What *If*?
Conditionals, Questions and Meaning

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Outline

❶ Background

❷ The Interrogative Link

❸ The Build-Up

❹ The Theory

Conditionals
The Basics

Conditionals (Two Varieties, Bad Terminology)

(1) If Bob danced, Leland danced
     (*indicative conditional*)

(2) If Bob had danced, Leland would have danced
   (*subjunctive conditional*)

- Conditionals are a heavily worked resource in planning, communication and inquiry
- Their study has proved particularly fertile for exploring the shape of semantic theory and different views on its role in the explanation of these activities

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Conditionals
Two Competing Theories

Propositional Theories

❶ Conditionals express propositions, i.e. they have truth-conditions

❷ The meaning of a conditional is its truth-conditions

❸ The meaning of *if* is rendered as a two-place function, mapping two propositions to a third one
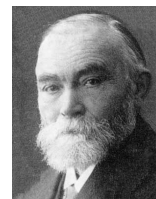
Frege (1893)   Lewis (1973)   Grice (1989)

Conditionals
Two Competing Theories

Suppositional Theories

❶ The assertion of a conditional does not involve the assertion of a conditional proposition

❷ Instead, the *if*-clause marks a supposition under which the consequent alone is asserted

von Wright (1957)   Adams (1975)   Edgington (1995)

The Debate
Between Propositional and Suppositional Theories

- This debate ranges over an array of phenomena
  - It remains hotly contested (Bennett 2003; Stalnaker 2005; Lycan 2006; Edgington 2008)
- It is a specific instance of a broader debate about the nature of meaning

The Propositional View A sentence's meaning consists in the way it represents the world as being

The Suppositional View A sentence's meaning consists in the role it plays in communicative and/or cognitive acts (assertion, acceptance, etc.)

The Plan
In Five Steps

❶ Introduce a phenomenon involving *if* that frustrates both suppositional and propositional theories

❷ Provide an intuitive account of the meaning of conditionals which captures this phenomenon

❸ Describe a formal implementation of this account

❹ Explain how the underlying concept of meaning unifies the different approaches to meaning embodied by propositional and suppositional theories

❺ Describe how this implementation also combines the benefits of those two kinds of theories

The Interrogative Link
If in Interrogative Environments

Under Interrogative Verbs (Harman 1979)

(3) Albert wondered **if** Mabel loved John

(4) Mabel asked **if** John was going to the party

But, also:

Interrogative Equatives

(5) The future is coming. The question is **if** we will be ready for it.

The Interrogative Link
The Problem

Interrogative *If*s

(3) Albert wondered **if** Mabel loved John

(4) Mabel asked **if** John was going to the party

(5) The future is coming. The question is **if** we will be ready for it.

The Problem Posed by (3)-(5)

❶ No binary operation on truth-values or propositions

❷ No suppositional speech act

The Interrogative Link
Skeptical Gambit 1

Skeptical Reply:

- Maybe the co-occurance of *if* in conditionals and (3)-(5) is a linguistic accident
  - Like use of *bank* for two very different things

Response:

- It's very uncommon for languages to use the same word for financial institutions and the land alongside a river

- But it's quite common, even across unrelated languages, to use homophonous words in interrogatives and conditional antecedents

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The Interrogative Link
Across Languages

The Link Beyond English

- Romance Langauges (Kayne 1991: §2.2)
- Bulgarian & Slavics (Bhatt & Pancheva 2006: 653)
- Hebrew (Roger Schwarzschild p.c.)
- Hua, Mayan Tzotzil, Tagalog (Haiman 1978: 570)
- ASL and LIS (Pyers & Emmorey 2008, Belletti p.c.)

- Also Embick & Iatridou (1994) on <u>conditional inversion</u>
- Also Austin (1956: 212) and Grice (1989: 78)

The Interrogative Link
Advertising Conditionals

(6) Do you need an efficient car? (Then) Honda has the vehicle for you

(7) Single? You haven't visited Match.com

(8) Art thou bound unto a wife? Seek not to be loosed. Art thou loosed from a wife? Seek not a wife. (*Corinthians 7:27*, cited by Jespersen 1940: 374)

- Jespersen (1940: 374): the 2nd sentence of (8) is issued in a context where an affirmative answer (*yes*) to the preceding question is being <u>supposed</u>

Enriching the Suppositional Process
Ramsey's Test & Hypothetical Information Change

The Ramsey Test (Ramsey 1931: 247)

"If two people are arguing 'If p, will q?' and are both in doubt as to p, they are adding p hypothetically to their stock of knowledge, and arguing on that basis about q..."

- This test may be enriched to reflect the interrogative contribution of *if p*

The Enriched Ramsey Test

If two people are arguing 'If p, will q?', they are adding *p?* hypothetically to the stock <u>issues</u> guiding their inquiry, and arguing on the basis of a hypothetical <u>affirmative resolution</u> of that issue about q

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The Enriched Ramsey Test
A Rough Paraphrase

(9) If Bob danced, Leland danced

(9′) a. Suppose we are wondering if Bob danced...
      b. ...and it turns out that he did.
      c. Then it will follow that Leland danced.

