Journal of Semantics, 40, 2024, 179–233
https://doi.org/10.1093/jos/ffac015
Advance Access Publication Date: 11 July 2023
Article

Knowing and Believing Things: What DP-Complementation Can Tell us about the Meaning and Composition of (Factive) Attitudes

Kajsa Djärv
University of Edinburgh
E-mail: k.djarv@ed.ac.uk

First version received 1 May 2021; Second version received 24 November 2022; Accepted 28 November 2022

Abstract

In the Hintikkan tradition, attitude verbs are viewed as relations between individuals and propositions. Previous work on *know* and *believe* with CONTENT DPs like *the rumour* has tended to treat *know CP* vs. *know DP* as polysemy. In this paper, I show that polysemy runs into conceptual and empirical problems, and propose instead a new decompositional approach to *know*-verbs, which avoids polysemy; linking both *know DP* and *know CP* to the same lexical root, which describes, broadly speaking, acquaintance. This analysis thus provides an explicit and compositional morpho-semantic link between *know DP* and *know CP* that accounts for the interpretation of DPs as objects of acquaintance, and further captures the idea that knowledge, and factivity more broadly, is tied to acquaintance with a situation, the *res* (Kratzer 2002, a.o.). Based on detailed examination of the morpho-syntax and interpretation of DP and CP complements of *believe*, I further show that DPs can either combine with *believe* in the same fashion as CPs, as a direct object (saturating a propositional argument slot, as in Uegaki 2016), or as an indirect object, via a type of attitudinal applicative (proposed here). The former option is defined for Content DPs and the latter for agentive DPs, so-called SOURCE DPs. Together, these proposals account for the observation that the interpretation of *believe DP* sentences varies depending on the type of DP (*believe the rumour* vs. *believe the referee*), whereas for *know*-verbs, both types of DPs are interpreted as objects of acquaintance. At the core of the current proposal is the idea that verbs like *know* and *believe* differ fundamentally at the level of argument structure and internal morpho-semantic composition, and thus combine with DPs via different routes; contrary to uniform approaches to *know* and *believe*. Whereas *believe*-verbs describe relations to intensional content, and require external licensing mechanisms to combine with DPs, *know*-verbs describe complex relations, fundamentally anchored in the attitude holder's acquaintance with (abstract or concrete) individuals in the world, and thus make reference to individuals as part of their argument structure. The current proposal also builds on and adds to previous insights about connections between factivity, DP-complementation, and question-embedding.

1 INTRODUCTION

In the Hintikkan tradition, attitude verbs are standardly analysed as relations between individuals (so-called *attitude holders*) and propositions. That is, they quantify over worlds: if Mary believes that Lisa won, then all of Mary's belief-worlds are worlds in which Lisa won, as shown in (1).

(1) a. $[\![\text{believe}]\!]^w = [\lambda p_{<st>}.[\lambda x_e.\text{DOX}_x^w \subseteq p]]$, where
b. $\text{DOX}_x^w = \{w': w' \text{ conforms to what x believes in w}\}$
c. $[\![\text{(that) Lisa won}]\!]^w = \{w': \text{Lisa won in } w'\}$
d. $[\![\text{Mary believes that Lisa won}]\!]^w = 1$ in w iff $\text{DOX}_{mary}^w \subseteq \{w': \text{Lisa won in } w'\}$

On this approach, the primary semantic difference between *believe* (1), and the stronger alternative *know* (2), is in the type of *accessibility relation* that determines the set of worlds quantified over: DOX vs. EPIST. They differ additionally in that *know*, like other factives, is taken to presuppose that p is true in *w*.

(2) a. $[\![\text{know}]\!]^w = [\lambda p_{<st>}[\lambda x_e:\underline{p(w) = 1}.\text{EPIST}_x^w \subseteq p]]$, where:
b. $\text{EPIST}_x^w = \{w': w' \text{ conforms to what x knows in w}\}$
c. $[\![\text{(that) Lisa won}]\!]^w = \{w': \text{Lisa won in } w'\}$
d. $[\![\text{Mary knows that Lisa won}]\!]^w = 1$ in w iff $\text{EPIST}_{mary}^w \subseteq \{w': \text{Lisa won in } w'\}$
{defined if Lisa won in w; otherwise #}

In terms of the compositional semantics and the selectional properties of *know* and *believe*, this suggests that both types of verbs combine with propositions. Considering only cases where these verbs take declarative complements, this nicely captures the intuition that the main difference between (1-c) and (2-c) is that – while both sentences imply that Mary takes p to be true – *know*, unlike *believe*, gives rise to the inference that the *speaker* assumes that Mary has good reason to believe p and also herself takes p to be true.

A challenge for a uniform approach to the semantics of *know* and *believe*, however, comes from their behaviour with respect to DP-complements.

1.1 *Two generalizations about know DP vs. believe DP*

As has been observed by a number of authors since Prior (1971) and Vendler (1972) (e.g. Pietroski 2000, Ginzburg 1995, King 2002, Moltmann 2013, Uegaki 2016, Elliott 2016), verbs like *know* and *believe* differ in terms of their entailments, when they combine with CONTENT DPs like *the claim* or *the rumour*; i.e. nominals with propositional content (Grimshaw, 1990; Higgins, 1973; Moulton, 2009; Stowell, 1981). With such DPs, *know* and *believe* differ in terms of whether they entail the corresponding verb+CP sentence, as illustrated in (3). I will refer to this contrast as 'the entailment contrast'.

(3) *Generalization 1: Entailment contrast*
a. Mary believes $[_{DP}$ the rumour that $[_P$ Lisa won$]]$. $\models$ Mary believes that p
b. Mary knows $[_{DP}$ the rumour that $[_P$ Lisa won$]]$. $\not\models$ Mary knows that p

As noted by Djärv (2019), the entailment contrast tracks a separate contrast with respect to DP-complementation. *Believe*, unlike *know*, allows for what Djärv refers to as a SOURCE DP.[1] Unlike Content DPs, these DPs are interpreted as the source of the propositional

1 Since writing this paper, I've become aware of an earlier discussion of 'believe someone'-sentences, from Anscombe (1979). Thanks to Friederike Moltmann, p.c. for pointing me to this paper.

information provided by the embedded clause—which, as shown in (4-a) may be either explicitly or contextually given. This contrast, which I refer to as 'the source contrast', is illustrated in (4).[2]

(4) *Generalization 2: Source contrast* (Djärv, 2019, 209–210)
   a. I believe the referee (that Lisa won).
   b. I know the referee (*that Lisa won).

As Djärv (2019) points out, in the case of *know*, the source and the entailment contrasts reduce to one generalization, whereas in the case of *believe*, the two generalizations come apart. With *know*, both abstract individuals like *the rumour* and regular individuals like *the referee* are interpreted as objects of acquaintance, and the epistemic meaning that we get with *know CP* (2) disappears.[3] With *believe*, on the other hand, the interpretation of DP-complements varies depending on the type of individual: Content DPs are interpreted as 'containers' of propositional information, whereas regular individuals are interpreted as sources of information (Source DPs). In both cases, the doxastic interpretation we get with *believe CP* sentences (1) is preserved.

The goal of this paper is to provide an explanation for the difference between *know* and *believe* with respect to DP-complements. Specifically, I aim to address the following questions, raised by the entailment and source contrasts in (3)–(4):

(5) *Analytical puzzles presented by the entailment and source contrasts*
   a. Why do *believe DP* sentences, unlike *know DP* sentences, always preserve the propositional (doxastic) relation present with CP complements?
   b. Why does the interpretation of DPs with *believe* vary depending on the type of DP, such that Content DPs are interpreted as containers of propositional content, whereas regular individuals are interpreted as sources of information?
   c. Why are *know DP* sentences interpreted as descriptions of acquaintance relations, with both abstract Content DPs like *the rumour* and regular individuals like *Anna* or *the referee*?

Previous work on *know CP* vs. *know DP* has tended to treat *know* – unlike *believe* – as being ambiguous between an epistemic verb ($know_{EPIST}$) which selects for propositional complements and an acquaintance predicate ($know_{AQ}$) which selects for individuals. In this paper, I point to a number of challenges for such an approach, and propose instead a derivational approach whereby *know DP* and *know CP* share the same morpho-semantic

2 A brief note on Source DPs: some English speakers report finding heavier NPs clunky in Source-positions. However, most speakers I've consulted allow for both proper names, pronouns, and common nouns, given appropriate context. (i) is from COCA (Davies, 2008), and seems fully natural to all native speakers I've consulted.

(i) Sometimes the patient doesn't believe the doctor that he's sick, until the doctor gives it a name.

3 DP-complements of *know* may also be interpreted as concealed questions, as in (i). In this case, the DP is interpreted as a type of question and the epistemic meaning associated with *know CP* is preserved. Here, I will not be concerned with these cases, though see fn. 17.

(i) Mary knows the price of milk. ⇝ Mary knows what the price of milk is.

core, a lexical root which describes, roughly speaking, an acquaintance relation between individuals. Crucially, on this approach, a DP will saturate the object-of-acquaintance slot of this root, resulting in an acquaintance predicate (*know DP*), and effectively also block the derivation of the epistemic meaning (*know CP*), which I propose is built on-top of this root in a morpho-semantically more complex structure. For *know CP* sentences, the object-of-acquaintance slot of the root is instead saturated by a (phonologically null) situation pronoun, contributing the *res* of the attitude (e.g. Heim 1994a; Kaplan 1968; Lewis 1979; Moulton 2009; Özyildiz 2017). Besides capturing the behaviour of *know*-verbs with respect to DPs vs. CPs, this account thus also provides a formal compositional implementation of the idea (e.g. in Kratzer 2002, a.o.) that knowledge and factivity involve acquaintance with a fact. Specifically, this proposal provides a derivational link between the presence of factivity with CP-complements and the interpretation of DPs as objects of acquaintance (Djärv, 2019).

Whereas *know*-verbs combine with individuals as part of their argument structure, I argue that verbs like *believe* describe basic relations to propositions, and therefore require external licensing mechanisms in order to combine with DPs. Specifically, I show that DPs can either combine with *believe*-verbs as direct objects of the verb, via type-shifting (as proposed in Uegaki 2016 for Content DPs), or as an indirect object, via a type of attitudinal applicative head (proposed here for Source DPs, building on Djärv 2019). To explain why these options for combining with DPs are not available to verbs like *know*, I follow Uegaki (2016), who argues (a) that verbs like *know* select for questions, whereas verbs like *believe* select for propositions, and (b) that the compositional mechanism by which *believe*-verbs combine with Content DPs (which derives the p-entailment) is only defined for proposition-selecting verbs, and is thus not compatible with verbs like *know*. I argue that the same holds for the source contrast (4).

The core of this proposal is that verbs like *know* and *believe* differ fundamentally at the level of argument structure and internal composition, and thus combine with DPs via different routes; contrary to uniform approaches. Whereas *believe*-verbs describe relations to intensional content and require external licensing mechanisms to combine with DPs, *know*-verbs describe complex relations, fundamentally anchored in the attitude holder's acquaintance with (abstract or concrete) individuals in the world. The idea that verbs like *know* describe acquaintance-relations to individuals, whereas verbs like *believe* describe Hintikkan relations to propositional content also plays a key role in recent proposals from Özyildiz (2017) and Djärv (2019).[4] The idea that argument structure plays a key in deriving factivity also has important precedence in Özyildiz (2017), Djärv (2019), and Bondarenko (2020a).

Before moving on, note that the contrasts in (3) and (4) are not due to a lexical quirk of *believe* vs. *know*, but represent a more general split between two classes of verbs, which for descriptive purposes, I refer to simply as *know*-verbs and *believe*-verbs. As has previously been noted, *know* is representative of a fairly large class of factive predicates. *Believe*, on the other hand, appears to represent a much smaller class of non-factive doxastic predicates, including verbs like *trust* and *doubt*.

(6) *Entailment contrast across verbs* (based on Djärv 2019; Elliott 2016; Uegaki 2016)
   a. Mary {believes, trusts, doubted} the rumor that Lisa won.
      ⊨ Mary {believes, trusts, doubted} that Lisa won.

4 A predecessor of the current proposal.

b. Mary {knows, discovered, noticed, resents, is surprised by} the rumor that Lisa won.
⊭ Mary {knows, discovered, noticed, resents, is surprised} that Lisa won.

(7) *Source contrast across verbs* (based on Djärv 2019, 208–211)
a. I trust him (that he will do the best for me).[5]
b. Do you have any reason to doubt him (that it was on that night that that conversation happened)?[6]
c. Mary {knows, discovered, noticed, resents, is surprised (by)} (*you) that Lisa won.

As I discuss in Section 3.2, Uegaki (2016) characterizes the entailment contrast in terms of a contrast with respect to question-embedding. Adding to the empirical picture, I show here that this split also tracks factivity, though as we shall see, this is still not the whole story.

1.2 *Outline*

This paper is structured as follows. Section 2 presents new observations about the structure and interpretation of *believe DP* sentences, focusing in particular on Source DPs (which are less well-studied) and how they compare with Content DPs. In Section 3, I discuss Uegaki's (2016) analysis of the entailment contrast, which I will follow in assuming (i) that the entailment of *believe*+Content DP sentences is derived via type-shifting, and (ii) that the difference between *know* and *believe* with respect to Content DPs follows from a difference in terms of question-embedding. This section also points to a number of empirical and conceptual issues for polysemy-based approaches to *know DP* and *know CP*. In Section 4, I present my proposal for CP and DP-complementation with *know* vs. *believe*-verbs. Section 4.1 presents the current decompositional approach to *know DP* and *know CP*, and Section 4.2 presents my analysis of Source DP sentences. In Section 4.3, I put all the pieces together, showing how these proposals, combined with Uegaki's (2016) analysis of Content DPs and the entailment contrast, capture the empirical contrasts discussed here, and further, provide a compositional link between DP-complementation and factivity. Section 4.4 resolves an issue from Section 2.1 regarding a morpho-syntactic contrast between languages like English and German with respect to Source DP sentences. In Section 5, I discuss four apparent counter-examples to the proposed link between DP-complementation and question-embedding. Finally, in Section 6, I compare the current proposal with two alternative approaches to CP vs. DP-complementation, as well as with a recent alternative to the contrast between *know* and *believe* in terms of question-embedding, offering arguments in favour of the current proposal. Section 7 concludes.

2 NEW DATA: *BELIEVE* WITH SOURCE DPs VS. CONTENT DPs

In this section, I examine in more detail the structure and meaning of *believe DP* sentences. I start in Section 2.1 by looking at morpho-syntactic differences between Content DPs and Source DPs; showing that while Content DPs combine with *believe* as *direct* objects, Source DPs pattern like *indirect* objects. In Sections 2.3 and 2.2, I examine the meaning of Source DPs in more detail, showing that Source DPs are interpreted similarly to assertion reports (Section 2.2) and that the source-inference is presuppositional (Section 2.3).

5 Original example from Free Children's Ministry Resources; equipu.kids4truth.com

6 Original example from Independent Counsel Solomon L. Wisenberg in a transcript of the Clinton Grand Jury Testimony, in Kuntz, Phil (ed). The Evidence: The Starr Report, p. 375

2.1 *Morpho-syntactic differences between Source DPs and Content DPs*

Above, we saw that when *believe*-verbs combine with Content DPs like *the claim/rumour that p*, they entail the corresponding *believe CP* sentence (the entailment contrast; (3)). In Section 3.2, I discuss a proposal from Uegaki (2016), who captures this entailment by type-shifting Content DPs to their propositional content, thereby allowing such DPs to combine with *believe* by saturating its propositional argument slot. In this section, we shall see that this analysis is supported by the morpho-syntactic properties of *believe*+Content DP sentences.

Regarding Source DPs, Djärv (2019) observes that in English, Source DPs and Content DPs cannot co-occur, as shown in (8).

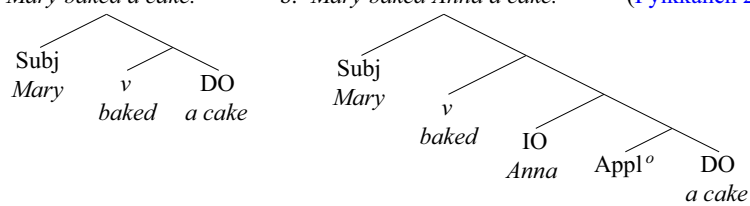
(8) Djärv (2019, p. 235)
*I believe you the claim that Mary is a genius.

This might lead us to think that the two DPs saturate, and therefore compete for, the same argument slot of *believe*, and that the interpretation of the DP depends on other factors. (This type of analysis has been proposed by Roberts 2020; see Section 6.2.). However, Djärv (2019) shows based on German data that this cannot be the right explanation: in German, as shown in (9), Source and Content DPs *can* co-occur:

(9) German (Djärv, 2019, 235)
Ich glaube ihr die Behauptung, dass Maria ein Genie war.
I believe her.DAT the.ACC claim that Maria a genius was
I believe the claim, that she told me, that Maria was a genius.

One possibility, in view of this contrast, is to suggest that Source DP sentences in German are composed differently from Source DP sentences in English. However, as we shall see in the remainder of this section, there is strong syntactic and semantic evidence in favour of a uniform approach to Source DPs in German and English.[7] Crucially, we find that in both languages, Source DPs and Content DPs behave differently from one another in terms of their syntactic properties; thus showing us that the two DPs do not occupy the same argument slot. In both German and English, Source DPs pattern like *indirect* objects of *believe*-verbs, whereas Content DPs and CPs both pattern like *direct* objects. In short, we find that the argument structure of *believe*, in both German and English, is parallel to that of optionally ditransitive verbs like *bake*, as illustrated in (10)–(11) (where F^o is used as a place-holder for the head proposed to license Source DPs; see Section 4.2)

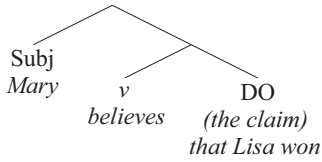
(10) a. *Mary baked a cake.* b. *Mary baked Anna a cake.* (Pylkkänen 2008)



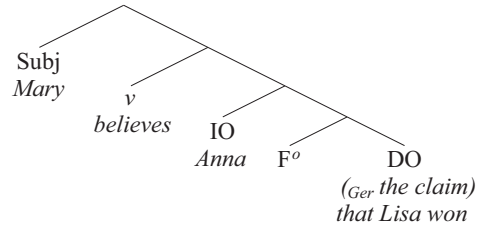
7 Up to a degree; which I argue is case-licensing, and which explains the contrast between (8) and (9); see Section 4.4.

(11) Proposed LFs for *believe CP/DP* sentences

a. CPs & Content DPs



b. Source DPs



Here, I discuss two types of morpho-syntactic evidence for this proposal: Case on Source DPs vs. Content DPs in German and extraction possibilities in German and English.

First, however, let us confirm that German behaves like English with respect to the entailment and source contrasts. As shown in (12-a) and (13-a), *glauben* (believe) triggers the DP-to-CP entailment with Content DPs and permits Source DPs. This is unlike *wissen/kennen* (know), as shown in (12-b) and (13-b).

(12) Entailment contrast: German

a. Er glaubt die Behauptung, dass Hans Maria das Buch gab.
He believes the.ACC claim that Hans Maria the book gave
He believes the claim that Hans gave Maria the book.
⊨ He believes that Hans gave Maria the book.

b. Er kennt/*weiß die Behauptung, dass Hans Maria das Buch gab.
He knows_{AQ}/knows_{EPIST} the.ACC claim that Hans Maria the book gave
He knows the claim that Hans gave Maria the book.
⊭ He knows that Hans gave Maria the book.

(13) Source contrast: German (Djärv, 2019, 235)

a. Ich glaube ihr, dass Hans Maria das Buch gab.
I believe her.DAT that Hans Maria the book gave
I believe her that Hans gave Maria the book.

b. *Ich weiß/kenne ihr/sie, dass Hans Maria das Buch gab.
I know_{AQ}/know_{EPIST} her.DAT/ACC, that Hans Maria the book gave
I know from her that Hans gave Maria the book.

2.1.1 *Case on Source vs. Content DPs* As we saw in (9) and (12)/(13), Source DPs in German are marked with dative case, and Content DPs with accusative.

(14) 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 Maria was a genius.

b. Ich glaube ihr/*sie.
I believe her.DAT/ACC
I believe her.

c. 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 Maria was a genius.[8]

8 Note that in (14-a), the accusative form is marked *, whereas in (14-c), the dative form is marked #. This represents the fact that certain kinds of Content DPs may also function as Source argument, namely

This is unlike DP-complements of *know*-verbs, which are marked with accusative case.

(15) German
a. Ich kenne sie/*ihr.
I know her.ACC/DAT
I know her.
b. Ich habe sie/*ihr bemerkt/entdeckt.
I have her.ACC/DAT noticed/discovered.
I noticed/discovered her.

The case-marking pattern that we find with Source DP sentences is the same as that found with optionally transitive verbs like *bake* and *steal*. As shown in (16), German allows both Goal and Source Applicatives. In either case, indirect objects, like Source DPs, are marked with dative, whereas direct objects, like Content DPs, are marked with accusative case.

(16) German
a. Sie gab ihr den Schlüssel.
she.NOM gave her.DAT the.ACC key
She gave the key to her. ✓Goal Applicative
b. Sie stahl ihr den Schlüssel.
she.NOM stole her.DAT the.ACC key
She stole the key from her. ✓Source Applicative

English, on the other hand, has only Goal Applicatives (17).

