

Conditionals, Questions and Meaning

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Outline

- 1 Background
- 2 The Interrogative Link
- 3 The Build-Up
- 4 The Theory

Conditionals

The Basics

Conditionals (Two Varieties, Bad Terminology)

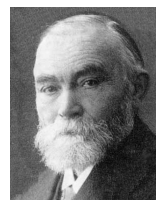
- (1) If Bob danced, Leland danced
(*indicative conditional*)
 - (2) If Bob had danced, Leland would have danced
(*subjunctive conditional*)
- Conditionals are a heavily worked resource in planning, communication and inquiry
 - Their study has proved particularly fertile for exploring the shape of semantic theory and different views on its role in the explanation of these activities

Conditionals

Two Competing Theories

Propositional Theories

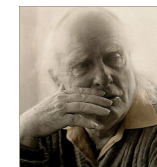
- 1 Conditionals express propositions, i.e. they have truth-conditions
- 2 The meaning of a conditional is its truth-conditions
- 3 The meaning of *if* is rendered as a two-place function, mapping two propositions to a third one



Frege (1893)



Lewis (1973)



Grice (1989)

Conditionals

Two Competing Theories

Suppositional Theories

- 1 The assertion of a conditional does not involve the assertion of a conditional proposition
- 2 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 cognitive acts (assertion, acceptance, etc.)

The Plan

In Five Steps

- 1 Introduce a phenomenon involving *if* that frustrates both suppositional and propositional theories
- 2 Provide an intuitive account of the meaning of conditionals which captures this phenomenon
- 3 Describe a formal implementation of this account
- 4 Explain how the underlying concept of meaning unifies the different approaches to meaning embodied by propositional and suppositional theories
- 5 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 *ifs*

- (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)

- ① No binary operation on truth-values or propositions
- ② No suppositional speech act

The Interrogative Link

Across Languages

The Link Beyond English

- Romance Languages (Kayne 1991: §2.2)
 - Bulgarian & Slavics (Bhatt & Pancheva 2006: 653)
 - Hebrew (Roger Schwarzschild p.c.)
 - Korean (Seunghun Lee p.c.)
 - Hua, Mayan Tzotzil, Tagalog (Haiman 1978: 570)
 - ASL and LIS (Pyers & Emmorey 2008, Belletti p.c.)
- Also Embick & Iatridou (1994) on conditional inversion
 - Also Austin (1956: 212) and Grice (1989: 78)

The Interrogative Link

Skeptical Gambit 1

Skeptical Reply:

- Maybe the co-occurrence 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

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 supposed

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 issues guiding their inquiry, and arguing on the basis of a hypothetical affirmative resolution of that issue about q

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 semantics, it holds promise for capturing the conditional-interrogative link

A Plan

For the Immediate Future

- 1 Adopt a convenient model of information
- 2 Describe an approach to semantics that deals in ‘transitions between bodies of information’
- 3 Scale up this model to capture:
 - 1 Not only information but issues (i.e. questions)
 - 2 Hypothetical changes to this body of info & issues
- 4 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

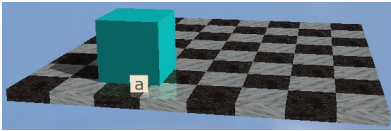
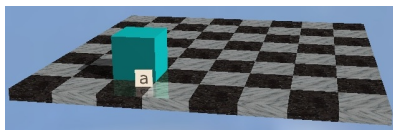
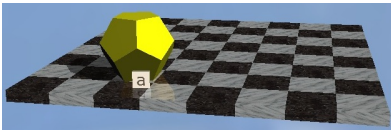
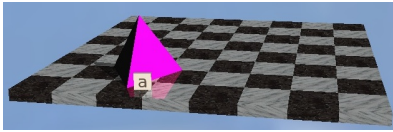
- Think of a set of possible worlds as distinguishing ways the world might be (possibilities in the set) from ways it isn't (possibilities excluded from the set)
 - This is what information (or a ‘proposition’) does
- This view on the nature of content is not required, but is convenient to operate with
 - **Truth Conditional Semantics:** pair each sentence ϕ with a proposition $\llbracket \phi \rrbracket$



Stalnaker (1984)