- This states the function of a conditional in terms of its contribution to the evolving body of information and issues that characterizes a conversation or inquiry
- If this statement can serve as a <u>semantics</u>, it holds promise for capturing the conditional-interrogative link

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A Plan
For the Immediate Future

❶ Adopt a convenient model of <u>information</u>
❷ Describe an approach to semantics that deals in 'transitions between bodies of information'
❸ Scale up this model to capture:
   ❶ Not only information but <u>issues</u> (i.e. questions)
   ❷ <u>Hypothetical</u> changes to this body of info & issues
❹ Use a semantics of this variety to give an analysis of conditionals
   - It will parallel the paraphrase of (9) given in (9′)

Information
A Convenient Model

### The Possible Worlds Model of Information

- Think of a set of possible worlds as distinguishing ways the world might be (possibilities in the set) from ways it isn't (possibilities excluded from the set)
- This is what information (or a 'proposition') does

- This view on the nature of content is not required, but is convenient to operate with
- **Truth Conditional Semantics**: pair each sentence ϕ with a proposition $[\![\phi]\!]$
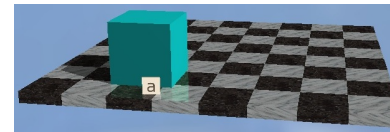

Stalnaker (1984)

Information
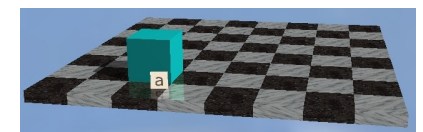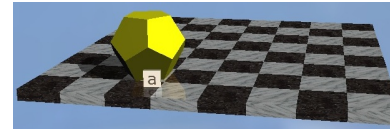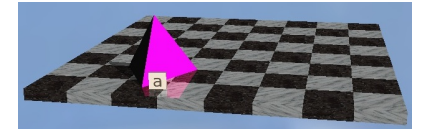### A Convenient Model

Start with a space of possibilities $W = \{w_1, w_2, w_3, w_4\}$

w_1 w_2

w_3 w_4

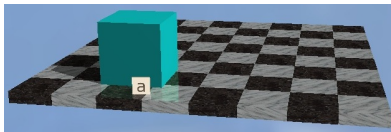---
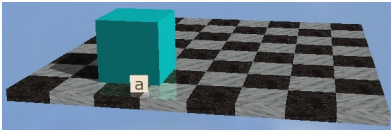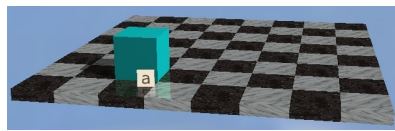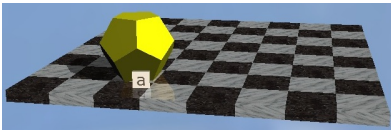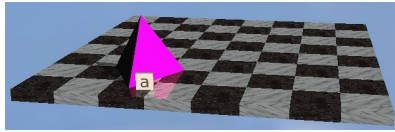
Information
The Convenient Model Meets Truth-Conditonal Semantics

- $[\![\mathsf{Cube}]\!] = \{w_1, w_2\}$ ('Cube': **a** *is a cube*)

w_1 w_2

w_3 w_4

Information
The Convenient Model Meets Truth-Conditonal Semantics

- $[\![\neg\mathsf{Cube}]\!] = W - [\![\mathsf{Cube}]\!] = \{w_3, w_4\}$

w_1 w_2
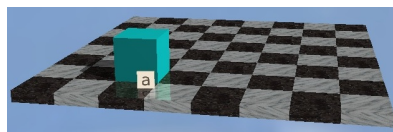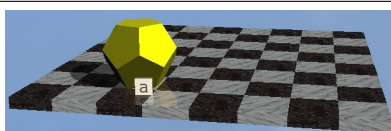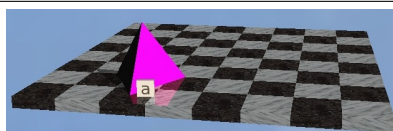
w_3 w_4

Information Change and Semantics
Two Views

- Everybody agrees that conversation takes place against an ever-changing background of information
  - <u>Call it c</u> for the *contextual possibilities/info*
  - Classic models: Stalnaker (1978), Lewis (1979)

Classical Picture Semantics delivers propositions and pragmatics provides rules for changing background information

Dynamic Picture Semantics operates directly on background information

In Short: meaning is information vs. meaning is <u>information change potential</u>

Information
The Convenient Model Meets a Different Kind of Semantics

Informational Dynamic Semantics

1. Assign each ϕ a function $[\phi]$ characterizing how it changes the information embodied by c: $c[\phi] = c'$
2. Think of this information as a way of tracking the agent's current state of mind
3. $[\phi]$ is the characteristic role that ϕ plays in changing an agent's mental states

Formal Inspirations: Pratt (1976); Heim (1982); Veltman (1996)

The Question

Do some sentences effect c in ways that can't be modeled as simply adding a proposition to it (i.e. $c \cap [\![\phi]\!]$)?

