

The ignorance implication of inquisitive predicates*

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1 Introduction

- Inquisitive predicates are ones that can take interrogative clauses as their complement, but not declarative clauses (Karttunen, 1977). For instance:
 - (1) The doctor **wonders** what the patient ate / *that the patient ate.
 - (2) The doctor **investigates** what the patient ate / *that the patient ate.
 - (3) The doctor **is curious** what the patient ate / *that the patient ate.
- Such predicates generally imply that their subject is **ignorant** about the embedded question: all the above examples imply that the doctor doesn't know what the patient ate.¹
- Questions addressed in this talk:
 - **Empirically:** What does this ignorance implication amount to exactly?
 - **Theoretically:** How should it be accounted for? Can it be related to other phenomena?
- We will focus throughout on the case of *wonder*, but the arguments apply to other inquisitive predicates as well.

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¹An exception is the inquisitive predicate *depend on*. This predicate expresses a relation between two questions, rather than between an individual and a questions. Hence, it cannot imply ignorance on the part of its subject about the question in object position.

- Roadmap:
 - §2 provides background on existing semantic accounts of *wonder*,
 - §3 raises a problem for these accounts, which we call the **distribution requirement**,
 - §4 considers a **pragmatic** account of the distribution requirement, and its shortcomings,
 - §5 specifies two **semantic** accounts, and
 - §6 attempts to tease these two accounts apart with additional empirical observations.

2 Background on the semantics of *wonder*

- A long-standing intuition: *wonder* \simeq *want to know* (Karttunen, 1977; Guerzoni and Sharvit, 2007; Uegaki, 2015).
- Recent formalization of the idea by Ciardelli and Roelofsen (2015):
The meaning of *wonder* φ is a conjunction of
 - ‘not knowing an answer to the issue expressed by φ ’ and
 - ‘wanting to be in a state that settles the issue expressed by φ ’.
- We give a brief overview of C&R’s account, couched in Inquisitive Epistemic Logic (IEL).

Information states and sentence meanings

- An INFORMATION STATE is modeled as a **set of possible worlds**, those worlds that are compatible with the information available in the state.
- The MEANING OF A SENTENCE, whether declarative or interrogative, is modeled as a **set of information states**, those states where:
 - The information conveyed by the sentence is established, and
 - The issue raised by the sentence is resolved.
- For instance:
 - $\llbracket \text{Bill left} \rrbracket = \{s \mid \forall w \in s : \text{Bill left in } w\}$
 - $\llbracket \text{Did Bill leave} \rrbracket = \{s \mid \forall w \in s : \text{Bill left in } w\} \cup \{s \mid \forall w \in s : \text{Bill did not leave in } w\}$
 - $\llbracket \text{Who left} \rrbracket = \{s \mid \exists d \in D : \forall w \in s : d \text{ left in } w\}$ [mention-some]
- The meaning of a sentence is always:
 - non-empty, and
 - closed under subsets: if $s \in \llbracket \varphi \rrbracket$ and $s' \subset s$ then $s' \in \llbracket \varphi \rrbracket$ as well

(for motivation of these constraints on sentence meanings, see Ciardelli et al., 2015)

- The maximal elements of $\llbracket \varphi \rrbracket$ are called the **alternatives** in $\llbracket \varphi \rrbracket$, denoted $\text{ALT}(\varphi)$.
- For instance:
 - $\text{ALT}(\text{Bill left}) = \{\{w \mid \text{Bill left in } w\}\}$
 - $\text{ALT}(\text{Did Bill leave}) = \{\{w \mid \text{Bill left in } w\}, \{w \mid \text{Bill didn't leave in } w\}\}$
 - $\text{ALT}(\text{Who left}) = \{\{w \mid d \text{ left in } w\} \mid d \in D\}$ [mention-some]

