The pragmatic ingredients to get perfect biscuits[1]

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Abstract. Building on previous work, we present a proposal for a pragmatic account of biscuit conditionals (BCs). We present a new phenomenon that we dub *biscuit perfection* to support our proposal and argue that differences between BCs and hypothetical conditionals can be explained once we consider the relation between *if*-constructions and discourse.

Keywords: Biscuit conditionals, contrastive topic, inferences in conditionals, causality.

1. Introduction

There is a contrast between the two *if*-constructions in (1):

(1) a. If you are hungry, I'll give you some biscuits.
b. If you are hungry, there are biscuits on the sideboard.

In its most prominent reading, an utterance of (1a) conveys that whether I give you biscuits or not depends on you being hungry. *If*-constructions with this reading are often called hypothetical conditionals, (HCs). In contrast, by uttering (1b) the speaker conveys that there are biscuits on the sideboard regardless of whether you are hungry or not, and in addition conveys a suggestion to eat the biscuits to still hunger. *If*-constructions with this reading are called *biscuit conditionals* after Austin's (1956) original example or, e.g., *relevance conditionals* (although in these cases the consequent is not at all 'conditional' on the antecedent). This contrast has been characterized as a difference in information update within a Stalnakerian model of communication (Stalnaker, 2002, 2014): the consequents in HCs update only the temporary context created by the antecedent clause, while in BCs the consequents update the entire context set. Theories of biscuit conditionals have aimed to explain this contrast, which we dub the *global update puzzle* (GUP). A second issue is why a speaker would utter (1b) instead of the plain declarative *there are biscuits on the sideboard*. We dub this second question the *conditional form puzzle* (CFP). As a third point, we would also like to understand how the 'extra meaning' pertaining to a suggestion arises in examples like (1b).

There are, roughly, two linguistic approaches to the study of BCs. Semantic theories (DeRose and Grandy 1999; Siegel 2006; Ebert et al. 2014 a.o.) claim that BCs and HCs have different logical forms that result in a different interpretation. Such accounts provide explanations for the GUP and the CFP and can also account for the fact that an utterance of (1b) conveys a suggestion.

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Pragmatic theories (Franke 2007, 2009; Sano and Hara 2014; Lauer 2015; Francez 2015 a.o.), in contrast, argue that the semantic meaning of *if*-constructions is the same and differences between HCs and BCs are derived pragmatically taking into account the independence between antecedent and consequent.

While semantic theories are designed to explain all the points in our desiderata so far, pragmatic theories have focused on how to derive the GUP, with the other puzzles often only sketched. In this paper we defend a pragmatic view of BCs. We build on previous work to provide a fleshed-out account of the factors that result in *if*-constructions being interpreted as either HCs or BCs. We further argue that the pragmatic mechanisms underlying one or the other reading of *if*-constructions are independently motivated. This point will be made by exploring new data illustrating a phenomenon that we call *biscuit perfection*. An example is provided in (2) (with prosodic annotations resulting from a pilot study, see §4 for more details):

(2) a. Oh, you are making pasta bolognese!
If you need wine$_{\text{(L)-H*}}$ for the sauce$_{\text{L+H* L-H\%}}$ ... there is a bottle by the microwave.

b. Oh, you are making pasta bolognese!
If you need wine for the sauce$_{\text{L+H* L-H\%}}$ ... there is a bottle by the microwave.

The two different prosodic patterns above lead to two different interpretations. In (2a), representing a "neutral" pattern, the speaker is not suggesting that the wine should not be used for other purposes, such as drinking (though such inferences could arise as a result of world-knowledge regarding the kinds of wine we cook with.). However, with the prosody in (2b) the speaker indicates that the recommendation to use the wine by the microwave extends only to the making of the sauce (i.e. the speaker wouldn't recommend drinking the wine). In this case, the suggestion inference we had already noted is strengthened to be applied only in the circumstances described by the antecedent. We call this *biscuit perfection*. A theory of BCs should also explain how biscuit perfection is derived, which becomes now the fourth point in our desiderata. As we will show, accounting for biscuit perfection requires taking into account the mapping between BCs and discourse structure, providing independent support for a pragmatic account of BCs.

The reminder of the paper is organized as follows: in §2 we briefly explain how pragmatic theories solve the GUP and introduce the notion of independence in BCs. In §3 we make a proposal regarding how BCs map into discourse. We argue that this mapping is what triggers the inferences in BCs. The case of perfect biscuits, §4, provides support for the idea that the mapping of BCs into discourse is crucial in the construction of meaning. Biscuit perfection is argued to be no more than C(ontrastive)T(opic)-marking in BCs. We conclude with a comparison between the resulting theory and semantic theories of BCs in §5.

2. Strengthening the consequent to a global update (GUP)

2.1. Independence

Pragmatic theories claim that independence between antecedent and consequent is key to biscuithood (in HCs they are dependent). However, there are different takes on how to spell out what it means for propositions to be independent (Merin, 2007; Sano and Hara, 2014; Francez, 2015; Franke, 2009). Here, we will confine ourselves to an informal characterization of independence emphasizing the core insight shared by the different positions.[2] Independence is regarded as an epistemic notion defined relative to an agent's information state.

(3) Epistemic independence of propositions
Two propositions ϕ, ψ are independent relative to an information state Σ iff learning the truth of ϕ does not provide information regarding ψ and vice-versa.

With this rough characterization of independence at hand let us turn now to the semantics of indicative *if*-constructions. We will then be prepared to tackle the GUP.

2.2. A dynamic semantics for the (indicative) *if*-constructions and the GUP in BCs

We employ a dynamic semantics for (indicative) *if*-constructions operating on a Stalnakerian *context set* c, the global context.[3] The meaning of an expression is its context change potential (CCP), i.e. a function from contexts to (updated) contexts. The CCP of a simple declarative proposes to eliminate from c all worlds in which the corresponding proposition is false. For conditionals, we adopt Heim's (1983) CCP (see Biezma and Goebel 2017 for an analysis building on Isaacs and Rawlins's 2008 proposal using a stack-based model):

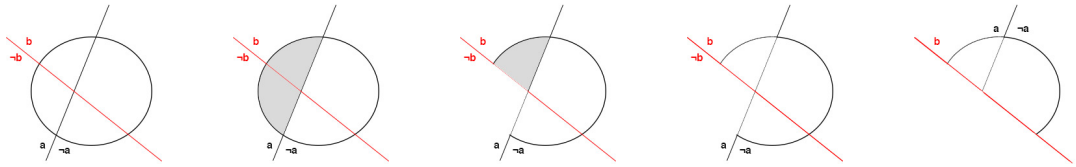
(4) Conditional declarative update: Where $M \backslash N = M \cap (W - N)$
$c + If\ \alpha, \beta = c \setminus (c + \alpha \setminus c + \alpha + \beta)$, where α and β are declarative clauses.

