.

⁵[http://www.wibc.com/blogs/tony-katz/morning-news/its-unbelievable-whos-lecturing-us-a](http://www.wibc.com/blogs/tony-katz/morning-news/its-unbelievable-whos-lecturing-us-about-fake-news)
bout-fake-news

me.⁶

- c. Everyone who was present that night was **incapable of believing** why UEFA allocated this stadium for a European Cup final.

Whatever the surface order of the three ingredients - the modal (M), negation (\neg), and **believe** (B), their LF scope is always identical: negation takes widest scope, followed by possibility and then belief ($\neg > M > B$).⁷

We might then expect that in languages which lexically distinguish between possibility modals which do and do not involve personal ability in the realization of an outcome, only those modals which are compatible with ability readings may be used in *can't believe*. As mentioned earlier, Estonian is such a language. In Estonian only those modals which are compatible with 'participant-internal possibility' readings, in which the modal base is related to the intrinsic capabilities⁸ of whoever brings about the relevant state of affairs, can license veridical interpretations of the verb *uskuma* 'believe' (Erelt 2003, Kehayov & Torn-Leesik 2009). The possibility modals *saama*, *võima*, and *suudma* can all receive participant-internal possibility readings, as seen in (115).

- (115) a. Ma **saan** maratoni joosta.
I can marathon run.INF
'I can run a marathon.'
- b. Ma **võin** aidata autosse tõsta.
I can help.INF car.ILL lift.INF
'I can help lift (it) into the car.'

⁶<http://thechronicleherald.ca/artslife/1523575-david-cassidy-club-med-and-me-%E2%80%98mon-get-happy%E2%80%99>

⁷Oddly, there is a sharp contrast in acceptability when comparing *unbelievable* to *not believable*—the latter is significantly degraded with interrogative complements, despite at least superficially containing semantically identical parts with the same scopal relationships:

- (114) ??It's not believable who's lecturing us about fake news.

It currently remains mysterious to me what difference between *unbelievable* and *not believable* should be responsible for this contrast.

⁸For example, their mental abilities, general demeanor, or other non-physical attributes.

- c. Ma **suudan** hingamata ujuda.
 I can breathing.ABE swim.INF
 ‘I can swim without breathing.’

All three modals are capable of licensing veridical *believe* when paired with negation. This is validated by examples of these constructions with embedded interrogative complements in naturally occurring sentences, seen in examples from the large etTenTen webpage corpus:⁹

- (116) Teie **ei vöi uskuda**, kuidas need raamatud köitsid mu väikesi.
 2PL NEG can.NEG believe how these books engage.3PL.PAST my little.ones
 ‘You won’t be able to believe how these books engaged my little ones.’
- (117) Vahel **ei suuda uskuda**, missugust mõttetut hala suust välja
 sometimes NEG can.NEG believe what.kind.of meaningless wail mouth.ELA out
 aetakse.
 drive.IMPERS
 ‘Sometimes I can’t believe what kind of nonsense comes out of his mouth.’

However, the possibility modals *jõudma* ‘to have the energy’ and *jaksama* ‘to have the physical ability’ are incompatible with the faux-veridical reading of *believe*. The sentences in (118) and (119) only have nonveridical interpretations available:

- (118) **Ei jõua uskuda**, et paljudele ei meenu-gi J.F.K
 NEG have.the.energy.NEG believe that many.PL.ALL NEG remember-even JFK
 läbielamused.
 experiences
 ‘I can’t believe that many people don’t even remember the experiences with JFK.’¹⁰
 ⊨ I don’t believe that many people remember the experiences with JFK.
- (119) Kes ikka veel **ei jaksaks uskuda**, et kevad on kohe-kohe käes, peab
 who still NEG can.NEG believe that spring is right.now hand.INESS must
 minema Sfääri.
 go Sfäär.ILL
 ‘Whoever can’t believe that spring is here right now must go to Sfäär [a restaurant].’¹¹

⁹Searchable online at <http://www.keeveeb.ee/dict/corpus/ettenten/> (interface in Estonian)

¹⁰<https://fp.lhv.ee/forum/invest/132278?locale=et&postId=2811857>

¹¹https://www.facebook.com/pg/Dkokaraamat/photos/?tab=album&album_id=1850868721613734

⊨ Whoever doesn't believe that spring is here right now must go to Sfäär.

So, in Estonian, it seems that while some sort of volitional behavior on the part of the subject is required with *can't believe*, only modals which permit *abstract* ability are compatible with the veridical *can't believe* construction.

4.2.2 The nonveridical component

Thus far, we have mostly seen cases where *believe* occurs under a combination of a modal and negation. However, while the modal is obligatory, negation *per se* is not; other nonveridical operators also license veridical *believe* when combined with a modal, similar to the proposal of Giannakidou (1998) for the licensing of negative polarity items (NPIs). Following Giannakidou, I define an operator *Op* as nonveridical iff *Op(p)* does not entail that *p* (cf. Ladusaw 1980). Several examples of nonveridical operators which, when scoping over *can believe*, license its veridical/question-embedding use are given below:

- (120) a. Can you believe where Gwyneth went on vacation? *Questions*
b. Few people can believe where Gwyneth went on vacation. *Downward-entailing quantifiers*
c. I can hardly believe where Gwyneth went on vacation. *Adversative adverbs*

These possibilities make it clear that negation itself is not a necessity, although nonveridicality is also not a perfect cut; there are some nonveridical contexts in which *can believe* lacks a veridical reading yet cannot embed questions:

- (121) a. *Be able to believe where Gwyneth went on vacation! *Imperatives*
b. ??Usually, I can believe where Gwyneth goes on vacation. *Habitual aspect*

The examples in (121) appear to undercut the emergent generalization that nonveridical oper-

ators can license question-embedding *can believe* in their scope. However, it seems that these putative counterexamples can be explained on independent grounds. *Believe*, as well as *can*, is stative; it cannot be used in the progressive aspect nor can it be the main verb of the complement of *force* (122). Stative verbs make for bad imperatives, and are marginal with habitual markers like *usually* (Dowty 1979), so we can rule out (121a) and (121b) on the basis of the stativity of *believe*, as opposed the nonveridicality (or lack thereof) of imperatives or habitual aspect.

- (122) a. *I am believing that Gwyneth went to Tahiti.
b. *Sharon forced me to (be able to) believe that Gwyneth went to Tahiti.

4.2.3 Summary

I have presented evidence that *believe* must be in the scope of two key ingredients to receive a veridical interpretation or to embed interrogatives: a nonveridical operator and an abilitative modal. Given these ingredients, our task is to devise a recipe to determine how these pieces fit together to yield the surface-level semantic interpretation they do; we must judge *can't believe* not just by its internal character, but by the company it keeps.

4.3 Analysis

In this section, I will argue that veridical/interrogative-embedding *believe* arises compositionally from the interaction of interrogative semantics, negation, modality, and an excluded middle presupposition. In doing so, I will crucially rely on the basic semantics for *believe* of Theiler et al. (2018).

4.3.1 Foundational assumptions

I make extensive use of the terminology and mechanisms of Inquisitive Semantics (Ciardelli et al. 2013). While nothing crucial hinges upon the adoption of InqSem *per se*, it is an attrac-

tive framework because it fundamentally treats declarative clauses and interrogative clauses as semantic objects of the same type, i.e., sets of sets of worlds, as in alternative semantics.

In IS, a state (proposition) is a set of worlds, and the denotation of both declaratives and interrogatives is an *issue*, which is a downward-closed set of states. (Here I use *issue* to refer to such sets, contrasted with *questions*, which are not downward-closed.) Downward closure means that if issue I contains a state s , it also contains every proper subset of s . I write the downward-closed set q as q^\downarrow where relevant (the reader is referred to Theiler et al. 2018 and citations therein for formal definitions of Inquisitive Semantics notions like *issue* and *state*).

I will also assume an Inquisitive denotation for negation as specified by Theiler et al. (2018). This is essential, because ordinary predicate logic negation \neg applies to propositions, rather than sets of propositions. Rather than taking a proposition as an argument and returning the complementary set of worlds in W , like classical negation, inquisitive negation (\neg) takes an issue q and returns the issue consisting of those states which are inconsistent with all states in q .

$$(123) \quad \llbracket \neg \rrbracket = \lambda q_T. \{p' \mid \forall p \in q : p' \cap p = \emptyset\}$$

As we will see shortly, this treatment of negation, and the downward closure of issues, combine in an important way with respect to negated interrogatives and *believe*.

4.3.2 The ingredients, revisited

4.3.2.1 Believe

As a starting point, I assume the Inquisitive denotation of *believe* proposed by Theiler et al. (2018). The basic at-issue content of their lexical entry is given in (124).

$$(124) \quad \llbracket \text{believe}_{IS} \rrbracket^w = \lambda p_T \lambda x. \text{DOX}_x^w \in p$$

Here, T refers to the type of sets of sets of worlds (type $\langle\langle s, t \rangle, t \rangle$). The denotation above

takes an individual x and an issue p and says that x 's doxastic state in w (i.e., the set of worlds consistent with x 's beliefs in w) is a member of (the downward-closed set) p .

A crucial property of *believe* is that it is neg-raising, i.e. $\neg\mathbf{believe}(p)$ is generally interpreted as $\mathbf{believe}(\neg p)$ (Bartsch 1973). This fact does not follow from (124), but we can fix this without making ancillary syntactic assumptions by augmenting our semantics. Following Gajewski (2007), Theiler et al. assume that *believe* carries an excluded-middle (EM) presupposition: namely, x believes p presupposes that x believes either p or $\neg p$.

To this end, Theiler et al propose the final lexical entry for *believe* in (199), which takes the EM presupposition into account.¹² Note that because *believe* does not take propositional arguments, we must formulate the EM presupposition (underlined) in terms of \neg , as well:

$$(125) \quad \llbracket \mathbf{believe} \rrbracket^w = \lambda p_T. \lambda x: \underline{\text{DOX}_x^w \in p \vee \text{DOX}_x^w \in \neg p}. \text{DOX}_x^w \in p \quad (\text{Theiler et al. 2018: 7})$$

This denotation can account for the ordinary inability of *believe* to take interrogative complements. In Theiler et al's view, interrogative clauses denote a downward-closed set of mutually disjoint propositions which partition the set of possible worlds. This has consequences when combined with \neg . Because every possible world is a member of some but not all propositional answers to a question q , there is no world which is incompatible with every state in q . Therefore, $\neg q$ will denote the empty set for any q denoted by an interrogative clause. If we make the reasonable assumption that an agent's doxastic state is never empty, then the negative disjunct of the EM presupposition is contradictory, and the presupposition of *believe* reduces to $\text{DOX}_x^w \in q$:

$$(126) \quad \begin{aligned} & \text{DOX}_x^w \in q \vee \text{DOX}_x^w \in \neg q \\ = & \text{DOX}_x^w \in q \vee \text{DOX}_x^w \in \emptyset \\ = & \text{DOX}_x^w \in q \vee \perp \\ = & \text{DOX}_x^w \in q \end{aligned}$$

¹²In Theiler et al. (2019), the authors separate the EM presupposition from *believe*, proposing a general excluded middle operator instead. This approach is compatible with the present account; what matters for our purposes is that the EM presupposition holds in the world of evaluation of the entire utterance.

I assume that sentences can only be felicitously uttered if their presuppositions are met or are able to be accommodated. Notice that the EM presupposition of *believe q* is equivalent to the at-issue content of *believe q* from (199); this assertion is therefore redundant. Theiler et al argue that this redundancy is responsible for the observation that *believe q*-sentences are generally unacceptable, despite being apparently grammatical. The idea, following Gajewski (2002), is that redundancies of this sort produce unacceptable utterances, redundancies Gajewski terms *L-analytic*. L-analyticity is a restriction on the Logical Form (LF) of grammatical utterances. In effect, a sentence is ungrammatical if its LF contains any constituents that are L-analytic, defined below:

- (127) An LF constituent α of type t is *L-analytic* iff the logical skeleton of α receives the same denotation under every variable assignment. (Gajewski 2002: 28)¹³

The logical skeleton of a sentence is simply its LF, but maximal constituents containing no logical items (such as nouns like *tree*) are replaced with type-equivalent variables. An L-analytic logical skeleton is one which contains subparts that are either tautological or contradictory. What matters for our purposes is that given Theiler et al's definition for *believe*, a sentence like *John believes q* will always be L-analytic. Because *John believes q* presupposes the same content it asserts, whenever this presupposition is met, the assertion of *John believes q* will be true. This is a systematic triviality of the precise kind that L-analyticity is designed to rule out; we will return to how L-analyticity plays a role in veridical *believe* below.

4.3.2.2 The modal

Recall that the modal—an essential ingredient of *can't believe*—obeys certain restrictions: it has to be an ability-oriented possibility modal, such as English *can*. My treatment of the *can* here draws from Kaufmann (2012) and is based in large part on the semantics for the Spanish *capaz*

¹³I have slightly modified Gajewski's definition here because it is ambiguous. In the original, L-analyticity is conditioned on the LS of α receiving 'the denotation 1 (or 0) under every variable assignment.' The formulation here is identical to Gajewski's intended meaning without errant ambiguity.

‘capable’ from Castroviejo & Oltra-Massuet (2018). The formal definition of *can* I will operate with to begin is given in (128), couched in a Kratzerian (1981) ordering semantics:

- (128) $\llbracket \text{can} \rrbracket^w = \lambda R_{eT} \lambda x_e: \exists u_s. u \in \text{BEST}(f_{dispo}(w)(x), g_{AB}(w)(x))[R(x)(u)]$
- a. f_{dispo} is a function from $\langle w, x \rangle$ pairs into a set of propositions that describe the inner make-up (i.e. individual characteristics) of x in w . $\cap f_{dispo}$ is the proposition containing exactly those worlds where x has the same inner make-up as in w .
 - b. g_{AB} is a function from $\langle w, x \rangle$ pairs into a set of propositions that describes states of affairs where x ‘applies their strength of body, character or intellect’ which induces a preorder \leq_g s.t. $w' \leq_g w''$ iff x applies at least as much of these abilities in w' as in w'' .
 - c. BEST is a function from modal base, ordering source pairs $\langle f, g \rangle$ into the set of worlds $w \in \cap f$ such that for all $w' \in \cap f$, $w \leq_g w'$. (See Portner 2009)

While this definition is a mouthful, it expresses a fairly intuitive point: x can R asserts that there is a world compatible with all of x ’s internal characteristics in w where x applies her abilities to their fullest extent where x R ’s. Thus, a sentence with ability *can* like (129a) has a semantic representation like that of (129b):

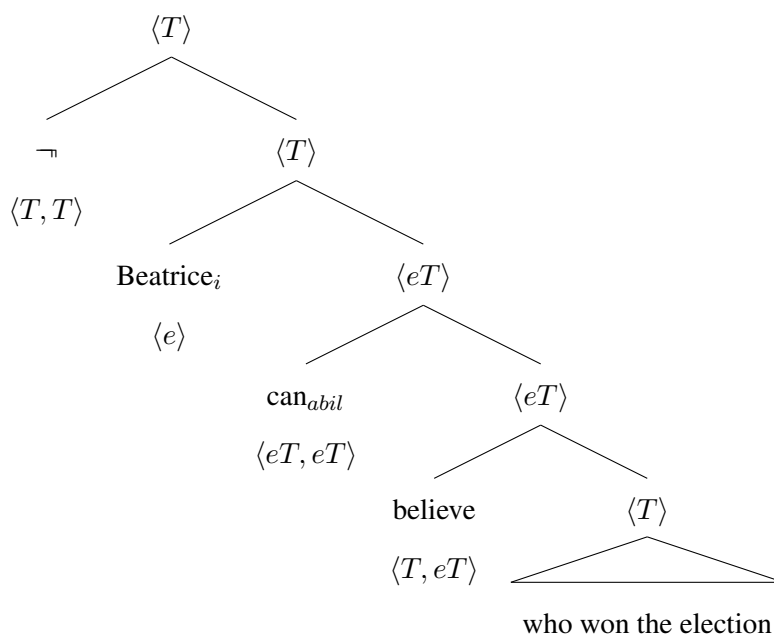
- (129) a. Lorelei can swim.
b. $\exists u_s. u \in \text{BEST}(\cap f_{dispo}(l)(u), g_{AB}(w)(l))[\mathbf{swim}(u)(l)]$

The relevant features of f_{dispo} here are Lorelei’s traits that correspond with her being able to swim—having limbs, being buoyant, and so on. The ordering source arranges the worlds in $\cap f_{dispo}$ in terms of how many of Lorelei’s applications of her strength, intellect, etc. she puts into action. In other words, in the best worlds according to g_{AB} are those in which Lorelei puts her abilities to use. And in at least one of these worlds, Lorelei swims.

4.3.2.3 Logical Form

I will assume an LF for sentences of the form x *can't believe* p as in (130), with type-labeled nodes, and a composition which proceeds through iterative uses of Function Application.¹⁴ I assume that embedded clauses denote objects of type T with their ordinary meaning in Inquisitive Semantics, and remain agnostic about their internal composition. Following Hackl (1998), I also assume that the ability modal scopes below negation (\neg) as discussed above.¹⁵

(130) LF for *Beatrice can't believe who won the election*:



With this in mind, the analysis of *believe* will focus on three key empirical desiderata:

1. *Believe* is incompatible with interrogatives in the absence of a nonveridical operator + ability modal.
2. When under a nonveridical operator + ability modal, *believe* is has a faux-veridical read-

¹⁴I remain agnostic as to the precise syntactic labels each of these projections has; the goal here is compositionality, and a closer investigation of the syntax might yield some fine-tuning of the structure proposed here.

¹⁵A similar assumption can be made for other nonveridical operators which license veridical *believe*, such as adversative adverbs or a polar interrogative operator.

ing, as well as a reading that is not veridical, with an embedded declarative.

3. When under a nonveridical operator + ability modal, *believe* is obligatorily veridical with an embedded interrogative.

4.3.3 Putting the pieces together

The analysis of Theiler et al. (2018) for *believe* has the immediate advantage of not predicting *can't believe q* to fail out of hand because of a type mismatch between the verb and its internal argument. Recall that in their theory, the source of unacceptability of *believe q* sentences is that they are **L-analytic**: when defined, they contain a *T*-type constituent that is either a tautology or a contradiction. In the case of *believe q*, this is because its presupposition is equivalent with its asserted content, rendering the assertion vacuous.

However, note that L-analyticity presumes that putting an L-analytic sentence under negation (or any other operator) should always yield an ungrammatical sentence, since any sentence with an ungrammatical constituent is L-analytic. We noted quite early on that *believe q* is markedly worse than *can't believe q*. If L-analyticity is to blame for the unacceptability of *believe q*, then we should not be able to repair such an utterance by adding *can't* on top.

Rather, the intuition is that *believe q* is unacceptable because its asserted content is entailed by its presupposition; we could imagine that utterances of this kind are systematically unacceptable according to a general condition on utterances like the following:

- (131) For an utterance *u*, if *u* includes presupposed content π and at-issue content α , *u* is unacceptable if $\pi \subseteq \alpha$.

