I can't believe it's not lexical: Deriving distributed factivity

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1 A pair of puzzles

The clausal-embedding verb *believe* ordinarily permits declarative complements and bans interrogative complements:

(1) a. Susan believes that Ehrenrang was obliterated by the meteor.
b. *Susan believes which town was obliterated by the meteor.

This asymmetry is historically explained as resulting from s(emantic)-selection (Grimshaw 1979, Pesetsky 1982, 1991): *believe* selects propositions (type $\langle st \rangle$), not questions (type $\langle st, t \rangle$).

However, when *believe* occurs under *can* or *will* + negation[1], interrogative complements are licit—which neither negation nor modals easily achieve on their own:

(2) Susan {can't/*can/*doesn't} believe which town was obliterated by the meteor.

Moreover, only non-polar interrogatives are permitted under *can't believe* (Lahiri 2002, Egré 2008):

(3) *Susan {can't/won't} believe whether Ehrenrang was obliterated by the meteor.

Assuming that selection is strictly local, this state of affairs poses a puzzle:

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[1] I call this construction *can't believe* throughout, but it should be understood to include all constructions which fit this description.

Puzzle 1: Why does *believe* permit interrogative complements only in certain contexts?

Additionally, *can't believe* is **veridical** with declarative complements: it gives rise to the implication that its complement is true, unlike *believe* on its own or under only negation:

(4) a. Mary can't believe that it's raining.
∴ It's raining.
b. Mary (doesn't) believe(s) that it's raining.
⁄∴ It's raining.

Puzzle 2: Why is *can't believe* veridical?

In this talk, I will propose a **compositional** solution to these puzzles.

1.1 The here and now

I advance two main claims in this talk:

- ⋆ **Claim 1**: *Believe* lexically selects for questions, contra a Hintikkan (1962)-style view in which it selects for propositions (Theiler et al. 2018).
  - → *Believe* cannot take interrogative complements in most contexts because it produces systematically trivial meanings (cf. Mayr 2017, 2018, Theiler et al. 2018)
- ⋆ **Claim 2**: The veridicality of *can't believe* is derived compositionally from a conspiratorial interaction between an excluded middle presupposition (Bartsch 1973, Gajewski 2007) an agent-oriented modal, and negation.
  - → We need not package factive (or factive-like) presuppositions with the lexical entries of particular clausal-embedding predicates

Roadmap:

§2 Evidence against treating *can't believe* as noncompositional

§3 Core empirical properties of *can't believe*

§4 A compositional semantics for *can't believe*

§5 Alternative accounts and their challenges

§6 Conclusion and remaining research

2 Why *can't believe* is non-idiomatic

It is tempting to treat *can't believe* as atomic, but a compositional account is preferable for at least two reasons.

First, a similar pattern is observed in other languages:[2]

(6) Je ne peux pas croire qui a gagné la course.
I NEG can NEG believe who has won the race
'I can't believe who won the race.' (French)

(7) Ik kan niet geloven wie heeft de race gewonnen.
I can not believe who has the race won
'I can't believe who won the race.' (Dutch)

(8) Vahel ei suuda uskuda, missugust mõttetut hala suust välja
sometimes NEG can believe what.kind.of meaningless wail mouth.ELA out
aetakse.
drive.IMPERS
'Sometimes I can't believe what kind of nonsense comes out of his mouth.' (Estonian)

(9) Džon ne može po-viriti, v te, ščo Mariya vigrala gonku.
John NEG can PERF-believe in that that Maria win.PAST race.ACC
'John can't believe that Maria won the race.' (Ukrainian; Anelia Kudin, p.c.)
(Gives rise to the inference that Maria won the race.)

Second, certain meaning-preserving lexical substitutions in *can't believe* are also veridical and license interrogative complements:

(10) a. It's **unbelievable** who's lecturing us about fake news.[3]
b. My appetite fled as I sat rigidly in my seat, **unable to believe** who was next to me.[4]
c. Everyone who was present that night was **incapable of believing** why UEFA

[2]In some languages, including Turkish, Setswana, Malay, Hungarian, and Hebrew, a similar construction to *can't believe* is licensed with negation + *believe*, without an overt modal:

(5) Nereye kadar yüzmüşşün ki inanmtyorum.
where extent swam.2SG COMP believe.NEG.PRES.1SG
'I don't believe how far you swam!' (Turkish; Michaelis 2001: 1043)

I leave the interesting question of how these languages might differ from languages like English as a question which merits much further investigation.