To evaluate a conditional, the antecedent clause sets up a temporary context $c + \alpha$ containing only worlds where the antecedent is true. Given that indicative conditionals presuppose that the antecedent proposition is a live option in c, $c + \alpha$ is a subset of c. Furthermore, $c + \alpha$ is updated with the consequent β. Complementation in $(c + \alpha \setminus c + \alpha + \beta)$ gives us all $\alpha \wedge \overline{\beta}$-worlds, i.e. those worlds eliminated when $c + \alpha$ is updated by β. In the final step, all $\alpha \wedge \overline{\beta}$-worlds are eliminated from the global context c.

However, for BCs this is not the end of the story. In pragmatic accounts of BCs following Franke (2009), the interplay with the contextual assumption of independence has the effect of eliminating all $\overline{\beta}$-worlds from the global context c, not only $\alpha \wedge \overline{\beta}$-worlds. Why is this so? The proposal is that in the context prior to the utterance of the BC there is a shared contextual assumption of

[2] The reader is referred to Biezma and Goebel (2017) for a full discussion and an improved alternative.

[3] Here we restrict ourselves to indicative BCs. In Biezma and Goebel (2017) we extend our account to also cover subjunctive BCs as observed by Swanson (2013) and further subjunctive cases.



(a) (b) (c) (d) (e)

Figure 1: Dynamic update and strengthening in BCs

independence between antecedent and consequent (while in HC-interpretations we take them to be dependent). We follow Francez (2015) in postulating that this means that dependence is excluded by shared world-knowledge of "causal and epistemic relations". Independence enforces that in c all possible truth-value distributions over antecedent and consequent are possible, as depicted in fig. (1a). This structure makes sure that learning that either the antecedent or the consequent is true doesn't provide information regarding the other proposition. The utterance of the conditional proposes to update c by first creating a temporary context $c+\alpha$ formed by all the α-worlds (fig. (1b)), and then eliminating from them the $\overline{\beta}$- worlds, leaving us only the $\alpha \wedge \beta$-worlds (grey area in fig. (1c)). At this point we return to the global context where all $\alpha \wedge \overline{\beta}$-worlds are eliminated (fig. (1d)). However, the induced structure on c depicted in (fig. (1d)) clashes with the independence assumption. The latter requires that learning about the truth of one proposition does not imply learning anything about the other proposition. In contrast, the structure depicted in fig. (1d) is fit for *modus ponens*, i.e. if the truth of the antecedent is learned, the truth of the consequent is also learned in c since after an update with α there are only $\alpha \wedge \beta$-worlds left. Hence, we arrive at a contradiction, since α and β are *not* independent here. The clash of the independence assumption and the semantically encoded update exerts *pragmatic pressure* on the addressee to modify her view of the context while preserving the assumptions of independence and that there are worlds in the context set in which the antecedent is true. With these constraints the only way to retrieve a coherent context set is to eliminate all $\overline{\beta}$-worlds from the global context c (fig. (1e)). In the resulting context set, in which β is always true, learning whether the antecedent α is true or false does not allow us to learn anything about the status of β, preserving in this way the assumption of independence as well. Hence, it is the assumption of independence what accounts for the GUP.

It is important to note that strengthening as described is a rational reconstruction and not an explicit reasoning process the interpreter goes through. Strengthening is a contextual entailment that is not cancellable, because it is an entailment of the context set given that certain presuppositions, i.e. independence and antecedent possibility, are met.

3. The discourse function of BCs

Having explained the GUP, let us tackle now the CFP: why does a speaker utter a BC when the utterance of the main clause alone (the consequent) would apparently suffice? We believe that part of the answer, following Franke (2009) and going back to DeRose and Grandy (1999), is

that BCs help to establish relevance (and hence felicity) of the utterance. The following example (adapted from Franke 2009: 275) illustrates the point:

(5) B has been helping A to pack for a trip by handing him stuff, and is obviously tired:
A: There are biscuits on the sideboard.
[B hands out the cookies to A who starts laughing. A explains that he was just suggesting that B eat them since he looks tired and sugar would do him good.]

B's interpretation of A's utterance was perfectly coherent given the overall context, but that is not what A intended (hence the laughter). Uttering the BC 'If you are hungry, there are biscuits on the sideboard' would have avoided the confusion and would have unambiguously resulted in the intended interpretation, i.e. that the speaker is suggesting that B eat some biscuits. The BC would have informed the addressee about the presence of biscuits on the sideboard and also about the intended context for that information. In this way the BC is more informative (while relevant) than the utterance of the main clause alone.[4] We now must face the question of how to capture the intuition that the participants' overall interpretation is that the speaker is providing the relevant context for that information as well as suggesting that the addressee eat the biscuits.

It is worth noting that classic BCs are not the only conditionals where antecedent and consequent are independent. Other examples have been discussed in the literature under the label of *non-interference* conditionals (see discussion in Bennett 2003: 122). In these cases, the intuition is also that our beliefs about the consequent proposition are unaffected by our beliefs about the antecedent. Bennett offers the following example:

(6) I express fear that the refrigerator will explode if you open its door, and you assure me that if I open the door, it won't explode. You base this on your belief that the door-opening and the non-explosion are irrelevant to one another, and put it in conditional form because I think they are connected. (p. 123)

In pursuing a unified analysis, we would conclude that examples like this are of the same kind as traditional BCs, with differences that should follow from pragmatics. This is interesting because in the case of non-interference conditionals, the role of the conditional does not (always?) seem to be to establish relevance. Consider the following example:

(7) A: Oh look at the weather! It's probably going to rain. Poor Betsy is still out there. She will get completely soaked.
B: Don't worry. She has her umbrella.
A: But the poor child! This is terrible! Dreadful!
B: Stop exaggerating. If it rains, she has her umbrella.