This formulation correctly rules out vanilla cases of *believe q*, but incorrectly predicts that *believe q* sentences are still acceptable when embedded under other attitude predicates, as in (132):

(132) *John said that Belinda believes who won the election.

While (132) presupposes that Belinda has a belief about who won the election, this is not entailed by the assertion of (132). It seems that what matters in this case is not whether there is *global* compatibility between the presupposed and at-issue content of an utterance, but rather if there is redundancy at the clausal level (even if that clause is embedded).

Furthermore, this definition erroneously predicts it to be perfectly fine to embed *believe q* under negation in general, since the presupposition of *–believe q* contradicts its at-issue content rather than entails it, so the conflict between the presupposed and at-issue content must be phrased much more generally. So it seems like we are dealing with a general phenomenon of the following sort: a clause cannot have a presupposition which either entails or contradicts its at-issue content. This is tantamount to a special kind of L-analyticity: a clausal constituent cannot be L-analytic, once we take the presuppositions of that clause into account. Thus, I will propose that our utterance condition be amended as follows:

(133) BLC (**B**an on **L**-analytic **C**lauses)

An utterance *u* is ill-formed if it contains a clausal constituent *c* which is L-analytic provided the presuppositions of *c* are satisfied.¹⁶

I assume here that ‘clausal constituents’ refers to those which correspond to CPs in the syntax, in order to ensure that in clauses with negation or modality, BLC does not apply to the verb phrase on its own.¹⁷ This also correctly predicts that we cannot embed *can believe* under a dubitative verb and obtain the veridical interpretation of *believe* with an embedded interrogative:

¹⁶Many thanks to an anonymous reviewer for the suggestion of this formulation.

¹⁷This formulation raises interesting questions about constituents that behave in many ways like clauses, but are often analyzed as not being CPs, as is true of small clauses (134a) and cases involving ECM (134b):

- (134) a. I believe [him foolish].
b. I believe [him to be a fool].

Because these kinds of constituents cannot be interrogative under *believe*, I set them aside, but future work could put a finer point on what a ‘clausal constituent’ should really be.

(135) I doubt that she can believe who came to the party.

≠ She has a belief about who came to the party.

The role of BLC in constraining semantic interpretations is relatively small, since it applies only to utterances with presuppositions. L-analyticity has little to say about these cases in and of itself, since it only applies to redundancies arising from choice of variable assignment. BLC does have uses outside *believe*, however. For example, BLC can explain the unacceptability of sentences like (136), in which a presupposition contributed by a definition description with a relative clause, cannot render the at-issue content of that utterance redundant. Note that the * here denotes unacceptability, rather than ungrammaticality.

(136) a. *I saw the dog that I saw.

Presupposed: There is a unique, salient dog x such that I saw x .

b. *The cookies were stolen by the one who stole the cookies.

Presupposed: There is a unique, salient individual x such that x stole the cookies.

With this principle in mind, we can now see how our semantics for *believe*, negation, and modality interact to derive the reported judgments. In this and examples that follow, I also will assign a shorthand to two sample constituents, P and Q , a declarative and an interrogative clause respectively, as follows.

(137) a. $P = \llbracket \text{F won the election} \rrbracket = \{\{w: \text{F won in the election in } w\}\}^\downarrow$

b. $Q = \llbracket \text{who won the election} \rrbracket = \{\{w: \text{no one won the election in } w\}, \{w: \text{A won the election in } w\}, \{w: \text{B won the election in } w\}, \dots\}^\downarrow$

Let's first consider the basic case, where *believe* embeds a declarative clause. We should hope that our assumptions don't rule out such cases, and indeed they do not:

(138) a. Beatrice believes that Fran won the election.

- b. LF: [B [believe [F won the election]]]

(139) **Derivation of (138):**

- a. $\llbracket \text{believe F won the election} \rrbracket^w = \lambda x_e : \frac{\text{DOX}_x^w \in P \vee \text{DOX}_x^w \in \neg P}{\text{DOX}_x^w \in P}$
- b. $\llbracket \text{B believe F won the election} \rrbracket^w = \begin{cases} 1 & \text{iff } \text{DOX}_b^w \in P \\ 0 & \text{iff } \text{DOX}_b^w \in \neg P \\ \# & \text{otherwise} \end{cases}$

Here, BLC is not violated; the presupposition *B believes F won the election or B believes F did not win the election* is strictly weaker than the assertion *B believes F won the election*. Although the asserted content does obviate the presupposition, this configuration does not violate BLC.

Turning to an example with an embedded interrogative, we see a case where BLC does correctly rule out an unacceptable utterance.

- (140) a. Beatrice believes who won the election.
b. LF: [B [believe [who won the election]]]

(141) **Derivation of (140):**

- a. $\llbracket \text{who won the election} \rrbracket^w = Q$
- b. $\llbracket \text{believe who won the election} \rrbracket^w = \lambda x_e : \frac{\text{DOX}_x^w \in Q \vee \text{DOX}_x^w \in \neg Q}{Q}$
- c. $\llbracket \text{believe who won the election} \rrbracket^w = \lambda x_e : \frac{\text{DOX}_x^w \in Q}{\text{DOX}_x^w \in Q}$
- d. $\llbracket \text{B believe who won the election} \rrbracket^w = \begin{cases} 1 & \text{iff } \text{DOX}_b^w \in Q \\ 0 & \text{iff } \text{DOX}_b^w \in Q \wedge \text{DOX}_b^w \notin Q \\ \# & \text{otherwise} \end{cases}$

The presupposition of (140) is identical with its at-issue content, so it is tautological if the presupposition is satisfied, and therefore ruled out by BLC. So far, so good: this is again the

core insight of Theiler et al’s analysis, without any additional machinery beyond that which they assume. When *believe* occurs under negation, the facts remain the same: *don’t believe* is acceptable when combined with a declarative complement, but unacceptable with interrogative complements. Again, BLC predicts this result, as seen in the derivations below. Note also that this derives the neg-raising interpretation of *don’t believe*.

(142) a. Beatrice doesn’t believe that Fran won the election.

b. LF: [\neg [B [believe [F won the election]]]]

(143) **Derivation of (142):**

a. $\llbracket \text{F won the election} \rrbracket^w = P$

b. $\llbracket \text{believe F won the election} \rrbracket^w = \lambda x_e : \underline{\text{DOX}_x^w \in P \vee \text{DOX}_x^w \in \neg P. \text{DOX}_x^w \in P}$

c. $\llbracket \text{B believe F won the election} \rrbracket^w = \underline{\text{DOX}_b^w \in P \vee \text{DOX}_b^w \in \neg P. \text{DOX}_b^w \in P}$

d. $\llbracket \neg \text{B believe F won the election} \rrbracket^w = \begin{cases} 1 & \text{iff } \text{DOX}_b^w \notin P \\ 0 & \text{iff } \text{DOX}_b^w \in P \\ \# & \text{otherwise} \end{cases}$

(144) a. Beatrice doesn’t believe who won the election.

b. LF: [\neg [B [believe [who won the election]]]]

(145) **Derivation of (144):**

a. $\llbracket \text{who won the election} \rrbracket^w = Q$

b. $\llbracket \text{believe who won the election} \rrbracket^w = \lambda x_e : \underline{\text{DOX}_x^w \in Q \vee \text{DOX}_x^w \in \neg Q. \text{DOX}_x^w \in Q}$

c. $\llbracket \text{believe who won the election} \rrbracket^w = \lambda x_e : \underline{\text{DOX}_x^w \in Q. \text{DOX}_x^w \in Q}$ (by (126))

d. $\llbracket \text{B believe who won the election} \rrbracket^w = \underline{\text{DOX}_b^w \in Q. \text{DOX}_b^w \in Q}$

$$e. \quad \llbracket \neg B \text{ believe who won the election} \rrbracket^w = \begin{cases} 1 & \text{iff } \text{DOX}_b^w \in Q \wedge \text{DOX}_b^w \notin Q \\ 0 & \text{iff } \text{DOX}_b^w \in Q \\ \# & \text{otherwise} \end{cases}$$

Up to this point, we have not really innovated beyond Theiler et al's analysis, since BLC and L-analyticity make identical predictions for the cases we've considered so far. Where BLC and plain L-analyticity differ is that the latter predicts that we cannot rescue a sentence with an unacceptable constituent no matter how many operators we stick on top of it.

On the other hand, the only constituents that matter for BLC are clauses, so we could potentially repair an unacceptable sentence by adding material clause-internally. To illustrate the differing predictions of Theiler et al and the present proposal, let us consider examples with *can believe*. Recall that *can believe* can take declarative and not interrogative complements. A derivation with a declarative complement is presented in (147).

- (146) a. Beatrice can believe that Fran won the election.
 b. LF: [B [can [believe [F won the election]]]]

(147) **Derivation of (146):**

- a. $\llbracket \text{F won the election} \rrbracket^w = P$
 b. $\llbracket \text{believe F won the election} \rrbracket^w = \lambda x_e : \underline{\text{DOX}_x^w \in P \vee \text{DOX}_x^w \in \neg P} . \text{DOX}_x^w \in P$
 c. $\llbracket \text{can believe F won the election} \rrbracket^w = \lambda x_e : \underline{\text{DOX}_x^w \in P \vee \text{DOX}_x^w \in \neg P} . \exists u \in \text{BEST}(f_{\text{dispo}}(w)(x), g_{AB}(w)(x)) . [\text{DOX}_x^u \in P]$
 d. $\llbracket \text{B can believe F won the election} \rrbracket^w = \begin{cases} 1 & \text{iff } (\text{DOX}_x^w \in P \vee \text{DOX}_x^w \in \neg P) \wedge \exists u \in \text{BEST}(f_{\text{dispo}}(w)(x), g_{AB}(w)(x)) . [\text{DOX}_x^u \in P] \\ 0 & \text{iff } (\text{DOX}_x^w \in P \vee \text{DOX}_x^w \in \neg P) \wedge \nexists u \in \text{BEST}(f_{\text{dispo}}(w)(x), g_{AB}(w)(x)) . [\text{DOX}_x^u \in P] \\ \# & \text{otherwise} \end{cases}$

As predicted by Theiler et al, this sentence is grammatical; it does not result in systematic triv-

ialities at any step of the derivation, and the meaning reached in the final step is a plausible interpretation of the sentence as a whole. Note that I assume here that *can* is a hole for presupposition projection: the excluded middle presupposition survives to the very top layer of the sentence. This is a property true of *can* generally¹⁸:

- (148) I can take my dog to any restaurant in this town.
Presupposes: I have a dog.

With this promising start, let us now consider what would occur with *can believe* and an embedded interrogative. The derivation would proceed quite similarly, but with the notable difference that the EM presupposition will reduce.

- (149) a. Beatrice can believe who won the election.
 b. LF: [B [can [believe [who won the election]]]]

(150) **Derivation of (149):**

- a. $\llbracket \text{who won the election} \rrbracket^w = Q$
 b. $\llbracket \text{believe who won the election} \rrbracket^w = \lambda x_e : \underline{\text{DOX}_x^w \in Q \vee \text{DOX}_x^w \in \neg Q} . \text{DOX}_x^w \in Q$
 c. $\llbracket \text{can believe who won the election} \rrbracket^w = \lambda x_e : \underline{\text{DOX}_x^w \in Q \vee \text{DOX}_x^w \in \neg Q} . \exists u \in \text{BEST}(f_{\text{dispo}}(w)(x), g_{AB}(w)(x)) . [\text{DOX}_x^u \in Q]$
 d. $\llbracket \text{B can believe who won the election} \rrbracket^w =$

$$\begin{cases} 1 & \text{iff } \text{DOX}_x^w \in Q \wedge \exists u \in \text{BEST}(f_{\text{dispo}}(w)(x), g_{AB}(w)(x)) . [\text{DOX}_x^u \in Q] \\ 0 & \text{iff } \text{DOX}_x^w \in Q \wedge \nexists u \in \text{BEST}(f_{\text{dispo}}(w)(x), g_{AB}(w)(x)) . [\text{DOX}_x^u \in Q] \\ \# & \text{otherwise} \end{cases}$$

This result could seem problematic, as the intuitive characterization of (149) is that it is unac-

¹⁸A consequence of this assumption for our purposes is that the world of evaluation for the modalized *can believe Fran won the election* and the EM presupposition of *believe* are the same, even though the modal takes scope over the attitude. Other interesting issues arise when the scope is reversed: see Anand & Hacquard (2013) a.o. for details.

ceptable. An utterance of (149) presupposes that Beatrice believes some p which constitutes an answer to the question "Who won the election?" and asserts that there is an ideal world compatible with her abilities in which she throws the full force of her will into believing some p . While there is nothing strictly speaking about this which is redundant, there is a pragmatic sense in which the asserted content is not contributing much information.

I propose that *can believe q* is not categorically ungrammatical, but rather its general unacceptability is pragmatically-motivated. Consider that there are some contexts in which *can believe q* is felicitous, such as in response to a *can't believe q* utterance, in which the speaker wants to stress a difference between the expectations of two conversational participants about the true answer to the embedded question:

- (151) A: I can't believe who won the election!
B: [I]_F can believe who won the election.

Note that in (151), both A and B are presumed to be committed to having a belief about who won, aligning with the meaning we would expect given the analysis. What seems to be important here is that unlike A, B doesn't find the winner of the election to be surprising, and this fact about B is somehow relevant to the current goals of the conversation. In other contexts where the current goal of the discourse is to determine the credibility of a particular answer to the q , *can believe q* is also markedly better than in out of the blue contexts:

- (152) *A and B are international observers for a contested election in a country with a history of government corruption. They stumble upon evidence that there was ballot-stuffing involved.*
A: Do you find the evidence for electoral fraud compelling?
B: I can believe who won the election, but the huge margin of victory is awfully suspicious.

On the other hand, if the QUD is simply about *what* someone believes, then answering that question with a *can believe* statement is infelicitous. Note that this is true regardless of whether *believe* embeds an interrogative or a declarative.

- (153) A: How many cookies do you think are left in the cookie jar?
- a. B: #I can believe that there are five left.
 - b. B': #I can believe how many cookies are left.

In other words, it seems odd to use *can believe* in discourse contexts where the fact that the verb is modalized is not relevant for the current conversation. However, the fact that in some contexts *can believe q* is licit suggests that it is desirable to not predict it to be categorically ungrammatical.

4.3.4 *Can't believe* and ideal believers

4.3.4.1 What is a non-ideal world?

According to our semantics, an individual *can* do a particular action if in worlds where they use their abilities to the fullest extent, they perform that action. A corollary of this definition is that if a *can*-sentence occurs in the scope of negation, this amounts to a statement that a particular individual will not perform a particular action, even in worlds in which they try their hardest. Intuitively, this seems correct, since following up an assertion that someone *can't* do something with an assertion that they *are* in fact doing that very thing is contradictory (Floris Roelofsen, p.c.):

- (154) a. #Joan can't yodel, but she is yodeling.
b. #Ben can't jump, but he is jumping.

It is clear that something is afoot with *can't believe*, since we do not get the same contradictory

interpretation in comparable sentences; as we have seen, in many contexts *can't believe p* is used when *believe p* is true, though surprising. I propose that what is different about *believing*, as opposed to yodeling or jumping, is with the notion of what it means for a world to be 'ideal' with respect to one's utilization of their abilities to *believe*. In a nutshell, *x can't believe p* can be felicitously uttered in contexts when *x* believes *p* and it is logically impossible for *x* to behave ideally with respect to the way rational agents normally go about forming beliefs, even if *x* is in fact doing their best to be an ideal believer.

To clarify, it is useful to think about this in terms of how we generally update our beliefs. We are constantly faced with new information, and often, this information is easily integrated into our belief state. I may have previously been agnostic as to whether my coworker Gary would wear a red shirt today, but if I see him in a dashing shade of crimson, it won't be terribly difficult for me to update my doxastic state—the set of worlds which I hold to be epistemically possible—to include this new fact.

But information integration is not always this straightforward. We are often surprised about new information, and can even have a difficult time putting credence into evidence that is right in front of our noses. Sometimes, a belief revision is necessary: I may have taken *p* to be true, but in the face of new information which entails $\neg p$, it is possible for me to discard my old, contradictory beliefs if the evidence for *p* wins out.

When faced with new information, how do I decide whether to adopt it in my beliefs or not? There exists a significant literature in philosophy, computer science, and cognitive science on this notion of belief revision. While full justice to the complexity of belief revision is well outside the scope of this paper, there are three major observations that are relevant for our purposes. First, agents cannot maintain inconsistent belief states (Alchourrón et al. 1985). Second, beliefs should only be formed on the basis of sufficient evidence (Doyle 1979; et seq.). Finally, agents should be as conservative as possible with their beliefs, and not discard or revise existing beliefs if they can help it (Gärdenfors & Makinson 1988).

With this in mind, I will propose these three properties of belief revision are the relevant

constraints for integrating new information into one's doxastic state. I formulate them below as maxims; i.e., ideals which rational agents generally try to uphold when faced with the choice of believing p or not. The real nature of belief is surely far more multifaceted than this simplistic set of rules would suggest, but nevertheless, this will get us off the ground:

(155) **Maxims of belief revision**

1. MAXIM OF CONSISTENCY: Do not have an inconsistent belief state (i.e., do not believe propositions p and q such that $p \wedge q$ is a contradiction).
2. MAXIM OF EVIDENTIALITY: Believe only that for which there is extremely good evidence.
3. MAXIM OF CONSERVATION: Do not revise existing beliefs.

It is not always possible to observe all three of these maxims at once. Suppose that I have been carefully tracking Gary's clothing habits every day for the last decade, and I have only ever seen him wear a black shirt. Because the pattern is so robust, I naturally expect Gary to wear a shirt any day. We could just as well render this expectation as a belief, something like *Gary wears black shirts every day*.

When I am faced with Gary in a red shirt, a conflict emerges. I might wish to update my belief state with the proposition *Gary is wearing a red shirt today* by the Evidentiality maxim, but I cannot both do this and also maintain my old belief that *Gary wears black shirts every day* without violating the Maxim of Consistency. I could just as well ditch (or revise) my original assumptions about Gary, but doing so would violate the Maxim of Conservation.

In this situation, I have no choice but to prioritize some maxims over others if I have any hope of maintaining rationality. It is not that much of a stretch to modify my existing beliefs about Gary to accommodate this new information: instead of wearing a black shirt *every day*, perhaps I can simply say that he wears a black shirt *most days*. On the other hand, I would be foolish to deny evidence in plain sight or maintain contradictory beliefs. It is in some sense

less "costly" to modifying one's existing beliefs than believing two things which cannot be true simultaneously or not believing things that are patently obvious. By the Maxim of Conservation, in general, we want to keep as much as possible of our existing doxastic state intact. We can state this formally as a ranking between the maxims, which I assume is observed generally by rational agents:

(156) **Believe your own eyes**

All else being equal, a violation of the Maxim of Conservation is preferable to a violation of the Maxim of Consistency or the Maxim of Evidentiality.

