

PRESUPPOSITIONS AND IMPLICATURES IN COUNTERFACTUALS

In this article, I propose a pragmatic account of temporally mismatched subjunctive past counterfactuals. The proposal consists of the following parts. First, I show that in cases of temporal mismatch, Past cannot be interpreted inside the proposition where it occurs at surface structure. Instead, it must be interpreted as constraining the time variable of the accessibility relation. This has the effect of shifting the time of the evaluation of the conditional to some contextually salient past time. Second, I will propose specific Felicity Conditions (presuppositions) for subjunctive conditionals and I will argue that there is a strict correspondence between the time of evaluation in the truth-conditions of a conditional and the time relevant for the felicity conditions. In other words, if the time relevant for the accessibility relation has been shifted to the past, then the conditional's presupposition will make reference to the speaker's *past* epistemic states. On the other hand, if no past is constraining the time argument of the accessibility relation, the conditional's felicity will make reference to the speaker's epistemic state *at the time of the utterance*. Third, I will argue that the intuition that the antecedent of mismatched counterfactuals is not true is a scalar implicature arising not from a competition between assertions but between presuppositions. Finally, I will investigate the general repercussions of my proposal on the problem of presupposition projection.

1. Introduction

Past subjunctive conditionals do not always talk about the past. Sometimes they may talk about the future, despite the overt past verbal morphology. This paper is a study of these cases, which have been left unaccounted for by most theories of conditionals or have been given what I will claim is the wrong analysis.

I will call past subjunctive conditionals that talk about the future *mismatched past counterfactuals* because their verbal morphology does not match the meaning of the temporal adverb. This is shown in (1), where the future adverb *tomorrow* conflicts with the past verbal morphology in both the antecedent and the consequent.

(1) If Charlie had taken his Advanced Italian test tomorrow, he would have passed.

Imagine the following scenario. Students who registered for the Advanced Italian class had to choose when to take their final test, either last Monday or tomorrow (but not both). Charlie took his final exam last Monday and didn't pass. He would have benefited a lot from extra study and practice, and if he could have taken the exam a few days later, he would have passed. In this scenario, (1) is felicitous. Actually, not only can (1) be uttered, but it must be uttered. Because in our scenario Charlie cannot take the test tomorrow (he's already taken it), the non-past subjunctive conditional in (2) cannot be uttered.

(2) If Charlie took his Advanced Italian test tomorrow, he would pass.

Descriptively, a mismatched past counterfactual must be uttered when the speaker regards the hypothetical event described by the antecedent as unrealizable (impossible). The counterfactuality of mismatched subjunctive conditionals was already noticed in Dudman (1983, 1984) and Ogihara (2000).

The mismatch between the tense and the adverb is not a property of standard past subjunctive counterfactuals, as shown in (3).

(3) If Charlie had taken his Advanced Italian test last Monday, he would have passed.

This relates to the observation I made above: (1) and (3) differ in meaning. (1) suggests more strongly than (3) that the proposition expressed by the antecedent is false. The falsity of the antecedent in standard past subjunctive conditionals has been studied and analyzed intensively and, on the basis of Anderson (1951), it is generally agreed that the falsity of the antecedent is an implicature and that, as such, it can be canceled.¹

(4) If Jones had taken arsenic, he would have shown just exactly those symptoms which he does in fact show. [So, it's likely that he took arsenic].

As we can see in (4), the speaker cannot assume the falsity of the antecedent because, if he did, he would defeat the purpose of the argument, i.e. to show that the antecedent is actually true. Hence, the past subjunctive conditional cannot entail or presuppose the falsity of the antecedent. Now, if we try to construct an Anderson-type example based on a mismatched past counterfactual, we do not get a coherent discourse.

(5) #If Charlie had gone to NY by train tomorrow, Lucy would have found in his pocket the ticket that she in fact found. So he must be going to NY tomorrow.

¹ Stalnaker (1975), von Stechow (1998), and references cited there.

The deviance of (5) points towards a difference between standard subjunctive counterfactuals and mismatched past subjunctive counterfactuals.² Is this difference real?

And if it is, how can we capture it? This is the subject of my investigation.

In §2 I shall discuss two current proposals about past subjunctive counterfactuals and show how neither of them can account for mismatched past counterfactuals. In §3 and §4 I shall present my proposal and its repercussions. In §5 I shall extend it to mismatched simple sentences and, finally, in §6 I shall conclude and sketch where this work may lead us in the future.

2. Mismatched Past Counterfactuals

2.1 The standard view of past counterfactuals

It is often suggested in informal treatments of subjunctive conditionals that the past tense in the antecedent of (6) is not a real past, but a ‘modal-past’ (Palmer 1986, 2001).

(6) If Mary came, John would stay. [Palmer 2001, 14]

² All the conditionals we’ll consider in this paper (except for the indicative ones) have been traditionally labeled *subjunctive conditionals*. What (i)-(iii) have in common is one layer of past morphology not interpreted as expressing a relation of anteriority. In (i)-(iii), I give the three kinds of subjunctive conditionals and the names by which I’ll refer to them throughout this paper.

- (i) **Non-past subjunctive conditional (NPSC)**
If Charlie played with Lucy tomorrow, he would make her happy.
- (ii) **Mismatched past subjunctive conditional (MPSC)**
If Charlie had played with Lucy tomorrow, he would have made her happy.
- (iii) **Standard past subjunctive conditional (SPSC)**
If Charlie had played with Lucy yesterday, he would have made her happy.

In languages like Italian where subjunctive mood can be used in conditionals, subjunctive is used in (i)-(iii). In this paper I remain agnostic on what exactly the subjunctive contributes, if anything. For example, Iatridou (2000) argues that mood is not a necessary ingredient in building up counterfactuality and that language-specific rules are responsible for its occurrence.

The intuition behind the label ‘modal-past’ is that the past tense in the antecedent does not locate the event in the past, but removes the speaker from the actual situation and places him into an unreal one. Now consider (7), where the past tense is marked twice.

(7) If John had come, Bill might have left. [Palmer 2001, 208]

Here the suggestion is that the past is marked once for unreality, once for past time, since “*have* functions in English as both a marker of perfect aspect and of past time” (Palmer 2001, 208).

Iatridou (2000) exploits this intuition as well. In her proposal, the past tense morphology instantiates what she calls the *exclusion feature*. This feature can either be interpreted in the domain of time or in the domain of worlds. In the former case, a sentence with past will be interpreted as talking about a time different from the time of the utterance; in the latter case, a sentence with past will be interpreted as talking about worlds different from the actual world. In a simple sentence such as *John left*, the past is interpreted temporally and the sentence talks about a past time at which an event of John’s leaving took place. The possibility of interpreting past modally (i.e. as excluding the actual world) is exploited in conditionals like (6) or (7). The difference between (6) and (7) is that, in the latter, two layers of past occur, the one instantiated by the auxiliary *have* and the one instantiated by the past *-ed*. Iatridou’s proposal is fundamentally similar to Palmer’s: one layer of past is interpreted modally, thus contributing to the modal interpretation of the structure; the other layer of past is interpreted temporally, i.e. as expressing a relation of anteriority between the hypothetical event and the utterance time.

Notice that this has an important consequence. The layer of past that is interpreted temporally locates the hypothetical event in time and, as such, is required to be interpreted *inside* the proposition expressed by the antecedent. This is exactly parallel to what happens in a simple sentence with the past tense: in (8), the past tense locates the event of playing in the past, which is the reason why it is compatible with the past adverb *yesterday* but not with *tomorrow*.

(8) Charlie played with Lucy (yesterday/#tomorrow).

Informally, the conditional in (7) is true iff the consequent is true in all the accessible possible worlds where the proposition that John *came* is true.

This proposal is in principle unable to account for the mismatched past counterfactuals. This is why: the analysis requires one layer of past to be interpreted inside the antecedent, but because of the future adverb *tomorrow*, the result is nonsensical.

Thus, we have made a step forward: at least in the case of mismatched past counterfactuals, we know that the past tense cannot be interpreted inside the antecedent. These cases are beyond the reach of the theories I sketched above.

2.2 A theory of mismatched past counterfactuals: Ogihara (2000)

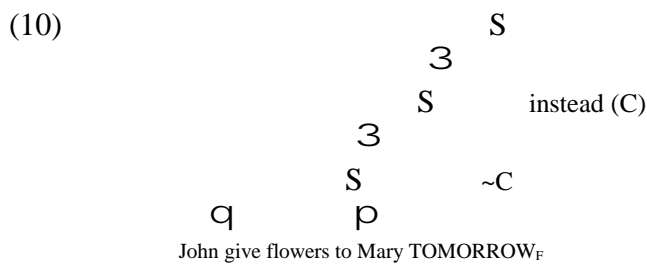
Unlike the one made in Iatridou (2000), Ogihara's proposal directly addresses mismatched counterfactuals. Ogihara's example is reported in (9). The relevant scenario is one in which tomorrow is Mary's birthday but John, who is her boyfriend, mistakenly

gave her flowers yesterday, thus making her very upset. The fact that he could give her flowers tomorrow too is not relevant because the flowers he gave her yesterday were meant as a birthday gift (as such unique) and he wrongly thought that her birthday was yesterday. In this scenario I can felicitously utter (9).

