An inquisitive perspective on hyperintensionality

Floris Roelofsen
Inquisitive Semantics Seminar
Amsterdam, 8 December 2017

Hyperintensionality

- An operator H is hyperintensional when HA and HB can differ in truth value, even if A and B have the same intension.

- Famous example from Barwise & Perry 1983:

  1. Melanie saw Jim eat an anchovy.

  2. Melanie saw Jim eat an anchovy and
     Sara eat a pickle or not eat a pickle.

(Berto & Nolan 2017, Hawke 2017, Hornischer 2017, Leitgeb 2017, many others)

Various approaches in philosophical logic

- Situation semantics
- Truthmaker semantics
- Impossible worlds
- Aboutness

Today

- Widening the solution space.
- Widening the range of success criteria.
- Widening the problem.

Perhaps some other day: using inquisitive or attentional semantics to model aboutness.

Widening the solution space

- Hyperintensionality is also a recurring theme in formal semantics, though not usually labelled as such.

- What are the possible solutions that formal semantics has to offer?

- Can these approaches be useful in philosophical contexts?

- Vice versa, can the formal semantic analyses benefit from the insights obtained in a philosophical setting?

Criteria for success

- How do we tell which approach to hyperintensionality is most suitable for a given phenomenon?
- By which criteria have the formal semantic approaches been compared?
- Can these criteria be useful in philosophical contexts?
- Vice versa, can philosophical criteria be applied to the formal semantic analyses?

Widening the problem

- Recall: an operator H is hyperintensional when HA and HB can differ in truth value, even if A and B have the same intension.

- Most commonly, we think of cases where A and B are declarative sentences, whose intensions amount to their truth-conditions.

- Similarly, we typically think of H as a sentential operator like ‘see’, ’believe’, or ‘because’, which take declarative complements.

Widening the problem

- But what if H is an operator like ‘wonder’ or ‘depend on’, taking questions as its complement rather than declaratives?

- When do we say that such operators are hyperintensional?

- This depends on what we take the intension of a question to be.

- Certainly, it does not amount to its truth-conditions.

Plan

1. Widening the problem.
2. Widening the solution space.
3. Criteria for success.

Widening the problem

- An operator H is said to be hyperintensional when HA and HB can differ in truth value, even if A and B have the same intension.

- If we want this to apply both to cases where A and B are declaratives and ones in which A and B are questions, what should we take intensions to be?

- Here, inquisitive semantics provides an answer.

From truth to support

- In inquisitive semantics, sentences are
  - not primarily assigned truth-conditions relative to a world,
  - but rather support-conditions relative to information states.
- A state s supports a sentence A iff:
  1. The information conveyed by A is already available in s;
  2. The issue expressed by A is already resolved in s.

This allows for a uniform treatment of declaratives and questions. For instance:

(1) [Declarative] Susan left.

is supported by all states in which it is known that Susan left.

(2) [Polar question] Did Susan leave?

is supported by all states in which it is either known that Susan left or that she didn't leave.

(3) [Wh-question] Which girl left?

is supported by all states in which, for some girl d, it is known that d left.

Back to hyperintensionality

- We can now say:

  An operator H is hyperintensional when HA and HB can differ in truth value, even if A and B have the same support-conditions.

- Or even better:

  An operator H is hyperintensional when HA and HB can have different support-conditions, even if A and B have the same support-conditions.

Back to hyperintensionality

This simple move significantly extends the domain of investigation, in two ways:

1. We can now ask whether question-embedding operators like ‘wonder’ and ‘depend on’ are hyperintensional, and if so, how this should be reflected in their logical treatment.

2. Of hybrid (aka responsive) operators like ‘know’ and ‘surprise’ we can now not only ask whether they are hyperintensional w.r.t. declarative complements but also w.r.t. questions.

Illustration: ‘wonder’

Indeed, I think that both ‘wonder’ and ‘surprise’ are hyperintensional w.r.t. questions, in interesting ways.

First consider ‘wonder’.

