

Janus Sentences: A Puzzle for Theories of Local Implicatures

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Abstract

A key breakthrough in research on the semantics/pragmatics interface was the discovery of ‘locally computed’ scalar implicatures. While initial accounts modified the interpretive procedure to account for them (Chierchia 2004), the dominant view is now that local implicatures are computed by an invisible but syntactically real version of *only*, the exhaustivity operator EXH (Chierchia, Fox, and Spector 2012). We argue that all current accounts (including the operator-based view) are faced with a challenge because some expressions display a Janus-faced behavior: they simultaneously seem to include and to exclude EXH. Take the discourse *Syldavia will invade Spain or Portugal. But Biden doubts it*. The first sentence is naturally understood to mean that Syldavia will *invade Spain or Portugal but not both*, but the second sentence means that Biden doubts that Syldavia will *invade Spain or Portugal (or both)*. We uncover several types of Janus sentences of this sort using anaphora and (in an appendix) using ellipsis and embedding under *unlike*. Janus sentences are found with unaccented scalar terms, but usually not with controls involving overt *only* or accented scalar terms. Without solving the puzzle, we discuss one broad solution strategy, which consists in complicating the semantics of the exhaustivity operator so that it can always be present, but with semantic effects that are systematically trivialized in some environments.

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I Introduction

1.1 Local implicatures with and without Exh

In Gricean and neo-Gricean approaches, scalar implicatures are triggered at the level of entire sentences: a sentence S triggers the implicature that an alternative S' is false if S' is more informative and hence cooperative than S (e.g. Grice 1991, Horn 1972). Neither the notion of speaker informativity nor of speaker cooperativity make sense for embedded constituents. It was thus a surprising and important discovery that there are locally computed scalar implicatures (Chierchia 2004; Landman 1998; Schwarz 2011). While initial accounts modified the interpretive procedure to account for them (Chierchia 2004), the dominant view is now that local implicatures are computed by an invisible version of *only*, the exhaustivity operator EXH (Chierchia, Fox, and Spector 2012).

In this piece, we uncover a systematic puzzle for theories of local implicatures in general and operator-based views in particular. In a nutshell, we will show that in sentences involving propositional pronouns (and ellipsis in an appendix), implicatures display a Janus-faced behavior: a constituent is understood with the enrichment, but the latter is invisible to the pronoun.

We should say at the outset that local implicatures have been extraordinarily productive to analyze multiple fine-grained phenomena, illustrated in (1); our goal is to help refine these

theories, not to do away with them.

- (1) a. **Embedded implicatures**
 Exactly one letter is EXH [connected with some of its circles] (Chemla and Spector 2011)
 ⇒ exactly one letter is connected with some but not all of its circles.
- b. **Intervention effects on NPI licensing (Chierchia 2013)**
 *Ann says that EXH [John didn't talk to Mary and to any other girl].
- c. **Hurford's constraint (Chierchia, Fox, and Spector 2012)**
 Ann visited EXH [some of the French cities] or all of them.
- d. **Free Choice and higher-order implicatures (Fox 2007; Chierchia 2013)**
 EXH EXH You may pick option A or option B
 ⇒ not EXH you may pick option A, hence: you may pick option B
 ⇒ not EXH you may pick option B, hence: you may pick option A

First, local implicatures produce correct truth conditions that couldn't be obtained without them. An example appears in (1a): the locally strengthened reading, evidenced with experimental means by Chemla and Spector 2011, does not entail the literal reading and thus couldn't be obtained from it by a global implicature, no matter how sophisticated.

Second, local implicatures are sometimes crucial to explain intervention effects on the licensing of Negative Polarity Items (NPIs), a point that was emphasized in Chierchia's initial work (Chierchia 2004). It is usually thought that an NPI is licensed when one can find a constituent in which it appears in a downward-monotonic environment (but see Homer 2010 for details). With global implicatures alone, this condition is clearly satisfied in (1b): the boxed constituent has exactly the right properties. By contrast, if an indirect implicature is triggered at the level of this constituent due to the embedding of *and* under negation, the facts can in principle be explained.

Third, disjunctions of the form *some or all* violate a constraint (Hurford's) according to which the second disjunct cannot entail the first. As shown (1c), some structures of precisely this form are acceptable, however. This can be explained if *some* is strengthened by a local implicature to mean *some but not all*, in which case it is not entailed by *all* anymore.

Finally, several researchers have argued that focus alternatives may themselves be enriched by local implicatures. This played a key role in an influential analysis of Free Choice readings of disjunction: from *You may pick option A or option B*, it can be inferred that *you may pick option A and you may pick option B*. This can be accounted for by a double application of the exhaustivity operator, as in (1d). Importantly, the outermost exhaustivity operator should have the effect of denying exhaustified alternatives (obtained through exhaustified versions of the individual disjuncts), leading schematically to a denial that *you may only pick option A* and of *you may only pick option B*.¹

¹A related logic has been explored in Spector 2007 in the analysis of plurals. In a nutshell, the idea was that *Ann saw horses* has a literal meaning akin to *Ann saw at least one horse* (this meaning makes itself felt in downward-monotonic environments). But it can be strengthened by competition with the exhaustified meaning of *Ann saw a horse*. Since *a horse* competes with *several horses*, EXH[*Ann saw horse*] means in essence *Ann saw exactly one horse*, and this competitor derives the *at least two horses* meaning for *Ann saw horses*.

1.2 Bar-Lev and Fox 2017: an ellipsis-based argument against an embedded instance of Exh

Bar-Lev and Fox 2017 constitutes an interesting precedent to the Janus sentences we study. In their discussion, they look at sentences with ellipsis like (2a). They note that these have a Janus behavior (in our parlance): the antecedent is naturally read with a Free Choice inference whereas the elided clause is read without one. Starting from an account of Free Choice in terms of double exhaustification, as in (1b) below, the authors notice that the ellipsis facts of (2a) can be captured if the ellipsis site is small enough, as in (2c).

- (2) a. Mary is allowed to eat ice cream or cake, and John isn't allowed to eat ice cream or cake.
 \Rightarrow Mary is allowed to eat ice cream and allowed to eat cake, and
 \Rightarrow John isn't allowed to eat ice cream and he isn't allowed to eat cake.
 Bar-Lev and Fox 2017
- b. Exh Exh Mary λx allowed $[Ax \vee Bx]$.
- c. John isn't $\langle \lambda x$ allowed $[Ax \vee Bx] \rangle$.

But Bar-Lev and Fox also notice that the quantified case in (3a) requires double exhaustification under the universal quantifier, yielding the expectation that a Free Choice reading should be obtained under the scope of the negative quantifier with ellipsis, as in (3b).

- (3) a. Every girl is allowed to eat ice cream or cake on her birthday.
 Interestingly, no boy is \langle allowed to eat ice cream or cake on his birthday \rangle .
 \Rightarrow every girl is allowed to eat ice cream and allowed to eat cake on her birthday, and
 \Rightarrow no boy is allowed to eat ice cream and (likewise) no boy is allowed to eat cake on his birthday.
- b. [every girl] λx Exh Exh allowed $[Ax \vee Bx]$.
 [no boy] λx Exh Exh allowed $[Ax \vee Bx]$
- c. ExhII [every girl] λx allowed $[Ax \vee Bx]$.
 [no boy] λx allowed $[Ax \vee Bx]$.