Informational Dynamic Semantics
For Epistemic *Might* (Veltman 1996)

- $c[\mathsf{Might}(\mathsf{Cube})] = \{w \in c \mid c[\mathsf{Cube}] \neq \varnothing\}$ 'Test'
  $= c$ or $\varnothing$
- $c = \{w_1, w_4\}[\mathsf{Might}(\mathsf{Cube})] = ?$
- $\{w_1, w_4\}[\mathsf{Cube}] =$

w_1 w_4

c

Informational Dynamic Semantics
For Epistemic *Might* (Veltman 1996)

- $c[\mathsf{Might}(\mathsf{Cube})] = \{w \in c \mid c[\mathsf{Cube}] \neq \varnothing\}$
- $c = \{w_1, w_4\}[\mathsf{Might}(\mathsf{Cube})] = ?$
- $\{w_1, w_4\}[\mathsf{Cube}] = \{w_1\} \neq \varnothing$

w_1

Informational Dynamic Semantics
For Epistemic *Might* (Veltman 1996)

- $c[\mathsf{Might}(\mathsf{Cube})] = \{w \in c \mid c[\mathsf{Cube}] \neq \varnothing\}$
- $c = \{w_1, w_4\}[\mathsf{Might}(\mathsf{Cube})] = c$
- $\{w_1, w_4\}[\mathsf{Cube}] = \{w_1\} \neq \varnothing$

w_1 w_4

$c' = c$

Informational Dynamic Semantics
Semantic Concepts

Support
$$c \vDash \phi \iff c[\phi] = c$$

Dynamic Consequence
$$\phi_1, \ldots, \phi_n \vDash \psi \iff c[\phi_1] \cdots [\phi_n] \vDash \psi$$

Truth in w (Starr 2010: Ch.1)
$$w \vDash \phi \iff \{w\}[\phi] = \{w\}$$

Propositions
$$\llbracket \phi \rrbracket = \{w \mid w \vDash \phi\}$$
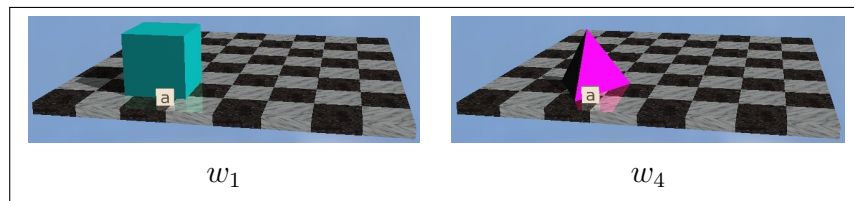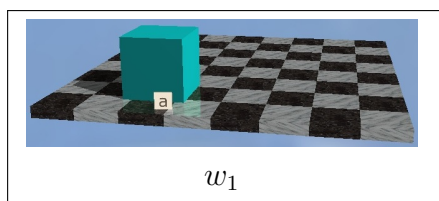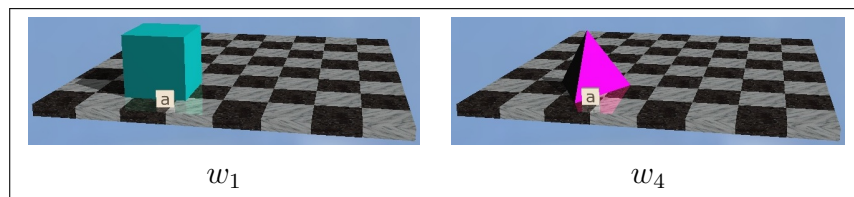

Informational Dynamic Semantics
The Question

The Question
Do some sentences effect c in ways that can't be modeled as simply adding a proposition to it (i.e. $c \cap \llbracket \phi \rrbracket$)?

1. **One Answer**: Yes, namely Might(p).
   (Veltman 1996: §2)
2. **My Answer**: Yes, namely (if ϕ) ψ, and in two ways
   - First, conditionals impact c in a way that can't be captured as $c \cap \llbracket (\text{if } \phi)\, \psi \rrbracket$
   - Second, articulating the compositional structure of conditionals demands the dynamic resources
   - I'll come back to the first way shortly

Semantics
Informational Dynamic Semantics vs. Truth-Conditional Semantics

- Regardless of 'The Question', the dynamic view is more general in one clear way
- Dynamic meanings are the characteristic role a sentence plays in changing mental states
- There may be more to it than informational effects
  - There's more to mental states than their informational content (desires, attention, questions)
- My semantics exploits this to build an interrogative semantics for *if* into a semantics for conditionals

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The Semantics of Interrogatives
Hamblin's Picture

Hamblin's (1958) Picture (Also Higginbotham 1996)
1. Knowing the meaning of an <u>interrogative</u> is knowing what would count as an answer to it
   (10)   a. Did Bob dance?
          b. Yes, Bob danced (*affirmative answer*)
          c. No, Bob didn't dance (*negative answer*)
2. To ask or wonder is to bear a certain relation to a set of these alternative propositions

On Answerhood Conditions (Hamblin 1973)
- Yes/no interrogatives: $\llbracket ?p \rrbracket = \{\llbracket p \rrbracket, \llbracket \neg p \rrbracket\}$
- if p is a yes/no interrogative, so: $\llbracket \text{if } p \rrbracket = \{\llbracket p \rrbracket, \llbracket \neg p \rrbracket\}$

Information and Issues
## Incorporating Hamblin's Picture

Issues

1. Thought and talk happen against a background of information <u>and issues</u>
   (Roberts 2004; Schaffer 2005; Groenendijk 2006; Yalcin 2008)
2. Issues are clusters of alternative propositions
   - <u>Open</u> alternatives that the agents are <u>concerned with deciding between</u>
3. Formally: a division of c into disjoint subsets