[3]http://www.wibc.com/blogs/tony-katz/morning-news/its-unbelievable-whos-lecturing-us-about-fake-news

[4]http://thechronicleherald.ca/artslife/1523575-david-cassidy-club-med-and-me-%E2%80%98c%E2%80%99mon-get-happy%E2%80%99

allocated this stadium for a European Cup final.

These facts suggest that *can't believe* is unlikely to be an English-specific idiom, but rather a compositional problem that reflects a deeper property of *believe* and its kin.

3 Core properties of *can't believe*

Intuition: *Can't believe* highlights a 'tension' between a speaker's belief in some proposition p and their extreme surprise at p's truth (cf. Sæbø 2007).

3.1 What is presupposed?

3.1.1 Declarative complements

A superficial assessment of factivity is that the speaker simply presupposes the truth of the complement of the factive predicate (Kiparsky & Kiparsky 1970, *et seq.*).

This seems true for *know*; these presuppositions project:

(11) John doesn't know that we're planning a surprise party for him.
Presupposed: We're planning a surprise party for John

Out of the blue *can't believe* is generally veridical:

(12) I can't believe that it's raining.
∴ It's raining.

However, in some contexts *can't believe* does not presuppose its declarative complement:

(13) No matter how hard the prosecutor tries to convince him, John can't believe that Mary is the murderer. He was with her on the other side of the town at the time of the crime.

While *can't believe p* may not be factive *per se*, it surely carries a veridical inference by default.[5]

3.1.2 Interrogative complements

Guerzoni & Sharvit (2007, G&S) propose two distinct notions of 'factivity' for predicates which embed questions:

- V is **speaker-factive** iff $X\ V\ Q$ presupposes that the speaker knows the true answer to Q.
- V is **subject-factive** iff $X\ V\ Q$ presupposes that X knows the true answer to Q.

[5] I sidestep the interesting and almost certainly important question of the role prosody may play in cases where the veridical inference is canceled.

G&S and Guerzoni (2007) argue that emotive factives like *surprise* are speaker-factive on the basis of examples like (14) if the speaker doesn't know who passed the exam:

(14) It will surprise Bill who passed the exam.

The same seems true at first brush for *can't believe*:

(15) Bill won't believe who passed the exam.

However, this oddity doesn't seem to be semantic. Romero (2015) challenges Guerzoni's claim for *surprise*, and her argument extends to *can't believe*:

(16) A: Hi John, do you know who was at the party?
B: No, but I can tell you Bill couldn't believe who was there. (cf. Romero 2015: (74))

Subject-factivity, on the other hand, seems indefeasible.

(17) Lorraine can't believe which country is holding the World Cup. #In fact, she has no idea where it will be.

But calling it subject **factivity** is still a bit too strong. The subject need not be committed to the true answer itself, but simply believe that they are:

(18) *Two parents normally give their daughter presents for Christmas addressed from themselves, but this year, they decided to give her a bunch of gifts from 'Santa.' She did not expect that Santa would be bringing her gifts, but she readily accepts it. One parent says to the other:*
She can't believe who brought her so many gifts this year.

Based upon this evidence, I will characterize the presupposition associated with *can't believe* q as **subject-certainty**: the subject believes that they know the true answer to q.

3.2 Permissible interrogative complements

Factive predicates across the board tend to allow both declarative and interrogative complements (Spector & Egré 2015), but do not form a homogenous class.

Emotive factives like *regret* differ from **doxastic** factives like *know* in that emotive factives disallow polar interrogative complements:

(19) Shawna knows/*regrets whether it's raining.

Can't believe patterns like the emotive factives in this regard:

(20) *I can't believe whether it's raining.

Mirative expressions like *be surprised* and *be amazed*, which are intuitively similar in meaning to *can't believe*, are also emotive factives.

3.3 The role of negation

Sentential negation *per se* is not necessary. *Can believe* is compatible with interrogative complements in polar questions and with adversative adverbs.

(21) Can you believe which dessert Sherrod baked?

(22) I can *(hardly/scarcely/barely) believe what score I got on the midterm!

What these have in common with negation, is that they do not seem to straightforwardly entail that there is a particular p that the subject believes.