This the crux of what it means to be unable for me to believe p : there is no world in which I both believe p and also adhere to the three maxims, because doing so is a logical impossibility. In the case of *can't believe q* , however, there is an additional wrinkle: the subject certainty which is derived from the EM presupposition. The utterance as a whole presupposes that the subject is certain about some p , but that in no ideal world could they be certain about that p .

The conjunction of these two observations, of course, is that the world of evaluation is non-ideal, and the speaker was forced to give up one of the maxims. If we take it for granted that speakers will never maintain inconsistent belief states, we are left with one of two options: stop believing things that are well-evidenced, or modify existing beliefs. In the case of *can't believe q* , the certainty presupposition indicates that the speaker errs on the side of doing the latter, because we know they end up believing some answer to q anyway.

In total, then, the subject has to modify their belief state in order to accommodate q . Happily, this state of affairs perfectly captures the intuition that the subject is surprised by whatever it is they now believe; if we treat surprise as a violation of expectations, it is expected that rational people would make some post-hoc adjustments to their belief states in the face of new evidence.

Such situations do not arise with predicates like *yodel* and *jump*. The reason why *I can't*

jump can never be truthfully uttered at a time when I am currently jumping is because jumping can *only* occur if I use my abilities to their fullest extent. On the other hand, *I can't believe p* can be uttered in situations when I do in fact believe *p* because believing *p* can happen despite my inability to be an 'ideal' believer.

4.3.4.2 Back to *can't believe*

Returning to *can't believe* in context, the derivation of the following sentences is stepwise identical to their corresponding negation-less counterparts, but with negation on top, taking widest scope.

- (157) a. Beatrice can't believe that Fran won the election.
 b. LF: $[\neg[B [\text{can} [\text{believe} [F \text{ won the election}]]]]]$

(158) **Derivation of (157):**

- a. $[[B \text{ can believe } F \text{ won the election}]^w = \underline{\text{DOX}_b^w \in P \vee \text{DOX}_b^w \in \neg P. \exists u \in \text{BEST}(f_{\text{dispo}}(w)(b), g_{AB}(w)(b)). [\text{DOX}_b^u \in P]}$
- b. $[[\neg B \text{ can believe } F \text{ won the election}]^w =$

$$\begin{cases} 1 & \text{iff } (\text{DOX}_x^w \in P \vee \text{DOX}_x^w \in \neg P) \wedge \nexists u \in \text{BEST}(f_{\text{dispo}}(w)(x), g_{AB}(w)(x)). [\text{DOX}_x^u \in P] \\ 0 & \text{iff } (\text{DOX}_x^w \in P \vee \text{DOX}_x^w \in \neg P) \wedge \exists u \in \text{BEST}(f_{\text{dispo}}(w)(x), g_{AB}(w)(x)). [\text{DOX}_x^u \in P] \\ \# & \text{otherwise} \end{cases}$$

The account correctly predicts *can't believe p* to be grammatical. What does seem problematic for *can't believe p*, rather, is its presupposition. This presupposition is an undoctored EM presupposition, but recall that *can't believe p* most canonically has a veridical-like interpretation:

- (159) A: I can't believe this spread is butter!¹⁹
 \rightsquigarrow A believes that this spread is butter.

¹⁹All rights reserved.

Why does (159) generate a faux-veridical inference? *Can* forces the at-issue component of the belief report to be relativized to ideal-believing worlds, whereas *believe* presupposes subject-opinionatedness in the actual world. Ordinarily, we assume that the actual world is ideal with respect to believing, in the sense that we are adhering to the maxims of belief revision. However, when *can* is additionally in the scope of negation, or in fact any non-veridical operator, this assumption is called into question, since doing so invalidates the notion that the speaker holds the relevant belief in ideal-believing worlds. For example, in (159), we presuppose that A has an opinion about the spread being butter in the actual world, while denying that he believes the spread is butter in the ideal-believing worlds. The combination of this presupposition and this assertion is logically compatible with two possible states of affairs:

1. The real world is in fact ideal with respect to A's ability to form beliefs (it is possible for A to adhere to all of the belief maxims) and A believes $\neg p$, that it is not the case that this spread is butter. ('non-veridical' reading)
2. The real world is non-ideal with respect to A's ability to form beliefs (it is impossible for A to adhere to all of the belief maxims) and A believes p , that this spread is butter. ('faux-veridical' reading)

The legwork done by the non-veridical operator here is, in effect, to open up the possibility that the actual world is non-ideal. If the real world is an ideal believing-world (and most worlds are), then A should believe that this spread is not butter. So what kind of situation should license the faux-veridical reading of (159)? Recall that the kinds of situations which render the world non-ideal with respect to belief formation are exactly those worlds in which there is a conflict between an attitude holder's beliefs and some particularly compelling evidence that contradicts those beliefs.

In this example, such a situation would be one in which A's existing belief is that the spread is not butter (perhaps because it is in a margarine tub in the fridge), but they are presented with very good evidence that it is in fact butter, such as if they tasted it and found it unmistakably

buttery. This is precisely the kind of context in which A would be licensed to utter (159) with the non-veridical interpretation: they must reconcile their surprising new belief (that the spread is butter) with their old belief that the spread is not butter. The effect of A's utterance here communicates the unlikely state of affairs that the actual world is non-ideal, and highlights this tension between reality and expectation.

The last question here is why it should be that the faux-veridical reading of (159) is somehow more salient. I propose that this is because uttering *can't believe p* with the intent of communicating a complete inability to believe *p* is pragmatically marked. The operative element here is the modal *can*. Assuming a discourse context which would license the non-veridical reading of (159)—one in which the speaker can be a normal, rational believer and they have evidence that the spread is *not* butter—the following strong implicature holds:

(160) I don't believe that this spread is butter.

↪ I can't believe that this spread is butter.

In other words, if I don't believe something, it is normally because I don't have sufficient evidence to do so (and therefore, cannot believe it and maintain my status as an ideal believer, per the Maxim of Evidentiality). Semantically, however, *I can't believe p* is strictly more complex than *I don't believe p*, since it has an identical LF with the addition of the modal. The modal's only contribution to the meaning of (159), under the non-veridical reading, is to highlight that it really is impossible for A to believe that the spread is butter. Assuming the inference in (160) normally holds, general pragmatic pressures (e.g. conversational maxims of Grice 1975 and a desire to make maximally informative utterances) dictate that *can't believe p* utterances are unlikely to be used to express the non-veridical reading, since that can be achieved by uttering the simpler *don't believe p* sentence with the implicature in (160). Knowing this, a speaker can reason that a likelier 'default' interpretation of *can't believes p*, is one in which the attitude holder believes *p*, but finds it difficult to do so. This is precisely the faux-veridical interpretation.

Finally, turning to *can't believe q*, we see the following:

- (161) a. Beatrice can't believe who won the election.
 b. LF: $[\neg [B [can [believe [who\ won\ the\ election]]]]]$

(162) **Derivation of (161):**

- a. $\llbracket can\ believe\ who\ won\ the\ election \rrbracket^w = \lambda x_e : \underline{DOX_x^w \in Q \vee DOX_x^w \in \neg Q} . \exists u \in$
 $BEST(f_{dispo}(w)(x), g_{AB}(w)(x)) . [DOX_x^u \in Q]$
- b. $\llbracket \neg B\ can\ believe\ who\ won\ the\ election \rrbracket^w =$

$$\begin{cases} 1 & \text{iff } DOX_x^w \in Q \wedge \nexists u \in BEST(f_{dispo}(w)(x), g_{AB}(w)(x)) . [DOX_x^u \in Q] \\ 0 & \text{iff } DOX_x^w \in Q \wedge \exists u \in BEST(f_{dispo}(w)(x), g_{AB}(w)(x)) . [DOX_x^u \in Q] \\ \# & \text{otherwise} \end{cases}$$

This derivation is, effectively, the payoff: the EM presupposition reduces to *be certain about an answer to q*, which strongly resembles (though differs from) veridicality; moreover, the utterance as a whole is grammatical. While *can* is sufficient to technically obviate the effects of BLC seen with *believe q*, it produces utterances that are largely redundant and only felicitous in very specific contexts.

This is not so for *can't believe q*, whose presupposition requires that the subject be committed to some answer to the embedded interrogative, and whose assertion is that in no ideal world does the subject hold such a belief. The conjunction of these two facts amounts to an assertion that the world is non-ideal with respect to the subject's ability to hold whatever belief it is they have. A similar argument can be made for sentences with *can believe* under nonveridical operators besides negation:

- (163) Beatrice can hardly believe who won the election.

Assuming that *hardly* scopes above the modal, under the current proposal, (163) presupposes

that Beatrice has a belief about who won the election, and asserts that she was hardly able to form that belief. Any nonveridical operator above *can believe q* will produce a similar tension between the presupposition (that the subject has a particular belief) and the at-issue content (either denying or not fully committing to the notion that the subject formed that belief in a way that one would expect given their abilities). This is precisely the same tension we observed with *can't believe q*: the 'ideal believing-ability world' picked out by *can* cannot be the actual world because *believe* is in the scope of a nonveridical operator. This matches the intuition that sentences of this kind seem to indicate that the subject's forming a belief was somehow challenging or non-ideal.

It is worth stopping at this point to ask whether the denotation given above actually derives veridicality with interrogatives for *can't believe*. Our semantics for *believe*'s reduced EM presupposition is equivalent to *subject certainty*, rather than veridicality: *x can't believe q* is true iff *x* believes some answer to *q*, whether it's true or not.

This is not necessarily a problematic prediction. While *can't believe q* is generally veridical, it is possible, in the right context, to express a third person subject's surprise at the answer to some *q* with *can't believe q* even if the speaker themselves is committed to a different answer to *q*. But this is a general property of veridical-responsive predicates, including *know*. This is shown in (164):

(164) *Two parents normally give their daughter presents for Christmas addressed from themselves, but this year, they decided to give her a bunch of gifts from 'Santa.' She did not expect that Santa would be bringing her gifts, but she fully accepts the mythos. One parent says to the other:*

She can't believe/knows who brought her so many gifts this year.

Nevertheless, our account should predict that *can't believe* is *in general* interpreted veridically. I suggest the ultimate source of this tendency might be a pragmatic artifact. For example,

can't believe is used an overwhelming majority of the time with first-person subjects. In the Corpus of Contemporary American English (COCA)²⁰, out of 6142 occurrences of the string *can't believe*, 4547 (74%) of those are immediately preceded by *I* or *I just*. But for first-person subjects, subject certainty and veridicality converge in belief reports, since a speaker cannot be certain of *some* answer to a question without knowing which answer, exactly, that is.

Additionally, the conditions under which *can't believe q* is used with a third-person subject while the speaker really is unaware of the answer to *q* (or has a conflicting opinion with the attitude holder) are pragmatically unusual. The speaker has to be aware of the attitude holder's surprise at the answer to *q*, while themselves not having access to whatever presumably good evidence the attitude holder has for that answer. This is of course *possible*, but for the speaker both to know that the attitude holder knows the answer to a question and not know that answer themselves requires a fairly restrictive pragmatic context.

(165) *B is looking at the results of a recent election with many candidates on a computer screen. Her eyes get wide and she looks surprised. A does not yet know the results and cannot see the screen, but sees B's reaction.*

A: She can't believe who won the election.

A's utterance in (165) is licensed even if A thinks it is possible that B has a faulty source of information, but that would be a very strange state of affairs indeed. Simply put, it is plausible that the apparent veridicality of *can't believe q* arises not from the semantics, but rather, the paucity of circumstances in which both the veridicality inference is licensed and the speaker is pragmatically licensed to utter *can't believe q*.

²⁰<https://www.english-corpora.org/coca/>

4.3.5 The projection problem

A potential problem for the analysis is that it makes critical use of an excluded-middle presupposition to account for the neg-raising behavior of *believe*, but the existence of this presupposition is controversial. Indeed, many authors derive neg-raising syntactically, by moving a negative element from the embedded clause to the matrix clause (Fillmore 1963, Ross 1973, Collins & Postal 2014; 2017, Crowley 2019; a.o.). I will not consider these accounts here, as if neg-raising were purely syntactic, there should be no contrast in acceptability between *can't believe q* and *can believe ¬q*, which we have seen is false.²¹

But even for semantic accounts of neg-raising, the excluded middle presupposition is not a given. It is an old observation that neg-raising is defeasible (see, e.g., Bartsch 1973). That is, an expression of the form *¬believe p* doesn't always entail *believe ¬p*:

(166) I don't believe that God exists, but I don't believe God doesn't exist, either. I'm agnostic.

While evidence of this type might tempt one towards a non-presuppositional account of neg-raising, Gajewski (2007), following Bartsch (1973), argues that neg-raising predicates are only 'soft' presupposition triggers in the sense of Abusch (2002; 2010), and examples like (166) can be analyzed as local accommodation of the EM presupposition—that is, it can be satisfied locally and therefore does not project.

Local accommodation is often invoked to account for presuppositions which fail to project past negation (Heim 1983). This account could in principle handle the basic case of the defeasibility of the EM presupposition under negation alone:

(167) a. I don't believe that God exists.

Presupposition: I either believe that God exists or that God does not exist.

²¹This does not preclude syntactic analyses of neg-raising for other constructions, of course.

- b. I don't believe that God exists, because I am agnostic.

Local accommodation: It is not the case that (I believe either that God exists or that God does not exist, and that I believe that God exists), because I am agnostic.

(Adapted from Homer 2015)

If this is feasible, we need to explain why the EM presupposition can be locally accommodated under negation, but not in the presence of both negation and a modal, i.e., *can't*, in examples like (168):

- (168) #I can't believe who won the election, because I have no opinion.

Here, the crucial observation is that negation obligatorily scopes above the modal. This is relevant because *can* itself seems to block local accommodation of the EM presupposition even in the absence of other higher operators:

- (169) #I can believe that God exists, because I am agnostic.

Upon closer examination, it becomes clear why this should be. The interpretation of (169), given local accommodation, is given in (170).

- (170) *Local accommodation of (169):* It is possible in view of my abilities that (I believe either that God exists or that God does not exist, and that I believe that God exists), because I am agnostic.

By definition, agnosticism with respect to ϕ entails neither believing ϕ nor believing $\neg\phi$. The contribution of the utterance reduces to *It is possible in view of my abilities that I believe that God exists, because I am agnostic*, which is contradictory if we assume that being agnostic means that one is incapable (given their current abilities) in believing otherwise. The contradictory flavor that necessarily rises with local accommodation *can believe p* utterance correctly

predicts that such utterances are not felicitous in contexts where the subject does not have an opinion with respect to the truth of p .

But just as negation on its own is enough to license a felicitous utterance with an accommodated EM presupposition, so should one with negation and *can*. Strikingly, the EM presupposition in *can't believe p* utterances does indeed seem to be accommodatable.

- (171) a. I can't believe that God exists, because it is impossible to know one way or the other whether God exists.
- b. *Local accommodation of* (171a): It is impossible that (I believe either that God exists or that God does not exist, and that I believe that God exists).

If local accommodation is possible for *can't believe p*, what explains the infelicity of (168)? We have derived the unacceptability of *believe q* more broadly from the inability to make utterances whose asserted content is completely obviated by their presupposed content. But if local accommodation is in principle possible, why can it not be used to circumvent this problem?

I propose that, analogously to the global restriction on making assertions that are rendered trivial by presuppositions, there is a similar ban on accommodating trivial presuppositions. Simply put, just as you cannot perform vacuous accommodation. I state this formally as a general pragmatic principle, the NON-TRIVIAL ACCOMMODATION CONDITION.

- (172) NON-TRIVIAL ACCOMMODATION CONDITION

A presupposition α cannot be accommodated into the same context as assertion β if α and β are mutually entailing.

Because the presupposition of *believe q* reduces to *believe q*, we cannot accommodate it. This explains why we cannot rescue, for instance, a *don't believe q* utterance, as below:

- (173) a. #I believe who won the election.

- b. *Attempted Local Accommodation of (173a)*: It is not the case that (I believe who won the election and I believe who won the election).

This condition, like BLC, is a restriction on presuppositions: they may neither be redundantly accommodated nor trivialize the at-issue content of the clause in which they appear. Thus, the impossibility of eliminating the EM presupposition of *can't believe q* has nothing to do with the modal or negation themselves, but rather the unavailability of local accommodation. In this way, the presupposition survives, and the desired interpretations still arise.

4.3.6 Summary

In the account detailed here, *believe* cannot ordinarily embed questions not because of selection but because doing so results in systematically trivial meanings. But if *believe* is embedded under a modal operator which makes explicit reference to the abilities of the subject and a nonveridical operator, this triviality is obviated; it presupposes belief in a proposition, while either denying or calling into question the notion that this belief is 'ideal'.

The analysis also proposes that the apparent veridicality of *can't believe* in both declarative- and interrogative-embedding contexts is not strictly semantic, but arises from restrictions on when *can't believe* can be used in discourse. I have argued that both core properties that differentiate *can't believe* from *believe* arise in large part from the combination of *believe* with negation and an ideal modality for abilities. In this way, there's nothing special about the *can't believe* construction at all; rather, the complexity of its empirical properties can be chalked up to interactions of its simpler constituent parts.

4.4 Outstanding issues

4.4.1 Is *can't believe* just hyperbolic?

An alternative analysis of *can't believe*, which requires much less complex compositional machinery, is that its interpretation is not strictly literal, but rather an instance of hyperbole, in which a speaker makes an extreme utterance in order to communicate a scalar alternative of that utterance that is slightly weaker. Under this view, the faux-veridical reading of *can't believe p* arises via implicature. For example, consider (173), a common example of hyperbole:

- (174) I'm starving to death.
 \approx I'm extremely hungry.

In general, we would not take an utterance of *I'm starving to death* literally, except in very dire and unfortunate circumstances, but rather take it to mean something like *I'm extremely hungry*. We can suppose that this implicature arises from the speaker's literal utterance being highly implausible, but a weaker alternative being very plausible. A sketch of how such an account could be applied to *can't believe* might look like the following:

- (175) I can't believe that Fran won the election.
 \approx It is very difficult for me to believe that Fran won the election.

The idea would look something like this: the semantic value of the utterance in (175) is that the speaker is completely incapable of believing that Fran won the election, and the speaker's implicated meaning is that they find it very difficult to believe that Fran won the election (perhaps because doing so would jeopardize their beliefs in some way). The faux-veridical reading of (175) could then arise as an effect of uttering (175) in a particular kind of discourse context, in which it is abundantly apparent that Fran won the election.

(176) *Watching the election results on TV. The network declares Fran the winner.*

I can't believe that Fran won the election.

≈ It is very difficult for me to believe that Fran won the election (but I believe it nevertheless because they just told me so).