B's utterance of the conditional is not meant to establish relevance (this was already clear!). B's point is to emphasize that Mary has her umbrella. If the only discourse purpose of the 'independent' conditionals were to establish relevance, it would have been redundant, but it is

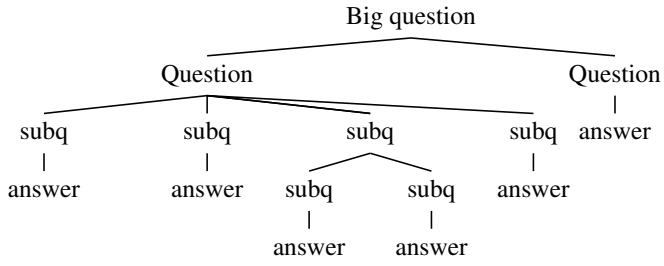
[4]This can be formalized in a number of neo-Gricean approaches, see Potts (2006) and reference therein a.o.

not. We will not be able to investigate all cases of *if*-constructions with independent antecedents and consequents. Our focus remains on 'classic' BCs. But the observation that there is a larger group, and that some members of that group do not appear to serve the discourse function of establishing relevance, is important in terms of deciding how it is that BCs come to establish relevance. A theory of BCs has to derive the old intuitions that BCs help to establish relevance, but also allow *if*-constructions with independent antecedents and consequents to serve other purposes, since they can also be used in scenarios like (7). In what follows we argue that the key is to be found in how conditionals map into discourse.

3.1. The mapping of *if*-constructions into discourse

We adopt the Q(uestion) U(nder) D(iscussion) discourse model (Roberts 1996; Büring 2003 a.o.) in which conversation is taken to be a cooperative inquiry and is modeled as as a hierarchical order of moves. Discourse moves are understood as either answering a (implicit) question (pay-off moves) or setting up a question for participants to answer (set-up moves). The hierarchical nature of discourse can be represented by Büring's (2003) D(iscourse)-trees:

(8)



Each node in the tree represents a *discourse move*. Participants can adopt *strategies* to address a given question (a strategy is a set of subquestions to the dominating question). Well-formedness in discourse is constrained by several notions, amongst them entailment and relevance:

(9) **Entailment:** One interrogative q_1 entails another q_2 iff every proposition that answers q_1 answers q_2 as well.
Relevance: A move M is *Relevant* to a question q iff M either introduces an (at least) partial answer to q in context c_M (M is an assertion) or is part of a strategy to answer q (M is a question).

The question now is how *if*-constructions map into discourse. Haiman (1978) already claimed that the antecedent clause in *if*-constructions is understood as establishing the topic of the utterance. In the QUD model this translates into the antecedent establishing the question that is being addressed. The consequent, on the other hand, provides the answer. This mapping is also suggested for BCs in Starr (2014) (although not directly in the QUD model), and Ebert et al. (2014). However, these proposals either encode the mapping in the semantics of *if*-constructions without allowing for other possibilities (which we will see is problematic), or fail to explain why this is the only possible mapping in BCs. A *default* mapping of *if*-constructions does not mean that other mappings are not possible. It has been argued, for example, that focus

particles associating with the entire antecedent proposition makes conditionals reverse this default mapping to one in which the consequent presents the QUD while the antecedent provides the answer (Biezma 2011a, b). This reverse mapping can also be forced contextually and has been claimed to be necessary in von Fintel (2009) to explain classic conditional perfection:

(10) A: When would you give me $5?
B: Well, if you mow the lawn, I'll give you $5.
$\rightsquigarrow$ If you don't mow the lawn, I won't give you $5. [Conditional perfection]

Conditional perfection arises when the antecedent is understood as an exhaustive answer to the on-going question presented by the consequent.

The discussion above argues against encoding the mapping between *if*-constructions and discourse in the semantics. In what follows we first assume that in BCs the antecedent always indicates the QUD, while the consequent provides the answer. This mapping, we argue, explains how inferences arise in BCs (when they do) and allows us to explain why some BCs are infelicitous. We close the section by explaining why this is the only possible mapping for the cases we identify as BCs.

3.2. Inferences in *if*-constructions and discourse-relevance

Under our unified perspective, an *if*-construction of the form *if* α, β will be true iff in all 'relevant' worlds in which α is true, β is also true (where 'relevant' depends on the particular theory of conditionals and how such theory restricts the domain of quantification). Assuming the default mapping of *if*-constructions, a BC (posits and) answers the following question:

(11) 'What do the 'relevant' worlds in which α is true look like?' ($\simeq$ What if α?)[5]

The consequent is interpreted as a (relevant) response to such question. This relevance assumption, we argue, is what gives rise to inferences in BCs:

(12) QUD: What do the relevant worlds in which the addressee is hungry look like?
($\simeq$ What if the addressee is hungry?)
Answer: There are biscuits on the sideboard.

Given that the consequent is taken to be a relevant response to the established question the addressee reasons that the speaker is trying to provide a way to solve hunger.[6] In paradigmatic cases of BCs like (1b), reasoning towards the relevance of the consequent as the answer to the question set by the antecedent leads the addressee to additionally infer, via pragmatic enrichment, that the speaker is suggesting that s/he eats the biscuits.

[5]The paraphrase *what if* α*?* is just a shortcut to illustrate the discourse inquiry and it may not be always suitable. We abstract away from additional meanings triggered by the utterance of these questions.

[6]The question established by the antecedent is rather vague, but in providing the answer, the speaker provides enough for the addressee to make out what the goal of the question is.

One prediction from this proposal is that the pragmatic inferences triggered in *if*-constructions are the same as the ones found in question-answer pairs. This prediction is borne out. (That the conditional form is congruent in giving rise to the same inferences as the distributed fragments had already been observed in Starr 2014: 18.[7])

(13) A: What if I get hungry?
B: There are biscuits on the sideboard.
$\rightsquigarrow$ I suggest that you eat the biscuits.

B's utterance in (13) is interpreted as providing an answer to A's question. Assuming that participants are cooperative, the response leads to the interpretation that A is allowed to eat the biscuits. Note also that unless it is done immediately the inference triggered via relevance in this case cannot be cancelled and becomes part of the common ground.[8]

In each of these cases, the inference is a result of a process of pragmatic enrichment derived by the same mechanisms that are at work in pragmatic enrichment generally. An example is given in (14) where the addressee A infers by pragmatic enrichment that B wants to bring across that it is very late.

(14) A and B are attending a party together and have been there for a while.
A: What time is it?
B: Most people already left.
$\rightsquigarrow$ It's very late

We won't get into the matter of how the mechanism of pragmatic enrichment works exactly (see e.g. Benz 2012 for a proposal). Rather, our point is to argue that an utterance of a BC leads to a triggering of such inferences in the same way as other discourse-relevance inferences are derived (where relevance is as defined in 2).