Context: Sue has three children, Sophie, Bill, and Mary, who all live on their own. Sue is waiting for all of them to arrive at her place for Thanksgiving dinner. Someone rings the bell. Sue isn’t sure who it is, but she knows that it can’t be Bill, because he just texted her that he would be late.

(1) Sue wonders whether Sophie, Bill, or Mary arrived.

(2) Sue wonders which of her children arrived.

Recent experimental data:

(Cremers, Roelofsen & Uegaki, 2017)

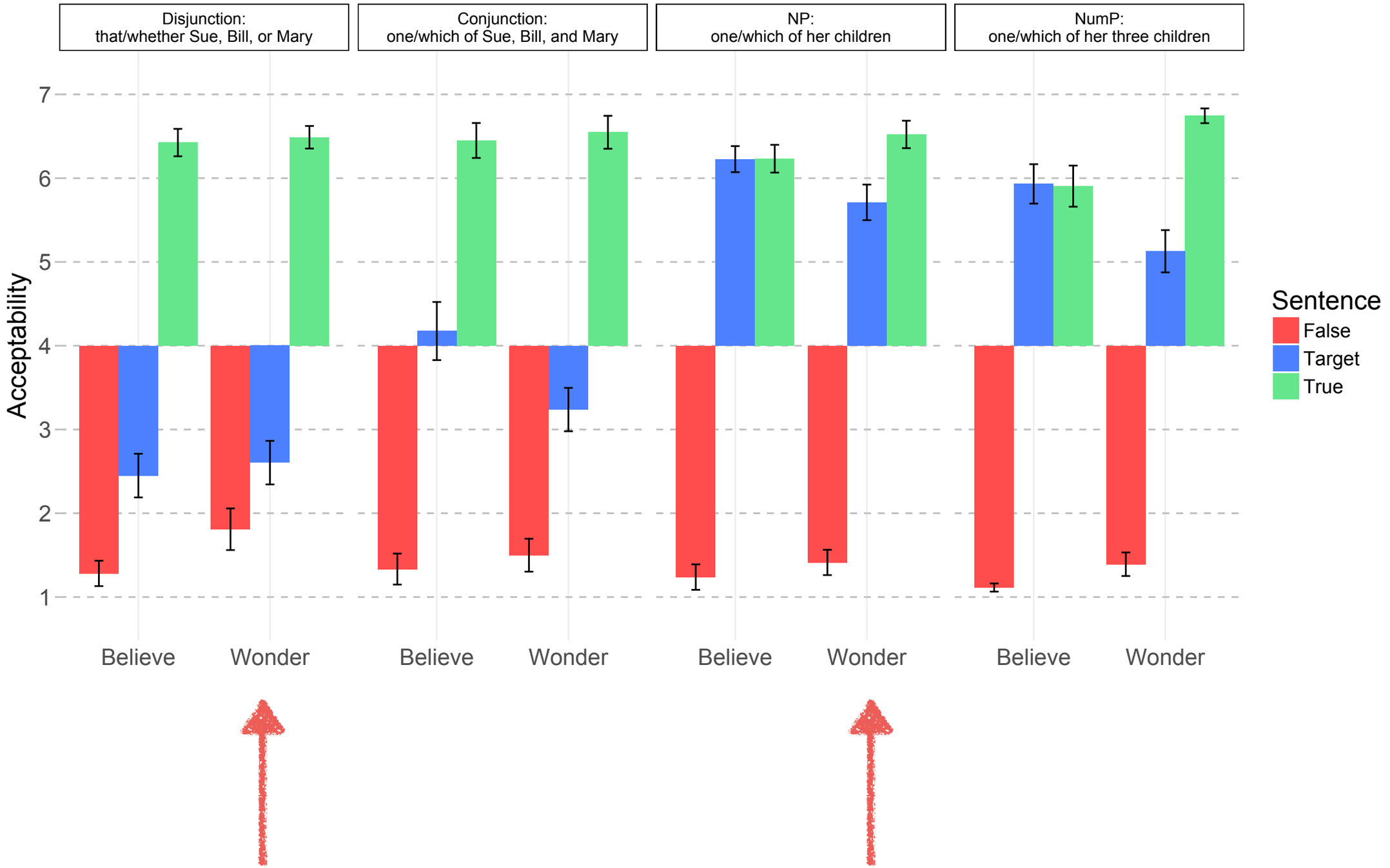


Illustration: ‘surprise’

