On the selectional restrictions of clause-embedding predicates

Floris Roelofsen

This talk is to a large extent based on joint work with Maria Aloni, Ivano Ciardelli, and especially ***Nadine Theiler***

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CLAUSE-EMBEDDING PREDICATES

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(1) a. Bill **knows** that Mary left.
    b. Bill **knows** whether Mary left / who left.

RESPONSIVES

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ROGATIVES

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ROGATIVES

Yet others only declarative complements:

(3) a. Bill **believes** that Mary left.
b. *Bill **believes** whether Mary left / who left.

ANTI-ROGATIVES

TWO APPROACHES

TYPE DISTINCTION
Declarative/interrogative complements have **different semantic types**

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	selectional restrictions	selectional flexibility
type distinction	✓	✗
uniformity	✗	✓

OUTLINE

Today:

1. Briefly discuss some limitations of the **type**-based approach
2. Survey some recent **uniform** accounts of
   - Anti-rogatives: *believe*, *hope*
   - Rogatives: *wonder*, *depend on*
3. Highlight some open issues that need to be investigated further

PART 1

Limitations of the type-based approach

TYPE-BASED APPROACH

- Many authors assume a type-distinction between declarative and interrogative complements.
- More specifically, it is usually assumed that:
  - Declarative complements are of **type $\langle s,t \rangle$**
  - Interrogative complements are of **type $\langle\langle s,t \rangle,t \rangle$**

Karttunen (1977); Heim (1994); Dayal (1996); Beck and Rullmann (1999)

Lahiri (2002); Spector and Egré (2015); among others

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- Assuming such a distinction, one could account for **selectional restrictions** by stipulating that:
  - anti-rogatives **only take** complements of type **⟨s,t⟩**
  - rogatives **only take** complements of type **⟨⟨s,t⟩,t⟩**

LIMITATION 1: TYPE-SHIFTING OBVIATES CLASH

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

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↑

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We lose the account of *wonder*that*

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

We **lose** the account of ***believe*wh***

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

LIMITATION 2: EXPLANATORY VALUE

- It needs to be stipulated which predicates take complements of type $\langle \mathbf{s,t} \rangle$ and which take complements of type $\langle\langle \mathbf{s,t} \rangle, \mathbf{t} \rangle$.
- Therefore, the account only has explanatory value to the extent that these stipulations can be independently motivated.

That is, we want to link the selectional restrictions of (anti-)rogatives to independently observable semantic properties of these predicates.

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That is, we want to link the selectional restrictions of (anti-)rogatives to independently observable semantic properties of these predicates.

- Uegaki (2015a) suggests that a type-distinction between *know* and *believe* could indeed be independently motivated.
- But Theiler *et al.* (2018) discuss a number of open issues for this line of motivation.
- Perhaps these issues can be resolved. But as long as they remain open, the type-based approach has limited explanatory value.

PART 2

Anti-rogatives

ANTI-ROGATIVES: INITIAL CLASSIFICATION

1. Likelihood predicates: e.g., *seem*, *be likely*
2. Epistemic attitude predicates: e.g., *believe*, *think*, *feel*
3. Preferential attitude predicates: e.g., *want*, *desire*, *hope*
4. Truth-evaluating predicates: e.g., *be true*, and *be false*
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- Why would such verbs not license interrogative complements?
- Do they have some semantic property in common from which this may be derived?

SOME RELEVANT SEMANTIC PROPERTIES

- So far, no unique semantic property has been identified that is common to all anti-rogative predicates.
- However, it has been observed that several sub-classes do have common semantic properties which may explain their anti-rogativity.
- In particular:

All **neg-raising** predicates are anti-rogative.
(Zuber, 1982)

All **non-veridical preferential** predicates are anti-rogative.
(Uegaki and Sudo, 2017)

SOME RELEVANT SEMANTIC PROPERTIES

These two properties together cover three classes on our list:

1. Likelihood predicates: e.g., *seem*, *be likely*
2. Epistemic attitude predicates: e.g., *believe*, *think*, *feel*
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5. Speech act predicates: e.g., *claim*, *suggest*

All elements of class (1) and (2) and some of class (3) are neg-raising.

All elements of class (3) are non-veridical preferential.

SOME RELEVANT SEMANTIC PROPERTIES

- Furthermore, recent work has argued that anti-rogativity can indeed be **derived** from each of these two properties.

  (Theiler *et al.*, 2016, 2017, 2018; Uegaki and Sudo, 2017, 2018; Mayr, 2017; Cohen, 2017)

- I will illustrate how this can be done (without going into all the details).

NEG-RAISING VIA AN EXCLUDED MIDDLE PRESUPPOSITION

Bartsch (1973) and Gajewski (2007) have argued that neg-raising predicates carry an **excluded middle presupposition**.

(4) John believes that Mary left.
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- Together they **imply** that John believes Mary didn't leave.