(17) a. She gave her the key. (≈ *She gave the key to her.*) ✓Goal Applicative
b. *She stole her the key. (≈ *She stole the key from her.*) ✗Source Applicative

Djärv (2019) uses this observation to propose that the co-occurrence contrast in (8) vs. (9) is linked to the presence vs. absence of Source Applicatives (16)–(17). Specifically, Djärv proposes that Source DPs in German are introduced by the same type of applicative head that is responsible for licensing the dative indirect object in (16-b). Here, I will argue instead that Source DPs in both German and English are introduced by a different type of –propositional– applicative head (details in Section 4.2). In Section 4.4, I suggest that the presence vs. absence of source datives nevertheless does play a role, though an indirect one, in explaining the co-occurrence contrast between English and German.[9]

2.1.2 *Extraction possibilities* In this section, I show that *in both German and English*, Source DPs pattern like indirect objects of verbs like *bake* and *steal* with respect to extraction-possibilities, whereas Content DPs and CPs pattern like direct objects.

Starting with German, we find that here, it's possible to promote direct objects in passives, but not indirect objects:

so-called Repository-of-Information nominals like *report* (see Anand & Hacquard 2009). I return to this point in Section 2.2.

9 There is disagreement in the literature about the connection between morphological case and argument licensing, with some authors arguing that the two are entirely independent (e.g., Marantz 1991, Sigurdhsson 2012). Here, I follow Vergnaud (2008), Chomsky & Lasnik (1977), Pesetsky & Torrego (2004), Legate (2008), Deal (2009), Rezac (2013), among others, in assuming that DPs do need licensing via abstract case assignment in the syntax.

(18) German
a. Sie stahl ihm den Schlüssel.
she.NOM stole him.DAT the.ACC key
She stole the key from him.
b. Der Schlüssel wurde ihm gestohlen.
the.NOM key was him.DAT stolen
The key was stolen from him. ✓Promote direct object
c. *Er wurde den Schlüssel gestohlen.
he.NOM was the.ACC key stolen
He had the key stolen from him. ✗Promote indirect object

With *believe*, we find that Content DPs and CPs (19-a) pattern with direct objects (18-b) in terms of extraction, whereas Source DPs (19-b) pattern with indirect objects (18-c).

(19) German
a. (Die Behauptung,) dass Maria ein Genie war, wurde ihm geglaubt.
(The.NOM claim,) that Maria a genius was, was him believed
(The claim that he made,) that Maria was a genius, was believed. ✓Promote Content DP
b. *Er wurde geglaubt (die Behauptung), dass Maria ein Genie war.
he.NOM was believed (the claim), that Maria a genius was
He was believed when he claimed that Maria was a genius. ✗Promote Source DP

As shown in (20), many varieties of English show the opposite pattern for double object constructions. Here, the *indirect*, but not the *direct* object can be promoted.

(20) a. I baked him a cake.
b. *A cake was baked him. ✗Promote direct object
c. He was baked a cake. ✓Promote indirect object

Of course, as we have seen, English does not allow Source DPs and Content DPs to co-occur. Nevertheless, we find that in a structure with a Source DP and a CP, the CP cannot be promoted in a passive (21-a), similarly to the direct object in (20-b). The Source DP, however, *can* be promoted, as shown in (21-b), just like the indirect object in (20-c).[10]

(21) a. *That Maria is a genius was (generally/widely) believed him. ✗Promote CP
b. He was generally believed that Maria was a genius. ✓Promote Source DP

Crucially, without a Source DP, both CPs and Content DPs can be promoted in passives, showing us that the restriction in (21-a) is not due to a general restriction on moving clauses or objects of *believe*.

(22) a. That Maria is a genius was (generally/widely) believed. ✓Promote CP
b. The claim that Maria is a genius was (generally/widely) believed. ✓Promote Content DP

10 Note that the ability to promote the Source DP in a passive sentence is also an argument that Source DPs are arguments, and not adjuncts; cf. *I had to stop due to the weather./ *The weather was stopped due to.* or *Mary ran a mile./*A mile was ran.*

The same is true for direct objects of verbs like *bake*, when there is no indirect object present (23):

(23) A cake was baked. ✓Promote direct object

This is in clear contrast to (20-b), where there is an indirect object present in the syntax. That is, the pattern we find for Source DP sentences is exactly the same as that we find with regular double object constructions.

Taken together, these observations speak against an analysis whereby Source DPs and Content DPs saturate the same type e argument slot of *believe*. Rather, the data discussed here suggest that CPs and Content DPs are direct objects of *believe*, whereas Source DPs are indirect objects. On the analysis of Pylkkänen (2008) and others, this implies that they are introduced by an external head, rather than being a core argument of the verb, as in (10)–(11) (see also (87) below). As for the co-occurrence contrast between English and German (8)–(9), I propose in Section 4.4 that this follows from a parametric difference in whether the head introducing the Source DP assigns case or not; a difference which I link to the availability of Source Datives (16-b) in the language more broadly. Thus, while the current proposal assumes a connection between the co-occurrence contrast and the presence of Source Applicatives, this link is less direct than that proposed by Djärv (2019).

Before concluding this section, further motivation for the claim that Source DPs are externally licensed, and are not core arguments of the verb, comes from the observation that in both English and German, *I believe you* implies the belief of some contextually salient proposition. *I believe that p*, on the other hand, does not imply the existence of some contextually available source of the p-information. This is shown in (24)–(25):

(24) Djärv (2019, p. 243)
  a. I believe Mary. $\rightsquigarrow \exists p_C$ s.t. Mary is the source of p_C
  b. I believe that [$_P$ it's raining]. $\not\rightsquigarrow \exists x_C$ s.t. x_C is the source of p

(25) German
  a. Ich glaube Maria.
     I believe Maria
     I believe Maria. $\rightsquigarrow \exists p_C$ s.t. Mary is the source of p_C
  b. Ich glaube, dass Lisa gewonnen hat.
     I believe, that Lisa won has
     I believe that Lisa won. $\not\rightsquigarrow \exists x_C$ s.t. x_C is the source of p

In the following two sub-sections, I examine in more detail the interpretation of Source DP sentences. Section 2.2 looks at the semantics and Section 2.3 at the discourse status of Source DPs.

2.2 *Interpretation: Source DP sentences refer to an assertion event*

In this section, I examine in more detail the meaning of Source DP sentences, asking what it means to be a 'source of information' in the context of these sentences. To this end, I consider the following two *prima facie* plausible alternatives, given in (26).

(26) Interpretation (informally) of *x believes y that p*
  a. **Hypothesis 1:** y caused x to believe p. **(to be rejected)**
  b. **Hypothesis 2:** there was an assertion event s.t. x proposed to make p common ground.

To tease apart these two hypotheses, I rely on two tests: contexts that satisfy causation but not assertion, and restrictions on inanimate DPs.[11]

2.2.1 *Non-assertive causation contexts* To see that Source DP sentences are appropriate in contexts where the referent of the DP has asserted p, we only need to consider cases like (27).

(27) Sue told me that Lisa won, and I believe her (that she did).

Such cases, however, are also compatible with Hypothesis 1, on the reasonable assumption that telling someone something can be a way of causing them to believe it. We therefore also need to look at whether Source DPs are felicitous in contexts that involve causation (Hypothesis 1), but which don't involve an assertion event (Hypothesis 2). If Source DP sentences are infelicitous in such contexts, that speaks against the causation hypothesis (H1) and lends support to the assertion hypothesis (H2).

(28) a. Context: A notorious burglar has robbed a bank and decided to plant misleading evidence at the scene of the crime; dropping a pack of cigarettes at the crime scene. Sue, who is a detective working on the case, finds the planted evidence and takes it at face value. Thus, the burglar leads Sue to believe that the burglary was committed by someone who smokes.
b. #Sue believes the burglar that the person who robbed the bank smokes.

(29) a. Context: Without being aware of it, Bill is hooked up to a machine that can manipulate people's beliefs. Ann, who Bill has never met and has never spoken to, is controlling this machine. By using this machine, Ann causes Bill believe that blueberries cure hiccups (a belief that he did not previously have).
b. #Bill believes Ann that blueberries cure hiccups.

As shown in (28-b)–(29-b), Source DP sentences are not appropriate or felicitous descriptions of such scenarios. This therefore speaks against the causation hypothesis (H1) and in favour of the assertion hypothesis (H2).

There are also interesting cases worth noting, where the referent of the Source DP has (linguistically) presupposed or implied that p, but where p is not part of the asserted content of their utterance:

(30) a. Context: Sue says to Morgan: "I'm really happy about the fact that blueberries cure hiccups." At a later point, Morgan says:
b. #I believe Sue that blueberries cure hiccups.

(31) a. Context: Sue says to Morgan: "I ate some blueberries and my hiccups stopped immediately!" At a later point, Morgan says:
b. #I believe Sue that blueberries cure hiccups.

11 I'm indebted to an anonymous reviewer for Journal of Semantics for suggesting the kinds of scenarios used in (29)–(31) as a way of teasing apart Hypotheses 1 and 2. In Section A of the Appendix, I also discuss a third diagnostic, left out here for reasons of space, which is based on the interpretation of epistemic modals.

According to the speakers I have consulted, these are also degraded; though the judgement is perhaps less sharp than in (28)–(29). Interestingly, however, the Source DP sentence becomes more felicitous in the slightly modified situation in (32).

(32) Poor Morgan has the hiccups. Sue hands Morgan some blueberries and says: "I ate some blueberries when I had the hiccups, and my hiccups stopped immediately!"

It's worth noting however, that this type of vagueness is actually what we would expect on the assertion hypothesis (H1), given that it also applies to our judgements about regular assertion reports. In (27), where the Source DP is felicitous, the judgement is clear: Sue definitely said that Lisa won. Conversely, in the cases in (28)–(29), where the Source DP is not felicitous, the judgement is also clear: we would not say that Ann said that blueberries cure hiccups or that the burglar said that the person who robbed the bank smokes. In (30)–(32), however, where the context contains a saying event which conveys, but doesn't assert p, the judgement becomes less sharp and more context dependent. That is, our judgements about the felicity of Source DP sentences are exactly what we would expect on the assertion hypothesis.

2.2.2 *Restrictions on inanimate DPs* The second diagnostic relies on restrictions on inanimate DPs. If Source DP sentences are interpreted as causers of belief-states (H1), then we expect that inanimate DPs like *the timing* should be available as Source DPs, as they can function as the causer of a belief-state, but are not capable of assertions, as illustrated in (33) from Anand & Hacquard (2009) [A&H]. If, on the other hand, Source DP sentences are interpreted as involving a type of assertion event (H2), then we'd expect that inanimate DPs like *the timing* should *not* be available as Source DPs.

(33) Anand & Hacquard (2009, ex. (24))
  a. #The time of death argues that the butler is the murderer.
  b. The time of death implies that the butler is the murderer.

A note is in order, however, about our predictions about the availability of inanimate DPs in Source DP sentences. As discussed by A&H in the context of assertion reports, inanimate DPs vary with respect to their ability to function as subjects of assertion reports. They distinguish between Repository-of-Information (RoI) subjects like *the report*, and non-discourse participants like *the timing*. They observe that RoI subjects are available with predicates that describe an assertion or speech act event, like *argue*, *claim*, and *imply*, but not with verbs that describe a belief state, like *believe* and *think*. This contrast is illustrated in (34).

(34) Anand & Hacquard (2009, ex. (21))
  a. #The book {believes, thinks} that the Earth might be flat.
  b. The book {argues, implies} that the Earth might be flat.

As pointed out by A&H, the reason for this is that while a book or a report can be understood as the agent of an assertion event, a doxastic attitude requires a sentient subject, capable of beliefs. This behaviour is different, however, from that of non-discourse participants like *the timing*. Unlike RoI subjects (34-b), non-discourse participants are only available with verbs like *imply*, and not with verbs like *argue*, as we saw in (33). A&H suggest that sentences like (33-b) are not in fact interpreted assertively, but rather as involving a causative doxastic meaning with an implicit generically quantified over experiencer.

(35) Based on Anand & Hacquard (2009, ex. (26))
The time of death implies that the butler is the murderer.
≈ GEN_x time of death causes x to believe that the butler is the murderer (≈ H2, (26-a))

Thus, if Source DPs are interpreted as agents of assertion events, then we expect that inanimate (RoI) DPs like *the report* should be available as Source DPs,[12] whereas inanimate (non-discourse participant) DPs like *the timing* should not be available. If, on the other hand, Source DPs are interpreted as causers of a belief-state, then we expect that both types of inanimate DPs should be available.

As shown in (36)–(37), Source DPs are subject to the same restrictions on inanimate DPs as subjects of assertion-predicates, like *argue*. Whereas DPs like *the report* or *the article* can at least with sufficient context be used as Source DPs, DPs like *the timing* are completely unavailable in source positions.[13]

(36) a. I (definitely) believe this article (that Voice and *v* are different heads).
b. #I (definitely) believe the time of the death (that the butler did it).

(37) German
a. Ich glaube dem Bericht, dass der Butler der Mörder ist.
I believe the.DAT report, that the butler the killer is
I believe the report that the butler is the killer.
b. #Ich glaube dem Timing/Zeitpunkt, dass der Butler der Mörder ist.
I believe the.DAT timing/point-in-time, that the butler the killer is
I believe the timing that the butler is the killer.

In this section, I have shown that Source DPs are interpreted similarly to agents of assertion events (as on Hypothesis 2), rather than as causers of belief-states (as on Hypothesis 1). Our conclusions about the interpretation of Source DP sentences so far are summarized in (38).

(38) Core components of meaning of Source DP sentences (informal, pre-final version):
a. The attitude holder believes p
b. There was an assertion event s.t. x_{source} proposed to make p common ground.

Before concluding this section, I examine the discourse status of these two aspects of the meaning of Source DP sentences.

12 See also footnote 8.

13 Note that we need to make sure that the DP is interpreted as a Source DP, and not as a Content DP with a clausal complement. In German, dative case on the definite article achieves this. For English, I'm using the noun *article*, since *article*, while it's a plausible Repository-of-Information, does not double as a Content noun, as shown by the fact that it is not available in copular-sentences with clauses, a characteristic typical of Content DPs (see for instance Moulton 2009).

(i) a. The claim/*article that the butler did it is true.
b. The claim/*article is that the butler did it.

2.3 *Discourse status: Source DPs are not at-issue*

In this section, I look at whether the belief and assertion inferences associated with Source DPs are both part of the truth-conditional meaning of the sentences they occur in. The first test for this is projection.

As shown with the German and English Source DP sentences in (39)–(40), whereas the inference that the attitude holder believes p gets cancelled by negation or called into question in questions, these sentences still take it for granted that the referent of the DP is the source of the p-inference. That is, the source-inference *projects*, a behaviour typical of presuppositions.

(39) Projection from negation

a. I don't believe you that Mary is a genius. English

b. Ich glaube dir nicht, dass Maria ein Genie ist.
I.NOM believe you.DAT not, that Maria a genius is
I don't believe you that Maria is a genius. German
↛ I believe that Maria is a genius.
⇝ you have asserted that Maria is a genius.

(40) Projection in questions

a. Do you believe me that Lisa won? English

b. Glaubst du mir, dass Lisa gewonnen hat?
believe you.NOM me.DAT, that Lisa won has
Do you believe me that Lisa won? German
Asks: Do you believe that Lisa won?
Assumes: I have asserted that Lisa won.

As shown in (41) and (42), projection of the indirect object relation is not a general property of double object constructions; thus casting further doubt on the idea that Source DPs are introduced by a generic Source Applicative.

(41) English Goal Applicative: negation, questions

a. She didn't give him the key. ↛ the key was given to him

b. Did you give him the key? ↛ the key was given to him

(42) German Source Applicative: negation, questions

a. Sie stahl ihm nicht den Schlüssel.
she stole him not the key
She didn't steal the key from him. ↛ the key was stolen from him

b. Stahl sie ihm den Schlüssel?
stole she him the key
Did she steal the key from him? ↛ the key was stolen from him

Further tests for presupposition corroborate the hypothesis that the assertion-inference is presupposed: (i) the classic 'hey, wait a minute' test (e.g. Shanon 1976; von Fintel 2004); (ii) presupposition filtering (Karttunen, 1973); and (iii) context update potential. Before applying them to Source DPs, the examples in (43)–(45) briefly illustrate these tests, using the trigger *Lisa's/her cat*. A key premise of these tests is that presuppositions, unlike asserted (truth-conditional and *at-issue*) content, have to be entailed by the conversational context. As a consequence, presupposed content projects from the scope of operators that target

truth-conditional content, as we saw in (39)–(40). It also means that they will not be targeted by polarity particles. That is, both a *yes* and a *no*-response to an utterance with a presupposition trigger will end up implicitly endorsing and inheriting the presupposition, as shown in (43)-B. In order to target the presuppositions of a sentence that one is responding to, an explicit flag, like *hey, wait a minute* . . . is needed, as shown in (43)-B′.

(43) A: **Lisa's cat** is a really cute. ⊨ Lisa has a cat
B: Yes, that's true. / No, that's not true. ⊨ Lisa has a cat
B': Hey, wait a minute – Lisa doesn't have a cat! ⊭ Lisa has a cat

However, as Karttunen (1973) notes, presuppositions can be 'filtered out', when their content is entailed by the trigger's local context, as illustrated with the *if, then* sentence in (44) (see Mandelkern *et al.* 2020 for recent discussion).

(44) If Lisa has a cat, then **her cat** must be a Sphynx (given that Lisa is allergic). ⊭ Lisa has a cat

Finally, since presuppositions are not *at-issue* and must already be entailed by the context, it is not felicitous to use an utterance with a presupposition trigger to update the context with the content of the presupposition. That is, as shown in (45), presuppositions resist being part of the asserted content of the sentence.

(45) **Lisa's cat** is a really cute. #Asserting that *Lisa has a cat*

Applied to Source DP sentences, we observe the same behaviour with the 'DP-has-asserted-p' inference of Source DP sentences.

(46) A: Morgan believes Sue that [$_P$ blueberries cure hiccups]. ⊨ Sue has asserted p
B: Yes, that's true. / No, that's not true. ⊨ Sue has asserted p
B': Hey, wait a minute – Sue would never say that! ⊭ Sue has asserted p

(47) If Sue says that blueberries cure hiccups, then Morgan will definitely believe her (that blueberries cure hiccups) (given that Morgan is very gullible). ⊭ Sue has asserted p

(48) Morgan believes Sue that blueberries cure hiccups. #Asserting that *Sue has asserted p*

I take this to motivate a presuppositional treatment of Source DPs. There is a discussion in the literature as to the theoretical status of different kinds of presuppositions, and the link between projection and *at-issueness* (see among others: Abrusán 2011, 2016; Abusch 2010; Djärv 2019; Djärv & Bacovcin 2020; Romoli 2015; Simons 2007; Simons *et al.* 2017, 2010). Here, I will set this question to one side, and simply treat the source-inference as a 'traditional' presupposition of the head introducing the Source DP, as the choice of approach here is orthogonal to the main proposal for the semantics and composition of Source DP-sentences.

2.4 *Interim summary*

Before moving on to the entailment contrast and the analysis, let us briefly take stock of our analytical conclusions so far. In Section 1, we saw that with verbs like *know*, both Content DPs like *the rumour* and regular individuals like *Lisa* are interpreted as objects of acquaintance. In both cases, the epistemic meaning we get with *know CP* disappears.

(49) *know CP* vs. *know DP*
  a. Mary knows that Lisa won. epistemic attitude verb
  b. Mary knows the referee (*that Lisa won). acquaintance verb, *Source DPs
  c. Mary knows the rumour that Lisa won. acquaintance verb

This is unlike *believe DP* sentences, which preserve the doxastic meaning present with *believe CP*. However, the exact interpretation of the sentence depends on the type of DP. Content DPs like *the rumour* are interpreted as 'containers' of propositional information, whereas individuals like *Lisa* or *the doctor*, on the other hand, are interpreted as sources of information (Source DPs). In both cases, the sentences entail the corresponding *believe CP* sentence.

(50) *believe DP* vs. *believe CP*
  a. Mary believes that Lisa won. doxastic attitude verb
  b. Mary believes the referee (that Lisa won). doxastic attitude verb + source-inference
  c. Mary believes the rumour that Lisa won. doxastic attitude verb + p-is-rumoured

In Section 2, I examined the structure and meaning of *believe DP* sentences in more detail. In Section 2.1, I presented morpho-syntactic evidence from German and English, showing that Source DPs and Content DPs combine with *believe* in different ways. Content DPs combine as direct objects, whereas Source DPs pattern like (optional) indirect objects.

(51) Conclusions about the structure of Source vs. Content DP sentences
  a. Content DPs: pattern like direct objects of *believe*
  b. Source DPs: pattern like (optional) indirect objects of *believe*

In Section 2.2, I looked at the interpretation of Source DP sentences, showing that semantically, they are similar to assertion reports. Finally, in Section 2.3, I showed that the source-inference is not-*at issue*. To summarise, we find that Source DP sentences like (52) involve two core components of meaning:

(52) Mary believes Anna that Lisa won.
  a. Truth-condition: Mary believes that Lisa won.
  b. Presupposition: There was an assertion event s.t. Anna proposed to make *Lisa won* common ground.

Before presenting the analysis of Source DPs, the following section returns to the entailment contrast between *know* and *believe* with Content DPs, repeated in (53).

(53) a. Mary believes [$_{DP}$ the rumour that [$_{P}$ Lisa won]]. $\models$ Mary believes that p
  b. Mary knows [$_{DP}$ the rumour that [$_{P}$ Lisa won]]. $\not\models$ Mary knows that p

3 THE ENTAILMENT CONTRAST AND THE LINK TO QUESTION-EMBEDDING

3.1 *know CP vs. know DP*

We have seen that with DP-complements, *know*-verbs are interpreted as describing some type of acquaintance relation to an individual. A natural way to capture this observation would be to say that *know*-verbs are ambiguous between a propositional attitude verb and

an acquaintance verb. This idea, illustrated in (54), has been adopted for instance by King (2002), Moltmann (2013), and Uegaki (2016).