3.4 Summary

Can't believe displays a set of properties highly reminiscent of emotive factives:

- ✓ Veridical with declarative complements
- ✓ Speaker-certainty presupposition with interrogative complements
- ✗ Doesn't embed polar interrogatives

4 Analysis

Can't believe is evidently composed of multiple contentful parts. The properties of these parts may provide a clue as to our original puzzles. The principal idea is twofold:

1. *Believe* lexically selects for sets of propositions, not propositions.
2. The intuitive tension of *can't believe* represents an apparent conflict between two types of content: a factive presupposition and a modalized antifactive assertion.

4.1 The verb

Believe is freely compatible with declarative complements, but only in specific circumstances with interrogatives.

If propositions denote sets of worlds (type st) and interrogatives denote sets of propositions (type $\langle st, t\rangle$), by s-selection, predicates should be able to embed only one or the other.

The classical view of *believe* from doxastic logics inspired by Hintikka (1962) is that it is proposition-taking (and therefore declarative-embedding):

(23) $[\![\text{believe}]\!]^w = \lambda p_{st} \lambda x . \text{DOX}_x^w \subseteq p$

But it is clear that we need to allow for the possibility that *believe* takes interrogatives.

Prior work on predicates which embed both kinds of clauses ('responsive predicates') gives us three main ways to achieve this without giving up s-selection:

- Reducing the meaning of interrogatives to declaratives (Karttunen 1977, Groenendijk & Stokhof 1982, 1984, Heim 1994, Lahiri 2002, Egré 2008, Spector & Egré 2015, a.o.)
- Reducing the meaning of declaratives to interrogatives (Uegaki 2016, Elliott et al. 2017, Roberts 2018, a.o.)
- Treat declaratives and interrogatives as type-equivalent (i.e., of type $\langle st, t \rangle$), as in Inquisitive Semantics (Ciardelli et al. 2013, Theiler et al. 2018)

I will demonstrate here how the account of Theiler et al. (2018) can account for the behavior of *can't believe*.

For them, the denotation of declarative and interrogative clauses alike is a downward-closed set of propositions (henceforth, type T).

They propose an account of *believe* which is broadly Hintikkan in nature: it predicates that the subject's doxastic state is a *member* of the set denoted by the complement of *believe*.

(24) $[\![\text{believe}]\!]^w = \lambda P_T \lambda x_e . \text{DOX}_x^w \in P$ (Theiler et al. 2018: 7)

This account is intuitively appealing because it permits *believe* to take interrogative complements without any type-shfiting.

It also provides an explanation for why these complements are ordinarily unacceptable, explained below.

Whence subject-factivity?

Believe is not ordinarily factive:

(25) John believes that it is raining, but he's wrong!

However, *believe* **is** a neg-raising verb (Zuber 1982): $\neg$*believe* p is typically interpreted to mean *believe* $\neg p$.

(26) John doesn't believe that it is raining.
$\therefore$ John believes that it is not raining.

This inference can be cashed out as a 'excluded middle' presupposition: *believe* presupposes that the subject believes either p or $\neg p$.(Bartsch 1973, Gajewski 2002)

Theiler et al. propose a similar presupposition augmented for Inquisitive Semantics. Because $\neg$ applies only to propositions, they must innovate a higher-order negation $\neg_?$:

(27) $\neg_? P := \{p | \forall q \in P : p \cap q = \emptyset\}$

Whereas $\neg p$ is defined as the set of all not-p worlds not, $\neg_? P$ is defined as the set of all sets of worlds which are not in any members of P.

Important consequence: $\neg_?$ applied to an interrogative clause yields the empty set, since interrogative clauses denote partitions over a set of worlds:

(28) $[\![$Who won the election$]\!]$ = {{A won}, {B won}, ... {Z won}}

With this in mind, consider Theiler et al.'s denotation for *believe* with an Inquisitive excluded middle presupposition (underlined):

(29) $[\![\text{believe}]\!]^w = \lambda P_T \lambda x : \underline{\text{DOX}_x^w \in P \vee \text{DOX}_x^w \in \neg_? P}.\ \text{DOX}_x^w \in P$ (Theiler et al. 2018: 7)

When P is interrogative, the EM presupposition reduces to $\text{DOX}_x^w \in P$:

(30)
$$\begin{aligned} & \text{DOX}_x^w \in P \vee \text{DOX}_x^w \in \neg_? P \\ = \ & \text{DOX}_x^w \in P \vee \text{DOX}_x^w \in \{\emptyset\} \\ = \ & \text{DOX}_x^w \in P \vee \bot \\ = \ & \text{DOX}_x^w \in P \end{aligned}$$

And the presupposed content of *believe P* becomes identical to its asserted content...