Inquisitive states

- The INQUISITIVE STATE of an agent a , Σ_a , is also represented as a **set of information states**.
 - Σ_a models what a **would like to know**, the issues that she entertains.
 - The information states in Σ_a are precisely those in which these issues are settled, i.e., ones that she would like to reach.
- It is assumed that Σ_a is always:
 - non-empty
 - closed under subsets: if $s \in \Sigma_a$ and $s' \subset s$ then $s' \in \Sigma_a$ as well
 - a **cover** of a 's information state, denoted as σ_a : $\bigcup \Sigma_a = \sigma_a$

(for motivation of these constraints on Σ_a , see Ciardelli and Roelofsen, 2015)
- This means that σ_a can always be determined on the basis of Σ_a .

Modal operators

- IEL has two basic modal operators. Informally:
 - An agent **knows** φ iff her **current** information state σ_a is a member of $\llbracket \varphi \rrbracket$, i.e., one where the issue expressed by φ is resolved.
 - An agent **entertains** the issue expressed by φ iff every information state **that she would like to reach** is a member of $\llbracket \varphi \rrbracket$, i.e., one where the issue expressed by φ is resolved.
- The semantics of *wonder* is defined in terms of these two basic operators. Informally:
 - An agent **wonders** about φ iff she doesn't know φ but does entertain the issue expressed by φ .

Models and semantics

- (4) An IEL MODEL for a set \mathcal{P} of atomic sentences and a set \mathcal{A} of agents is a triple $M = \langle \mathcal{W}, V, \Sigma_{\mathcal{A}} \rangle$, where:
- \mathcal{W} is a set of POSSIBLE WORLDS
 - $V : \mathcal{W} \mapsto \wp(\mathcal{P})$ is a VALUATION MAP
 - $\Sigma_{\mathcal{A}} = \{\Sigma_a \mid a \in \mathcal{A}\}$ is a set of INQUISITIVE STATE MAPS, one for each agent $a \in \mathcal{A}$, mapping every world $w \in \mathcal{W}$ to the inquisitive state of a in w , $\Sigma_a(w)$.
- (5) The information state of a in w , $\sigma_a(w)$, is defined as $\bigcup \Sigma_a(w)$.
- (6) **Semantics for non-modal fragment of IEL**
- $\llbracket A \rrbracket := \{s \mid \forall w \in s : A \in V(w)\}$ for any atomic sentence $A \in \mathcal{P}$
 - $\llbracket \neg \varphi \rrbracket := \{s \mid \forall t \in \llbracket \varphi \rrbracket : s \cap t = \emptyset\}$
 - $\llbracket \varphi \wedge \psi \rrbracket := \llbracket \varphi \rrbracket \cap \llbracket \psi \rrbracket$
 - $\llbracket \varphi \vee \psi \rrbracket := \llbracket \varphi \rrbracket \cup \llbracket \psi \rrbracket$
- (7) **Truth conditions for basic modal operators**
- $w \models K_a \varphi \iff \sigma_a(w) \in \llbracket \varphi \rrbracket$ (the ‘know’ modality)
 - $w \models E_a \varphi \iff \Sigma_a(w) \subseteq \llbracket \varphi \rrbracket$ (the ‘entertain’ modality)
- (8) **Wonder modality**
- $$W_a \varphi := \neg K_a \varphi \wedge E_a \varphi$$
- (9) **Translation from natural language to IEL**
- $$\lceil \text{wonder} \rceil = \lambda Q_{\langle \text{st}, \text{t} \rangle} \lambda x_e. W_x(Q)$$

Example

- (10) a. $\lceil \text{John wonders whether Ann or Bill arrived.} \rceil = W_j(A \vee B)$
- b. $w \models W_j(A \vee B) \iff \sigma_j(w) \notin \llbracket A \vee B \rrbracket \wedge \Sigma_j(w) \subseteq \llbracket A \vee B \rrbracket$
- c. John’s current information state doesn’t resolve the question whether A or B , but every information state that he wants to be in is one in which the question *is* settled.²

Side-note

- This semantics explains the badness of **wonder-that*. Since the meaning of a declarative complement includes only one alternative, *wonder-that* constructions are systematically contradictory.
- See Uegaki (2015) for a similar idea based on the decomposition of *wonder* into ‘want to know’, and Theiler et al. (2016) for an extension of C&R’s account orthogonal to our present concerns.

