Floris Roelofsen, Nadine Theiler & Maria Aloni

A *semantic* account of the selectional restrictions of some (anti-)rogative verbs

SALT 27
WORKSHOP ON MEANING AND DISTRIBUTION
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CLAUSE-EMBEDDING VERBS

Some verbs take **both** declarative and interrogative complements:

(1) a. Bill **knows** that Mary left.
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TWO APPROACHES

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	selectional restrictions	selectional flexibility
type distinction	✓	✗
uniformity	✗	✓

OUTLINE

Today I will:

1. discuss a challenge for type-distinction-based accounts
2. sketch a uniform treatment of clause-embedding
3. propose an account of the selectional restrictions of anti-rogatives
4. review an account of *wonder*that*

TYPE-BASED ACCOUNTS

- **Most previous work** assumes a type distinction:

  Karttunen (1977); Heim (1994); Dayal (1996); Beck and Rullmann (1999); Lahiri (2002); George (2011); Spector and Egré (2015); Uegaki (2015); among others

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- Account for **selectional restrictions** of (anti-)rogatives:
  - anti-rogatives **only take** complements of type $\langle s,t \rangle$
  - rogatives **only take** complements of type $\langle\langle s,t \rangle,t \rangle$

PROBLEM: TYPE-SHIFTING

John **knows** that Mary arrived $\langle s,t\rangle$ and he **knows** what she brought $\langle\langle s,t\rangle,t\rangle$

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that Mary arrived: ⟨**s,t**⟩

what she brought: ⟨⟨**s,t**⟩,**t**⟩

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A type-based account cannot directly capture the selectional restrictions of **both** rogatives and anti-rogatives **at once**.

PART 2

A *uniform* treatment of clausal complements

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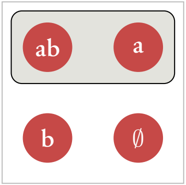
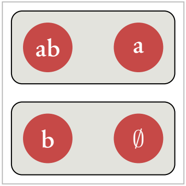
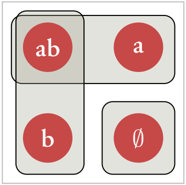


Ann left.



Did Ann leave?



Who left?

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doxastic state of x in w

$$[\![\text{be certain}]\!]^w = \lambda P_{\langle st,t\rangle}.\lambda x.\ \textsc{dox}_x^w \in P$$

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(5) Mary is certain whether John left.

$\rightsquigarrow$ **True** in w iff $\exists p \in \left\{\begin{array}{l}\{w \mid \text{John left in } w\},\\ \{w \mid \text{John didn't leave in } w\}\end{array}\right\}$ s.t. $\textsc{dox}_m^w \subseteq p$

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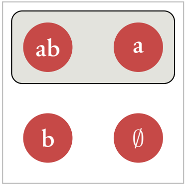

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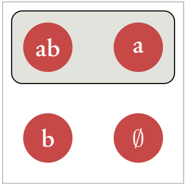

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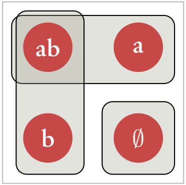

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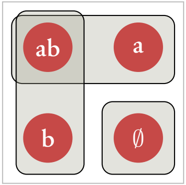

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PART 3

Selectional restrictions of *anti-rogative* verbs

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1. Attitude verbs: e.g., *believe*, *think*, *feel*, *expect*, *want*, *desire*
2. Likelihood verbs: e.g., *seem*, *be likely*
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Zuber (1982): **all neg-raising verbs are anti-rogative.**

NEG-RAISING VIA EXCLUDED MIDDLE PRESUPPOSITION

Neg-raising verbs come with an **excluded middle presupposition** (Bartsch, 1973; Gajewski, 2007).

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- Presupposed and asserted content logically **independent**.
- Together they **imply** that John believes Mary didn't leave.

STATUS OF THE EXCLUDED-MIDDLE PRESUPPOSITION

- Neg-raising is defeasible (Bartsch, 1973):

(9) Bill doesn't know who killed Caesar. Bill isn't even sure whether or not Brutus and Caesar lived at the same time. So, naturally, Bill **doesn't** believe Brutus killed Caesar.
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- It can't be a **semantic presupposition**.
- However, it can't be purely pragmatic either, since there is **no obvious semantic property** determining if a verb is neg-raising (Horn, 1978).

✓*want*/✗*desire*	✓*hope*/✗*hoffen*
(Horn, 1978)	(Gajewski, 2007)

A SOFT PRESUPPOSITION

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- Thus, they are more context-dependent than semantic presuppositions.
- Simons (2001)'s **explicit ignorance contexts:**

(10) I don't know whether Bill even participated in the singing contest, but if he won, he's surely over the moon.