...which I argue produces a systematic trivality, and is therefore unacceptable, inspired by Gajewski's (2002) L-Analyticity:[6]

(32) **B**AN ON **A**SSERTING **T**RIVIALITIE**S** (BATS)
For an utterance u, if u contains a clausal constituent with presupposed content ρ and at-issue content α, u is ungrammatical if $\rho \subseteq \alpha$ or $\rho \cap \alpha = \emptyset$.

Because *x believe q* involves an assertion which is obviated by the presupposition, it is system-

[6]Theiler et al. explain this fact using L-Analyticity itself:

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

Although this is intuitively quite similar, I present the modified version above because L-Analyticity makes the unwelcome prediction that if *believe q* is L-Analytic, then any operators above *believe q* won't be able to produce a grammatical sentence, which is inadequate for the data here.

atically trivial and therefore ungrammatical.

Similarly, in the case of *don't believe*, the presupposed content systematically *contradicts* the asserted content, again producing ungrammaticality.

Thus, with an Inquisitive modification of fairly standard semantics for *believe*, we can understand why *believe* is often allergic to interrogative complements, but can still permit them.

4.2 The modal

It's not the case that any modal will license this use of *believe*. For instance, we cannot substitute *must*, *have to*, or *should* in a *can't believe* sentence and yield acceptability:

(33) *I {must not/don't have to/shouldn't} believe who came to the party.

In addition to *can*, *will* + negation also similarly licenses this use of *believe*, e.g. in 'clickbait' headlines:

(34) You'll never believe what J.J. Abrams wrote before Star Wars.

Both *can't* and *won't* share a core of meaning: they have uses that require that their complement took some effort to achieve, much like implicative verbs (Karttunen 1971, Bhatt 1999).

In other words, *x can VP* indicates that in the worlds where x has the same essential characteristic as in the actual world and applies their abilities to the fullest, x brings VP about.

(35) *Context: The weather is hot and humid.*
Susan can't believe what the weather is like today.
if Susan is in Hawaii
✓ if Susan is in Antarctica

Drawing from Kratzer (1981), Kaufmann (2012), Castroviejo & Oltra-Massuet (2018), I assume here that the modal *can* existentially quantifies over the best worlds in a modal base f_{dispo} describing the subject's intrinsic qualities in w ('disposition') relative to an ordering source g_{AB} defined as follows:

(36) $[\![\text{can}]\!]^w = \lambda R_{\langle s,eT\rangle}\lambda x_e\colon \exists u_s.u \in \text{BEST}(f_{dispo}(w)(x), g_{AB}).[R(u)(x)]$

a. f_{dispo} is a function from $\langle w, x\rangle$ pairs into a set of propositions that describe the inner make-up (i.e. individual characteristics) of x in w. $\cap f_{dispo}$ is the proposition containing exactly those worlds where x has the same inner make-up as in w.

b. g_{AB} is a function from $\langle w, x\rangle$ pairs into a set of propositions that describes states of affairs where x 'applies their strength of body, character or intellect'.

c. BEST is a function which takes modal base, ordering source pairs $\langle f, g \rangle$ and returns the set of worlds $w \in \cap f$ such that for all $w' \in \cap f$, $w \leq_g w'$. (See Portner 2009)

In short: *x can R* means that there is some best world compatible with x's intrinsic characteristics in w where x exerts the extent of their abilities and brings R about.

4.3 Deriving the behavior of *can believe*

To see how our modal semantics interacts with *believe*, consider *can believe* with a declarative complement.

