Towards an explanatory account of conditional perfection

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▷ Conditional perfection
  a. If you mow the lawn, I’ll give you five dollars.
  b. ⇔ If and only if you mow the lawn, I’ll give you five dollars.

“Inclusive” or

a. If Martin plays a blues number or dances a jig, I’ll imitate a porcupine.
b. ⇔ If Martin plays a blues number and dances a jig, I’ll imitate a porcupine.

▷ Inferred causation
  a. After a large meal, we slept soundly.
  b. ⇔ As a result of having had a large meal, we slept soundly.
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Conditional perfection is associated with a “tendency to ‘perfect conditionals to biconditionals’” (attr. to L. Karttunen):

Example (1)

a. If you mow the lawn, I’ll give you five dollars.
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c. If and only if you mow the lawn, I will give you five dollars.
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(1)a is claimed to imply the truth of (1)b and thus to give rise to the “perfected” (1)c, when utterance and implication are taken together.
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- Perfection seems to be a “good move” in practical or conversational reasoning (although not formally) – so it’s something like a “linguistically available” pattern of reasoning

- It’s related to both the “logical form” of the utterance (a conditional) as well as to its illocutionary force
The state of perfection

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Unfortunately, there is no stated consensus on what the right contextual factors are, and there is also more active disagreement on how the inference is actually derived (more later).
Central claim: Statements of the form “if $p$, $q$” are interpreted as biconditional when they can be understood as asserted in response to a polar (yes/no) question on their consequent.
Overview

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- Where and why do the theoretical accounts disagree?
- “Integration” of the accounts is needed; Groenendijk & Stokhof’s exhaustive interpretation provides the necessary link
- Conclusions: a new (clearer?) way of looking at GCIs and “default” or conventionalized implicatures
Conditional types

I distinguish three main conditional types:

- Causal/predictive conditionals
  a. If the Pied Piper called, the children of Hamlin followed.
  b. If the Pied Piper had called, the children of Hamlin would have followed.

- Epistemic conditionals
  a. If Mary is in the lobby, her plane must have arrived early.

- "Biscuit" conditionals
  a. If you need any help, my name is Ann.

Mostly predictive conditionals are perfectible: promises, threats, warnings, recommendations, (some) commands, and some counterfactuals.
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Recommendations
(5) If you want to save energy, turn off the computer when you’re not using it. [van Canegem-Ardijns & van Belle 2008]
Non-perfectible conditionals

Biscuit conditionals

(6) If you are hungry, there are biscuits in the cupboard.

Epistemic conditionals

(7) If this cactus grows native to Idaho, then it's not an Astrophytum.

But again:
A: Isn’t this cactus an Astrophytum?
B: If this cactus grows native to Idaho, then it’s not an Astrophytum.
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But a perfected or perfection-like reading seems available in the following exchange:

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Contextual cues for perfection

Many perfectible conditionals share certain features w.r.t. speaker control and hearer desire (van Canegem-Ardijns & van Belle 2008, Evans & Twyman- Musgrove 1998).
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- The inference must be “relevant”:
  A: What will you give me for mowing the lawn?
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- The inference must be “relevant”:
  - A: What will you give me for mowing the lawn?
  - B: If you mow the lawn, I’ll give you five dollars.
- The inference is also defeasible:
  - A: Did the plane arrive early?
  - B: If Mary is in the lobby, the plane must have arrived early. But I don’t know otherwise.
Theoretical approach: GCI theory

GCIs are “default” implicatures, which “capture our intuitions about preferred or normal interpretations.” Levinson 2000 bases them on three broad “heuristics” for communicative behavior:

- **Q-principle**: communicate as much information as possible (with respect to situational need)
- **I-principle**: do not communicate extraneous or unnecessary information
- **M-principle**: communicate information in a manner that matches the content
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Conditional perfection seems to meet the criteria: but should it be treated as a Q- or an I-implicature?
Q or I? The I account

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**Principle of Informativeness** (paraphrased from A&L)
If there are competing interpretations for $U$, the listener selects the “most informative”
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BUT: where does the availability of the biconditional interpretation come from in the first place? Why is (1) interpretable as a biconditional at all?
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Attempts to answer the “where” question treat perfection as scalar implicature. (Cornulier 1983, van der Auwera 1997, Horn 2000, von Fintel 2001)
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(8)  
  a. **ALL** > **SOME**  
  b. **Some** of the guests are leaving.  
  c. ⇔ **Not all** of the guests are leaving.

Naively, the Horn scale for conditionals would be \{IFF > IF\}. But this would derive exactly the wrong inference!
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Atlas & Levinson (1981), Matsumoto (1995) and others provide various arguments that this cannot be a Horn scale for conditionals.
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▶ Horn 2000, von Fintel 2001:

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\text{(WHATEVER THE CASE) } q > \\
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(\text{WHATEVER THE CASE}) \quad q > \text{IF } p, q
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(whatever the case) \( q > \text{IF} \ p, q \)

This isn’t a strong enough scale to generate conditional perfection! The best we can do is “not unconditionally \( q \).”
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\[(\text{WHATEVER THE CASE}) \ q > \text{ IF } p, q\]

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**Central problem:**
Perfection as an I-implicature fails to be explanatory, but perfection as a Q-implicature is too weak. We need both!
Exhaustive interpretation

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- Conditional “strengthening” is the scalar implicature ($q$ is not unconditional)

Perfection arises when we expect the speaker to list all of the conditions for $q$; we assume the list provided is exhaustive.