(11) I don't know whether anyone watered the plants, #but if it is Mary who did it, she probably gave them too much water.

NEG-RAISING *BELIEVE*

$$[\![\text{believe}]\!]^w = \lambda P_{\langle st,t\rangle}.\lambda x : \underline{\textsc{dox}_x^w \in P \vee \textsc{dox}_x^w \in \neg P}\ .\ \textsc{dox}_x^w \in P$$

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The negation is **inquisitive negation:**

$$\neg P := \{p \mid \forall q \in P : p \cap q = \emptyset\}$$

For example:

$P =$  $\neg P =$ 

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The effect of this presupposition depends on whether P is a declarative or an interrogative complement.

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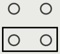
$\neg P =$ 

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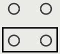
$P =$  $\neg P =$ 

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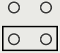
$P =$  $\neg P =$ 

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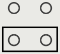
$P =$  $\neg P =$ 

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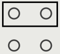
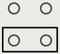
$P =$  $\neg P =$ 

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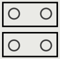
$P =$ 

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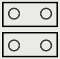
$P =$ 

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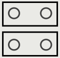
$P =$  $\neg P = \{\emptyset\}$

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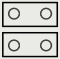
$P =$  $\neg P = \{\emptyset\}$

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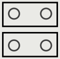
$P =$  $\neg P = \{\emptyset\}$

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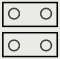
$P =$  $\neg P = \{\emptyset\}$

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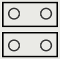
$P =$  $\neg P = \{\emptyset\}$

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Whenever $[\![\text{believe}]\!]^w(P)(x)$ is defined, it is true. In other words, its assertive content is **trivial relative to its presupposition.**

GAJEWSKI'S L-ANALYTICITY

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- Gajewski (2002, 2008) proposes a notion to delineate systematic from non-systematic triviality: **L-analyticity.**
- L-analyticity, he argues, manifests as **ungrammaticality**:

(13) There is a/***every** wooden table.

We need to distinguish between **logical vocabulary** and **non-logical vocabulary** (approximation: invariance conditions).

logical: *every*, *if*, *is*   **non-logical:** *table*, *brother*

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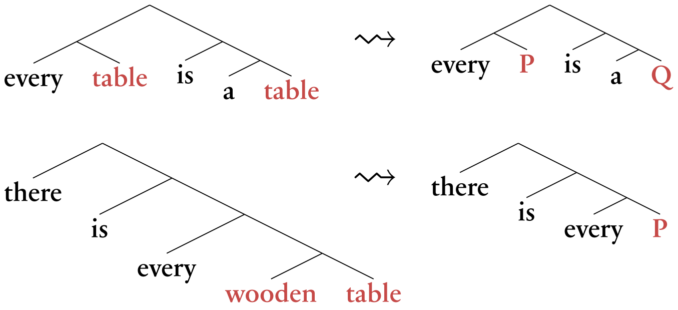

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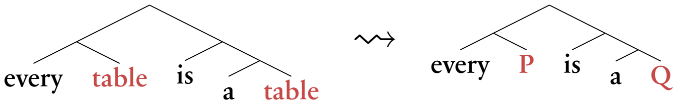

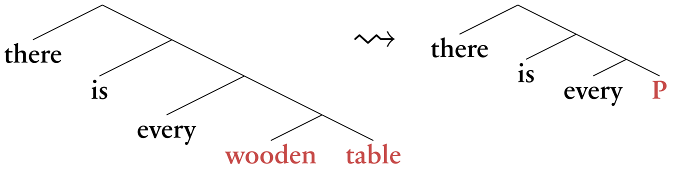

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S is ungrammatical if its LF contains an L-analytical constituent.

DECOMPOSING ATTITUDE VERBS

To show that the systematic triviality of *believe*wh* is a case of L-analyticity, we assume that:

1. Interrogative complements are headed by the **interrogative marker ?**:

$$[\![?]\!]^w := \lambda P_{\langle st,t \rangle}.P \cup \neg P$$

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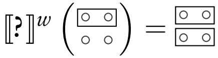
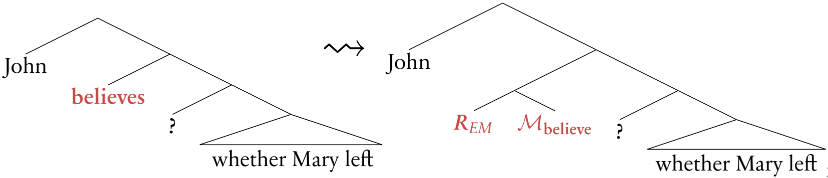
e.g. 