Information

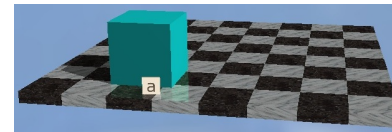
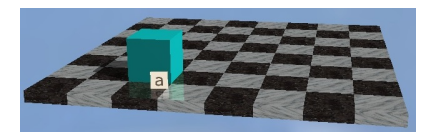
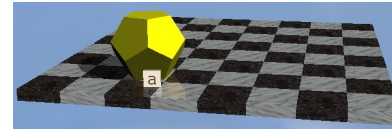
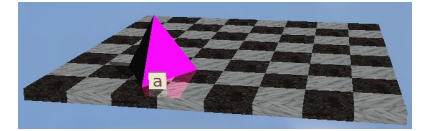
A Convenient Model

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-Conditional Semantics

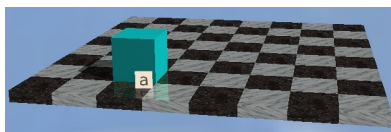
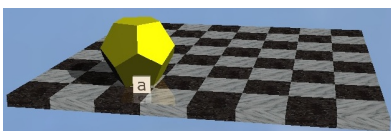
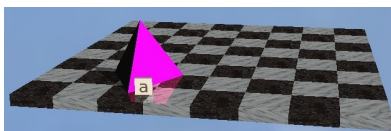
- $[[\text{Cube}]] = \{w_1, w_2\}$

('Cube': a is a cube) w_1  w_2  w_3  w_4

Information

The Convenient Model Meets Truth-Conditional Semantics

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

 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
 - Call it c 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 information change potential

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)

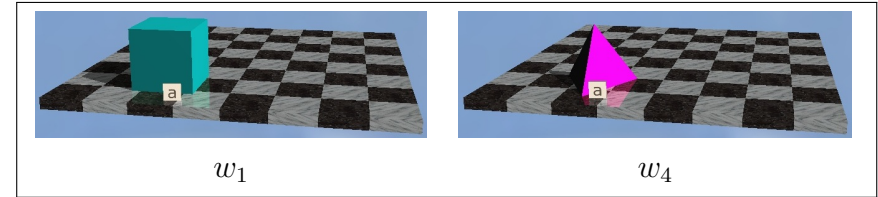
The Question

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)

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

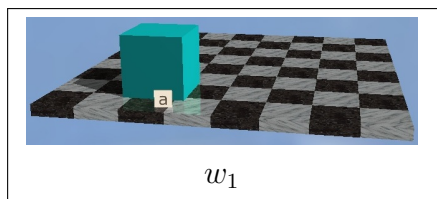


c

Informational Dynamic Semantics

For Epistemic *Might* (Veltman 1996)

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

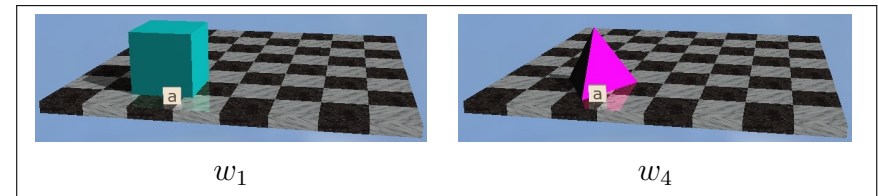


w_1

Informational Dynamic Semantics

For Epistemic *Might* (Veltman 1996)

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



$c' = c$

Informational Dynamic Semantics

Semantic Concepts

Support

$$c \models \phi \iff c[\phi] = c$$

Entailment

$$\phi_1, \dots, \phi_n \models \psi \iff c[\phi_1] \cdots [\phi_n] \models \psi$$

Truth in w (Starr 2010: Ch.1)

$$w \models \phi \iff \{w\}[\phi] = \{w\}$$

Propositions

$$\llbracket \phi \rrbracket = \{w \mid w \models \phi\}$$

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 **Another Answer:** When the propositions may be context-dependent, e.g. $\llbracket \text{Might}(p) \rrbracket_c$, the situation is complicated. (Starr 2010: Ch.1) There are, however, reasons to prefer the dynamic account over a contextualist one. (Yalcin 2008: §2.6)