(9) If John had given flowers to Mary TOMORROW_F, she would have been happy.

In this section, I shall present Ogihara’s proposal and show that it does not account for the set of data he considers. Moreover, I will present a set of data that Ogihara does not discuss and I will argue that this new evidence refutes his theory.

Ogihara starts from the assumption that focus is essential to the interpretation of mismatched past counterfactuals such as (9). Assuming Rooth (1985) and subsequent work, focus is associated with a focus operator and a variable that gets introduced as a sister node to an expression that contains a focused constituent in the syntactic representation. So, the antecedent has the structure in (10).



The focus semantic value of *John gives flowers to Mary TOMORROW_F* is the set of (temporally indeterminate) propositions of the form ‘John give flowers to Mary at *x*’, where *x* is a variable ranging over times. Notice that the relevant propositions are

“temporally indeterminate”, that is to say, they are tenseless. This is because the tense in the antecedent of the conditional is employed to constrain C by making a past time contextually salient. As a result, only past alternatives are relevant, i.e. only propositions where *x* is assigned a past time as its value (e.g. “John gave flowers to Mary yesterday”, “John gave flowers to Mary two days ago”). In sum, according to Ogihara’s proposal, the perfect tense in a mismatched past counterfactual does not locate the hypothetical event in time but indicates the time at which some similar event took place in the actual world, the relevant proposition contrasted with the hypothetical one being obtained via focus. It is then crucial to Ogihara’s proposal that some proposition in the set of alternatives to the antecedent was true at some past time.

I take his proposal to be that in *all* past counterfactuals, whether standard or mismatched, the past tense is not locating the hypothetical event in time but is making some relevant (past) proposition salient. Therefore, it must be the case that there is some relevant true past proposition with which the antecedent is contrasted. This seems incorrect, though. First of all, Anderson (1951) already discussed cases of felicitous past counterfactuals whose *antecedents* are true. Second of all, even if the antecedent is false, there does not need to be a past true proposition with which it is contrasted. For example, consider the following scenario. Lucy and Sally have just learned that Charlie, who suffers from several food allergies, did not eat any fruit at all and they have gotten into an argument about what would have made Charlie sick, if he had eaten it: Lucy believes that strawberries would have made Charlie sick, whereas Sally believes that peaches would have made Charlie sick. I join their conversation and, disagreeing with both of them, I utter (11).

(11) If Charlie had eaten BLUEBERRIES_F, he would have gotten sick.

Here it is by hypothesis not the case that something made him sick, i.e. there is no true proposition of the form “that Charlie ate x ”, where x is a kind of fruit. Yet, the conditional is felicitous.

Indeed, upon further scrutiny, it turns out that even in the case of mismatched past counterfactuals, there does not have to be any true past proposition contrasted with the antecedent, contrary to what Ogihara claims. Imagine the following scenario: Charlie died a month ago before ever going to New York and both Lucy and Sally know it. Lucy and Sally are talking about him and Lucy says that she believes that if Charlie had gone to New York today, he would have met his friends. Sally disagrees, and she utters (12).

(12) No. If Charlie had gone to New York TOMORROW_F, he would have met his friends.

Again, by hypothesis no proposition of the form ‘that Charlie went to New York at x ’ is true, because he never went to NY. The alternatives that are considered are themselves hypothetical and they do not have to hold in the actual world.

A second argument against Ogihara’s proposal is specific to mismatched past counterfactuals: a mismatched past counterfactual is good even when no relevant alternative is past. This shows that focus on the temporal adverb should not play any role in the theory of mismatched past counterfactuals. Scenario: Lucy has just told me that

Charlie is going to Rome tomorrow to meet my sister, who actually lives in Milan. It's now too late to stop him. I then utter (13).

(13) Oh no! If he had gone to MILAN_F tomorrow, he would have met my sister.

All the alternatives here are propositions of the form “that Charlie goes to x tomorrow”, i.e. propositions that will only vary depending on the value assigned to the variable x that ranges over places, not times. Therefore, it is not true that the perfect tense is interpreted as constraining the set of alternatives, because the alternative propositions all talk about tomorrow.

To conclude, Ogihara's proposal has the following drawbacks. First, it makes the prediction that some proposition in the set of the relevant alternatives has to be true in the actual world. This prediction extends to both standard and mismatched past counterfactuals. We saw that it is incorrect in both cases. Second, if his proposal were correct, the contrast between standard and mismatched past counterfactuals would not be accounted for. Third, if the focus story is wrong (and it is), the role of the (relevant) past in the mismatched past counterfactual is left unaccounted for. It can't be interpreted within the proposition but there is no variable C to constrain.

Ogihara's proposal cannot be maintained but some of his insights are correct. My proposal will indeed agree with his with respect to the following point: the (relevant) past tense is *not* interpreted *inside* the antecedent of the conditional but is constraining something else. What? Answering this question is the objective of this paper.

3. Building my proposal

In what follows, I will present my proposal for mismatched past counterfactuals, which will consist of giving an account of the role of Past and making (and defending) a proposal about the presuppositions of conditionals.

Consider again the mismatched future counterfactual in (1), repeated below: despite the future adverb *tomorrow*, two layers of past occur in the antecedent (the pluperfect is analyzed as composed by two layers of past in Palmer 1986, 2001 and Iatridou 2000, who refers to Steedman 1997 and others).

(14) If Charlie had taken his Advanced Italian test tomorrow, he would have passed.

In what follows I make a proposal about what is contributed by the extra layer of past and about how to derive the falsity of the antecedent. The claims that I make here are meant to be cross-linguistic.

3.1 The contribution of tense to the Accessibility Relation

Following my previous work,³ I suggest that the connection between the two layers of past and the falsity of the antecedent is that the extra past tense in (17) *is* the source of the falsity. What follows should justify this claim.

I shall assume the possible world semantics and the theory of conditionals developed in Kratzer (1981), (1986) and (1991).⁴ In the same vein as Lewis (1975)'s treatment of

³ Ippolito (2001).

⁴ A quantificational theory of modality was developed in Carnap (1947), Hintikka (1961) and Kripke (1959) and (1963), among others. A theory of possible worlds in relation to counterfactuals was developed by Lewis (1973) and (1986).

adverbs of quantification, Kratzer does not analyze the connective *if* as a two-place operator taking the antecedent and the consequent as its arguments. Instead, a conditional sentence is analyzed as a tripartite structure: the *if*-clause is interpreted in the restriction of a possibly *covert modal operator*, whereas the consequent is interpreted in the nuclear scope. Thus, the structure determined by a modal operator is similar to any other quantificational structure. Let us start, though, from simpler cases.

Consider the modal sentence in (15).

(15) Charlie must be here.

According to a version of the standard treatment of modality, the structure of this sentence looks like (16).⁵ The quantification over worlds here is restricted by the accessibility relation R , a binary relation between worlds.⁶ If (15) is understood epistemically, R will be interpreted as in (17). Notice that the accessibility relation is relative to the *world of evaluation* (w_1 in (16)), which – unless specified otherwise – is the actual world (the world of the speaker).⁷

⁵ The version I am assuming comes from lecture notes by K. von Stechow and I. Heim, where world variables are assumed to be syntactically present at the level of logical form (LF).

⁶ s is the type of a world; $\langle s, t \rangle$ is the type of a proposition (a function from possible worlds to truth-values); t is the type of a truth-value.

⁷ If the whole sentence is embedded, then the world variable could be bound by some higher operator.

$$\begin{array}{c}
 (16) \quad \begin{array}{c}
 \begin{array}{c}
 \supset \\
 \gamma \quad \delta \langle st \rangle \\
 \langle st, t \rangle
 \end{array} \\
 \supset \\
 \begin{array}{c}
 \text{must} \quad \beta \\
 \langle \langle s, t \rangle, \langle st, t \rangle \rangle \quad \langle s, t \rangle
 \end{array} \\
 \supset \\
 \begin{array}{c}
 R \quad w_1 \\
 \langle s, \langle s, t \rangle \rangle
 \end{array}
 \end{array}
 \end{array}$$

(17) $R = \lambda w. \lambda w'. w'$ is compatible with that the speaker knows in w .

The modal *must* will have the lexical entry in (18). Composing all the pieces in (18) by Functional Application, we eventually get the truth-conditions in (19).

(18) $[[\mathbf{must}]] = \lambda p \in D_{\langle s, t \rangle}. \lambda q \in D_{\langle s, t \rangle}. \forall w \in W (p(w)=1 \rightarrow q(w)=1)$

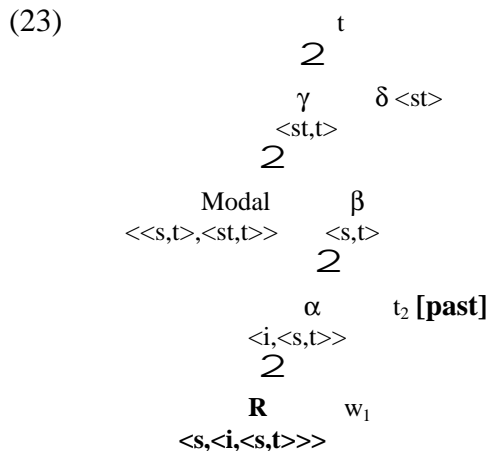
(19) $[[\mathbf{Charlie must be here}]]^w = 1$ iff for all the worlds w' compatible with what the speaker knows in w , Charlie is here in w' .