2. Neg-raising attitude verbs are **decomposed** at LF into two predicates: R_{EM}, which is common to all neg-raising attitude verbs, and $\mathcal{M}_V$, which is specific to the respective verb:



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$\mathcal{M}_V$ is a function mapping an individual x to a **modal base.**

e.g. $[\![\mathcal{M}_{\text{believe}}(j)]\!]^w = \textsc{dox}_j^w$

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R_{EM} triggers the EM presupposition and connects $\mathcal{M}_V$ to the subject and the complement meaning:

$$[\![R_{\text{EM}}]\!] := \lambda \mathcal{M}_{\langle \text{e,st} \rangle}.\lambda P_{\langle st,t \rangle}.\lambda x : \underline{\mathcal{M}(x) \in P \lor \mathcal{M}(x) \in \neg P}. \mathcal{M}(x) \in P$$

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$\mathcal{M}_V$ is "contentful", hence **non-logical.** R_{EM} is **logical.**

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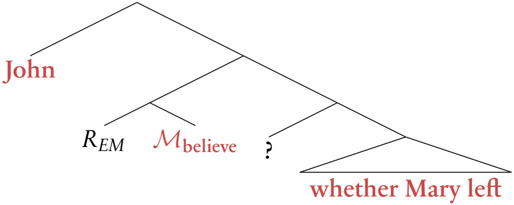

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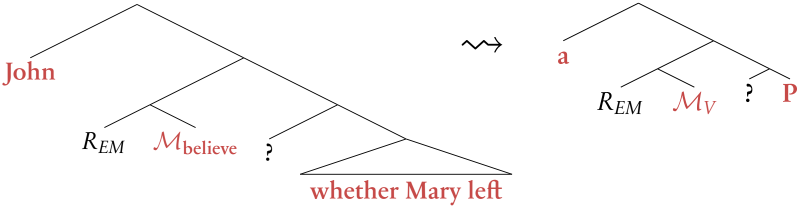

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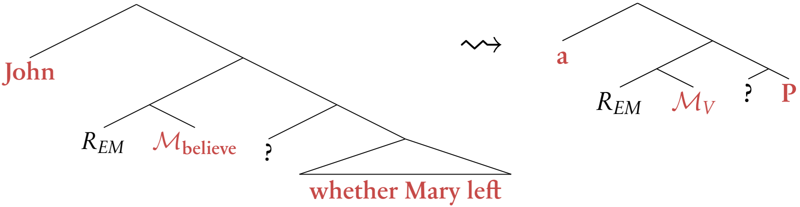

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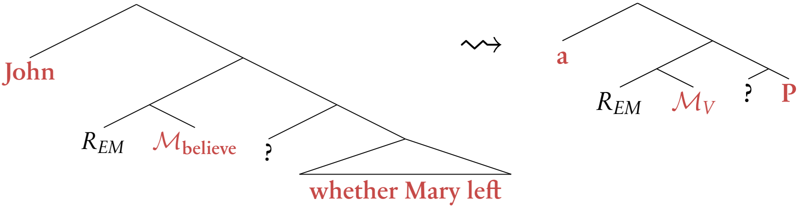

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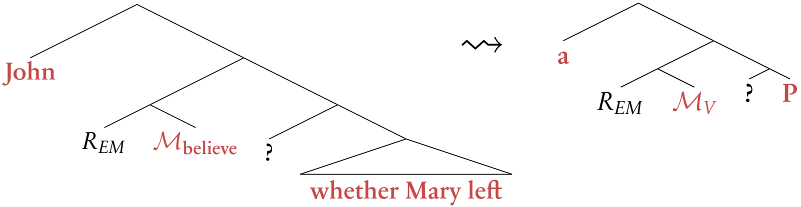

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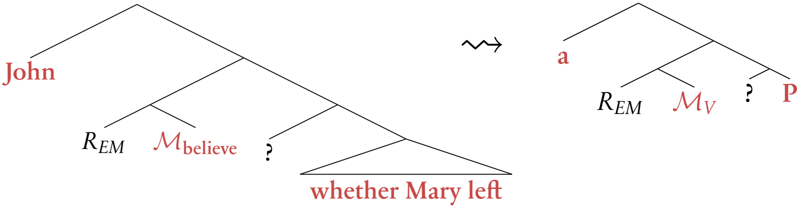

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True whenever defined = L-analytical. Hence, ungrammatical.