Semantics

Informational Dynamic Semantics vs. Truth-Conditional Semantics

- Regardless of how we answer 'The Question', there is one way in which the dynamic view is clearly more general
- I think of a dynamic meaning as the characteristic role a sentence plays in changing mental states
- There may be more to that role than its informational effects, since there is more to mental states than their informational content
- It precisely this property that my semantics requires

The Semantics of Interrogatives

Hamblin's Picture

Hamblin's (1958) Picture (Also Higginbotham 1996)

- 1 Knowing the meaning of an interrogative 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

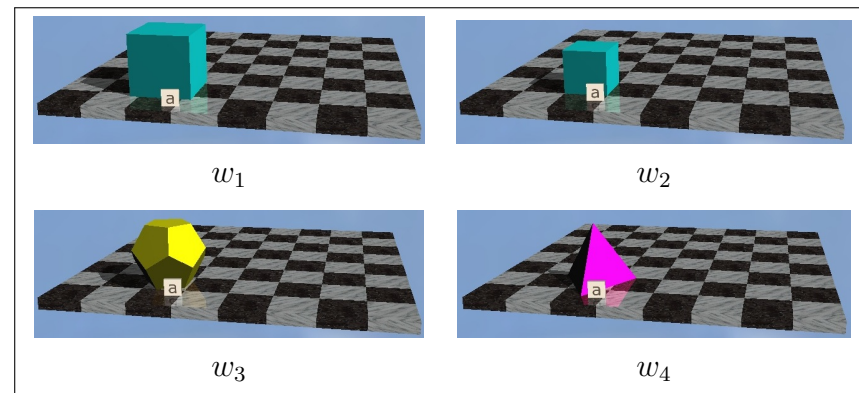
Issues

- 1 Thought and talk happen against a background of information and issues
(Roberts 2004; Schaffer 2005; Groenendijk 2006; Yalcin 2008)
 - 2 Issues are clusters of alternative propositions
 - Open alternatives that the agents are concerned with deciding between
 - 3 Formally: a division of c into disjoint subsets
- Interrogative operators — e.g. $(? \cdot)$, $(\text{if } \cdot)$ — don't change background information, but rather, issues
 - I.e. $?p$ partitions c into the p -worlds and the $\neg p$ -worlds

Information and Issues

The Effect of an Interrogative Operator

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

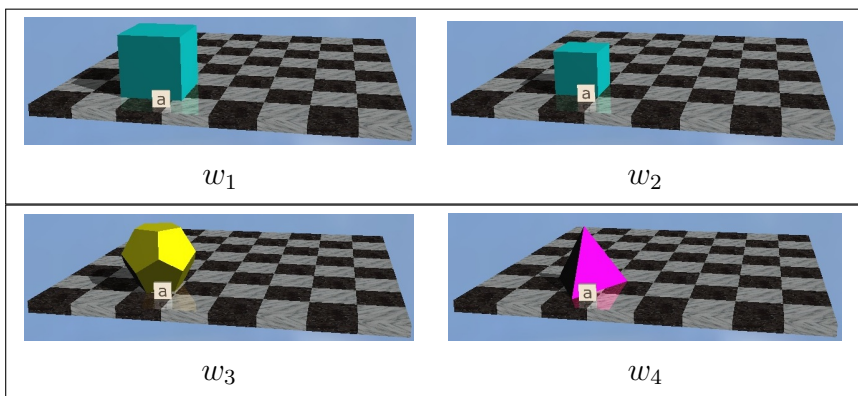


$$C = \{c\}$$

Information and Issues

The Effect of an Interrogative Operator

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



$$C'$$

Information and Issues

Wondering *If*

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

- Eliminates each world w where the issues and information representing Jay's doxastic state C_J^w doesn't already contain the issue that would be raised by (if Cube)

$$\begin{aligned} \{c_0, \dots, c_n\} [\text{Wonders}(\text{Jay}, (\text{if Cube}))] = \\ \{ \{w \in c_0 \mid C_J^w[(\text{if Cube})] = C_J^w\}, \dots, \\ \{w \in c_n \mid C_J^w[(\text{if Cube})] = C_J^w\} \} \end{aligned}$$

