Hedging your ifs and vice versa

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The plan

Scandals, dreams, and despair

The restrictor theory of *if*

Trouble

The way to salvation?

Section 1

Scandals, dreams, and despair

The semanticist's quest

- What do conditionals mean?
- How do they come to mean what they mean?

An ancient scandal

According to Sextus Empiricus, the Alexandrian poet Callimachus reported that the Greek philosophers' debate about the semantics of the little word *if* had gotten out of hand:

> *Even the crows on the roof-tops are cawing about which conditionals are true.*

An ancient scandal

It finally became too much for Cicero, who complained in his *Academica*:

> *In this very thing, which the dialecticians teach among the elements of their art, how one ought to judge whether an argument be true or false which is connected in this manner, 'If it is day, it shines', how great a contest there is; Diodorus has one opinion, Philo another, Chrysippus a third.* Need I say more?

More or less reasonable ideas

1. Material conditional
2. Strict conditional (epistemic)

The semanticist's laboratory

- Put things together
- Shake
- See what happens
- Reason backwards to the ingredients

Edgington's Challenge

> *Any theory of conditionals has consequences for less-than-certain judgements. Something is proposed of the form:* If A, B *is true iff* $A * B$. *If a clear-headed person, free from confusions of a logical, linguistic or referential sort, can be nearly sure that* $A * B$ *yet far from sure that if A, B, or vice versa, then this is strong evidence against the proposal.*

(Edgington 1995/2007)

Conditionals + Probability

(1) If I rolled a prime number, it was an odd number.

(2) Probably if I rolled a prime number, it was an odd number.

(3) If I rolled a prime number, it probably was an odd number.

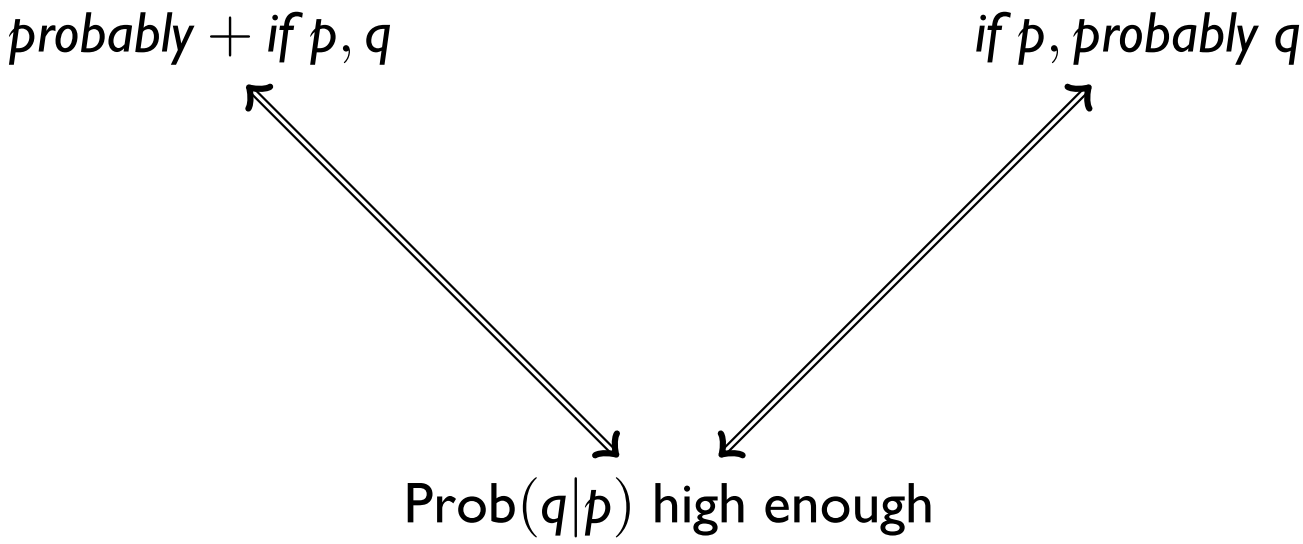
Neither of the reasonable approaches gets these examples right.