²For simplicity, we assume here that the embedded alternative question *whether Ann or Bill arrived* is translated into IEL as $A \vee B$, disregarding the fact that alternative questions presuppose that exactly one of the disjuncts holds. This simplification, however, does not affect the arguments that we will make.

3 Problem: distributive ignorance

The distribution requirement

- (11) **Situation** John has three students, Ann, Bill and Carol. He is waiting for all of them to arrive at a lab meeting. Someone knocks at the door, but John knows that it can't be Carol because she has just emailed him that she will be late.

Example John wonders whether Ann, Bill or Carol arrived. (Judgment: *False*)

- The sentence in (11) is only true in a context in which:
 - John's information state is **compatible** with **every alternative** expressed by the complement, i.e., the sets of worlds in which Ann arrived, Bill arrived and Carol arrived.
 - At the same time, each of these alternatives is **not entailed** by his information state.
 - That is, John is **ignorant** about whether each alternative is true.
- We refer to this requirement in the meaning of *wonder* as the DISTRIBUTION REQUIREMENT.
- Later, we will discuss in detail what this requirement looks like in examples with a complement involving a *wh*-question.

C&R's semantics does not capture the distribution requirement

- C&R's semantics incorrectly predicts that (11) is **true** in the above situation.
- This is so since John's current information state does not resolve the question whether *A*, *B* or *C*, and every information state he wants to be in does resolve the question whether *A*, *B* or *C*.
- Formally, we have the following analysis of the example:

$$(12) \quad \ulcorner \text{John wonders whether Ann, Bill or Carol arrived.} \urcorner = W_j(A \vee B \vee C)$$

$$(13) \quad w \models W_j(A \vee B \vee C) \iff \sigma_j(w) \notin \llbracket A \vee B \vee C \rrbracket \wedge \Sigma_a(w) \subseteq \llbracket A \vee B \vee C \rrbracket$$

- John's inquisitive state Σ_j , his information state σ_j , and the meaning of the complement are the following, in the given situation (see Figure 1):

$$- \Sigma_j = \{s \mid s \in \llbracket A \rrbracket \cup \llbracket B \rrbracket \text{ and } \forall t \in \llbracket C \rrbracket : s \cap t = \emptyset\} \quad (\text{John's inquisitive state})$$

$$- \sigma_j = \{w \mid (w \in \llbracket A \rrbracket \text{ or } w \in \llbracket B \rrbracket) \text{ and } s \notin \llbracket C \rrbracket\} \quad (\text{John's information state})$$

$$- \llbracket A \vee B \vee C \rrbracket = \llbracket A \rrbracket \cup \llbracket B \rrbracket \cup \llbracket C \rrbracket \quad (\text{meaning of the complement})$$

- Given these, we can show that the truth conditions in (13) are met in the given situation.

$$- \sigma_j \notin \llbracket A \rrbracket \cup \llbracket B \rrbracket \cup \llbracket C \rrbracket \quad (\text{John's info state does not resolve the complement question})$$

$$- \Sigma_j \subseteq \llbracket A \rrbracket \cup \llbracket B \rrbracket \cup \llbracket C \rrbracket \quad (\text{every info state John wants to be in resolves the question})$$