Context: Ann and Chris have placed an order online. They are kept up to date about the status of the order, which is first ‘in progress’ and then at some point turns into ‘sent’. Ann looks at her email and then tells Chris:

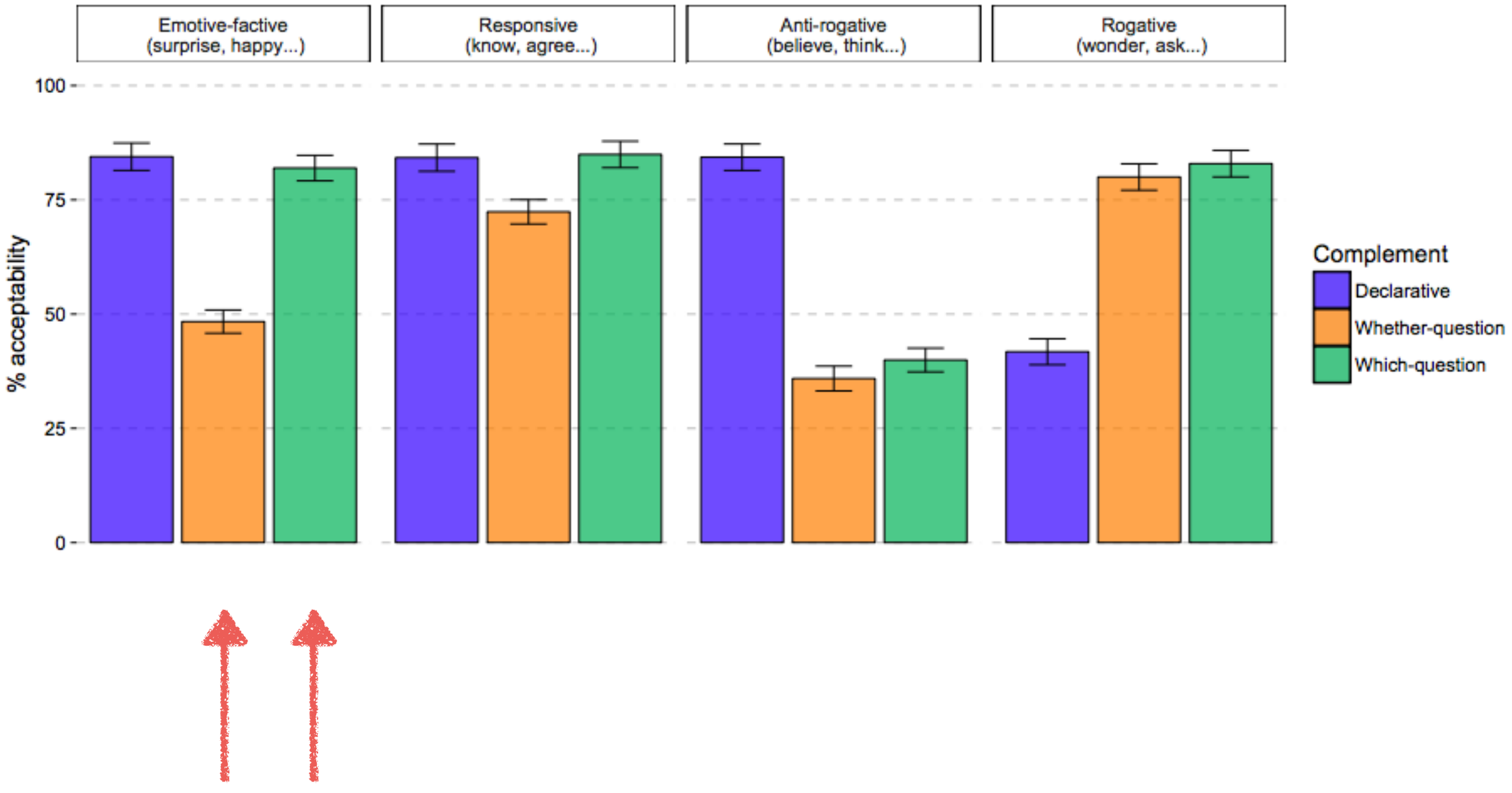
(1) It is surprising what the status of the order is.

