A problem for inquisitive semantics of conditionals

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Let U be an utterance and c a context suitable for U.

What is $[\![U]\!]^c$?

Are there any data to help answer this?

Alternatives in counterfactual antecedents

(1)
a. [*There are delays at the airport.*] If you had taken the plane, you would have been late.
b. If you had grown wings and flown, you would have been on time.
c. If you had taken the plane, or grown wings and flown, you would have been late.

(cf. Nute 1975; Alonso-Ovalle 2006)

Contemporary semantics of conditionals distinguish:

(e.g. Alonso-Ovalle 2006; Fine 2012; Ciardelli et al. 2018b)

- the alternatives raised by a conditional antecedent
- the mechanism used to hypothetically assume each alternative

Each alternative is assumed separately

⇒ Disjunctive antecedents are represented by sets of propositions Alonso-Ovalle (2006)

Conditionals are a playground

Theory of conditionals	Semantic content
Stalnaker (1968); Lewis (1973)	possible worlds semantics
Kratzer (1986)	possible worlds semantics
Alonso-Ovalle (2006)	alternative semantics
Fine (2012)	truthmaker semantics
Santorio (2018)	truthmaker/alternative semantics
Willer (2018)	dynamic semantics
Schulz (2018)	modified inquisitive semantics
Ciardelli et al. (2018b)	inquisitive semantics

1. Alternative semantics

   Rooth (1985, 2016); Kratzer and Shimoyama (2002); Alonso-Ovalle (2006)

2. Inquisitive semantics

   Ciardelli, Groenendijk, and Roelofsen (2018a)

Downward closure

A set A is downward closed iff for all $p \in A$ and $q \subseteq p : q \in A$.

	Alternative semantics	Inquisitive semantics
Semantic content:	Any set of propositions	Any downward closed set of propositions

$$B \overset{?}{\equiv} B \vee (A \wedge B)$$

Alternative semantics

$$[\![B]\!] = \{|B|\}$$
$$[\![B \vee (A \wedge B)]\!] = \{|B|, |A| \cap |B|\}$$

$\neq$

The downward closure of a set A is $A^{\downarrow} := \{q \mid \exists p \in A : q \subseteq p\}$.

Inquisitive semantics

$$[\![B]\!] = \{|B|\}^{\downarrow}$$
$$[\![B \vee (A \wedge B)]\!] = \{|B|, |A| \cap |B|\}^{\downarrow}$$

$=$

Alternative semantics	Inquisitive semantics
$B \not\equiv B \vee (A \wedge B)$	$B \equiv B \vee (A \wedge B)$

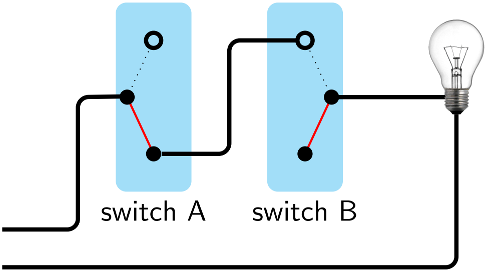

Figure: The light is on just in case A is down and B is up.

(2)
a. If switch B was up, the light would be on. $B > On$
b. If switch B was up, or switches A and B were up, the light would be on. $B \vee (A \wedge B) > On$

Hurford's constraint

- A disjunction in which one disjunct entails the other is generally infelicitious Hurford (1974)

(3) #The ring is made of gold or metal.

- Hurford's constraint also appears in conditional antecedents.

(4) #If the ring is made of gold or metal, it will be heavy.

Hurford antecedents

Some Hurford disjunctions are acceptable Gazdar (1979)

(5) Alice ate some or all of the cookies.

This extends to conditional antecedents:

(6) If switch B was up, or switches A and B were up, ...

- Embedded exclusivity operators van Rooij and Schulz (2004); Chierchia (2004); Chierchia, Fox, and Spector (2008)

(7) Alice ate exh(some) or all of the cookies.
$\equiv$ Alice ate some (but not all) or all of the cookies.

- Apply Roelofsen and van Gool (2010)'s exh operator for inquisitive semantics: (cf. also Aloni and Ciardelli 2011)

$$\mathsf{exh}(B) \vee \mathsf{exh}(A \wedge B) \equiv (B \wedge \neg A) \vee (A \wedge B)$$

Exclusive interpretation

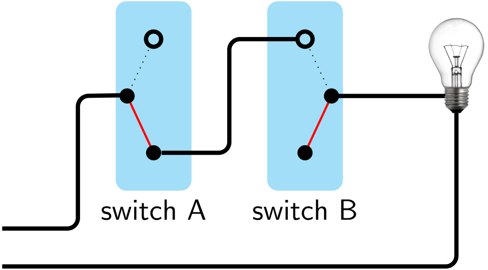

Figure: The light is on just in case A is down and B is up.