- Interrogative operators — e.g. $(? \cdot)$, $(\mathsf{if}\ \cdot)$ — don't change background information, but rather, <u>issues</u>
- I.e. $?\mathsf{p}$ <u>partitions</u> c into the p-worlds and the $\neg\mathsf{p}$-worlds

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Information and Issues
The Effect of an Interrogative Operator

$$C = \{c\} = \{\ \{w_1, w_2, w_3, w_4\}\ \}[?\mathsf{Cube}] =$$

w_1

w_2

w_3

w_4
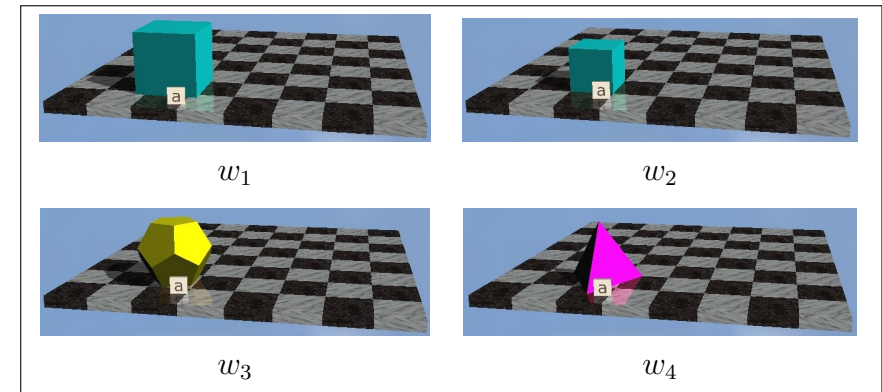
$$C = \{c\}$$

Information and Issues
The Effect of an Interrogative Operator

$$C = \{c\} = \{\ \{w_1, w_2, w_3, w_4\}\ \}[?\mathsf{Cube}] = \{\ \{w_1, w_2\}, \{w_3, w_4\}\ \}$$

w_1

w_2

w_3

w_4

$$C'$$
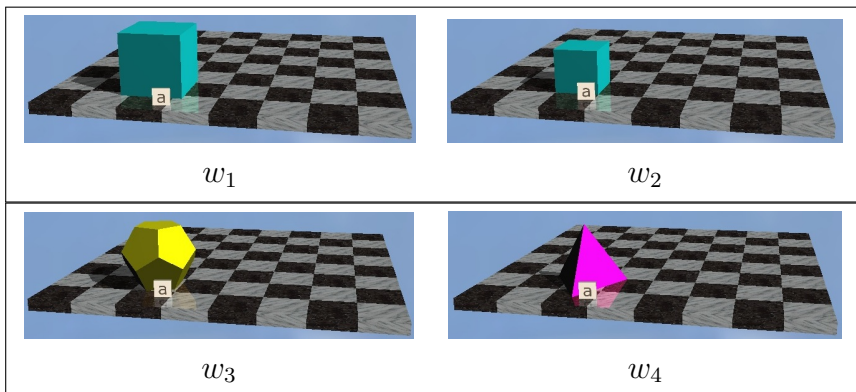
Information and Issues
Wondering *If*

*Jay wonders if **a** is a cube*: $\mathsf{Wonder}(\mathsf{Jay}, (\mathsf{if}\ \mathsf{Cube}))$

- Eliminates each world w where the issues and information representing <u>Jay's doxastic state</u> C_J^w doesn't already contain the issue that would be raised by $(\mathsf{if}\ \mathsf{Cube})$

$$\{c_0, \ldots, c_n\}[\mathsf{Wonders}(\mathsf{Jay}, (\mathsf{if}\ \mathsf{Cube}))] =$$
$$\{\ \{w \in c_0 \mid C_J^w[(\mathsf{if}\ \mathsf{Cube})] = C_J^w\}, \ldots,$$
$$\{w \in c_n \mid C_J^w[(\mathsf{if}\ \mathsf{Cube})] = C_J^w\}\ \}$$

The Upshot: if has an interrogative semantics, just like ?

Hypothetical Additions
Logical Tourism

- Information and issues are not only taken for granted in conversation and inquiry
- Agents routinely <u>entertain</u> certain enrichments of the information and issues they are taking for granted
  - 'Virtual information' so to speak
- Acts like <u>supposition</u> introduce these enrichments; the speech acts which follow may exploit what's entertained in addition to what's taken for granted
- The real virtuosity: the ways that what's <u>entertained</u> can be <u>related</u> to what's <u>accepted</u>

States of Inquiry
States of Inquiry and Hypothetical Change

Proposal: represent hypothetical change via <u>states of inquiry</u>
Let s be a state of inquiry — *state* for short

Figure: Supposing p

1. $s = \langle c \rangle$: nothing entertained
2. $s \downarrow \mathsf{p} = \langle c, \langle c[\mathsf{p}] \rangle \rangle$: $c[\mathsf{p}]$ is entertained
3. Call $s \downarrow \mathsf{p}$ <u>Subordination</u>

(Related proposal: Kaufmann 2000)

Two More Operations
For Suppositional Discourse and Reasoning

Relevant moves that exploit what's entertained:

Elaboration: $s \Downarrow \mathsf{q}$

Continues enriching the supposition itself, e.g.
$\langle c, \langle c[\mathsf{p}] \rangle \rangle \Downarrow \mathsf{q} = \langle c, \langle c[\mathsf{p}][\mathsf{q}] \rangle \rangle$.