(2) It is surprising whether the order is still in progress.

Roelofsen (2017)

Recent experimental data:

(Cremers & Chemla, 2017)



Interim conclusion

- The truth / support-conditions of

  ‘x wonders about Q’ and ‘x is surprised at Q’

  is not fully determined by the support-conditions of Q.

- These are concrete instances of our generalised notion of hyperintensionality.

- And they may well be just the tip of a huge iceberg.

Widening the solution space

Some approaches to deal with hyperintensional phenomena in formal semantics, more or less in order of appearance:

- Dynamic semantics (Kamp, Heim ~1981)
- Situation semantics (Barwise & Perry 1983)
- Focus semantics (Rooth 1985)
- Local exhaustification (Chierchia 2004)
- Alternative semantics (Aloni, Simons, Alonso Ovalle ~2006)
- Inquisitive semantics (Ciardelli, Zhang & Champollion 2016)

Dynamic semantics

(1) Bill found all of the ten marbles that he lost, except for one.
It is probably under the sofa.

(2) Bill found nine of the ten marbles that he lost.
#It is probably under the sofa.

- The initial sentences in (1) and (2) have the same truth-conditions. But only one licenses the given continuation.

- Dynamic semantics accounts for this contrast by capturing not only truth-conditional content, but also the discourse referents that sentences make available for anaphoric expressions.

- An alternative approach based on situation semantics has been developed as well — for comparison see e.g. Brasoveanu & Dotlacil (2017)

Focus semantics

(1) Bill only heard that SAM failed the oral exam.

(2) Bill only heard that Sam failed the ORAL exam.

- The embedded clauses have the same truth-conditions, but differ in focus structure.

- Assuming that only is focus-sensitive, this can account for the fact that (1) and (2) differ in truth-conditions.

- Many other operators, including negation and certain attitude verbs, seem focus-sensitive as well.

Local exhaustification

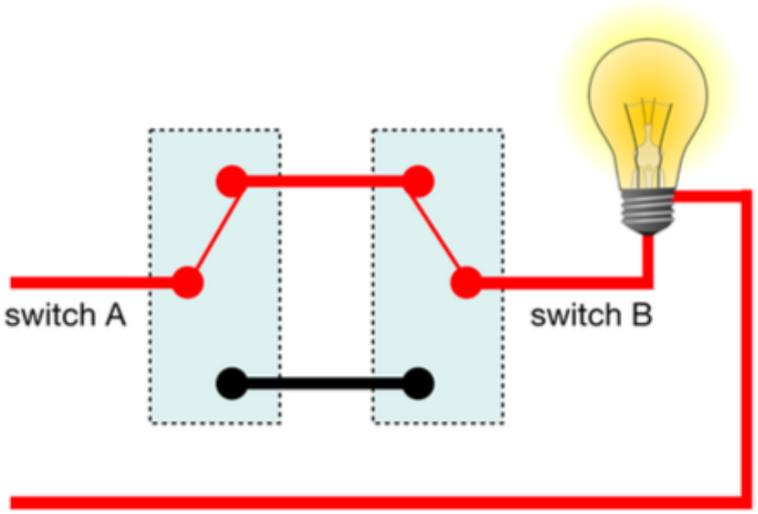
(1) If Sam fails some of the exams he will take the necessary resits.
If he fails all of them, he will transfer to another program.

(2) If Sam fails some or all of the exams he will take the necessary resits.
#If he fails all of them, he will transfer to another program.