COMBINING THE EXCLUDED MIDDLE PRESUPPOSITION WITH A UNIFORM TREATMENT OF CLAUSAL COMPLEMENTS

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

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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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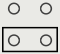
$\neg P =$ 

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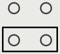
$P =$  $\neg P =$ 

$$
\begin{aligned}
[\![\text{believe}(P)(x)]\!]^w &= 1 \text{ iff } \textsc{dox}_x^w \in P \\
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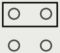
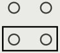
$P =$ 

$\neg P =$ 

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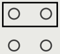
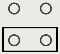
$P =$ 

$\neg P =$ 

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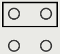
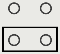
$P =$  $\neg P =$ 

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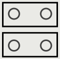
$P =$ 

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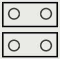
$P =$  $\neg P = \{\emptyset\}$

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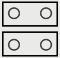
$P =$ 

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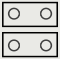
$P =$  $\qquad \neg P = \{\emptyset\}$

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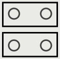
$P =$  $\qquad \neg P = \{\emptyset\}$

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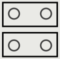
$P =$  $\qquad \neg P = \{\emptyset\}$

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identical!

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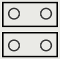
$P =$  $\qquad \neg P = \{\emptyset\}$

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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.**

L-ANALYTICITY

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- Gajewski (2002, 2008) proposes a notion that delineates systematic from non-systematic triviality: **L-analyticity.**

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This triviality is systematic: it arises independently of the specific predicate and the specific complement—as long as the predicate is neg-raising and the complement interrogative.

- Gajewski (2002, 2008) proposes a notion that delineates systematic from non-systematic triviality: L-analyticity.
- L-analyticity, he argues, is perceived as ungrammaticality:

(6)	Every table is a table.	'plain' tautology
(7)	*There is every table in the kitchen.	L-analytical

- Theiler *et al.* (2017) show that neg-raising predicates with interrogative complements always yield L-analyticity.

NON-VERIDICAL PREFERENTIAL PREDICATES

- Non-veridical preferential predicates are anti-rogative: (Uegaki and Sudo, 2017)

(8) a. Bill **hopes** / **wishes** that Mary left.
b. *Bill **hopes** / **wishes** whether Mary left.
c. *Bill **hopes** / **wishes** who left.

- By contrast, veridical preferential predicates, aka emotive factives are only anti-rogative to a milder degree.
- They generally license *wh*-complements (except *regret*), though *whether*-complements are still bad:

(9) a. Bill is **happy** / **surprised** that Mary left.
b. *Bill is **happy** / **surprised** (about) whether Mary left.
c. Bill is **happy** / **surprised** (about) who left.

NON-VERIDICAL PREFERENTIAL PREDICATES

- Can this pattern be derived from the semantics of preferential predicates?
- To see this, let us try to identify some general semantic properties of preferential predicates.
- First, consider cases with a **declarative complement**:

(10) Bill hopes that Mary left.

(11) Bill is happy that Mary left.

- When taking a declarative complement, preferential predicates convey that the proposition p expressed by the complement is in some sense preferable w.r.t. a set of alternatives for p.
- The relevant set of alternatives C is contextually determined, constrained by focus.

  (Heim, 1994; Villalta, 2008, among others)

NON-VERIDICAL PREFERENTIAL PREDICATES

- Now let's consider a case with an **interrogative complement**.
- We have to look at a veridical predicate because non-veridicals don't license interrogative complements.

(12) Bill is happy (about) who left.

- Here, the predicate conveys that the true answer *p* to the question expressed by the complement is prefered w.r.t. other answers to the question.

- So again, one proposition *p*, determined by the complement, is compared to a set of alternative propositions *C*, again partly determined by the complement.

NON-VERIDICAL PREFERENTIAL PREDICATES

Romero (2015) and Uegaki and Sudo (2017) formalise this roughly as follows (I am simplifying here):

$$[\![\text{be happy}_C]\!]^w = \lambda Q_{\langle \text{st,t} \rangle}.\lambda x.$$

$$\exists p \in Q(\ p(w)\ \wedge\ \textsc{pref}^w_x(p) > \textsc{ave}(\{\textsc{pref}^w_x(p') \mid p' \in C\})\ )$$

veridical

preferential

(13) Bill is happy that Mary left.

(14) Bill is happy (about) who left.

NON-VERIDICAL PREFERENTIAL PREDICATES

Uegaki and Sudo (2017) extend this to non-veridicals and note that this semantics predicts anti-rogativity:

$[\![\text{hope}_C]\!]^w = \lambda Q_{\langle st,t \rangle}.\lambda x.$

$\exists p \in Q(\cancel{p(w)} \wedge \textsc{pref}^w_x(p) > \textsc{ave}(\{\textsc{pref}^w_x(p') \mid p' \in C\}))$

non-veridical — preferential

(15) Bill hopes that Mary left.