(54) Polysemy of *know* (to be rejected):
a. $[\![\text{know}_{EPIST}]\!]^w = [\lambda p_{<st>}.[\lambda x_e{:}\underline{p(w) = 1}.\text{EPIST}_x^w \subseteq p]]$ Epist. attitude: *know CP*
b. $[\![\text{know}_{AQ}]\!]^w = [\lambda y_e.[\lambda x_e.\text{acquainted}_w(x)(y)]]$ Acquaintance verb: *know DP*

Intuitive support for this idea comes from the fact that languages like German, French, and Swedish use different forms for these two meanings:

(55) a. Sara vet att Lisa vann.
Sara knows that Lisa won
Sara knows that Lisa won. Propositional *know* (Ger. *wissen*, Fr. *savoir*)
b. Sara känner Lisa.
Sara knows Lisa
Sarah knows Lisa. Aquaintance-*know* (Ger. *kennen*, Fr. *connaitre*)

Assuming that *know* is ambiguous between a propositional attitude verb and an acquaintance predicate, as in (54), would capture the fact that we don't get the propositional entailment, but instead an acquaintance-reading, with *know*+Content DPs. However, as Uegaki (2016) points out, this in itself is not enough to account for the entailment contrast between *know* and *believe*-verbs. The reason for this is that if we assume: (i) that the DP-to-CP entailment with *believe*-verbs is derived *compositionally* (i.e. that some general compositional mechanism enables Content DPs to combine with *believe* and gives rise to the entailment); and (ii) that *know* and *believe*-verbs are of the same semantic type, as in (1)–(2)/(54-a), then we incorrectly predict that both *know* and *believe*-verbs should give rise to the entailment.

Uegaki's (2016) solution is to reject the second assumption, that *know* and *believe*-verbs are of the same semantic type.[14] This is motivated by his observation that the entailment contrast tracks a different contrast between the two verb types, in terms of question-embedding (Karttunen 1977a, *et seq*): whereas *know*-verbs embed both declarative and interrogative complements, *believe*-verbs are exclusively declarative embedding. I refer to this contrast, illustrated in (56), as 'the selection contrast'.[15]

(56) *Generalization 3: Selection contrast* (Uegaki, 2016, 623)
a. Mary knows/discovered {that Lisa came / who came} to the party.
b. Mary believes/trusts {that Lisa came / *who came} to the party.

In the following section, I present Uegaki's (2016) approach to the entailment contrast.

14 In Section 6.1, I discuss an alternative approach, from Elliott (2016), which takes the *lack of the entailment* to be the compositional default, and treats the presence of the entailment with *believe* as a lexical exception. As we shall see however, this proposal faces a number of empirical challenges in view of the data discussed here.

15 The link between the selection and the entailment contrast has been challenged by Theiler *et al.* (2019), who note two potential counter-examples: *prove* and *hear*. In Section 5, I discuss these cases along with two other apparent counter-examples, *doubt* and *tell*, arguing that neither case does in fact present a genuine counter-example to the proposed link to question-embedding.

3.2 *Uegaki (2016) on the entailment contrast*

Uegaki (2016) argues that both the entailment contrast and the selection contrast can be accounted for if we assume (a) that *know*-verbs are polysemous between an epistemic attitude verb (57-a) and an acquaintance-predicate (57-b), and (b) that epistemic, CP-selecting *know*-verbs select for questions (type <st,t>) whereas *believe*-verbs select for propositions (type <st>), as in (57-a) vs. (57-c).

(57) Lexical entries (Uegaki, 2016, 631-641)

a. $[\![\text{know}_{EPIST}]\!]^w = [\lambda Q_{<st,t>}.[\lambda x_e.\exists p \in Q[p(w) = 1 \wedge \text{DOX}_x^w \subseteq p]]$

b. $[\![\text{know}_{AQ}]\!]^w = [\lambda y_e.[\lambda x_e.\text{acquainted}(x)(y)(w)]]$

c. $[\![\text{believe}]\!]^w = [\lambda p_{<st>}.[\lambda x_e.\text{DOX}_x^w \subseteq p]]$

In accounting for the selection contrast (56), the key assumption is that it's possible to shift propositions into the singleton sets that contain them, {p}; i.e. to questions with only one alternative. This is achieved by the type-shifter ID in (58).[16] ,[17]

(58) p-to-Q type shifter (Uegaki, 2016, 632)
$[\![\text{ID}]\!]^w = [\lambda p_{<st>}.[\lambda q_{<st>}.q = p]]$

This allows *know*-verbs to combine with declaratives as singleton proposition sets (59-b), but leaves *believe*-verbs without a way to combine with questions (60-a), thus deriving the selection contrast in (56):[18]

(59) Uegaki's (2016) solution to the selection contrast: Declarative CPs

a. $[\![\text{Mary believes that Lisa won}]\!]^w = 1$ in w iff $\text{DOX}_{mary}^w \subseteq \{w' : \text{won}(lisa)(w')\}$

b. $[\![\text{Mary knows that Lisa won}]\!]^w = 1$ in w iff $\exists p \in \{\lambda w'.\text{won}(lisa)(w')\}[\text{EPIST}_{mary}^w \subseteq p]]$

(60) Uegaki's (2016) solution to the selection contrast: Interrogative CPs

a. $[\![\text{Mary believes whether Lisa won}]\!]^w = \#$ ***Type-mismatch***

b. $[\![\text{Mary knows whether Lisa won}]\!]^w = 1$ in w iff $\exists p \in \{\lambda w'.\text{won}(lisa)(w'), \lambda w'.\neg\text{won}(lisa)(w')\}[\text{EPIST}_{mary}^w \subseteq p]]$

16 The name ID is inspired by the analogous <e,et> type-shifter IDENT from Partee (1986).

17 Uegaki (2016) also argues, following Aloni (2008), that a type-shifter (type <e,<st,t>>) is available to allow $know_{EPIST}$ to combine with DPs as concealed questions, e.g. (i), i.e. a different reading from those we're concerned with here.

(i) Mary knows the price of milk. ⇝ Mary knows what the price of milk is.

18 There are other proposals in the literature addressing the observation that *believe* and *know*-verbs differ with respect to question-embedding. On the classic approach (e.g. Groenendijk & Stokhof 1984; Karttunen 1977a; Lahiri 2002, a.o.), responsive predicates (verbs like *know*) select for propositions and combine with questions by question-to-proposition reduction. For a comparison of the current approach with such approaches, I refer the reader to detailed discussion in Uegaki (2016, Sec. 4.2). A more recent approach comes from Theiler *et al.* (2019), who account for the selection contrast within a uniform approach to question and declarative embedding, couched in the framework of Inquisitive Semantics. See Section 6.3 for a discussion of why this approach, at least in its current form, is not compatible with the present approach the entailment and source contrasts.

To account for the entailment contrast in (3)/(53), Uegaki (2016) further proposes the type-shifter CONT in (61).

(61) Content retrieval type shifter (Uegaki, 2016, 634)
$[\![\text{CONT}]\!]^w(x) = \lambda w'.w' \in \text{CONT}_w(x)$
$\left\{\begin{array}{l} \textit{defined if } \text{CONT}_w(x) = \text{CONT}_{w'}(x) \\ \#\textit{otherwise} \end{array}\right\}$

This type-shifter relies on the content function CONT from Kratzer (2006), Hacquard (2006), and Moulton (2009) in (62-a), which extracts the intensional content, a proposition, from individuals like *the rumour* or *the claim*.

(62) a. $\text{CONT}_w(x) = \{w'\text{: } w' \text{ is compatible with the intensional content determined by x in w}\}$
b. $[\![\text{the claim that Lisa won}]\!]^w = \iota x.\text{claim}_w(x)$ & $\text{CONT}_w(x) = \{w'\text{: won}(\textit{lisa})(w')\}$

Applied to a contentful individual like *the claim that Lisa won*, the type-shifter in (61) returns the intensional content of that individual, as shown in (63). The presupposition ensures that the attitude holder additionally believes that p is the content of the rumour or the claim; given the standard assumption that the presupposition of *believe*'s complement universally projects to the attitude holder's beliefs (Karttunen, 1974) (see Uegaki 2016, 635 for discussion).

(63) Uegaki (2016, 634-5)
$[\![\text{CONT}]\!]^w([\![\text{the claim that Lisa won}]\!]^w) = \lambda w'.\text{won}(\textit{lisa})(w')$
$\left\{\begin{array}{l} \textit{defined if } \text{CONT}_w([\![\text{the claim that Lisa won }]\!]) = \text{CONT}_{w'}([\![\text{the claim that Lisa won }]\!]) \\ \#\textit{otherwise} \end{array}\right\}$

As shown in (64), this straightforwardly allows proposition-selecting *believe* (57-c) to combine directly with Content DPs, and predicts that *believe*+Content DP sentences will entail the corresponding *believe CP* sentence: at the level of truth-conditional content, these are equivalent (see (59-a) for comparison).

(64) Uegaki's (2016) solution to the entailment contrast: *believe*
$[\![\text{Mary believes the claim that Lisa won}]\!]^w = 1$ *in w iff* $DOX^w_{mary} \subseteq \{w'\text{:won}(\textit{lisa})(w')\}$
$\left\{\begin{array}{l} \textit{defined if } DOX^w_{mary} \subseteq \{w' | \lambda w''.won(lisa)(w'') = \text{CONT}(w')([\![\text{the claim that Lisa won}]\!])\} \\ \#\textit{otherwise} \end{array}\right\}$

Given the assumption that *know*-verbs are ambiguous between a question-embedding attitude verb and an acquaintance relation between individuals, this analysis also guarantees that the only way for *know*-verbs to combine with a Content DP will be via the acquaintance-predicate in (57-b) (thus giving rise to an acquaintance-relation, as in (65-b)). With the question-embedding predicate in (57-b), composition with (61) will result in a type-mismatch, as shown in (65-a) (see Uegaki 2016, Section 3.2.2 for discussion).

(65) Uegaki's (2016) solution to the entailment contrast: *know*
a. $[\![\text{know}_{EPIST}]\!]^w([\![\text{CONT}]\!]^w([\![\text{the claim that Lisa won}]\!]^w)) = \#$ ***Type-mismatch***
b. $[\![\text{know}_{AQ}]\!]^w([\![\text{the claim that Lisa won}]\!]^w = 1$ in w iff acquainted(x)($\iota x.\text{claim}_w(x)$ & $\text{CONT}_w(x) = \{w'\text{: won}(\textit{lisa})(w')\}$)(w)

A reader may wonder whether it's possible to simply nest the ID and CONT types shifters in (58) and (61), as in (66), and thereby derive the entailment with *know*-verbs.

(66) Uegaki (2016, 642)
John knows$_{EPIST}$ [ID [CONT [the rumor that Mary left]]].

Uegaki (2016, Sec. 3.2.3) discusses this issue, and presents two potential solutions, one in terms of an economy or blocking constraint on type shifting, and one in terms of a different assumption about the basic semantic type of declaratives. The first solution is to suggest that the nesting of CONT and ID as in (66) is blocked by the *CQ* type shifter mentioned in footnote 17, which shifts entities to concealed questions. This blocking is couched in terms of a more general economy principle on type shifting operations, which states that: *A structure involving successive applications of multiple type-shifters α and β to the form φ i.e.*, [β[α φ]], *is ruled out if there is a basic type-shifter γ such that the semantic type of* [γ φ] *is the same as that of* [β[α φ]] (Uegaki, 2016, 643, ex. (45)). Crucially, type-shifting is viewed as a last resort *repair strategy* for resolving type-mismatches, which is blind to the actual meaning of the type-shift. That is, given a type-mismatch, the grammar will simply choose the simplest type-shifting operation available. Thus, given that the *CQ* type shifter (<e,<st,t>>) achieves in one step what the nesting of CONT (<e,st>) and ID (<st,<st,t>>) would achieve in two steps, the application of first CONT and then ID to a Content DP, in order to derive a singleton question meaning, is ruled out. The other solution is to assume that declaratives are fundamentally singleton proposition sets, and that, in order to combine with proposition-selecting verbs like *believe*, they must be shifted to propositions. As Uegaki points out, this too would preserve the explanation in terms of a selectional difference between *know* and *believe*, but avoid the potential problem of nesting.

In what follows, I will continue to assume, with Uegaki (2016), that declarative complement clauses are fundamentally proposition denoting. Adding further to the explanation in terms of an economy principle, I would also like to suggest that the restriction on nesting CONT and ID might also be viewed in terms of avoiding 'look-ahead', in favour of a local economy of derivations. That is, in order to resolve the type-mismatch between *know*$_{EPIST}$ (<<st,t>,<et>>) and a Content DP (<e>) by step-wise application of first CONT and then ID, the compositional semantics, at the point where CONT (<e,st>) is applied to the DP, would need to know that further application of ID (<<st>,<st,t>>) will eventually resolve the type-mismatch. That is, the compositional semantics would need to have access to more global information than is available at that particular point in the derivation.

To summarize, Uegaki's (2016) proposal accounts for the entailment and the selection contrasts by appealing to three ingredients: (i) a selectional difference between clause-embedding *know* and *believe*-verbs (57-a)/(57-c); (ii) the ID and CONT type-shifters in (58) and (61); and (iii) polysemy of *know*-verbs (57-a)/(57-b). I agree with Uegaki (2016), that if we assume a uniform analysis of the selectional properties of CP-selecting *know* and *believe*, then it's difficult to explain why they should differ with respect to Content DPs (the entailment contrast). The same issue also arises in the context of the source contrast. That is, if *believe* is compatible with a Source DP, and *believe* and CP-selecting *know* differ only with respect to the accessibility-relation and the factive presupposition, as in (1)–(2), then it's hard to explain why CP-selecting *know* is not compatible with Source DPs. Thus, the contrasts with respect to DP-complementation is in itself an argument for a non-uniform analysis of CP-selecting *know* vs. *believe*-verbs. Crucially, this argument only requires the

assumption that the entailment is derived via some general compositional mechanism. Given that the entailment and source contrasts occur across verbs (and with similar verbs across languages, as we saw in Section 2), and additionally track the selection contrast, I take this assumption to be motivated.

In my analysis of *know CP/DP* vs. *believe CP/DP*, and in addressing the puzzles in (5), I will therefore adopt the two core ingredients from Uegaki's (2016) analysis: (i) the assumption of a selectional difference between clause-embedding *know* and *believe*-verbs, and (ii) the ID and CONT type-shifters in (58) and (61). I reject the third ingredient of Uegaki's analysis, namely the assumption that *know*-verbs are ambiguous between an epistemic attitude verb and an acquaintance predicate.[19] Motivation for this is discussed in Section 3.3. In Section 4.1, I propose instead a novel decompositional analysis of *know*-verbs, whereby CP and DP-selecting *know*-verbs are derivationally related.

Additionally, Uegaki's analysis doesn't say anything about Source DPs. In Section 4.2, I spell out my analysis of Source DPs. In Section 4.3, I show how the current proposals for Source DPs and *know CP* vs. *know DP*, together with Uegaki's approach to Content DPs and the entailment contrast, allow us to capture the full set of empirical contrasts discussed in this paper.

3.3 *Problems with polysemy of know-verbs*

As discussed in Djärv (2019), there are several problems with assuming that *know*-verbs are ambiguous between a propositional attitude verb and an acquaintance predicate, as in (54)/(57). First, while the contrast in (55), between *wissen/veta/savoir* and *kennen/känna/connaitre* in German, Swedish, and French, seems to support the claim that English *know* is polysemous, the interpretation of DPs as individuals doesn't just arise with *know*, but with essentially all factive clause-embedding verbs (e.g. *notice, discover, see, like, resent, be surprised by*). In order to generalize, a polysemy-based account would therefore have to posit systematic polysemy for *all* of these verbs. Besides *know*, however, I am not aware of any language that systematically distinguishes between CP and DP-selecting forms of these verbs *in general*; thus undermining the argument from the formal distinction (e.g. *wissen* vs. *kennen*) in (55).

Moreover, by appealing to polysemy, we fail to capture the strong intuition that the CP and DP-taking versions of *know, notice, discover, see, like, resent*, etc. all share a semantic core. On the polysemy analysis of CP and DP-selecting *know* in (54)/(57), where the two are simply two separate lexical items, it is not clear what derives this intuition. In fact, on such an analysis, we might expect (67) to behave more like (68), which can only be acceptable as a joke or word-play.

(67) a. I love many things: I love my family and I love that I have so many great friends.
b. Today I noticed two disturbing things: I noticed an ominous sign on the wall and I noticed that my neighbour's car had been broken into.

19 Or some version thereof, for verbs like *discover, notice*, etc.

(68) a. #Today I did a lot of firing: I fired a bunch of fireworks and I fired my manager.
b. #I can tell you two things about pupils: they tend to dilate in bright light and they are never able to sit still.

Finally, Swedish data actually speaks *against* polysemy: in complex forms, *känna* (55-b), by hypothesis $know_{AQ}$ (54-b)/(57-b), can combine with questions, as shown in (69). This is difficult to account for on the above analysis where there is no formal link between $know_{AQ}$ (<e,et>) and $know_{EPIST}$ (<<st,t>,<et>>).[20]

(69) Jag känner till [$_{Q}$ vem som gjorde vad].
I know to who that did what
I'm aware of who did what.

I will therefore propose a decompositional analysis of *know*-verbs, whereby the DP and CP-selecting forms of these verbs are derivationally related via the same lexical root (Section 4.1).

4 PROPOSAL

In this section, I present my proposal for CP and DP-complementation with *know* vs. *believe*-verbs. Section 4.1 presents the current decompositional approach to *know CP/DP*, and Section 4.2 presents my analysis of Source DP sentences. In Section 4.3, I put all the pieces together, showing how these proposals, together with Uegaki's (2016) approach to Content DPs and the entailment contrast, allow us to capture the full set of empirical contrast discussed in this paper. In Section 4.4, I return to the co-occurrence contrast between German and English discussed in Section 2.1.

4.1 *know CP/DP*

In Section 3, I pointed to a number of conceptual and empirical problems with assuming polysemy for *know CP* vs. *know DP*. In this section, I propose instead a decompositional analysis of *know*-verbs, whereby the DP and CP-selecting versions of these verbs are derivationally related. (I illustrate here with *know*, and comment later on points of lexical variation.)

Specifically, I argue that the DP and CP-selecting versions of these verbs share the same lexical root. My proposal for this shared root is given in (70). As on the polysemy-based analysis of *know DP* in (54)/(57), this root is a simple acquaintance predicate, describing a relation between two individuals (type <e,et>).

(70) $[\![\sqrt{\text{AQ}}]\!]^{w} = [\lambda y_{e}.[\lambda x_{e}.\text{AQ}_{w}(x)(y)]]$

20 The presence of multiple *wh*-elements in (69) ensures that the complement is interpreted as a question of type <st,t>, and not as a free relative of type *e* (e.g. Dayal 2016).

Know$_{AQ}$ or *know DP* is the result of $\sqrt{\text{AQ}}$ combining directly with an individual, thus saturating its internal argument slot, as shown in (71).

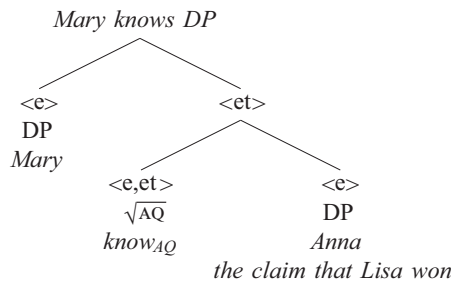
(71) $[\![know_{AQ}]\!]^w = [\![\sqrt{\text{AQ}}]\!]^w([\![\text{DP}]\!]^w) = [\lambda y_e.[\lambda x_e.\text{AQ}_w(x)(y)]]([\![\text{DP}]\!]^w)$

The resulting interpretation of *know DP* sentences is given in (72) (assuming the analysis of Content DPs from (62) above).

(72) a. $[\![\text{Mary knows Anna}]\!]^w = 1$ in w iff $\text{AQ}_w(mary)(anna)$
b. $[\![\text{Mary knows the claim that p}]\!]^w = 1$ in w iff $\text{AQ}_w(mary)(\iota x.\text{claim}_w(x)\ \&\ \text{CONT}_w(x) = p)$

The LF of *know DP* sentences is given in (73).

(73)



Like polysemy-based approaches, this correctly predicts that we neither get a Source reading of the DP in (72-a), nor a propositional entailment with the Content DP in (72-b). My departure from polysemy-based approaches, and previous analyses of *know* more broadly, is in my treatment of *know CP*.

I propose that epistemic, CP-selecting *know* is built on-top of the root $\sqrt{\text{AQ}}$ in a more complex morpho-semantic structure. Specifically, I propose that CP-selecting *know* is derived by combining the lexical root $\sqrt{\text{AQ}}$ in (70) with the head, SITU (type <<e,et>,<<st,t>,<et>>>), given in (74).