However the representation in (3b) predicts an overly weak reading, one that doesn't derive the observed inferences: it wrongly predicts that the elided VP should have a free choice reading computed in the scope of *no boy*. Bar-Lev and Fox take this to be one piece of evidence for replacing the standard exhaustivity operator (based on 'innocent exclusion') with a new one, based on 'innocent inclusion', and written as ExhII . The crucial observation is that this new operator can be given matrix scope and still yield the desired reading in the first (universal) sentence of (3a), as displayed in (3c). This configuration allows ellipsis to target an operator-free constituent, as is desired in view of the intuitive truth conditions.

This argument provides an interesting precedent for the type of arguments we will construct. We will return to it in section 4.4 in light of our own Janus examples.

1.3 Goals

Starting from the standard operator-based view of exhaustification, we construct examples involving parallelism conditions to probe the reality of EXH, and raise a challenge for this view. Specifically, we study several sentences that display a Janus-faced behavior. With respect to their truth conditions, they appear to involve a clause with an occurrence of EXH. With respect to other tests, EXH appears to be absent. Our argument can in principle be developed with several types of test, notably ellipsis and propositional pronouns. However ellipsis raises theoretical and especially empirical difficulties (the crucial examples are so complex that they are hard to judge). The body of this paper is thus concerned with propositional pronouns, where judgments are rather clear. An extension to ellipsis and also to constructions involving *unlike* is sketched in the appendix.

Matrix exhaustification and embedded exhaustification raise slightly different empirical and theoretical problems, and we will thus discuss them in turn. Our first challenge, developed in Section 2, pertains to the interaction between matrix exhaustification and propositional pronouns (we will explain why the interaction between ellipsis and matrix exhaustification is harder to diagnose in Appendix A). In (4a), the first sentence naturally receives an exhaustified reading, and the operator-based view predicts that the pronoun *it* could target a constituent with or without EXH—in (4b), the exhaustified predicate EXH [*S or P*], or the bare disjunction [*S or P*]. But only the reading that targets the constituent without EXH seems to be available.

- (4) a. Syldavia will invade Spain or Portugal. However Biden doesn't believe it.
 b. EXH[S or P]. not B believe it.

Our second challenge, developed in Section 3, involves sentences with obligatory embedded exhaustification due to 'Hurford's constraint'. In (5a), in the absence of an embedded exhaustivity operator, the second disjunct would entail the first, a violation of Hurford's constraint (which states that in a disjunction *A or B*, *B* shouldn't entail *A*). This makes exhaustification of the first disjunct obligatory. For operator-based views, this translates into the Logical Form in (5b). When propositional anaphora is applied to both disjuncts, as in (5c), the theory overgenerates: propositional pronouns to the first disjunct could be expected to target either the exhaustified or the non-exhaustified constituent, but only the latter possibility seems to be instantiated.

- (5) a. The DGS will talk to a few students or she will talk to all students.
 b. $D \lambda x. [\text{EXH Few } x] \text{ or } [\text{All } x]$
 c. The Chair will do neither the former nor the latter.

(In the Appendix, we discuss other potential tests, involving ellipsis and the word *unlike*; as alluded to, they are less decisive than anaphora-based tests.)

While most of our discussion is framed within the standard operator-based view of exhaustification, we ask in Section 4 whether operator-free views are faced with a version of our challenge. They are, and we go on to discuss one broad solution that can be adopted by operator-based and operator-free theories alike: exhaustification is a more complicated

operation than meets the eye, and its effects can be systematically trivialized in some environments. As a result, the exhaustivity operator can be present everywhere, thus satisfying parallelism conditions without necessarily yielding incorrect truth conditions. This strategy can be developed in several directions, involving functionalization, trivalence, or multidimensional meanings (we do not claim that any of these solutions is compelling).

2 Problems with Matrix Exhaustification: Propositional pronouns

We start by explaining why propositional pronouns raise problems for cases with matrix exhaustification.

2.1 The import of propositional pronouns

We will assume, with the literature, that EXH can have scope over a constituent but not over an entire discourse. We will show that propositional pronouns to exhaustified clauses in discourse only target unstrengthened clauses, hence a puzzle.

Let us first consider (6a). Unlike our control without *or* in (6b), it yields a ‘not both’ inference. Within the operator-based view, this suggests that (6a) has the Logical Form in (6c), with a matrix exhaustivity operator. But then one would expect that a reading can be obtained on which propositional pronouns target the exhaustified disjunction. Such a reading of propositional *it* is clearly available with *only* or with accented *or*, as in (6d-e), but emphatically not in (6a). While it might be tempting to posit that EXH appears in a higher position than *only*, this view is unlikely to help in the case at hand: as seen in (6e), as ‘super high’ *only* differs from EXH in being seen by propositional pronouns.

- (6) a. Syldavia will invade Spain or Portugal. However Biden doesn’t believe it.
 \Rightarrow Syldavia won’t invade both.
- b. Syldavia will invade the Iberian peninsula. However Biden doesn’t believe it.
 \nRightarrow Syldavia won’t invade both.
- c. Syldavia will only invade Spain or Portugal. However Biden doesn’t believe it.
 \Rightarrow Syldavia won’t invade both.
 \Rightarrow Biden doesn’t believe that Syldavia will invade one but not both
- d. Syldavia will invade Spain OR Portugal. However Biden doesn’t believe it.
 \Rightarrow Syldavia won’t invade both.
 \Rightarrow Biden doesn’t believe that Syldavia will invade one but not both
- e. It’s only the case that Syldavia will invade Spain OR Portugal. However Biden doesn’t believe it.
 \Rightarrow Syldavia won’t invade both.
 \Rightarrow Biden doesn’t believe that Syldavia will invade one but not both

Under the operator-based view, the propositional anaphor *it* in (6a) could *a priori* have the two antecedents in (7a) and (7b). However, our observations suggest that only the antecedent in (7a) is available.

- (7) EXH [S or P]. not [B believes it]
- a. $it \rightsquigarrow [S \text{ or } P]$
 - b. $it \rightsquigarrow \text{EXH} [S \text{ or } P]$

But what constraints prevent the antecedent from being picked up by the pronoun? These constraints, in light of examples (6c-e), will be hard to formulate, especially since the reading missing from (6a) (where *it* is anaphoric to a strengthened proposition) is present in the other structurally similar sentences of (6). So the purported constraints must somehow allow a propositional pronoun to take as antecedent a clause exhaustified by *only* (example (6c)) or by EXH with a focused scalar term (example (6d)). But simultaneously, the constraints must prohibit the propositional pronoun to take as antecedent a clause exhaustified by EXH without focus. We do not know how such constraints, if they can be formulated at all, could even be motivated.

Finally, we note that the same conclusions can be drawn from examples in which the exhaustified disjunction is replaced with an exhaustified indefinite, as in (8).