The proposal can also explain Sano and Hara's (2014) empirical observation that BCs like (15) are (almost always) judged infelicitous. As predicted in our theory, the same is found with the corresponding question-answer pair:

(15) If France is hexagonal, there is beer in the fridge.

(16) A: What if France is hexagonal?
B: There is beer in the fridge.

[7]There are several differences between Starr's (2014) proposals and the one in this paper. Most importantly, Starr establishes in the semantics of the *if*-constructions that the antecedent signals the question being addressed. It is not clear to us whether his proposal can be modified to allow for the required flexibility in the mapping between *if*-constructions and discourse argued for above.

[8]While we have no space to address all BCs, our proposal can also handle *discourse hedging* BCs such as *if you want to hear a big fat lie, George W. and Condi Rice are secretly married.* The QUD inquires 'what do the worlds in which the speaker tells a big fat lie look like?'. The response is that these are worlds in which the addressee says that George and Condi are secretly married. More, certainly, needs to be said about these cases and their apparently special behavior (see Csipak 2015). The reader is referred to Biezma and Goebel (2017) for discussion within the framework presented in this paper.

Our proposal allows us to predict that these BCs and the parallel question-answer pair will be bad unless the participants can come up with an explanation as to why the consequent is relevant to the QUD. There are in fact contexts in which (15) and (16) are good. Imagine a context in which a couple of friends are making a bet regarding the shape of France. While one thinks it's hexagonal, the other thinks it's a square. When clarifying what's at stake, the speaker betting for the square shape can felicitously utter (15), or respond to the question as in (16), to establish what the addressee will win were the shape be hexagonal.

Our proposal also applies to HCs and intuitions regarding 'causality'. The mapping from *if*-constructions to discourse we have been exploring for BCs is also possible for HCs (although HCs also can have the reverse one). The difference is that when interpreting the relation between question and answer in a HC via relevance, we can recover a dependence relation between the two propositions:

(17) If you are hungry, I'll make you some sandwiches.
QUD: What if I'm hungry?
Response: I'll make you some sandwiches.

In a scenario in which it is conceivable that sandwiches wouldn't necessarily be made and that the making of the sandwiches can be dependent on someone's hunger, we can draw the inference that the addressee being hungry is what 'causes' / 'leads to' the making of the sandwiches (the intuition being that if the addressee is not hungry, the sandwiches won't be made). The intuition that there is a dependence between the antecedent and consequent proposition can be taken to respond to the mapping of *if*-constructions into discourse and the need to satisfy relevance. When there is no plausible dependence relation between antecedent and consequent, the inference of causality does not arise.[9]

[9]Ippolito (2016) also considers the mapping of BCs into discourse and their differences in interpretation with HCs in a short note on relevance conditionals, although her overall proposal is rather different. Ippolito (2016) proposes that conditionals (what we carefully term *if*-constructions) of the form *if* ϕ, ψ address a 'conditional question' of the form *if* ϕ, Q?, where ψ is a possible answer to Q. The BC in (1b), for example, is taken to address an ongoing QUD that can be paraphrased by 'If you are hungry, is there anything to eat?'. The BC addresses this question by offering the 'premise' in the consequent that, indirectly, answers it. It is not clear to us how this question is identified in Ippolito's system, i.e. what are the conventional cues in the information structure of the utterance identifying that such is the inquiry being addressed, which is essential within the QUD model. In addition, given the arbitrary choice of question, it is not clear to us how this system would account for cases of 'classic' conditional perfection like (10), or cases of 'biscuit perfection' (see §4), which are explained by assuming a mapping to discourse that does not involve conditional questions but a classic information-structural division of labor between antecedent and consequent like the one explained above and adopted in this paper. In addition, Ippolito (2016: 56) also aims to offer and explanation as to why some *if*-constructions have a 'causal' interpretations while others don't: "The proposal that I would like to make is that the difference between causal and non causal counterfactuals lies in their relation to the [QUD]. A causal counterfactual answers the [QUD] *directly*, whereas a non-causal counterfactual answers de [QUD] *indirectly* by spelling out a premise assuming which the [QUD] is then answered." In our system, causality is also an inference, but it does not result from the utterance providing a direct answer. In our account, that the HC is taken to provide a *direct* answer to a QUD is the byproduct of there being a dependence relation between antecedent and consequent.

Overall, Ippolito (2016) is not devoted to BCs but aims to explain how context dependence allows us to identify the premises relevant in the interpretation of counterfactuals. We leave for future research the evaluation of her claims once we adopt a mapping between *if*-constructions and discourse that considers their information structure.

In sum, BCs are merely *if*-constructions in which we understand that antecedent and consequent are independent. This is a possibility for *if*-constructions and can be reinforced through linguistic means. For example, many stereotypical examples of BCs involve stative predicates. This is not accidental. With stative predicates it can be easier (though not necessary) to interpret that the antecedent and consequent temporally overlap, without a causal dependency. On the other hand, linguistic means can block the independent interpretation. Following Biezma (2014), the presence of the discourse maker *then* prevents a BC-reading since it conventionally requires that two propositions (antecedent and consequent) enter into a 'causal explanatory claim'-relation in which one (the antecedent) provides the 'reasons' for the other (the consequent) and causality is not cancellable anymore (but see discussion on *then* in §5).[10]

Let us finish this section with a discussion of why the reverse discourse-mapping for *if*- constructions, one in which the antecedent provides the answer to a question signaled by the consequent, is not available for BCs. According to the (rough) semantics of *if*-constructions adopted in this paper, the QUD for such a mapping would be *what are the propositions such that for all 'relevant' worlds in which those propositions are true, the consequent is true?* We can paraphrase this inquiry with the question *When q?*,[11] and this is indeed what we take the question to be in the 'regular' perfect conditional in (10). We illustrate this mapping for BCs in (18):

(18) QUD: When are there biscuits on the sideboard?
Response: If you are hungry (there are biscuits on the sideboard).

A BC is not a felicitous answer to this QUD and a mapping of the BC to this discourse structure is ruled out. Given the QUD in (18), it is relevant whether or not all circumstances are such that there are biscuits on the sideboard, and, if not all, in which. The BC leads to an answer (in all of them) but only indirectly as a result of the BC-strengthening process. It also provides extra information that is not requested (i.e. that, in particular, the worlds in which you are hungry are worlds in which there are biscuits on the sideboard). One way to explain the infelicity is using the economy principle in Romero and Han (2004).[12]

We have claimed that considering how BCs map into discourse can explain several properties of BCs. In the following section we argue that the proposed mapping is necessary independently to explain biscuit perfection.