(8) a. If switch B was up, the light would be on. B

b. If switch B was up (and A not up), or switches A and B were up, the light would be on.
$(B \wedge \neg A) \vee (A \wedge B)$

A subtle difference

Alternative semantics:

$$\llbracket B \rrbracket = \{|B|\}$$
$$\llbracket B \vee (A \wedge B) \rrbracket = \{|B|, |A| \cap |B|\}$$
$$\llbracket (B \wedge \neg A) \vee (A \wedge B) \rrbracket = \{|B| \cap |\neg A|, |B| \cap |A|\}$$

Inquisitive semantics:

$$\llbracket B \vee (A \wedge B) \rrbracket = \llbracket B \rrbracket$$
$$\llbracket \mathsf{exh}(B) \vee \mathsf{exh}(A \wedge B) \rrbracket = \llbracket (B \wedge \neg A) \vee (A \wedge B) \rrbracket$$

A three-valued switch

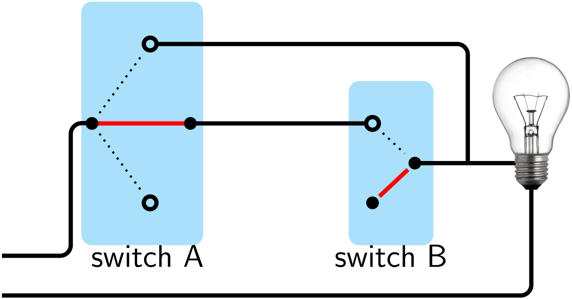

Figure: The light is on iff A is up, or A is in the middle and B is up

(9) a. If B was up, the light would be on.
b. If B was up, or A and B were up, the light would be on.
c. If B was up and A not up, or A and B were up, the light would be on.

What negation does to alternatives

Observation

$B \vee (A \wedge B)$ and $(B \wedge \neg A) \vee (A \wedge B)$ seem to raise different hypothetical scenarios

- When A is not mentioned, its position is kept fixed
- When $\neg A$ is mentioned, its position is not kept fixed
    - In particular, $\neg A$ invites considering A down

Schulz (2018)'s experiment

- In counterfactual antecedents, mentioning something already true does not make the same contribution as not mentioning it at all.

Comparing alternative and inquisitive semantics

In alternative semantics, without downward closure, the right distinctions fall out immediately:

$$\llbracket B \rrbracket = \{|B|\}$$
$$\llbracket B \vee (A \wedge B) \rrbracket = \{|B|, |A| \cap |B|\}$$
$$\llbracket (B \wedge \neg A) \vee (A \wedge B) \rrbracket = \{|B| \cap |\neg A|, |B| \cap |A|\}$$

Compare with inquisitive semantics:

$$\llbracket B \vee (A \wedge B) \rrbracket = \llbracket B \rrbracket$$
$$\llbracket \mathsf{exh}(B) \vee \mathsf{exh}(A \wedge B) \rrbracket = \llbracket (B \wedge \neg A) \vee (A \wedge B) \rrbracket$$

A pragmatic explanation of (9c)'s interpretation

(9c) If B was up and A not up, or A and B were up, the light would be on.

Alternative semantics:

- $B \vee (A \wedge B)$ is an alternative to $(B \wedge \neg A) \vee (A \wedge B)$
- The speaker chose to express $\{|B| \cap |\neg A|, |B| \cap |A|\}$ rather than $\{|B|, |B| \cap |A|\}$
- But A is already not up
- If the speaker wanted to keep A fixed, she should have used $\{|B|, |B| \cap |A|\}$

⇒ The speaker wants me not to keep switch A fixed

Inquisitive semantics:

- No meaning of the sort $\{|B|, |B| \cap |A|\}$ exists

⇒ No pragmatic comparison of alternatives

Upshot 1

Downward closure makes inquisitive semantics blind to some meanings – e.g. $\{|B|, |A| \cap |B|\}$ *– which the interpretation of conditionals requires.*

Why downward closure?

Alternative semantics	Inquisitive semantics
Any set of propositions	Any downward closed set of propositions

Alternative semantics is too permissive (Ciardelli, Roelofsen, and Theiler, 2017; Ciardelli and Roelofsen, 2017)

In particular, it cannot account for Hurford's constraint:

(10) # John is from Paris or France.