- (8) a. Syldavia will invade some of the Baltic states. However Biden doesn't believe it.
 \Rightarrow Syldavia won't invade all Baltic states.
- b. Syldavia will invade the Baltic region. However Biden doesn't believe it.
 \nRightarrow Syldavia won't invade all Baltic states.
- c. Exh[some_{Baltic}]. not B believe it.
- d. Syldavia will only invade some of the Baltic states. However Biden doesn't believe it.
 \Rightarrow Syldavia won't invade all Baltic states.
 \Rightarrow Biden doesn't believe that Syldavia will invade some but not all of the Baltic states
- e. Syldavia will invade SOME of the Baltic states. However Biden doesn't believe it.
 \Rightarrow Syldavia won't invade all of the Baltic states.
 \Rightarrow Biden doesn't believe that Syldavia will invade some but not all of the Baltic states
- f. It's only the case that Syldavia will invade SOME of the Baltic states. However Biden doesn't believe it.
 \Rightarrow Syldavia won't invade all of the Baltic states.
 \Rightarrow Biden doesn't believe that Syldavia will invade some but not all of the Baltic states

2.2 Intermediate summary

The interaction between matrix exhaustification and propositional pronouns present a challenge for operator-based views of local implicatures: an exhaustified clause can be the antecedent of propositional *it* if exhaustification is performed by *only* or by EXH associating with an accented scalar term, but not if exhaustification involves EXH and an unaccented scalar term. Furthermore, the latter behavior cannot be replicated in sentences involving a

‘super high’ *only*, which suggests that the syntactic position of EXH isn’t the source of the problem.

One possibility is to posit that propositional *it* can only target the unstrengthened version of its antecedent, but it is unclear how such a view can be motivated. An alternative is to take matrix exhaustification to be effected, in a broadly neo-Gricean fashion, without an operator, while preserving the view that there might be embedded exhaustivity operators.² It is thus essential to determine whether similar problems arise the cases of embedded exhaustification that neo-Gricean reasoning does not deliver. As we will now see, similar problems do arise in this case and, as a result, we argue (in Section 4) that the semantics of the exhaustivity operator must be considerably refined.

3 Problems with Embedded Exhaustification

After summarizing the argument for embedded exhaustification coming from Hurford disjunctions, we show that tests involving propositional pronouns present difficulties for the operator-based approach (an extension to tests involving *unlike* and ellipsis is developed in Appendix A and B resp). These challenges will be extended to operator-free approaches in Section 4.

3.1 Hurford’s constraint and embedded exhaustification

A strong argument for the existence of embedded exhaustification comes from Hurford’s constraint, which was also briefly introduced with example (1c) of section 1.1. In a typical disjunction, the first disjunct may not entail the second, as in (9a). This has come to be known as Hurford’s constraint.

- (9) a. # Otilia visited either Paris or France.
- b. ✓ Otilia visited either some of the French cities or all of them.

As has been noted, however, this constraint is apparently obviated when one of disjuncts is a scalar item, as in (10b). Chierchia, Fox, and Spector 2009 propose to explain the obviation effect by assuming that the operator EXH can be inserted on one of the disjuncts, locally. In this position, the operator strengthens *some* to *some but not all*, which is not contextually entailed by *all*. Hurford’s constraint is thus satisfied after local exhaustification.

- (10) Otilia visited either EXH [some of the French cities] or all of them.
- ⇔ Otilia visited either some but not all of the French cities, or all of them

In the case of (10), inserting EXH in this way does not change the truth conditions of the sentence as a whole, which remains logically equivalent to *Otilia invited some of the French cities*.

In support of their analysis, Chierchia, Fox, and Spector 2009 note that in some Hurford disjunctions, EXH has a detectable truth-conditional effect. For instance, (11a) is understood

²One possibility could be that neo-Gricean mechanisms compete with operator-insertion but are more economical, with the result that operator-insertion should be possible in embedded but not in matrix contexts. We do not further discuss this point because our embedded data show that this is the wrong way to go.

as if it were (11b). It excludes the possibility that the assistant director will invite the first-year and the second-year students but not the third-year students. In particular, it is not judged equivalent to the weaker disjunct (11c).

- (11) a. The assistant director will invite the first-year students or all of the students.
- b. The assistant director will invite only the first-year students or all of the students.
- c. The assistant director will invite the first-year students.

In sum, Hurford's constraint suggests that embedded exhaustification is in some cases obligatory: this helps explain apparent obviation of an otherwise robust constraint, and embedded exhaustification predicts truth-conditional effects that are in fact attested.

3.2 Hurford's constraint and propositional pronouns

Hurford sentences are interesting for Janus sentences: in such cases, EXH is obligatory and it appears on the first disjunct. If either of these conditions were not met, Hurford's constraint would be violated. But as we will now see, when propositional pronouns are applied, we encounter a different version of the problem discussed in Section 2.1: propositional pronouns can target the literal meaning of the first disjunct with a bare scalar term but not with one associating with *only*, despite the fact that an exhaustifier is present in both cases.

The Janus case in (12a-c) is the same as the example (11a), with a continuation that denies both disjuncts, using an anaphoric construction. The clearest example, given in (12a), which is unfortunately stilted, is *neither the former nor the latter*. We take the more natural-sounding expression *neither* in (12c) to receive a related analysis, specifically: *neither of the two mentioned VP-denotations*. Similarly, *neither one nor the other* involves rather transparently an existential quantification over VP-denotations. In all cases, the director is understood to be exempt from the plain (non-exhaustified) property in (12), and to be exempt from the exhaustified property in (13).

- (12) The assistant director will invite the first-year students or all of the students ...
 - a. The director will do neither the former nor the latter.
 - b. The director will do neither one nor the other.
 - c. The director will do neither.

- (13) The assistant director will invite only the first-year students or all of the students.
 - a. The director will do neither the former nor the latter.
 - b. The director will do neither one nor the other.
 - c. The director will do neither.

Since the English expression *neither one nor the other* is a bit stilted in this context, we provide in (14) a natural example with a related expression in French, *ni l'un ni l'autre*; the inferential facts are the same.

- (14) a. *Le sous-directeur va rencontrer notre meilleur étudiant ou tous nos étudiants. La directrice ne va faire ni l'un, ni l'autre.*
 The assistant director will meet our best student or all our students. The director not will do nor the-one, nor the-other

‘The assistant director will meet our best student or all of our students. The director will do neither one nor the other.’

- b. *Le sous-directeur va rencontrer seulement notre meilleur étudiant, ou tous nos étudiants. La directrice ne va faire ni l'un, ni l'autre.*
 The assistant director will meet only our best student, or all our students. The director not will do nor the-one, nor the-other

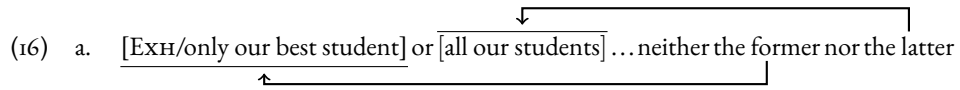
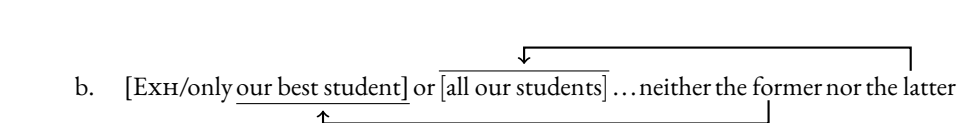
‘The assistant director will meet only our best student, or all of our students. The director will do neither.’