Knowledge, beliefs, plans, desires and other human attitudes change over time. But also, the relevant facts about the world change over time. Therefore, the set of worlds over which modal operators quantify will depend not only on what the actual world is but also on what the time of evaluation is. What I know, believe, plan or desire may be different from what I knew, believed, planned, desired in the past. Also, the world now may be different from what it used to be. Therefore, what was compatible with knowledge or beliefs or plans, or the world *then* may be incompatible with it *now*.

The time variable t_2 gets as its value the utterance time, *unless specified otherwise*. What does ‘*unless specified otherwise*’ mean?

I will make here the not too controversial assumption that the future is modal, i.e. it’s not a tense. Consequently, the functional category under which temporal information is generally hosted, T, can either be interpreted as past or as present. We can further simplify this picture by suggesting that the only real tense is past and that present is the interpretation given to a T node marked as non-past, i.e. the default interpretation. We can implement this in two ways. We could assume a binary feature $[\pm\text{past}]$ so that a T node will be interpreted as expressing temporal simultaneity if it hosts the feature $[-\text{past}]$. Alternatively, we could assume a unary feature $[\text{past}]$ so that a T node will be interpreted as expressing simultaneity if it hosts no feature. I will not argue for either of them here, but for the time being I shall assume a unary feature $[\text{past}]$.

Given a modal quantificational structure, the tense feature $[\text{past}]$ can be interpreted either in the restriction of the operator or in the nuclear scope. Referring to the tree in (23), what we are interested in is the possibility that $[\text{past}]$ be interpreted inside the node β , rather than inside the node δ .



In (23) the past tense restricts the accessibility relation by constraining the range of possible values for the time variable t_2 .

I will adopt the presuppositional variant of the referential analysis of tense developed by Partee (1973), Enç (1987) and Kratzer (1998). Heim (1994) suggests that the tense feature [past] is interpreted as a presupposition: the sentence will only be defined if there is a relevant past time in the context. Thus the analysis of tense closely parallels the analysis of gender features for pronouns (Heim and Kratzer 1998). The interpretation is given in (24).

(24) $[[\mathbf{PAST}_1]]^{g,c}$ defined only if $g(1) < t_c$; if defined, then $[[\mathbf{PAST}_1]]^{g,c} = g(1)$

If [past] occurs inside the restriction of the modal operator, the truth-conditions for the sentence will be as in (25) (S_{MP} stands for a sentence with a modal operator and a past temporal argument of R).

(25) $[[\mathbf{S}_{MP}]]^{g,c} = 1$ iff $\forall w' \in W[p(w') \text{ at } w_1 \text{ and } t_2 \rightarrow q(w')]$ *defined if* $g(2) < t_c$

Here is a schematic derivation for the tree in (23).

$$\begin{aligned}
(26) \quad [[\mathbf{R}]] &= \lambda w \in W. \lambda t \in I. \lambda w' \in W. R(w)(t)(w') \\
[[\mathbf{\alpha}]]^{g,c} &= [[\mathbf{R}]]([[w_1]]^{g,c}) = [[\mathbf{R}]](g(1)) = \lambda t \in I. \lambda w' \in W. R(g(1))(t)(w') \\
[[\mathbf{\beta}]]^{g,c} &= [[\mathbf{\alpha}]]([[PAST_2]]^{g,c}) = \\
& \quad [[\mathbf{\alpha}]](g(2)) = \lambda w' \in W. R(g(1))(g(2))(w') = \\
& \quad R(g(1))(g(2)), \text{ defined only if } g(2) < t_c \\
[[\mathbf{\gamma}]]^{g,c} &= [[\mathbf{Modal}]]([[\mathbf{\beta}]]) \\
&= \lambda p \in D_{\langle s,t \rangle}. \lambda q \in D_{\langle s,t \rangle}. \forall w' \in W [p(w')=1 \rightarrow q(w')=1] (R(g(1))(g(2))) \\
&= \lambda q \in D_{\langle s,t \rangle}. \forall w' \in W [R(g(1))(g(2))(w')=1 \rightarrow q(w')=1], \text{ defined only if } \\
& \quad g(2) < t_c.
\end{aligned}$$

This immediately captures the fact that modals can be tensed. Even in English – where most modals cannot bear tense – periphrastic modals can be tensed. As an illustration, consider the sentence in (27).

(27) Before the referendum in 1974, Italians could not divorce.

The theory of modality and the notion of accessibility relation we have adopted give us the correct truth-conditions: (30) is true if and only if for all the possible worlds w' compatible with the laws (rules) in w *at the contextually salient past time* (before 1974), the Italians do not divorce in w' . In order to capture the fact that (27) talks about *rules in force before 1974*, the worlds we have to quantify over are worlds accessible from the actual world w *at that relevant past time*, and not at the utterance time. An accessibility relation of type $\langle s, \langle i, \langle s, t \rangle \rangle \rangle$ readily provides us with the time-dependence we need.

The pair in (28) overtly shows the position of the past tense and how it affects interpretation. In the epistemic interpretation, (28a) says that it is necessary in view of what is known in the actual world at the utterance time that Lucy *arrived* at 8. Here the Past tense occurs and is interpreted inside the proposition and the time argument of the accessibility relation picks the utterance time as its value. (28b) is different, though, because the Past occurs on the modal and it is interpreted outside the proposition: the sentence says that it is necessary in view of what was known in the actual world at some contextually salient past time that Lucy *arrives* at 8.

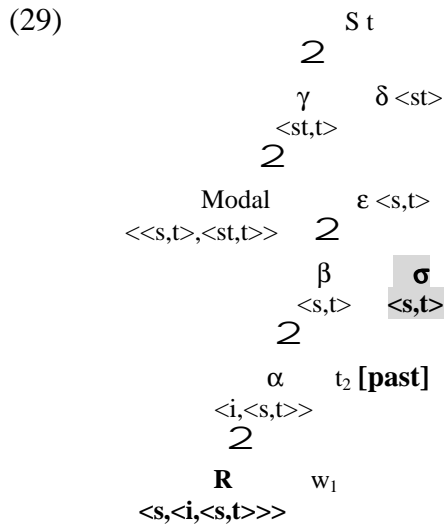
- (28) a. Lucy must have arrived at 8.
b. Lucy had to arrive at 8.

Let me sum up the discussion so far. Given a modal quantificational structure, the tense feature [past] can occur in the nuclear scope or in the restriction of the operator. Our familiar quantificational theory of modality naturally accounts for this phenomenon by letting the past tense be interpreted inside the accessibility relation.

We saw that tense can affect *overt* modals. We have said nothing that would prevent tense from affecting *covert* modals too. In the next section, I will argue that tense does affect covert modals. I will mainly focus on covert modal operators in conditional sentences (Kratzer 1981, 1991), but later in the paper I will also consider covert modals occurring in non-conditional sentences.

3.2 Mismatched Past Counterfactuals

I analyze a conditional sentence as a quantificational structure *à la* Kratzer, where the antecedent is interpreted in the restriction of the modal operator, and the consequent in the nuclear scope. Given that the modal operator will always be restricted by an accessibility relation R , the antecedent will actually have to compose with R . This is shown in (29), where σ is the antecedent and δ the consequent.



Node ε is the conjunction of β and σ and will be composed by some version of the Predicate Modification (cf. Heim and Kratzer 1998)⁸. The truth-conditions for (14) – repeated in (30) – are given below. The nature of the modality is left unspecified: in (31) the set of worlds w over which we quantify is the set of those worlds *relevantly*

⁸ As is explained in the text, the node ε in (29) is derived by some version of Predicate modification, i.e. by *intersecting* β and σ . This operation creates a downward monotonic environment. But, as argued in Stalnaker (1968, 1975, 1981, 1984) and Lewis (1973a,b), assuming that the antecedent of a conditional is monotonic runs into great problems: the failure of strengthening the antecedent (downward monotonicity), the failure of hypothetical syllogism (transitivity) and the failure of contraposition. For the sake of simplicity, I shall nevertheless assume that the structure in (29) is correct. Notice, however, that a pragmatic analysis of conditionals that would actually preserve the downward monotonicity of the antecedent, and the structure in (29), has been proposed by von Stechow (2001).

*accessible from the actual world.*⁹ Moreover, as a consequence of the fact that the tense is interpreted inside β , both propositions σ and δ are interpreted as tenseless propositions.

(30) If Charlie had taken his Advanced Italian test tomorrow, he would have passed.

(31) $[[\mathbf{S}]]^{g,c} = 1$ iff $\forall w \in W$ [w is accessible from $g(1)$ at $g(2)$ and Charlie takes his Advanced Italian test tomorrow in $w \rightarrow$ Charlie passes in w] *defined only if*
 $g(2) < t_c$

The assignment function g will assign the actual world to the index 1 (i.e. $g(1) = w_c$). Informally, (30) is true if and only if for all the worlds w compatible with the actual world at some (contextually salient) past time and such that Charlie takes his Advanced Italian test tomorrow in w , he passes in w . This is all the semantics gives you.

We naturally achieve an important result: the mismatched past subjunctive counterfactual in (30) is like the non-past subjunctive conditional in (32), but without the contribution of the past tense:

(32) If Charlie took his Advanced Italian test tomorrow, he would pass.