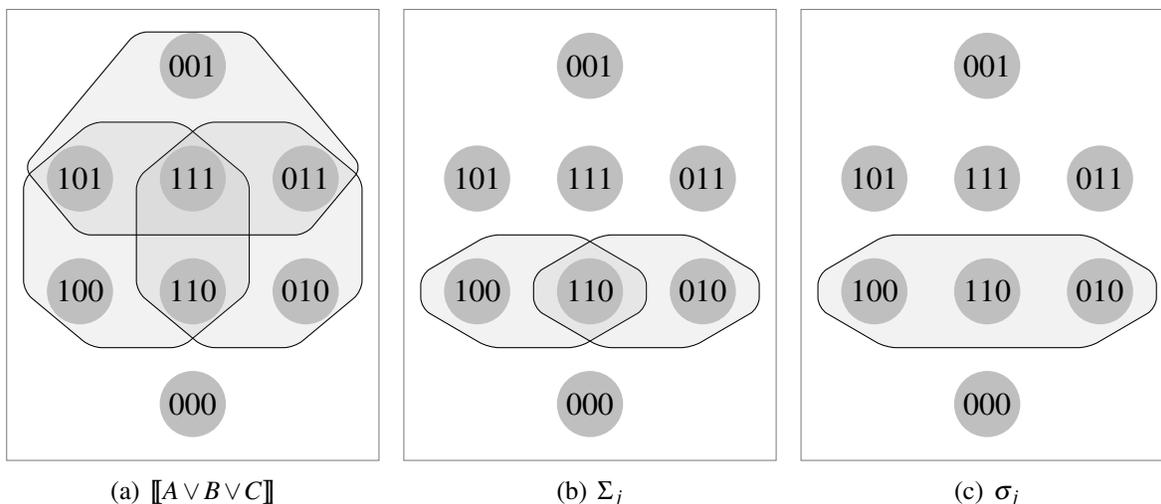


Figure 1: John wonders whether Ann, Bill, or Carol arrived.

4 A pragmatic account and its problems

4.1 The distribution requirement as a conversational implicature

- Prima facie, one may think that the distribution requirement could be explained pragmatically.
- We will illustrate a possible pragmatic derivation using the following simplified example:

(14) John wonders whether A , B or C .

- The speaker of (14) could have uttered another sentence with a **shorter disjunction**:

(15) John wonders whether A or B .

- This would have been a simpler, presumably still relevant, way to describe John's state.
- Thus, we could derive the following implicature:³

(16) a. **It is not the case that** John wonders whether A or B .

b. $\neg W_j(A \vee B)$

c. $w \models \neg W_j(A \vee B) \iff \sigma_j \in \llbracket A \rrbracket \cup \llbracket B \rrbracket \text{ or } \Sigma_j \notin \llbracket A \rrbracket \cup \llbracket B \rrbracket$

d. John knows whether A or B , or not every information state he wants to reach resolves the question whether A or B .

- It can't be that $\sigma_j \in \llbracket A \rrbracket \cup \llbracket B \rrbracket$ since this would contradict the ignorance condition of the original assertion.

³There is a pitfall: according to C&R's semantics for *wonder*, (15) is not more informative than (14). Under standard assumptions this blocks the implicature in (16a). For the sake of the argument, however, we assume that either the semantics of *wonder* or the standard assumptions about implicatures could be minimally adjusted in such a way that the implicature in (16a) does arise.

- Therefore, $\Sigma_j \not\subseteq \llbracket A \rrbracket \cup \llbracket B \rrbracket$. That is, not every information state John wants to be in resolves the question whether A or B.
- Together with the ‘entertainment’ condition of the original assertion, $\Sigma_j \subseteq \llbracket A \rrbracket \cup \llbracket B \rrbracket \cup \llbracket C \rrbracket$, this allows us to conclude that $\Sigma_j \cap \llbracket C \rrbracket \neq \emptyset$.
- That is, $\llbracket C \rrbracket$ is compatible with John’s inquisitive state, and hence with his information state.
- Following the same line of reasoning for the other disjuncts, we can derive that John’s information state has to be compatible with $\llbracket A \rrbracket$, with $\llbracket B \rrbracket$, and with $\llbracket C \rrbracket$.
- At the same time, his information state cannot entail any of $\llbracket A \rrbracket$, $\llbracket B \rrbracket$ and $\llbracket C \rrbracket$ due to the ignorance condition of the original assertion.
- Thus, we derive that John has to be ignorant w.r.t. $\llbracket A \rrbracket$, $\llbracket B \rrbracket$, and $\llbracket C \rrbracket$.