To our ear, (14a) can have a reading on which the director will not meet our best student, either alone or with some of our other students. Such a reading does not obtain in (14b), which merely implies that the director will not meet only our best student and that she will not meet all of our students.

On the operator-based analysis, the first sentences of (12) and (13) receive a similar parse, as illustrated in (15a-b) respectively. The challenge to the operator view, in a nutshell, is that to the extent that the semantics of EXH and *only* are similar, we don’t expect any contrast between the two sentences. Yet, we find that (12) receives a different reading from (13): the second sentences in (12a-c) negates that the director will meet the first-year students, whereas (13a-c) negates that the director will meet *only* the first-year students.

- (15) a. ...[EXH our best student] or [all our students]
 b. ...[only our best student] or [all our students]

To derive the stronger reading, to the effect that the director will not invite the first-year students, the operator-based view must assume that the antecedent of *one* does not contain EXH. For instance, the antecedent could be a sub-constituent of the disjunct, as in (16b). This would indeed yield a reading of (12), but one would then have to explain why such an antecedent is not available when EXH is replaced by ‘only’ in (13).

- (16) a. 
 b. 

3.3 Intermediate summary

Stepping back, we saw in Section 2 that matrix exhaustification yields a puzzle when it interacts with propositional pronouns: the truth conditions suggest that a matrix occurrence of EXH is present, but propositional pronouns can only access the unstrengthened version of the corresponding proposition. The same problem recurs with embedded exhaustification. In the matrix case, one could in principle argue that EXH has the same effect as neo-Gricean reasoning and is for this reason dispreferred. But this solution does not extend to the case of obligatory embedded exhaustification in Hurford disjunctions, since those cannot be obtained with neo-Gricean reasoning.

4 Challenges and Theoretical Directions

We turn to a summary of the challenges we uncovered for operator-based views of exhaustification. We sketch some possible solution strategies. Finally, we explain why operator-free views are not in a better position and encounter a version of the same problems.

4.1 Summary of the challenges

Let us start by summarizing the challenge raised by Janus sentences with propositional pronouns; key example types appear in (18).

(17) **Propositional pronouns**

A propositional pronoun should be able to take as antecedent a constituent containing EXH. With unaccented scalar terms, this is not so, for both matrix and embedded exhaustification.

- (18) a. Sylavia will invade Spain or Portugal. However Biden doesn't believe it.
b. [our best student] or [all our students] ... neither one nor the other

Additional tests are discussed in the appendices. In Appendix A, we show that similar environments combined with ellipsis are not as conclusive as propositional pronouns. In Appendix B, we show that additional challenges can arise in constructions involving *unlike*.

4.2 Possible directions

In all our examples, the scalar item displays a Janus-faced behavior: when used in one clause, it has a strengthened meaning, with a local implicature; when accessed in another clause, whose meaning is parallel to the first, it doesn't show an implicature (where parallelism is guaranteed either through pronominal reference or, in the appendices, with ellipsis and *unlike*). This suggests that there must be some way to retrieve the unstrengthened meaning from the enriched meaning output by EXH. It is even the case that, in negative environments, *only* the unstrengthened meaning is retrievable from EXH.

We will discuss several ways to achieve this. They are (non-exhaustively) listed below from most to least conservative:

1. **Functional meanings:** the set of alternatives used by EXH is functional, just like implicit domain restriction is functional. The literal meaning is retrieved by setting the set of alternatives to the empty set, for a certain value of the contextual parameters.
2. **Trivalent meanings:**
EXH delivers a trivalent meaning. It is true when the strengthened meaning is true ; it is not false when the literal meaning is true. The literal meaning can thus be retrieved from the falsity conditions.
3. **Multi-dimensional semantics:**
The scalar implicature is added to another dimension of meaning. The composition still operates over literal meanings.

Let us briefly describe each of these theoretical possibilities and explain how they may deal with the challenges at hand.

Functional approach. The functional approach in 1 makes the fewest changes to the traditional view of EXH. In standard theories of EXH, certain alternatives may be removed from the set of excluded alternatives, a process called *alternative pruning*. This is commonly thought to be the mechanism underlying the cancellation of scalar implicatures. Formally, EXH may be written as EXH_C , where C is a contextually specified set of alternatives (constrained by syntax, accent placement, etc).

From there on, it's only a minimal step to the assumption that the value of C may depend on the value of certain contextual parameters. Let us illustrate how this addendum would help with the case of ellipsis in (19). Although we deviate from our examples using propositional pronouns, the logic for ellipsis might be more familiar. In (19), the first sentence carries an implicature that Syldavia won't invade both countries ; the second one does not negate this implicature, thus displaying a Janus-faced behavior.

- (19) Syldavia will invade Spain or Portugal.
Borduria won't <invade Spain or Portugal>.

We assume EXH is present in both the antecedent VP and the elided VP³, as in (20). There, we explicitly mark EXH with $C(x)$, an index to the set of alternatives used for exhaustification, dependent on a bound variable x . Exploiting the fact that x may vary across clauses, we can explain why the first clause exhibits an implicature but not the second one. It suffices to stipulate that $C(\llbracket \text{Syldavia} \rrbracket) = \{\llbracket \text{will invade Spain and Portugal} \rrbracket\}$, which yields an implicature for the first clause, while assuming $C(\llbracket \text{Borduria} \rrbracket) = \emptyset$ which means that EXH applies vacuously in the second clause. Still, we do have focus parallelism ; both the elided constituent and its antecedent have (21) as their focus value. There is also syntactic parallelism. All in all, ellipsis is expected to be licensed.

- (20) [Syldavia λx . will $\text{EXH}_{C(x)}$ invade Spain or Portugal].
Borduria λx . won't [$\text{EXH}_{C(x)}$ invade Spain or Portugal].

³In Appendix A, we go over a different explanation of (19) on the basis of syntactic position of EXH. This assumption is simply there to illustrate the functional approach.

$$(21) \quad \{x \mid \text{EXH}(\llbracket x \text{ will invade Spain or Portugal} \rrbracket^g, C(x))\}$$

As discussed in Appendix A, the reading without an implicature in the second clause is the only possible one with unaccented *or*. To account for this, it would crucially *need* to be the case that $C(\llbracket \text{Borduria} \rrbracket) = \emptyset$. Presumably, the constraints needed to ensure that *or* does not have a strong reading in a sentence such as *Borduria won't invade A or B* (cf Fox and Spector 2018, a.o.) could be used.