The truth-conditions for (32) are like those for (30), except for the lack of [past] constraining the time variable t_2 . The set of worlds quantified over is the set of worlds

⁹ In what follows I may sometime use the shorter “accessible from the actual world” instead of the correct but longer “*relevantly accessible from the actual world*”. Whenever I do that, I mean the latter.

compatible with the actual world at the time of the utterance (the default time). As above,
 $g(1) = w_c$.

(33) $[[S]]^{g,c} = 1$ iff $\forall w \in W$ [w is accessible from $g(1)$ at $g(2)$ and Charlie takes his
Advanced Italian test tomorrow in $w \rightarrow$ Charlie passes in w] $g(2)=t_c$.

Because the sets of worlds over which the modal operator quantifies over in MPSCs and non-past NPSCs may be different, MPSCs and NPSCs are truth-conditionally different. Hence, we expect to find cases where one conditional is false and the other is true. This seems correct. Suppose Charlie got married yesterday. (34a) is true, but (34b) is false.

- (34) a. If Charlie got married tomorrow, he would be married twice.
b. If Charlie had gotten married tomorrow, he would have been married twice.

Why is (34b) false? It is false because the worlds the modal quantifies over are those worlds accessible from the actual world (immediately before the time) when Charlie got married and where Charlie gets married tomorrow: it is not true that in these worlds he gets married twice. On the other hand, (34a) quantifies over worlds compatible with the actual world at the utterance time, i.e. worlds where Charlie got married yesterday. Consequently, if in those worlds the antecedent is true, it is true that he gets married twice.

If the truth-conditions in (31) are all the semantics gives us, where does the intuition that the antecedent *cannot be true* come from? This question is addressed in §4.

4. Presuppositions and Gricean scalar implicatures

The semantics for (30) only gives us half of the story: it requires that in all the possible worlds compatible with the actual world at some past time and in which the antecedent is true, the consequent is true too. This is not enough, though: we must find a way to account for the intuition that, for (30) to be felicitous, the antecedent is not true. My proposal is that the other half of the story belongs to pragmatics: *it is a scalar implicature*.

A Gricean implicature results from a competition between two propositions, α and β , in a relation of asymmetric entailment ($\alpha \rightarrow \beta$). If the speaker chooses to utter β (the entailed or ‘weaker’ proposition), his interlocutors will reason as follows: If the speaker was in the position to utter α , he would have done so; instead, he said something weaker (less informative). Thus, it must be the case that he was not in the position to utter α , i.e. either he did not know that α or he knew that $\neg\alpha$.

In order to explain the falsity of the antecedent in a mismatched past subjunctive counterfactual as a Gricean implicature, there have to be two propositions in an asymmetric entailment relation. In the next two sections I propose that the implicature of falsity derives from the competition between the *presuppositions* of conditionals. Thus, we have an extension of the Gricean theory: not only can *two assertions* in relation of asymmetric entailment compete, but *two presuppositions* in that relation can compete too.

We shall see how this proposal is in accordance with other research in the domain of presuppositions.

In 4.1 I'll propose new felicity conditions for subjunctive conditionals on the basis of the discovery of new facts about the presuppositions of subjunctive conditionals. In 4.2 I'll show that the new proposal gives us the right ingredients for the pragmatic account to work.

4.1 The Presuppositions of Subjunctive conditionals ('Felicity Conditions')

I shall adopt Stalnaker (1975)'s notion of a Context Set, defined as in (35).

(35) Context Set $C = \{w \in W: w \in p \text{ for all } p \text{ in the Common Ground}\}$

(36) Common Ground = $\{p \subseteq W: p \text{ is presupposed by the participants to the conversation}\}$

In Stalnaker's words "The most important element of a context, I suggest, is *the common knowledge, or presumed common knowledge* and common assumptions of the participants in the discourse" (Stalnaker 1975, p. 67) (the emphasis is mine).¹⁰

I shall make the notion of context set and common ground time-sensitive. Let C_u be the context set at the utterance time, that is to say the set of all possible worlds w such that all the propositions true in the common ground at t_u (the utterance time) are true in w .

¹⁰ A little later he explicitly says that the (presumed) common ground are the *presuppositions of the speaker*: they are common to the speaker and his audience in so far as he assumes they are. Thus, in defining the Common Ground, I will only make reference to the participants in the conversation, with the

The more general characterization of a time dependent context set is given in (c), which is, in turn, based on the time-dependent notion of common ground in (d).

- (37) a. Context Set $C_u = \{ w \in W : w \in p \text{ for all } p \text{ in the Common Ground at } t_u \}$
b. $CG_u = \{ p \subseteq W : p \text{ is presupposed by the participants to the conversation at } t_u \}$
c. Context Set $C_n = \{ w \in W : w \in p \text{ for all } p \text{ in the Common Ground at } t_n \}$
d. $CG_n = \{ p \subseteq W : p \text{ is presupposed by the participants to the conversation at } t_n \}$

Now consider the non-past subjunctive conditional in (38).

- (38) #Charlie is dead. If he came to the party tomorrow, he would meet Sally.

Charlie cannot come to the party because he is dead. Intuitively, the deviance of (38) is due to the fact that coming to the party tomorrow presupposes being alive and this is inconsistent with Charlie being dead. In different terms: the deviance of this sentence is due to the fact that the presuppositions of the antecedent will have to hold in that context, thus causing the context to be inconsistent. Therefore, there must be a condition on the felicity of a non-past subjunctive conditional: the presuppositions of the antecedent must not be inconsistent with the context of the utterance.

More formally, let P be the set of all worlds w such that the conjunction of all the presuppositions of the antecedent p of the conditional is true in w . (39) says that a non-past subjunctive conditional presupposes that the intersection of P and C_u is not empty. In

understanding that the presuppositions are the *presuppositions of the speaker*, which are projected onto his

other words, there must be worlds in the context set where the conjunction of all the presuppositions of p is true, i.e. what the antecedent presupposes must be consistent with what is presupposed at the utterance time.

(39) *Felicity Condition for non-past conditionals*

$$P \cap C_u \neq \emptyset$$

Recall the truth-conditions for a non-past subjunctive conditional, for example (33), repeated below in (40).

- (40) $[[S]]^{g,c} = 1$ iff $\forall w \in W$ [w is accessible from w_c at t_c and Charlie takes his Advanced Italian test tomorrow in $w \rightarrow$ Charlie passes in w].

Notice that the time of the evaluation in the truth-conditions corresponds to the time of C in the felicity condition. I'll make the hypothesis that in general the time relevant for the felicity condition is identical to the time of the evaluation.

(41) *Hypothesis*

The time relevant for the felicity conditions of a subjunctive conditional is identical to the value of the time argument of the accessibility relation.

audience as well.

Thus, in a mismatched past subjunctive counterfactual too the time of C will depend on the time of evaluation, which in this case is a (contextually salient) past time. If the hypothesis is correct, the felicity condition for a mismatched past subjunctive counterfactual will be as in (42). In (43) I repeat the truth-conditions for a mismatched past counterfactual.

(42) *Felicity Condition for mismatched past counterfactuals*

$$P \cap C_{t_2 < u} \neq \emptyset$$

(43) $[[S]]^{g,c} = 1$ iff $\forall w \in W$ [w is accessible from $g(1)$ at $g(2)$ and Charlie takes his Advanced Italian test tomorrow in $w \rightarrow$ Charlie passes in w] *defined only if* $g(2) < t_c$

$C_{2 < u}$ is the context set built on $CG_{2 < u}$.

- (44) a. Context Set $C_{2 < u} = \{ w \in W : w \in p \text{ for all } p \text{ in the Common Ground at } t_{2 < u} \}$
 b. $CG_{2 < u} = \{ p \subseteq W : p \text{ is presupposed at } t_{2 < u} \text{ by the participants to the conversation} \}$

The felicity condition in (42) says that a mismatched past counterfactual presupposes that the intersection between the set of worlds w where the conjunction of the presuppositions of the antecedent is true, and the set of worlds w' where all that is presupposed – i.e. all that is (presumed) shared knowledge – at some (contextually salient) past time t_2 is true,

is not empty. In other words, the presuppositions of the antecedent must be consistent with the (presumed) common knowledge *at some past time*.

We predict that the propositions true in CG_u – i.e. the (presumed) knowledge that the speaker and the interlocutors share at the utterance time – should be irrelevant to the felicity of a mismatched past counterfactual. I have discovered that this is indeed correct, at least with respect to some presuppositions. Suppose Charlie died last week. Coming to the party tomorrow presupposes being alive tomorrow and this is inconsistent with Charlie being dead at the utterance time. Nevertheless, the mismatched past counterfactual in (45a) is acceptable. Notice the contrast with (38) above.

- (45) a. Charlie is dead. If he had come to the party tomorrow, he would have met Sally.
- b. Charlie is dead. If he had come to the party yesterday, he would have met Sally.

The behavior of non-past and mismatched past subjunctive conditionals is consistent across a number of different presuppositions. Let us consider the presupposition of *to sell*, *to quit* and the existence presupposition of a definite noun phrase.

The verb *to sell* presupposes that the object that is sold is owned by the seller immediately before the selling takes place. In other words, to sell something presupposes to own it at the time of the selling. Negation tests for presupposition in (46).