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

(38) **Derivation of (37)**:
a. $[\![\text{F won the election}]\!]^w = P$
b. $[\![\text{believe F won the election}]\!]^w = \lambda x_e : \text{DOX}_x^w \in P \vee \text{DOX}_x^w \in \neg P.\ \text{DOX}_x^w \in P$
c. $[\![\text{can believe F won the election}]\!]^w = \lambda x_e : \underline{\text{DOX}_x^w \in P \vee \text{DOX}_x^w \in \neg P}.\exists u \in \text{BEST}(f_{dispo}(w)(x), g_{AB}(w)(x)).[\text{DOX}_x^u \in P]$
d. $[\![\text{B can believe F won the election}]\!]^w = \underline{\text{DOX}_b^w \in P \vee \text{DOX}_b^w \in \neg P}.\exists u \in \text{BEST}(f_{dispo}(w)(b), g_{AB}(w)(b)).[\text{DOX}_b^u \in P]$

This more or less matches our intuitions: there is a world where Beatrice can apply her might and come to the conclusion that Fran won the election.

(39) a. *Beatrice can believe who won the election.
b. $[\![\text{B can believe who won the election}]\!]^w = \underline{\text{DOX}_b^w \in Q}.\exists u \in \text{BEST}(f_{dispo}(w)(b), g_{AB}(w)(b)).[\text{DOX}_b^u \in Q]$

Uh-oh! This semantics does not generate unacceptability: it simply says that there is an ideal world in which Beatrice is opinionated about the election.

This is fortunately not a problem: *can believe q* utterances are licit in certain contexts, e.g., in response to *can't believe q* utterances:

(40) A: I can't believe who won the election!
B: $[\text{I}]_F$ can believe who won the election.

Nevertheless, *can believe q* is typically rejected. Why? The speaker presupposes subject-certainty about q in w and asserts this certainty is possible in the best-of-subj-ability worlds.

This assertion is quite weak, since it effectively only tells us that w is an ideal world vis-a-vis the subject's ability to form a belief about q.

This is generally licit only in contexts where the 'believability' of the embedded question is somehow in question, which are specific pragmatic circumstances:

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

4.4 *Can't believe*

Finally, we want *can't believe* to be acceptable with both kinds of complements. First consider the declarative case:

(42) a. Beatrice can't believe that Fran won the election.
b. $[\![\neg$B can believe F won the election$]\!]^w = \underline{\text{DOX}_b^w \in P \vee \text{DOX}_b^w \in \neg P}.\nexists u \in \text{BEST}(f_{dispo}(w)(b), g_{AB}(w)(b)).[\text{DOX}_b^u \in \overline{P}]$

Here, the speaker asserts that there is no ideal world in which Beatrice believes that Fran won the election. This is compatible with Beatrice believing Fran won or not.

If Beatrice *does* believe that Fran won, (42a) gives rise to the inference that she is surprised about it:

(43) Beatrice (still) can't believe that Fran won the election. Fran never stood a chance, yet there she was on CSPAN taking the oath of office.

If Beatrice *doesn't* believe that Fran won, (42a) can be used to emphasize the impossibility of that belief:

(44) Beatrice can't believe that Fran won the election. She inspected every ballot herself and knows that Fran lost.

In both of these situations, Beatrice believing that Fran won is non-ideal:

- In (43), Fran's victory is shocking/unexpected.
- In (44), Fran's victory is false, and therefore incompatible with B's abilities in $w_@$

Because the EM presupposition does not reduce, (42a) is utterable whether Beatrice truly believes Fran won or not.

Turning to interrogative complements, we find a similar story:

(45) a. Beatrice can't believe who won the election.

b. $[\![\neg$B can believe who won the election$]\!]^w = \underline{\text{DOX}_b^w \in Q}.\nexists u \in \text{BEST}(f_{dispo}(w)(b), g_{AB}(w)(b)).[\text{DOX}_b^u \in Q]$

Here, speaker certainty is again presupposed by virtue of reduction of the EM presupposition. However, the meaning of (45) is not systematically trivial.

The core insight here is that the subject is presupposed to be opinionated about q in the actual world, while simultaneously asserted that in no ideal world are they opinionated about q.

→ Thus, **the actual world is non-ideal**.

It is only the particular combination of modal + negation that licenses this inference.

4.4.1 What is an ideal belief?

When an agent is faced with a piece of new information, how do they update their beliefs? Whether they do and how depends on a) their existing beliefs and b) the quality of evidence.

More concretely, anyone who tries to believe p is going to have to square it with what they already think is true.