The case of propositional pronouns requires additional amendments to this strategy. Consider the case in (22). As in the previous example, the implicature of the first clause is captured by assuming $C = \{\llbracket \text{will invade Spain and Portugal} \rrbracket\}$. Making this assumption means that the proposition expressed by the first clause is *Syldavia will invade Spain or Portugal but not both*. If the denotation of *it* is that proposition *simpliciter*, the implicature computed in the scope of *believe*, contrary to fact.

$$(22) \quad [\text{Syldavia will EXH}_C \text{ invade Spain or Portugal}]. \text{ Biden doesn't believe it.}$$

In this case, we must assume that the propositional pronoun *it* is functional in some way (cf *paycheck pronouns* (Jacobson 2000)). Specifically, *it* must denote a function from contexts to propositions, for instance a function that maps assignment functions g to the meaning of the first clause evaluated against g . When saturated with g' , *it* will denote the unstrengthened *Syldavia will invade Spain or Portugal but not both*, as desired.

$$(23) \quad \llbracket \text{it} \rrbracket^{g'} = \llbracket \text{Syldavia will invade EXH}_C \text{ invade Spain or Portugal} \rrbracket^{g'}$$

As with ellipsis, the functional construal of the propositional pronoun would need to be not only possible but required, since the reading on which the strengthened meaning is denied is absent. The difficulty is that here, syntactic or semantic constraints on EXH itself would not apply straightforwardly, since EXH is not present in the second clause.

Trivalent approach. A second solution is the trivalent approach to EXH proposed by Bassi, Pinal, and Sauerland 2021. These authors propose that EXH should be replaced by a presuppositional operator dubbed *p-EXH*. *p-EXH* is defined in (24): it returns true when the original EXH would have returned true (i.e. when the literal meaning and the implicature are both true), and it is false when its prejacent is false. In other words, *p-EXH*(p) is defined only in case p is false or $\text{EXH}(p)$ is true. In presuppositional terms, it triggers a presupposition that $p \rightarrow \text{EXH}(p)$.

$$(24) \quad \begin{aligned} p\text{-EXH}(p) &= 1 \text{ iff } \text{EXH}(p) = 1 \\ p\text{-EXH}(p) &= 0 \text{ iff } p = 0 \\ p\text{-EXH}(p) &= \# \text{ otherwise} \end{aligned}$$

With *p-EXH*, one no longer needs to assume that *p-EXH* is absent or vacuous under negation. By (24), a sentence like (25) will be true just in case $p = \text{'Borduria will invite A or B'}$ is false; the insertion of the operator *p-EXH* does not alter the truth conditions of the sentence. In presuppositional terms, the falsity of p suffices to satisfy the presupposed material implication $p \rightarrow \text{EXH}(p)$.

- (25) Bordura won't [p -EXH invade A or B]

The presuppositional approach, without further assumptions, can deal with the challenges raised by the unembedded cases. In (26), *it* presumably denotes a trivalent proposition. If not believing p means considering it possible that p is false, then it is predicted that '*Biden doesn't believe it*' would mean that he does not believe that Syldavia will invade either country (i.e. the unstrengthened meaning of the antecedent).

- (26) [Syldavia will p -EXH invade Spain or Portugal]. Biden doesn't believe it.

The discussion of Janus cases involving Hurford disjunctions in the framework of p -EXH is more involved. One first needs to understand how p -EXH can account for Hurford disjunctions, which are not discussed in Bassi, Pinal, and Sauerland 2021. Only after the necessary assumptions have been laid out can one determine whether the Hurford cases we consider can be explained. We go through this complicated discussion in Appendix C. Our conclusion is that a theory like p -EXH is also faced with non-trivial challenges involving Janus sentences.

The p -EXH theory looks *prima facie* very minimal in its commitments, requiring only that we treat as (conditional) presuppositions the implicatures previously assumed to be assertive. However there are differences in the projection properties of implicatures and presuppositions, and they causes difficulties for p -EXH. For instance, under *unlikely*, presuppositions tend to project to the level of the entire sentence. The purported presuppositions associated with implicatures don't seem to.

- (27) a. It's unlikely that Mary will stop smoking.
 $\sim \rightarrow$ *Mary smokes*
 b. It's unlikely that Mary or Bill will pass.
 \nrightarrow *if either one of them pass, both won't*

It is in principle possible to deny that implicatures are presuppositional and claim that the trivalence generated by p -EXH is *sui generis*, with no connection to presuppositions whatsoever. This would preserve the empirical predictions of the account, while allowing for the projection properties of implicatures and presuppositions to be different. This would also make the theory more stipulative and potentially as appealing or unappealing as the other solutions sketched in this section.

Multi-dimensional approach. The multi-dimensional approach is in spirit related to Chierchia 2004 (cf also Landman 1989's account of numerals) and bears some resemblance to the trivalent approach just discussed. In this approach, the meaning of a constituent is a pair. The first component of the pair is the traditional literal meaning and the second component the implicated meaning. In most cases, such as the lexical items in (28a), the second component is empty, indicating that no implicature is computed. In the multi-dimensional approach, EXH can be modeled as adding implicatures to the second component — the implicature dimension — while keeping the first component constant ; this ideas is sketched in (28b).

- (28) a. $\llbracket \text{invade} \rrbracket^g = (\text{invade}, \{\})$
 b. $\llbracket \text{Exh} [A \text{ or } B] \rrbracket^g = (\llbracket A \text{ or } B \rrbracket_{\text{lit}}^g, \llbracket A \text{ or } B \rrbracket_{\text{impl}}^g \cup \{\llbracket A \text{ and } B \rrbracket_{\text{lit}}^g\})$
 where $\llbracket \cdot \rrbracket_{\text{lit}}^g$ and $\llbracket \cdot \rrbracket_{\text{impl}}^g$ designate, respectively, the first and the second component of the pair $\llbracket \cdot \rrbracket^g$ (e.g. $\llbracket \text{invade} \rrbracket_{\text{lit}}^g = \text{invade}$ and $\llbracket \text{invade} \rrbracket_{\text{impl}}^g = \{\}$)

To account for the lack of implicatures in downward-entailing environments, several approaches may be taken. One is to define negation and other downward-entailing items so that they empty the implicated dimension, as in (29). This is the approach found in Chierchia 2004. Once this step is taken, even if the antecedent contains EXH, its effect, which is only felt in the implicated component, will be erased by negation. Such operations as (29) are easy to define precisely because the multi-dimensional approach always keeps track of the literal meaning.

- (29) $\llbracket \text{not Exh} [A \text{ or } B] \rrbracket^g$
 $= (\neg \llbracket \text{Exh} [A \text{ or } B] \rrbracket_{\text{lit}}^g, \emptyset)$
 $= (\neg \llbracket [A \text{ or } B] \rrbracket_{\text{lit}}^g, \emptyset)$ (by (28b))

We can then exploit this property to account for the lack of implicature in Janus sentences. In principle, the propositional pronoun *it* in (30) can either take the constituent with EXH or its prejacent as antecedents. If the former is taken as an antecedent, the filtering behavior of negation defined in (29) applies and any implicated content carried by this pronoun is erased. If the prejacent of EXH is the antecedent, then no implicature is predicted.

- (30) [Syldavia will EXH invade Spain or Portugal]. However, Biden doesn't believe it.

The Janus cases involving Hurford disjunctions require an involved discussion. As with the trivalent case, we must first determine how Hurford disjunctions can be accounted for in this system; depending on the choices made for these cases, the Janus versions of Hurford disjunctions may or may not be predicted. Although we do not pursue it here, the discussion would probably follow a similar dialectic to that of Appendix C.

