

# Towards an explanatory account of conditional perfection

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## Preliminaries: “invited inferences”

Geis & Zwicky (1971) propose a class of pragmatic inferences with a “quasi-regular association” to the sentences that “invite” them:

### (1) Conditional perfection:

- a. If you mow the lawn, I'll give you five dollars.
- b.  $\rightsquigarrow$  *If and only if you mow the lawn, I'll give you five dollars.*

- ▶ CP is observed in e.g. promises and threats (Fillenbaum 1986)
- ▶ It is related to the fallacies of *affirming the consequent* and *denying the antecedent*
- ▶ It's a “good move” practically speaking
- ▶ It has a relationship to both the “LF” of the utterance as well as to its illocutionary force

## Preliminaries: conditional perfection

An extensive literature (see van der Auwera 1997) points to classifying CP as a **generalized conversational implicature** (cf Levinson 2000).

- ▶ It meets diagnostics for conversational implicature
- ▶ It behaves like a “default” inference (arises automatically in certain circumstances)
- ▶ These circumstances are contextual/pragmatic, often associated with illocutionary force

Despite this, a (stated) consensus on the “inviting” factors is lacking, and there is more active disagreement as to *how* CP is derived.

## In this talk:

**Central claim:** When it is understood as responding to a polar question on its consequent ( $q$ ), a conditional statement (*if  $p$ ,  $q$* ) is interpreted as biconditional (see also Franke 2009).

- ▶ A (brief) overview of the empirical picture: which conditionals are perfected, and when
- ▶ A summary of past theoretical accounts, where they disagree, and why
- ▶ A new generalization: “integration” of past accounts via **exhaustive interpretation** (Groenendijk & Stokhof 1984)
- ▶ Conclusions and outlook: a formal approach to pragmatic reasoning

# The empirical picture: perfectible conditionals

I distinguish three main conditional types:

- ▶ Causal, or **predictive** conditionals (indicative and subjunctive)
  - (4) If the Pied Piper called, the children of Hamelin followed.
  - (5) If the Pied Piper had called, the children of Hamelin would have followed.
- ▶ **Epistemic** conditionals
  - (6) If Mary is in the lobby, her plane must have arrived early.
- ▶ Speech act or **“biscuit”** conditionals
  - (7) If you need any help, my name is Ann.

## **In general:**

Predictive conditionals are perfectible (esp. promises, threats, warnings, advice); epistemic and biscuit conditionals are not.

## The empirical picture: contextual cues

- ▶ **Speaker control** over the consequent (see van Canegem-Ardijns & van Belle)

(8) [promises] If you get me some coffee, I'll give you a cookie.

(9) [threats] If you don't give me your money, I'll kill you.

- ▶ Presuming **complete speaker knowledge** on the consequent

(10) [warnings] If you step on that wire, you'll get a shock.

- ▶ These also share the feature of **hearer concern** (desirability) on the consequent

(11) [recommendations]

H: Should I give my cat Petboost?

S: If you love your cat, you'll give him Petboost.

## The empirical picture: contextual cues

These features must be contextually **relevant** for perfection to occur:

- (12) H: What will you give me if I mow the lawn?  
S: If you mow the lawn, I'll give you five dollars.

When the cues are all met, even non-predictive conditionals can get a perfection-like reading:

- (13) H: Do you have any food?  
S: If you're hungry, there are biscuits in the cupboard.

## The theoretical picture: GCI theory (Levinson 2000)

GCI theory is a theory of conversational implicatures with a “default” nature, which “capture our intuitions about preferred or normal interpretations.”

Levinson’s three heuristics:

- ▶ **Q-principle**: communicate as much information as required
- ▶ **I-principle**: do not communicate unnecessarily
- ▶ **M-principle**: communicate information in a manner that matches the content

GCI theory falls between “grammar” and speaker meaning: they are conventionalized, but not lexicalized (they are defeasible).

CP fits the diagnostics: but should it be treated as a Q- or an I-implicature?



## The theoretical picture: I-based reasoning

Atlas & Levinson (1981), Levinson (2000) treat CP as an I-implicature.

**Principle of Informativeness** (paraphrased)

If there are competing interpretations for  $U$ , the listener selects the “most informative” interpretation compatible with what is known

(1) If you mow the lawn, I'll give you five dollars.

So, the hearer will always select biconditionality (when it is not blocked), and the speaker is aware of this.

**BUT:** where does the availability of the biconditional interpretation come from? Why is (1) interpretable as a biconditional at all?

## The theoretical picture: Q-based reasoning

Attempts to answer this question treat perfection as a Q-based **scalar implicature**. (Cornulier 1983, van der Auwera 1997, von Stechow 2001)

- (14)
- a. ALL > SOME
  - b. **Some** of the guests are leaving.
  - c.  $\rightsquigarrow$  **Not all** of the guests are leaving.

Naïvely, the Horn scale for conditionals would be  $\{\text{IFF} > \text{IF}\}$ . But this would derive precisely the wrong inference!

Matsumoto (1995) and others provide arguments blocking this scale. A number of alternatives have been suggested, of varying plausibility.