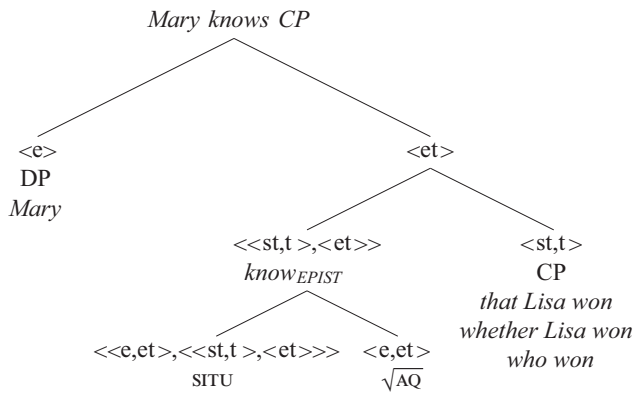
(74) $[\![\text{SITU}]\!]^w = [\lambda R_{<e,et>}.[\lambda P_{<st,t>}.[\lambda x_e.\exists s \leq w[\exists p \in P[s \text{ is a situation exemplifying } p \wedge R(s)(x)]]]]]$

To derive *know*$_{EPIST}$, SITU takes $\sqrt{\text{AQ}}$ as its first (R) argument, causing the object-of-acquaintance slot of $\sqrt{\text{AQ}}$ to be saturated with a situation pronoun (for which I use the variable s), the *res*, and an individual variable x (for the attitude holder). Following Kratzer (2002), I understand situations to be particulars, which (for the purpose of the compositional semantics) I take to be of the more general type e. The result is a function of type <<st,t>,<et>> given in (75); which I propose is the minimal, bare-bones meaning of *know*$_{EPIST}$ (see discussion below on how to incorporate other aspects of meaning). This predicate states that there exists a situation s, which is part of the evaluation world w ($s \leq w$), and a proposition $p_{<st>}$ in $P_{<st,t>}$, such that s exemplifies p, and x is acquainted with s (more discussion on this in a moment).

(75) $[\![know_{EPIST}]\!]^w = [\![\text{SITU}]\!]^w([\![\sqrt{\text{AQ}}]\!]^w) =$
$[\lambda P_{<st,t>}.[\lambda x_e.\exists s \leq w[\exists p \in P[s \text{ is a situation exemplifying } p \wedge \text{AQ}_w(x)(s)]]]]$

The LF of *know CP* sentences, on this proposal, is given in (76).

(76)



Like Uegaki's (2016) analysis of $know_{EPIST}$, this analysis treats CP-selecting *know*-verbs as selecting for questions, rather than propositions. For *know*-verbs to combine with declaratives, I adopt Uegaki's (2016) p-to-Q type-shifter ID (58); see Section 4.3 for details.

(77) a. $[\![\text{Mary knows that Lisa won}]\!]^w = 1$ in w iff
$\exists s \leq w[\exists p \in \{\lambda w'.won(lisa)(w')\}[s \text{ is a situation exemplifying } p \wedge AQ_w(mary)(s)]]$

b. $[\![\text{Mary knows whether Lisa won}]\!]^w = 1$ in w iff
$\exists s \leq w[\exists p \in \{\lambda w'.won(lisa)(w'), \lambda w'.\neg won(lisa)(w')\}[s \text{ is a situation exemplifying } p \wedge AQ_w(mary)(s)]]$

c. $[\![\text{Mary knows who won}]\!]^w = 1$ in w iff
$\exists s \leq w[\exists p \in \{\lambda w'.won(lisa)(w'), \lambda w'.won(jane)(w')\}[s \text{ is a situation exemplifying } p \wedge AQ_w(mary)(s)]]$

Given that SITU involves existential quantification over the alternatives in P, this will only require that the attitude holder knows *some* proposition in the set. Thus, when *know* combines with a *wh*-complement, this gives us a mention-some reading as the default.[21]

This account correctly predicts that DP and CP complements of *know*-verbs should be in complementary distribution: if $\sqrt{AQ}$ combines with a DP like *Anna*, as in (71)–(72), then the object-of-acquaintance slot of $\sqrt{AQ}$ gets saturated, and the resulting predicate, a function of type <et> (describing the property of being acquainted with Anna), is no longer able to combine with SITU, which selects for (R) arguments of type <e,et>. That is, the derivation of *know DP* sentences effectively blocks the derivation of *know CP* sentences. This analysis thus ensures that *know DP* sentences are interpreted as describing an acquaintance relation to an individual and *know CP* sentences as describing a factive attitude, and additionally rules out

21 Here, I assume that the domain of the *wh*-phrase in (77-c) includes only *Lisa* and *Jane*. The interpretation of *wh*-questions varies in terms of exhaustivity (Groenendijk & Stokhof, 1982, 1984). On the strongly exhaustive reading, *know who won* entails that the attitude holder, besides knowing the winner, additionally knows who did not win. On the weakly exhaustive reading, the attitude holder may have false beliefs or no beliefs about the non-winners. There is currently some debate in the literature concerning the availability of strongly and weakly exhaustive readings across responsive verbs, such as *know, surprise*, etc. (see for instance Cremers & Chemla 2017; Djärv & Romero 2021; Guerzoni 2007; Guerzoni & Sharvit 2014; Heim 1994b; Klinedinst & Rothschild 2011; Nicolae 2013; Romero 2015; Spector & Egré 2015; Theiler 2014; Uegaki 2015). Since the issue of exhaustivity is not immediately relevant to the issue at hand, I leave it to the side for the remainder of the paper.

stacking of DPs and CPs, as in (78); an aspect of the current proposal which distinguishes it from previous accounts (see further discussion in the context of (82)–(83) below, and in Section 6.1).

(78) *Mary knows [$_{DP}$ Lisa] [$_{CP}$ that she's the winner].

We also avoid the challenges faced by polysemy-based accounts. Given that the DP and CP selecting versions of *know*-verbs share the same lexical root, it is not surprising that they should *generally* share the same phonological form, as well as a semantic core. In fact, on this view, it is the formal contrast between $know_{AQ}$ and $know_{EPIST}$ in languages like Swedish, German, and French, that is the odd one out. For concreteness sake, I assume that these cases involve contextually triggered allomorphy, such that the *veta/vissen/savoir* forms are triggered in the context of the SITU head, whereas *känna/kennen/connaitre* are the default forms of the verb. The picture presented here is somewhat reminiscent of the case of polarity sensitive items, which can function both as Free Choice and as Negative Polarity Items. As discussed by Chierchia (2006), while these two uses share a common semantic core, there is variation across languages in terms of whether they are lexicalized using one or two phonological forms.

So what does it mean for a fact to exemplify a proposition p? Building on previous work in situation semantics (e.g. Barwise 1981, 1989; Barwise & Perry 1983; Kratzer 1989), Kratzer (2002) characterizes facts as situations, which like individuals are particulars, parts of possible worlds. Situation semantics assumes that all situations s are related to a unique maximal element, which is the world which s is a part of.[22] Just like properties (like being blue) apply to or characterize individuals —which in turn exemplify the properties in question—, propositions apply to or characterize situations or facts, which in turn exemplify them.[23] Informally, a situation that exemplifies p is a situation in which p is true, which doesn't contain anything that doesn't contribute to the truth of p. A formal definition is given in (79).

(79) Exemplification (Kratzer, 2002, 660)
If s is a possible situation and p a proposition, then s is a fact exemplifying p iff for all s' such that $s' \leq s$ and p is not true in s', there is an s'' such that $s' \leq s'' \leq s$, and s'' is a minimal situation in which p is true. (A minimal situation in which p is true is a situation that has no proper parts in which p is true.)

The current analysis thus gives us a concrete morpho-semantic implementation of the idea, from Goldman (1967), Lewis (1979), and Kratzer (2002), a.o., that knowledge, and factivity, is tied to acquaintance with a fact, the *res* (for more recent accounts of knowledge-reports that incorporate this idea, see also Özyildiz 2017 and Djärv 2019).[24] My characterization of knowledge ascriptions builds on Kratzer (2002). Based on considerations about the kinds of cases that cause problems for the view of knowledge as 'justified true

22 While a situation may only be part of one possible world, they may be related across worlds via a counterpart relation; see Lewis (1986).

23 Technically, on this perspective, then, propositions are sets of possible situations.

24 A question arises of whether the current proposal is perhaps too strong. Here, I will leave this question to the side, but see for instance Kratzer (2002) and Lewis (1979) for discussion.

belief', including Gettier cases, Kratzer proposes the following analysis of what it means to know p:

(80) *S* knows *p* if and only if (Kratzer, 2002, 664)
  a. There is a fact *f* that exemplifies *p*,
  b. *S* believes *p de re* of *f*, and
  c. *S* can rule out relevant possible alternatives of *f* that do not exemplify *p*.

Kratzer (2002) argues that (part of) what goes wrong in Gettier cases, and other cases where someone has a belief that is accidentally true (which may or may not be justified), is that the condition in (80-b) is violated. In such cases, Kratzer (2002, 665) argues, the reason why we don't want to say that the attitude holder knows p is that "the believers are not acquainted with any facts that exemplify the proposition they believe." The idea that some type of causal or acquaintance relation is required for knowledge has been argued for instance by Goldman (1967), Kaplan (1968), and Lewis (1979). Kratzer (2002), however, couches this acquaintance relation in terms of *de re* beliefs of facts.[25] The discussion in this paper, however, shows us that in order to capture the shared semantic core of *know DP* and *know CP* sentences, we need to separate out the acquaintance relation from the belief-condition, and treat these as two separate conditions. While the condition in (80-b) works well for *know CP* sentences, it does not extend naturally to *know DP* sentences, which involve acquaintance, but clearly not belief. On the current proposal, where *know DP* and *know CP* involve the same semantic core, a lexical root which describes acquaintance, and where the propositional relation associated with *know CP* is built up compositionally on top of this root, we straightforwardly capture this. To incorporate belief into the current analysis of *know*, it would therefore have to be introduced by SITU. Here, I will leave it a question for future work to determine exactly how to best characterize the intuition that belief (in some form) is part of propositional knowledge, and to consider more carefully the consequences of different theoretical alternatives. One option might be to incorporate Kratzer's (2002) *de re*-belief condition (80-b) as well, as shown in (81).[26] However, the key point here is simply that SITU will have to do the work of introducing any propositional inferences associated with *know*-verbs.

25 The condition in (80-c) deals with the observation that our willingness to say that a person *knows p* depends not just on whether they are suitably acquainted with a fact that exemplifies p, but also on whether the person in question is able to distinguish a true p-situation from relevant alternatives. The case discussed by Kratzer (2002) (from Goldman 1967) involves the attitude holder seeing a real barn and correctly identifying it as such. The crux is that the person in question has just entered a fake-barn district, which is full of fake barns. Crucially, in this case, our willingness to say that the person knows that it's a barn that they are looking at depends on factors around their ability to rule out the fake-barn alternative. While I agree that this matters for knowledge ascriptions, I have not included it as part of my analysis of the minimal, core meaning of *know*. Here, I will leave it to future work to determine exactly how this condition should be formally characterized.

26 Another option comes from Roberts (2021), who discusses projection in attitude reports. She adopts an earlier version of the current proposal for *know*-verbs (from Djärv 2019), but suggests in place of Kratzer's *de re* belief condition that the attitude holder instead needs to recognize the situation with which she is acquainted as a situation that exemplifies p.

(81) Meaning of *know*-verbs, using Kratzer's *de re* belief condition

a. $[\![\text{SITU}_{bel}]\!]^w = [\lambda R_{<e,et>}.[\lambda P_{<st,t>}.[\lambda x_e.\exists s \leq w[\exists p \in P[s \text{ is a situation exemplifying p} \wedge R(s)(x) \wedge \text{believe}_w(x)(s)(p)]]]]]$

b. $[\![know_{EPIST-bel}]\!]^w = [\![\text{SITU}_{bel}]\!]^w([\![\sqrt{\text{AQ}}]\!]^w) = [\lambda P_{<st,t>}.[\lambda x_e.\exists s \leq w[\exists p \in P[s \text{ is a situation exemplifying p} \wedge \text{AQ}_w(x)(s) \wedge \text{believe}_w(x)(s)(p)]]]]$
's is a situation exemplifying p & x is acquainted with s & x believes p of s'

With this addition, we capture the insight from Kratzer (2002), that "in knowledge ascriptions, the *that*-clause seems to have a double function. One is to characterize the information content of the belief ascribed. The other one is to characterize a fact that the belief ascribed is a belief of." (p. 659).

Finally, note that while the current proposal gives us the inference that p is a fact, is does not as it currently stands capture projection. That is, verbs like *know* generally give rise to a not-*at issue* inference that the speaker is committed to p, which tends to project from the scope of entailment targeting operators like negation. Traditionally, this is captured by a presupposition (definedness condition) associated with verbs like *know*, that p must be true in the evaluation world (see (2)). However, recent work has argued against treating p as a presupposition of factive verbs (e.g. Karttunen 2016, Wiegand 2018, Djärv 2019), while other work has argued that projection of p is the consequence of the not-*at issue* status of a (truth-conditional) p-entailment (e.g. Abrusán 2011, 2016, Simons *et al.* 2017). On the analysis of *know*-verbs offered here, as currently stated, the factive existence condition is part of the truth-conditional meaning of the verb, and would therefore not be expected to project. It is clear, however, that *know CP* sentences are interpreted as statements about the attitude holder, and their relation to p, rather than as statements about the existence of facts — and also that the factive inference tends to project. In view of this, it would seem more appropriate to analyse this existence condition as a presupposition. Here, I leave the question open of exactly how this presupposition is derived; whether as a traditional presupposition or as a not-*at issue* entailment.[27] Additionally, it is clear that for a complete analysis of the meaning of *know*-verbs, further lexically specific information (like the manner of acquiring knowledge with verbs like *notice* and *discover*) will have to be incorporated. To the extent that this information is shared by the DP and CP-taking versions of these verbs, such information will have to be incorporated into the meaning of the $\sqrt{\text{AQ}}$-root.

The idea that argument structure plays a key role in generating factive inferences is also present in Özyildiz (2017), Djärv (2019), and Bondarenko (2020a). The current proposal shares the idea in common with all of these proposals, that factive verbs combine with individuals as their internal arguments. In particular, my proposal shares the idea in common with Özyildiz (2017) and Djärv (2019) (an earlier version of the current proposal) that acquaintance with a situation that exemplifies p is a core ingredient of the semantics of factive attitudes, and also that it is this property that distinguishes verbs like *know*

27 The choice of analysis in this regard is orthogonal to the current proposal. However, it's worth noting that Djärv *et al.* (2018); Schwarz *et al.* (2020) argue, based on experimental results from Italian and English, that cognitive, unlike emotive factives, encode the presupposed content also as part of their conventionally entailed content (along the lines of Klinedinst 2010, Sudo 2012). See also Djärv (2019, Ch. 5) for a characterization of these results in slightly different terms.

from verbs like *believe* (for which these accounts propose, just like I have argued here, a traditional Hintikkan semantics). The current proposal differs crucially, however, from both Özyildiz (2017) and Bondarenko (2020a), in terms of their empirical predictions, as well as their intended empirical coverage. This is not just a matter of implementation or technical differences: rather, these proposals differ in important ways in terms of their predictions. The empirical focus of Özyildiz (2017) and Bondarenko (2020a) are so-called factivity alternations (in Turkish and Barguzin Buryat, respectively), whereby certain verbs give rise to a factive inference only when they combine with a nominalized clause, but not with a CP. Though Özyildiz's (2017) and Bondarenko's (2020a) accounts differ from one another in important respects, a crucial prediction of both accounts is that it should be possible for a CP and a nominal to co-occur. For Özyildiz, this is because factive verbs select for both a *res*-argument, which may be saturated by an overt DP, *and* for a propositional argument. For Bondarenko, this is because nominals saturate the internal argument slot of the verb, whereas CPs modify its eventuality argument.[28] For both languages, this prediction is borne out, as shown in (82)–(83).

(82) Turkish (Özyildiz, 2017, 14)
Tunç {o-nu, o durum-u} [Hillary kazandı diye] biliyor.
Tunç 3s-ACC that situation-ACC Hillary won DIYE knows
Tunç believes of {that, that situation} that Hillary won.

(83) Barguzin Buryat (Bondarenko, 2020a, 11)
Sajana [$_{NMN}$ Badm-i:n Xurumxa:n-ha: jɔr-ɔ:d bai-ga:ʃ-i:jɔ-n'] [$_{CP}$ gɔr-tɔ
Sajana Badma-GEN Kurumkan-ABL come-CVB2 be-PART-ACC-3 house-DAT
xulgaiʃan or-o: gɔžɔ] han-a:
burglar go.in-PST COMP think-PST
Sajana recalled the/an event of Badma returning from Kurumkan, (thinking) that a burglar entered the house.

As we saw in (78), such stacking of DPs and CPs is ruled out in English; a result which the current analysis guarantees. Given this contrast, it is difficult to see how Özyildiz's (2017) and Bondarenko's (2020a) analyses could be extended to *know*-verbs in English (see also Section 6.1 for further discussion of this issue). Moreover, as I mentioned above in the context of Kratzer's (80), a challenge for adopting Özyildiz's analysis, is the fact that while *know DP* sentences share a semantic core with *know CP* sentences, they lack any propositional inferences associated with *know CP*. This, then, is an argument in favour of separating out the propositional inferences from the acquaintance-relation, as proposed here. Additionally, of course, English doesn't have the kinds of factivity alternations found in Turkish and Barguzin Buryat. Rather, what the cross-linguistic picture suggests is that similar ingredients are used in composing factive attitudes across languages.

Next, I turn to my proposal for Source DPs. In Section 4.3, I then put all the pieces together, showing how the analysis proposed here capture the source and entailment contrasts (3)–(4), as well the observations that they track both one another and the selection contrast (56).

28 Following Elliott (2016), whose proposal for the entailment contrast I discuss in Section 6.1.

4.2 *Proposal: Source DPs*

The key observation to be accounted for in this section is the observation, repeated in (84), that verbs like *believe*, unlike verbs like *know*, allow for a regular individual to co-occur with a *that*-clause, and that such DPs are interpreted as the source of some (implicitly or explicitly provided) propositional information.

(84) a. I believe the referee (that Lisa won).
b. I know the referee (*that Lisa won).

In Sections 2.3– 2.2, I presented new data which allowed us to refine the notion of what it means to be a source of information in these constructions. The conclusion was that Source DP sentences are similar in meaning to assertion reports, though this inference is part of the sentence's not-*at issue* content. In terms of their *at-issue* content, they are equivalent to their corresponding *believe that p* sentence.

(85) Components of meaning of Source DP sentences:
a. Truth-condition: the attitude holder believes p
b. Presupposition: there was an assertion event s.t. x_{source} proposed to make p common ground.

Additionally, I showed, building on observations by Djärv (2019), that Source DPs behave like *indirect* objects of double object constructions, whereas Content DPs and CPs behave like *direct* objects of the verb (in line with Uegaki's 2016 proposal for Content DPs, which we discussed in Section 3.2, whereby such DPs combine with *believe* by saturating its propositional argument slot).

To capture these observations, I propose that Source DPs are licensed by a head $Asst^o$, given in (86) (to replace the head F^o in (11)).

(86) $[\![Asst^o]\!]^w = [\lambda p_{<st>}.[\lambda x_e.[\lambda f_{<st,et>}.f(p)]]]$
$\left\{\begin{array}{l} \textit{defined if } \exists e[assert(e) \ \& \ agent(e)(x) \ \& \ goal(e) = p \cap c] \\ \#\textit{otherwise} \end{array}\right\}$

In terms of its argument structure, $Asst^o$ is similar to other applicative heads, like (87) (recall also (10)–(11)).

(87) Pylkkänen (2008, 45)
a. $[\![Appl^o_{goal}]\!] = \lambda x.\lambda y.\lambda f_{<e,vt>}.\lambda e.f(e,x)$ & to-the-possession(x,y) Goal Applicative
b. $[\![Appl^o_{source}]\!] = \lambda x.\lambda y.\lambda f_{<e,vt>}.\lambda e.f(e,x)$ & from-the-possession(x,y) Source Applicative

Crucially, $Asst^o$ preserves the semantic relation between the verb (*believe*) and the direct object or internal argument of the verb, the proposition introduced by the CP (or a Content DP, in languages like German; see Section 4.4). Additionally, it increases the n-arity of the predicate by introducing the indirect object, the Source DP. Unlike the regular applicatives in (87), which describe relations between individuals, and are defined for transitive verbs like *bake* and *steal*, $Asst^o$ describes a relation between individuals and propositions, and is defined for proposition-selecting verbs like *believe*.

As shown in (88), a Source DP sentence will be true iff the attitude holder believes p, and will be defined if there exists in the common ground an assertion event e, the agent of which is the Source DP and the conversational goal of which is to make p common ground; i.e. if the Source DP has asserted p.

(88) $[\![\text{Mary believes Anna that Lisa won}]\!]^w = 1$ in w iff $\text{DOX}^w_{mary} \subseteq \{w': won(lisa)(w')\}$

$$\left\{\begin{array}{l} \textit{defined if } \exists e[\text{assert}(e) \,\&\, \text{agent}(e)(anna) \,\&\, \text{goal}(e) = \{w' : won(lisa)(w')\} \cap c] \\ \#\textit{otherwise} \end{array}\right\}$$

As in Anand & Hacquard (2009) (and in Farkas & Bruce 2010, a.o.), the goal of the assertion event is identified as a 'projected common ground', a future conversational state in which p is common ground. In (86), this is captured by the condition [goal(e) = p ∩ c], where c is the *context set*, the set of worlds which is the intersection of all of the propositions in the common ground. Unlike with predicates like *argue*, this assertion-event is part of the presuppositional, and not the truth-conditional content of Asst^o. The LF and derivation of (88) is given in (89).