4.2 Arguments against the pragmatic account

- Under standard Gricean assumptions, implicatures are **cancellable** and **global**.
- This is not what we observe with the distribution requirement.

4.2.1 Obligatoriness

- The distribution requirement is **obligatory**:

(17) John wonders whether Ann, Bill or Carol arrived.

In fact, he already knows that Carol is still at home, but he doesn’t know yet whether Ann or Bill arrived.

- The continuation sounds felicitous only as a **retraction** of the first sentence.

4.2.2 Locality

- The distribution requirement is **local**. The following example illustrates this.

(18) **Situation** There is a crime with three suspects, Ann, Bill, and Carol. There are five detectives investigating the case; one has already ruled out Carol but is still wondering whether it was Ann or Bill. The others don’t know anything yet.

Example Exactly four detectives are wondering whether it was Ann, Bill, or Carol.

(Judgment: *true*)

- The judgment that this example is **true** can only be accounted for if the distribution requirement is **embedded** under the subject quantifier *exactly four detectives*.
- If the distribution requirement is derived as a global implicature, the sentence would be predicted to be **false**.

- Here's why: the literal meaning of the given assertion would be that **exactly four detectives** are such that they don't know whether it was Ann, Bill, or Carol and that every information state they want to be in resolves the issue of whether it was Ann, Bill or Carol.
- This is **false** in the situation above since **all five detectives** meet these conditions.
- Adding implicatures to the literal meaning of the sentence could only strengthen it and could thus not make it true in the given situation.
- Another example:

(19) **Situation** There is a crime with three suspects, Ann, Bill, and Carol; There are three detectives investigating the case.

- Detective 1 has ruled out Ann but still wonders whether it was Bill or Carol.
- Detective 2 has ruled out Bill but still wonders whether it was Ann or Carol.
- Detective 3 has ruled out Carol but still wonders whether it was Ann or Bill.⁴

Example Every detective is wondering whether it was Ann, Bill, or Carol.

(Judgment: *false*)

- Again, the judgment that this example is **false** makes sense if the distribution requirement is **embedded** under *every detective*.
- On the other hand, a global pragmatic account predicts the sentence to be **true**.
- Here's why: the predicted implicatures would be as follows:
 - (20) It is not the case that every detective wonders whether it was Ann or Bill.
 - (21) It is not the case that every detective wonders whether it was Bill or Carol.
 - (22) It is not the case that every detective wonders whether it was Carol or Ann.
 and so on...
- These implicatures are all **true** in the given situation. The presence of detectives 1 and 2 makes (20) true. The presence of detectives 2 and 3 makes (21) true. The presence of detectives 1 and 3 makes (22) true.

5 Two semantic accounts

- The fact that the distribution requirement is obligatory and local indicates that it has to be treated as part of the **semantics** of *wonder*.
- There are two plausible semantic analyses for the distribution requirement:
 - One involving a **stronger ignorance requirement** in the lexical semantics of *wonder*.

⁴We thank Benjamin Spector for drawing our attention to this type of situations.

- One involving an **exhaustivity operator** as part of the lexical semantics of *wonder*.⁵

5.1 A semantic account based on strong ignorance

- In C&R’s semantics for *wonder*, the ignorance condition is defined simply as $\neg K_a \varphi$.
- That is, the subject’s information state must not be contained in any alternative in $\llbracket \varphi \rrbracket$.
- This is a relatively weak notion of ignorance.
- A natural way to strengthen it would be to require that, in addition, the subject’s information state should be **compatible** with every alternative in $\llbracket \varphi \rrbracket$.
- We introduce a new modal operator, I , which expresses this strong form of ignorance:

$$(23) \quad w \models I_a \varphi \iff \forall \alpha \in \text{ALT}(\varphi) : \sigma_a(w) \not\subseteq \alpha \text{ and } \sigma_a(w) \cap \alpha \neq \emptyset$$

- Using this strong ignorance operator, we can re-define the *wonder* modality in IEL:

$$(24) \quad W_a \varphi := I_a \varphi \wedge E_a \varphi$$

- This analysis directly encodes the distribution requirement in the lexical semantics of *wonder*.
- Clearly, the local and obligatory nature of the requirement are captured in this way.