The Compelling Intuition

probably $\boxed{\text{if } p, q}$ = if p, $\boxed{\text{probably } q}$ =

the conditional probability of q, given p is high

Notation: Prob $(q|p)$ is high


probably + *if* p, q
if p, *probably* q
Prob$(q|p)$ high enough

Frank Jackson

I ask you the following question, If you throw a dart at the board, how likely is it to land in the area marked *q* if it lands in the area marked *p*? *It is compelling that the answer to this question is nothing other than how likely the dart is to land in the intersection of p and q given it lands in p, which equals the probability of its landing in the intersection of p and q as a fraction of the probability of its landing in p.*

Nirvana

Prob (if p, q) = Prob ($q|p$)

Lewisian triviality

There's no $\rightarrow$ such that $\text{Prob}(p \rightarrow q) = \text{Prob}(q|p)$ ...

Jackson's despair

Our usage of the indicative conditional construction is governed by a mistaken intuition […]. We […] wrongly think and speak as if the indicative conditional in fact has truth conditions such that its probability is the conditional probability of its consequent given its antecedent.

NTV

Conditionals do not express propositions. They thus do not have truth-conditions or truth-values.

$\Rightarrow$ *No Truth-Values*

(Another form of despair?)

Section 2

The restrictor theory of *if*

The idea

What goes on in *probably (if p, q)* and *if p, probably q*

is neither *probably* applying to a conditional nor *probably* occuring in the consequent of a conditional.

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is neither *probably* applying to a conditional nor *probably* occuring in the consequent of a conditional.

Instead, the *if*-clause restricts the probability operator.

Lewis on Adverbs of Quantification

(4) { Always / Usually / Sometimes / Never } if a farmer owns a donkey he beats it.

Lewis

The if *of our restrictive if-clauses should not be regarded as a sentential connective. It has no meaning apart from the adverb it restricts. The* if *in* always if …, …, sometimes if …, …, *and the rest is on a par with the non-connective* and *in* between …and …, *with the non-connective* or *in* whether …or …, *or with the non-connective* if *in* the probability that …if …. *It serves merely to mark an argument-place in a polyadic construction.*

Tripartite structures

The structure here isn't like either of these:

(5) a. $\mathcal{Q}\,[(\textit{if}\,p)(q)]$

b. $(\textit{if}\,p)(\mathcal{Q}\,q)$

Instead it's [quantifier + restrictor] + nuclear scope:

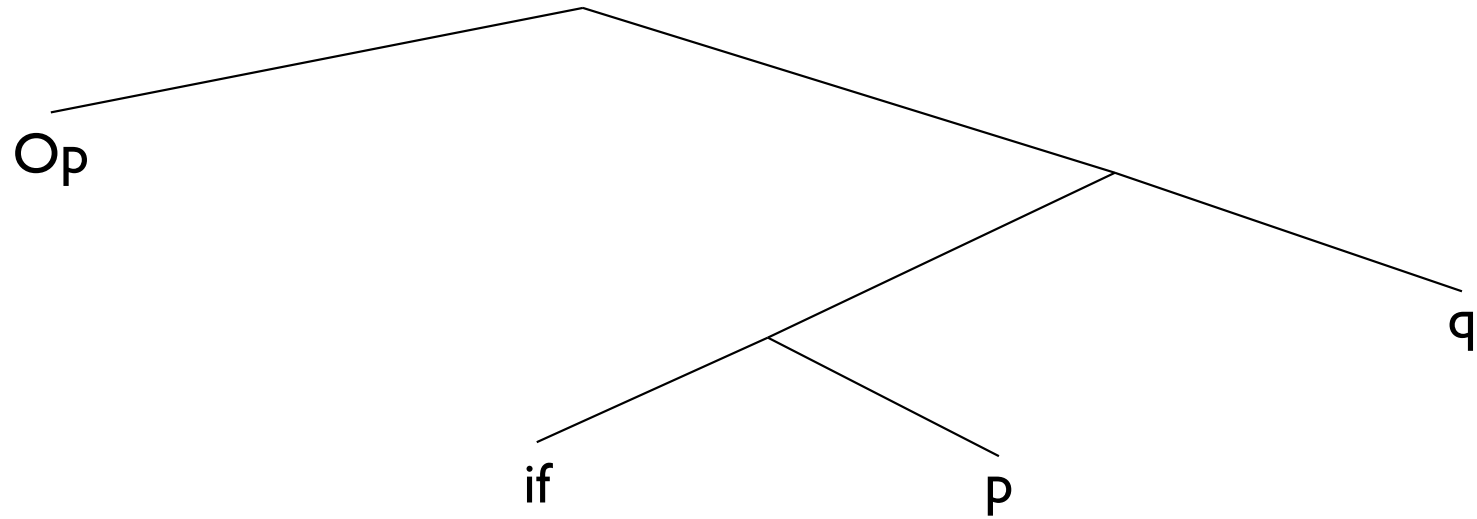
(6) $[\mathcal{Q} + p] + q$

Kratzer's Thesis

Lewis wasn't just right about adverbial quantification. His analysis is right across the board.