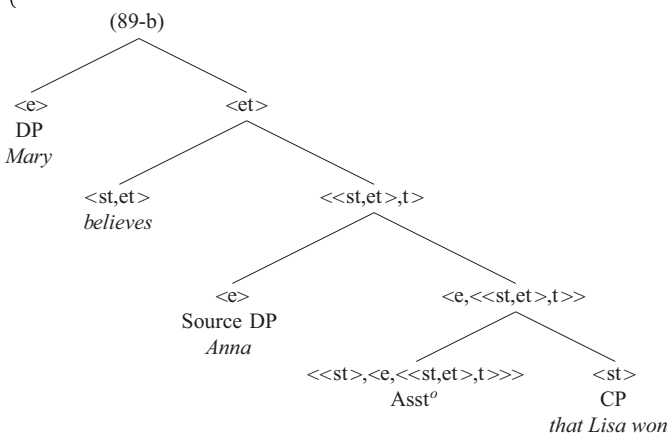
(89) a. $[\![\text{believe Anna that Lisa won}]\!]^w = [\![\text{Asst}^o]\!]^w([\![\text{that Lisa won}]\!]^w)([\![\text{Anna}]\!]^w)([\![\text{believe}]\!]^w)$
$= [\lambda p_{<st>}.[\lambda x_e.[\lambda f_{<st,et>}.f(p)]]]([\lambda w'.won(lisa)(w')])(anna)([\lambda p_{<st>}.[\lambda x_e.\text{DOX}^w_x \subseteq p]])$
$= [\lambda x_e.\text{DOX}^w_x \subseteq \{w': won(lisa)(w')\}]$

$$\left\{\begin{array}{l} \textit{defined if } \exists e[\text{assert}(e) \,\&\, \text{agent}(e)(anna) \,\&\, \text{goal}(e) = \{w': won(lisa)(w')\} \cap c] \\ \#\ \textit{otherwise} \end{array}\right\}$$

b. $[\![\text{Mary believes Anna that Lisa won}]\!]^w = [\![\text{believe Anna that Lisa won}]\!]^w([\![\text{Mary}]\!]^w)$
$= [\lambda x_e.\text{DOX}^w_x \subseteq \{w': won(lisa)(w')\}](mary)$
$= 1$ in w iff $\text{DOX}^w_{mary} \subseteq \{w': won(lisa)(w')\}$

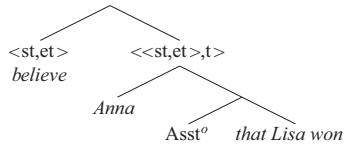
$$\left\{\begin{array}{l} \textit{defined if } \exists e[\text{assert}(e) \,\&\, \text{agent}(e)(anna) \,\&\, \text{goal}(e) = \{w': won(lisa)(w')\} \cap c] \\ \#\ \textit{otherwise} \end{array}\right\}$$

c.

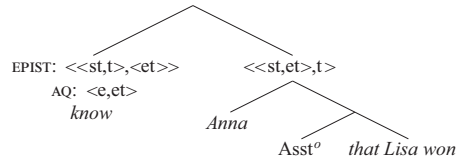


Apart from capturing the above observations about the structure and meaning of Source DP sentences, the fact that Asst^o selects for a verbal argument of type <st,et> ensures, together with the assumption that *know* and *believe* differ in their selectional properties, that *believe*-verbs, but not *know*-verbs, will be compatible with Source DPs. Thus, the explanation for the source contrast receives a similar explanation to Uegaki's (2016) account of the entailment contrast. For the entailment contrast, however, the problem was in getting *know*-verbs, which select for questions (type <st,t>), to combine with the type-shifted Content DP (type <st>) (Section 3.2). Here, as shown in (90), the problem is in getting verbs like *know* to combine with Asst^o itself. Unlike with Content DPs, where *know* can combine via the $\sqrt{\text{AQ}}$ root (resulting in a grammatical sentence without an epistemic interpretation), in the case of Source DPs, neither $know_{AQ}$ nor $know_{EPIST}$ is able to combine with Asst^o, thus correctly predicting that sentences like *I know Anna that p* are simply ungrammatical.

(90) a. *believe Anna that Lisa won.*



b. **know Anna that Lisa won.*



In Section 4.3, next, I show how the current proposals for Source DPs and *know CP/DP* sentences, together with Uegaki's (2016) proposal for Content DPs and the selection contrast, are able to capture the full range of empirical contrasts which this paper set out to account for.

4.3 *Proposal summary: deriving the source and entailment contrasts*

We now put all the pieces together, to show how the proposals outlined above capture Generalizations 1 and 2, repeated in (91)–(92). Crucially, the current account also captures the fact that these two generalizations track one another across verbs.

(91) *Generalization 1: Entailment contrast*

a. Mary believes the rumour that Lisa won. ⇝ Mary believes p & p is a rumour

b. Mary knows the rumour that Lisa won. ⇝ Mary is acquainted with the rumour that p

(92) *Generalization 2: Source contrast*

a. Mary believes Anna (that Lisa won). ⇝ Mary believes p & Anna has asserted p

b. Mary knows Anna (*that Lisa won). ⇝ Mary is acquainted with Anna

The current proposal follows Uegaki's (2016) approach to the entailment contrast, in appealing to a contrast in the types of complements that these two verb-classes select for. Specifically, *believe*-verbs select for propositions (<st>), whereas CP-taking *know*-verbs select for questions (<st,t>). This assumption is motivated by the observation that *know* and *believe*-verbs differ in terms of the kinds of complements that they may combine with (the selection contrast), repeated in (93).

(93) *Generalization 3: Selection contrast*

a. Sue believes {that Lisa came / *who came} to the party.

b. Sue knows {that Lisa came / who came} to the party.

Before turning to the cases where these verbs combine with DPs, let us first take stock of how these verbs combine with CPs.

4.3.1 *Summary of proposal for know vs. believe (CP-complements)* The lexical entries proposed for *believe* and *know*-verbs are given in (94)–(96). For *believe*-verbs, I assume a traditional Hintikkan relation between an individual x and a proposition p, such that x's beliefs entail p.

(94) *Proposal for believe-verbs*

$[\![\text{believe}]\!]^w = [\lambda p_{<st>}.[\lambda x_e.\text{DOX}_x^w \subseteq p]]$

For *know*-verbs, I have followed Uegaki (2016) in assuming that CP-taking *know* selects for questions, and that DP-selecting *know* describes an acquaintance relation between

individuals. However, I have rejected the idea that these are two separate lexical items: an epistemic Hintikkan verb and an acquaintance verb, and argued instead that the two verbs are derivationally related via the lexical root $\sqrt{\text{AQ}}$ in (95-a); thus capturing the idea, from Kratzer (2002) and others, that knowledge relations are fundamentally anchored in the attitude holder's acquaintance with situations, or facts, in the world. CP-selecting *know*-verbs are derived by combining $\sqrt{\text{AQ}}$ with the head SITU in (95-b); thereby saturating the argument slots of $\sqrt{\text{AQ}}$ with a situation pronoun, the *res*, and a variable x (for the attitude holder). The resulting predicate (CP-selecting *know*) states that there exists a situation s, which is part of the evaluation world, and a proposition p in the set containing p, such that s exemplifies p and x is acquainted with s. (See discussion in Section 4.1 on how to incorporate belief into the meaning of SITU.)

(95) *Proposal: components of know-verbs*

a. $[\![\sqrt{\text{AQ}}]\!]^w = [\lambda y_e.[\lambda x_e.\text{AQ}_w(x)(y)]]$

b. $[\![\text{SITU}]\!]^w = [\lambda R_{<e,et>}.[\lambda P_{<st,t>}.[\lambda x_e.\exists s \leq w[\exists p \in P[s \text{ is a situation exemplifying p} \wedge R(s)(x)]]]]]$

The proposed (bare-bones) denotations for *know DP* and *know CP* are given in (96).

(96) *Proposal: know DP vs. know CP*

a. $[\![know_{AQ}]\!]^w = [\![\sqrt{\text{AQ}}]\!]^w([\![\text{DP}]\!]^w) =$ *know DP*
$[\lambda y_e.[\lambda x_e.\text{AQ}_w(x)(y)]]([\![\text{DP}]\!]^w)$

b. $[\![know_{EPIST}]\!]^w = [\![\text{SITU}]\!]^w([\![\sqrt{\text{AQ}}]\!]^w) =$ *know CP*
$[\lambda P_{<st,t>}.[\lambda x_e.\exists s \leq w[\exists p \in P[s \text{ is a situation exemplifying p} \wedge \text{AQ}_w(x)(s)]]]]$

To explain how *know*-verbs combine with declaratives, I adopt Uegaki's (2016) ID type-shifter, repeated in (97), which applies to propositions and returns the singleton sets containing them.

(97) $[\![\text{ID}]\!]^w = [\lambda p_{<st>}.[\lambda q_{<st>}.q = p]]$

Applied to a proposition p, ID returns the singleton proposition set containing p, as shown in (98).

(98) $[\![\text{ID}]\!]^w([\![\text{that Lisa won}]\!]^w) = \{\lambda w'.\text{won}(lisa)(w')\}$

Thus, *know*-verbs combine with declaratives as singleton sets, as shown in (99), and with questions as multi-member sets, as shown in (100) (for other types of questions, see (77) above).

(99) $[\![\text{know that Lisa won}]\!]^w$
$= [\![know_{EPIST}]\!]^w([\![\text{ID}]\!]^w([\![\text{that Lisa won}]\!]^w))$
$= [\lambda P_{<st,t>}.[\lambda x_e.\exists s \leq w[\exists p \in P[s \text{ is a situation exemplifying p} \wedge \text{AQ}_w(x)(s)]]]]$
$(\{\lambda w'.\text{won}(lisa)(w')\})$
$= [\lambda x_e.\exists s \leq w[\exists p \in \{\lambda w'.\text{won}(lisa)(w')\}[s \text{ is a situation exemplifying p} \wedge \text{AQ}_w(x)(s)]]]$

(100) $[\![\text{know whether Lisa won}]\!]^w$
$= [\![\text{know}_{EPIST}]\!]^w([\![\text{whether Lisa won}]\!]^w)$
$= [\lambda P_{<st,t>}.[\lambda x_e.\exists s \leq w[\exists p \in P[s \text{ is a situation exemplifying p} \wedge \text{AQ}_w(x)(s)]]]]$
$(\{\lambda w'.\text{won}(lisa)(w'), \lambda w'.\neg\text{won}(lisa)(w')\})$
$= [\lambda x_e.\exists s \leq w[\exists p \in \{\lambda w'.\text{won}(lisa)(w'), \lambda w'.\neg\text{won}(lisa)(w')\}[s \text{ is a situation exemplifying p} \wedge \text{AQ}_w(x)(s)]]]$

As shown in (101)–(102), *believe*-verbs, on the other hand, have no way of combining with questions. This, as proposed by Uegaki (2016), thus captures the selection contrast.

(101) $[\![\text{believe that Lisa won}]\!]^w$
$= [\![\text{believe}]\!]^w([\![\text{that Lisa won}]\!]^w)$
$= [\lambda p_{<st>}.[\lambda x_e.\text{DOX}_x^w \subseteq p]](\lambda w'.\text{won}(\textit{lisa})(w'))$
$= [\lambda x_e.\text{DOX}_x^w \subseteq \{w' : \text{won}(\textit{lisa})(w')\}]$

(102) $[\![\text{believe whether Lisa won}]\!]^w$ ***Type-mismatch***
$= [\![\text{believe}]\!]^w([\![\text{whether Lisa won}]\!]^w)$
$= [\lambda p_{<st>}.[\lambda x_e.\text{DOX}_x^w \subseteq p]](\{\lambda w'.\text{won}(\textit{lisa})(w'), \lambda w'.\neg\text{won}(\textit{lisa})(w')\}) = \#$

Let us turn now to the core desiderata of the paper; namely accounting for the entailment contrast and the source contrast, and the observation that they track one another. These two contrasts both follow from the fact that the derivation of the entailment with Content DPs and the composition of Source DP-sentences are defined only for proposition-selecting verbs. Therefore, since *know*-verbs describe relations to questions (proposition sets), these means of combining with DPs are not defined for those verbs.

4.3.2 *Deriving the entailment contrast (Generalization 1)* The explanation for the entailment contrast given here follows Uegaki (2016); the difference being in the approach to *know CP* vs. *know DP*, discussed in Section 4.1 above. To extract the intensional content of a Content DP, I adopt Uegaki's content retrieval type-shifter in (103) (see Section 3.2 for details). Applied to a Content DP like *the claim that Lisa won*, CONT in (103) returns its propositional content, as shown in (104).

(103) $[\![\text{CONT}]\!]^w(x) = \lambda w'.w' \in \text{CONT}_w(x)$
$\left\{\begin{array}{l} \textit{defined if } \text{CONT}_w(x) = \text{CONT}_{w'}(x) \\ \#\textit{otherwise} \end{array}\right\}$

(104) $[\![\text{CONT}]\!]^w([\![\text{the claim that Lisa won}]\!]^w) = \lambda w'.\text{won}(\textit{lisa})(w')$
$\left\{\begin{array}{l} \textit{defined if } \text{CONT}_w([\![\text{the claim that Lisa won }]\!]) = \text{CONT}_{w'}([\![\text{the claim that Lisa won }]\!]) \\ \#\textit{otherwise} \end{array}\right\}$

In Section 2.1, I showed that *believe*-verbs (94) combine with both Content DPs and CPs as direct objects. This is what we expect from the analysis in (104), which explains how this is achieved compositionally. Crucially, this analysis also predicts that *believe*+Content DP sentences (105) will entail the corresponding *believe CP* sentence (101), since at the truth-conditional level, these are equivalent.

(105) $[\![\text{believe the claim that Lisa won}]\!]^w$ ***Entails believe p***
$= [\![\text{believe}]\!]^w([\![\text{CONT}]\!]^w([\![\text{the claim that Lisa won}]\!]^w))$
$= [\lambda p_{<st>}.[\lambda x_e.\text{DOX}_x^w \subseteq p]](\{w' : \text{won}(\textit{lisa})(w')\})$
$= [\lambda x_e.\text{DOX}_x^w \subseteq \{w' : \text{won}(\textit{lisa})(w')\}]$
$\left\{\begin{array}{l} \textit{defined if } \text{DOX}_x^w \subseteq \{w' : \lambda w''.\text{won}(\textit{lisa})(w'') = \text{CONT}(w')([\![\text{the claim that Lisa won}]\!])\} \\ \#\textit{otherwise} \end{array}\right\}$

As shown in (106), CP-selecting *know*-verbs (96-b) cannot combine with Content DPs in this way, as it would result in a type-mismatch (see Section 3.2 for discussion of why nesting ID and CONT is not an option).

(106) $[\![\text{know}_{EPIST}$ the claim that Lisa won$]\!]^w$ ***Type-mismatch***
$= [\![\text{know}_{EPIST}]\!]^w([\![\text{CONT}]\!]^w([\![\text{the claim that Lisa won}]\!]^w))$
$= [\lambda P_{<st,t>}.[\lambda x_e.\exists s \leq w[\exists p \in P[s \text{ is a situation exemplifying } p \wedge AQ_w(x)(s)]]]](\{w': won(\textit{lisa})(w')\})$
$= \#$

The only way that *know*-verbs can combine with Content DPs is by saturating the internal argument slot of the $\sqrt{\text{AQ}}$ root (96-a);[29] thus giving rise to the acquaintance meaning of *know*, as shown in (107).

(107) $[\![\text{know}_{AQ}$ the claim that Lisa won$]\!]^w$ ***AQ-reading***
$= [\![\text{know}_{AQ}]\!]^w([\![\text{the claim that Lisa won}]\!]^w)$
$= [\lambda y_e.[\lambda x_e.AQ_w(x)(y)]](\iota x.\text{claim}_w(x) \;\&\; \text{CONT}_w(x) = \{w': won(\textit{lisa})(w')\})$
$= [\lambda x_e.AQ_w(x)(\iota x.\text{claim}_w(x) \;\&\; \text{CONT}_w(x) = \{w': won(\textit{lisa})(w')\})]$

As proposed by Uegaki (2016), we thus derive the result that with Content DPs, *believe*-verbs give rise to the corresponding *believe p* entailment, whereas with *know*-verbs, we get an acquaintance reading. That is, we capture the entailment contrast (3)/(91).

4.3.3 *Deriving the source contrast (Generalization 2)* In Section 2.1 I showed that syntactically, Source DPs behave like (optional) indirect objects of double object constructions (cf. *I baked (Anna) a cake*). Semantically, I showed that Source DPs are presuppositional, and that the presupposition they introduce is, informally, that *there was an assertion event s.t. DP_{source} proposed to make p common ground*. Truth-conditionally, *believe*+Source DP sentences (like *believe*+Content DP sentences) are equivalent to *believe CP* sentences. To capture these observations, I proposed that Source DPs are introduced by the head Asst^o, repeated in (108).

(108) $[\![\text{Asst}^o]\!]^w = [\lambda p_{<st>}.[\lambda x_e.[\lambda f_{<st,et>}.f(p)]]]$
$\left\{\begin{array}{l} \textit{defined if } \exists e[\text{assert}(e) \;\&\; \text{agent}(e)(x) \;\&\; \text{goal}(e) = p \cap c] \\ \#\textit{otherwise} \end{array}\right\}$

As we saw in Section 4.2, Asst^o is straightforwardly compatible with *believe*-verbs (type <st,et>) (94).

(109) $[\![\text{believe Anna that Lisa won}]\!]^w$ ***Entails believe p & gives rise to the source-reading***
$= [\![\text{Asst}^o]\!]^w([\![\text{that Lisa won}]\!]^w)([\![\text{Anna}]\!]^w)([\![\text{believe}]\!]^w)$
$= [\lambda p_{<st>}.[\lambda x_e.[\lambda f_{<st,et>}.f(p)]]](\lambda w'.won(\textit{lisa})(w'))(\textit{anna})(\lambda p_{<st>}.[\lambda x_e.DOX_x^w \subseteq p])$
$= [\lambda x_e.[\lambda f_{<st,et>}.f(\lambda w'.won(\textit{lisa})(w'))]](\textit{anna})(\lambda p_{<st>}.[\lambda x_e.DOX_x^w \subseteq p])$
the x argument of Asst^o (anna) goes into agent(e)(x) *in the presupposition*
$= [\lambda f_{<st,et>}.f(\lambda w'.won(\textit{lisa})(w'))](\lambda p_{<st>}.[\lambda x_e.DOX_x^w \subseteq p])$
$= [\lambda p_{<st>}.[\lambda x_e.DOX_x^w \subseteq p]](\lambda w'.won(\textit{lisa})(w'))$
$= [\lambda x_e.DOX_x^w \subseteq \{w': won(\textit{lisa})(w')\}]$
$\left\{\begin{array}{l} \textit{defined if } \exists e[\text{assert}(e) \;\&\; \text{agent}(e)(\textit{anna}) \;\&\; \textit{goal}(e) = \{w' : won(\textit{lisa})(w')\} \cap c] \\ \#\textit{otherwise} \end{array}\right\}$

29 See footnote 17 on Concealed Questions.

As shown in (110)–(111), given that the third (*f*) argument of Asst^o is a predicate of type <st,et>, Asst^o is only compatible with proposition-selecting verbs, and is therefore neither compatible with *know*$_{EPIST}$ (96-b), nor with *know*$_{AQ}$ (96-a).

(110) $[\![\text{know}_{EPIST}$ Anna that Lisa won$]\!]^w$ ***Type-mismatch***
$= [\![\text{Asst}^o]\!]^w([\![\text{that Lisa won}]\!]^w)([\![\text{Anna}]\!]^w)([\![\text{know}_{EPIST}]\!]^w)$
$= [\lambda p_{<st>}.[\lambda x_e.[\lambda f_{<st,et>}.f(p)]]](\lambda w'.won(\textit{lisa})(w'))(\textit{anna})(\lambda P_{<st,t>}.[\lambda x_e.\exists s \leq w[\exists p \in P[s$ is a situation exemplifying $p \wedge AQ_w(x)(s)]]])$
...
$= [\lambda f_{<st,et>}.f(\lambda w'.won(\textit{lisa})(w'))](\lambda P_{<st,t>}.[\lambda x_e.\exists s \leq w[\exists p \in P[s$ is a situation exemplifying $p \wedge AQ_w(x)(s)]]])$
$= \#$

(111) $[\![\text{know}_{AQ}$ Anna that Lisa won$]\!]^w$ ***Type-mismatch***
$= [\![\text{Asst}^o]\!]^w([\![\text{that Lisa won}]\!]^w)([\![\text{Anna}]\!]^w)([\![\text{know}_{AQ}]\!]^w)$
$= [\lambda p_{<st>}.[\lambda x_e.[\lambda f_{<st,et>}.f(p)]]](\lambda w'.won(\textit{lisa})(w'))(\textit{anna})(\lambda y_e.[\lambda x_e.AQ_w(x)(y)])$
...
$= [\lambda f_{<st,et>}.f(\lambda w'.won(\textit{lisa})(w'))](\lambda y_e.[\lambda x_e.AQ_w(x)(y)])$
$= \#$

Crucially, since *believe*-verbs do not combine with individuals as part of their argument structure, and since individuals like *Anna* have no propositional content, the only way that *believe* can combine with such individuals is via Asst^o. This guarantees that in cases where the proposition in question is contextually recoverable (p_C), the sentence is still going to entail the belief that p_C and that Anna has asserted p_C, as shown in (112).[30,31]

(112) $[\![\text{believe Anna}]\!]^w$ ***Entails believe p & gives rise to the source-reading***
$= [\![\text{Asst}^o]\!]^w(p_C)([\![\text{Anna}]\!]^w)([\![\text{believe}]\!]^w)$
$= [\lambda p_{<st>}.[\lambda x_e.[\lambda f_{<st,et>}.f(p)]]](p_C)(\textit{anna})(\lambda p_{<st>}.[\lambda x_e.DOX_x^w \subseteq p])$
...
$= [\lambda p_{<st>}.[\lambda x_e.DOX_x^w \subseteq p]](p_C)$
$= [\lambda x_e.DOX_x^w \subseteq p_C]$
$\left\{\begin{array}{l}\textit{defined if } \exists e[\text{assert}(e) \,\&\, \text{agent}(e)(\textit{anna}) \,\&\, \text{goal}(e) = p_C \cap c] \\ \#\textit{otherwise}\end{array}\right\}$

A sentence like *know Anna*, on the other hand, while it has the same surface string as (112), can only be derived by combining *Anna* with the $\sqrt{\text{AQ}}$ root, thus guaranteeing that

30 A question remains of why it is possible to not pronounce the clause in a *believe*+Source DP sentence, given that *believe* typically doesn't allow this (e.g. *#I believe* vs. *I know*). Here, I have no definitive answer to this question; perhaps it it linked to the fact that with Source DPs, p must be accessible in the common ground; this is one of the definedness conditions of Source DP sentences (similarly to sentences with *know*). However, I take this to be an orthogonal question about the PF-discourse interface, and I leave this issue for future research to resolve.