This is appealing because it derives the faux-veridical interpretation of *can't believe p* from general pragmatic principles which are independently motivated. However, a hyperbolic account would face two empirical challenges. The first is that paraphrases of (the literal interpretation of) *can't believe p* do not universally have faux-veridical readings, which is difficult to explain since they presumably give rise to similar scalar alternatives as *can't believe p*:

(177) a. I can't think that Fran won the election.

↪ I think that Fran won the election.

b. It is very difficult for me to believe that Fran won the election.

↪ I believe that Fran won the election.

Second, a hyperbolic analysis of *can't believe* does not on its own explain why *can't believe* can embed interrogatives where *believe* cannot. While it stands to reason that a pragmatic process of this kind could derive the (faux)-veridicality of *can't believe* in general, this embedding behavior will still require an analysis of *believe* in which it is capable of embedding questions. Nevertheless, it is a promising avenue to explore the possibility that some of the labor of the semantic mechanisms at work in the *can't believe* construction could be offloaded to a more articulated notion of hyperbolic implicature.

4.4.2 The ban on embedded polar interrogatives

Turning to matters of empirical coverage, the analysis fails to predict that *believe* cannot embed polar interrogatives, since it assumes that all inquisitive issues have the same basic semantic representation. This is a much more general problem, though, since it applies to emotive factive

predicates as well. Numerous proposals have been made to account for this fact about emotive factives. Many of these accounts fall into two camps: appealing to 1) semantic incompatibility between the meaning of emotive factives and *whether/if*-clauses (d’Avis 2002, Abels 2004, Nicolae 2013, Romero 2015; a.o.), or 2) pragmatic competition between *whether/if*-clauses and declarative clauses, which for one reason or another results in the former being systematically dispreferred (Guerzoni 2007, Sæbø 2007, Roelofsen et al. 2019; a.o.)

Ultimately, this puzzle is outside the scope of the current paper, which is to account for why *can’t believe*, but not *believe*, can embed interrogatives at all. Nevertheless, the incompatibility between *can’t believe* and polar interrogatives merits further study, and may shed additional light on recent findings that emotive factives with polar interrogative complements can be licensed in the scope of quantifiers (Abenina-Adar 2018), or that while emotive factives are degraded with polar interrogative complements compared to constituent interrogative ones, they were still judged better than verbs like *think* with an interrogative complement (Cremers & Chemla 2017).

4.4.3 The role of the ability modal

The current account relies heavily on the assumption that the world in which the excluded middle presupposition of *believe* holds is not necessarily the same world as the one which serves as a ‘best’ world for the modalized *can*-statement. More generally, the fact that the modal contributes quantification over worlds which need not overlap with the EM-satisfying worlds means that *believe* under a modal will not violate BLC, regardless of what kind of complement it takes.

We have seen that this isn’t a problem for *can*, but we might expect that any kind of modal operator could achieve the same outcome. However, there are modal operators under which *believe*, even if it is negated, does not comfortably embed interrogatives:

(178) ??/*Beatrice shouldn’t believe who came to the party.

Moreover, it's not immediately obvious why *can* should be restricted to abilitative interpretations, as opposed to, say, epistemic *can*. Assuming that we want all modal operators to contribute quantification over possible worlds, if we have any hope of squaring this fact with our analysis, we would need to rule out utterances like (178) on grounds independent from BLC; further investigation is needed to sharpen our understanding of the characteristics that the modal in *can't believe* constructions may have. Importantly, such an analysis must grapple with the fact that some languages seem to license *believe q* without an overt modal at all.

4.4.4 Why *can't believe* and not *can't think*?

Perhaps the most persistent mystery remaining is what makes *believe* so special, given that other verbs (even neg-raising ones) don't seem to behave the same way. For instance, in many contexts, *believe* and *think* receive quite similar interpretations; both can be used to report an attitude holder's doxastic state with an embedded declarative:

- (179) a. Shaan believes that the world will end tomorrow.
 b. Shaan thinks the world will end tomorrow.

Similarly, both *believe* and *think* are neg-raising (Zuber 1982): that is, \neg *believe/think p* is ordinarily interpreted to mean *believe/think \neg p*:

- (180) a. Lucretia does **not** believe/think that her mother is home.
 ∴ Lucretia believes/thinks her mother is **not** home.

Given the critical role of neg-raising in the analysis, we might expect that all neg-raising verbs can embed interrogatives under *can't*. But as it turns out, *can't think* does not behave at all like *can't believe*. While *can't believe* is to my knowledge universally acceptable to English speakers, judgments about *can't think* in sentences like (181) are highly variable:

(181) %I can't think when I've had such a good salmon dinner.

Moreover, *can't think* does not have a veridical interpretation with interrogative complements; in fact, a paraphrase of (181) in informal logicese might be: *There is no occasion x that I can recall such that I had such a good salmon dinner in x*. Whatever the facts might be—whether *can't think* can take interrogatives or not—it's clear that we can't straightforwardly analyze it in the same way.

One potential avenue to explore in understanding why *think* and *believe* differ in this way is to probe comparable constructions in other languages more closely. Preliminary research suggests that counterparts of *think* in other languages cannot systematically embed interrogatives under *can't* or negation, whereas counterparts of *believe* can.

In Slavic languages, for example, *can't believe* is only possible with perfective aspect on the verb. In Bulgarian, for instance, *can't believe* requires the perfective prefix *po-* on the equivalent of *believe*, which is not obligatory for ordinary past-tense *believe* (Vesela Simeonova, p.c.):

(182) **Bulgarian**

Ne moga da *(po)-vyarvam, che Mariya e tuk.
NEG can I PO-believe that Mariya is here
'I can't believe that Maria is here!' (≈ I am surprised that Maria is here)

Similar facts are true of the closely related Russian. Notably, while (183) is grammatical without the perfective prefix *po-*, if *po-* is absent, the modal receives an epistemic interpretation, not an ability interpretation. More strikingly, *po-* is obligatory if *can't believe* embeds an interrogative, which suggests that aspect is somehow relevant.²²

(183) **Russian**

²²Thanks to Anelia Kudin for discussion of the Russian examples and an anonymous reviewer for helpful suggestions and contributing two of the examples.

Don ne moet *(po)-verit', to Mariya vyigrala gonku.
 John NEG can PERF-believe.INF that Maria win.PAST race.ACC
 'John can't believe that Maria won the race.'

- (184) Ja ne mogu *(po)-verit' kto priël.
 I NEG can PERF-believe.INF who came.
 'I can't believe who came.'

Note that while this indicates that aspect plays a role in the behavior of *can't believe*, it is not sufficient to explain the contrast between *believe* and *think*, since *dumat'* 'think' can be prefixed with *po-* but nevertheless cannot embed interrogatives regardless of the presence of *po-*:

- (185) *Ja ne mogu (po)-dumat' kto priël.
 I NEG can PERF-think.INF who came.
 'I can't think who came.'

Taken together, these observations about Slavic suggest that aspect does indeed play a role in the *can't believe* construction, but future study on languages with rich overt aspectual morphology is needed to determine precisely what that role is.

4.5 Conclusion

In this chapter I sought to explain why *believe* can embed interrogatives and is veridical, or faux-veridical, in some but not all linguistic contexts. The analysis revealed a conspiracy: the excluded middle presupposition of *believe* can interact with a special combination of nonveridical and modal operators to produce an interpretation that is both (faux-)veridical and allows for interrogative-embedding. Unlike unmodalized *believe*, *can't believe* does not produce a systematically trivial meaning in virtue of its containing an ability modal and inceptive aspect. This explains why *can't believe* can take interrogative complements, but *believe* on its own cannot. In other words, when *believe* keeps the right company, its interpretation is altered in such a way as to give the appearance of 'lifting' some of its selectional restrictions.

This solution to the *believe q* puzzle is couched in the Inquisitive Semantics treatment of embedded clauses of Theiler et al. (2018). Theiler et al.'s uniform treatment of clause types and derivation of selectional restrictions of verbs based upon their lexical semantics is conceptually appealing. However, this approach still has the unfortunate side effect of ruling out the possibility of 'context-sensitive' selectional properties like that which I have argued here for *believe*. Recent work by Cremers & Chemla (2017) and (van Gessel et al. 2018; p.c.) suggests that other predicates besides *believe* may be susceptible to changing their embedding behaviors in the presence of negation. But rather than being a weakness for Theiler et al., I think this is a strength of their proposal: if question-embedding requires certain 'ingredients' to be licit, it stands to reason that those ingredients may be contributed by multiple possible sources.

Several facts remain mysterious in light of the analysis; in particular, the emergent typological picture of question-embedding under *believe* is not fully clear. For instance, what is special about *believe* such that it can embed questions in the right contexts, but not other neg-raising predicates, like *think*? And what is responsible for the variation we see in *believe* across languages, such as some languages requiring a modal to license *believe q* and others not? And why can *can't believe* not embed polar interrogatives? Ultimately, through nuanced exploration of the semantic context of clausal-embedding predicates, we may be able to find a crucial foothold in understanding the semantics of question-embedding and the range of possible meanings of clausal-embedding predicates.

Chapter 5

Believe me: Evidentiality in belief predicates

The standard 'relational' theory of attitudes is that attitude verbs denote two-place relations between agents and propositions. Although there is a proliferation of approaches to characterizing the meanings of attitude verbs and the clauses they embed, the basic wisdom of the relational view—namely that attitude verbs all express two-place relations—is frequently taken for granted. For example, in the Hintikka (1962, *et seq.*) tradition, attitude verbs denote universal quantifiers over worlds; the differences among attitudes lies in the domain of quantification. In the influential neo-Davidsonian theory of attitudes proposed by Kratzer (2006) and elaborated by (Moulton 2009; 2015) and (Elliott 2017), on the other hand, verbs denote predicates of eventualities; again the locus of variation is in the characterization of those eventualities.

Unfortunately, the selectional behavior of attitude verbs is not always so well-behaved. For instance, it is well-established that a proper subset of propositional attitude verbs, which ordinarily take clausal complements, can also take 'content' DPs, such as *the claim* and *the rumor*, as complements (Vendler 1972, King 2002, Moltmann 2013, Uegaki 2016, Djärv 2019; a.o.).

(186) a. Lucretia believes/denies/thinks [that she is Elena Ferrante]_{CP}

- b. Lucretia believes/denies/*thinks [the rumor/claim/story (that she is Elena Ferrante)]_{DP}.

The contrast between *believe* and *deny* on one hand and *think* on the other cannot be straightforwardly explained by a purely Hintikkan view, since (186a) ostensibly reveals that all three verbs denote quantifiers over possible worlds, but (186b) would require us to commit to either allowing nominals like *the rumor* to denote propositions (for *believe* and *deny*) or forbidding it (for *think*). Of course, there is more to life than semantics, so we might be tempted instead to chalk this difference up to syntax: perhaps *believe* and *deny* subcategorize for DPs, and *think* does not.

This might be sufficient to account for (186), but there is reason to believe that is not the whole story. It is an understudied fact (though for a very notable exception, see Djärv 2019; 2021) that some verbs which embed content DPs may also embed certain non-content DPs. As it turns out, *believe* can embed both content and non-content nominals and retain a clearly proposition-embedding interpretation, whereas *deny* cannot.¹ A non-content DP can be paraphrased with a *claim*-DP, as (187b) illustrates. And while this paraphrase is available with *believe*, it is not with *deny*.

- (187) a. Lucretia believes/*denies the seer/the book/Maude.
b. Lucretia believes/denies {the seer/the book/Maude}'s **claim**.

If all of these attitudes are merely expressing different flavors of quantifier, there should be no reason to expect that there should be a contrast like in (187). So why does (187) nevertheless persist? Before I begin to address that question, I will throw one additional monkey wrench into the mix: *believe*-like verbs which exhibit the alternation in (187) can apparently embed **both** a DP and a CP at the same time, in that order (Djärv 2019).

¹The corresponding sentences with *deny* here are grammatical, but do not express the attitudinal sense of *deny*, but rather something along the lines of 'forbid from having access to something'. This is the crucial distinction with *believe*.

- (188) a. Lucretia believes [the seer]_{DP} [that she will inherit a great fortune]_{CP}.
b. *Lucretia believes [that she will inherit a great fortune]_{CP} [the seer]_{DP}.

This is all the more puzzling under the assumption that *believe* selects for a proposition (and only a proposition) as an internal argument: if the embedded CP fills this role, then it is not clear how the embedded DP is integrated into the semantic composition. On a similar token, if the DP fills the propositional argument slot of *believe*, then the embedded CP will be orphaned.

In this chapter, I propose an update to the semantics of verbs which exhibit this dual-embedding ability: they select for not only a proposition but also an ‘evidential’ argument which is a *content-denoting entity* and can be saturated by a nominal expression, akin to a weak form of response stance predicates (Cattell 1978), focusing on *believe* and building on the analysis from Chapter 4. I further demonstrate that if we make this assumption, we can explain other puzzling semantic facts about these predicates, such as restrictions on predicates of personal taste in complement clauses and its uses to signal acceptance of discourse updates. I give typological evidence that this approach is preferable to one in which non-content nominals are introduced by a functional element (Djäv 2019; 2021). In so doing, I suggest that attitude verbs can have more complex argument structures than simply expressing relations between attitude holders and proposition, and that this complexity can explain variation in the embedding behavior of propositional attitude verbs, though many mysteries with respect to the syntax of this construction will remain at large.

5.1 Empirical properties of *believe DP (CP)*

I lay out in this section the semantic behavior of *believe DP* with and without a following CP, as well as some very basic structural assumptions. Many of these empirical observations are owed to Djäv (2019), who was to my knowledge the first to propose an explicit analysis of *believe DP CP*.

5.1.1 Structure

In much previous work (e.g. Uegaki 2016) which examined the behavior of *believe DP CP* sequences, the focus on content DPs like *the rumor* generally gave rise to the assumption that such sequences uniformly structures like (189), in which the CP is a modifier of the nominal. This a reasonable analysis, since *the rumor that school will be cancelled* is clearly a structurally licit DP. On the other hand, the same cannot be said if we replaced *the rumor* with a proper name, like *Lily*.

- (189) a. Sam believes [the rumor [that school will be cancelled]_{CP}]_{DP}.
b. Sam believes [Lily]_{DP} [that school will be cancelled]_{CP}.

Indeed, standard tests of constituency indicate that *Lily that school will be cancelled* in this context is not a syntactic constituent.²

- (190) a. A: What/who does Sam believe? *Fragment Answers*
B: *Lily that school will be cancelled.
b. *It is Lily that school will be cancelled that Sam believes. *Clefting*
c. *Lily that school will be cancelled is what Sam believes. *Pseudoclefting*

What is unusual about this structure is that it is clear that, at some level of composition, the embedded clause *that school will be cancelled* is specifying the content of Sam's belief, despite the presence of an intervening DP *Lily* that does not obviously compose with either the matrix predicate or the embedded clause. I will not attempt in this chapter to provide an analysis of the syntax of *believe DP CP* constructions; rather, the primary structural assumption I will make is that a non-content DP cannot compose with a *that*-clause to form a semantically interpretable object.

²This bears more than a passing resemblance to DP-DP sequences in double object constructions, which clearly do not compose directly with one another but by some metrics may form a syntactic constituent; we will revisit this later in the chapter.

5.1.2 Interpretation

The basic entailment pattern of *believe* with content nominals is shown in (191): for any content DP *CONTDP*, *believe CONTDP that p* entails *believe CONTDP* and *believe that p* (Vendler 1972, Ginzburg 1995, King 2002, Moltmann 2013, Uegaki 2016):

- (191) John believes the rumor that Mary left.
 \models John believes that Mary left.
 \models John believes the rumor. (Uegaki 2016: 626)

Djävrv (2019: 210) notes a similar pattern occurs with non-content DPs as objects of *believe*:

- (192) John believes Mordecai that Mary left.
 \models John believes that Mary left.
 \models John believes Mordecai.

As we have seen, the difference between these constructions is that content nouns like *rumor* can be modified by *that*-clauses, whereas non-content nouns like *Mordecai* cannot. So while (191) can plausibly be analyzed as *believe* embedding a DP, (192) cannot:

- (193) a. John believes [the rumor that Mary left]_{DP}.
 b. *John believes [Mordecai that Mary left]_{DP}.

Thus, we need some way of understanding how *believe* can apparently compose with both a nominal expression like *Mordecai* and an embedded clause, despite the fact that those two objects do not straightforwardly themselves create a single semantic unit. Moreover, these two patterns of entailment are not idiosyncratic properties of *believe*. Verbs which can participate this construction (i.e., preserving the entailment pattern in (192)), fall into clear semantic cate-

gories, which I will call ‘verbs of (dis)credence’:

- (194) a. **Verbs of credence:** *agree (with), believe, cite, corroborate, have confidence (in), take DP at face value, trust, validate...*
- b. **Verbs of discredence:** *challenge, contradict, counter, disagree (with), dispute, doubt, question, rebut...*

The class of verbs in (194), which permit both (191) and (192)-type sentences, with the associated entailment patterns, are those which intuitively indicate an attitude holder’s estimation of the veracity of a particular proposition (especially those associated with speech acts, such as the response-stance verbs of Cattell 1978). This apparent semantic overlap, as we will see, suggests that whatever these verbs have semantically in common gives rise to this sort of embedding behavior.

5.1.2.1 What can be *believed*

The kinds of non-content DPs that can be the object of *believe* are those that can ‘stand in’ for propositional content, including conversational agents like *John* and repositories of information like *the encyclopedia* as we have seen, but also depictive artifacts like *the photograph*. Notably, this final category only makes a good argument of *believe* in certain discourse contexts—namely, those in which the question of whether the artifact in question is accurate in its depiction of the world, such as in a courtroom.

- (195) The jury believed the photograph that the defendant is guilty.

What these three kinds of entities have in common is that they are all, broadly construed, capable of making claims about the world. This is no coincidence, since *believe DP*, with non-content DPs, requires the referent of that DP to have made an assertion, which can optionally be spelled

out with a following CP (Djäv 2021).³

This requirement that the object DP have made a particular assertion becomes especially clear when we consider that *believe DP CP* utterances are not licensed when the attitude holder of *believe* is only licensed to believe the truth of the embedded CP on the basis of some non-assertive act on the part of the referent of the DP.

(196) *John knows that Mordecai believes Mary to be the life of any party, so whenever Mary leaves a gathering, Mordecai leaves shortly after. John also knows that Mordecai is quite a party animal himself, so he will never leave a party early unless Mary did. John, who has no knowledge of Mary's whereabouts, is waiting outside a party and sees Mordecai leave.*

#John believes Mordecai that Mary left.

John believes Mordecai that Mary left is only felicitous in a context where Mordecai told John that Mary left. Djäv (2021) indicates that this assertion requirement is presupposed, rather than at-issue, based on the fact that the inference that the assertion was made projects through standard presupposition holes, such as negation, polar questions, and antecedents of conditionals. Note that the inference that the attitude holder believes *p* does not project:

- (197) a. John doesn't believe Mordecai that Mary left.
b. Does John believe Mordecai that Mary left?
c. If John believes Mordecai that Mary left, then he will have an accurate head-count.
⊨ John doesn't believe that Mary left. ⊨ Mordecai claimed that Mary left.