Conclusion: $s \uparrow \mathsf{q}$

Relates what's entertained to what's accepted via an <u>entailment test</u>. Let $s = \langle c, \langle c[\mathsf{p}] \rangle \rangle$:

- If $c[\mathsf{p}]$ (what's entertained) entails q, c remains as is
- Otherwise, something *actually* contradictory has been proposed, i.e. we are brought to: $\langle \varnothing, \langle c \rangle \rangle$
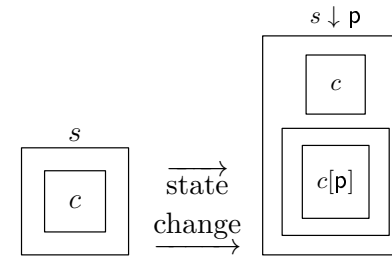
$s \uparrow \mathsf{q} = \langle \{ w \in c \mid c[\mathsf{p}] \vDash \mathsf{q} \}, \langle c[\mathsf{p}][\mathsf{q}] \rangle \rangle$

The Theory
Based on the Paraphrase

- Everything is in place to specify the meaning of a conditional in terms of how it changes a state:
  $s[(\mathsf{if}\ \phi)\ \psi] = s'$

(9) If Bob danced, Leland danced

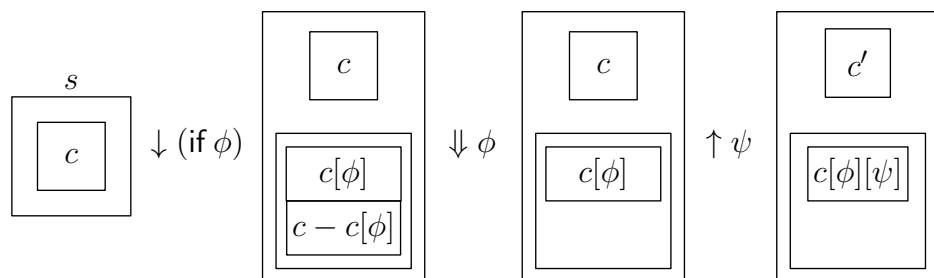(9′) a. Suppose we are wondering if Bob danced…
      b. …and it turns out that he did.
      c. Then it will follow that Leland danced.

1. Subordinated question: $s \downarrow \mathsf{if}\ \mathsf{p}$
2. Elaborated *yes*-answer: $(s \downarrow \mathsf{if}\ \mathsf{p}) \Downarrow \mathsf{p}$
3. Concluded consequent: $((s \downarrow \mathsf{if}\ \mathsf{p}) \Downarrow \mathsf{p}) \uparrow \mathsf{q}$

The Theory
In Pictures

$$s[(\text{if } \phi)\,\psi] = ((s \downarrow (\text{if } \phi)) \Downarrow \phi) \uparrow \psi \qquad \text{(preliminary version)}$$

$$c' = \{w \in c \mid c[\phi] \vDash \psi\}$$
$$= c \text{ or } \varnothing$$

The Theory
Official Version

(11) # Bob never danced. If Bob danced, Leland danced.

- Indicative conditionals presuppose the possibility of their antecedent (Stalnaker 1975: §3)
- Modeling presupposition failure as undefinedness:

Inquisitive Conditional Semantics (Official Semantics)

$$s[(\text{if } \phi)\,\psi] = \begin{cases} ((s \downarrow (\text{if } \phi)) \Downarrow \phi) \uparrow \psi & \text{if } s[\phi] \neq \langle \varnothing, \ldots \rangle \\ \text{Undefined} & \text{otherwise} \end{cases}$$

Playing the Interrogative Role
Conditionals at Work

- Abstractly, the goal of inquiry and communication is the reduction of uncertainty
  - Gaining information = eliminating possibilities
- But there are always distinctions btwn possibilities that we either can't or don't care to distinguish
  - That is: issues we can't or don't care to settle
  - Modeling inquiry and communication in terms of C captures this
  - It captures the distinctions between worlds we are attending to
- Interrogative meaning of *if* fits nicely in this picture
  - Antecedents: raise new issue, highlight an answer to it
  - Consequents: say what follows from that answer

Playing the Interrogative Role
Justifying the Presuppositions of Indicatives

- Antecedents bring to attention a new issue and highlight the positive answer to it
- What if that positive answer is incompatible with c?
- Your contribution is, in principle, irrelevant
- So it makes sense for *q if p* to presuppose that there are live *p*-worlds
  - Given that *if* has an interrogative meaning...
- This motivation of the presupposition is welcome (everyone else just stipulates it)
- Particularly since the presupposition does a lot of work in my account of the logic and truth conditions of indicative conditionals

Additional Benefits
More Compensation

> **Additional Benefits**
> 1. A highly successful logic of indicative conditionals
>   - Key components: dynamic entailment, presupposition (Starr to appear: §3.1)
> 2. An attractive account of indicative conditionals' truth-conditions
>   - Key components: presupposition, dynamic reconstruction of classical truth-conditions (Starr to appear: §3.2)
> 3. An analysis that mixes the best of propositional and suppositional theories

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The Logic of Indicatives
Preliminary Note

> **Dynamic Consequence**
> $$\phi_1, \ldots, \phi_n \vDash \psi \iff c[\phi_1] \cdots [\phi_n] \vDash \psi$$

- Since consequence concerns only c, we need only study a conditional's effect on c to study its logic

> **How $(\text{if } \phi)\, \psi$ affects c**
> $$c[(\text{if } \phi)\, \psi] = \begin{cases} c & \text{if } c[\phi] \neq \varnothing \ \& \ c[\phi] \vDash \psi \\ \varnothing & \text{if } c[\phi] \neq \varnothing \ \& \ c[\phi] \nvDash \psi \\ \text{Undefined} & \text{otherwise} \end{cases}$$

The Logic of Indicatives
Why Like It?