31 Another question, which I will also leave for future consideration, is how to formally treat cases where there is no single salient proposition, as in *Mary believes Anna whenever she talks about linguistics* or *Mary always believes Anna, whatever she says*.

these sentences can only be interpreted as involving an acquaintance relation, as we saw in (107).[32]

(113) $[\![\text{know}_{AQ}\ \text{Anna}]\!]^w$ ***AQ-reading***
$= [\![\text{know}_{AQ}]\!]^w([\![\text{Anna}]\!]^w)$
$= [\lambda x_e.\text{AQ}_w(x)(\textit{anna})]$

Thus, this account correctly derives the result that *believe*-verbs, unlike *know*-verbs, will be compatible with Source DPs. That is, we capture the source contrast (4)/(92).

Finally, as we saw in Section 2.1, German allows Source DPs and Content DPs to co-occur, as shown in (114), repeated from (9) above. Putting the accounts for the source and the entailment contrasts together, we get a straightforward explanation for the fact that such sentences are interpreted, truth-conditionally, like their counterparts with a Source DP and a CP, as in (109).

(114) Ich glaube ihm die Behauptung, dass Maria ein Genie war.
I believe him.DAT the.ACC claim that Maria a genius was
I believe the claim, that he told me, that Maria was a genius.

On the current account, the derivation of such sentences involves both Uegaki's (2016) CONT type-shifter, and the Asst^o head proposed here. This is shown in (115).[33]

(115) $[\![\text{believe Anna the claim that Lisa won}]\!]^w$ ***Entails believe p & gives rise to the source-reading***
$= [\![\text{Asst}^o]\!]^w([\![\text{CONT}]\!]^w([\![\text{the claim that Lisa won}]\!]^w))([\![\text{Anna}]\!]^w)([\![\text{believe}]\!]^w)$
$= [\lambda p_{<st>}.[\lambda x_e.[\lambda f_{<st,et>}.f(p)]]](\lambda w'.\text{won}(\textit{lisa})(w'))(\textit{anna})(\lambda p_{<st>}.[\lambda x_e.\text{DOX}_x^w \subseteq p])$
$= [\lambda p_{<st>}.[\lambda x_e.\text{DOX}_x^w \subseteq p]](\lambda w'.\text{won}(\textit{lisa})(w'))$
$= [\lambda x_e.\text{DOX}_x^w \subseteq \{w' : \text{won}(\textit{lisa})(w')\}]$
$\left\{\begin{array}{l}\textit{defined if } \exists e[\text{assert}(e)\ \&\ \text{agent}(e)(\textit{anna})\ \&\ \text{goal}(e) = \{w' : \text{won}(\textit{lisa})(w')\} \cap c], \\ \textit{and if } \text{DOX}_x^w \subseteq \{w' : \lambda w''.\text{won}(\textit{lisa})(w'') = \text{CONT}(w')([\![\text{the claim that Lisa won}]\!])\} \\ \#\textit{otherwise}\end{array}\right\}$

In the following section, I return to this contrast between English and German, regarding the ability of Source and Content DPs to co-occur.

32 Note that the current proposal does not rule out sources of knowledge being specified in other ways with these verbs, e.g. in adjunct *from*-PPs. Interestingly, as pointed out to me by Muffy Siegel (p.c.), *know from x that p* completely lacks the restrictions on inanimate DPs that we observed with Source DPs in Section 2.2, (36)–(37):

(i) a. Mary knows from the time of death that the butler did it. (Muffy Siegel, p.c.)
b. #Mary believes the time of death that the butler did it. ≈(37-b)

It's also noteworthy that there is some variation with respect to the availability of such PPs with *believe*: while *from*-PPs are (predictably) degraded with *believe* if the intended meaning is the same as what we would get with a Source DP (**I believe from Anna that* . . . ; cf. *I believe Anna that p*), such *from*-PPs are possible in other cases, e.g. *I believe from what I heard on the radio that p* (cf. **I believe what I heard on the radio that p*).

33 Using our (in this case, ungrammatical) running example from English for clarity of exposition.

4.4 *Source DPs in German vs. English: the role of case*

In Section 2.1, I suggested that the availability of Source DPs to co-occur with Content DPs is linked to the general presence vs. absence of Source Applicatives in the language. This is supported by the observation that the restriction on multiple DPs in Source DP sentences appears to track whether the language in question allows for Source Applicatives more generally. The following is by no means a comprehensive cross-linguistic survey. However, indicative of such a link, is the observation that Dutch and Swedish, which *lack* Source Applicatives, pattern like English in terms of not allowing Source and Content DPs to co-occur (116)–(117), whereas Spanish, which *does* have Source Applicatives, behaves like German in terms of allowing the two types of DPs to co-occur (118).

(116) Dutch

a. Zij heeft hem het boek gegeven/*gestolen.
she has him the book given/stolen
She gave the book to him./She stole the book from him. ✗Source Applicative

b. Ik geloof je (*de bewering) dat Mary een genie is.
I believe you (the claim) that Mary a genius is
*I believe you (*the claim) that Mary is a genius.* ✗Source DP+Content DP

(117) Swedish

a. Hon gav/*stal honom boken.
she gave/stole him book.DEF
She gave the book to him./She stole the book from him. ✗Source Applicative

b. Jag tror dig (*påståendet/*ditt påstående) att Maria är ett geni.
I believe you (claim.DEF/your claim) that Maria is a genius
*I believe you (*the claim) that Maria is a genius.* ✗Source DP+Content DP

(118) Spanish

a. Le di/robé el libro.
her.DAT gave.1SG/stole.1SG the book
I gave the book to her./I stole the book from her. ✓Source Applicative

b. Le creo (la afirmación) que Maria es un genio.
her.DAT believe.1SG (the claim) that Maria is a genius
I believe you (the claim) that Mary is a genius. ✓Source DP+Content DP

In Section 2.1, I suggested that the contrast between English and German follows from a parametric difference in terms of whether Asst^{o}, the head responsible for introducing Source DPs, assigns case. What (116)–(118) suggests is that this contrast is not due to a lexical quirk of Asst^{o} in German vs. English, but rather, tracks the availability of Source Datives in the language more broadly.

We can think about this in terms of learnability. That is, if a language has both Source Applicatives, and Source DPs, then it is not surprising if the child will infer that Source DPs, like other source-arguments in the language, will be dative. In languages like English, on the other hand, there is no evidence in the child's input that would lead the child to infer that Source DPs should be dative. Thus, on this view, the co-occurrence contrast between English and German (and other languages) is linked to the presence vs. absence of Source Applicatives, even though the head introducing the Source DP is not itself a standard Source Applicative head (87-b). Crucially, on this view, the co-occurrence contrast follows from syntactic, rather than semantic facts.

In the context of this discussion, we might also note that this proposal makes a further prediction about the distribution of Source DPs in English. Since Source DPs in English must be licensed (with accusative case) by the head associated with *believe*, it follows that Source DPs should not be available in *believe*-sentences where there are other DPs that depend on the matrix verb for case. In ECM constructions (119), the subject of the embedded predicate is syntactically licensed with accusative case from the matrix verb.

(119) I believe her$_{ACC}$ to be a talented athlete.

We therefore predict that Source DPs should not be possible in ECM constructions; a prediction which is borne out.[34]

(120) a. I believe you$_{ACC}$ that she$_{NOM}$ is a talented athlete.
b. *I believe you$_{ACC}$ her$_{ACC}$ to be a talented athlete.

A related consequence is that Source DPs should only be possible with verbs that license DP-arguments more broadly. This might explain why a verb like *think*, which is similar to *believe* both in terms of its meaning and its selectional properties (121), nevertheless doesn't allow Source DPs (122). As shown in (123), *think* differs from *believe* in that it neither permits ECM, nor Content DPs.

(121) Do you {believe, think} {that Lisa won / *whether Lisa won}?
(122) I {believe, *think} you (that Lisa won).
(123) a. I {believe, *think} Lisa to be the winner.
b. I {believe, *think} the claim that Lisa won.

It's worth noting, however, that neither the restriction on *believe wh* nor on *think DP* is absolute; see for instance Roberts (2019), White (2019), and Özyildiz (2021), on the first point, and Moulton (2009) on the second. These authors show that under certain conditions, the generalizations in (121) and (123) fail to hold. I leave a more in-depth discussion of the contrast between *think* and *believe* for future research.

5 QUESTION-EMBEDDING AND DP-COMPLEMENTATION: POTENTIAL COUNTER-EXAMPLES

In this section, I look at four verbs which, at least on the surface, seem to provide counter-examples to the link assumed here between question-embedding and DP-complementation: *prove*, *hear*, *tell*, and *doubt*. These verbs appear to behave like *believe* with respect to DPs, but like *know* in terms of question-embedding. If these verbs are genuinely question-embedding, and can be shown to compose with DPs in the same fashion as *believe*, then they would undermine the current explanation (after Uegaki 2016) for why verbs like *know* do not give rise to a propositional entailment when they combine with DPs, and why they are incompatible with Source DPs. Here, I argue that none of them does in fact present this kind of challenge.

34 Through it's worth noting that there might also be other reasons for this incompatibility. As discussed by Moulton (2009), while finite and non-finite complements appear to be semantically equivalent in some contexts, there are also contexts where only one of the options is available, suggesting that they are not in fact semantically equivalent.

5.1 *Prove*

As shown in (124), from Theiler *et al.* (2019), *prove* appears to behave like *believe* in terms of the entailment contrast, despite being question-embedding, as shown in (125).

(124) Theiler *et al.* (2019, 126)
John proved the hypothesis that every positive integer has a unique prime factorization.
⊨ John proved that every positive integer has a unique prime factorization.

(125) Egré (2008, 17)
As yet, there is probably no evidence that would definitively prove whether or not some dinosaurs were warm-blooded.

However, if we look more closely at the complementation-behaviour of *prove*, we find that it's in fact a very different type of verb from *believe*. On the current account, the *believe p* entailment of *believe*+Content DP sentences is compositionally derived. Hence, we predict that it should not depend on the meaning of the noun. As shown in (126), this prediction is borne out: the propositional entailment goes through with Content DP like *the propaganda, the lie, the narrative*, and *the declaration*.[35]

(126) a. only some people believe the propaganda that these dinosaurs were warm-blooded.
⊨ only some people believe that these dinosaurs were warm-blooded
b. I believe the declaration that all people are created equal
⊨ I believe that all people are created equal
c. at the expense of everyone who believed the lie that it would lead to prosperity
⊨ at the expense of everyone who believed that it would lead to prosperity
d. they believe the narrative
⊨ they believe the content of the narrative

This is unlike *prove*, which, as shown in (127), is generally infelicitous with such Content DPs, and does not license the corresponding *prove p* inference with such DPs.

(127) a. #they proved the propaganda that these dinosaurs were warm-blooded.
b. #they proved the declaration that all people are created equal
c. #they proved the lie that it would lead to prosperity
d. #they proved the narrative

This suggests that the entailment in (124) is not in fact derived in the same way as with *believe*+Content DP sentences. If it were, *prove* in (127) would be expected to behave like *believe* in (126). Of course, given that *prove* is veridical, a meaning like *they proved p and p is a lie* (127-c) would be contradictory, and might therefore be ruled out on independent grounds. However, this is not the case for *the propaganda*. Being the content of propaganda doesn't render it false. Therefore, if *prove* worked in the same way as *believe*, we would expect (127-a) to mean that *they proved that these dinosaurs were warm-blooded, and 'these dinosaurs were warm-blooded' is propaganda*, just like (126-a) means that *only some people believe that these dinosaurs were warm-blooded, and 'these dinosaurs were warm-blooded' is propaganda*. Similarly, there is nothing contradictory about demonstrating that the content of a declaration or a narrative is true, as in (127-b) and (127-d). This suggests that the

35 Examples based on data from Davies (2008), the Corpus of Contemporary American English (COCA).

general problem with the sentences in (127) lies in the restrictions that *prove* imposes on its DP-complements and the way that *prove* composes with DPs; which are both different from what we have seen for *believe*-verbs.

The observations in (124)–(125) would only be a problem for the current account if it could be shown that *prove* combines with DPs in the same compositional fashion as *believe*, thereby deriving the entailment, while at the same time being question-embedding. However, as this does not seem to be the case, I conclude that *prove* is not in fact a genuine problem for the current proposal.

5.2 *Hear*

As shown in (128), also from Theiler *et al.* (2019), *hear* also looks like it that behaves like *believe* in terms of the entailment contrast, while at the same time being question-embedding (129).

(128) Theiler *et al.* (2019, 126)
John heard the rumor that Mary left. ⊨ John heard that Mary left.

(129) When I listen, I want to hunt down bootlegs of the band to hear whether this was as good live as it sounds like it might have been.[36]

The case of *hear* is interesting, as it highlights the fact that *hear* is simultaneously a perception verb and a weak factive predicate. As shown in (130)–(131), with *hear DP* sentences, these readings can be teased apart by manipulating elements of the context.

(130) Context: Reliable source of information $\rightsquigarrow$ p-inference
There's a rumour currently going around the office that Lisa has been promoted to CEO. This morning, our colleague Mary, who had just come back from a conference, walked into the office just in time to overhear the head of HR say to one of the senior board members that Lisa has been promoted. Mary heard the claim/rumour that Lisa has been promoted to CEO.
a. ⊨ Mary heard (it said) that Lisa has been promoted to CEO. (perception reading)
b. ⊨ Mary heard that Lisa has been promoted to CEO. (factive reading)

(131) Context: non-reliable source of information $\not\rightsquigarrow$ p-inference
There's a rumour currently going around the office that Lisa has been promoted to CEO. This morning, our colleague Mary, who had just come back from a conference, walked into the office just in time to overhear one of the summer interns say to another summer intern that Lisa has been promoted. Mary heard the claim/rumour that Lisa has been promoted to CEO.
a. ⊨ Mary heard (it said) that Lisa has been promoted to CEO. (perception reading)
b. ⊭ Mary heard that Lisa has been promoted to CEO. (#factive reading)

In both (130) and (131), Mary heard the rumour that Lisa had been promoted. And because of what it means to hear something, it follows that if Mary heard a claim or rumour with content p, then Mary must have heard p (being said). This is the perception reading of *hear*

36 Example from Davies (2008), the Corpus of Contemporary American English (COCA).

that p, which always follows from *hear the claim/rumour that p*. However, *hear that p* also has a weak factive reading, which is not entailed by *hear the claim/rumour that p*. Rather, whether or not the factive reading of *hear that p* is licensed depends on whether or not the rumour or claim has a reliable source. In (130), where the source of the p-information is the head of HR speaking to a senior board member, who would most likely be sharing true information about Lisa's promotion, the factive reading of *hear that p* is licensed. In (131), on on the other hand, where the source of information is a summer intern, who would not necessarily know the truth of the matter, the factive inference is not licensed.[37]

Crucially, this is unlike what we find in the case of *believe*, for which I have argued (following Uegaki 2016) that the entailment is compositionally derived. This predicts that *believe p* will always follow from *believe the claim that p*; regardless of the perceived reliability of the source of the claim or rumour that p — i.e. independently of contextual factors. As shown in (132), this prediction (just like the prediction that the entailment should not be sensitive to lexical factors) is borne out.

(132) Context: non-reliable source of information ⇝ p-entailment (*believe*)
There's a rumour currently going around the office that Lisa has been promoted to CEO. This morning, our colleague Mary, who had just come back from a conference, walked into the office just in time to overhear one of the summer interns say to another summer intern that Lisa has been promoted. Now Mary believes the claim/rumour that Lisa has been promoted to CEO.
⊨ Mary believes that Lisa has been promoted to CEO.

Thus, on closer inspection, we find that the data in (128)–(129) doesn't in fact undermine the current account.

5.3 *Tell*

As shown in (133), *tell* allows for a type of recipient argument, which, like Source DPs, can occur with CPs. As shown in (134), *tell* is question-embedding.

(133) Mary told Anna that Lisa won.
(134) a. Tell me whether (or not) Lisa won.
b. Tell me whether Lisa or Sue won.
c. Tell me who won.

At a first glance, a plausible analysis of the DP in (133) seems to be that it is licensed by a head similar to Asst^{o}, which —rather than specifying the *source* of the propositional information provided by the CP— specifies the *recipient* of that information (the addressee of the telling event, rather than the speaker). If such an analysis was correct, then that would undermine the current explanation for why *know*-verbs can't combine with Source DPs. As it turns out, however, such an analysis is not plausible for *tell* (133). As shown in (135), whereas Source DPs are entirely optional, the recipient argument of *tell* is obligatory.

(135) a. Mary believes (Anna) that Lisa won.
b. Mary told *(Anna) that Lisa won.

37 For further discussion, see Djärv (2019, Ch. 5), who treats factivity in terms of a presupposition that there is reliable evidence for p.

This suggests that, unlike *believe*-verbs, which describe relations to propositions and make no reference to individuals as part of their argument structure (and therefore require external mechanisms to combine with DPs), *tell* selects for two arguments: a type e recipient argument and a clausal argument, of type <st,t>. Crucially, Asst^{o}, or a similar type of head, never enters the derivation. This is a desirable result also for other reasons: with *believe*-verbs, which describe doxastic relations, Asst^{o} introduces an assertion event which includes an agent, specified by the Source DP. In the case of *tell*, however, it is not so clear what semantic effect such a head would have, given that *tell* itself already describes the relevant type of assertion relation. (For further discussion of the semantics of *tell*, see Karttunen 1977a and subsequent work.)

5.4 *Doubt*

As we saw in Section 1.1, *doubt* patterns like *believe* with respect to DP-complementation. (136), repeated from (6)–(7), shows that *doubt* behaves like *believe* with respect to Source DPs and Content DPs.

(136) a. Mary doubted the rumour that Lisa won. ⊨ Mary doubted that Lisa won.
b. Do you have any reason to doubt him that it was on that night that that conversation happened?

However, as shown in (137), *doubt* also allows for polar questions. Crucially, however, it does not allow for alternative or constituent questions (Karttunen 1977a,b, *et seq*).

(137) Biezma & Rawlins (2012, 395)
a. Alfonso doubts whether (*or not) it is raining (*or not).
b. *Alfonso doubts whether it is raining or snowing.
c. *Alfonso doubts what the weather is.

This is clearly a different pattern from what we observe with *know*. Here, I take the evidence to weigh in favour of treating *doubt* as a *believe*-verb. For discussion of its behaviour with respect to question-embedding, see for instance Biezma & Rawlins (2012) and Uegaki (2021).

In this section, I have argued that none of the verbs discussed here are true counter-examples to the link assumed here between question-embedding and DP-complementation. What these cases do, however, is highlight that a more fine-grained typology of attitude verbs is motivated, in terms of the relationship between DP-complementation, factivity/veridicality, and question-embedding.

Before concluding this paper, I compare the current approach with two recent alternative approaches to DP and CP-complementation (the entailment contrast in Section 6.1, and Source DPs in Section 6.2), as well as with a recent alternative approach to the selection contrast (Section 6.3).

6 ALTERNATIVE APPROACHES TO THE ENTAILMENT CONTRAST, SOURCE DPs, AND THE SELECTION CONTRAST

6.1 *Elliott (2016) on the entailment contrast and a note on explain*

An alternative proposal for the lack of the DP-to-CP entailment with *know*-verbs comes from Elliott (2016), who focuses on *explain* as a representative case. Elliott proposes that the absence of the entailment can be accounted for in terms of a general difference in how

CPs and DPs combine with attitude verbs. As shown in (138), CP-complements of *explain* are typically interpreted as the explanation provided for something, the *explanans*, whereas DPs are interpreted as the thing explained, the *explanandum*.

(138) Elliott (2016, 171)
a. Angela explained [$_{DP}$ the fact that Boris resigned]. *explanandum*
b. Angela explained [$_{CP}$ that Boris resigned]. *explanans*

To account for this, Elliott analyses attitude verbs as simple predicates of events, as shown in (139-a). He argues that CPs combine with such verbs by modifying their eventuality argument, as shown in (139-b)–(139-c); building on the view from Moulton (2009), whereby clauses combine with content nouns like *claim* via Predicate Modification (Elliott further assumes that individuals and eventualities are of the same semantic type). This is illustrated in (139).