OTHER ANTI-ROGATIVES

1. Attitude verbs: e.g., *believe*, *think*, *feel*, *expect*, *want*, *desire*
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So, if truth-assessing verbs take a complement which covers the entire logical space, this results in systematic triviality, too.

PART 4

Accounting for *wonder*that*

ROGATIVE VERBS

At least three subclasses within the class of rogative verbs (cf., Karttunen, 1977):

1. **Attitude verbs:** e.g., *wonder*, *be curious*, *investigate*
2. **Speech act verbs:** e.g., *ask*, *inquire*
3. **Verbs of dependency:** e.g., *depend on*, *be determined by*

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- For example:

$\textsc{dox}_x^w =$  $\Sigma_x^w =$ 

$$[\![\text{wonder}]\!]^w := \lambda P.\lambda x.\ \underbrace{\textsc{dox}_x^w \notin P}_{x \text{ isn't certain}} \wedge \underbrace{\forall q \in \Sigma_x^w : q \in P}_{\text{but wants to find out}}$$

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If *wonder* takes a declarative complement, the two conjuncts in the entry for the verb always become contradictory.

This contradiction is systematic too, but is it also L-analytical?

CONCLUSION

- Assuming a type distinction between declarative and interrogative complements is not necessary for capturing the selectional restrictions of clause-embedding verbs.

- We have seen several examples of how these restrictions can instead be derived from the interplay between:
    - the semantic properties of the respective complements and
    - independently motivated features of the embedding verbs.

THANK YOU!

Abusch, D. (2002). Lexical alternatives as a source of pragmatic presuppositions. In *Proceedings of SALT*, volume 12, pages 1–19. Citeseer.

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

AnderBois, S. (2014). The semantics of sluicing: Beyond truth conditions. *Language*, **90**(4), 887–926.

Bartsch, R. (1973). "Negative transportation" gibt es nicht. *Linguistische Berichte*, **27**(7).

Beck, S. and Rullmann, H. (1999). A flexible approach to exhaustivity in questions. *Natural Language Semantics*, **7**(3), 249–298.

Ciardelli, I. and Roelofsen, F. (2015). Inquisitive dynamic epistemic logic. *Synthese*, **192**(6), 1643–1687.

Dayal, V. (1996). *Locality in wh-quantification: questions and relative clauses in Hindi*. Kluwer Academic Publishers.

Gajewski, J. (2002). L-analyticity and natural language. Manuscript, MIT.

Gajewski, J. (2008). NPI *any* and connected exceptive phrases. *Natural Language Semantics*, **16**(1), 69–110.

Gajewski, J. R. (2007). Neg-raising and polarity. *Linguistics and Philosophy*, **30**(3), 289–328.

George, B. R. (2011). *Question embedding and the semantics of answers*. Ph.D. thesis, University of California, Los Angeles.

Heim, I. (1994). Interrogative semantics and Karttunen's semantics for *know*. In R. Buchalla and A. Mittwoch, editors, *The Proceedings of the Ninth Annual Conference and the Worshop on Discourse of the Israel Association for Theoretical Linguistics*. Academon, Jerusalem.

Horn, L. (1978). Remarks on neg-raising. *Syntax and semantics*, **9**, 129–220.

Karttunen, L. (1977). Syntax and semantics of questions. *Linguistics and Philosophy*, **1**, 3–44.

Lahiri, U. (2002). *Questions and answers in embedded contexts*. Oxford University Press.

Roelofsen, F. (2013). Algebraic foundations for the semantic treatment of inquisitive content. *Synthese*, **190**(1), 79–102.

Simons, M. (2001). On the conversational basis of some presuppositions. In B. J. Rachel Hastings and Z. Zvolenszky, editors, *Proceedings of Semantics and Linguistic Theory (SALT 11)*, pages 431–448. Cornell University, CLC Publications.

Spector, B. and Egré, P. (2015). A uniform semantics for embedded interrogatives: An answer, not necessarily the answer. *Synthese*, **192**(6), 1729–1784.

Uegaki, W. (2015). *Interpreting questions under attitudes*. Ph.D. thesis, Massachusetts Institute of Technology.

Zuber, R. (1982). Semantic restrictions on certain complementizers. In *Proceedings of the 12th International Congress of Linguists, Tokyo*, pages 434–436.

WHAT IF THE EM INFERENCE IS NO PRESUPPOSITION?