(16) *Bill hopes who left. **trivial**

ANTI-ROGATIVES OVERVIEW

1. Likelihood predicates: e.g., *be likely* — TRA/Mayr
2. Epistemic attitude predicates: e.g., *believe* — TRA/Mayr
3. Preferential attitude predicates: e.g., *hope* — U&S
4. Truth-evaluating predicates: e.g., *be true* — TRA
5. Speech act predicates: e.g., *assert*, *claim*, *suggest*

Note that a theory of speech act predicates has to account for the difference between:

- Anti-rogative speech act predicates like *assert*, *claim*, and *suggest*;
- Response speech act predicates like *state*, *announce*, and *tell*.

This does not seem straightforward.

PART 3

Rogatives

ROGATIVE PREDICATES: CLASSIFICATION

Three **subclasses** (cf., Karttunen, 1977):

1. Inquisitive predicates: *wonder*, *be curious*, *investigate*
2. Dependency predicates: *depend on*, *be determined by*
3. Speech act predicates: *ask*, *inquire*

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- $\textsc{inq}_x^w$ is defined as a downward closed set of consistent information states, those that resolve the issues that x entertains.
- Together, the states in $\textsc{inq}_x^w$ cover $\textsc{dox}_x^w$: $\bigcup \textsc{inq}_x^w = \textsc{dox}_x^w$
- For example:

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

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

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

ROGATIVES: OVERVIEW

1. Inquisitive attitudes: e.g., *wonder*, *be curious* — Uegaki / C&R
2. Dependency predicates: e.g., *depend on* — Theiler *et al.* (2018)
3. Speech act predicates: e.g., *ask*, *inquire* — Theiler *et al.* (2018)

- The account for *depend on* is similar to that for *wonder*.
- For *ask* and *inquire*, we may assume that the reported speech acts involve a sincerity condition requiring that the uttered sentence be inquisitive w.r.t. the common ground. This cannot be satisfied if the complement is declarative.
- A challenging case is the contrast between *be curious* (rogative) and *interest* (responsive).

PART 4

Further issues

EMOTIVE FACTIVES

- We have already seen above that the class of **emotive factive** predicates are incompatible with *whether*-complements, but do accept *wh*-complements.

(17) a. *Bill is happy (about) whether Mary left.
b. Bill is happy (about) who left.

- Some potentially relevant semantic properties:
  - Speaker factivity — Guerzoni (2007)
  - Focus sensitivity — Romero (2015)
  - Require existential presupposition — Roelofsen *et al.* (2016)
  - Don't license NPIs in wh-complements — Roelofsen (2018)
- It seems that *regret* does not license interrogative complements at all (see Cremers and Chemla, 2017, for experimental data). Why this would be is an open puzzle (cf., Egré, 2008).

POLARITY SENSITIVITY

- Certain predicates don't like *whether*-complements in positive episodic sentences, while they do under negation:

(18) a. *Bill is certain whether Mary left.
 b. Bill is not certain whether Mary left.

(19) a. *Bill said whether Mary left.
 b. Bill didn't say whether Mary left.

- Mayr (2017) proposes that the environments in which these predicates license *whether*-complements are exactly those that license NPIs.
- Experimental data in van Gessel *et al.* (2018) sheds doubt on this generalization.
- Much further work is needed here, both empirically and theoretically.

CONCLUSION

- The selectional restrictions of clause-embedding predicates can, at least in some cases, be **derived** from independently observable semantic properties of these predicates.
- Several issues remain open:
  - Anti-rogative *assert/claim* versus responsive *state/announce*
  - Rogative *be curious* versus responsive *interest*
  - Emotive factives like *surprise*, and especially *regret*
  - Polarity sensitive predicates like *be certain*
- Moreover, what we have seen is only part of a much wider landscape of selectional puzzles (involving mood, nominal arguments, exhaustivity, pair-list readings, root phenomena like auxiliary inversion and discourse particles, and more).

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- Hopefully, we'll know more by the end of the project!

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APPENDIX

A uniform treatment of clausal complements

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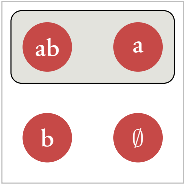
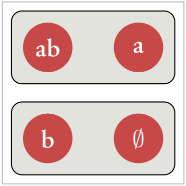
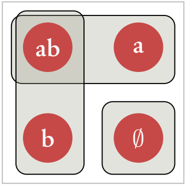


Ann left.



Did Ann leave?



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(21) Mary is certain whether John left.

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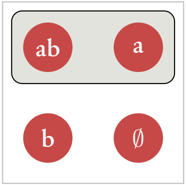

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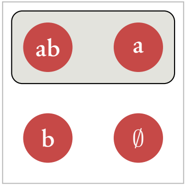

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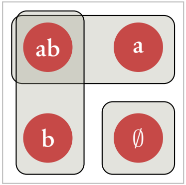

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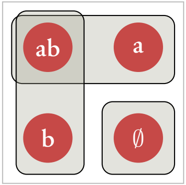

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