One final observation to be made about this assertion condition is that while it is necessary

³The use of the word 'assertion' here is a bit loose. Photographs, being recordings, are not volitional, and don't stand to make claims about the world on their own. That being said, photographic evidence that plainly depicts a particular event can be used as part of an effort make the claim that that event occurred; it is in this sense that photos and the like are assertive.

for licensing *believe DP CP*, it is not sufficient. *Believe DP CP* sentences are true only if the attitude holder's belief is *because of* the DP's claim, which can be made evident by examples like (198).

- (198) *Mordecai tells John that Mary left, but John already knew that.*
#John believes Mordecai that Mary left.

Here, we can see that the *believe DP CP* sentence is infelicitous if John happens to believe that Mary left on grounds besides what Mordecai claimed. The presuppositional nature of *believe DP CP* raises the question of where the presupposition comes from, given that *believe* and *Mordecai* on their own do not seem to generally presuppose the existence of assertions; this will be addressed in §5.3.

5.1.3 Summary

I have shown that *believe DP CP* sentences, those of the form *x believe y that p* entail corresponding sentences *x believe y* and *x believe p*, and additionally, presuppose that:

1. *y* has content *p* (if *y* is a content DP) or *y* made the claim that *p* (if *y* is a non-content DP)
2. *x* is aware of *y/y's* claim
3. *y/y's* claiming that *p* would lead *x* to believe that *p*

In the following sections, I will propose a formal compositional semantic account which derives these empirical observations, as well as some semantic consequences for the account, and highlight several challenges in integrating this account with observations about the syntax of the *believe DP CP* construction.

5.2 The meaning of *believe*

Having now a suite of empirical desiderata, we must now address the question of what *believe* means, and how it composes with nominals and clauses. If the intuition is that *believe* alone expresses a relation involving something mind-external, this bears a strong conceptual similarity to the class of ‘response-stance’ predicates, which presuppose the existence of a particular speech act (Cattell 1978, Kastner 2015). In fact, as I will argue, *believe* is in effect a response-stance predicate when it takes a nominal argument; however, without this argument, *believe* still presupposes the need for evidence of a certain kind, thus behaving as a very weak sort of response-stance predicate. I assume that this core property is shared between all verbs which can embed non-content DP + CP combinations, including *trust*, *corroborate*, and so on, although I do not spell out explicit semantics for those predicates as they may be subject to other (possibly irrelevant) lexical idiosyncrasies.

Before presenting the account, I will note that I make no assumptions about the relationship between the LF of a *believe*-sentence and its syntactic structure; *argument* in the contexts I describe here refers simply to the semantic object which is fed into another semantic object as an input via Functional Application. For a syntactically-formed account of the structural properties of this construction, see Djärv (2021) and discussion of the analysis therein in §5.4.3 of this chapter.

As a starting point, let us take the denotation for *believe* from (Theiler et al. 2018) assumed from Chapter 4. Recall that in this lexical entry, *believe* selects a p of type T , and contributes two layers of meaning: at-issue is that an attitude holder’s doxastic state is a member of the downward-closed issue p , and presupposed is the excluded middle.

$$(199) \quad \left[\begin{array}{l} \llbracket \text{believe} \rrbracket^w = \lambda p_T . \lambda x_e . \text{DOX}_x^w \in p \\ \left\{ \begin{array}{l} \text{defined if } \text{DOX}_x^w \in p \vee \text{DOX}_x^w \in \neg p \\ \# \text{ otherwise} \end{array} \right\} \end{array} \right. \quad (\text{Theiler et al. 2018: 7})$$

This lexical entry captures the basic uses of *believe*, but it does not straightforwardly account for many of the observations in §5.1. There is still the question of how we should handle the issue of embedded DPs in the *believe DP CP* construction, and in particular the two following observations:

1. *Believe x that p*, where *x* is a non-contentful entity, presupposes that *x* made the claim that *p*, and that *x* believes *p* on the basis of that claim.
2. *Believe x that p* entails *believe x* and *believe p*.

The claim presupposition poses a potential problem: namely, what is its trigger? While *I believe John that it's raining* clearly presupposes that John asserted that it is raining, it's clear that *John* on its own does not generally presuppose that John claimed anything at all. But it's also the case that *believe* doesn't presuppose the existence of a claim more generally either:

(200) I believe that it's raining, even though no one said that it's raining.

I propose that the solution to this problem is to say that, despite appearances, *believe* is presuppositional, but in a very particular way: it presupposes the existence of a particular external content-denoting entity whose content is equivalent to that of the relevant belief, which is more over the *source* of that belief. I will call this the *evidential source* component of *believe*.

Crucially, this content-denoting entity is a semantic argument of *believe*. I take content-denoting entities (the type of which I will notate *c*) to be a proper subset of entities ($D_c \subset D_e$) which are abstract and have propositional content. Nouns which refer to classes of entities of type *c* include *proposition*, *claim*, and *rumor*.⁴ I also assume the existence of a metalanguage function CON of type $\langle c, st \rangle$ which maps contentful entities to their (unique) propositional content (Hacquard 2006).

⁴Although the content of objects like books which are 'repositories of information' can arguably be identified with a particular proposition, they are not in and of themselves contentful entities because they are tangible objects. See Anand & Hacquard (2009) for discussion of the behavior of these nominals with other attitudes.

The updated meaning I will assign to *believe* is presented in (203). The at-issue contribution of the verb and its EM presupposition remain as they were before; the only new addition is an evidential source presupposition that there is a particular contentful entity with content p that is the source of the belief that p . Descriptively, this smacks of evidentiality: *believe* presupposes the existence of some particular evidence for the belief. While there are many plausible ways of cashing out the requirement that the attitude holder’s belief be *because of* that evidence, I opt here for a counterfactual analysis in the style of von Fintel (2001), in order to say that the attitude holder would not have the belief in question were it not for the particular evidence at hand, evidence with which they are acquainted (expressed using the metalanguage function ACQ).⁵

This semantics for counterfactuals requires two ancillary notions: a similarity relation on worlds \leq_w and a function $max_{\leq,w}$ which allows us to pick out worlds that are ‘closest’ to w (definitions from von Fintel 2001: 126):

(201) For worlds w', w'' , $w' max_{\leq,w} w''$ iff w' is more similar to w than w'' is to w .

(202) $max_{\leq,w}(p) = \{w' : p(w') = 1 \wedge \forall w'' [p(w'') = 1][w' \leq_w w'']\}$

The resultant updated denotation for *believe* follows:

(203) $\llbracket \text{believe} \rrbracket^w = \lambda y_c. \lambda p_T. \lambda x_e. DOX_x^w \in p$ (Theiler et al. 2018: 7)

$\left\{ \begin{array}{l} \text{defined if } DOX_x^w \in p \vee DOX_x^w \in \neg p \text{ (**Excluded Middle**), and} \\ \text{CON}(y) \in p \wedge \\ \text{ACQ}(x)(y)(w') \wedge \\ \forall w' [w' \in max_{\leq,w}(\neg \text{ACQ}(x)(y)(w))][(\neg DOX_x^{w'} \in p)] \text{ (**Evidential Source**)} \\ \# \text{ otherwise} \end{array} \right.$

⁵One could also in principle define this presupposition using any other semantics for counterfactuals, or a modified version evidential semantics (e.g. Faller 2010, Murray 2010). Nothing critical rests upon the implementation chosen here, except that it basically captures the intuitions of a Lewis (1981)-style approach.

This presupposition states that the contentful entity argument *y* has content which is a member of *p*, the attitude holder is acquainted with (i.e., aware of) *y*, and that in worlds maximally similar to the world of evaluation in which the attitude holder is not acquainted with *y*, they do not develop a belief with respect to *p*. This captures the relevant notion of causality between the evidence supplied by the contentful entity and the actual belief: were it not for that evidence, the attitude holder would not form that belief.

In a nutshell, we've baked into *believe* a requirement that a *believe*-report assumes that the attitude holder's belief is on the basis of some particular contentful evidence, which can be explicitly stated. Importantly, *believe* itself does not specify that this evidence need to be a particular assertion (a point to be revisited momentarily). This overall approach contrasts with a more conservatively relationalist one, e.g. Uegaki (2016), in which an attitude verb is fundamentally proposition- or question-taking, but content nominals which have been type-shifted into propositions can serve as complements of these verbs. (Uegaki does not discuss non-content nominals.)

5.2.1 *Believe CP*

Obviously, *believe* frequently occurs without a direct object, which seems like it could pose a problem. In those situations, what happens to *believe*'s content argument? I propose that in such cases, the argument is implicit, and interpreted existentially, analogous to direct objects of verbs like *eat*.⁶ Thus, an objectless *believe*-report has a minimally different paraphrase with *some particular evidence* as an object (205).⁷

⁶See Williams 2015: Chapter 5 and many citations therein for discussion about formal approaches to this problem.)

⁷We don't necessarily want to claim that the object of *believe* is precisely parallel to the object of *eat*. Chung et al. (1995) point out that implicit arguments with existential interpretations can occur in sluices with a *wh*-phrases corresponding to the implicit argument. Attempting the same with the putative implicit argument of *believe* results in ungrammaticality:

- (204) a. Mary ate, but I don't know what.
b. *Mary believes that the cookies are ready, but I don't know what.

(205) Mary ate.

\models Mary ate something.

(206) Mary believes that the cookies are ready.

\models Mary believes some particular evidence that the cookies are ready.

This can be achieved by an operation like Existential Closure, replacing the lambda-binder of the variable corresponding to the content argument with \exists . So given our semantics, (206) results in the meaning in (207):

$$(207) \quad \llbracket (206) \rrbracket^w = \text{DOX}_m^w \in \{w' : \text{the cookies are ready in } w'\}^\downarrow$$

$$\left\{ \begin{array}{l} \text{defined if } \text{DOX}_m^w \in \{w' : \text{the cookies are ready in } w'\}^\downarrow \vee \\ \text{DOX}_m^w \in \{w : \text{the cookies are not ready in } w\}^\downarrow \text{ (**Excluded Middle**), and} \\ \exists y_c[\text{CON}(y) \in \{w' : \text{the cookies are ready in } w'\}^\downarrow \wedge \\ \text{ACQ}(m)(y)(w) \wedge \\ \forall w' [w' \in \text{max}_{\leq, w}(\neg \text{ACQ}(m)(y)(w'))][(\neg \text{DOX}_m^{w'} \in \{w'' : \text{the cookies are} \\ \text{ready in } w''\}^\downarrow)] \text{ (**Evidential Source**)} \\ \# \text{ otherwise} \end{array} \right.$$

What's critical in these cases is that *believe* always carries its evidential presupposition, even when the source of evidence is not overtly specified. This might seem surprising at first blush, but upon further scrutiny, it becomes clear that when the content argument of *believe* becomes existentially closed, the resulting presupposition is extraordinarily weak. In the case of (207), for instance, we presuppose that Mary has access to some particular 'contentful entity' which led her to believe that the cookies are ready. But there is no reason that contentful entities cannot be a very broad category—they could include things like claims, but perhaps also smells from the kitchen, or the declarative knowledge that chocolate chip cookies that starting baking 9 minutes ago will be ready now.

If we allow for the domain of contentful entities to be sufficiently rich, such that

they can include all manner of evidence, then the existentially-closed evidential presupposition amounts to an essentially trivial requirement that believing something require evidence. To put it a little too bluntly: people don't believe things for no reason. While this might sound blindly obvious, it is the hallmark of an attitude which encodes evidential sourcehood. After all, while non-veridical mental acts like daydreams, musings, and imaginings can all be construed as thoughts, they cannot be construed as beliefs.

5.2.2 Composing with Content DPs

In this picture which we are painting, the composition of *believe* with a content nominal like *the rumor* proceeds straightforwardly, since it saturates the content argument of the verb in the normal way. Given that content nominals need not co-occur with an embedded CP, this makes the prediction that *believe the claim that p* is ambiguous between two readings: one where the *that*-clause saturates an argument of *believe*, and one in which it is a modifier of the nominal:

- (208) a. **Modifier reading of *that*-clause:** Mary believes [the claim that the cookies are ready]_{DP}.
 b. **Argument reading of *that*-clause:** Mary believes [the claim]_{DP} [that the cookies are ready]_{CP}.

We cannot tell the difference between these two readings in isolation, since they are nearly truth-conditionally indistinguishable. However, if we assume that when a predicate of contentful entities *claim* is modified by a *that*-clause, the resulting denotation is one which specifies the (characteristic function of the) set of contentful entities with content identical to that of the *that*-clause (Hacquard 2006, Kratzer 2006, Moulton 2009; 2015), the two readings can be teased apart. Given this assumption, the DP *the claim that the cookies are ready*, as in (208a), denotes the following.

- (209) $\llbracket \text{the claim that the cookies are ready} \rrbracket^w = \iota x_c [\mathbf{claim}(x)(w) \wedge \mathbf{CONT}(x)(w)] = \{\lambda w'. \text{the}$

cookies are ready in $w'\}^{\downarrow}$]

(Adapted from Moulton 2015: 313)

On the other hand, the argument reading of the *that*-clause does not *equate* its content with that of the claim; rather, the content of the claim is a *subset* of the set of worlds in which the cookies are ready. This leaves the door open for the relevant claim to consist not only of the cookies being ready, but also additional information. As the following example shows, it is possible to *believe the claim that the cookies are ready* while denying other aspects of that claim.

(210) *Context: Mordecai is making cookies. He tells Mary that the cookies are ready and that he made them with love.*

Mary believes the claim_{*i*} that the cookies are ready, but doesn't believe it_{*i*} that they were prepared with love.

While this sentence is admittedly contrived, it does demonstrate an important point. If *the claim that the cookies are ready* were unambiguously a DP, we would expect (210) to be unacceptable. Because *it* in the second conjunct has to be coindexed with whatever particular claim was discussed in the first, it cannot refer to a full DP *the claim that the cookies are ready*, since the content of that claim is exhausted by the modificational *that*-clause. On the other hand, if *the claim* is allowed to refer to entire Mordecai's conjunctive assertion, we can report Mary's belief in part of the claim and disbelief in another part using (210). This indicates that with content nominals under *believe*, there are two routes to composing with an embedded declarative: saturating an argument of the verb or modifying the content DP.

5.2.3 Composing with non-content DPs

Because *believe* requires an argument of type *c*, we need an explanation for why it can take some non-contentful DPs like *John*, but not others, like *the smells in the kitchen*. I propose to handle this by stipulating limits on a process of type-coercion: allowing *e*-type objects to be treated as *c*-type objects in the proper circumstances. Because *c*-type entities are (by their

nature) propositional, we need a principled way of mapping *e*-type entities to propositions. I propose that this mapping involves matching individuals with a particular *claim* that they made. Formally, the rule for composing with *e*-to-*c* arguments is given in (211), inspired by Pustejovsky (1995), with the corresponding mapping defined in (212).

(211) **FA with contentful entity coercion**

For α of type *e* and β of type $c \rightarrow \tau$ (where τ is any type), $\beta(\alpha) = \beta(\text{CLAIM}(\alpha))$

(212) $\llbracket \text{CLAIM} \rrbracket^w = \lambda x_e. \lambda y_c. [\mathbf{claim}(y)(w) \wedge \text{AUTH}(y)(w) = x]$ ⁸

I define CLAIM as a metalanguage operator which takes an individual and returns the unique claim of which that individual was the author (i.e., the one who made the claim). I also assume that claims are objects of type *c* which can be identified with a particular assertive speech act. Given this compositional technology being available, we expect that any claim-like interpretation of non-content DPs should be possible anytime those DPs occur as arguments of certain types of functions. In fact, we do observe a similar phenomenon with predicates like *correct* and *right*:⁹

(214) John/the book is correct/right/incorrect/wrong.

≈ John's claim/the book's claim is correct/right/incorrect/wrong.

To see how this process works, let's consider an example with this coercion process in action:

(215) Mary believes Janet that the cookies are ready.

⁸It is worth pointing out that the use of the iota operator suggests that the individual *x* makes a *unique* claim. Given that people tend to make lots of claims, we might ask how we ensure that CLAIM gives us the one we want. This is an instantiation of a much more general puzzle about how context constrains the domain of reference of quantificationally-determined expressions. I will not take a stand on how exactly context shrinks the domain of quantification here, though see Partee 1986, Roberts 1995, Recanati 1996, Stanley 2002, a.m.o. for discussion.

⁹Note however that the same does not work for predicates like *true*, which suggests that a finer-grained approach might be ultimately necessary:

(213) *John is true.

Because *Janet*, being a proper name, denotes an *e*-type object, we must coerce it into a *c*-type object using the rule in (211):

$$(216) \quad \mathbf{jclaim} := \llbracket \text{CLAIM}(j) \rrbracket^w = \mathbf{jclaim}$$

I will refer to the contentful individual referring to Janet's unique claim **jclaim** for readability. Feeding this as an argument to *believe* alongside the embedded CP, we get:

$$(217) \quad \left[\begin{array}{l} \llbracket (215) \rrbracket^w = \text{DOX}_m^w \in \{w' : \text{the cookies are ready in } w'\}^\downarrow \\ \left\{ \begin{array}{l} \text{defined if } \text{DOX}_m^w \in \{w' : \text{the cookies are ready in } w'\}^\downarrow \vee \\ \text{DOX}_m^w \in \{w : \text{the cookies are not ready in } w\}^\downarrow \text{ (Excluded Middle), and} \\ \text{CON}(\mathbf{jclaim}) \in \{w' : \text{the cookies are ready in } w'\}^\downarrow \wedge \\ \text{ACQ}(m)(\mathbf{jclaim})(w) \wedge \\ \forall w' [w' \in \text{max}_{\leq, w} (\neg \text{ACQ}(m)(\text{ly}_c[\mathbf{claim}(y)(w') \wedge \text{AUTH}(y)(w') = j])(w'))] \\ [(\neg \text{DOX}_m^{w'} \in \{w'' : \text{the cookies are ready in } w''\}^\downarrow)] \text{ (Evidential Source)} \\ \# \text{ otherwise} \end{array} \right. \end{array} \right.$$

Here, we can see that (215) presupposes that Janet made a claim of which Mary is acquainted with content entailing that cookies are ready, and that moreover, had Mary not been acquainted with this claim, she would not believe that the cookies are ready. This is exactly the intended meaning. The stipulation that entities can only be coerced into contentful entities representing their claims may also help us make sense of why it is that if, as I argued in §5.2.2.1, the class of contentful entities is actually much broader than things like propositions and claims that correspond to speech acts, I am not licensed to utter (218a) if I believe that my toe is broken on the basis of the fact that I stubbed it and hurts a lot, despite the fact that I could utter (218b):

- (218) a. #I believe the pain that I broke my toe.
 b. I believe that I broke my toe.