(This intuition is repeated all over the literature . . . but)
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**Exhaustive interpretation** is modeled as a formal operation on a question-predicate $R$ and a term (subsentential) answer $F$:

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\text{exh} = \lambda F. \lambda R [F(R) \land \neg \exists R' : [F(R') \land R \neq R' \land \forall x [R'(x) \rightarrow R(x)]]]
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- $R = \text{“in-the-garden”, } F = \text{“Mary”}$
- Mary is a member of the set picked out by \text{“in-the-garden”}
- There is no proper subset of \text{“in-the-garden”} containing Mary
- \text{“in-the-garden”} is a singleton set; Mary is the only person in the garden (applying \text{exh} is like applying \text{“only”})
Exhaustive interpretation and perfection

Groenindijk & Stokhof provide an example involving conditionals:

(10) A: Does John walk? \[ R = \text{walk}(j) \]
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- \( \text{exh} \) demands that when “Mary walks” is true, so is “John walks,” and when “Mary walks” is false, so is “John walks.”
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(11)  A: Under what conditions will Robin come to the party?
     B: If there is vegetarian food, Robin will come to the party.

In Groenendijk & Stokhof’s example, however, A asks a yes or no question about $q$ and is (somewhat unexpectedly) given a conditional in response. The calculation on the previous slide shows that biconditionality is a result of seeking yes/no exhaustivity on a conditional.

(12)  A: Will Robin come to the party?
     B: If there is vegetarian food.
Completeness

This is the right generalization!
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- The hearer demonstrates belief that the speaker has complete information about $q$
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Exhaustivity captures all of these.
Some further examples

(13) A: Will John be replaced?
    B: If he quits, he’ll be replaced.

(14) A: Are you going to kill me?
    B: If you don’t give me your wallet, I’ll kill you.

(15) A: Should I give my cat Petboost?
    B: If you love your cat, you should give him Petboost.
Mention-some readings

Not all answers are interpreted exhaustively: this has to do with the purpose of the information.
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(16)  A: Where can I buy an Italian newspaper?
     B: The drugstore around the corner.
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(16) A: Where can I buy an Italian newspaper?  
B: The drugstore around the corner.

Similarly, if one simply wants a means of achieving the consequent:

(17) A: How can I get Robin to come to the party?/  
B: If there’s vegetarian food, he’ll come.
Non-perfectible conditionals again

Epistemic conditionals are usually about providing the reasoning from premise to conclusion, not about whether or not the consequent is true:

(18)  A: Mary just called from the lobby.
      B: If she’s in the lobby, the plane must have arrived early.
Non-perfectible conditionals again

Epistemic conditionals are usually about providing the reasoning from premise to conclusion, not about whether or not the consequent is true:

(18)  A: Mary just called from the lobby.  
     B: If she’s in the lobby, the plane must have arrived early.

Speech act conditionals are about grounding the offer/act:

(19)  A: I haven’t eaten since lunchtime.  
     B: If you’re hungry, there are biscuits in the cupboard.

It’s precisely when we suspend these “normal” uses in order to answer a polar question on \( q \) that we get perfected readings.
Updating our conditional semantics

Conditional statements cannot reasonably be modeled as material implication – does all of this work when we update our representations?
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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 essentially the Lewis-Kratzer conditional; it only applies to “bare” conditionals. The accessibility relation can vary according to conditional type.
Updating exhaustivity

- Exhaustivity is a special case of McCarthy’s (1980) predicate circumscription, which formalizes “normality” assumptions accompanying practical reasoning (van Benthem 1989).
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- A model (possible world) $v$ is more minimal than $w$ with respect to a predicate $P$ just in case the set picked out by $P$ in $v$ is a proper subset of the set picked out by $P$ in $w$. 
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- A model (possible world) $v$ is more minimal than $w$ with respect to a predicate $P$ just in case the set picked out by $P$ in $v$ is a proper subset of the set picked out by $P$ in $w$.
- Dynamically: let’s call a world $w$ an information state, and let $w[\phi]$ be the set of information states that a proposition $\phi$ maps $w$ to. This context update allows us to accommodate the selection of an appropriate accessibility relation.
Updating exhaustivity

For a question-predicate $R$, and a term-answer $F$ in state $W$:

$\text{exh}^W(F, R) := \{ i \in W[F(R)] | \neg \exists i' \in W[F(R)] : i' <_R i \}$
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- $F(R)$ picks out states where $P$ does not occur without $Q$. 
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- So, if $w$ has $P$, it also has $Q$, and is minimal. There can be no $v <_Q w$ any such $v$ must also have $P$, and therefore $Q$ by selection, so $v = w$
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- So, if \( w \) has \( P \), it also has \( Q \), and is minimal. There can be no \( v <_Q w \) any such \( v \) must also have \( P \), and therefore \( Q \) by selection, so \( v = w \).
- If \( w \) does not have \( P \), it cannot have \( Q \) either. If it did, we could find \( v <_Q w \) by choosing \( v \) to have neither \( P \) nor \( Q \), and \( w \) would not be minimal.
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This is a different way of looking at default implicatures than standard GCI theory; exhaustivity manages the “conflict” between Q and I. The idea is that default inferences are about interpreting conversational contributions as meeting the contextually-developed discursive needs – that is, about finding informational equilibria, rather than acting on heuristics.
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The intuition that the relationship between perfection and “logical fallacy” is significant is borne out.

Exhaustivity/predicate circumscription is about making discursively-useful nonmonotonic extensions to formal logic (Schulz & van Rooij use this to derive scalar implicatures as well).

Instead of lumping GCIs together via the heuristics, it may be possible to classify them according to models (like circumscription) of common-sense reasoning patterns.

Defaults need not be automatic in Levinson’s sense; they can incur cost (Noveck, et al 2011).
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