(46) a. Charlie sold the Ducati.

PRESUPPOSITION: Charlie owned the Ducati

b. Charlie didn't sell the Ducati.

PRESUPPOSITION: Charlie owned the Ducati.

Being a presupposition trigger, the verb *to own* can be used to test my hypothesis that whereas in non-past subjunctive conditionals the presuppositions of the antecedent have to be consistent with the speaker's and interlocutors' (presumed) shared knowledge at the utterance time, in mismatched past counterfactuals the presuppositions of the antecedent have to be consistent with the speaker's and interlocutors' (presumed) shared knowledge at some past time.

The following examples support the hypothesis.

(47) Charlie used to own a lot of stocks but ten years ago, after a crisis of the stock market, he sold everything and since then he's never had any stocks.

a. #Too bad. If Charlie sold his stocks tomorrow, he would make a lot of money.

b. Too bad. If Charlie had sold his stocks tomorrow, he would have made a lot of money.

c. Too bad. If Charlie had sold his stocks yesterday, he would have made a lot of money.

In example (a), the presupposition required by the counterfactual event is that Charlie owns the stocks until tomorrow, which is inconsistent with the presupposition in the

utterance context. No accommodation is possible and the sentence is deviant. Interestingly, the acceptability of the mismatched past counterfactual in (b) tells us that in the world in which the antecedent is true, the proposition that Charlie owns the stocks until tomorrow is true too, despite its inconsistency with the presupposition in the utterance context that Charlie hasn't owned stocks for the past ten years. Notice that the same is true for the past counterfactual in (c), which follows the pattern of the mismatched past counterfactual in (b).

According to the hypothesis I am arguing for, the felicity condition for (47b) is (42): $P \cap C_{t_1 < t_u} \neq \emptyset$. The intersection between the set of worlds w such that the conjunction of all the presuppositions of the antecedent is true in w and the set of worlds where the conjunction of all the presuppositions in the common ground at some past time is true, must not be empty. In other words, the felicity condition for a mismatched past counterfactual is that the presuppositions of the antecedent not be inconsistent with some *past* common ground. Of course, this allows for the possibility that they could be inconsistent with the *current* common ground, which is a welcome result, given the acceptability of (45a) and (47b).

Incidentally, notice that the non-mismatched past counterfactual in (47c) is not deviant either. The fact that non-mismatched past counterfactuals seem to pattern like mismatched past counterfactuals with respect to the phenomenon under discussion but differently from non-past conditionals, suggests that in non-mismatched past counterfactuals too the (relevant) past tense may actually restrict the accessibility relation, thus forcing the evaluation time to be past to the utterance time. I leave the investigation of this issue to the future.

In addition, consider the following case. To quit an activity x requires that x goes on at the time of the quitting. Thus, we say that to quit smoking presupposes that one smokes immediately before the quitting time. Negation, again, tests for the presupposition.

(48) a. Lucy quit smoking.

PRESUPPOSITION: Lucy smoked

b. Lucy didn't quit smoking.

PRESUPPOSITION: Lucy smoked

Again, the counterfactuals behave exactly as predicted by our hypothesis.

(49) Lucy was a heavy smoker but she quit smoking ten years ago, after she had pneumonia. A new law was passed last week that says that if you quit smoking from now on, you have to undergo a new medical test which is quite painful even if very useful in detecting problems for the lungs of the ex-smoker. Thinking about Lucy, I say:

a. #Good for her! If she quit smoking tomorrow, she would have to take the new painful test.

b. Good for her! If she had quit smoking tomorrow, she would have had to take the new painful test.

c. Good for her! If she had quit smoking yesterday, she would have had to take the new painful test.

Again, the presupposition that Lucy's smoking stretches up to yesterday is not available in (a), but it is in (b), the only difference between the two being the extra layer of past in the antecedent (and in the consequent). As before, the presupposition is also available in (c), which thus patterns like (b) and not like (a).

Lastly, let me consider the case of an existence presupposition. In (50a) the presupposition required by the antecedent – that there is a guitar and that Lucy owns it until tomorrow – is not available; in (50b), it is.

- (50) Lucy's unique guitar burned in the fire that destroyed her home six months ago.
- a. #Too bad. If Lucy played her guitar tomorrow, she would make a lot of money.
 - b. Too bad. If Lucy had played her guitar tomorrow, she would have made a lot of money.
 - c. Too bad. If Lucy had played her guitar yesterday, she would have made a lot of money.

The conclusion is that the restriction that the presuppositions of the antecedent must not be inconsistent with the presuppositions of the common ground at the utterance time only holds for non-past subjunctive conditionals. Pluperfect subjunctive conditionals do not obey this restriction. In other words, a non-past subjunctive conditional cannot presuppose something that is inconsistent with the common ground at the utterance time. A pluperfect subjunctive conditional can: this is so regardless of when the counterfactual

eventuality takes place (past or future) and, therefore, regardless of when the relevant presupposition is required to hold (past or future).

4.2. Gricean scalar implicatures

The felicity conditions in (39) and (42) talk about the relation between the presuppositions of the antecedent of a conditional and the common ground at the time at which the conditional is evaluated. My proposal is that it is at the level of the felicity conditions (presuppositions) that the Gricean competition occurs.

The felicity conditions given above require that the presuppositions of the antecedent be compatible with the common ground at some specific time. As Stalnaker wrote in the quote above, presuppositions can be *presumed* common knowledge. Whereas knowledge is always true (factive), presumed knowledge may turn out to be false. But in the dynamics of a conversation, this distinction turns out to be irrelevant: if both the speaker and his interlocutors believe that what they assume to be true, *is* true (i.e. is knowledge), then the inferences that they will draw are the same as those that they would draw if what they assume to be true were actually true. Consequently, for the sake of simplicity, we will be simply talking about knowledge.

Knowledge is factive. When you know that *p*, you believe that *p*, you have good evidence that *p* and *p* is true. I cannot discover that what I knew at some past time is no longer true now, because if I now know that it is not true, then I didn't know it, I merely believed it.¹¹

¹¹ Knowledge is generally defined *in terms of* belief; indeed it is a belief that has the property of being true. That knowledge *cannot just* be justified true belief was shown by E. Gettier in his (1963) article "Is justified true belief knowledge?" (*Analysis*). Philosophically, important epistemological questions arise

Hence, being a proposition compatible with my knowledge at the utterance time entails being compatible with my knowledge at any time t earlier than the utterance time. But not vice versa: being compatible with what I knew at some past time, does not entail being compatible with what I know now because, for example, I may have learned that the proposition in question is false. Thus we have what we needed: two propositions in a relation of asymmetric entailment. Because the notion of presupposition is built on knowledge, we can conclude that being compatible with the common ground at the utterance time entails being compatible with the common ground at any time earlier than the utterance time. Therefore, we obtain the asymmetric entailment in (51).

$$(51) \quad P \cap C_u \neq \emptyset \text{ entails } P \cap C_{t < u} \neq \emptyset$$

$$P \cap C_{t < u} \neq \emptyset \text{ does not entail } P \cap C_u \neq \emptyset$$

The asymmetric entailment in (51) draws a distinction between beliefs on one hand and knowledge and presumed knowledge on the other. It is neither the case that if I believe a proposition p at some time t' , I believe it at any time t'' later than t' , nor that if I believe p now, then p must have been consistent with my beliefs at any time t' earlier than now. Beliefs change over time: I may believe now that what I believed yesterday is false; or I may now believe true some proposition that yesterday I believed to be false. The same is true for other kinds of human attitudes (desires, plans and wishes constantly change) and for the way the world is (states of affairs constantly change). Thus, none of these modalities makes the asymmetric entailment (51) above true.

with respect to a satisfactory definition of knowledge. For our purposes, though, the discussion above is sufficient.

Two counterexamples can be brought against the view advocated in this paper: one is the case of the loss of knowledge; the other is the case of forgetting. I will briefly discuss the former and show why it is irrelevant to pragmatics; what I say applies to the forgetting case as well.¹² Suppose it is true that Chomsky wrote *Syntactic Structures* (SS). Somebody tells me that it's been discovered that somebody else wrote half of what is attributed to Chomsky. Thus, I can no longer be sure about the identity of the author of SS, i.e. I have lost the belief that Chomsky wrote SS. As knowledge that p entails believing that p, it follows that I have lost the knowledge that Chomsky wrote SS. The general point is that knowledge can be lost. And, if this is true, then it can't be true that being compatible with what I know now entails being compatible with what I knew at some past time. Why? Because I may have lost some piece of knowledge. Hence, my argument can't be right, because it assumes something false (i.e. that knowledge can't be lost).

Unfortunately, knowledge can be lost. But is that at all relevant in a *pragmatic* account? I maintain that it is not. When somebody loses a piece of knowledge, *he* does not know that he lost a piece of knowledge. Here is why I think so. Suppose you've lost (some) knowledge. To know that you lost a piece of knowledge is to know that what you lost is true. Knowing that what you lost is true entails believing that what you lost is true. But believing that what you lost is true is incompatible with having lost that knowledge, i.e. with having stopped believing its truth.

¹² An objection raised by Sylvain Bromberger during a presentation of this paper at MIT helped me understand the relevance of these cases.