In summary, the multi-dimensional approach gains in flexibility what it loses in simplicity. On the one hand, it offers a clean separation between literal meaning and implicated meaning, which allows us to retrieve an unstrengthened meaning at will. On the other hand, it is also dangerously expressive and requires redefining many semantic concepts (rules of composition, notions of entailment, etc).

4.3 Extension to operator-free views

Up to this point, we have assumed that implicatures are semantic inferences derived in the grammar by an operator EXH. However, the grammatical approach to scalar implicatures (which holds that implicatures are semantic rather than pragmatic inferences) is also compatible with operator-free views. The most representative example of such an approach is Chierchia 2004; in his system, scalar implicatures are derived through the rules of composition and a multi-dimensional semantics similar to that of section 4.2.

One might think that Janus sentences provide an argument in favor of operator-free analyses of exhaustification, but this isn't so. Let us briefly explain why. The challenge of

Janus sentences with propositional pronouns lies in an overgeneration problem: while locally enriched meanings should be accessible to propositional pronouns, they seem not to be. Whether the enrichment is performed by syntactic or non-syntactic means, the puzzle persists: it is unclear why the enriched meaning of a constituent cannot be picked out by propositional pronouns. (If anything, depending on how the operator-free views are developed, they might encounter an additional problem, which is to *allow* the propositional pronoun to access the unstrengthened meaning of the scalar terms.)

4.4 A note on Bar-Lev and Fox 2017.

Having discussed some solution strategies for Janus sentences, we conclude with a brief excursion to Bar-Lev and Fox 2017’s ellipsis argument for a matrix innocent inclusion analysis of Free Choice, first discussed in section 1.2. Bar-Lev and Fox note that if the Free Choice implicature of the first sentence of (31a) is obtained by embedded exhaustification, it would also need to be generated in the scope of *no boy* due to the parallelism constraints on ellipsis.

- (31) a. Every girl is allowed to eat ice cream or cake on her birthday.
 Interestingly, no boy is \langle allowed to eat ice cream or cake on his birthday \rangle .
 \Rightarrow every girl is allowed to eat ice cream and allowed to eat cake on her birthday,
 and
 \Rightarrow no boy is allowed to eat ice cream and (likewise) no boy is allowed to eat cake on his birthday.
- b. [every girl] λx Exh Exh allowed $[Ax \vee Bx]$.
 [no boy] λx Exh Exh allowed $[Ax \vee Bx]$
- c. ExhII [every girl] λx allowed $[Ax \vee Bx]$.
 [no boy] λx allowed $[Ax \vee Bx]$.

In light of our discussion of Janus sentences, it appears that this argument no longer goes through. All of the solutions seen so far permit a constituent with an implicature to be semantically identical to one with no implicature. If this is so, then, in a structure like (31b), it would be possible that the recursive EXH in the scope of *no boy* is vacuous and yet semantically parallel to the EXH responsible for the Free Choice inferences in the antecedent, yielding the attested reading. (As before, constraints prohibiting non-vacuous exhaustification under negation may be responsible for explaining why the attested reading is the only one possible.)

5 Conclusion

The grammatical approach to scalar implicatures assumes that implicatures are derived in the semantics. This view successfully explains cases in which scalar implicature computation interacts with the semantics: embedded scalar implicatures and obviation of Hurford’s constraint. The dominant formulation of the grammatical view posits a syntactically real but covert operator EXH, with a semantics similar to the semantics of *only*.

This dominant view brings with it an expectation that semantic processes which require some form of identity between distant constituents, like ellipsis or propositional pronouns, would likewise require identical implicatures. Contrary to that expectation, we presented

Janus-faced sentences, sentences in which an implicature is present in an antecedent clause, but not in an expression that should be parallel to it because of propositional pronouns.

As discussed in section 4.3, operator-free views are not in a better position: one would expect the strengthened version of exhaustified expressions to be available for propositional pronouns, contrary to fact.

Although we do not provide a solution to these challenges, we propose that the semantics of EXH could be enriched in such a way that its effects can be ‘turned off’ in some environments in which it is present. This can be achieved in various ways, either by functionalizing the alternatives to EXH, or by adopting enriched views on exhaustification, such as the trivalent view of Bassi, Pinal, and Sauerland 2019 or a multi-dimensional semantics in the spirit of Chierchia 2004.⁴

In the end, what does that tell us about the interface between syntax, semantics and pragmatics? If the effect of EXH may be selectively turned off, it is in principle possible that EXH is always present, even when no implicatures arise. This dovetails with the view of Magri 2009. In fact, one could go further: since the semantics of the exhaustivity operator must be flexible enough that it can in principle be inserted everywhere (without necessarily having semantic effects), this opens the possibility that whatever semantic effect EXH has can be directly built into the semantic procedure. This would yield an operator-free approach to exhaustification.

Appendices

Appendix A Janus sentences with *ellipsis*

In the body of this article, we focused exclusively on Janus sentences with propositional pronouns. But a more common way of imposing semantic parallelism between two clauses is ellipsis. In fact, ellipsis was already used to diagnose the presence of covert operators including EXH, as we discussed in section 1.2). Here we explain why ellipsis examples are not completely conclusive: in the case of matrix exhaustification, there could be alternative explanations consistent with the classical operator-based treatments; in the case of embedded exhaustifications, the crucial examples are so complicated that some key judgments are unclear.

A.1 Difficulties with matrix exhaustification

Let us start by explaining why ellipsis-based tests are hard to interpret in matrix cases. An example of Janus sentence with ellipsis is (32a). In this example, the first clause is naturally interpreted with an implicature (e.g. *not both*). Within the operator-based view, it would thus be represented as (33a) or (33b). By contrast, the second clause in (32a), which contains the elided constituent, only has a meaning that targets the literal meaning of the disjunction (e.g. *won’t fund one and won’t fund the other*). Compare this with the control in (32b) where the elided clause can receive a strengthened meaning.

⁴As cautionary note, we should add that the puzzle we uncovered is an overgeneration problem, of a kind that is rarely lethal for a theory if one is willing to make appropriate stipulations to rule out the undesirable readings.

- (32) a. Syldavia will fund UNESCO or WWF. Borduria won't.
 \Rightarrow not Borduria will fund [UNESCO or WWF]
 b. Syldavia will only fund UNESCO or WWF. Borduria won't.

Within the standard operator-based theory, this contrast can be explained if the Logical Form of (32a) is as in (33a), and crucially not as in (33b). In the latter case, parallelism would require that EXH be present under the negation of the second clause as well, yielding an unattested negated strengthened meaning. But the upshot is that the operator-based view *can* account for the data by postulating that EXH obligatorily appears high.

- (33) a. EXH [Syldavia will fund UNESCO or WWF]. Borduria won't.
 b. Syldavia λx . EXH [x will fund UNESCO or WWF]. Borduria won't.

Related facts hold when disjunction is replaced with an indefinite, as in (34), with the possible difference that association of overt *only* with *some* might be easier than with *or*. Here too, it seems that *only* can easily be copied under ellipsis whereas EXH cannot. This can again be explained if EXH preferably appears unembedded whereas *only* is not subject to this constraint.