- Romoli suggests the EM inference is a **scalar implicature.**
- If we adopt this view, we can't explain the anti-rogativity of neg-raisers in termss of **"if defined, then always true."**
- We then need a modified definition of L-analyticity, appealing to **local redundancy** rather than triviality.
- Gajewski himself actually suggests such a definition:

> A sentence *S* is ungrammatical if its Logical Skeleton contains a nonlogical terminal element that is **irrelevant to determining the semantic value of *S*.**

EM SUSPENSION AND UNGRAMMATICALITY

Why doesn't suspending the EM presupposition fix the ungrammaticality of believe*whs?

- Because grammar, Gajewski assumes, is **blind** to the non-logical aspects of sentence meaning.
- Following Abusch, the EM presupposition arises from a **pragmatic default principle**, which can be suspended by the **context**.
- This **contextual information** falls into exactly the category of **non-logical meaning aspects**, to which grammar is blind.
- Hence, suspending the EM presupposition **doesn't have an influence on grammaticality**.

WHY NOT TREAT ALL VERBS LIKE *BE TRUE*?

Why don't we treat all anti-rogative verbs like *be true*, i.e., assume that they operate purely on the informative content of their complements?

- Because to assume this for all verbs would be a stipulation.
- Which motivation do we have to assume that *believe* only operates on informative content, while *be certain* operates on inquisitive content?
- It is clear what (14) *would* mean if grammatical.

(14) *John believes whether Mary left.

- It isn't clear what (15) *would* mean if grammatical.

(15) *It is true whether Mary left.

HYBRID COMPLEMENTS

(16) John believes that Mary lives in NYC and when she moved there.

- We currently predict that (16) is grammatical.
- The reason is that the complement in (16) is a **hybrid**: it both conveys information and requests information.
- Our treatment of *believe*wh* relies on questions being uninformative though.
- This is a real problem for our account.
- One possible solution: treat conjunction of complements in terms of ellipsis.

YOU WON'T BELIEVE WH

(17) You won't believe who won!

This is not a very productive construction.

- It is limited to *believe*:

  (18) *You won't think who won!

- It is limited to *wh*-interrogatives:

  (19) *You won't believe if/whether Mary won!

- Moreover, *believe* in this construction becomes factive.

Inquisitive negation

There is both empirical and conceptual independent support for the inquisitive negation operator:

- Conceptually, the operator is determined by exactly the same algebraic properties as the standard truth-conditional negation operator (Roelofsen, 2013).
- Empirical support comes, for instance, from the behavior of negation in sluicing constructions (AnderBois, 2014).

Speech act verbs

(20) x asked φ.

- It's natural to assume that part of what (20) conveys is: x uttered a sentence φ which was inquisitive w.r.t. the CG in the context of utterance
- (This is something that seems to be an inherent aspect of the speech act of asking)
- This is impossible if φ is a declarative, because then it is bound to be non-inquisitive.

ABUSCH'S SOFT TRIGGERS

- Abusch (2002, 2010) assumes that soft triggers don't carry semantic presuppositions, but introduce sets of alternatives:

$$\textsc{alt}(\textbf{win}) = \{\, \textbf{win}, \textbf{lose} \,\}$$

- Via pointwise composition, these alternatives manifest at the sentential level:

$$\textsc{alt}(\textbf{Mary won}) = \{\, \textbf{won}(m), \textbf{lost}(m) \,\}$$

- A pragmatic default principle then requires the disjunction of the sentential alternatives to hold in the context of evaluation:

$$\bigvee \textsc{alt}(\textbf{Mary won}) = \textbf{won}(m) \vee \textbf{lost}(m)$$

- This disjunction entails the soft presupposition:

$$(\textbf{won}(m) \vee \textbf{lost}(m)) \Rightarrow \textbf{participated}(m)$$

EXCLUDED MIDDLE AS A SOFT PRESUPPOSITION

Gajewski (2007): neg-raising verbs are soft triggers.

$$\textsc{alt}(\textbf{believe}(p)) = \left\{ \begin{array}{c} \textbf{believe}(p), \\ \textbf{believe}(\neg p) \end{array} \right\}$$

- Then the disjunctive closure gives us exactly the excluded middle presupposition:

  $$\bigvee \textsc{alt}(\textbf{believe}(p)(j)) = \textbf{believe}(p)(j) \vee \textbf{believe}(\neg p)(j)$$

- The defeasibility of neg-raising inferences is explained by the default-nature of the pragmatic principle.
- This treatment of neg-raising strikes a balance between context-dependence and lexical idiosyncrasy.