5.2 A semantic account based on built-in exhaustivity

- We will now consider a more indirect account, which consists in building an **exhaustivity operator** into C&R’s lexical semantics of *wonder*.
- We will assume that this exhaustivity operator is sensitive to the **formal structure** of its argument, rather than just its semantic content.
- A purely semantic exhaustivity operator would be difficult to distinguish from the above ‘strong ignorance’ account.
- For any two natural language expressions φ and φ' , we write $\varphi' \lesssim \varphi$ iff φ' is formally simpler than φ in the sense of Katzir (2007).
- The semantics of *wonder* can then be formulated as follows:⁶

$$(25) \quad \ulcorner \text{wonder } Q \urcorner = \lambda x. \mathbf{EXH}_{\{W_x(\ulcorner Q \urcorner) \mid Q' \lesssim Q\}} W_x(\ulcorner Q \urcorner)$$

where:

⁵Yet another possible analysis would be one involving an exhaustivity operator in the syntax (Chierchia et al., 2012) rather than in the lexical semantics of *wonder*. However, on such an approach additional assumptions would be needed about the distribution of this operator, in order to account for the locality and obligatory nature of the ignorance implication of *wonder*. For now, we leave this possible analysis out of consideration.

⁶Since the exhaustivity operator is structure-sensitive, we need to give a syncategorematic treatment of *wonder*.

$$(26) \quad \mathbf{EXH}_A(\varphi) := \varphi \wedge \forall \varphi' \in \mathbf{NW}(\varphi, A) : \neg \varphi'$$

$$(27) \quad \mathbf{NW}(\varphi, A) = \{\psi \in A \mid \varphi \not\models \psi\}$$

- The alternatives for the exhaustification are sentences of the form ‘ x wonders Q' ’, where Q' is a simpler question than the original question Q .
- As a result of the exhaustification, *wonder* negates those alternatives that are not entailed by the original meaning.⁷
- The obligatory and local nature of the distribution requirement follow from this analysis as well.

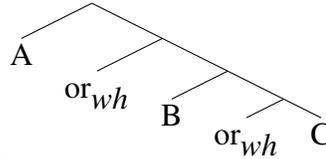
$$(28) \quad \lceil \text{Every detective wonders whether } A, B \text{ or } C \rceil$$

$$= \forall x : \mathbf{detective}(x) \rightarrow \mathbf{EXH}_{\{W_x(\lceil Q' \rceil) \mid Q' \lesssim \text{whether } A, B \text{ or } C\}} W_x(A \vee B \vee C)$$

$$(29) \quad = \forall x : \mathbf{detective}(x) \rightarrow \left(\begin{array}{l} W_x(A \vee B \vee C) \\ \wedge \neg W_x(A \vee B) \\ \wedge \neg W_x(B \vee C) \\ \wedge \neg W_x(C \vee A) \\ \wedge \neg W_x(A) \\ \wedge \neg W_x(B) \\ \wedge \neg W_x(C) \end{array} \right)$$

$$(30) \quad \equiv \forall x : \mathbf{detective}(x) \rightarrow \left(\begin{array}{l} W_x(A \vee B \vee C) \\ \wedge \neg W_x(A \vee B) \\ \wedge \neg W_x(B \vee C) \\ \wedge \neg W_x(C \vee A) \end{array} \right)$$

- Note: we assume here that the syntactic structure of *whether A, B, or C* is as follows:



⁷We could furthermore add a restriction to the set of alternatives to be those that are innocently excludable (IE), in order to avoid potential contradiction arising from the negation of an alternative (Fox, 2007):

$$(i) \quad \mathbf{EXH}_A(\varphi) := \varphi \wedge \forall \varphi' \in \mathbf{IE}(\varphi, A) : \neg \varphi'$$

$$(ii) \quad \mathbf{IE}(\varphi, A) := \bigcap \{A' \subseteq A \mid A' \text{ is a maximal subset of } A \text{ s.t. } \{\neg \varphi' \mid \varphi' \in A'\} \cup \{\varphi\} \text{ is consistent}\}$$

However, we keep the simpler formulation in (26) since there would be no contradiction arising from the negation of non-weaker alternatives in the examples under consideration.

6 Attempts to tease the two semantic accounts apart

6.1 Data favoring the exhaustivity account

- *Wonder* with a *wh*-question complement, such as the following, seems to **lack the distribution requirement**.

(31) John wonders **which of his students** arrived.

- (31) is **true** even if John has ruled out the possibility that one of the students, Carol, arrived.
- The same holds if we make the domain explicit in the context so that an **implicit domain restriction would be difficult**.

(32) **Situation** John has three students: Ann, Bill, and Carol. He is waiting for all of them to arrive at a lab meeting. Someone knocks the door, but he knows that it can't be Carol because she has just emailed him that she will be late.

Example John wonders which of his students arrived. (Judgment: *true*)

- It turns out, though, that the distinction is **not** about alternative questions vs. *wh*-questions. This is so since the following example does exhibit the distribution requirement, even though it involves a *wh*-question.

(33) John wonders **which of Ann, Bill and Carol** arrived.

- The problem here is how to account for the contrast between
 1. **'normal' *wh*-questions** like (31), and
 2. **'list-partitive' *wh*-questions** like (33), and **alternative questions**.
- The contrast is puzzling if the mechanism responsible for the distribution requirement is only sensitive to the **semantic properties** of the complement of *wonder*.
- This is so since it is hard to distinguish between 'normal' *wh*-questions and 'list-partitive' *wh*-questions in terms of semantic properties.
- On the other hand, the contrast *can* be accounted for under the view that the distribution requirement is a result of exhaustification w.r.t. structural alternatives.
 - *whether Ann or Bill arrived* \lesssim *whether Ann, Bill or Carol arrived*.
 - *which of Ann and Bill arrived* \lesssim *which of Ann, Bill and Carol arrived*.
 - *whether Ann or Bill arrived* $\not\lesssim$ *which of his students arrived*.
- This is a potential **argument for the exhaustivity-based account** given that it is implemented with a **structural notion of alternatives**. The account based on strong ignorance, on the other hand, can only take the semantic properties of the complement into account.

Further evidence for the lack of the distribution requirement in ‘normal’ *wh*-questions

- (34) **Situation** There is a crime with three suspects, Ann, Bill, and Carol; There are five detectives investigating the case; one has already ruled out Carol but is still wondering whether it was Ann or Bill. The others don’t know anything yet.

Example Exactly four detectives are wondering which of the suspects did it.

(Judgment: *false*)

- (35) **Situation** There is a crime with three suspects, Ann, Bill, and Carol; There are three detectives investigating the case.

- Detective 1 has ruled out Ann but still wondering whether it was Bill or Carol.
- Detective 2 has ruled out Bill but still wondering whether it was Ann or Carol.
- Detective 3 has ruled out Carol but still wondering whether it was Ann or Bill.

Example Every detective is wondering which of the suspects did it. (Judgment: *true*)

- If the distribution requirement were there in the same way as in our original example involving alternative questions, (34) should be true and (35) should be false.
- It should be noted that we cannot rule out the possibility that there is an implicit domain restriction in examples with *wh*-questions. In particular, (34) and (35) could be taken to involve domain restrictions with a variable bound by the subject quantifier, as made explicit in the following examples:

(36) Exactly four detectives are wondering which of the suspects **that they are still suspecting** did it.