- (34) a. Syldavia will invade some of the Baltic states. Borduria won't.
 \Rightarrow not Borduria will invade some of the Baltic states.
 b. Syldavia will only invade some of the Baltic states. Borduria won't.
 \Rightarrow not Borduria will only invade some of the Baltic states.
 c. It's only the case that Syldavia will invade some of the Baltic states. Borduria won't.
 \Rightarrow ??
 d. Syldavia will invade SOME of the Baltic states. Borduria won't.
 e. EXH[Syldavia will invade some of the Baltic states]. Borduria won't.
 f. Syldavia λx EXH[x will invade some of the Baltic states]]. Borduria won't.

In sum, ellipsis-based tests do not directly bear on the syntactic reality of the exhaustivity operator in matrix cases. From the perspective of the operator-based view, these tests suggest that the distribution of EXH is more limited than that of *only*. Specifically, in the cases we discussed, EXH only appears in a high matrix position.

The reason propositional pronouns, as discussed in the main text, yield a more significant challenge than ellipsis is that the latter straightforwardly comes with restrictions: if an operator is 'too high', it cannot be targeted by ellipsis. No such constraint is standardly assumed for propositional anaphora, hence a more interesting dialectical situation.

A.2 Difficulties with embedded exhaustification

Things are different for ellipsis when we consider its interaction with embedded exhaustification. As we will now see, the theoretical situation is clear, but unfortunately the key judgments are not.

In (35a-b) alike, the exhaustifier (be it *EXH* or *only*) must be within the ellipsis site in order to satisfy Hurford's constraint. The question is whether there is a difference between (35a) and (35b). The critical scenario is one in which (say) the CIA will talk to my father and my sister but not my entire family. If the second clause of (35a) is read with the Hurford implicature, then this scenario should be judged true ; otherwise, it would be judged false. ⁵

- (35) a. The FBI will contact my father or my entire family. The CIA won't.
 b. FBI λx [Exh[x contacts my father] or x contacts my entire family]
 c. The FBI will contact only my father or my entire family. The CIA won't.

The judgement of our consultant is not clear: while (35b) is definitely compatible with the critical scenario, judgments are not so easily passed on (35a). Our consultant feels they can accept it under such scenario but they report their judgment with lower confidence than in the case of (35b). It is clear that more empirical work will be needed before conclusions can be reached on such sentences.

Appendix B Janus sentences with *unlike*

In some respects, *Unlike NP₂, NP₁ VP* behaves like a type of ellipsis case we considered, of the form: *NP₁ VP. NP₂ not*. For instance, *Unlike Borduria, Syldavia will invade Spain* means roughly the same thing as: *Syldavia will invade Spain. Borduria won't*. But there are some differences : (i) ellipsis involves two sentences and *unlike* just one, and (ii) ellipsis presents as asserted (by the elided clause) what the *unlike* constructions presents as presupposed. ⁶

It could be noted that *only*-constructions can also play the same kind of role as ellipsis-based-constructions. Specifically, *Only Syldavia will invade Spain* means roughly the same thing as: *Syldavia will invade Spain. The other countries won't*. The difference is that now the construction with *only* presents as presupposed the fact that Syldavia *will* invade Spain.

Both *unlike*- and *only*-constructions are in principle useful to further probe the syntactic reality of Exh. But *unlike* is preferable for our purposes for a practical reason: it allows for easy controls in which Exh is replaced with *only*. Doing the same thing with *only* rather than *unlike* would give rise to two occurrences of *only* in the same sentence, possibly at the cost of comprehensibility.

The similarity between ellipsis and *unlike* constructions extends to exhaustification, in the sense that the *unlike* construction targets the unstrengthened version of the relevant property (just like ellipsis does). But the fact that *unlike* constructions involve a single sentence opens an additional analytical possibility, namely the insertion of *Exh* above *unlike* (the equivalent in discourses with ellipsis would involve an exhaustivity operator with scope over an entire discourse, something we assumed isn't possible.)

As we will now see, *unlike* constructions raise a challenge for operator-based analyses: When a scalar term is accented or explicitly exhaustified (by way of an embedded occurrence

⁵The use of a matrix disjunction triggers ignorance implicatures that are easiest to satisfy with claims in the future, hence our choice of example in (34).

⁶The presuppositional character of the *unlike* construction can be demonstrated by applying standard projection tests. For instance, both of the following sentences give rise to an inference that Borduria will not invade Spain. (i) It's possible that, unlike Borduria, Syldavia will invade Spain. (ii) If unlike Borduria, Syldavia invades Spain, a response will be required.

of *only*), a reading is obtained which can be analyzed with an embedded Exh. But unaccented scalar terms fail to yield such readings.

B.1 Interaction between *unlike*-constructions and matrix exhaustification

When it appears in the main clause combined with an *unlike* construction, disjunction yields different readings depending on whether it is accented. In all the examples in (36), *or* is naturally read with exhaustification of the main clause, but there are differences in the interpretation of the *unlike* clause. With unaccented *or*, as in (36a), the *unlike* clause targets the literal meaning of the disjunction. When *or* is accented or associates with embedded *only*, as in (36d-e), the *unlike* clause targets the exhaustified version of the disjunction.

- (36) a. Unlike Borduria, Syldavia will invade Spain or Portugal.
 \Rightarrow Syldavia won't invade both
 \Rightarrow Borduria will invade neither
- b. Unlike Borduria, Syldavia will invade the Iberian peninsula.
 \nRightarrow Syldavia won't invade both
 \Rightarrow Borduria won't invade (any of) the Iberian peninsula
- c. EXH [Unlike Borduria, Syldavia λx [x will invade or x will invade Portugal]]
- d. Unlike Borduria, Syldavia will only invade Spain OR Portugal.
 \Rightarrow Syldavia won't invade both
 \Rightarrow Borduria will invade both
- e. Unlike Borduria, Syldavia will invade Spain OR Portugal.
 \Rightarrow Syldavia won't invade both.
 \Rightarrow Borduria will invade neither or both

- (37) Unlike Borduria, Syldavia λx EXH [x will invade Spain or x will invade Portugal]

It is easy to see that embedded occurrence of EXH, as in (37), yields appropriate inferences for (36d-e). It is harder to see that a matrix occurrence of EXH as in (36c) yields appropriate inferences for (36a), but this is nonetheless the case with standard assumptions. In fact, there are two conceivable ways to obtain the observed inferences. One is just to assume that a sentence *Unlike X, S* has as alternatives those of *S*, obtained by disregarding the *unlike*-clause. This is in line with views of alternative generation on which all syntactic simplifications of the target construction can be active alternatives (Katzir 2007). When we apply this procedure to (36c), the exhaustivity operator has access to the simple sentence *Syldavia λx [x will invade or x will invade Portugal]*, which is non-weaker than the entire sentence and can thus be excluded by the exhaustivity operator. This, in turn, yields the inference that *Syldavia won't invade both Spain and Portugal*. But since the exhaustivity operator is above the expression *unlike X*, the latter attributes to Borduria the negation of the literal meaning of the disjunction.