(46) **Maxims of belief revision**

1. MAXIM OF CONSISTENCY: Do not have an inconsistent belief state (i.e., do not believe propositions p and q such that $p \cap q = \emptyset$). (Alchourrón et al. 1985)
2. MAXIM OF EVIDENTIALITY: Believe that for which there is extremely good evidence. (Doyle 1979, et seq.)
3. MAXIM OF CONSERVATION: Do not revise existing beliefs. (Gärdenfors & Makinson 1988)

Suppose that I believe $\neg p$ but now encounter extremely good evidence for p. How do I reconcile these two facts?

- If we assume that agents never entertain belief states they consider inconsistent, the Maxim of Consistency is inviolable.
- I could violate the Maxim of Evidentiality, but that too seems highly irrational.
- My only choice then is to give up of some my existing beliefs (in this case, those which entail $\neg p$), i.e., violate Conservation.

Given that *can't believe q* carries a presupposition of speaker certainty, we now have a way of understanding the pragmatic factors which govern its use.

Can't believe q, then, is only uttered felicitously when the subject of *believe* cannot follow all the maxims, but nevertheless believes some particular answer to q.

→ The only maxim they can give up in this context is Conservation, giving the effect of 'surprise'.

5 Some alternative accounts

5.1 Quantification over propositions

Spector & Egré (2015), following Lahiri (2002), propose that factive predicates compose with questions via existential quantification over propositions:[7]

(47) $[\![\text{believe Q}]\!] = \lambda x.\exists P \in Q(\text{x believe P})$

This approach quickly runs into problems, as there is no reason why *believe* shouldn't always be compatible with embedded interrogatives.

Suppose instead that *believe* **universally** quantifies over propositions:

(48) $[\![\text{believe Q}]\!] = \lambda x.\forall P \in Q\,(\text{x believe P})$

This will get us the anti-rogativity of *believe*, since if Q is interrogative, *believe* Q is always a contradiction, as people cannot *believe* multiple answers to the same question.

However, this account (and others like it) struggle with *can't believe's* presupposition with interrogative complements—it would need to be stipulated into the semantics.

5.2 Hyperbole

A purely compositional analysis (as the one proposed here) cannot straightforwardly account for the contrast between *believable* and *unbelievable*.

It is plausible to think of a sort of middle ground. For instance, perhaps *can't* here may not be completely 'literal'; consider that *can't wait* is used in contexts where it is not actually true:

(49) I can't wait until tomorrow!

If *can't believe* is not interpreted compositionally, we would need to determine:

(a) to what extent (if any) compositional interpretation is involved, and

(b) whether this noncompositional interpretation is derived lexically, pragmatically, or some other way.

[7] I abstract away here from whether *believe* is selecting for propositions or questions. This general schematic is compatible with a semantics where it selects for questions, or one where propositional arguments are type-shifted into singleton-set questions.

Ultimately, however, this approach must still grapple with the question of what type of object *believe* embeds and why, and like reductive analyses, needs additional machinery to explain the presupposition with interrogative complements.

6 Conclusion

I have given here a compositional account of *can't believe*:

1. *Believe* underlyingly selects interrogative complements, but this usually results in trivial (and therefore unacceptable) meanings, following Theiler et al. (2018)
2. When *believe* takes an interrogative complement, its excluded middle presuppositions reduces to subject-certainty.
3. In the right contexts, the unacceptability of *believe q* can be obviated, and the speaker certainty presupposition projects.
4. The intuitive characterization of *can't believe* as denoting 'surprise' arises from a conflict between speaker-certainty presupposition and impossible-speaker-certainty assertion.

And this account suggests we may rethink certain aspects of clausal complementation:

⋆ Restrictions on clause type of complements of attitude predicate may not always be chalked up to selectional requirements of the predicate.

⋆ 'Factivity' can be generated compositionally, rather than being an atomic lexical property.

As always, a number of empirical questions remain quite open:

- What differentiates *believe* from *think* and other similar verbs that don't behave the same way?
- What other verbs, if any, behave similarly to *believe*? (One candidate: *expect*)
- How can we account for languages where factive *believe* seems to be possible without an overt modal?
- Is there hope for a unified account of *can't believe* and emotive factives like *be surprised*? This seems empirically desirable given their similarities.
  - I have not semantically derived the restriction on polar interrogative complements. Recent work on this restriction for emotive factives suggests it may be at least partially pragmatic (Cremers & Chemla 2017, Abenina-Adar 2018). It remains to be seen how well such accounts can be extended to account for this data.[8]
  - If *can't believe* is at least partially decomposable, this may shed on how factive presuppositions arise with emotive factives more generally.