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

Hypothetical Additions

Logical Tourism

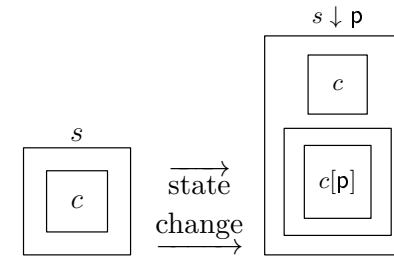
- Information and issues are not only taken for granted in conversation and inquiry
- Agents routinely entertain certain enrichments of the information and issues they are taking for granted
- Acts like supposition introduce these enrichments; the speech acts which follow may exploit what's entertained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

States of Inquiry

States of Inquiry and Hypothetical Change

Proposal: represent hypothetical change via states of inquiry

Let s be a state of inquiry — *state* for short



- $s = \langle c \rangle$ — nothing entertained
- $s \downarrow p = \langle c, \langle c[p] \rangle \rangle$ — $c[p]$ is entertained
- Call $s \downarrow p$ Subordination

Figure: Supposing p

(Related proposal: Kaufmann 2000)

Two More Operations

For Suppositional Discourse and Reasoning

Relevant moves that exploit what's entertained:

Elaboration: $s \Downarrow q$

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

Conclusion: $s \Uparrow q$

Relates what's entertained to what's accepted via an entailment test. Let $s = \langle c, \langle c[p] \rangle \rangle$:

- If $c[p]$ (what's entertained) entails q , c remains as is
- Otherwise, something *actually* contradictory has been proposed, i.e. we are brought to: $\langle \emptyset, \langle c \rangle \rangle$

$s \Uparrow q = \langle \{w \in c \mid c[p] \models q\}, \langle c[p][q] \rangle \rangle$

The Theory

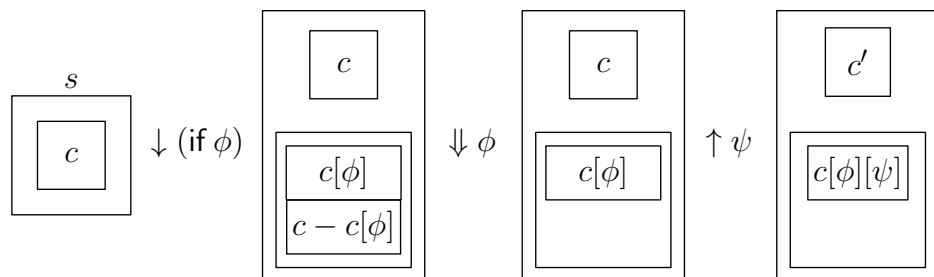
Based on the Paraphrase

- Everything is in place to specify the meaning of a conditional in terms of how it changes a **state**:
 $s[(\text{if } \phi) \psi] = s'$
- (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**.
- Subordinated question: $s \downarrow \text{if } p$
 - Elaborated *yes*-answer: $(s \downarrow \text{if } p) \Downarrow p$
 - Concluded consequent: $((s \downarrow \text{if } p) \Downarrow p) \Uparrow q$

The Theory

In Pictures

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



$$c' = \{w \in c \mid c[\phi] \models \psi\}$$

$$= c \text{ or } \emptyset$$

The Theory

Official Version

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

- Indicative conditionals presuppose the possibility of their antecedent (Stalnaker 1975: §3; Bennett 2003: §23)
- This is not mysterious on an interrogative analysis of *if*
- Modeling presupposition failure as undefinedness:

Inquisitive Conditional Semantics (Official Semantics)

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

Additional Benefits

More Compensation

Additional Benefits

- 1 A highly successful logic of indicative conditionals
 - Key components: dynamic entailment, presupposition (Starr 2009: §3.1)
- 2 An attractive account of indicative conditionals' truth-conditions
 - Key components: presupposition, dynamic reconstruction of classical truth-conditions (Starr 2009: §3.2)
- 3 An analysis that mixes the best of propositional and suppositional theories

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 2010: Ch.3)
- Truth-value judgements ✓
- Fully compositional ✓
- Unifies with truth-conditional frameworks ✓ (E.g. Muskens 1996)
- Account of sensitivity to private information ✓
 - In parallel with earlier remarks about Might
- Conditionals' probabilities: open issue

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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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