4. Biscuit perfection

We have seen above that some BCs can give rise to inferences such as suggestions. As we have noted in §1, however, there is a contrast between (19) and (20) ('$\rightsquigarrow$' signals any non-

[10] Obviously this is derived from the original temporal meaning of *then*: when found coordinating two events it requires that the two take place sequentially.

[11] The same caveat as above holds for this rough paraphrase, i.e. the topical question is not to be confused with proper utterance of this specific interrogative. This is merely a shortcut to illustrate the discourse inquiry.

[12] The principle of economy prevents the use of meta-conversational moves unless they are necessary to resolve epistemic conflicts or to ensure Quality.

conventional meaning):[13]

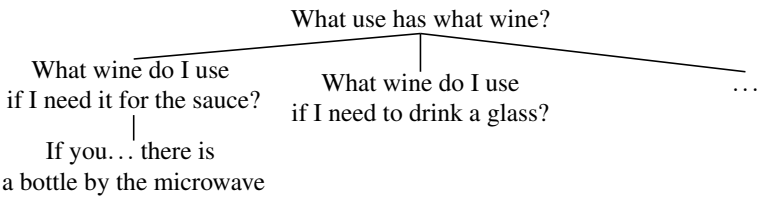
(19) Oh, you are making pasta bolognese!
If you need wine for the sauce… there is a bottle by the microwave.
(L)-H* L+H* L-H%
⇝ There is a bottle of wine by the microwave [BC strengthening]
⇝ I suggest that you use the wine by the microwave. [Discourse relevance]
⇏ I only suggest that you use the wine by the microwave if it is for the sauce.

(20) Oh, you are making pasta bolognese!
If you need wine for the sauce… there is a bottle by the microwave.
L+H* L-H%
⇝ There is a bottle of wine by the microwave [BC strengthening]
⇝ I suggest that you use the wine by the microwave. [Discourse relevance]
⇝ I only suggest that you use the wine by the microwave if it is for the sauce. [?]

We will now focus on (20). As we have noted earlier, a speaker uttering the BC in (20) provides information regarding what wine to use for the sauce while explicitly signalling that there are other circumstances in which wine may be needed that s/he is not addressing (contrary to what happens with (19)). In this sense, the BC in (20) is explicit about the fact that it offers only a partial resolution to a question regarding what wine is to be used when. This results in the inference that the use of the wine by the microwave is only a suggestion for the making of the sauce and nothing else, i.e. the suggestion-inference is strengthened. This is what we have called *biscuit perfection*. How can we derive this strengthened inference? In what follows we argue that it results from the specific details of the mapping of (20) into discourse.

Our proposal is that the strengthened reading results from mapping the BC in (20) to the D-tree in (21):

(21)



Given this D-tree, the QUD addressed by the BC is part of a larger strategy to answer a complex question. With this mapping, the speaker has clearly marked that s/he is addressing a specific (sub-)question and not others contextually salient that contrast with it. Given that the speaker was careful to signal that this answer was not provided with respect to any other salient question, the resulting inference is that the suggestion to use the wine by the microwave is only made if it is for the purpose of making the sauce. The question now is: why does (20) map into a D-tree like (21) while (19) doesn't?

[13] Notice that even though the shape of the complex accent is the same, the height of the pitch is different. In a pilot study the H* in *sauce* is much higher (≃ 290Hz) in the perfected version, (20), than in the non-perfected one in (19) (≃250Hz). Also, the high pitch on wine is ≃365Hz in (19) whereas it only receives a pre-nuclear accent at best in (20). We are very grateful to Anja Arnhold and Marc Brunelle for their help discussing the prosodic data.

Our proposal is that the mapping of (20) into the D-tree in (21) depends on conventional linguistic devices that give rise to such a mapping. In this case, it is prosody that is (conventionally) responsible (but see below for additional mechanisms).[14] In what follows we argue that the phenomenon of biscuit perfection is nothing more than contrastive topic (CT) marking in BCs. The discussion revolves mostly around BCs because this data is used in this paper as an argument in favor of a pragmatic account of BCs. However, notice that similar phenomena can be observed in HCs, with the only difference that the inference that is perfected in HCs concerns causality. At the end of the day, the claim is that 'inference perfection' via linguistic marking in *if*-constructions is nothing more than contrastive topic in *if*-constructions.

In what follows we sketch Constant's (2014) proposal for CT and examine a straight-forward application of this account to conditionals. We close the section with a discussion of the fact that CT-marking in *if*-constructions seems to be more complicated than it is taken to be in Constant (2014). The discussion serves the purpose of showing how *if*-constructions can serve as probes to broaden our understanding of CT-marking in English.

4.1. A theory of Contrastive Topic and BCs

We adopt Constant's (2014) theory of CT (see references therein for other accounts and discussion). In this section, we sketch Constant's (2014) proposal and examine its application to BCs. As we will see, CTs provide the crucial insight to understand biscuit perfection.

The phenomenon of CT in simple sentences is illustrated in (22) (adapted from Constant 2014):

(22) I arrive late to a potluck party and I am not aware of who brought what. I have asked another guest to fill me in on the details. A few minutes into the conversation, the next exchange takes place:
A: What about Persephone and Antonio? What did *they* bring?
B: PERSEPHONE… brought the GAZPACHO.
L+H* L-H% H* L-L%
Antonio, I'm not sure about.

As Constant puts it, by using these specific prosodic features B indicates that he has decided to break the asked question in two smaller pieces, one about Persephone and one about Antonio. In a way, Persephone and Antonio become "*topics* of smaller issues, and they *contrast*" (Persephone is the contrastive topic). In addition to indicating that the question is now split in two parts, the speaker provides an exhaustive answer regarding what Persephone brought, this is the constituent *the gazpacho*. (The constituent that provides the exhaustive answer is the exhaustive focus.) A paraphrase could be as follows: "As for the issue of Persephone, the answer to the question of what she brought is the gazpacho." The claim in the literature is that there is a systematic relationship between the surface realization of B's response and the discourse role of its constituents, so we can predict one from the other. In Constant (2014), contrastive topic is an information-structural category indicating the question that is being answered. Regarding

[14] Notice that not all BCs trigger extra inferences such as suggestions and hence not all biscuits can perfect via conventional mechanisms such as the use of prosody. See discussion in §4.2 below.

the interpretation, CT-marking is merely focus marking (it evokes alternatives à la Rooth as any other focus marking) with additional information of how the focus alternatives are used in the semantic computation. The instructions regarding how to manipulate the generated alternatives are cashed out in the CT-operator indicated in English by a special intonation, the complex contour L+H* L-H%. The CT constituent is "a F-marked phrase in a particular structural position, or bound by a particular focus-sensitive operator" (Constant, 2014: 85). This proposal can be seen as belonging to a family of configurational approaches, "[a theory that tries] to establish what configuration defines a focus as CT, and to model how this configuration is spelled out in surface syntax and phonology" (see Constant 2014 for discussion).