[8] Though see White (2019) for corpus evidence that *believe whether* may not be so terrible in the first place.

Appendix A *Can't believe* is not exclamative-embedding

That the interrogative complements of *can't believe* are really all exclamatives is the explicit claim of several early works on the topic (Elliott 1971, 1974, Grimshaw 1979).

And the complements of *can't believe* have a lot in common with exclamatives:

- Morphosyntactically, both involve left-edge *wh*-expressions.
- Semantically, both express a degree of surprise in an unexpected eventuality

(50) a. How fast you ate that sushi boat!
b. I can't believe how fast you ate that sushi boat!

However, the complement of *can't believe* appears, at least sometimes, to be incompatible with exclamative interpretations.

Permissible wh-phrases

Rett (2011), following Huddleston (1993), points out that only *wh*-words which can range over degrees can be used in *wh*-exclamatives, i.e., *what* and *how*:

(51) a. What a lovely house you have!
b. How grand our adventure was!
c. *Where Susanna has visited!
d. *Which candidate won the election!
e. *When the acceptance letter arrived!
f. *Who the gardener saw sneaking out of the cellar!
g. *Why he sent the envelope stuffed with dried carnations!

Can't believe is fine with any constituent interrogative complement:

(52) a. Yolanda can't believe {who/what/which zookeeper} was in the photos.
b. I couldn't believe {why/where/when/how} you stole a zamboni!

Multiple *wh*-phrases

Matrix and embedded exclamatives alike also ban multiple *wh*-words in English (53), but multiple *wh*-questions are routine in both environments (54).

(53) a. *How nice of a house who has!
b. *Wally knows how very tall who is!

(54) a. Who confiscated which piece of contraband?
b. Sloane knows who is how tall.

Can't believe allows multiple *wh*-word complements:

(55) a. Joan can't believe who confiscated which piece of contraband.
b. Sloane can't believe who is how tall.

Compatibility with sluicing

Jim McCloskey (p.c.) also pointed out to me that only bonafide interrogatives, and not exclamatives, are potential sites for sluicing (Lahiri 2002). Sluicing under *can't believe* is possible:

(56) Someone brought a tarte tatin to the potluck, though I couldn't believe who.

In sum: Morphosyntactically interrogative complements of *can't believe* do not behave like exclamatives, but do behave like interrogatives.[9]

Appendix B What's wrong with *can't think?*

Strikingly, this construction occurs with *believe*, and not some semantic neighbors like *think*.

Though *think* can occur with embedded interrogatives for some speakers, but crucially is not factive.

(57) %I can't think when I've had such a lavish meal.
(≈I can't remember a time when I have had an equally lavish meal.)

But, like *believe*, *think* is:

- Neg-raising
- Ordinarily proposition-embedding
- Used to express a doxastic relation between individuals and propositions

So what is the difference?

However, they have overlapping but nonidentical pragmatic profiles. For instance, *believe* can be used to accept an assertive update to the common ground, but *think* is quite odd.

(58) *Mildred and Horace are discussing their neighbor, Gertrude. Mildred doesn't know that Gertrude is on vacation, but she is known by both to be an extravagant spender who often travels to exotic locales.*
Horace: Gertrude is in Tahiti again this week.
Mildred: I believe that.
Mildred': #I think that.

[9] I don't intend to preclude the possibility that *can't believe* can sometimes embed exclamatives; rather, I simply mean to say that it has to also permit genuine interrogative complements.

Whatever the source of this difference, it seems relevant: *believe* can be used to 'accept' an assertion in a way that *think* cannot.

One possible way of thinking about this is that *believe* is compatible with some kind of change-of-state aspect, unlike *think*.

The importance of aspect is also suggested by cross-linguistic evidence. In South Slavic, for instance, *can't believe* is only veridical with perfective aspect on *believe*:

(59) Džon ne može po-viriti, v te, ščo Mariya vigrala gonku.
John NEG can PERF-believe in that that Maria win.PAST race.ACC
'John can't believe that Maria won the race.' =(9)

There are of course many other differences between *believe* and *think*, such as their compatibility with certain nominal and prepositional complements. I leave this to future work.

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