- Just like Stalnaker (1968, 1975) and Adams (1975), this semantics avoids the pitfalls of the material conditional

  (12) **Material Antecedent (MA)** $\neg\phi \vDash \phi \supset \psi$
  Bob didn't dance. So, if Bob danced, he was a turnip.

  Material Negation (MN) $\neg(\phi \supset \psi) \vDash \phi$
  It's not true that if God exists, he's a turnip. So, God exists.

The Logic of Indicatives
Why Like It?

- But unlike Stalnaker (1968, 1975) and Adams (1975), this success does not come at the cost of invalidating:

Import-Export $\phi_1 \to (\phi_2 \to \psi) \dashv\vDash (\phi_1 \wedge \phi_2) \to \psi$

Antecedent Strengthening $\phi_1 \to \psi \vDash (\phi_1 \wedge \phi_2) \to \psi$

Disjunctive Antecedents $(\phi_1 \vee \phi_2) \to \psi \vDash (\phi_1 \to \psi) \wedge (\phi_2 \to \psi)$

Transitivity $\phi_1 \to \phi_2, \phi_2 \to \psi \vDash \phi_1 \to \psi$

Contraposition $\phi \to \psi \vDash \neg\psi \to \neg\phi$

The Cover Up
Adams and Stalnaker in Favor of the Compromise

- They offer counterexamples to AS, Trans and Contra as justification
- For Contra Adams (1975: 15) offers:

  (13) If it rains, there won't be a terrific cloudburst

  (14) If there is a terrific cloudburst, it won't rain
- But let's think about it the present view's take:
  - Premise: all rain worlds are not-cloudburst worlds
  - Conclusion presupposes cloudburst worlds
  - Given the premise, these can't be rain worlds, but there's no cloudburst without rain!
- So this conclusion's presupposition fails

The Logic of Indicatives
What Happens When the Unspeakable Happens?

Dynamic Consequence
$$\phi_1, \ldots, \phi_n \vDash \psi \iff c[\phi_1] \cdots [\phi_n] \vDash \psi$$

- As it stands, our logic counts presupposition failure against a pattern of inference
  - But this won't do! Then you can invalidate modus ponens with a c where there are no antecedent worlds!
- Proposal: follow Strawson (1952: 173-9) and only count cases where all presuppositions are met

Strawsonian Dynamic Consequence
$$\phi_1, \ldots, \phi_n \vDash \psi \Leftrightarrow \forall c : c[\phi_1] \cdots [\phi_n] \vDash \psi$$

- If $c[\phi_1] \cdots [\phi_n][\psi]$ is defined.

The Logic of Indicatives
And So On

- It turns out, all of the 'counterexamples' offered to AS, Trans and Contra have this feature
- So the present account not only succeeds in validating these patterns, it also explains away the alleged counterexamples
- Disclaimer: this basic idea is variously considered in Warmbrod (1983: §5), Veltman (1985) and Gillies (2009: 338, 347)
- A few details aside, my contribution is to ground the essential presuppositional nature of *if* in its interrogative meaning

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Additional Benefits
Truth-Conditions

Key Definitions

Truth in w	$w \vDash \phi \Leftrightarrow \langle \{w\} \rangle[\phi] = \langle \{w\}, \ldots \rangle$
Propositional Content	$[\![\phi]\!] = \{w \mid w \vDash \phi\}$

Truth-Conditions for Indicative Conditionals
- If ϕ is false in w, $\langle \{w\} \rangle[(\text{if } \phi)\,\psi]$ is undefined
  - Since $\langle \{w\} \rangle[\phi] = \langle \varnothing, \ldots \rangle$
- If ϕ is true in w:
  - $(\text{if } \phi)\,\psi$ is true in w just in case ψ is true in w

These are long-coveted truth-conditions but previous attempts yielded implausible logics

(e.g. de Finetti 1936: 35; Jeffrey 1963: 39; McDermott 1996: 6; Milne 1997)

The Truth Conditions of Indicatives
Dynamic and Static Semantics

- Recall, a truly dynamic semantics is one where:
  - $c[\phi] \neq c \cap [\![\phi]\!]$
- $[\![(\text{if } \phi)\,\psi]\!]$ isn't generally defined, but suppose it were
  - It would contain any worlds where $\phi \wedge \psi$ is true
  - It would not contain any worlds where $\phi \wedge \neg\psi$ is true
- Suppose c contains one $\phi \wedge \neg\psi$-world w_1 and one $\phi \wedge \psi$-world w_2.
- The assertion of $(\text{if } \phi)\,\psi$ performs a test which fails for this c, and so $c[(\text{if } \phi)\,\psi] = \varnothing$
- Yet: $c \cap [\![(\text{if } \phi)\,\psi]\!] = \{w_2\}$
- So $c[(\text{if } \phi)\,\psi] \neq c \cap [\![(\text{if } \phi)\,\psi]\!]$