- The antecedents in (1) and (2) have the same truth-conditions, but arguably have different 'formal alternatives'.

- Assuming the existence of local exhaustification operators, which are sensitive to such formal alternatives, the contrast between (1) and (2) can be accounted for.

Inquisitive semantics



(1) If switch A or switch B was down, the light would be off.

(2) If switch A and switch B were not both up, the light would be off.

Experimental results:

(Ciardelli, Zhang & Champollion, 2016)

	Sentence	Number	True	(%)
	$\overline{A}$ > OFF	256	169	66.02%
	$\overline{B}$ > OFF	235	153	65.11%
(1) →	$\overline{A} \vee \overline{B}$ > OFF	362	251	69.33%
(2) →	$\neg(A \wedge B)$ > OFF	372	82	22.04%
	$\neg(A \wedge B)$ > ON	200	43	21.50%

Account in a nutshell

Consider the two antecedents:

(1) Switch A or switch B is down.

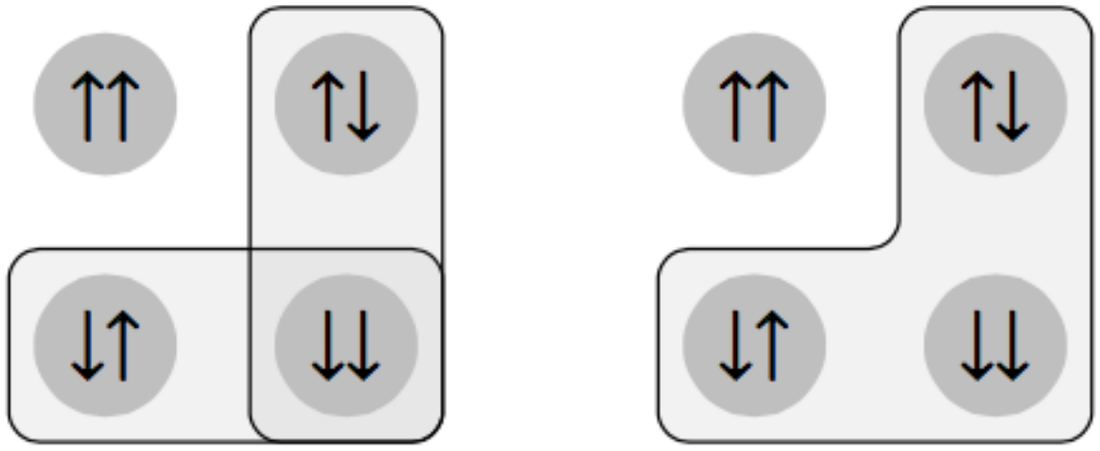
(2) Switch A and switch B are not both up.

In inquisitive semantics these are not equivalent:

- s supports (1) iff it supports ‘A down’ or ‘B down’
- s supports (2) iff it is incompatible with any state that supports ‘both up’.

Account in a nutshell

In a picture:



(c) $\overline{A} \vee \overline{B}$ (d) $\neg[A \wedge B]$

The observed contrast can then be accounted for by making the conditional operator sensitive to inquisitive content.

Roughly, each ‘alternative’ in the meaning of the antecedent is considered as a separate counterfactual assumption.

Criteria for success

- For some hyperintensional phenomena, multiple approaches have been developed. For instance:
    - Anaphora
        - dynamic semantics
        - situation semantics
    - Counterfactuals
        - inquisitive semantics (Ciardelli et al 2016)
        - alternative semantics (Alonso Ovalle 2006)
        - dynamic semantics (van Rooij 2006)

- By which criteria should these be compared?

Criteria for success

- I will focus here on the case of counterfactuals.
- Two kinds of criteria:
    - Theoretical parsimony / explanatory power
    - Empirical predictions about cases which arguably should involve redundancy

Parsimony

- In dynamic semantics, disjunctive antecedents can be treated as introducing two propositional discourse referents.

- Counterfactuals can then be treated as being sensitive to these propositional discourse referents.

- This could also account for the contrast found by Ciardelli et al.