The mapping between utterances and discourse is done via focus anaphora in the Roothian tradition: focus structure helps identify the question in discourse that the utterance is answering. This is done via the familiar '$\sim$' operator with a slight modification to relax the membership relation in (23ciii) (see Constant 2014 for discussion). The '$\sim$' introduces the presupposition that there is a discourse antecedent that is a question of a particular shape:

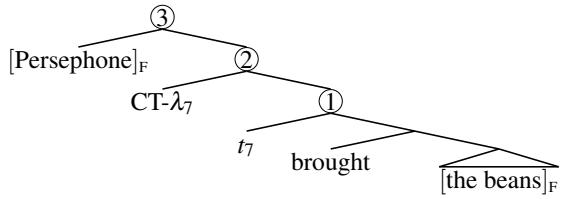
(23) Constant's (2014) '$\sim$'
- a. $[\![\sim \phi]\!]^o = [\![\phi]\!]^o$
- b. $[\![\sim \phi]\!]^f = \{ [\![\phi]\!]^o \}$
- c. ... and presupposes that the context contain an antecedent C such that:
  - (i) $C \subseteq [\![\phi]\!]^f$
  - (ii) $|C| > 1$
  - (iii) $[\![\phi]\!]^{o\,*} \in C$ "C contains $[\![\phi]\!]^o$ somewhere within it."

The other addition to the system is the mechanism that combines the focus alternatives in utterances with CT-marking. This is done via the CT-operator, with CT-hood linked in English to the complex contour L+H* L-H% that we find in standard CT-constructions:[15]

(24) **Topic abstraction**
- a. $[\![\text{CT-}\lambda_i\ \phi]\!]^o_g = \lambda x.\ [\![\phi]\!]^o_{g[i\to x]}$ (Ordinary semantic value)
- b. $[\![\text{CT-}\lambda_i\ \phi]\!]^f_g = \{\lambda x.\ [\![\phi]\!]^f_{g[i\to x]}\}$ (Focus semantic value)

The ordinary semantic value of CT-λ is merely predicate abstraction, but at the focus value provides us with the expected result. Following Constant, let us look at the structure of the CT-utterance in (22):

(25) $[\![[\text{Persephone}]_F \text{ brought } [\text{the beans}]_F]\!]^f_g$



[15] Constant (2014) considers that the complex pitch accent could also adopt other forms, such as H* or L*+H.

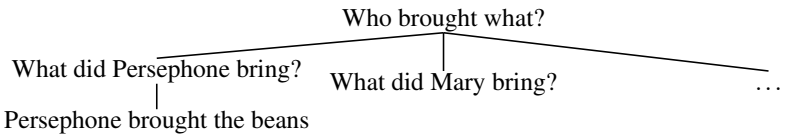
a. $[\![①]\!]^f_g = \{g(7)$ brought the beans, $g(7)$ brought the pasta$\ldots\}$
b. $[\![②]\!]^f = \{\lambda x.\{g(7)$ brought the beans, $g(7)$ brought the pasta$\ldots\}\}$
c. $[\![③]\!]^f = \left\{ \begin{array}{l} \{\text{Persephone brought the beans, Persephone brought the pasta, } \ldots\}, \\ \{\text{Mary brought the beans, Mary brought the pasta, } \ldots\}, \\ \ldots \end{array} \right\}$

CT here involves left-dislocation of the contrastive topic constituent, justifying predicate abstraction and the CT-operator. Topic-abstracting the subject helps to create a nested focus value containing a set of questions varying in the position of *Persephone*. The resulting focus value is a complex question sorted by the topic-abstracted argument (*who brought what?*).[16] This focus value is the input of the squiggle operator enforcing the congruence that derives the interpretation of utterances with CT:

(26) $[\![\sim [[\text{Persephone}]_F\ CT\text{-}\lambda_7\ \ t_7 \text{ brought } [\text{the beans}]_F]]\!]^f = \{\text{Persephone brought the beans}\}$
felicitous iff there is a question in discourse made up of multiple questions of the form "What did x bring?", one of which is the question "What did Persephone bring?".

That is, the utterance of *Persephone brought the beans* with the CT-marking in (22) is felicitous in a discourse structure like (27):

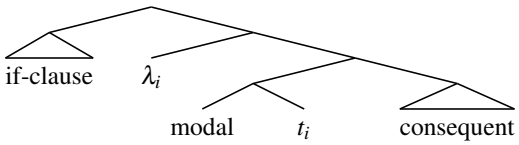
(27)



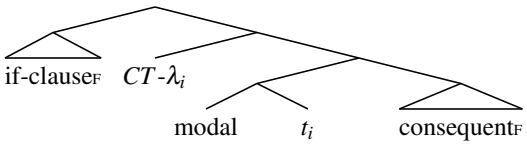
The structure in (27) is exactly like the one we want to derive in (21). We propose that in both cases, CTs provide the key to understanding how the D-tress are generated. The question is whether we can merely adopt Constant's (2014) proposal to explain biscuit perfection. The answer is yes, mostly. We turn to the straight-forward application of Constant's (2014) proposal below and discuss some problems in §4.2.

Following much of the literature (see Bhatt and Pancheva 2006 for discussion), we take it that *if*-clauses are correlative/free-relative adjuncts and assume the syntax in (28a). In *if*-constructions we do not need to assume movement of the topic-constituent. We have binding of the restrictor to the modal in the matrix clause being interpreted via predicate abstraction. With CT-marking we get the CT-operator and not just mere predicate abstraction, (28b).

(28) a. Conditionals as correlatives



b. Conditionals as correlatives with CT-marking



The interpretation of the utterance in (20), unlike the utterance in (19), is then as follows:[17]

[16] This assumes that questions denote sets of propositions, specifically, their possible answers (Hamblin 1973).
[17] Strictly speaking, focus marking is on *sauce* (see (20)). This is what evokes alternatives to the antecedent.