Kratzer

'The history of the conditional is the story of a syntactic mistake. There is no two-place if …then *connective in the logical forms of natural languages.* If-*clauses are devices for restricting the domains of various operators.*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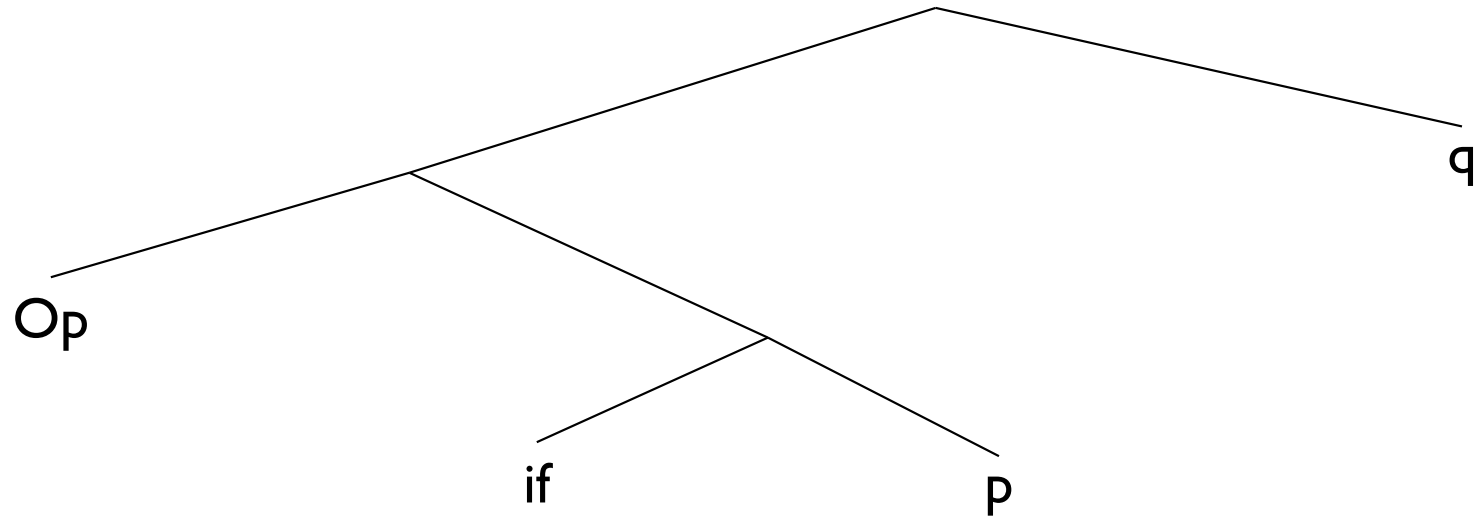
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Bare Conditionals

(7) If this dog is approached, he bites.

(8) If John was here on time, he left Cambridge at noon.

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Kratzer:

- covert operator restricted by *if*-clause
- covert frequency adverb in (7) (≈ "always")
- covert epistemic necessity modal in (8) (≈ "must")

Radicalism

NTV: conditionals do not express propositions

The Restrictor Theory: there are no conditionals

Cf.

(9) Every student smokes.

"student smokes" is not a constituent

(10) Probably if p, q.

"if p, q" is not a constituent (at LF)

The worry from thought

But even when I just think about the probability of

(11) If I rolled a prime number, it was an odd number

I think of it in terms of the conditional probability of *odd* given *prime*.

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Q: How can that be since we're not dealing with LFs that can be parsed according to the restrictor theory?

The worry from anaphora

(12) A: He told Tom.
B: Probably so.
B': That's very unlikely.

B uses some anaphoric device α to pick out A's claim.

B's replies express the Restricted Meaning:

(13) A: If he didn't tell Harry, he told Tom.
B: Probably so.
B': That's very unlikely.

Section 4

The way to salvation?