(37) Every detective is wondering which of the suspects **that they are still suspecting** did it.

- If this is indeed what is going on, the data is compatible with the ‘strong ignorance’ account, which hardcodes the distribution requirement in the lexical semantics of *wonder*.
 - (36) would then be judged false because all five detectives are such that they satisfy the distribution requirement with respect to the suspects that they are still suspecting.
 - (37) would be judged true because all detectives are such that they satisfy the distribution requirement with respect to the suspects that they are still suspecting.
- However, on this account it remains to be explained why the assumed implicit domain restriction seems to be **obligatory**.
- Prima facie, one would expect that implicit domain restriction is **optional**, and that there are **various** possible restrictions, not just this particular one.

6.2 Problematic data for the exhaustivity account

- Adding a **numeral** in the domain of *wh*-phrases seems to flip the judgments.

(38) **Situation** John has three students: Ann, Bill, and Carol. He is waiting for all of them to arrive at a lab meeting. Someone knocks the door, but he knows that it can't be Ann because she has just emailed him that she will be late.

Example John wonders which of his **three** students arrived. (Judgment: *false*)

(39) **Situation** There is a crime with three suspects, Ann, Bill, and Carol; There are five detectives investigating the case; one has ruled out Carol but is still wondering whether it was Ann or Bill. The others don't know anything yet.

Example Exactly four detectives are wondering which of the **three** suspects did it. (Judgment: *true?*)

(40) **Situation** There is a crime with three suspects, Ann, Bill, and Carol; There are three detectives investigating the case.

- Detective 1 has ruled out Ann but still wondering whether it was Bill or Carol.
- Detective 2 has ruled out Bill but still wondering whether it was Ann or Carol.
- Detective 3 has ruled out Carol but still wondering whether it was Ann or Bill.

Example Every detective is wondering which of the **three** suspects did it. (Judgment: *false*)

- This phenomenon is surprising under the exhaustivity-based account with structural alternatives.
- The structural alternatives for *wh*-questions with numerals do not include alternatives such as *whether Ann or Bill arrived*, which would be necessary for the derivation of the distribution requirement.
- On the other hand, the 'strong ignorance' analysis would predict the given judgments, under the assumption that **numerals block implicit domain restriction**.
- However, at this point we cannot tell yet whether this is a valid assumption, and if so, why.

7 Conclusion

- If an inquisitive predicate like *wonder* takes an alternative question or a list-partitive *wh*-question as its complement, it implies that the subject is ignorant about each of the alternatives in the question meaning.
- We call this the **distribution requirement**.
- The distribution requirement is **obligatory** and **local**.
- We considered two semantic accounts:
 - one based on a **strong notion of ignorance** (stronger than $\neg K_a \phi$)

- the other based on a **built-in exhaustivity operator**.
- The fact that the distribution requirement is absent with ‘normal’ *wh*-questions but present with ‘list-partitive’ *wh*-questions suggests that the distribution requirement is sensitive to the **form** of the complement.
- This is a potential argument in favor of the exhaustivity-based account with a **structure-sensitive notion of alternatives** (Katzir, 2007).
- If this account indeed turns out to be correct, inquisitive predicates like *wonder* involve a lexical manifestation of a structure-sensitive exhaustivity operator, just like *only* according to Fox and Katzir (2011).
- However, data involving numerals remain problematic and may be easier to accommodate on the ‘strong ignorance’ account.
- One interesting question we did not address here is whether the distribution requirement could be related in an insightful way to the selectional restrictions of inquisitive predicates.
 - Perhaps the distribution requirement could play a role in explaining why these predicates only take interrogative complements.
 - Or the other way around.
 - Or inquisitive predicates have yet another common property which in turn explains both the distribution requirement and the selectional restrictions.

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