Additional Benefits
Propositional vs. Suppositional Theories

Propositional Theory's 'Exclusive' Benefits

1. Unified account of indicatives and subjunctives (Stalnaker 1975)
2. Account of truth-value judgements
3. Fully compositional
4. Unifies with truth-conditional frameworks used for other constructions

Suppositional Theory's 'Exclusive' Benefits

1. Sensitivity to private information (Gibbard 1981)
2. Indicative conditionals' probabilities (Edgington 2008)

Additional Benefits
Combining the Benefits of Suppositional and Propositional Theories

- Indicatives semantics offered here can be unified with a semantics for subjunctives (Starr 2012)
- Truth-value judgements ✓
- Fully compositional ✓
- Unifies with truth-conditional frameworks ✓ (Using work like Muskens 1996)
- Account of sensitivity to private information ✓
- Conditionals' probabilities:
  - Possible to have $P((\text{if } \phi)\,\psi) = P(\psi \mid \phi)$ w/o triviality
  - Controversy: do we want this?

Combining Two Perspectives
On Meaning

- Propositional theories hold that meaning resides in truth-conditions
- Suppositional theories hold that meaning resides the cognitive and communicative acts in which language features
- Here I've provided a formal and conceptual sketch of a semantics that unifies these two perspectives
- Meaning determines truth-conditions
- But it is a more general property of sentences which resides in the characteristic role they play in changing the mental states of language users

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Slides at http://williamstarr.net

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References I

ADAMS, E. W. (1975). *The Logic of Conditionals*. Dordrecht: D. Reidel.

AUSTIN, J. L. (1956). 'Ifs and Cans'. *Proceedings of the British Academy* **42**: pp. 109–132.

BENNETT, J. (2003). *A Philosophical Guide to Conditionals*. Oxford: Oxford University Press.

BHATT, R. & PANCHEVA, R. (2006). 'Conditionals'. In EVERAERT, M. & van RIEMSKIJK, H., eds., 'The Blackwell Companion to Syntax', vol. 1, chap. 16, 638–687. Malden, MA: Blackwell. URL http://www-rcf.usc.edu/~pancheva/bhatt-pancheva_syncom.pdf.

EDGINGTON, D. (1995). 'On Conditionals'. *Mind, New Series* **104**(413): pp. 235–329.

EDGINGTON, D. (2008). 'Conditionals'. In ZALTA, E. N., ed., 'The Stanford Encyclopedia of Philosophy (Winter 2008 Edition)', URL http://plato.stanford.edu/archives/win2008/entries/conditionals/.

EMBICK, D. & IATRIDOU, S. (1994). 'Conditional Inversion'. In GONZÁLES, M., ed., 'Proceedings of the North Eastern Linguistic Society 24', 189–203. Amherst, MA: Graduate Linguistics Association.

DE FINETTI, B. (1936). 'La Logique de la Probabilité'. *Actes du Congrés International de Philosophie Scientifique* **4**: pp. 31–9.

References II

FREGE, G. (1893). *Grundgesetze der Aritmetik, begriffsschriftlich abgeleitet, Vol. 1*. Jena: H. Pohle, 1st edn.

GIBBARD, A. F. (1981). 'Two Recent Theories of Conditionals'. In HARPER, W. L., STALNAKER, R. C. & PEARCE, G., eds., 'Ifs: Conditionals, Beliefs, Decision, Chance, Time', 211–247. Dordrecht: D. Reidel Publishing Co.

GILLIES, A. (2009). 'On Truth-Conditions for *If* (but Not Quite Only *If*)'. *Philosophical Review* **118**(3): pp. 325–349. URL http://rci.rutgers.edu/~thony/truth-conditions-if-phil-review-2009.pdf.

GRICE, H. P. (1989). 'Indicative Conditionals'. In 'Studies in the Way of Words', chap. 4, 58–85. Cambridge, MA: Harvard University Press.

GROENENDIJK, J. (2006). 'The Logic of Interrogation'. In ALONI, M. & BUTLER, A., eds., 'Questions in Dynamic Semantics', vol. 17 of *Current Research in the Semantics/Pragmatics Interface*, 43–62. Oxford: Elsevier Science Ltd.

HAIMAN, J. (1978). 'Conditionals are Topics'. *Language* **54**(3): pp. 564–589.

HAMBLIN, C. L. (1958). 'Questions'. *Australasian Journal of Philosophy* **36**: pp. 159–168.

HAMBLIN, C. L. (1973). 'Questions in Montague English'. *Foundations of Language* **10**(1): pp. 41–53.

HARMAN, G. (1979). '*If* and Modus Ponens'. *Theory and Decision* **11**: pp. 41–53.

References III

HEIM, I. (1982). *The Semantics of Definite and Indefinite Noun Phrases*. Ph.D. thesis, Linguistics Department, University of Massachusetts, Amherst, Massachusetts.

HIGGINBOTHAM, J. (1996). 'The Semantics of Questions'. In LAPPIN, S., ed., 'The Handbook of Contemporary Semantic Theory', 361–383. Oxford: Blackwell Publishers.