If the reasoning above is correct, although it is certainly possible for everyone of us to know that we could lose knowledge, it is not possible to know that we have lost knowledge that p when we do. Thus, we face what we would call the “first person-puzzle”: although it is certainly possible for *you* to know that *I* have lost knowledge, it is not possible for *me* to know that *I* have lost knowledge.¹³

Let us return to the point where we were before this digression. I had construed the asymmetric entailment between the presupposition of MPSCs and the presupposition of non-past subjunctive conditionals. We can now turn to the task of generating the correct implicature.

The Gricean competition between (39) and (42) goes like this:

(52) *Gricean competition*

- a. You presupposed: $P \cap C_{t1 < tu} \neq \emptyset$
- b. You didn't presuppose: $P \cap C_u \neq \emptyset$
- c. Thus: $\neg K (P \cap C_u \neq \emptyset)$
- d. $K \neg (P \cap C_u \neq \emptyset)$
- e. $\equiv K (P \cap C_u = \emptyset)$

Line (c) is the step we are familiar with from classical examples of scalar implicatures: because the speaker appealed to the less informative presupposition, the interlocutor will implicate that the speaker does not know that P is incompatible with the common ground

¹³ The special status of the first person reminds us of the Moore's paradox. The sentence *It is raining but I don't know that it is raining* is felt as contradictory even though the two conjuncts are not contradictory, as shown by the full acceptability of *It is raining but he does not know that it is raining*. Very superficially,

at the utterance time. Because it is assumed that the speaker knows what he presupposes, step (d) and (e) follow: the speaker knows that P is incompatible with the common ground at the utterance time. For this to be true, it is sufficient that one of the presuppositions of the antecedent is false. If (at least) one presupposition of the antecedent is inconsistent with the context, then the antecedent is not true.¹⁴ As I said in section 4, the result of a Gricean competition is that the speaker is not in a position to assert the strong proposition *p*. This is consistent with two possibilities: that he does not know that *p* or that he knows that $\neg p$. In most cases of scalar implicatures, the stronger result (that he knows that $\neg p$) has to be stipulated. On the contrary, in our competition the stronger result (i.e. line (d)) follows naturally. The weaker option is discarded because it is assumed that the speaker knows what he is presupposing. In other words, if the presuppositions of the utterance that the speaker made are not compatible with what he in fact presupposes, then the speaker knows that they are not.

That the Gricean Maxim of Quantity (“Make your contribution as informative as necessary given the purpose of the conversation”) can have application in the domain of presuppositions has already been suggested explicitly by Heim (1991)’s discussion of indefinites. Heim, for example, suggests that, assuming the \exists -analysis of the indefinite article, the definite and indefinite articles stand in an asymmetric entailment relation – [*a* ζ]ξ follows from [*the* ζ]ξ (under the Fregean analysis) – and, consequently, we expect the phenomenon of a Gricean scalar implicature to arise: the use of [*a* ζ]ξ should

the deviance of the former sentence has to do with the speaker’s attribution of contradictory beliefs to himself.

¹⁴ The Context Change Potential of a sentence – as defined in Heim (1992) – is a partial function: it is defined only for those contexts that satisfy the presuppositions of the sentence in question. This clarifies what I wrote above: if the presuppositions of the antecedent are not satisfied in C (i.e. if the C does not entail them), then the antecedent will not be defined.

conversationally implicate that the speaker is not in a position to utter [*the ζ*]ξ. But this is not sufficient to explain why a sentence like (53a) is not acceptable: because it is known that each person has only one father, (53a) conveys the same amount of information as (53b) with the definite article.

- (53) a. #I interviewed a father of the victim.
b. I interviewed the father of the victim.

The asymmetry between (53a) and (53b) would be captured if we postulated the following principle: “Presuppose as much as possible”. If this were the case, then (53b) would have to be uttered because it *presupposes* uniqueness.¹⁵

Now, let me give an overview of the next sections. In 4.3, I will provide a further argument for my analysis. In 4.4, I will talk about the repercussion that my analysis of counterfactuals may have on the *presupposition puzzle* (Heim (1992)). In section 4.5, I will show that, *contra* what has been claimed in the literature, the falsity of a mismatched past counterfactual is cancelable, as predicted by my pragmatic account. Finally, in section 4.6, I will compare non-past subjunctive to indicative conditionals.

¹⁵ Hawkins (1991) makes a similar point, even if he does not explicitly talk about presuppositions. Another place where a similar idea appears implicitly is Schwarzschild (1999)’s *AvoidF* (Heim, p.c.):

- (i) *AvoidF*
F-mark as little as possible, without violating Givenness.
- (ii) *GIVENess*
If a constituent is not F-marked, it must be GIVEN.

4.3 Truth-conditions and asymmetric entailment

As argued in the previous sections of this paper, when past is interpreted as constraining the time argument of the accessibility relation, it has two important consequences: (i) it contributes to the truth-conditions of the conditional (by shifting the time of evaluation to the past) and (ii) it determines the presupposition of the conditional (by construing the context set on the basis of the common ground at some contextually salient past time).

It is important to stress that the asymmetric entailment could not be construed at the level of truth-conditions. Not only do the truth-conditions of a non-past subjunctive conditional *not* entail the truth-conditions of a MPSC, but the truth-conditions of a MPSC entail those of a non-past subjunctive conditional: the truth-conditions for a non-past subjunctive conditional and a MPSC repeated in (54) and (55) respectively, show that the set of worlds quantified over by the modal operator in a MPSC is (potentially) bigger than the set of worlds quantified over in a non-past subjunctive conditional. Thus, the Gricean competition cannot take place at this level. We need to move to the level of the felicity conditions.

- (54) $[[S]]^{g,c} = 1$ iff $\forall w \in W$ [w is accessible from w_c at t_c and Charlie takes his
Advanced Italian test tomorrow in $w \rightarrow$ Charlie passes in w].

Because the Given is the old information, and F marks new information, (i) requires to have as much old information as possible, i.e. to presuppose as much as possible. See also H. Truckenbrodt (1995), *Phonological Phrases: Their Relation to Syntax, Focus and Prominence*.

- (55) $[[S]]^{g,c} = 1$ iff $\forall w \in W$ [w is accessible from $g(1)$ at $g(2)$ and Charlie takes his Advanced Italian test tomorrow in $w \rightarrow$ Charlie passes in w] *defined only if* $g(2) < t_c$

I have shown that the proposal I made above is correct in that the asymmetric entailment can only hold at the level of the felicity conditions. In section 4.6, I will explain why it is necessary that the compatibility relation hold between the common ground and the *presuppositions of the antecedent*, rather than the antecedent itself. The argument will be based on the contrast in felicity between (56) and (57).

(56) #Charlie is dead. If he came to the party tomorrow, he would meet Sally.

(57) Charlie is dead. If he were alive and came to the party tomorrow, he would meet Sally.

4.4 The presupposition puzzle

In Heim (1992) the following puzzle is presented: In order to check the presuppositions of the antecedent p of a counterfactual, we must make reference to the main context, but the antecedent cannot be updated in the main context because, being a *counterfactual*, there are no p -worlds in it.

The framework that Heim adopts is an elaboration of Robert Stalnaker's ideas. The main assumption is that the meaning of a sentence is its *context change potential* (CCP),

where by ‘sentence’ she means a specific LF. A CCP is a function from contexts to contexts, where contexts are sets of possible worlds.

The problem that Heim addresses is that the rule for indicative conditionals in (58) could not be used for counterfactual conditionals, whose “antecedents are typically inconsistent with the common ground and would thus come out undefined” (Heim 1992: 204).

$$(58) \quad c + \text{if } p, q = \{w \in c : \text{Sim}_w(c+p)+q = \text{same}\}$$

(58) says that the CCP of an indicative conditional is the set of worlds in the context set such that the set of worlds where all that is presupposed in the main context and p are true, are such that q is true there.

On the other hand, counterfactuals with presuppositional antecedents are subject to the same condition as indicative conditionals, i.e. that the main context entails their presuppositions.

Heim’s suggestion is that the antecedent is not added to the main context but to a revision such that some assumptions are suspended but all the presuppositions of the antecedent are not.

(59) For any context c , LF ϕ :

$$\text{rev}_\phi(c), \text{ the revision of } c \text{ for } \phi, \text{ is } \cup\{X \subseteq W : c \subseteq X \text{ and } X+\phi \text{ is defined}\}$$

The CCP for a counterfactual conditional will then be like (60).

(60) $c + \text{if } p, \text{ would } q = \{w \in c: \text{Sim}_w(\text{rev}_p(c) + p) + q = \text{same}\}$

This solves the problem, but – as Heim herself acknowledges – it solves it by stipulating the appropriate constraint in (59).

I would like to suggest that the relativization of context sets to times may shed light on the resolution of this puzzle. The ideas presented here are sketchy, and more will have to be said to turn these remarks into a satisfactory account.

Above I suggested that at least with respect to some presuppositions (that in (45), those of *sell* and *quit*, and that triggered by a definite expression like *his guitar* in (50)), it seems that the requirement that the presuppositions of the utterance context be satisfied in the worlds where the antecedent is true, holds for non-past subjunctive conditionals but does not hold for mismatched past counterfactuals nor for standard past counterfactuals.