## The theoretical picture: Q-based reasoning

A viable alternative (Zaefferer 1991/Horn 2000, von Stechow 2001):

(15) (WHATEVER THE CASE)  $q > \text{IF } p, q$

### Example (16)

- a. If you mow the lawn, I'll give you five dollars.
- b.  $\rightsquigarrow$  NOT [whatever the case, I'll give you five dollars]
- c. *I won't give you five dollars no matter what*

This only produces the implicature that  $q$  is not unconditional, which is too weak!

# The theoretical picture: Q and I

The problem:

- ▶ I-reasoning justifies choosing the biconditional, but doesn't generate it
- ▶ Q-reasoning generates a related inference, but isn't strong enough

We need both types of reasoning:

- ▶ We want to provide the required information while maximizing the information/effort ratio
- ▶ The right generalization should balance these pressures
- ▶ It should generate the biconditional *in response* to contextual informational need

## A new generalization

Recall the empirical contextual features:

- ▶ Relevance of truth value of  $q$
- ▶ Presumption of speaker control/knowledge over  $q$
- ▶ Presumption of hearer concern over  $q$

These conditions are all met when the **question under discussion** (Roberts 1996) is whether or not  $q$  holds:

(17) H: Will I be reimbursed for this?

S: If you properly itemize your receipts [you will be reimbursed].

The response is interpreted as if it provides the truth-value of  $q$ :

- ▶ we maximize the informational content of the conditional
- ▶ specifically, this is done *relative* to QUD

## A new generalization

**Proposed generalization:** Statements of the form *if p, q* are interpreted biconditionally when they provide a response to a yes/no question on *q*.

Promises and threats automatically induce this question:

- (1) If you mow the lawn, I'll give you five dollars.
- (9) If you don't give me your money, I'll kill you.

And in general:

- (18) H: Is the company hiring someone for John's job?  
S: If he quits [they are].
- (11) H: Should I give my cat Petboost?  
S: If you love him [you should give him Petboost].

## A new generalization: exhaustive interpretation

**Proposed generalization:** Statements of the form *if p, q* are interpreted biconditionally when they provide a response to a yes/no question on *q*.

- ▶ H demonstrates belief that S has complete information on *q*
- ▶ H demonstrates a desire for the categorical information on *q*
- ▶ The biconditional is thus a relevant interpretation
- ▶ S can cancel the inference (by rejecting the assumption of knowledge, e.g.)

Formally, this result can be derived using **exhaustive interpretation** (Groenendijk & Stokhof 1984)

## Exhaustive interpretation

Groenendijk & Stokhof (1984) argue that answers to questions are interpreted **exhaustively**:

- (19) H: Who is in the garden?  
S: Mary. (*... and only Mary*).

**Exhaustive interpretation** is modeled as a formal operation on a question-predicate  $R$  and a subsentential term answer  $F$ :

$$\text{exh} = \lambda F. \lambda R [F(R) \wedge \neg \exists R' : [F(R') \wedge R \neq R' \wedge \forall x [R'(x) \rightarrow R(x)]]]$$

- ▶  $R$  = “in-the-garden”,  $F$  = “Mary”
- ▶  $Mary$  is a member of the set of individuals in the garden
- ▶ No proper subset of individuals in the garden contains Mary
- ▶ Mary is the only individual in the garden



## Exhaustive interpretation and conditionals

This also works for (truncated) material conditionals:

- (20) H: Does John walk?       $R = \text{walk}(j)$   
S: If Mary walks.       $F = \lambda S[\text{walk}(m) \rightarrow S]$

$$\text{exh}(F)(R) = \\ [\text{walk}(m) \rightarrow \text{walk}(j)] \wedge \\ \neg \exists S' [[\text{walk}(m) \rightarrow S'] \wedge S' \neq \text{walk}(j) \wedge [S' \rightarrow \text{walk}(j)]]$$

- ▶ This goes through at the level of truth-value equivalence
- ▶  $\text{walk}(m) = 1 \rightarrow \text{walk}(j) = 1$ . (Any sentence  $S'$  satisfying  $\text{walk}(m) \rightarrow S'$  also has  $S' = 1$ ).
- ▶ If  $\text{walk}(m) = 0$ , then  $\text{walk}(j)$  must also be 0. If it were not, we could set  $S' = 0$  and violate the second conjunct.
- ▶ So: when “Mary walks” is true, so is “John walks,” and when “Mary walks” is false, so is “John walks.”