(Hurford, 1974)

Katzir & Singh (2013) on redundancy

1. Avoid redundancy

A sentence is deviant if its logical form contains a binary operator $\circ$ applying to two arguments A and B, and the outcome $A \circ B$ is semantically equivalent to one of the arguments

2. Contextual Equivalence

X and Y are contextually equivalent in context c iff

$$\{w \in c : [\![X]\!](w) = 1\} = \{w \in c : [\![Y]\!](w) = 1\}$$

(cf. Schlenker 2012)

In alternative semantics,

(11) a. $[\![$ John is from France $]\!] = \{|\text{John is from France}|\}$
b. $[\![\text{John is from Paris or France}]\!] =$
$\{|\text{John is from Paris}|, |\text{John is from France}|\}$

where $|P| = \lambda w.\, P$ is true in w

- John is from Paris or France. $\not\models$ John is from France.
- John is from France. $\not\models$ John is from Paris or France.

No entailment!

Ciardelli and Roelofsen (2017) conclude:

$\Rightarrow$ No redundancy

$\Rightarrow$ No account of Hurford's constraint in alternative semantics

What is redundancy?

Two accounts

To be redundant is to...

1. be contextually equivalent to a simpler alternative
   Simons (2001); Katzir and Singh (2013); Meyer (2013, 2014)
2. perform the same function as a simpler alternative

Accounting for Hurford's constraint

What is redundancy?

For an utterance to have a redundant part is for the part to fail to contribute to the utterance's function.

In general, for sincere speakers,

Utterance type:	Declarative	Interrogative	Conditional antecedent
Function:	Communicate information	Raise issues	Raise contexts of evaluation

Utterance functions

Take an utterance U and your favourite semantics of declaratives/interrogatives/conditionals:

- Let $\mathsf{info}(U)$ be U's informative content
- Let $\mathsf{inq}(U)$ be U's inquisitive content
- Let f be a counterfactual selection function and define U's hypothetical content to be:

$$\mathsf{hyp}(U, w) = \{w' : w' \in f(p, w) \text{ for some } p \in \mathsf{alt}(U)\}$$

Function-sensitive redundancy

Let U be an utterance and U^* a simpler alternative to U.
Then U is infelicitous if (but not only if)

- U is declarative and $\mathsf{info}(U) = \mathsf{info}(U^*)$
- U is interrogative and $\mathsf{inq}(U) = \mathsf{inq}(U^*)$
- U is a conditional antecedent, w is the actual world, and $\mathsf{hyp}(U, w) = \mathsf{hyp}(U^*, w)$

Hurford's constraint in alternative semantics

(12) a. # If John were from Paris or France, he would speak French.

b. If switch B was up, or switches A and B were up, the light would be on.

According to any suitable semantics of conditionals:

$$f(|\text{John is from Paris}|, w) \subseteq f(|\text{John is from France}|, w)$$
$$f(|\text{switches A and B are up}|, w) \not\subseteq f(|\text{switch B is up}|, w)$$
$$\Rightarrow$$
$$\mathsf{hyp}(\text{John is from Paris or France}, w) = \mathsf{hyp}(\text{John is from France}, w)$$
$$\mathsf{hyp}(\text{A and B are up}, w) \neq \mathsf{hyp}(\text{B is up}, w)$$

Alternative semantics predicts:

✓ (12a)'s redundancy (and hence infelicity)

✓ (12b)'s lack of redundancy (and hence felicity)

Upshot 2

Alternative semantics can account for Hurford's constraint by defining redundancy in terms of utterance function.

Conclusion

The question of semantic content is an empirical question

- **Upshot 1** Downward closure makes inquisitive semantics blind to some meanings – e.g. $\{|B|, |A| \cap |B|\}$ – which the interpretation of conditionals requires
- **Upshot 2** Alternative semantics can account for Hurford's constraint by defining redundancy in terms of utterance function

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Exhaustivity

Aloni and Ciardelli (2011):

$$s \models \mathsf{exh}(\varphi) \;\Leftrightarrow\; s \subseteq \mathsf{exh}(\alpha, |RA(\varphi)|) \text{ for some } \alpha \in Alt(\varphi)$$

Where

- $|RA(\varphi)| = \{|\psi| \mid \psi \in RA(\varphi)\}$

Roelofsen and van Gool (2010):