To a closer scrutiny, what Heim regarded as a very general fact – i.e. that the presuppositions of the antecedent have to be entailed by the main (utterance) context – seems true only for those conditionals whose time of evaluation *is* the utterance time. A new generalization emerges: *The presuppositions that have to be satisfied in those worlds where the antecedent is true are the presuppositions of the evaluation context, not necessarily those of the utterance (main) context.*

In the case of the non-past subjunctive conditionals, the evaluation context *is* the utterance (main) context: hence, the presuppositions of the antecedent have to be consistent with the utterance context. This is why (38), for example, is deviant: the antecedent presupposes that Charlie is alive, but the Common Ground at the utterance time t_u entails the proposition that Charlie is dead. Because the context of evaluation is

the utterance context C_u (recall: C_u is the set of worlds w such that all the presuppositions in CG at t_u are true in w), then the presuppositions of the antecedent have to hold in C_u . This is impossible.

In (45a), on the other hand, the context of evaluation is built from the Common Ground not as it is at t_u but as it was at some $t_1 < t_u$ (thanks to the shift determined by the extra past in the accessibility relation). Hence, the presuppositions of the antecedent have to be satisfied in $C_{t_1 < t_u}$. In (45a) the context of evaluation is a context built on some past CG in which it is true that Charlie was alive. Hence, it will contain the proposition that Charlie is alive: when the antecedent is added, no inconsistency arises. Or, in (47b), the context of evaluation is one that contains the proposition that Charlie owns stocks tomorrow and in which he hasn't sold them yet.

Notice that what allows the context to shift is the extra past tense, interpreted as a restriction on the time-argument of the accessibility relation. Therefore, we also have a tentative answer to the question why the felicity condition on non-past subjunctive conditionals is what it is. The simplest answer is to assume that the extra past in the antecedent of a conditional can be interpreted as an instruction to shift the evaluation time. In the absence of such an instruction, the evaluation time will have to be the default time, i.e. the utterance time.¹⁶

4.5 Cancelability

I have argued above that the falsity of the antecedent of a mismatched past counterfactual is an implicature. Implicatures are cancelable. Therefore, the falsity of the antecedent of a

mismatched past counterfactual must be cancelable. I will show that, despite appearances, it is cancelable.

It seems natural and harmless to assume the following pragmatic principle: in engaging in a conversation with other people, we are interested in what the epistemic state of these people is *at the time at which the conversation takes place*. Vice versa, they will be interested in what *our current* epistemic state is. My claim above has been that the implicature of falsity in mismatched past counterfactuals is drawn because the speaker's presupposition makes reference to his *past epistemic state* rather than his *current* epistemic state, which would have been more informative given the principle above.

Therefore, the circumstances in which the implicature will be canceled are those in which it would not have been more relevant for the speaker to inform his interlocutor about his *current* epistemic state. In other words, in those circumstances in which it is enough to inform his audience about his past epistemic states, the implicature won't be drawn.

I believe this is indeed the case. In the following example, the mismatched past counterfactuals can be used even though the antecedent of one of them (the one referring to tomorrow) is actually true.

¹⁶ This is consistent with a general treatment of the present tense as lack of past, as we mentioned at the beginning of this paper. Thus, we would only have one tense feature, [past]. If this feature is absent, then

- (61) Lucy wanted to visit her mother but she was afraid she will fight with her brother and sister, with whom she does not get along at all. I met Charlie this morning and I asked him whether he knew what Lucy has decided to do. Charlie said:
- a. Yes, she decided to go tomorrow. When I saw her last she was deeply torn: she had to choose between tomorrow and the day after, because those are her only days off work. She didn't know what to do: true, if she had gone to visit her mom tomorrow, she would have met her brother but, if she had gone the day after tomorrow, she would have met both her siblings, which is certainly worse. She chose tomorrow so as to meet only one of them.

Canceling the implicature of falsity in (61) is possible because the relevant epistemic state here is not that of the speaker at the utterance time but that of Lucy at the time she was making the decision. Charlie – the speaker – is reporting Lucy's thinking: the thoughts she went through in order to decide between tomorrow and the day after.

This is exactly the same mechanism at work in other cases of implicature cancellation. Normally, if somebody says, "I own two cars", his interlocutors will draw the implicature that he does not own three (or more) cars. But, now, consider the following scenario: In order to get a meal plan you must have at least two children. Suppose B has four children and he's applying for a meal plan. The following exchange takes place between A – the employee – and B.

(62) A: Do you have two children?

B: Yes, I do.

the default time will be assigned to the time variable, i.e. the utterance time.

Here, the employee will correctly not draw the implicature that B only has two children. Why? Because the information about the exact number of children B has is not expected (it's actually irrelevant). Hence, B not giving that piece of information will not have any significance whatsoever.

4.6 Non-past subjunctive versus indicative conditionals

I have suggested above that non-past subjunctive conditionals have the felicity condition in (42), repeated below in (63).

(63) *Felicity Condition for non-past conditionals*

$$P \cap C_u \neq \emptyset$$

I argued that this is the correct felicity condition based on examples such as (38), (47a), (49a) and (50a), which were deviant because uttered in a context inconsistent with the presupposition required by the antecedent. When such a clash occurs between the context of utterance and the presuppositions of the antecedent, there are two possible strategies for resolving it.

One strategy is to use a mismatched past counterfactual, i.e. a conditional with two layers of past. As I explained above, the extra layer of past will be interpreted in the restriction of the modal operator (specifically, it will constrain the time-argument of the accessibility relation), and the Gricean implicature of falsity will be triggered.

The second strategy is to *overtly* cancel the offending presupposition. The simplest way to overtly cancel an offending presupposition is by adding its negation to the

antecedent. Let me illustrate how this works. Consider the deviant (38) again, repeated in (64a), and compare it to (64b).

- (64) a. #Charlie is dead. If he came to the party tomorrow, he would meet Sally.
b. Charlie is dead. If he were alive and came to the party tomorrow, he would meet Sally.

In (64b) the proposition that has been added to the antecedent (that Charlie is alive) has the effect of removing the presupposition that Charlie is alive from P: now, the antecedent p in (64b) no longer presupposes that Charlie is alive because it *supposes* it. (39) – $P \cap C_u \neq \emptyset$ – is satisfied: the set of worlds w in which all the presuppositions of P are true includes worlds in which Charlie is dead and worlds where Charlie is alive. Hence, its intersection with C_u (that only contains worlds where Charlie is dead) will not be empty. Consequently, the presuppositions of (64b) *are* compatible with C_u .

Indicative conditionals are different. Better, their felicity conditions are different. Not only do the presuppositions of the antecedent of an indicative conditional have to be consistent with the context of utterance but also the antecedent itself must be consistent with it. The felicity condition for an indicative conditional should be something like (65). Small p is the antecedent.

(65) *Felicity condition for indicative conditionals*

$$p \cap C_u \neq \emptyset$$

Indeed, consider the following pair.

- (66) a. #Charlie is dead. If he comes to the party tomorrow, he'll meet Sally.
b. #Charlie is dead. If he is alive and comes to the party tomorrow, he'll meet Sally.

The fact that (b) is also deviant tells us that the second strategy is unavailable in the case of indicative conditionals; *the antecedent p* must be compatible with C_u . The same is true for past indicative conditionals.

- (67) a. #Charlie died a week ago. If he came to the party yesterday, he met Sally.
b. #Charlie died a week ago. If he was alive and came to the party yesterday, he met Sally.

The precise definition of the felicity condition for indicative conditionals requires a deeper investigation that I can't pursue here. For the time being, let the sketchy remarks above be sufficient.

5. Covert modality in mismatched matrix sentences

In this paper, I have discussed how temporal mismatches in conditionals are cases of tense (Past) being interpreted outside the proposition where it occurs in surface structure. The proposal is that (at least in cases of temporal mismatches) Past is interpreted in the domain of the modal operator (more precisely, it is interpreted inside the accessibility

relation).¹⁷ Notice that in mismatched conditionals this is the only option available, as Past *cannot* be interpreted inside the antecedent because of the future temporal adverb.

This can be generalized to all sentences with temporal mismatches. In no sentence with a temporal mismatch can Past be interpreted inside the proposition where the future temporal adverb occurs. In other words, in every temporally mismatched sentence Past must be interpreted in the domain of the modal operator, more specifically, in the accessibility relation of a modal operator. Consequently, we predict that all sentences with a temporal mismatch will be interpreted modally. The goal of this section is to show that this is correct.

Sentence (68) has a special interpretation. It *only* has a special interpretation.

(68) Originally, Charlie left tomorrow.

The Past cannot be interpreted inside the proposition; that is to say, it cannot locate the event of leaving in the past. If it did, the event of Charlie's leaving would be said to occur

¹⁷ This hypothesis is supported by further data, thorough discussion of which the reader can find in Ippolito (2001). The relation between modal operators and the complementizer's domain has already been exploited, for example in Stowell (1982). More specifically, in the literature on the syntax of conditionals, it has been observed that there exists a kind of subjunctive conditional where (one layer of) past moves *overtly* to C (Pesetsky 1989, Iatridou and Embick 1994). Iatridou and al. also observe that 'inverted conditionals' have a stronger "irrealis" flavor when compared with their non-inverted counterpart:

- (i) Had Lucy met him for the first time yesterday, she would not have married him.
- (ii) If Lucy had met him for the first time yesterday, she would not have married him.