(29) $[[\text{If you need wine for the sauce}]_{\text{F}}$ CT-λ_9 $[\ t_9$ there is a bottle by the microwave$]_{\text{F}}]$

(30) $[\![\sim(29)]\!]^f = \{$If you need wine for the sauce there is a bottle by the microwave$\}$
felicitous iff there is a question in discourse made up of multiple questions of the form "What if the addressee needs wine for x?", one of which is the question "What if the addressee needs wine for the sauce?".

At the core of CT is partial answerhood. In contrast with (20), in (19) we do not convey (linguistically) that there are contrasting alternatives that the speaker is not answering, hence do not mark conventionally that the utterance is embedded in a D-tree like (27).

To summarize, we have seen above that 'biscuit perfection' and in general conventional strengthening of the inferences in *if*-constructions is just CT-marking in *if*-constructions and can be explained by using mechanisms argued for independently of conditionals. Crucially, these mechanisms result in a mapping of BCs to discourse that explains the inferences in BCs and the effect of biscuit perfection. No special BC-specific semantics needs to be invoked.

4.2. Shedding light on CT-marking in English

Constant (2014) also discusses the case of conditionals and their mapping in discourse. The claim is that conditionals "generally make good CT" , but Constant explicitly excludes BCs and factual conditionals (without considering that there are biscuits that are factual) and, hence, only (non-factual) HCs are taken to be able to encode CT. The reason, he states, is that "the antecedent of a HC makes good contrastive topics, since considering one hypothetical possibility almost inevitably leads to questions about contrasting possibilities[...] Non-hypothetical conditionals, on the other hand, do not typically set-up contrasts with different antecedents" (Constant, 2014: 321).[18] He provides the following prosodic characterization of a conditional with a CT-reading. (Constant 2014 does not provide prosodic annotation for BCs):[19]

(31) If it's RAINING... (L+H* L-H%) we'll have to cancel the PICNIC. (H* L-L%) (Constant, 2014: 285)

According to Constant, it is the interpretation of factual conditionals and BCs what prevents them from being interpreted as conveying CT: to a non-factual HC like (31) one can respond with "And if it doesn't rain?", but that is not a possible response to the former merely because either other alternatives to the antecedent are already discarded (in factual conditionals the antecedent is taken to be true) or because the consequent is taken to be true across the board (in BCs). However, while it is true that questions about what is the case in circumstances other than the ones established in the antecedent are impossible in factual conditionals and BCs, one can ask about the inferences triggered by the utterance of a BC (if there are any). For example, given

[18] Constant's discussion of conditionals aims to explain the contrast between *if*-constructions and *because*-clauses. In both cases we find the prosodic markings tied to CT-interpretations, i.e. L+H* L-H%, but *because*-clauses do not have a CT-interpretation. His conclusion is that not all L-H% in English convesys CT: "while sentence final L-H% is robustly interpreted as CT, non-final L-H% is unreliable in this regard".

[19] We take it from the discussion that he assumes this to be the default intonation for HCs.

an utterance of (2b), one could ask "And if I want to pour myself a glass? (does the suggestion still hold? shall I use the same wine?)" Notice that when a BC doesn't trigger extra-inferences, such as in (7) (or at least these are harder to grasp), no question of this sort is possible and there, in fact, we do not (easily) get a CT interpretation.

Several questions arise at this point pertaining to CT-marking in conditionals and CT-marking in general. Given that (2b) does have a CT-reading while (2a) doesn't, and both have L+H* L-H% marking, it seems that it is not this specific complex contour what is responsible for the CT-reading in conditionals. The data suggests that what delivers the CT-reading is merely the marking of contrast in the constituent that is understood as establishing the QUD (the antecedent): this happens in (2b) by de-accenting everything else but one word, while in (2a) there are two words that receive H* or L+H*.[20] In *if*-constructions, L-H% is merely a continuation tone. This is also true for non-factual HCs.[21] The general claim is that the CT-reading appears in *if*-constructions when we understand that there are salient alternative questions to the one being addressed and that they won't get necessarily the same answer. We can enforce this reading conventionally by using specific prosody, or by other means that indicate that the speaker is answering only a particular question amongst a contextually salient set (the others remain un-answered). An illustration is provided in (32). The presence of *only/just* in (32) ensures that the use of wine the speaker is talking about contrasts with others.

(32) Well, if you only/just need the wine for the sauce, there is a bottle by the microwave.

A CT-type interpretation can also arise in BCs without any linguistic marking as an inference from world-knowledge. In (33), it is world-knowledge what tells us that the suggestion/permission regarding killing people is tied to people turning into zombies.

(33) A virus is transforming people into zombies. A farmer in an area suspected of infection tells his farm workers:
Farmer: If the virus breaks out, the rifles are in the safe.

It is understood that if the virus does not break out, shooting of people should not happen, i.e. we understand that there are contextually salient alternatives to the antecedent for which the answer wouldn't be the same, leading to a CT-type interpretation without CT-marking.

The conclusion is that CT-marking is not necessarily done prosodically via the complex L+H* L-H% contour. When the information structure of the sentence already establishes what is the

[20] More work needs to be done regarding the prosody of BCs. Notice however that marking contrast in *rained* in (7), where no extra-inference can arise, doesn't seem to be felicitous. The explanation would be that the enforced discourse structure doesn't have a plausible interpretation.

[21] As mentioned above, HCs often perfect. Constant (2014) argues that this is due to the prosodic marking L+H* L-H%, but just as in the case of BCs this specific prosodic marking does not convey CT in conditionals. We do not have space to provide a fair discussion on the matter, but we would like to argue that the CT-type interpretation that often arises in HCs is an inference resulting from there being a dependence relation between antecedent and consequent, together with the fact that the speaker has decided to make a claim about only a subset of c. This inference, hence, arises via world-knowledge and (Gricean-) reasoning about why the claim was only made about a subdomain. However, this interpretation can also be enforced with specific prosodic marking (as discussed in ftn. 13) or other means (see below), all CT-marking, and in this case the interpretation is not an inference anymore.

QUD being addressed, marking that there are other contrasting questions that are not being addressed with other prosodic means (see ftn. 13), or lexically, is a type of CT-marking (i.e. it conventionally derives a CT-type reading). Research in this direction is left for the future.

5. Comparing theories

One question that remains to be addressed is whether the resulting theory of BCs is superior to semantic theories of BCs. While we cannot draw here a full comparison, we will conclude this paper by pointing to some advantages that this theory has over semantic approaches.