JEFFREY, R. C. (1963). 'On Indeterminate Conditionals'. *Philosophical Studies* **14**(3): pp. 37–43.

JESPERSEN, O. (1940). *A Modern English Grammar on Historical Principles, Part V: Syntax*, vol. 4. Copenhagen: Ejnar Munksgaard, 1st edn.

KAUFMANN, S. (2000). 'Dynamic Context Management'. In FALLER, M., KAUFMANN, S. & PAULY, M., eds., 'Formalizing the Dynamics of Conversation', 171–188. Stanford, CA: CSLI Publications.

KAYNE, R. (1991). 'Romance Clitics, Verb Movement and PRO'. *Linguistic Inquiry* **22**: pp. 647–686.

LEWIS, D. K. (1973). *Counterfactuals*. Cambridge, Massachusetts: Harvard University Press.

LEWIS, D. K. (1979). 'Scorekeeping in a Language Game'. *Journal of Philosophical Logic* **8**(3): pp. 339–359.

References IV

Lycan, W. (2006). 'Conditional-Assertion Theories of Conditionals'. In Thompson, J. & Byrne, A., eds., 'Content and Modality: Themes from the Philosophy of Robert Stalnaker', 148–164. New York: Oxford University Press. URL http://www.unc.edu/~ujanel/CondAssnThs.htm.

McDermott, M. (1996). 'On the Truth Conditions of Certain 'If'-Sentences'. *The Philosophical Review* **105**(1): pp. 1–37.

Milne, P. (1997). 'Bruno de Finetti and the Logic of Conditional Events'. *The British Journal for the Philosophy of Science* **48**(2): pp. 195–232.

Muskens, R. (1996). 'Combining Montague Semantics and Discourse Representation'. *Linguistics and Philosophy* **19**(2): pp. 143–186.

Pratt, V. R. (1976). 'Semantical Considerations on Floyd-Hoare Logic'. In 'Proceedings of the 17th IEEE Symposium on Foundations of Computer Science', 109–121.

Pyers, J. & Emmorey, K. (2008). 'The Face of Bimodal Bilingualism'. *Psychological Science* **19**(6): pp. 531–6.

Ramsey, F. P. (1931). 'General Propositions and Causality'. In Braithwaite, R., ed., 'The Foundations of Mathematics: Collected Papers of Frank P. Ramsey', 237–255. London: Routledge and Kegan Paul.

References V

Roberts, C. (2004). 'Context in Dynamic Interpretation'. In Horn, L. & Ward, G., eds., 'The Handbook of Pragmatics', 197–220. Malden, MA: Blackwell. URL http://www.ling.ohio-state.edu/~croberts/context.pdf.

Schaffer, J. (2005). 'What shifts? : Thresholds, standards, or alternatives?' In 'Contextualism in Philosophy: Knowledge, Meaning, and Truth', Oxford University Press.

Stalnaker, R. C. (1968). 'A Theory of Conditionals'. In Rescher, N., ed., 'Studies in Logical Theory', 98–112. Oxford: Basil Blackwell Publishers.

Stalnaker, R. C. (1975). 'Indicative Conditionals'. *Philosophia* **5**: pp. 269–286. Page references to reprint in Stalnaker (1999).

Stalnaker, R. C. (1978). 'Assertion'. In Cole, P., ed., 'Syntax and Semantics 9: Pragmatics', 315–332. New York: Academic Press. References to reprint in Stalnaker (1999).

Stalnaker, R. C. (1984). *Inquiry*. Cambridge, Massachusetts: The MIT Press.

Stalnaker, R. C. (1999). *Context and Content: Essays on Intentionality in Speech and Thought*. Oxford: Oxford University Press.

References VI

Stalnaker, R. C. (2005). 'Conditional Propositions and Conditional Assertions'. In Gajewski, J., Hacquard, V., Nickel, B. & Yalcin, S., eds., 'New Work on Modality', vol. 51 of *MIT Working Papers in Linguistics*. Cambridge, MA: MITWPL.

Starr, W. B. (2010). *Conditionals, Meaning and Mood*. Ph.D. thesis, Rutgers University, New Brunswick, NJ. URL http://williamstarr.net/research/dissertation.pdf.

Starr, W. B. (2012). 'A Uniform Theory of Conditionals'. Ms. Cornell University.

Starr, W. B. (to appear). 'What *If*?' .

Strawson, P. F. (1952). *Introduction to Logical Theory*. London: Methuen.

Veltman, F. (1985). *Logics for Conditionals*. Ph.D. dissertation, University of Amsterdam, Amsterdam.

Veltman, F. (1996). 'Defaults in Update Semantics'. *Journal of Philosophical Logic* **25**(3): pp. 221–261. URL http://www.pgrim.org/philosophersannual/xix/velt/index.htm.

Warmbrod, K. (1983). 'Epistemic Conditionals'. *Pacific Philosophical Quarterly* **64**: pp. 249–265. URL http://philpapers.org/archive/WAREC.1.pdf.

von Wright, G. H. (1957). *Logical Studies*. London: Routledge and Kegan Paul.

Yalcin, S. (2008). *Modality and Inquiry*. Ph.D. thesis, MIT, Department of Linguistics and Philosophy, Cambridge, MA. URL http://dspace.mit.edu/handle/1721.1/45893?show=full.