Because *the pain* does not denote a contentful entity, we have to coerce it into one using (211) when it occurs under *believe*. However, this can only result in a valid composition if *the pain* is in the domain of CLAIM, which seems unlikely, as pain is not normally capable of making claims. (218) does, however, have an anomalous interpretation in which the anthropomorphic manifestation of my pain appears and tells me I broke my toe, but it is exactly that observation which suggests that the ability to turn entities into content-bearers is inextricably linked to speech acts. So while the experience of pain itself might be construable as a contentful entity (for instance, the declarative knowledge that I am in pain), that contentful entity cannot be expressed by the DP *the pain*. It is this asymmetry that explains the contrast in (218).

Before we return to our empirical desiderata, there remains one curious fact about *believe*'s composition with DPs. Namely, while *believe* cannot normally occur without a complement, the clausal (CP) argument of *believe* can be omitted when *believe* takes a nominal complement:¹⁰

- (219) a. *Mary believes.
 b. Mary believes the claim/Janet.

However, unlike the content argument, the missing clausal argument cannot be interpreted existentially, but rather only if it is pragmatically recoverable. This is similar to verbs like *win* and *watch*, whose implicit objects are obligatorily interpreted as pragmatically recoverable definites (Williams 2015). One possible explanation for this fact is that the clausal argument of *believe* is always in principle pragmatically recoverable, but the presence of two implicit arguments (as in (219a)) is simply too taxing to interpret. If this idea is on the right track, it suggests that the relative complexity of *believe*'s argument structure is responsible for its inability to occur without at least one overtly pronounced internal argument.

¹⁰Maya Wax Cavallaro (p.c.) pointed out to me that *Mary believes* is in fact grammatical, but it can only mean something to the effect of 'Mary is a (religious) believer' in very particular situations. It is possible that a sufficiently rich discourse context may be able to rescue bare *believe*-reports, although further investigation is needed to understand what aspects of discourse context are necessary to license it, as well as where the 'religious' flavor of these sentences comes from.

5.3 Welcome consequences of the account

In addition to providing an account of *believe DP CP*, I argue that assuming *believe* to have an evidential presupposition also allows us to understand two other facets of its behavior in contexts where it embeds only a clause: restrictions on the interpretation of embedded predicates of personal taste, and the use of *believe* to accept or reject assertions. Further, I examine an apparently counterexample to the claim that *believe* has this presupposition—vows of religious belief—and suggest that upon careful examination, vestiges of a weak evidential presupposition can also be viewed in such sentences.

5.3.1 Predicates of personal taste

When predicates of personal taste occur under *believe*, they give rise to the inference that the attitude holder is not speaking from their own experience (Stephenson 2007). No such inference is associated with the similar verb *think*: if a PPT occurs in a clause under *think*, the attitude holder can be speaking either from direct experience or indirect evidence.

(220) *Alistair, Belinda, and Candace are at a potluck. A and B brought a cake, and surreptitiously watch from across the room as C tries it. C's face lights up. Relieved, A says:*

- a. Candace thinks that the cake is tasty!
- b. #Candace believes that the cake is tasty! (adapted from Stephenson 2007:63)

The intuition is that (220b) is odd because it seems to suggest that Candace has not tried the cake. Stephenson accounts for this contrast by way of stipulating that *believe*, and not *think*, presupposes that the attitude holder's evidence for the truth of the embedded clause is from a source other than their own sensory experience. Under the current view, this restriction could be easily cashed out as a condition on the evidential source: i.e., that it not merely be the speaker's

own opinion. Indeed, PPTs can occur in embedded clauses in *believe DP CP* sentences; in such cases, the judge of the embedded PPT is made explicit—it is the direct object of *believe*.

(221) *Dante eats the cake before Candace and tells her that it's delicious. Dante has a refined palate so Candace takes his word for it.*

Candace believes Dante that the cake is tasty.

This is further exemplified by the fact that when the object DP is a reflexive anaphor, it obligatorily receives a *de se* interpretation in which the attitude holder is believing some external version (or *doppelgänger*, perhaps) of themselves:

(222) #Candace believes herself that the cake is tasty.

5.3.2 Accepting and rejecting assertions

One hallmark of *believe* is its ability to signal a speaker's acceptance of a prior discourse move when used with a first person subject. For instance, consider the example in (224), which demonstrates that an utterance of *I believe that*, and not the similar *I think that*, is a felicitous response to a novel assertion.¹¹

(223) *Context: Paul is unfamiliar with Caucasian writing systems. Steven is an expert.*

Steven: Fun fact: Laz uses the Georgian alphabet.

Paul: I believe that.

Paul': #I think that.

In this scenario, Paul's utterance of *I believe that* indicates that he is willing to accept the proposition that Laz uses the Georgian alphabet on the basis of Steven's utterance (ostensibly

¹¹Oddly, *I believe so* is much worse in the same context; I have no explanation for this puzzling fact, but I believe it should be attributed to *so* rather than the matrix predicate, as *I think so* is equally bad.

owing to Paul's assumption that Steven is knowledgeable about the subject).¹² On the other hand, Paul cannot target Steven's speech act in this same way with saying *I think that*, which instead seems to suggest that Paul was already aware of the Laz orthography.

If we assume that *I believe that* and *I think that* both communicate roughly the same at-issue meaning, namely that Paul believes that Laz uses the Georgian alphabet, we can understand this contrast as arising from the presence of the evidential presupposition with *believe*, and its absence with *think* in conjunction with a general pragmatic constraint like Maximize Presupposition!, which requires speakers to use presuppositionally stronger alternatives if their presuppositions are met, all else being equal.

The proposal is that *believe* and *think* are similar semantically, but differ only in the presence/absence of an evidential source presupposition. MP! dictates that if this presupposition is met, Paul should use the presuppositionally stronger alternative, *believe*, as opposed to *think*. In this context, the evidential source presupposition is satisfied by Steven's claim, so we expect *believe* to be the preferred option. In addition, if Paul intends to signal that he believes *p on the basis of Steven's claim*, he should be especially motivated to do so by using *believe*, which signals that Paul is basing his belief on the available evidence directly.

On a similar note, the negated response *I don't believe that* can be used to reject an outlandish assertion. In the same discourse context, a response of *I don't think that* gives rise to the inference that the speaker is not rejecting the assertion because he finds it implausible, but rather indicating he already had a different view on the matter.

(224) *Context: Paul is unfamiliar with Caucasian writing systems. Steven knows this and tries to play a trick on him.*

Steven: Fun fact: Laz uses the katakana syllabary.

Paul: I don't believe that.

¹²Given that tacet acceptance of assertions is the norm in conversation, there is a bit more to be said about the function of *I believe that* as a discourse move. It seems to be particularly licensed by contexts in which the prior assertion is in some way unusual or surprising. One plausible analysis is that in such cases the speaker overtly signals that they are on board with the preceding assertion, despite its surprising nature.

Paul': ?I don't think that.

This contrast can be explained on the same grounds. Steven's utterance is treated as potential evidence for the proposition that Laz uses katakana. Paul acknowledges this sourcehood by using *believe*, but ultimately rejects the belief, expressing this using negation.

5.3.3 Religious beliefs

At this point, the skeptical reader might rightly point out that some belief reports really don't seem like they require evidence in support of the stated belief at all, and for that matter, how are we supposed to detect the presence of an extremely weak presupposition which can be effortlessly accommodated all the time? This skepticism is well-founded. We might describe declarations of religious belief as not requiring evidence. Of course plenty of religious beliefs can be supported by holy texts and the like, but others can be the result of gut feelings or raw intuition:

- (225) a. I believe that all men are created equal.
b. Deep down, she believes that God will save her.

This might seem to be at odds with the idea that *believe* lexically encodes an evidential presupposition. We could in principle explain this away by saying that in fact, these cases *are* compliant with the evidential presupposition of *believe*, precisely because it admits a wide variety of evidential sources, including hunches, instincts, or vague intuitions. This is not, however, an empirically convincing argument. Rather, we would ideally be able to see a contrast between *believe* and a similar verb, such as *think*, with respect to behavior that is sensitive to the presence of presuppositions.

I propose that examples like (225) **really do** involve evidence-based beliefs, but the definition of 'evidence' which *believe* requires is extraordinarily permissive. One observation in favor of this analysis is that overtly denying the existence of an evidential source seems to be

degraded with follow-ups to *believe*-reports, and not *think*-reports:

- (226) a. #I believe that God exists but I have no reason for believing that.
b. I think that God exists but I have no reason for thinking that.

This is, admittedly, a very subtle and sensitive judgment, however, other English speakers I have consulted have shared the judgment. One potential confound is that (226a) can quite naturally be interpreted as hyperbole, in which the speaker is suggesting not that they literally have no basis for their belief, but that they have no good or clear reason. Under that reading, (226a) is quite acceptable. This possibility may make the (un-)cancellability of the evidential source an unreliable diagnostic.

Another way to test for the presence of the evidential source presupposition is to see whether it persists through presupposition holes, such as negation. In response to broad-focus questions, *believe*-statements under negation seem infelicitous, particularly if the belief in question is not one most people are likely to be aware of any opinions about.

- (227) A: What is a view that you have?
B1: #I don't believe that Kepler-296f is habitable.
B2: I don't think that Kepler-296f is habitable.

In (227), B1's response seems to suggest that there is some reason to believe that Kepler-296f is habitable, which is difficult to accommodate for most speakers with an ordinary amount of astronomical knowledge. Such an inference is only weakly present in the case of B2's response (and may arise from trying to make sense of why one would answer such a general question with such a specific answer). This seems difficult to explain if *believe* does not have the evidential source presupposition. An alternative explanation for this contrast is that *believe* presupposes that its complement somehow addresses a prior Question Under Discussion (Roberts 1996/2012) which is somehow specific enough to warrant this kind of response. However, in

cases where B1's response more directly addresses the QuD, the contrast between *believe* and *think* is still observed, though admittedly less so:

(228) A: Do you suppose that any distal exoplanets can support life?

B1: ?I don't believe that Kepler-296f is habitable.

B2: I don't think that Kepler-296f is habitable.

This attenuation of the contrast could be reasonably attributed to the fact that it is easier to accommodate the evidential source presupposition about Kepler-296f's habitability in a conversation about exoplanets than it is in a conversation about one's general views about things. If the embedded clause is about something which most people have heard about being believed before, such as the existence of God, the contrast between *believe* and *think* essentially disappears in responses to broad-focus questions:

(229) A: What is a view that you have?

B1: I don't believe that God exists.

B2: I don't think that God exists.

B1's response, in a North American 2021 context, is unlikely to raise any hackles about generating an unreasonable presupposition that there are reasons why one might believe God exists; in this case, the presupposition is essentially invisible. So while it is certainly the case that the evidential source presupposition of *believe* is difficult to detect in the absence of an object DP, it can be sussed out in contexts where speakers are unlikely to have an opinion about the believability of the embedded clause.

5.4 Outstanding issues

5.4.1 Evidential source interactions with negation

One remaining puzzle, which I will address here (though I will not solve it completely), concerns what happens when *believe* is put under negation:

(230) Mary doesn't believe that the cookies are ready.

By our semantics, this sentence should presuppose that there is some contentful evidence with which Mary is acquainted that would lead Mary to conclude that the cookies are ready, since the presuppositions of *believe* should project past negation. While I did conclude that these sentences in fact presuppose the existence of evidence in favor of the embedded proposition in §5.3.3, an issue with this example is that (230) asserts that Mary in fact *does not* believe that the cookies are ready, apparently despite the evidence to the contrary. This is not completely captured by our semantics. Formally, the account produces the following meaning for (230):

$$(231) \quad \llbracket (230) \rrbracket^w = \text{DOX}_m^w \notin \{w' : \text{the cookies are ready in } w'\}^\downarrow$$

$$\left\{ \begin{array}{l} \text{defined if } \text{DOX}_m^w \in \{w' : \text{the cookies are ready in } w'\}^\downarrow \vee \\ \text{DOX}_m^w \in \{w : \text{the cookies are not ready in } w\}^\downarrow \text{ (Excluded Middle), and} \\ \exists y_c [\text{CON}(y) \in \{w' : \text{the cookies are ready in } w'\}^\downarrow \wedge \\ \text{ACQ}(m)(y)(w) \wedge \\ \forall w' [w' \in \text{max}_{\leq, w} (\neg \text{ACQ}(m)(y)(w'))] [(\neg \text{DOX}_m^{w'} \in \{w'' : \text{the cookies are} \\ \text{ready in } w''\}^\downarrow)] \text{ (Evidential Source)} \\ \# \text{ otherwise} \end{array} \right.$$

Strictly speaking, the evidential source presupposition does not contradict the fact that Mary doesn't believe the cookies are ready, because its counterfactual component is conditional: *if* Mary were in a counterfactual world in which the evidence for the cookies' readiness did not

exist, she would not believe that the cookies are ready, but that does not entail that if she has evidence for the cookies being ready that she will accept it. Nevertheless, this feels like an accidentally correct result. Somehow, the notion we want to express is that the evidential source is such that, if any reasonable person were to observe it, they would come to the conclusion that the cookies are ready. Additional precisification of the evidential source presupposition (such as an overtly evidential treatment, like that of Murray 2010) is needed to capture this intonation, beyond a naive counterfactual semantics.

5.4.2 *Can't believe DP*

In Chapter 4, I laid out a proposal for how the apparently aberrant meaning of *can't believe* can be derived compositionally; since then, we've altered the meaning of *believe* significantly. But interestingly, when *can't believe* takes a DP, it cannot longer embed interrogatives. What's more is that it no longer has the 'be surprised' paraphrase with an embedded declarative, but instead conveys emphatic disbelief:

- (232) a. *Mary can't believe Janet what kind of cookies there are in the kitchen.
 b. Mary can't believe Janet that there are snickerdoodles in the kitchen.
 ⊨ It's not the case that Mary believes that there are snickerdoodles in the kitchen.

These observations pose some problems for linking the analyses of Chapters 4 and 5, but the ungrammaticality of (232a) at least can be explained in terms of the interaction between the modal *can* and the evidential source presupposition. (The reader is referred to discussion in Chapter 4 for the relevant formal technologies involving the modal.) I give the presumed semantics for (232a) below. For the sake of space, let q be the denotation of *what kind of cookies there are in the kitchen*, the downward-closed set of propositions corresponding to answers to that question $\{\{w: \text{there are chocolate chip cookies in } w\}, \{w: \text{there are sugar cookies in } w\}, \{w: \text{there are oatmeal raisin cookies in } w\}, \dots\}^\downarrow$, and define **jclaim** as in (216).

$$(233) \quad \left[\begin{array}{l} \llbracket (232a) \rrbracket = 1 \text{ iff } \nexists u \in \text{BEST}(f_{dispo}(w)(m), g_{AB}(w)(m)). [\text{DOX}_m^u \in q] \\ \left\{ \begin{array}{l} \text{defined if } \text{DOX}_m^w \in q \vee \text{DOX}_m^w \in \neg q \text{ (Excluded Middle), and} \\ \text{CON}(\mathbf{jclaim}) \in q \wedge \\ \text{ACQ}(m)(\mathbf{jclaim})(w) \wedge \\ \forall w' [w' \in \text{max}_{\leq, w} (\neg \text{ACQ}(m)(\iota y_c [\mathbf{claim}(y)(w') \wedge \text{AUTH}(y)(w') = j])(w'))] \\ [(\neg \text{DOX}_m^{w'} \in q)] (\mathbf{Evidential Source}) \\ \# \text{ otherwise} \end{array} \right. \end{array} \right.$$

Just as it would without the embedded DP, (232a) means that in no ideal world vis-à-vis Mary's abilities to have a belief about what kind of cookies there are, while presupposing that she does have such a belief in the actual world. However, the Evidential Source presupposition says, additionally, that Janet made a claim that Mary is aware of which answered the question of the kind of cookies there are, and that if Mary were not aware of Janet's claim, she would not have a belief about what kind of cookies there are.

To see why this is problematic, consider two reasonable criteria for Mary to be an ideal believer (in the sense of $\text{BEST}(f_{dispo}(w)(m), g_{AB}(w)(m))$ —one who uses their abilities to believe to the fullest extent): (1) that she believes things for which she has very good evidence, and (2) that she does not believe things for which she does not have very good evidence.

Suppose that Janet tells Mary that there are snickerdoodles in the kitchen. Should Mary believe her, if she's trying to be an ideal believer? That depends on Mary's opinion of Janet: if she's a reliable source of information, then Mary should adopt the belief that there are snickerdoodles in the kitchen. If Janet is not a reliable source, then Mary shouldn't adopt that belief. But whether Janet turns out to be reliable or not, (232a) will result in an unsatisfiable truth conditions.

If Janet is a good source of information, then Mary should believe whatever Janet claims in all ideal worlds. But if that is the case it is not clear under what circumstances (232a) could ever be true: it presupposes Janet has made a claim, and given her reliability, there will always

be some ideal worlds in which Mary believes that there are snickerdoodles in the kitchen. The combination of Janet's trustworthiness and the evidential source presupposition therefore conspire to ensure that $\text{BEST}(f_{dispo}(w)(m), g_{AB}(w)(m))$ will always include some worlds where Mary's beliefs accord with Janet's claim that there are snickerdoodles.

If Janet is not reliable, we might say that then the evidential source presupposition will never be met, on the grounds that the untrustworthy Janet's claims are essentially worthless. They don't influence Mary's beliefs in ideal worlds (since she ignores unreliable claims), so we cannot safely make the counterfactual claim that in worlds minimally different from w in which Janet didn't assert the presence of snickerdoodles, Mary doesn't believe that there are snickerdoodles in the kitchen. But this argument generates the faulty prediction that the counterfactual component of the evidential source presupposition can never be met for *believe* in general in the referent of the content argument is unreliable, regardless of the presence of *can*. This is evidently false:

(234) Mary doesn't believe Janet that there are snickerdoodles in the kitchen, because she knows that Janet is a liar.

We face a similar problem with (232b), *Mary can't believe Janet that there are snickerdoodles in the kitchen*. Letting $p = \{\{w: \text{there are chocolate chip cookies in } w\}, \{w: \text{there are sugar cookies in } w\}, \{w: \text{there are oatmeal raisin cookies in } w\}, \dots\}^\downarrow$, our semantics produces the following for (232b):

(235) $\llbracket(232b)\rrbracket = 1$ iff $\nexists u \in \text{BEST}(f_{dispo}(w)(m), g_{AB}(w)(m)).[\text{DOX}_m^u \in p]$

$$\left\{ \begin{array}{l} \text{defined if } \text{DOX}_m^w \in p \vee \text{DOX}_m^w \in \neg p \text{ (**Excluded Middle**), and} \\ \text{CON}(\mathbf{jclaim}) \in p \wedge \\ \text{ACQ}(m)(\mathbf{jclaim})(w) \wedge \\ \forall w' [w' \in \text{max}_{\leq, w} (\neg \text{ACQ}(m)(\text{ly}_c[\mathbf{claim}(y)(w') \wedge \text{AUTH}(y)(w') = j])(w'))] \\ [(\neg \text{DOX}_m^{w'} \in p)](\mathbf{Evidential Source}) \\ \# \text{ otherwise} \end{array} \right\}$$

For *can't believe p* sentences of the type *Mary can't believe that there are snickerdoodles in the kitchen*, without the direct object, I argued that these sentences can be truthfully uttered in two situations: one in which Mary is an ideal believer in w and therefore doesn't believe that there are snickerdoodles in the kitchen in w , and another in which Mary is *not* an ideal believer in w and can potentially believe in the presence of snickerdoodles. However, (232b) is more restrictive: it entails that Mary does not believe there are snickerdoodles in the kitchen.