The first point is that in order to explain perfect biscuits, semantic theories would actually have to appeal to mechanisms similar to the ones proposed here in addition to stipulating that the semantics of BCs is different from that of HCs. For the remainder of this section, let us take Ebert et al.'s (2014) proposal (henceforth EEH) as a point of comparison, since this is a recent sophisticated semantic proposal and it covers the largest range of data. In EEH's proposal, all *if*-constructions introduce two speech acts: the antecedent introduces a referential speech act (identifying a maximal plurality of possible worlds compatible with the world of evaluation, X), and the consequent introduces another speech act. HCs are *if*-constructions in which the consequent is evaluated in the worlds identified by the antecedent, (34a). In BCs the consequent is evaluated in the actual world and there is no interpretational link with the antecedent (34b):

(34) EEH's analysis of conditionals applied to the contrast between (1a) and (1b) above:

a. HCs (aboutness topicality) If you are hungry, I'll give you some biscuits:
$\text{REF}_x(w_0.\lambda w'.M_{w'}(\lambda w.\text{hungry}(w)(\text{listener}))) \;\&\; \text{ASSERT}(X, \lambda w.\text{give\_you\_some\_biscuits}(w))$

b. BCs (relevance topicality) If you are hungry, there are biscuits on the sideboard:
$\text{REF}_x(w_0.\lambda w'.M_{w'}(\lambda w.\text{hungry}(w)(\text{listener}))) \;\&\; \text{ASSERT}(w_0, \lambda w.\text{biscuits\_on\_sideboard}(w))$

Where $M_{w'}(p) \underset{\text{def}}{=} \sigma(\lambda w.p(w) \wedge R_{ep}(w')(w))$ and $R_{ep}(w')(w)$ is the set of worlds epistemically compatible with w';
$\text{ASSERT}(w, p_{\langle s,t\rangle}) \equiv$ the speaker commits herself to the truth of p in w
$\text{REF}_X(w, d_{\langle s,\sigma\rangle}) \equiv$ the speaker draws the listener's attention to $d(w)$

EEH capitalize on the claim often repeated in the literature that *then* is not possible in BCs. Adopting a correlative account of conditionals, they take *then* to be a proform that when present at LF (if covertly) forces the consequent to be interpreted in the antecedent worlds delivering the HC-reading. The LF in BCs does not have *then*. Differences between HCs and BCs result from different LFs. We discuss this proposal below, pointing to problematic issues.

1. Then *is possible in* BCs*!*

When naive speakers of English are asked about (35), they often accept it without hesitation:

(35) If you are hungry, then there are biscuits on the sideboard.

The paraphrase that is given is that "given the possibility that you are hungry, I'm telling you that there are biscuits on the sideboard". The reading that biscuits will magically appear upon

your being hungry could also be conveyed by uttering (35), but given our knowledge of how the world works (the dependence relations), this reading is discarded because of its implausibility. It is possible if our assumptions about *dependencies* change (e.g. if the sentence is uttered in a movie involving a magical world). Another example is provided in (36), judged to be perfect:

(36) If you want to know my opinion, then I think you are making a mistake marrying him.

Again, (36) has two readings, one in which my thinking of you making a mistake is caused by your will to know my opinion, a HC-reading, and one in which my telling you what I think (which is that you are making a mistake) is the result of you wanting to know it. This last reading is still a BC in our account (since for an *if*-construction to be a BC it is the relation between the propositional content of antecedent and consequent what has to be independent).

That *then* is possible in BCs is a problem for EEH's account, since we now lack support for the proposal that there are two different LFs responsible for the two different readings. What *then* does can be explained in a theory along the lines of Biezma (2014) where *then* is a discourse marker that enforces a causal explanatory relation between an antecedent and a consequent. Crucially, in Biezma (2014) there is enough freedom to allow the fact that a particular move was made to be the content manipulated by *then* (see Biezma 2014). The different readings described above depend on the choice of content targeted by *then*.

2. *If they ask you how old you are, you are four*

BCs like 2 are handled very easily with the theory proposed here:

(37) In a bus, the father doesn't want to pay his kid's fare. Knowing that kids under five ride for free he says:
Father: If they ask you how old you are, you are four.

The interpretations of this BC is that the speaker is requesting the addressee to lie (which would be derived as a relevance inference in our proposal). Notice, however, that the speaker does not mean for the addressee to go right away to the ticket collector and tell him that he is four (which would, for example, be the interpretation derived in EEH, in which the consequent is headed by a command speech act regardless of the fact that the clause is a declarative).[22] BCs providing a command always perfect, and this is so because commands are always tied to specific circumstances and hence, to the circumstances specified in the *if*-clause. Our knowledge of commands and their dependence on the circumstances allows us to understand that when the circumstances in the antecedent are not met, the command doesn't apply. The consequent in 2 is a declarative, but this can be shown with an imperative too: *...tell them you are four.*[23] Obviously this anchoring to the circumstances does not arise when the imperative conveys dis-

[22]Note that EEH end up needing to postulate a number of rather idiosyncratic speech acts that raise questions about the predictive power of the account, such as "not run of the mill assertions", invoked in EEH(:361) to explain the interpretation of the consequent in *if you want to hear a big fat lie, George W. and Condi Rice are secretly married* (the consequent is understood here as being claimed to be false).

[23]This wouldn't be a BC in our account. The semantics of the imperative form can be taken to be either the content proposition or a deontic statement, and in this case it obviously depends here on the truth of the antecedent.

interested wishes or when using equivalent modal statements:

(38) If I don't see you before you leave, have a good trip!! / I wish you a good trip.

By uttering (38) I am not saying that I desire you to have a good trip only if I don't see you before you leave. Crucially, it is due to our understanding of how disinterested wishes work that we understand that in any circumstances alternative to those expressed in the antecedent, you desire the addressee a good trip.

3. *Encoding the mapping into discourse in the semantics is not a good idea*

Ebert et al. (2014) propose that we can understand the referential speech act in conditionals as identifying the QUD in discourse. However, this means encoding the mapping of conditionals to discourse in the semantics. As we have seen above, any theory that forces a unique mapping of conditionals to discourse runs into problems to explain cases in which the mapping has to be the opposite, as in classic conditional perfection illustrated in (10).

6. Conclusion

Taking into account discourse congruence and relevance, BCs are revealed as examples of the flexible set of strategies we deploy in the construction of meaning, requiring no departure from the semantics of other conditionals. Furthermore, BCs and perfect-BCs show that the interplay between semantic meaning and considerations regarding discourse-structure, as well as information gained in discourse reasoning, are crucial in the construction of meaning.

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