As it happens, even without this particular alternative, one might derive the desired inferences. If the exhaustivity operator is appropriately defined, it can negate the alternative *Unlike Borduria, Syldavia will invade Spain and Portugal* (obtained without syntactic simplification by just replacing *or* with *and*). But the asserted sentence, *Unlike Borduria, Syldavia*

will invade Spain or Portugal, implies that Borduria won't invade Spain or Portugal, from which it follows that it won't invade both. In other words, in the presence of the asserted sentence, the *unlike X* component of the *and* alternative is vacuously satisfied, and negating this entire *and*-alternative is thus tantamount to negating *Syldavia will invade Spain and Portugal*.

As things stand, then, the operator-based approach can derive the desired readings by placing EXH above or below *unlike X*. The key question, however, is why a narrow scope insertion of EXH is impossible with unaccented *or*. It is standard to assume that EXH cannot normally be inserted in downward-monotonic environments, but such isn't the case of the examples at hand. They are non-monotonic because the presupposition makes a negative contribution while the main clause makes a positive contribution. But one key argument *in favor* of local implicatures was precisely that they can arise in the scope of non-monotonic operators, as discussed above in (1a). It is likely that a principle could be added to the operator-based view to constrain its distribution, but the precise motivation for such a principle is not currently clear to us⁷.

The facts and problems are similar if one replaces the embedded disjunction with an indefinite, as seen in (38).

- (38) a. Unlike Borduria, Syldavia will invade a/some Baltic state.
 \Rightarrow Syldavia won't invade all
 \Rightarrow Borduria will invade none
- b. Unlike Borduria, Syldavia will invade the Baltic region.
 \nRightarrow Syldavia won't invade all Baltic states
 \Rightarrow Borduria won't invade (any of) the Baltic region
- c. EXH[Unlike Borduria, Syldavia λx x will invade a/some Baltic state]
- d. Unlike Borduria, Syldavia will only invade SOME Baltic state.
 \Rightarrow Syldavia won't invade all
 \Rightarrow Borduria will invade all
- e. Unlike Borduria, Syldavia will invade SOME Baltic state.
 \Rightarrow Syldavia won't invade all.
 \Rightarrow Borduria will invade none or all
- f. Unlike Borduria, Syldavia λx EXH[x will invade some Baltic state]

To summarize the challenge, the *unlike*-construction seems to be lacking an embedded implicature obtained by inserting EXH under *unlike*.

Appendix C Hurford disjunctions in Bassi, Pinal, and Sauerland 2021

Bassi, Pinal, and Sauerland 2021 do not discuss how their account extends to the cases of Hurford disjunctions. This section describes the necessary assumptions needed by the triva-

⁷The environment ... in *Unlike X, Y will ...* is in fact Strawson-upward-entailing. Consider the inference from *Unlike X, Y will A* to *Unlike X, Y will [A or B]*. If the presupposition of the latter claim is granted, then X won't [A or B]; and under this assumption, the first statement entails the second.

lent account to fully explain the basic Hurford cases. We find that Bassi, Pinal, and Sauerland 2019 must assume that *p*-EXH is locally accommodated in Hurford disjunction and thus no different in meaning from EXH in this configuration. We show that the trivalent account is faced with the same challenge with Janus sentences as the traditional account.

C.1 Hurford disjunction in the trivalent account

Following the logic of the account of Hurford disjunctions in the bivalent cases, we ask whether inserting *p*-EXH in the first disjunct prevents it from being entailed by the second.

- (39) Mary had [*p*-EXH some] or all of the ice-cream.

In a trivalent system, this depends on the notion of entailment used. Strawson-entailment requires that if the antecedent is true, the consequent is not false (Von Fintel 1999). As a result, *all* does Strawson-entail '*p*-EXH *some*', for the following reason: any world where Mary had *all* of the ice-cream is a world where '*p*-EXH *some*' is undefined (by definition). As a result, inserting *p*-EXH should not obviate Hurford's constraint, as it should continue to be the case that the second disjunct entails the first. From the perspective of *p*-EXH, this is undesirable.

But an alternative notion of entailment can solve the problem, namely strong entailment. It requires that if the antecedent is true, the consequent is true as well. This notion fares better because now *all* does not strongly entail '*p*-EXH *some*'. So it *prima facie* seems the *p*-EXH-based account must assume that Hurford's constraint is stated using strong entailment, not Strawson-entailment, if *p*-EXH is to obviate Hurford's constraint.

Still, a challenge arises for this view when we consider more elaborate structures such as (40), with a matrix *p*-EXH on top of the Hurford disjunction. In accounts of exhaustification based on EXH, the addition of another EXH has no effect: both the alternatives 'Mary had EXH some of the ice-cream' and 'Mary had all of the ice-cream' can be individually excluded, but excluding both contradicts the prejacent, so neither are *innocently excludable*. But with *p*-EXH, things are different: asserting the negation of the alternative '*Mary had [p-EXH some] of the ice-cream*' means asserting '*Mary didn't eat any ice-cream*'; this alternative cannot be excluded, as that would contradict the prejacent. Thus, the alternative '*Mary had all of the ice-cream*' becomes *innocently excludable*: because the alternative corresponding the first disjunct is no longer excludable at all, there is no longer any symmetry.

- (40) a. *p*-EXH [Mary had [*p*-EXH some] or all of the ice-cream.]
 b. **Alternatives:**
- Mary had [*p*-EXH some] of the ice-cream
 - Mary had some of the ice-cream
 - Mary had all of the ice-cream

In other words, *p*-EXH predicts that it is possible to read (39) with the implicature that '*Mary didn't have all of the ice-cream*' (and if *p*-EXH is obligatory, this reading is predicted to be the only one available).

C.2 Strawson entailment and local accommodation

One solution to the problem is to assume that p -EXH in the first disjunct is obligatorily locally accommodated, as in (41). Since applying EXH is equivalent to locally accommodating p -EXH, the predictions for (40) will be the same as in the standard bivalent system and thus correct.

(41) p -EXH Mary had [A p -EXH some] or all of the ice-cream.

But why should local accommodation be forced in this case? A possibility is that the Hurford constraint does not in fact make reference to strong entailment but to Strawson-entailment. As seen above, p -EXH, on its own, is unable to obviate Hurford's constraint, if Hurford's constraint is defined in terms of Strawson-entailment. Local accommodation offers a solution: ' A p -EXH some' (with A representing local accommodation) receives the same truth-value in all worlds as '*some but not all*'; in particular, it is not (Strawson-)entailed by *all*.

To conclude, this discussion has uncovered two key assumptions needed to account for Hurford disjunctions in a trivalent setting: a Hurford constraint based on Strawson-entailment and obligatory local accommodation. The upshot of this appendix for the present article is this: these new assumptions give an entirely bivalent meaning to the first disjunct of a Hurford disjunction. But this means that we are essentially back where we started: it is mysterious why this bivalent meaning cannot be picked up by a propositional pronoun, the very challenge raised in section 3. In short, although the trivalent account initially showed promise on Hurford cases, it does not evade the problems raised by Janus sentences in embedded context.

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