What this means is that (232b) is incompatible with the latter of these two situations, the possibility that w is non-ideal and Mary believes that there are snickerdoodles in the kitchen. But again, it seems that we should expect this possibility to be compatible with (232b) if we take it for granted that Janet is untrustworthy, along similar lines as before: if in reality Mary believes that there are snickerdoodles in the kitchen after Janet told her that despite Janet being a liar, then the truth conditions of (235) are met: Mary isn't an ideal believer (having taken the word of a liar), but believes there are snickerdoodles in the kitchen all the same. As they so often do in life, untrustworthy people pose a problem for our analysis of *can't believe DP*.

One potential way out of this conundrum is by challenging the presumption that the evidential source presupposition projects globally, like the EM presupposition. Let us suppose instead that the counterfactual component of this presupposition projects instead *into* the modal. Assuming this projection into *can*, for (232b), we get:

$$(236) \quad \llbracket (232b) \rrbracket = 1 \text{ iff } \nexists u \in (\text{BEST}(f_{dispo}(w)(m), g_{AB}(w)(m))) \cap$$

$$\forall w' [w' \in \max_{\leq, u} (\neg \text{ACQ}(m)(\iota y_c[\mathbf{claim}(y)(u) \wedge \text{AUTH}(y)(u) = j])(u))] [(\neg \text{DOX}_m^{w'} \in p)] [\text{DOX}_m^u \in p]$$

$$\left\{ \begin{array}{l} \text{defined if } \text{DOX}_m^w \in p \vee \text{DOX}_m^w \in \neg p \text{ (**Excluded Middle**), and} \\ \text{CON}(\mathbf{jclaim}) \in p \wedge \\ \text{ACQ}(m)(\iota y_c[\mathbf{claim}(y)(w) \wedge \text{AUTH}(y)(w) = j])(w) \\ \# \text{ otherwise} \end{array} \right\}$$

What has changed here is that we are now requiring that there is no world which is both ideal (again, in the relevant sense having to do with Mary’s ability to form beliefs) and one in which Mary believes that snickerdoodles are in the kitchen on the basis of Janet’s claim, and in which Mary believes that there are snickerdoodles in the kitchen. This statement is going to be tautologous if we assume that Janet is untrustworthy, since then the overlap between ideal-belief-worlds and believing-Janet-worlds will be empty. Simply put, Mary cannot believe that there are snickerdoodles in the kitchen (or anything, for that matter) from the evidence of the notorious Janet’s claim while preserving her status as an ideal believer. It should be noted at this point that the same argument holds equally for cases where the embedded clause is interrogative, as well.

Thus, by stipulating that this presupposition projects into the ability modal—thereby restricting the domain of worlds it quantifies over—we can explain away the apparently problematic prediction of the account that *can’t believe p* and *can’t believe q* should be able to receive ‘non-literal’ interpretations with the presence of an overt source. If this analysis is correct, it suggests we need to articulate a more fine-grained notion of what projects and why to account for this apparent difference between the EM and ES presuppositions.

5.4.3 Comparison to Djärv (2019, 2021)

Djärv (2019, 2021), who observed many of the crucial syntactic facts about the nominal-embedding behavior of *believe*, proposes a spiritually similar account of the interpretation of

believe DP utterances. However, her analysis differs from that advanced in this chapter in one key way: rather than *believe* having a complex argument structure which requires a content argument, *believe* has a standard Hintikkan denotation, and selects only for a proposition. She claims that *believe* combines differently with ‘source’ DPs like *John* and *the book* versus content DPs like *the rumor*, in that only the latter saturate the propositional argument of the verb. Rather, source arguments are introduced by a low applicative head $Asst^o$, defined in (237).

$$(237) \quad \begin{aligned} & \llbracket Asst^o \rrbracket^w = \lambda p_{st} . \lambda x_e . \lambda f_{\langle st, et \rangle} . f(p) \\ & \left\{ \begin{array}{l} \text{defined if } \exists e [\text{assert}(e) \wedge \text{agent}(e)(x) \wedge \text{goal}(e) = p \cap c] \\ \# \text{ otherwise} \end{array} \right\} \quad (\text{Dj}{\ddot{a}}rv \text{ 2021:22}) \end{aligned}$$

Here, c is taken to be the context set of a particular discourse context (presumably that of the event e). Essentially, $Asst^o$ is intended to contribute the assertive presupposition associated with *believe* x that p : it presupposes that x made an assertion, the goal of which was to shrink the context set to include only world in which p is true (as is commonly assumed in many models of discourse update, e.g. Farkas & Bruce 2010). while preserving the semantic relation between *believe* and a clausal complement.

In this section, I will outline the differences between my proposal and Dj}{\ddot{a}}rv’s, and suggest that although the proposals largely achieve the same empirical coverage on the core cases, my analysis can explain surprising semantic facts about *believe* without embedded nominals, and Dj}{\ddot{a}}rv’s equation of non-content arguments with Source DPs outside this construction makes some problematic cross-linguistic predictions. However, the present proposal lacks an explanation for certain syntactic facts about the difference between non-content DP objects and content DP objects which are elegantly captured by Dj}{\ddot{a}}rv’s proposal; this suggests that it may be profitable to attempt bridging this two theories together.

5.4.3.1 Semantics

The primary difference between my analysis and that of Djärv (2021) is that Djärv assumes a standard Hintikka denotation for *believe*, given in (238):

$$(238) \quad \llbracket believe \rrbracket^w = \lambda p_{st} . \lambda x_e . \text{DOX}_x^w \subseteq p$$

Because source arguments are introduced via a functional head, they are not present in the lexical entry of *believe*; rather, the argument-structural complexity is imparted into Asst^o , which combines first with the embedded proposition, then the source argument, and then *believe*, through iterative uses of Function Application. The final compositional semantics Djärv gives for a sentence with a source DP is in (239).¹³

$$(239) \quad \llbracket \text{Renee believes Anna that Lisa won} \rrbracket^w = \quad \text{(Djärv 2021: 26)}$$

$$\left. \begin{array}{l} 1 \text{ iff } \text{DOX}_r^w \subseteq \{w' : \mathbf{won}(l)(w')\} \\ \left\{ \begin{array}{l} \text{defined if } \exists e[\text{assert}(e) \wedge \text{agent}(e)(a) \wedge \text{goal}(e) = \{w' : \mathbf{won}(l)(w')\} \cap c \\ \# \text{ otherwise} \end{array} \right\} \end{array} \right\}$$

At the end of the day, this is fairly similar to what I have proposed: *believe Anna that Lisa won* presupposes that Anna made an assertion whose goal was updating a conversational context c with the proposition that Lisa won. However, the major unanswered question left by this approach is what relationship Anna's assertion has to the belief of the attitude holder, Renee, who is not explicitly present in the presupposition at all.

A related question, which could potentially solve this problem, is how we determine which conversational context c is actually referring to. It clearly need not be the context in which (239) is uttered, because it's possible that Anna mentioned Lisa's victory to Renee last week. We could suppose that the reference of c is anaphorically determined, and take for granted that this is generally going to involve a conversation where Renee was present (and perhaps the

¹³This example has been lightly modified to include a subject, as opposed to simply being a bare VP.

addressee of Anna's claim). But this still strikes me as a bit too weak: the definition given here does not establish a clausal link between Anna's claim and Renee's belief.

Ultimately, these issues are easily solvable by establishing some way of determining the reference of *c* and adding an additional requirement that the attitude holder's belief result from the presupposed assertion (such as the counterfactual proposal outlined in this chapter). With these changes, I believe the two accounts would make very similar predictions for the interpretation of *believe DP CP* utterances. However, when we examine the interpretation and use of *believe* in other contexts, such as the restrictions on the interpretation of embedded PPTs, it is not clear how the bare Hintikka denotation for *believe* can capture this fact, whereas the presupposition of the present proposal gets that fact for free.

5.4.3.2 Syntax

Djäv's principal motivation for treating source and content DPs differently is syntactic, based on evidence in particular from English and German. Although the account presented in this Chapter does not account for syntax, it is worth exploring this aspect of her proposal, since it nevertheless sheds some light on semantic aspects of the construction, and in particular the question of whether DPs embedded by *believe* are of a syntactic kind with DPs that occur elsewhere. In German, unlike English, DPs with 'source' thematic roles are available with a wide variety of verbs, and must be marked by dative case (240).

(240) **German** (Schäfer 2008: 76)

Hans stahl Maria das Buch.
Hans stole Maria.DAT the.ACC book
'Hans stole the book from Maria.'

(241) *Hans stole Maria a book. (Intended meaning: (240))

Djäv additionally shows that German source DPs as objects of *glauben* 'believe' are also obligatorily dative-marked (242a), whereas content nominals in the same context are obligatorily

accusative (242b).

(242) **German** (Djärv 2019: 235)

- a. Ich glaube ihr/*sie, dass Maria ein Genie war.
I believe her.DAT/ACC that Maria a genius was
'I believe her that Mary was a genius.'
- b. Ich glaube die/#der Behauptung, dass Maria ein Genie war.
I believe the.ACC/DAT claim that Maria a genius was
'I believe the claim that Mary was a genius.'

Given that (242a) is indistinguishable in meaning and from its English counterpart, and apparently mirrors its syntax, Djärv quite reasonably assumes that *believe DP* and *glauben DP* should receive the same treatment. Indeed, there are also syntactic arguments for why content and source DPs are syntactically distinct in English.

She also points out that passivization behavior of content and source DPs under *believe* mimics the extraction patterns of direct and indirect objects in double object constructions in many varieties of English. Chiefly, an embedded CP can be passivized only when a source DP is not present (see Djärv 2021: 11):

(243) That she will win the race is widely believed (*him).

Despite these similarities, elsewhere the comparison between double object constructions and *believe DP* break down. As Djärv notes, unlike direct and indirect objects, content and source DPs cannot co-occur in English. Notably, this contrasts with German, in which the combination of the two DPs is allowed.

(244) *She believes him the claim.

In order to account for the ungrammaticality of examples like (244), Djärv proposes that Asst^o does not assign Case in English, but does in German; thus, (244) violates the Case Filter, which

mandates that every overt DP be assigned abstract Case (Chomsky & Lasnik 1977, Vergnaud 1977/2008). This is taken to be a locus of parametric variation, which tracks the general availability of Source DPs in German, but their limited distribution in English. She additionally shows that Dutch and Swedish, like English, neither allow for source DPs to occur generally nor co-occur with content DPs under *believe*, whereas Spanish patterns with German in permitting source DPs generally, and source DPs and content DPs together under *believe*.

The robustness of this correlation is certainly good evidence that there is a systematic syntactic distinction to be drawn between Dutch, Swedish, and English on the one hand, and German and Spanish on the other. However, I will present three arguments that the putative (in)ability of Asst^o to assign Case is not the source of this variation.

First, this theory predicts that if an English propositional attitude verb assigns (accusative) Case, it should be able to take Source DP objects, since Asst^o is not a Case assigner. But the presence or absence of Source DPs is not only about syntax. We have seen that *think* does not normally take either source or content DPs, but it can license certain kinds of DP objects: what Elliott (2017) dubs ‘propositional DPs’, including special quantifiers (in the sense of Moltmann 2013) like *something*, free relatives, and anaphoric expressions like *that*.

- (245) a. Garnet thinks [something]_{DP}.
b. Garnet thinks [whatever her mother thinks]_{DP}.
c. Garnet thinks [that]_{DP}.

Given this assumption that every DP must be assigned abstract Case,¹⁴ we must conclude that *think* is a Case licenser. But then it is not clear at all why *think* should not permit source DPs. In the proposal of this chapter, this fact follows straightforwardly from the fact that *think* does not take an argument of type *c*.

Second, Djärv’s analysis relies on a unified treatment of source DPs as arguments of

¹⁴I do not take a stand here on whether this abstract Case needs to correlate with morphological case, though the variation in overt case among languages here suggests that this construction gives credence to theories which do not require the two to be linked (Vergnaud 1977/2008, Pesetsky & Torrego 2004, Legate 2008; a.o.).

believe and source DPs which occur in the language more generally, but there is reason to suspect that this may not be feasible in all languages. There appear to be languages in which the case-marking behavior of source and content DPs is identical, but also differs from source DPs in other contexts. In Estonian, which has an extensive system of overt morphological case, both source and content arguments of *uskuma* ‘believe’ receive partitive case, which canonically occurs on some direct objects. These arguments cannot receive allative case, which is normally assigned to indirect objects of ditransitive verbs like *andma* ‘give’ (247), nor ablative case, which is used to mark the equivalent of source DPs (248).¹⁵

- (246) a. Ma usun Liisi/*Liisile/*Liisilt, et koroonaviirus on ohtlik.
 I believe Liis.PART/ALL/ABL that coronavirus is dangerous
 ‘I believe Liis that coronavirus is dangerous.’
- b. Õpetaja usub valet/*valele/(valelt, (et ma haige olen).
 teacher believes lie.PART/ALL/ABL that I sick am
 ‘The teacher believes the lie (that I am sick).’
- (247) Ma annan kingi Liisile/*Liisi.
 I give gift.ACC Liis.ALL/PART
 ‘I give a gift to Liis.’
- (248) Keegi varastas temalt raha.
 someone stole 3SG.ABL money.ACC
 ‘Someone stole money from him.’

If source DPs are really the same kind of argument in eventualities of stealing and believing (i.e., licensed by the same functional head), we would expect the source DPs in (246a) and (248) to receive the same morphological case. This is clearly not so, which suggests that they are assigned case by different heads from one another. This observation points to a potential typological confound in the sample of languages Djärv examines in detail, which all have relatively small inventories of morphological case, thus necessitating that some cases are re-

¹⁵Like English, Estonian lacks, as far as I can tell, a productive source construction which utilizes a clear-cut structural case. We might be tempted to say that the morphological ablative case on sources is really analogous to a postposition, but ablative case marked-nouns participate in adjective-noun case concord, which casts doubt on this idea (see Norris 2014).

purposed for multiple uses. If source DPs with *steal* and *believe* are really two different beasts altogether, the differential case-assigning behavior of Estonian is not surprising, but neither is the fact that both arguments are morphologically dative in German; there are simply not enough cases to go around.

A final issue is theory-internal. If Asst^o does not assign Case in English, then we need an explanation for why *believe* can assign Case to both source DPs and content DPs if they occur on their own, given that they are in different structural positions with respect to the Case-assigning V. Under a configurational approach to Case assignment, we do not expect the same head to assign Case to multiple different positions, unless by some sort of Agree-like mechanism. The precise mechanics of Case assignment are left unspecified here, but this would presumably need to be worked out.

5.4.4 *Believing in other languages*

The syntactic facts of English *believe DP* are not readily captured by my proposal; what I have argued for here is a particular arrangement of the *semantic* arguments of *believe*. *Believe* can either have its contentful entity argument saturated by a content DP, or by a source DP which has been coerced into an object of type *c*; the two kinds of DPs cannot co-occur because they are competing for the same argument slot. What remains unexplained under the analysis I have discussed here is how the account could be extended to handle the observation that in German and Spanish, source DPs and content DPs can co-occur under *believe*.

One possibility is that the difference between German and English is purely syntactic: not about whether or not Asst^o assigns Case, but whether it is present in the syntax at all. Under this view, German could work more or less exactly as Djärv proposes: content DPs saturate the propositional argument of *believe*, and source DPs are introduced by Asst^o . English, on the other hand, does not syntactically differentiate between the two types of arguments, both of which saturate a content argument of *believe*. This alternative theory makes the clear prediction that English and German *believe* differ in their lexical content: the former has a more complex

argument structure than the latter.

While the overwhelming semantic similarities between *believe* and *glauben* do indicate that pursuing a unified semantic account of the two is desirable, it requires additional exploration to determine whether the two pattern similarly with respect to some of the data considered in this chapter. For instance, we saw that English *believe* generates the strong inference that a PPT in its complement clause is judged by someone other than the attitude holder. If it turns out that *glauben* doesn't generate such an inference, that might suggest that this alternative proposal is on the right track.

To make matters even more complicated, there are other languages where, according to judgments I have solicited, *believe DP CP* sequences are disallowed altogether, such as Turkish and Canadian French:

(249) **Turkish** (Deniz Özyıldız, p.c.)

Anna Brian'a (*Brian'in partide oldugun-a) inaniyor.
Anna Brian.DAT Brian.GEN party.LOC be.NMZ-DAT believe
Anna believes Brian (*that Brian was at the party).

(250) **Canadian French**

Marie croit Gaston (*qu'il a cambriolé une banque).
Marie believes Gaston that.he has robbed a bank
'Marie believes Gaston (*that he robbed a bank).'

These judgments bear more systematic scrutiny, but if they hold up, they may tell us something about the extent of variation in the relationship between the syntax and semantics of *believe*. In the case of Turkish, both source DPs and clauses embedded under *believe* must be dative-marked (the embedded clause having been nominalized), which suggests that they could be in competition for the same syntactic position, thereby explaining their inability to co-occur. In Canadian French, on the other hand, there is no obvious way in which the embedded clause is case-marked (and evidence from clitics suggests that the source DP is also not dative), so this

argument is more challenging to make.

Finally, it seems there are at least some languages in which *believe*-sentences can carry the presupposition that an assertion was made even in the absence of an overtly referential source DP. In Russian, a dative-marked non-referential demonstrative pronoun can occur in the left periphery of an embedded clause that occurs in a position where dative case is normally assigned (Knyazev 2016). When this pronoun does not occur in a clause under *believe*, it does not presuppose the existence of a claim identified with the embedded clause, but when the pronoun is present, there is such a presupposition. This may suggest that perhaps the embedded clause can fulfill either the content argument of *believe*, or its clausal argument.

(251) **Russian** (Tanya Bondarenko, p.c.)

- a. Ja verju [tomu čto byli fal'sifikacii].
I believe that.DAT COMP were falsifications
'I believe that there were falsifications.'

(Presupposed: there was a claim that there were falsifications)

- b. Ja verju [čto byli fal'sifikacii].
I believe COMP were falsifications
'I believe that there were falsifications.'

(No pre-existing claim necessary)

What is clear from all this is that although *believe DP* appears to be a robustly presuppositional construction across many languages (indicating that there is a good deal of semantic overlap between *believe* and its cross-linguistic counterparts), there is considerable variation in the syntactic realization of these constructions, especially with respect to morphological case. However, there remains much work to be done to determine the extent of semantic variation in *believe* across languages, a task which this chapter has only begun to scratch the surface of.