- Alternative semantics offers a similar solution.

Parsimony

- What is particularly attractive about the inquisitive account, in comparison with the dynamic one and the one couched in alternative semantics, is that nothing special needs to be stipulated about disjunction.

- It is just treated as a join operator w.r.t. entailment.

- Only, entailment is now sensitive to both informational and inquisitive content.

(Roelofsen, 2013)

Predicting redundancy

- If we make our notion of semantic content more fine-grained, our notion of semantic equivalence becomes more sparse.

- This is exactly what we need to deal with hyperintensional phenomena.

- But there are also phenomena requiring that our notion of equivalence does not become *too* sparse.

- These include phenomena involving redundancy.

Predicting redundancy

- So-called Hurford disjunctions are a case in point:

  (1) #The value of x is different from 6 or greater than 6.

  (2) #John is American or Californian.

- Standard account: the stronger disjunct is redundant.

- This is true in truth-conditional semantics.

- But what if we refine our notion of content?

Predicting redundancy

- It turns out that this question teases apart the various approaches to disjunctive counterfactual antecedents.
    - Under the refined treatment of disjunction in dynamic/alternative semantics (as well as truthmaker semantics), the stronger disjuncts in Hurford disjunctions are no longer redundant.
    - In inquisitive semantics, the stronger disjuncts in HDs are still redundant.
- So the treatment of disjunction in inquisitive semantics strikes a good balance: it is more fine-grained than truth-conditional theories, but not too fine-grained.
- Note: this is not an argument that inquisitive semantics is the way to deal with hyperintensionality in general. But it does make inquisitive semantics a very attractive option in dealing with HI phenomena involving disjunction.

(Ciardelli & Roelofsen 2017)

Back to wonder and surprise

Recall the contrasts showing that ‘wonder’ and ‘surprise’ are hyperintensional w.r.t. questions:

(1) Sue wonders whether Ann, Bill, or Mary arrived.
(2) Sue wonders which of her children arrived.

(3) It is surprising what the status of the order is.
(4) It is surprising whether the order is still in progress.

How should these phenomena be accounted for?

Back to wonder and surprise

- Note that support conditions as such are not fine-grained enough for this. This is exactly why we take these phenomena to be hyperintensional.

- For ‘wonder’ local exhaustification seems promising (Cremers et al, 2017)

- For ‘surprise’ there are several proposals:

    - focus-based (Romero 2015)

    - dynamic (Roelofsen 2017)

- The latter has greater empirical coverage, but there is no principled argument yet why a dynamic or a focus-based approach should be preferable in dealing with the hyperintensionality of ‘surprise’.

Conclusion

- Inquisitive semantics allows us to broaden the notion/problem of hyperintensionality.

- It also provides a particularly attractive account of hyperintensional phenomena involving disjunction.

- The criteria for success considered here may be applicable more broadly in comparing theories of other hyperintensional operators as well.

Some references

- Brasoveanu & Dotlacil (2017). Donkey anaphora: Farmers and bishops. *Wiley's Companion to Semantics*.

- Ciardelli, Zhang & Champollion (2016). Two switches in the theory of counterfactuals: A study of truth conditionality and minimal change. Forthcoming in *Linguistics & Philosophy*.

- Ciardelli & Roelofsen (2017). Hurford's constraint, the semantics of disjunction, and the nature of alternatives. *Natural Language Semantics*.

- Cremers & Chemla (2017). Experiments on the acceptability and possible readings of questions embedded under emotive-factives, *Natural Language Semantics*.

- Cremers, Roelofsen & Uegaki (2017). Distributive ignorance implications of inquisitive and epistemic attitudes. *Manuscript, submitted for publication*.

- Roelofsen (2013). Algebraic foundations for the semantic treatment of inquisitive content. *Synthese*.

- Roelofsen (2017). Surprise for Lauri Karttunen. *To appear in a festschrift for Karttunen*.

- Maribel Romero (2015). Surprise-predicates, strong exhaustivity and alternative questions. *Semantics and Linguistic Theory.*