- $\text{exh}(\pi, \Pi) = \pi - \bigcup\{\pi' \in \Pi \mid \pi \nsubseteq \pi'\}$
- $\text{exh}(\Pi) = \{\text{exh}(\pi, \Pi) \mid \pi \in \Pi\}$

$$RA(a) = \{a\} \cup C_a$$
$$RA(\varphi \vee \psi) = RA(\varphi) \cup RA(\psi)$$
$$RA(\varphi \wedge \psi) = RA(\varphi) \cup RA(\psi)$$

$$RA(\neg\psi) = \{\neg\psi \mid \psi \in RA(\varphi)\}$$
$$RA(\text{exh}(\varphi)) = \{\text{exh}(\psi) \mid \psi \in RA(\varphi)\}$$

where C_a is a set of contextually relevant alternatives to a.

Schulz (2018)'s experiment

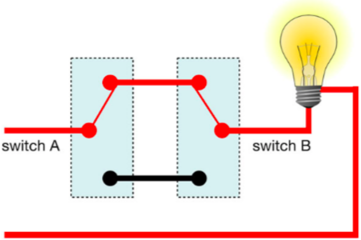


Figure: Scenario used in Ciardelli et al. (2018b)'s experiment

(13) a. If the electricity was working, then the light would be on.

b. If the electricity was working and switch A was up, then the light would be on.

c. If the electricity was working and switch A and switch B were not both up, then the light would (still) be off.

Results from Schulz (2018)'s experiment

sentences	true	%	false	%	indet.	%
$E \rightsquigarrow On$	8	16%	42	82%	1	2%
$(E \wedge A) \rightsquigarrow On$	43	84%	5	10%	2	4%
$[E \wedge \neg(A \wedge B)] \rightsquigarrow On$	14	27%	27	53%	8	16%
$[E \wedge \neg(A \wedge B)] \rightsquigarrow On^*$	9	26%	20	59%	5	15%

Figure: Results from Schulz (2018)'s experiment

Conclusion

- The mechanism for making hypothetical assumptions in Ciardelli et al. (2018b) keeps too much fixed

Overt versus covert negation

(14) a. If exh(B was up), or A and B were up, the light would be on.

b. If B was up and A not up, or A and B were up, the light would be on.

- Perhaps exh should be sensitive to counterfactual alternatives
  - But this invites worries about compositionality
- Perhaps overt negation has extra-semantic effects

Ciardelli and Roelofsen (2017): redundancy is purely semantic

- Inquisitive semantics: $\mathsf{exh}(B) \vee (A \wedge B)$ and $(B \wedge \neg A) \vee (A \wedge B)$ are semantically equivalent
- Neither is a simpler alternative utterance to the other

$\Rightarrow$ They have the same redundancy conditions

- And we cannot compare them with $\{|B|, |A| \cap |B|\}$
    - No meaning of the sort exists in inquisitive semantics

Explicit exhaustification is fine

(15) a. The request may be extended to **all or only some** of the designs included in the registration. Latvian Patent Office `https://www.latvija.lv/en/PPK/uznemejdarbiba/registri/p2667/ProcesaApraksts`

b. The GGS-OCC data consist of employment, mean wage, and median wage estimates by occupation, presented for three groups of establishments: those with **none**, **all**, or **some, but not all**, of their revenue from green goods and services. US Bureau of Labor Statistics, `https://www.bls.gov/news.release/ggsocc.tn.htm`

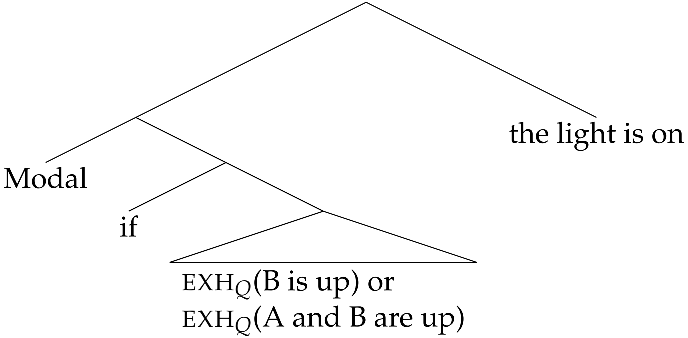
Counterfactual exhaustification

exh is calculated with respect to a question under discussion Q

Two options for Q:

1. Q = What are the positions of the switches?
2. Q = What happened to the switches when shifting to the counterfactual scenario?

(16)



Partee (1991); Kratzer (2012)