5.5 Summary

In this chapter, I proposed an analysis of verbs *believe*, which can embed both a nominal and a clause at the same time: *believe* carries a presupposition that the attitude holder has some particular evidence for their belief, and selects (at the level of argument structure) for a content-bearing entity to fulfill that evidential role, *in addition to* a Hintikka-like clausal argument.

I couched the analysis in an extension of the InqSem framework leveraged in analysis of *believe* in Chapter 4, in which the basic meaning of an embedded clause is a set of propositions. The biggest departure from orthodoxy was in introducing a content argument for *believe*, which *think* simply lacks; in so doing, I necessarily proposed that *think* and *believe* don't rely denote relations of the same kind at all, despite appearances. I further demonstrated that enriching the lexical semantics of *believe* can still allow it the flexibility to compose with different kinds. Simply put, it seems that the lexical semantic representation of different attitudes can be profitably utilized to explain differences in their syntactic and pragmatic behavior.

A primary upshot of this proposal is that there is significant reason to doubt that attitude verbs all necessarily have the same basic argument structural template (such as denoting a relation between an agent and a proposition). In at least some cases, we clearly need to chalk up a predicate's syntactic complexity to the complexity of its meaning, and we cannot always offload this complexity onto functional heads. And by lexical semantics, I do not simply mean the formal types of these verbs, but at some deep level, what these verbs actually *mean*.

There is something fundamentally different about the internal walled garden of the mind in and of itself as opposed to the mind's relation with the observable world. I suggest that verbs like *believe* express relations of the latter kind, perhaps by comparison with verbs like *think* which are strictly inward-looking. And given that many other languages seem to distinguish between *thinking* and *believing*, perhaps this distinction is a fundamentally important one to humans, though clearly more robust cross-linguistic evidence is needed.

To take it a step further, we might even conceive of the contrast between *think* and

believe as analogous to the two guises of *mōtlema* we witnessed in Chapter 3. Whereas *mōtlema* exemplifies how a single denotation can interact with linguistic context to give rise to extremely different interpretations, *think* and *believe* have quite different lexical entries but nevertheless end up meaning very similar things in many contexts.

Chapter 6

Conclusion

This dissertation is broadly concerned with understanding the nature of the relationship between the lexical semantics of belief verbs and their syntax. I have shown, I hope, that the role semantic type plays in clausal selection is relatively weak; rather, a rich and complex lexical semantics for attitude predicates, and a correspondingly rich ontology of attitudes, can give us a deeper understanding of the syntactic distribution of such predicates.

Rather than being marginalia, lexical semantics above and beyond types actually plays a central role in semantic composition; however, this role can be obscured by focusing too much on the use of a predicate in a limited set of contexts.

Chapter 3 presented an in-depth study of the Estonian verb *mõtlema*, an attitude of **contemplation**, and demonstrated that despite its sharply divergent interpretations with different types of complements, it can still be understood with a single lexical entry, and that lexical entry must select for objects of type *T*, as opposed to objects of type *st*. The vast difference in the interpretations of *mõtlema* in different contexts arises compositionally, from the interactions between the attitude of contemplation and the meanings of different types of clauses.

Chapter 4 zoomed in on the English predicate *believe*. I showed that while *believe* is normally analyzed as an anti-rogorative verb, it may also embed interrogative clauses when occurring in certain linguistic contexts (i.e., under particular combinations of negation and modality,

like *can't*), which suggests that its underlying semantics is not proposition-taking. Moreover, in those same linguistic contexts, *believe* also obtains a veridical 'reading'. Rather than being an aberrant quality of English *believe*, this non-veridical/veridical alternation is observed in a variety of languages, suggesting this pattern reveals something relatively deep about the nature of language.

I proposed that the apparent 'relaxing' of *believe*'s selectional restrictions under certain conditions can be understood in compositional terms if we make the assumption that it selects objects of type *T* underlyingly, and is incompatible with interrogatives in most contexts for independent reasons, a similar conclusion to (Theiler et al. 2018). This incompatibility is obviated precisely under the conditions afforded by the semantic addition of *can't*. In the picture that emerges from this work, the compatibility between an attitude verb and its potential complements is not principally determined by semantic type, but rather much more general rules about possible and impossible interpretations of sentences.

Chapter 5 pivoted to examine the argument structure of *believe*, and in particular, why verbs like *believe*, as opposed to other attitudes, which can take non-content-denoting nominal complements like *John*. I proposed that the answer lies in argument structure: *believe* takes an evidential argument this property of *believe* can be integrated into a clausal-embedding denotation. This proposal also served to explain certain pragmatic features of *believe*'s interpretation, despite the fact that this evidential argument of *believe* appears to contribute little to the meaning of *believe*-reports in most contexts.

I now present several remaining open questions raised by this dissertation, as well as potential promising avenues for future work in deepening our understanding of clausal embedding.

6.1 Scaling up

This dissertation largely consists of in-depth studies of a small number of words in a small number of languages. This may sound picayune and navel-gazing, but what this kind of study can tell us is anything but. By examining individual words under a microscope, in a large variety of contexts, we can see the ways in which their behavior is much more nuanced and expansive than previously thought. And by comparing these minute distinctions across languages, we come across a striking number of similarities, suggesting that our small-scale studies are not merely obsessing over idiosyncracies, but are revealing that these seemingly minute quirks are much more regular than they appear at first blush.

Fruitful though it may be, the method of extensive armchair analysis of individual attitude predicates, and sorting them into classes, does not scale well to the entire lexicon of a language, let alone multiple languages; the inventory of attitude predicates in a single language can number in the thousands. Recent technological developments, however, provide promising routes for further study. One is to use online crowdsourcing platforms, such as Amazon’s Mechanical Turk, to collect acceptability judgments for a variety of predicates from a large number of people, as in the MegaAttitude project (White & Rawlins 2016; 2020). In addition to potentially being informative about the behavior of individual predicates, the sheer scale of this data allows for study of lexical patterns in a way that was highly impractical before crowdsourcing.

Another potential approach to understanding lexicon-scale patterns is the use of computational models to determine which kinds of predicates are more or less likely to exist, thereby avoiding some of the work in the trenches of fine-grained study of individual predicates. For instance, it is generally assumed that ‘learnability’ is a major factor in constraining possible versus impossible meanings (either because of hardwired linguistic machinery in the brain or domain-general cognitive abilities). One way of operationalizing a learnability investigation is by using neural networks, and seeing whether words which conform to apparent typological restrictions are more easily learned by such networks than words which are not.

For instance, Steinert-Threlkeld (2020), building upon Steinert-Threlkeld & Szymanik (2019), used an artificial NN to determine whether predicates which are veridically uniform (either veridical with respect to both declarative and interrogative complements, or non-veridical with respect to both kinds of complements) were easier to learn than predicates which were not veridically uniform. Predicates in the latter case have been argued to be absent from natural language. Ultimately, Steinert-Threlkeld found that uniform verbs were indeed learned more easily than non-uniform ones by the network, suggesting that the typological gap of non-veridically-uniform predicates can be explained by a tendency for languages to lexicalize easy-to-learn predicates over hard-to-learn ones.

It of course remains a matter of debate the extent to which NNs actually model human learning, but the ability to use NNs (which have proven successful at ‘learning’ a huge variety of patterns) as a proxy for human learners is undoubtedly a powerful tool. For one, we can abstract away from parts of lexical meaning (such as idiosyncratic connotations) that might interfere with human judgments. However, the use of NNs will not be sufficient to answer all of our questions, if for no reason than it is often difficult to understand *why* an NN succeeds at a particular task. Rather, a NN is often perceived as an inscrutable ‘black box’ and not all the patterns an NN’s behavior are human-legible. So while it may help us understand whether something is learnable or not, it will not necessary help us understand *why* it is learnable.

Finally, a major limit of all big data methodologies—whether they involve neural networks or large judgment-collection studies—is that they can only easily be implemented for languages for which there is a lot of easily accessible data or a large body of available speakers, like English, Japanese, or Russian. Many languages lack enough speakers to provide a statistically adequate sample size for collecting lexicon-scale numbers of judgments or enough written data to train computational models. And the data-abundant languages are, of course, those which are already highly over-represented in linguistic theory, so an over-reliance on these methods can shape the questions we ask through the biased lens of common languages.

This should not discourage us from using these methods. Access to huge quantities of

data and unprecedented computing power to analyze that data are undoubtedly a boon to lexical semantics, and will surely inform theories of clausal embedding for years to come. However, there is not yet a replacement for intensive work on individual words in understudied languages in Estonian; in future work, I hope to integrate both these careful (if low-tech) methods with the affordances of big data to develop a broader picture of clausal embedding.

6.2 The cross-linguistic picture

In recent work, a number of authors have proposed broad generalizations about the connection between the syntax and semantics of attitude predicates, such as a bidirectional entailment between veridicality and responsivity (Egré 2008) or all neg-raising predicates being anti-rogative (Theiler et al. 2018; 2019). A natural next step is to rigorously investigate the typological predictions of these generalizations in a wide variety of languages.

But our work is cut out for us: large-scale studies of fine-grained lexical semantics of attitude predicates have been studied in a scant number of the world's languages. In this work, I focused primarily on a handful of verbs English and Estonian, with cursory looks at other (mostly European) languages. Clearly, this does not constitute a typologically robust sample, although this work is to my knowledge the only to investigate these particular questions about attitudes in Estonian, and certainly I hope not the last.

As in other domains of linguistics, extending analyses of relatively well-studied languages like English to lesser-studied ones has proved fruitful for uncovering patterns of variation. For example, I proposed that *believe* lexically specifies an evidential source for a particular belief, from the perspective of the attitude holder, though we can only 'see' the effects of this source in particular linguistic environments. Crucially, this evidential source can be explicitly stated in the form of a direct object for *believe*.

If this dissertation is on the right track, we expect that differences in syntactic behavior between apparent counterparts across languages correspond (perhaps always) to differences in

their semantics. That being said, we should take care not to expect that every semantic difference between predicates also gives rise to a syntactic difference. Take, for instance, the English predicate *true* compared to its Irish counterpart *fíor*. *True* is unlike most attitude predicates in that it does not take an external argument, so a sentence of the form *It is true that p* can be taken as a claim that *p* is true in general, as opposed to relative to any individual's information state (252a). However, *true* can optionally occur with an oblique argument (252b). But sentences of the form *It is true to x that p* generate the strong inference that *x* is mistaken in their belief that *p*, ostensibly because we do not ordinarily conceive of *true* as being judge-dependent.

- (252) a. It is true that she would be betrayed.
 b. It is true to Miriam that she would be betrayed.

Fíor, for its part, behaves much like English *true* when it occurs with a complement clause and no external argument (253a). However, when *fíor* combines with an oblique argument in the same manner as *true*, its interpretation is sharply different: the speaker is taken to believe that the referent of the argument is correct, not mistaken, about the truth of the embedded proposition (253b).¹

- (253) a. Is fíor go bhfuil an fharraige fealltach.
 PRES true C is the sea treacherous
 'It is true that the sea is treacherous.'
- b. B' fhíor dó go ndéanfaí feall orthu.
 PAST true to-him C do.COND-IMPERS treachery on-them
 'He was right that they would be betrayed.' (Lit. 'It was true to him that they would be betrayed.')

There are several possible explanations for explaining the apparent syntactic similarity but semantic dissimilarity between *true* and *fíor*. One possibility is that the two words really are syntactically distinct, and we happen to not be examining the right contexts to distinguish between

¹I am indebted to Jim McCloskey for these examples and discussion of *fíor*.

them. Another is that we are comparing apples with oranges, and that *fīor* is more comparable to something like *right* than *true*, so we have no *a priori* expectation that *fīor* and *true* should be similar to begin with.

A third possibility is that although *true* and *fīor* have the same argument structure, but nevertheless don't have the same meaning. There would be nothing shocking about this: it is abundantly clear that there are semantic classes of predicates with similar if not identical syntactic profiles (see e.g. Levin 1993 for extensive demonstration of this within English). Rather, we could say that *true* and *fīor* share a semantic core, despite not overlapping, and it is that semantic core which correlates with the particular embedding behaviors we see here.

Going forward, as cross-linguistic work on clausal embedding evolves, it is important to maintain strong predictions about the syntax-semantic interface in order to guide the questions we ask about any one particular language. Moreover, such guidelines give us clear metrics by which we can compare one language to another and identify loci of variation. But we must also take care to evaluate languages on their own terms, and not assume one-to-one correspondences between predicates from language to language. *Mōtlema* does not have a clear English correlate, but the analytical tools developed in Chapter 3 can be profitably used to understand the behavior of similar (but not identical) English predicates.

6.3 Parting thoughts

If there is one message to take away from this dissertation, it is that the role of lexical semantics in composition and linguistic theory cannot be understated. While formal semantics has historically shied away from the fuzziness and imprecision of articulating the conceptual meaning of content words (and for good reason), I hope to have demonstrated that it is nevertheless worth our while to formalize aspects of lexical meaning that might have once been thought to be outside the purview of a formal semanticist, because these apparent minutiae have real consequences for syntax and interpretation.

Excitingly, this dissertation was written at a time when this task is being taken seriously, particularly in the domain of clausal embedding. A particularly promising avenue for inquiry lies in unifying accounts of clausal embedding with two other relatively well-studied domains: argument structure and event structure. I hope to have advanced the former with this dissertation, particular Chapter 5 (no doubt in the footsteps of Djärv 2019); as for the latter, this is a mantle bravely taken up by Özyıldız (2021). It is clear that as a field, we still don't have a complete grasp on what aspects of predicate semantics interact with their embedding behavior. In future research, I plan to investigate the answer to this question, and determine just how well our existing generalizations hold up in the many less-studied languages of the world. It is only with both broad and deep inquiry that we will begin to figure out what kind of elephant we are dealing with.

Appendix A

Why *can't believe* is not exclamative-embedding

It is commonly assumed that *can't believe* takes complements which are exclamative, not interrogative (see, e.g., Grimshaw 1979 and Michaelis 2001), since exclamatives in English are often string-identical to comparable *wh*-interrogatives, particularly in embedded contexts (Elliott 1971; 1974). While there is considerable variation in the precise formal treatment of exclamatives—for instance, the interrogative-like semantics of Zanuttini & Portner (2003) or the degree property semantics of Rett (2011), there is generally agreement about the broad empirical properties of exclamatives, and these requirements are not always met by the complement of *can't believe*. Thus, treating *can't believe* as exclamative-embedding cannot explain all of its behavior.

A.1 Syntax

In matrix contexts, *wh*-exclamatives are syntactically distinct from their interrogative counterparts. While a hallmark of English matrix *wh*-questions is that they involve T-to-C movement (254a), this does not occur in *wh*-exclamatives (254b):

- (254) a. How easy is syntax?
 b. How easy syntax is! (McCawley 1973)

In embedded contexts, *wh*-interrogatives lack T-to-C movement, so it is less straightforward to determine whether certain embedded *wh*-clauses are interrogative or exclamative. Grimshaw (1979) observed that sentences like (255) are ambiguous between ‘exclamative’ and ‘non-exclamative’ readings, roughly paraphrased below in (255a) and (255b) respectively. Huddleston (1993) and Zanuttini & Portner (2003) propose that this contrast indicates that predicates like *know* can select both exclamatives and interrogatives.

- (255) Wally knows how tall Blanche is. →
- a. Wally knows that Blanche is *d*-tall, where *d* is Blanche’s actual height (interrogative)
- b. Wally knows that Blanche’s height greatly exceeds some contextually available standard (exclamative)

Other diagnostics confirm that string-identical exclamatives and interrogatives are indeed distinct. *how very*-interrogative is compatible only with an exclamative interpretation; similarly, the use of a precision-denoting adverb like *exactly* rules out the possibility of an exclamative interpretation:

- (256) a. Wally knows how very tall Blanche is. But he doesn’t know her precise height.
 ✓exclamative ✗interrogative
- b. Wally knows exactly how tall Blanche is. #But he doesn’t know her precise height.
 ✗exclamative ✓interrogative

Given that embedded exclamatives and interrogatives are both possible, we can turn now to the facts with *can’t believe*. Much like *know*, *can’t believe* can be used both with complements that

are unambiguously exclamative and those where are unambiguously interrogative.

- (257) a. Wally can't believe how very tall Blanche is.
b. Wally can't believe exactly how tall Blanche is.

This suggests that even if *some* complements of *can't believe* are exclamative, it is, at the very least, compatible with interrogative complements as well. Huddleston (1993) makes an argument to this effect, but he does not discuss in any detail the actual selectional properties of *believe* itself. As I discuss below, however, there are other freedoms afforded to the complement of *can't believe* that are also issues for any account which treats all *wh*-complements of *can't believe* as exclamative.

A.2 Permissible *wh*-words

As noted by Elliott (1971; 1974), not all *wh*-words make equally good matrix exclamatives: while *what* and *how*-exclamatives are both perfect in matrix contexts, the same cannot be said of other *wh*-words:

- (258) a. What a nice house you have!
b. How he smiles at me!
c. *Who she nominated for the worst job!
d. *Why the police will never track me down!
e. *Which mystery vegetable the pie is stuffed with!
f. *Where the meteor struck!
g. *When that house of cards came crashing down!

However, note that all of the above make perfectly fine complements of *can't believe*:

- (259) a. I can't believe what a nice house you have!

- b. I can't believe how he smiles at me!
- c. I can't believe who she nominated for the worst job!
- d. I can't believe why the police will never track me down!
- e. I can't believe which mystery vegetable the pie is stuffed with!
- f. I can't believe where the meteor struck!
- g. I can't believe when that house of cards came crashing down!

If one were to adopt the hypothesis that the complements of *can't believe* are indeed exclamative, then we need an explanation for why constituents which can't function as matrix exclamatives are somehow acceptable under *can't believe*.

A.3 Multiple *wh*-complements

Matrix and embedded exclamatives alike also ban multiple *wh*-words in English (260), but multiple *wh*-questions are routine in both environments (261).

- (260) a. *How nice of a house who has!
- b. *Wally knows how very tall who is!
- (261) a. Who confiscated which piece of contraband?
- b. Sloane knows who is how tall.

Tellingly, *can't believe* is perfectly fine with taking multiple *wh*-word complements:

- (262) a. Joan can't believe who confiscated which piece of contraband.
- b. Sloane can't believe who is how tall.

The desired interpretations in (262) are pair-list interpretations: e.g., Joan is surprised by some (possibly partial, possibly complete) set of confiscator-contraband pairs. As Rett (2011) argues, this kind of ranging over multiple variables yields a nearly unparseable meaning with exclama-

tives, which for her have a degree semantics.

In short, there are at least some complements of *can't believe* that cannot be plausibly treated as exclamative; rather, they are true interrogatives. While it is possible that *some* complements are exclamative, I remain agnostic here as to the most appropriate treatment for these complements, which should be incorporated into a treatment of embedded exclamatives more broadly.

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