## Exhaustive interpretation and perfection: formal pragmatics

Groenendijk & Stokhof treat *exh* as a semantic operation, but the account provided here is strictly intended as pragmatic:

- ▶ exhaustive interpretation is applied in response to contextual constraints
- ▶ its application can be cancelled by rejecting, e.g., presumption of knowledge
- ▶ exhaustive interpretation formalizes intuitions behind Gricean maxims
- ▶ in fact, it is a special case of McCarthy's (1980) **predicate circumscription**, which formalizes the process behind "normality" assumptions in practical reasoning (van Benthem 1989)

## Exhaustivity and perfection: formal pragmatics

Let's see how this works when we update our representations:

### **Conditional statements (Lewis-Kratzer):**

Given a context  $C$ , and an accessibility relation  $S$ :

$$\text{If } P, Q := \forall[W^{C,S} \cap P][Q]$$

where  $W^{C,S}$  is the set of worlds most  $S$ -accessible in  $C$

- ▶ This is the “restrictive” conditional
- ▶ As stated here, it only applies to conditionals lacking an overt quantifier (modal or otherwise)
- ▶ The accessibility relation can vary by conditional type

## Exhaustivity and perfection: formal pragmatics

### Exhaustive interpretation (Schulz & van Rooij 2006):

For a question-predicate  $R$ , and a term-answer  $F$  in world  $w$ :

$$\text{exh}^w(F, R) := \{u \in w[F(R)] \mid \neg \exists v \in w[F(R)] : v <_R u\}$$

where  $w[F(R)]$  is the set of worlds that  $F(R)$  maps  $w$  to.

- ▶ exhaustivity/circumscription is about interpreting properties in “minimal models”
- ▶ Given worlds (models)  $v$  and  $u$ , and a predicate  $P$ :  
 $v <_P u$  just in case the set picked out by  $P$  in  $v$  is a proper subset of the set picked out by  $P$  in  $u$
- ▶ So: *exh* picks out the world (or worlds) that satisfy  $F(R)$  and are minimal with respect to the question-predicate
- ▶ Dynamically: we can think of  $w$  as an *information state*

## Exhaustivity and perfection: formal pragmatics

$$\text{exh}^w(F, R) := \{v \in w[F(R)] \mid \neg \exists u \in w[F(R)] : v <_R u\}$$

- ▶ A polar question on  $Q$  has question-predicate  $R = Q$ .
- ▶  $v <_Q u$ :  $v$  matches  $u$  in all respects except that  $u$  has  $Q$  and  $v$  does not
- ▶  $F(R) =_{\text{IF}} P, Q$  ( $:= \forall[W^{C,S} \cap P][Q]$ )
- ▶  $F(R)$  picks out worlds where  $P$  does not occur without  $Q$
- ▶ Suppose  $u$  has  $P$ . Then it also has  $Q$  since  $u \in w[F(R)]$ . Any  $Q$ -minimal  $v$  must also have  $P$  and therefore also  $Q$ , so  $u$  is minimal.
- ▶ Suppose  $u$  does not have  $P$ . Then it cannot have  $Q$ . If it did, then any  $v$  with neither  $P$  nor  $Q$  would satisfy  $v <_Q u$ .

# Summary

## Conditional perfection:

- ▶ *exh* produces biconditional reading when a conditional responds to a topic/QUD of *whether Q?*
- ▶ this invokes informativity reasoning and produces the desired interpretation as a *default*

## Outlook:

- ▶ GCIs are inferences that match contributions to informational needs (goal-based equilibria; cf. Schulz & van Rooij)
- ▶ they are conventionalized as practical reasoning: generated by strategies rather than heuristics
- ▶ Gricean maxims can be thought of as descriptions of equilibrium-finding processes (see also Franke's 2009 game-theoretic pragmatics)

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## Side note: mention-some readings

Descriptions of CP often suggest that it occurs when we expect that S would have mentioned all conditions for the consequent:

- ▶ Von Stechow (2001) relies on this to go from (scalar) *not unconditionally q* to full CP

(21) H: Under what conditions will Robin come to the party?

S: If there is vegetarian food, Robin will come to the party.

- ▶ The notion of expectation is right, but questions about conditions typically favour a **mention-some** reading:

(22) H: Where can I buy an Italian newspaper?

S: The shop around the corner [has them].

- ▶ With conditionals:

(21') H: How can I get Robin come to the party?

S: If there is vegetarian food, Robin will come to the party.

## Conditional strengthening: non-optional implicatures

An intuition that appears in a number of places in the literature (notably Horn 2000) is that the necessity of  $P$  in *if P, Q* is inferred from the fact that the speaker bothered to mention it:

- ▶ this is a reflex of a more general principle preferring shorter, more informative alternatives
- ▶ this principle can lead to non-optional, “Need-a-Reason” implicatures (Lauer 2013)

(23) a. John is in Paris or he is  
in London.

- b.  $\rightsquigarrow$  *S does not know which*  
... or has some other  
reason for being  
unspecific

(24) a. If this cactus is native to  
Idaho, it's not an  
*Astrophytum*.

- b.  $\rightsquigarrow$  *S doesn't know what  
sort of cactus it is*  
... or has some other  
reason for  
conditionalizing

## Some more supporting evidence

Epistemic conditionals are (often) about providing the reasoning from premise to conclusion:

(25) H: Mary just called from the lobby.

S: If she's in the lobby, the plane arrived early.

(25') H: Did the plane arrive early?

S: If Mary's in the lobby, the plane arrived early.

Speech act conditionals are about grounding the offer/act:

(26) H: I haven't eaten since lunchtime.

S: If you're hungry, there are biscuits in the cupboard.

(26') H: Are there any biscuits?

S: If you're hungry, there are biscuits in the cupboard.

When we suspend these “normal” uses in order to answer a polar question on  $q$  that we get perfected readings.