(139) Elliott (2016, 180)
a. $[\![\text{explain}]\!]^w = [\lambda e.\text{explaining}_w(e)]$
b. $[\![\text{that Boris resigned}]\!]^w = [\lambda x.\text{CONT}_w(x) = \lambda w'.\text{resigned}(\textit{boris})(w')]$
c. $[\![\text{explain that Boris resigned}]\!]^w = [\lambda e.\text{explaining}_w(e) \wedge \text{CONT}_w(e) = \lambda w'.\text{resigned}(\textit{boris})(w')]$

As a result, verb+CP sentences like (138-b) are invariably interpreted as a set of (explaining, saying, believing, knowing, etc.) events with propositional content p. To explain how these verbs combine with DPs, as in (138-a), Elliott proposes a neo-Davidsonian approach, whereby the verb combines with a theme-head which introduces a type e argument slot, thus allowing the verb to combine with a Content DP. This is illustrated in (140).

(140) Based on Elliott (2016, 177–181)
a. $[\![\text{TH}]\!]^w = [\lambda f_{<et>}.[\lambda x_e.[\lambda e_e.f(e) \wedge \text{theme}_w(e) = x]]]$
b. $[\![\text{explain TH}]\!]^w = [\![\text{TH}]\!]^w([\![\text{explain}]\!]^w) = [\lambda x_e.[\lambda e_e.\text{explaining}_w(e) \wedge \text{theme}_w(e) = x]]$
c. $[\![\text{explain the fact that B resigned}]\!]^w$
$= [\![\text{explain TH}]\!]^w([\![\text{the fact that B resigned}]\!]^w)$
$= [\lambda x_e.[\lambda e_e.\text{explaining}_w(e) \wedge \text{theme}_w(e) = x]](\iota x.\text{fact}_w(x) \wedge \text{CONT}_w(x) = \lambda w'.\text{resigned}(b)(w'))$
$= [\lambda e_e.\text{explaining}_w(e) \wedge \text{theme}_w(e) = \iota x.\text{fact}_w(x) \wedge \text{CONT}_w(x) = \lambda w'.\text{resigned}(b)(w')]$

This account therefore correctly predicts the lack of the entailment from *explain DP* to *explain CP*, as well as the interpretation of CP and DP complements of *explain* (138).

There are three problems, however, with this approach. The first is that on this account, there is nothing preventing stacking of CPs and DPs, as in (141) (recall discussion around (78) in Section 4.1).

(141) a. *The City explained [$_{DP}$ the delay] [$_{CP}$ that they were having problems with the factory].
b. *The City explained [$_{DP}$ the fact that there was a delay] [$_{CP}$ that they were having problems with the factory].

Compositionally, sentences like (141) should be possible, given that *explain DP* (140-c) is of the same semantic type as *explain* itself (139-a), as shown in (142).

(142) a. $[\![\text{explain}]\!]^w = [\lambda e.\text{explaining}_w(e)]$
b. $[\![\text{explain DP}]\!]^w = [\lambda e.\text{explaining}_w(e) \wedge \text{theme}_w(e) = \text{DP}]$

Because of this, we should be able to derive *explain DP CP* sentences like (141) in exactly the same way that we derive *explain CP* sentences (139), with the result in (143); i.e. where the explanation for Boris' resignation was that he wanted a holiday.

(143) $[\![$*explain the fact that Boris resigned that Boris wanted a holiday$]\!]^{w}$
$= [\lambda e.\text{explaining}_{w}(e) \wedge \text{theme}_{w}(e) = [\iota x.\text{fact}_{w}(x) \wedge \text{CONT}_{w}(x) = \lambda w'.\text{resigned}(\textit{boris})(w')]$
$\wedge \text{CONT}_{w}(e) = \lambda w'.\text{wanted-a-holiday}(\textit{boris})(w')]$

Conceptually, there is also no obvious reason why sentences like (141) and (143) should be ill-formed, given that the meaning assigned to them on this system is equivalent to that of the well-formed sentences in (144).[38]

(144) a. the City explained [$_{DP}$ the delay] by saying [$_{CP}$ that they were having problems with the factory][39]
b. the City explained [$_{DP}$ the fact that there was a delay] by saying [$_{CP}$ that they were having problems with the factory]

On the current proposal for *know*-verbs, on the other hand, *know DP* and *know CP* sentences share the same morpho-semantic core, the lexical root $\sqrt{\text{AQ}}$. When a DP combines with this root, the DP saturates its object-of-acquaintance slot and, as a consequence, blocks the derivation of CP-selecting *know*, which is built on-top of $\sqrt{\text{AQ}}$ in a more complex structure. As discussed in Section 4.1, this correctly predicts that stacking CPs and DPs, as in (78), (141), and (143), should be ruled out.

The second problem for this approach concerns its treatment of *believe*. According to Elliott, the interpretation of a theme argument is an idiosyncratic fact about the root itself. For *believe*, Elliott proposes that the theme specifies the propositional content of the belief-eventuality; thereby giving us the DP-to-CP entailment. A consequence of this account, therefore, is that CPs and Content DPs compose with *believe* in *different* ways, and it is essentially a lexical quirk of *believe* that we get the p-entailment with Content DPs. As we saw in Section 2.1, however, there is strong morpho-syntactic evidence suggesting that with *believe*, Content DPs and CPs combine with the verb in the *same* way, i.e. by saturating the (propositional) direct object slot of the verb, as predicted by Uegaki's (2016) account of the entailment contrast.

Finally, on this account, it is not clear why the entailment contrast between *know* and *believe*-verbs should correlate with other properties, like the availability of Source DPs (the source contrast) and question-embedding (the selection contrast). On the current approach, on the other hand, where the derivation of the entailment with Content DPs and the composition of Source DP-sentences are defined only for proposition-selecting verbs, it is no coincidence that they should pattern together.

A note on explain. In the context of this discussion, it's worth asking whether the current proposal for *know*-verbs is applicable also to non-factive verbs like *explain*. Crucially, while *explain* shares a number of characteristics of *know*-verbs, it also differs from those verbs in important ways. Besides the difference in terms of factivity, *explain* differs from *know*-verbs in terms of the thematic roles of CP and DP complements, respectively. With the *know*-verbs,

38 In fact, as we discussed in Section 4.1, this type of approach does make the correct predictions in the case of Barguzin Buryat (84), where stacking CPs and DPs *is* possible (Bondarenko, 2020a).

39 From Davies (2008), the Corpus of Contemporary American English (COCA).

as we have seen, both CPs and DPs characterize the object of the attitude, the thing known. With *explain*, however, this is not the case. As we saw in (138), only DP-complements of *explain* are interpreted as the thing explained. This contrast also becomes apparent when we look at *fact*-nominals. As shown in (145-a), if Mary knows a fact that exemplifies a proposition p, then it follows that she knows p.[40] With *explain*, on the other hand, as shown in (145-b), there is no such entailment. If Mary explains explains a fact that exemplifies p, then it follows that *something* was said by way of explanation (i.e. *explain CP* sentences have an existential *explanandum*-entailment). However, it does not follow that she gave p as an explanation.

(145) a. Mary knew the fact that there was a delay. ⊨ Mary knew that there was a delay.
b. Mary explained the fact that there was a delay. ⊭ Mary explained that there was a delay.

This difference, however, does not rule out the possibility that *explain*-verbs might still share aspects of their argument structure and semantic composition with *know*-verbs. It only shows us that the relations involved must be different. In fact, *know CP/DP* and *explain CP/DP* are similar in a number of respects. For instance, as we saw in (78) and (141) above, *explain* shares the property of *know*-verbs that it does not allow DP and CP complements to co-occur. As discussed above, this ban on stacking DP and CP complements is a core prediction of the current, decompositional analysis of *know*-verbs. Moreover, *explain CP*-sentences like (138-b) entail that there exists an *explanandum*, something that was explained. This is also something that the current compositional proposal for *know* is well-equipped to account for. To see this, let's assume that *explain CP* and *explain DP* both involve the same lexical root, which like the $\sqrt{\text{AQ}}$ root of *know*-verbs, is of type <e,et>. Rather than introducing an object of acquaintance, however, it introduces the *explanandum*, the thing explained. To derive *explain CP*, we assume a function (F) of the same semantic type as SITU (though with entirely different semantic content). As with SITU and $\sqrt{\text{AQ}}$ in (75)–(76), the function F would take the *explain*-root as its first argument, causing its internal argument-slot (for the *explanandum*) to be saturated with a situation pronoun s (for the explained situation or fact); thus giving us the *explanandum*-entailment of *explain CP*, i.e. that something was explained. In a parallel fashion to SITU, this function would also be responsible for introducing the propositional content of the explanation; the *explanans*, provided by a CP (of type <st,t>). If a DP saturates the internal argument slot of this root, however, we get the obligatory *explanandum* reading of *explain DP*, and further block the derivation of *explain CP*; thus ruling out stacking. This extension of the current proposal for *know*-verbs to *explain* is illustrated schematically in (146).

(146) a. $[\![\text{explain}_{explanandum}]\!]^w = [\![\sqrt{\text{EXPL}}]\!]^w$ (*explain DP*: type <e,et>)
b. $[\![\text{explain}_{explanans}]\!]^w = [\![\text{F}]\!]^w([\![\sqrt{\text{EXPL}}]\!]^w)$ (*explain CP*: type <<st,t>,<et>>)

For purposes of space, I will not attempt to spell out a complete formal proposal for *explain* along these lines, but it's worth noting that the kind of explanation outlined here would have the same benefits as the current approach to the *know*-verbs, in that it would compositionally derive: (i) the obligatory *explanandum* interpretation of DPs and

40 For discussion and a formal account, see Uegaki (2016, 651–2).

the *explanans* reading of CPs; (ii) the *explanandum*-entailment of *explain CP* sentences (that something was explained); (iii) the lack of a DP-to-CP entailment; (iv) the ban on stacking DPs and CPs; and (v) the fact that *explain* allows for both questions and declarative complements. (For further discussion of *explain*, see also Pietroski 2000, and more recently, Bondarenko 2020b on *explain*-verbs in Russian.)

6.2 *Roberts (2020) on believe with Content and Source DPs*

As we saw in Sections 2.1 and 4.4, Source DPs and Content DPs in English cannot co-occur. In Section 2.1, I mentioned that this might suggest that the two DPs saturate, and therefore compete for, the same argument slot of *believe* – a proposal which I rejected. This idea has been developed by Roberts (2020), who argues that *believe* selects for contentful individuals, as shown in (147) (where v is the type of eventualities and c the type of content individuals).

(147) Roberts (2020, 11)
$[\![\text{believe}]\!] = [\lambda x_c.[\lambda e_v.\text{believe}(e) \wedge \textsc{cont}(x) = \textsc{cont}(e)]]$

On this view, Content DPs and Source DPs both combine with *believe* by saturating its internal argument (x_c) slot. For Content DPs, this works out straightforwardly, as shown in (148).

(148) Roberts (2020, 6, 10)
a. $[\![\text{the claim that it's raining}]\!] = \iota x_c.\text{claim}(x) \wedge \textsc{cont}(x) = \lambda w'.\text{rain}(w')$
b. $[\![\text{believe the claim that it's raining}]\!]$
$= [\lambda e_v.\text{believe}(e) \wedge \textsc{cont}(\iota x_c.\text{claim}(x) \wedge \textsc{cont}(x) = \lambda w'.\text{rain}(w')) = \textsc{cont}(e)]$

For Source DPs, which are not associated with propositional content, Roberts proposes that they are type-shifted into a type of Content DP by an operator which Roberts terms CLAIM (149-a), which denotes a function from individuals x_e to the unique contentful individual x_c which has the same content as the claim of x_e in w (type <e,c>). Thus, as shown in (149), Source DPs can thus combine with *believe* in the same fashion as Content DPs, by saturating the x_c argument slot of *believe*.

(149) Roberts (2020, 12, 14)
a. $[\![\textsc{claim}]\!]^w = [\lambda y_e.\iota x_c.\textsc{cont}(x_c)(w) = \textsc{cont}(\text{claim}(y)(w))]$
b. $[\![\textsc{claim}]\!]^w([\![\text{Maude}]\!]) = \iota x_c.\textsc{cont}(x_c)(w) = \textsc{cont}(\text{claim}(\textit{maude})(w))$
c. $[\![\text{believe Maude}]\!]$
$= [\lambda e_v.\text{believe}(e) \wedge \textsc{cont}(\iota x_c.\textsc{cont}(x_c)(w) = \textsc{cont}(\text{claim}(\textit{maude})(w))) = \textsc{cont}(e)]$

Thus, as shown in (148-b) and (149-c), on this analysis both Source DPs and Content DPs combine by saturating an internal argument slot of *believe*, i.e. as direct objects. To further combine with a CP (taken to be of type <vt>, as shown in (150-a)), Roberts proposes that it combines with the *believe*+Source DP constituent (149-c) as a modifier of the event argument of *believe*, as shown (150-b).[41]

(150) Roberts (2020, 10, 13-14)
a. $[\![\text{that it's raining}]\!]^w = [\lambda e_v.\textsc{cont}(e)(w) = \lambda w'.\text{rain}(w')]$
b. $[\![\text{believe Maude that it's raining}]\!]^w$
$= [\![\text{believe Maude}]\!]([\![\text{that it's raining}]\!]^w)$

41 Along similar lines to Elliott's (2016) proposal, discussed in Section 6.1.

$= [\lambda e_v.\text{believe}(e) \wedge \text{CONT}(\iota x_c.\text{CONT}(x_c)(w) = \text{CONT}(\text{claim}(\textit{maude})(w)) = \text{CONT}(e)) \wedge \text{CONT}(e)(w) = \lambda w'.\text{rain}(w')]$

As we saw Sections 2.1 and 4.4, however, this account makes the wrong empirical predictions for the morpho-syntax and argument structure of Source DP sentences. Given that Roberts (2020) takes Source DPs and Content DPs to saturate the same internal (x_c) argument slot of *believe*, this account predicts that the two types of DPs compete for the same position, and should therefore be in complementary distribution. As we have seen, however, the two types of DPs *can* in fact co-occur in languages like German and Spanish.[42] Importantly, however, this account also makes the wrong predictions for English. In Section 2.1, we looked at syntactic evidence showing us that in English, just like in German and Spanish, Source DPs pattern like *indirect* objects of *believe*, whereas Content DPs (and CPs) pattern like *direct* objects.

Thus, *both* the German and the English data speak against the type of analysis offered by Roberts (2020), according to which Source DPs and Content DPs compose with *believe* in the same way. The data discussed here also speak in favour of a uniform treatment of *believe DP* sentences in English and in German, as proposed here.

6.3 *Theiler et al. (2019) on the selection contrast*

In this paper, I have followed Uegaki (2016) in treating CP-taking *know*-verbs as selecting for questions, and *believe*-verbs as selecting for propositions. To allow *know*-verbs to combine with declaratives, which are traditionally assumed to denote propositions, I adopted Uegaki's (2016) p-to-Q type shifter (58). However, in recent work in inquisitive semantics (Ciardelli *et al.* 2013, 2015, a.o.), interrogatives and declaratives (and declarative complements; e.g. Theiler *et al.* 2019) are uniformly analysed as proposition sets. While such a uniform analysis presents an attractive alternative to the type-shifter assumed here, it unfortunately runs into problems in the context of DP-complementation.

The reason for this goes back to Uegaki's argument in favour of a non-uniform approach to the selectional properties of *know* vs. *believe*-verbs discussed in Section 3. The core of the argument is that if we assume: (a) that the DP-to-CP entailment with *believe*-verbs is derived *compositionally* (via some general compositional mechanism that enables Content DPs to combine with *believe* and give rise to the entailment); and (b) that *know* and *believe*-verbs are of the same semantic type, then we incorrectly predict that both *know* and *believe*-verbs should be able to combine with Content DPs and compositionally give rise to the entailment. (As above, the same argument applies to Source DPs.)

On Theiler *et al.*'s (2019) account, both *know* and *believe*-verbs select for complements of type <st,t>. Their (simplified) entry for *believe* is given in (151).

(151) Theiler *et al.* (2019, 102)
$[\![\text{believe}_Q]\!]^w = [\lambda P_{<st,t>}.[\lambda x_e.\text{DOX}_x^w \in P]]$

On their approach, the incompatibility of *believe* with interrogative complements (the selection contrast) is explained in terms of systematic triviality stemming from an excluded middle presupposition of *believe* (Bartsch, 1973; Gajewski, 2007). I'm omitting this

42 I argued in Section 4.4 that the reason why English doesn't allow the two types of DPs to co-occur is because of morpho-syntactic facts about this language, rather than because of the semantics of this construction.

presupposition here, since the current issue is not preventing *believe* from combining with questions, but rather, preventing *know* from combining with DPs and giving rise to a propositional entailment/allowing Source DPs.

On this approach to the selection contrast, in order to capture the propositional entailment with Content DPs and the availability of Source DPs with *believe*, we would have to assume that whatever the nature of the compositional mechanisms that derive these, they would have to be defined for question-embedding predicates. The problem is that these mechanisms would now also be defined for *know*-verbs, and thus, we incorrectly predict that *know*-verbs should pattern like *believe*-verbs with respect to Content DPs and Source DPs. That is, we would fail to capture the entailment and source contrasts.

Note, as before, that this argument doesn't depend on the exact implementation of the mechanism deriving the entailment and licensing Source DPs. As Uegaki (2016, 628) points out (in the context of theories that take both types of verbs to be uniformly proposition-taking), "as long as there is a general compositional mechanism deriving the relevant entailment for any proposition-taking predicate, we would predict the same mechanism to hold for both [exclusively proposition taking predicates] and [responsive predicates] given the standard assumption that both kinds of verbs have proposition-taking denotations." My point here is simply that the same argument will apply also to theories that take both types of verbs to have question-taking denotations, such as Theiler *et al.* (2019). What Uegaki's (2016) non-uniform approach to the selectional restrictions of *know* vs. *believe* achieves, is a way to capture the observation that *know*-verbs (unlike *believe*-verbs) are restricted with respect to certain types of propositional inferences, namely those present with Content DPs and Source DPs.

7 CONCLUSION

Based on the interpretation and distribution of DP and CP-complements of *know* vs. *believe*-verbs, I have argued that the two verb-types differ fundamentally from one another at the level of internal morpho-semantic composition and argument structure, and thus combine with DPs via different routes.

For *know*-verbs, I have proposed a novel decompositional approach, according to which *know*-verbs describe relations that are fundamentally anchored in the attitude holder's acquaintance with abstract or concrete individuals in the world, both when they combine with CPs and DPs. This account provides a compositional link between factivity (with CP-complements) and the interpretation of DPs as objects of acquaintance. In particular, I have argued that *know DP* and *know CP* involve the same lexical root, which describes an acquaintance relation between individuals. The object-of-acquaintance argument of this root can either be saturated by a regular individual (with DPs) or by a situation pronoun, the *res* (with CPs). The latter option is achieved in a morpho-semantically more complex structure, via the head SITU, which takes the acquaintance root as its first argument. The head SITU fills two key roles: introducing the *res*, and further providing an open argument slot for the CP, of type <st,t>. The resulting predicate, CP-selecting *know*, states that there exists a situation s and a proposition $p_{<st>}$ in $P_{<st,t>}$, such that s exemplifies p, and x is acquainted with s. On this view then, *know*-verbs always involve an acquaintance relation, both when they combine with DPs and CPs. While the idea that knowledge, and factivity more broadly, involves acquaintance with a fact or a *res* is in itself is not new (e.g. Goldman 1967, Lewis 1979, Kratzer 2002, 1989, Özyildiz 2017), this account is novel in that it

provides a compositional morpho-semantics for *know CP* vs. *know DP* that captures this intuition, as well as the link between the factivity and DP-complementation, and also the fact that in English, DP and CP complements are in complementary distribution.

For *believe*-verbs, I have argued that they are fundamentally Hintikkan: i.e. they describe relations to propositions, and are not intrinsically anchored to facts. To combine with DPs, they therefore require either type-shifting (defined for contentful DPs, as proposed by Uegaki 2016), or an external licensing head (defined for agentive DPs; proposed here for Source DPs). For Content DPs, which I have shown pattern like direct objects of *believe*, similarly to CPs, Uegaki's (2016) content-retrieval type-shifter guarantees that *believe that p* and *believe the rumour that p* will be truth-conditionally equivalent, and also correctly predicts that Content DPs combine as direct objects, by saturating a propositional internal argument slot of *believe*. For Source DPs, I have shown that they are (optional) indirect objects of *believe*, introduced by a type of attitudinal applicative head, Asst^o, which describes a not-*at issue* assertion event, such that the Source DP has proposed to make p common ground. Like other applicatives, Asst^o preserves the relation between the verb and the direct object, the proposition denoted by the CP. This guarantees that *I believe Anna that Lisa won* will entail that I believe that Lisa won, just like *I baked Anna a cake* will entail that I baked a cake.

This proposal also has implications for theories of question-embedding. Previous work has observed a connection between factivity/veridicality and question-embedding (e.g. Egré 2008, Spector & Egré 2015, Uegaki 2015, 2016, Uegaki & Sudo 2017, Theiler *et al.* 2018, Steinert-Threlkeld 2019), and Uegaki (2016) further links the contrast in question-embedding to the interpretation of Content DPs. Following Uegaki (2016), I have argued that the reason why the mechanisms that enable *believe*-verbs to combine with DPs are not available to *know*-verbs, is because of a contrast in their selectional properties: *know*-verbs are question-embedding and *believe*-verbs are proposition-embedding. Given the derivational relation between *know DP* and *know CP* proposed here, the current proposal thus adds further to the link between DP-complementation, factivity/veridicality, and question-embedding.