Strategies

- Despair
- Copy & Reparse
- Divide & Conquer
- Belnapian Partiality
- Move to Higher Ground

Copy & Reparse

Copy the *string* “if p, q” into the slot held by the anaphor then reparse the second sentence.

Divide & Conquer

(14) A: Every student smokes before class.
B: Most (of them) (do/do that).

Two anaphors here: *most* has a covert anaphor for the restrictor and then there's the VP anaphor.

Divide & Conquer

So ditto for the conditional.

(15) A: If he didn't tell Harry, he told Tom.
B: Probably so.
B': That's very unlikely.

The overt anaphors pick out just the consequent/scope, hedges (somehow) have a covert anaphor inside that inherits the restrictor.

Kratzer on Divide & Conquer

(16) If a wolf entered the house, he must have eaten grandma, since she was bedridden. He might have eaten the girl with the red cap, too. In fact, that's rather likely. The poor little thing wouldn't have been able to defend herself.

The third clause in (16) has an interpretation that says that it is rather likely that, if a wolf entered the house, he ate the little girl with the red cap. But then rather likely *is restricted by the if-clause in the first sentence, and* that *refers to the proposition in the scope of might in the second sentence. No conditional proposition is picked up. […] The case against embedded "conditional propositions" still stands, then.*

Not the Way Out

(17) A: If he didn't tell Harry, he told Tom.
B: I'm not sure that's true.
A: No, really. I know he told one of them.

(18) A: If he didn't tell Harry, he told Tom.
B: I'm not sure (it's true that) he told Tom.
A: Me either./??No, really. I know he told one of them.

Not the Way Out

(19) A: If he didn't tell Harry, he told Tom.
B: That may be true./That's plausible./I guess that's true.
A: No, really. I know he told one of them.

(20) A: If he didn't tell Harry, he told Tom.
B: Maybe (it's true that) he told Tom./It's plausible that he told Tom./I guess it's true he told Tom.
A: ??No, really. I know he told one of them.

Not the Way Out

(21) A: If he didn't tell Harry, he told Tom.
B: I doubt that's true.
A: No, really. I know he told one of them.

(22) A: If he didn't tell Harry, he told Tom.
B: I doubt (it's true that) he told Tom.
A: ??No, really. I know he told one of them.

Belnap's Alternative

Belnap's meaning for conditionals: $(\textit{if}\, p)(q)$ is true if p and q are true, false if p is true but q is false, and is neither if p is false.

Embedding operators are restricted to quantify over possibilities where the embedded proposition has a truth-value.

Extending the underlying Prob to cover possibly-third valued sentences is close to trivial: assign each sentence the ratio of the probability that it's true to the probability that it has a truth-value at all.

Escape?

(23) a. A: If he didn't tell Harry, he told Tom.
$\rightsquigarrow \Box\,(\mathit{if}\,p)(q)$

b. B: Probably so.
$\rightsquigarrow \mathit{probably}\,(\mathit{if}\,p)(q)$

A Worry

We have to re-think what we're up to in assertion. It can't be that we try to say something true.

(24) If you spill the beer, we'll be all out!

So everywhere our semantics uses *true* we now put in *true-if-defined*

A Worry

Mutatis mutandis for entailment: it's gotta be *Strawson Entailment*

> *X S-entails p iff all worlds where X, p have a truth-value are such that the X-worlds are p-worlds.*

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But then indicatives entail (presuppose, actually) their antecedents.

Moving to Higher Ground

Maybe *if* wants an operator to restrict because what it means is actually a function from operators to (standard) conditional meanings.

Implementation

Re-Schönfinkel (re-Curry) the Lewis-Kratzer meaning of *if*

$[\![\textit{if}]\!] \rightsquigarrow: \lambda P.\lambda Q.\lambda \mathbb{O}.\ \mathbb{O}_P Q$

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Re-Schönfinkel (re-Curry) the Lewis-Kratzer meaning of *if*

$[\![\textit{if}]\!] \rightsquigarrow$: $\lambda P.\lambda Q.\lambda \mathbb{O}.\ \mathbb{O}_P Q$

(25) a. A: If he didn't tell Harry, he told Tom.
$\rightsquigarrow \lambda \mathbb{O}.\ \mathbb{O}_p q(\square)$

b. B: Probably so.
$\rightsquigarrow \lambda \mathbb{O}.\ \mathbb{O}_p q(\textit{probably})$

What Else?

OK. We're out of ideas now.

That's It