Acknowledgements

Special thanks to Luke Adamson, Felix Frühauf, Alexandros Kalomoiros, David Krassnig, Julie Anne Legate, Erlinde Meertens, Keir Moulton, Nadine Theiler, Lefteris Paparounas, Maribel Romero, Florian Schwarz, and Wataru Uegaki, for helpful feedback and discussion at various stages of this project. Many thanks also to audiences at BCGL 13 (fall 2020, where the current proposal for *know CP/DP* was first presented), the Workshop on Clause-Embedding Predicates at OSU (where the current proposal for Source DPs was first presented), WCCFL 39, SALT 31, the Meaning and Grammar Research Group in Edinburgh, and the UCL Semantics Research Seminar (in 2021) for much helpful discussion. Many thanks also to Floris Roelofsen and the anonymous reviewers at Journal of Semantics for their helpful comments. Thanks to the DFG project RO 4247/4-2 and the Alexander von Humboldt Foundation for financial support. This paper builds on and supersedes Chapter 4 of my dissertation (Djärv, 2019). All errors are my own.

A Meaning of Source DPs: Interpretation of epistemic modals

In Section 2.2, we looked at two diagnostics for teasing apart our two hypotheses about the meaning of Source DP sentences, repeated in (152): contexts that satisfy causation but not assertion, and restrictions on inanimate DPs.

(152) Interpretation (informally) of *x believes y that p*

a. **Hypothesis 1:** y caused x to believe p. **(rejected)**

b. **Hypothesis 2:** there was an assertion event s.t. x proposed to make p common ground.

As I mentioned, there is also a third diagnostic worth noting, which I left out above for reasons of space, namely, the interpretation of epistemic modals. This diagnostic is based on an observation from Runner & Moulton (2017) about the interpretation of epistemic modals in Source DP sentences, and relies on Tancredi's (2007) modified version of von Fintel & Iatridou's (2003) Epistemic Containment Principle [ECP]. In its original form, the principle states that quantifiers cannot bind their traces across an epistemic modal. In the modified version, the generalization is that quantifiers cannot bind their traces across a *subjectively interpreted* epistemic modal. Objectively interpreted epistemic modals obviate the ECP. This is illustrated in (153). The idea is that the sentence with the subjectively interpreted modal (153-a) is degraded because the only interpretation available is the not very plausible one that 'it is possible that all guests are the murderer' (*might* > *every*). The sentence with the objectively interpreted modal (153-b), on the other hand, is fine, because the more plausible interpretation that 'for each guest x, it is possible that x is the murderer' (*every* > *might*) is available.

(153) Anand & Hacquard (2009, ex. (15)–(16))

a. #(Subjectively speaking), every guest might be the murderer.

(i) #It is possible that all guests are the murderer. *might* > *every*

(ii) *For each guest x, it is possible that x is the murderer. **every* > *might*

b. Objectively speaking, every guest might be the murderer.

(i) #It is possible that all guests are the murderer. *might* > *every*

(ii) For each guest x, it is possible that x is the murderer. *every* > *might*

Anand & Hacquard (2009) observe that there is a contrast between doxastic attitudes and assertion-reports with respect to the ECP, as shown in (154).

(154) Anand & Hacquard (2009, ex. (17))

a. #Holmes believed that every guest might be the murderer. *might* > *every* / **every* > *might*

b. Holmes claimed that every guest might be the murderer. *might* > every / *every* > *might*

Anand & Hacquard account for this by proposing that for doxastic attitudes, p (and thus the modal) is evaluated with respect to the attitude holder's subjective belief state. For assertion reports, on the other hand (unlike in matrix assertions; cf. (153-a)), p is evaluated with respect to a projected common ground, where p is part of the general consensus, thus yielding an objective stance. An informal version of their proposal for belief vs. assertion reports is given in (155); for more detail, see their Section 3.3.

(155) Anand & Hacquard (2009, ex. (28), (30))

a. John believes that it might be raining.
There is a belief state of John s.t. [it is raining] *is compatible with his doxastic alternatives.*

b. John claimed that the Earth is flat.

There was a claiming event e by John proposing to make [the Earth is flat] *common ground*.

Crucially, for our purposes, Runner & Moulton (2017, 15) observe that sentences with Source DPs, like assertion reports, obviate the ECP.

(156) They believed Holmes that every guest might be the murderer. (Runner & Moulton, 2017, 15)
   a. #believed H's claim that it is possible that all guests are the murderer. *might >every*
   b. believed H's claim that for each guest x, it is possible that x is the murderer. *every >might*

Runner & Moulton (2017) (who are primarily concerned with *believe* in the context of non-finite complements) suggest that in these sentences, *believe* is interpreted assertively. I would like to suggest, however, that the obviation effect observed in (156) is not due to *believe* itself being interpreted assertively, but rather follows from the fact that Source DP sentences, in addition to making a statement about the attitude holder's private subjective beliefs, additionally presuppose that there was an assertion event such that x proposed to make p common ground (Hypothesis 2). The objective stance arises from this additional dimension of meaning, whereby p is evaluated with respect to a projected common ground; the conversational goal of the assertion-event introduced by the Source DP. Some support for this possibility comes from the fact that my consultants find the judgement in (156) to be less sharp than in (153) and (154). On the hypothesis entertained here, this is actually what we'd expect, given that this sentence simultaneously describes a private doxastic state (*they believed p*) and an assertion event (*Holmes has asserted p*).[43] Adding to the diagnostics discussed in Section 2.2, this therefore lends further support to the assertion hypothesis for Source DPs.

References

Abrusán, Márta (2011), 'Predicting the presuppositions of soft triggers'. *Linguistics and Philosophy* **34**: 491–535.

Abrusán, Márta (2016), 'Presupposition cancellation: Explaining the 'soft–hard' trigger distinction'. *Natural Language Semantics* **24**: 165–202.

Abusch, Dorit (2010), 'Presupposition triggering from alternatives'. *Journal of Semantics* **27**: 37–80.

Aloni, Maria (2008), 'Concealed questions under cover'. *Grazer Philosophische Studien* **77**: 191–216.

Anand, Pranav & Valentine Hacquard (2009), 'Epistemics with attitude'. In *Semantics and Linguistic Theory (SALT)*, T. Friedman and S. Ito (eds.), vol. 18. Ithaca, NY.

Anscombe, G. Elizabeth (1979), 'What is it to believe someone?' In C. F. Delaney (ed.). *Rationality and Religious Belief*. University of Notre Dame Press. Notre Dame.

Bartsch, Renate (1973), '"Negative transportation" gibt es nicht'. *Linguistische Berichte* **27**: 1–7.

43 I also consulted five German (linguist and non-linguist) native speakers about these judgements. Interestingly, among these speakers, only one person agreed with the judgements in the 'basic' cases (153) and (154) and actually preferred the *might* > *every* reading in (156). Given that the basic scope-judgements are not clear in German, I'll leave it for future research to further investigate the nature of the ECP-facts in German.

Barwise, Jon (1981), 'Scenes and other situations'. *The Journal of Philosophy* **78**: 369–97.
Barwise, Jon (1989), *The Situation in Logic*. Center for the Study of Language.
Barwise, Jon & John Perry (1983), *Situations and Attitudes*. MIT Press. Cambridge, MA.
Biezma, María & Kyle Rawlins (2012), 'Responding to alternative and polar questions'. *Linguistics and Philosophy* **35**: 361–406.
Bondarenko, Tanya (2020a), 'Factivity from pre-existence: Evidence from Barguzin Buryat'. *Glossa: A Journal of General Linguistics* **5**: 1–35.
Bondarenko, Tanya (2020b), 'Two paths to explain'. Talk presented at the *13th Brussels Conference on Generative Linguistics: The Syntax and Semantics of Clausal Complementation (BCGL13)*. Brussels. 16–8.
Chierchia, Gennaro (2006), 'Broaden your views: Implicatures of domain widening and the "logicality" of language'. *Linguistic Inquiry* **37**: 535–90.
Chomsky, Noam & Howard Lasnik (1977), 'Filters and control'. *Linguistic Inquiry* **8**: 425–504.
Ciardelli, Ivano, Jeroen Groenendijk & Floris Roelofsen (2013), 'Inquisitive semantics: A new notion of meaning'. *Language and Linguistics Compass* **7**: 459–76.
Ciardelli, Ivano, Jeroen Groenendijk & Floris Roelofsen (2015), *Inquisitive Semantics*. ESSLLI Lecture Notes.
Cremers, Alexandre & Emmanuel Chemla (2017), 'Experiments on the acceptability and possible readings of questions embedded under emotive-factives'. *Natural Language Semantics* **25**: 223–61.
Davies, Mark (2008), 'The Corpus of Contemporary American English (COCA)'. Available online at https://www.english-corpora.org/coca/.
Dayal, Veneeta (2016), *Questions*. Oxford Surveys in Semantics and Pragmatics. Oxford University Press. Oxford.
Deal, Amy Rose (2009), 'The origin and content of expletives: Evidence from "selection"'. *Syntax* **12**: 285–323.
Djärv, Kajsa (2019), *Factive and Assertive Attitude Reports*. Ph.D. thesis, The University of Pennsylvania. Philadelphia, PA.
Djärv, Kajsa & Maribel Romero (2021), 'Emotive factives and strong exhausitvity: An experimental investigation'. Talk presented at the *MECORE Workshop: Approaches to the Semantics of Clause-Embedding Predicates: Theories, Cross-Linguistic Data, and Experimentation*.
Djärv, Kajsa, Jérémy Zehr & Florian Schwarz (2018), 'Cognitive vs. emotive factives: An experimental differentiation'. In R. Truswell, C. Cummins, C. Heycock, B. Rabern and H. Rohde (eds.), *Sinn und Bedeutung (SuB)*. 367–85.
Djärv, Kajsa & Hezekiah Akiva Bacovcin (2020), 'Prosodic effects on factive presupposition projection'. *Journal of Pragmatics* **169**: 61–85.
Egré, Paul (2008), 'Question-embedding and factivity'. *Grazer Philosophische Studien* **77**: 85–125.
Elliott, Patrick D. (2016), 'Explaining DPs vs. CPs without syntax'. In *Proceedings of CLS*, vol. 52.
Farkas, Donka F. & Kim B. Bruce (2010), 'On reacting to assertions and polar questions'. *Journal of Semantics* **27**: 81–118.
Gajewski, Jon Robert (2007), 'Neg-raising and polarity'. *Linguistics and Philosophy* **30**: 289–328.
Ginzburg, Jonathan (1995), 'Resolving questions'. *Linguistics and Philosophy* **18**: 459–527.
Goldman, Alvin I. (1967), 'A causal theory of knowing'. *The Journal of Philosophy* **64**: 357–72.
Grimshaw, Jane (1990), *Argument Structure*. MIT Press.
Groenendijk, Jeroen & Martin Stokhof (1982), 'Semantic analysis of *wh*-complements'. *Linguistics and Philosophy* **5**: 175–233.
Groenendijk, Jeroen Antonius Gerardus & Martin Johan Bastiaan Stokhof (1984), *Studies on the Semantics of Questions and the Pragmatics of Answers*. Ph.D. thesis, University of Amsterdam.
Guerzoni, Elena (2007), 'Weak exhaustivity and 'whether': A pragmatic approach'. In T. Friedmann and M. Gibson (eds.), *Semantics and Linguistic Theory (SALT)*, vol. 17. 112–29.

Guerzoni, Elena & Yael Sharvit (2014), 'Whether or not anything but not whether anything or not'. In L. Crnič and U. Sauerland (eds.), *The Art and Craft of Semantics: A Festschrift for Irene Heim*, vol. 1. MIT Working Papers in Linguistics. Cambridge, MA. 199–224.

Hacquard, Valentine (2006), *Aspects of Modality*. Ph.D. thesis. MIT Press.

Heim, Irene (1994a), 'Comments on Abusch's theory of tense'. In H. Kamp (ed.), *Ellipsis, Tense, and Questions*. University of Amsterdam. Amsterdam. 143–70.

Heim, Irene (1994b), 'Interrogative semantics and Karttunen's semantics for know'. In *Proceedings of The Proceedings of the Ninth Annual Conference and the Workshop on Discourse of the Israel Association for Theoretical Linguistic (IATL)*, vol. 1. Academon. Jerusalem. 128–44.

Higgins, Francis Roger (1973), *The Pseudo-Cleft Construction in English*. Ph.D. thesis, MIT Press.

Kaplan, David (1968), 'Quantifying in'. *Synthese* **19**: 178–214.

Karttunen, Lauri (1973), 'Presuppositions of compound sentences'. *Linguistic Inquiry* **4**: 169–93.

Karttunen, Lauri (1974), 'Presuppositions and linguistic context'. *Theoretical Linguistics* **1**: 181–94.

Karttunen, Lauri (1977a), 'Syntax and semantics of questions'. *Linguistics and Philosophy* **1**: 3–44.

Karttunen, Lauri (1977b), 'To doubt whether'. In *The CLS Book of Squibs*. 58–9.

Karttunen, Lauri (2016), 'Presupposition: What went wrong?' In *Semantics and Linguistic Theory (SALT)*, vol. 26. CLC Publications. Ithaca, NY. 705–31.

King, Jeffrey C. (2002), 'Designating propositions'. *The Philosophical Review* **111**: 341–71.

Klinedinst, Nathan (2010), 'Totally hardcore semantic presuppositions'. Unpublished manuscript.

Klinedinst, Nathan & Daniel Rothschild (2011), 'Exhaustivity in questions with non-factives'. *Semantics and Pragmatics* **4**: 1–23.

Kratzer, Angelica (2002), 'Facts: Particulars or information units?' *Linguistics and Philosophy* **25**: 655–70.

Kratzer, Angelika (1989), 'An investigation of the lumps of thought'. *Linguistics and Philosophy* **12**: 607–53.

Kratzer, Angelika (2006), 'Decomposing attitude verbs'. Talk given in *Honor of Anita Mittwoch at The Hebrew University of Jerusalem*.

Lahiri, Utpal (2002), *Questions and Answers in Embedded Contexts*, vol. 2. Oxford Studies in Theoretical Linguistics. Oxford University Press. Oxford.

Legate, Julie Anne (2008), 'Morphological and abstract case'. *Linguistic Inquiry* **39**: 55–101.

Lewis, David (1979), 'Attitudes de dicto and de se'. *The Philosophical Review* **88**: 513–43.

Lewis, David (1986), *On the Plurality of Worlds*. Basil Blackwell. Oxford.

Mandelkern, Matthew, Jérémy Zehr, Jacopo Romoli & Florian Schwarz (2020), 'We've discovered that projection across conjunction is asymmetric (and it is!)'. *Linguistics and Philosophy* **43**: 473–514.

Marantz, Alec (1991), 'Case and licensing'. In *Proceedings of ESCOL '91*. Cornell Linguistics Club. 234–53.

Moltmann, Friederike (2013), *Abstract Objects and the Semantics of Natural Language*. OUP. Oxford.

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

Nicolae, Andreea Cristina (2013), *Any Questions? Polarity as a Window into the Structure of Questions*. Ph.D. thesis, Harvard University.

Özyildiz, Deniz (2017), 'Attitude reports with and without true belief'. In D. Burgdorf, J. Collard, S. Maspong and B. Stefánsdóttir (eds.), *Semantics and Linguistic Theory (SALT)*, vol. 27. 397–417.

Özyildiz, Deniz (2021), *The Event Structure of Attitudes*. Ph.D. thesis, University of Massachusetts Amherst.

Partee, Barbara (1986), 'Noun phrase interpretation and type-shifting principles'. In J. Groe-

nendijk, D. de Jong and M. Stokhof (eds.), *Studies in Discourse Representation Theory and the Theory of Generalized Quantifiers*. Foris. Dordrecht. 115–43.
Pesetsky, David & Esther Torrego (2004), 'Tense, case, and the nature of syntactic categories'. In J. Gu'eron and A. Lecarme (eds.), *The Syntax of Time*. MIT Press. Cambridge, MA. 495–538.
Pietroski, Paul M. (2000), 'On explaining that'. *The Journal of Philosophy* **97**: 655–62.
Prior, Arthur N. (1971), *Objects of Thought*. Clarendon Press. Oxford.
Pylkkänen, Liina (2008), *Introducing Arguments*, vol. 49. MIT Press.
Rezac, Milan (2013), 'Case and licensing: Evidence from ECM+DOC'. *Linguistic Inquiry* **44**: 299–319.
Roberts, Craige (2021), 'Meaning postulates in lexical pragmatics: Background vs. presupposition'. Talk presented at the *MECORE Workshop: Approaches to the Semantics of Clause-Embedding Predicates: Theories, Cross-Linguistic Data, and Experimentation*.
Roberts, Tom (2019), 'I can't believe it's not lexical: Deriving distributed veridicality'. In *Semantics and Linguistic Theory (SALT)*, vol. 29. 665–85.
Roberts, Tom (2020), 'Argument saturation and the syntactic status of embedded clauses'. Paper presented at *BCGL 13: The Syntax and Semantics of Clausal Complementation*.
Romero, Maribel (2015), 'Surprise-predicates, strong exhaustivity and alternative questions'. In S. D'Antonio, M. Moroney and C. R. Little (eds.), *Semantics and Linguistic Theory (SALT)*, vol. 25. 225–45.
Romoli, Jacopo (2015), 'The presuppositions of soft triggers are obligatory scalar implicatures'. *Journal of Semantics* **32**: 173–219.
Runner, Jeffrey T. & Keir Moulton (2017), *The Accusative Plus Infinitive Construction in English*. The Wiley Blackwell Companion to Syntax, 2nd ed. 1–19.
Schwarz, Florian, Kajsa Djärv & Jérémy Zehr (2020), 'Do Italian factives entail their presuppositions? Yes, but . . . '. In R. Bhatt, I. Frana, & P. Menendez-Benito (eds.), *Making Worlds Accessible. Essays in Honor of Angelika Kratzer*. ScholwarWorks at UMass. Angelika Kratzer Festschrift, MA.
Shanon, Benny (1976), 'On the two kinds of presuppositions in natural language'. *Foundations of Language* **14**: 247–9.
Sigurdhsson, Halldór Ármann (2012), 'Minimalist C/case'. *Linguistic Inquiry* **43**: 191–227.
Simons, Mandy (2007), 'Observations on embedding verbs, evidentiality, and presupposition'. *Lingua* **117**: 1034–56.
Simons, Mandy, David Beaver, Craige Roberts & Judith Tonhauser (2017), 'The best question: Explaining the projection behavior of factives'. *Discourse Processes* **54**: 187–206.
Simons, Mandy, Judith Tonhauser, David Beaver & Craige Roberts (2010), 'What projects and why'. In N. Li and D. Lutz (eds.), *Semantics and Linguistic Theory (SALT)*, vol. 20. CLC Publications. 309–27.
Spector, Benjamin & Paul Egré (2015), 'A uniform semantics for embedded interrogatives: An answer, not necessarily the answer'. *Synthese* **192**: 1729–84.
Steinert-Threlkeld, Shane (2019), 'An explanation of the veridical uniformity universal'. *Journal of Semantics* **37**: 129–44.
Stowell, Timothy Angus (1981), *Origins of Phrase Structure*. Ph.D. thesis, MIT Press.
Sudo, Yasutada (2012), *On the Semantics of Phi Features on Pronouns*. Ph.D. thesis, MIT Press. Cambridge, MA.
Tancredi, Christopher (2007), *A Multi-Model Modal Theory of I-Semantics: Part I: Modals*. University of Tokyo.
Theiler, Nadine (2014), *A Multitude of Answers: Embedded Questions in Typed Inquisitive Semantics*. MA thesis, University of Amsterdam. ILLC.

Theiler, Nadine, Floris Roelofsen & Maria Aloni (2018), 'A uniform semantics for declarative and interrogative complements'. *Journal of Semantics* **35**: 409–66.

Theiler, Nadine, Floris Roelofsen & Maria Aloni (2019), 'Picky predicates: Why *believe* doesn't behave like interrogative complements, and other puzzles'. *Natural Language Semantics* **27**: 95–134.

Uegaki, Wataru (2015), *Interpreting Questions under Attitudes*. Ph.D. thesis, MIT Press.

Uegaki, Wataru (2016), 'Content nouns and the semantics of question-embedding'. *Journal of Semantics* **33**: 623–60.

Uegaki, Wataru (2021), 'Doubt, highlighting, and exhaustification'. Talk given at the *52rd North East Linguistic Society (NELS 52)*.

Uegaki, Wataru & Yasutada Sudo (2017), 'The anti-rogativity of non-veridical preferential predicates'. In *Proceedings of the 21st Amsterdam Colloquium*. Univ. Amsterdam. Amsterdam. 492–501.

Vendler, Zeno (1972), *Res Cogitans: An Essay in Rational Psychology*. Cornell University Press. Ithaca, NY.

Vergnaud, Jean-Roger (2008), 'Letter to Noam Chomsky and Howard Lasnik on "filters and control," April 17, 1977'. In *Foundational Issues in Linguistic Theory: Essays in Honor of Jean-Roger Vergnaud*. MIT Press. Cambridge, MA. 3–17.

von Fintel, Kai (2004), 'Would you believe it? The King of France is back! (Presuppositions and truth-value intuitions)'. In M. Reimer and A. Bezuidenhout (eds.), *Descriptions and Beyond*. Oxford University Press. Oxford.

von Fintel, Kai & Sabine Iatridou (2003), 'Epistemic containment'. *Linguistic Inquiry* **34**: 173–98.

White, Aaron Steven (2019), 'Nothing's wrong with believing (or hoping) whether'. Under review at Semantics and Pragmatics.

Wiegand, Mia (2018), ''I just know it': Intensification as evidence for non-presuppositional factivity'. Talk at the *LSA 2018 Annual Meeting*. Salt Lake City. Utah.