The former sentence suggests more strongly that the antecedent is false and, consequently, would resist Anderson's type of examples. Indeed, a future adverb can replace *yesterday* in (i): according to the speakers I have consulted, (iii) is the preferred way to talk about a future impossibility.

- (iii) Had Lucy met him for the first time tomorrow, she would not have married him.

Turkish offers another case of overt movement of Past to C and, interestingly, this movement is associated with the falsity of the antecedent (see Ippolito (2001) for a discussion of the Turkish data).

both tomorrow and past relative to the utterance time, and the sentence would be as nonsensical as (69).¹⁸

(69) #Tomorrow, Charlie left.

The former sentence is acceptable, though. What does the past do? In order to answer this question, we need to ask what (68) intuitively means and in what circumstances it would be felicitously uttered. Suppose today is Monday and Charlie had scheduled to leave tomorrow (Tuesday). I meet Lucy and she tells me that Charlie is coming to dinner on Wednesday. I am surprised and I tell her that I thought he would have already gone by then. She can then felicitously utter (68). A similar example is (70a).

(70) It is 10am and Charlie has just told Sally that they will play the basketball game tomorrow. Sally was told last week that they would play tonight. So, she says:
a. Didn't we play tonight?

Intuitively, (68) talks about what should have been the case if some plans had been realized. The truth of the proposition expressed by a mismatched sentence such as (68) is evaluated in all those worlds compatible with some relevant aspect of the actual world:

¹⁸ The same point can be duplicated using the past progressive:

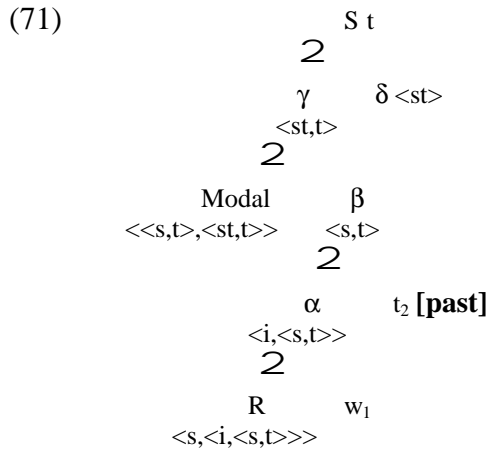
(i) Charlie was leaving tomorrow.

I have chosen the simple past forms so as to isolate the contribution of tense from the contribution of aspect. The speakers I have consulted accepted these sentences in the appropriate context. I found similar examples in Dudman (1983). For analysis of the interaction between progressive aspect and modality, see Dowty (1977) and Copley (2001).

plans, beliefs, desires, etc. Sentence (68) is a *modal sentence*, even though its modality is hidden.

The broader generalization I made above finds support: in every temporally mismatched sentence, the Past must be interpreted inside the accessibility relation, thus escaping the nonsensical interpretation.

The structure and truth-conditions for (68) will be as in (71) and (72) (ignoring the adverb *originally*). As usual, $g(1) = w_c$.



(72) $[[S]]^{g,c} = 1$ iff $\forall w \in W$ [w is compatible with the plans in $g(1)$ at $g(2) \rightarrow$ Charlie leaves in w] *defined only if* $g(2) < t_c$

As mentioned above, the accessibility relation may be of different kinds: planning, epistemic, doxastic, etc. For example, whereas example (68) seems to involve a planning modality, the following example seems to involve mere evidence/knowledge.

(73) A gigantic meteor is threatening our planet and many mysterious phenomena have occurred in the last few days. The scientists are clueless and are afraid something terrible may happen to the earth. Today on TV, they announced that a new series of strange events will happen. You haven't watched TV today and now want me to update you. I then say:

“You wouldn't believe it! Originally, the sun rose at 5:32 tomorrow but, due to the meteor, it will actually have a delay of 5 minutes!”

That the sun will rise at a certain time is a reliable kind of evidence (if not knowledge), but cannot be planned.

As in the case of conditionals, the semantics in (72) only talks about what *was* compatible with some aspect of the actual world at some past time. Where does the intuition that, when the speaker utters (68), he doubts or no longer believes that Charlie will leave tomorrow? The answer should now be obvious: it is a scalar implicature.

5.1 Scalar implicatures in mismatched matrix clauses

Following the proposal I presented above, I suggest that the scalar implicature is derived through a competition between *presuppositions* (felicity conditions). Recall that the time of the context set *C* in the felicity conditions discussed above is identical to the time of the evaluation of the modal sentence. Thus, given the truth-conditions in (72), the felicity condition of a mismatched matrix sentence will be (74).¹⁹

¹⁹ Notice that, whereas in the case of subjunctive conditionals it mattered whether the presupposition was about *P* or *p*, in the case of a matrix sentence, it does not. This is because the strategy of overtly canceling one presupposition by turning it into a *supposition* (which is what we do in subjunctive conditionals) is not available for non-conditional sentences. The question whether (74) should be about *P* or *p* is still open,

$$(74) \quad p \cap C_{2 < u} \neq \emptyset$$

(74) requires that the proposition expressed by the mismatched sentence be consistent with the common ground at some past time t_2 . Or, to put it differently, the intersection between the set of worlds w where p is true in w and the context set at some past time t_2 is not empty.

In analogy with the reasoning I developed for conditionals, the presupposition in (74) will have to compete with (75), which will have to be the presupposition of a sentence whose truth-conditions are those given in (76).

$$(75) \quad p \cap C_u \neq \emptyset$$

$$(76) \quad [[S]]^{g,c} = 1 \text{ iff } \forall w \in W [w \text{ is compatible with what the speaker knows in } g(1) \text{ at } g(2) \rightarrow \text{Charlie leaves tomorrow in } w], g(2)=t_c$$

Informally, (76) is true if and only if that Charlie leaves tomorrow is true in all those worlds in which the current plans are true. This is indeed what (77) means.

$$(77) \quad \text{Charlie leaves tomorrow/is leaving tomorrow.}$$

though, and finding a decisive answer will require further study. Notice, however, that the felicity condition in (74) may be interesting for conceptual reasons. Indeed, in my theory, felicity conditions are compatibility relations between past or present common grounds on one hand, and P (the presuppositions of p) or the proposition p itself on the other. Thus, there are four combinations in principle: (i) $P-C_{2 < u}$; (ii) $P-C_u$; (iii) $p-C_u$; and finally (iv) $p-C_{2 < u}$. In this article, I have argued that the possibility in (i) is instantiated by MPSCs (and potentially by standard past subjunctive conditionals); the possibility in (ii) is instantiated by non-past subjunctive conditionals; the possibility in (iii) is instantiated by indicative conditionals. In the discussion above, nothing was said about the possibility in (iv). As a result, our paradigm had a gap. If what

The sentence in (74) competes with (75) and the implicature is drawn as explained above.

Note that, according to what I am suggesting, (77) *says* that at the utterance time there is a plan for Charlie to leave tomorrow and *presupposes* that the *speaker's* knowledge at the utterance time is consistent with the proposition expressed by the sentence. We can actually test this claim. Suppose I heard that Charlie is flying to New York tomorrow but I know that tomorrow all airlines will be on strike and no plane will leave. It would then be inappropriate for me to utter (77). Given that (77) only says that there is a plan for Charlie to leave tomorrow and given that Charlie does have a plan, why is it inappropriate for me to utter (77)? Clearly, the deviance of (77) in the given scenario is due to its felicity condition in (75), according to which the common ground must be consistent with the presupposition of the sentence.

To sum up, (i) the proposal that the past tense is interpreted as restricting the time argument of the accessibility relation, (ii) the proposal for specific presuppositions for modal sentences, and (iii) the proposal that Gricean scalar implicatures can be drawn in the domain of presuppositions, allow us to account for all the properties of complex and simple mismatched modal sentences.

6. Future direction and conclusion

Above, I observed that standard past counterfactuals behave like mismatched past counterfactuals and not like non-past subjunctive conditionals with respect to the presupposition problem. Could this be due to the fact that in standard past counterfactuals, as well as in mismatched past counterfactuals, the extra layer of past in

I suggest in 5.1 above is correct, then what instantiates the possibility in (iv) are matrix mismatched

the antecedent is interpreted in the restriction of the modal operator (i.e. it constrains the time-argument of the accessibility relation)?

We seem to have an argument that it *can* be interpreted that way. I have shown that there are cases where the past tense in the antecedent of a past counterfactual cannot be interpreted inside the proposition expressed by the antecedent but must be interpreted somewhere else. I suggested that accessibility relations take a time-argument besides the standard world-argument and that, whenever the past tense cannot be interpreted inside the proposition, it constrains the possible values for the time-argument of the accessibility relation.

Nevertheless, we do not have an argument that it *must*. Given the existence of such a possibility for mismatched past counterfactuals, we cannot exclude that such a possibility is available for standard past counterfactuals as well. But we also must allow for the extra past tense to be interpreted inside the antecedent (no clash arises in the case of standard past counterfactuals). Do then standard past counterfactuals always have two logical forms, one where the extra past sits inside the antecedent and one where it is in the domain of the accessibility relation?

The behavior of presuppositions we observed in 3.2 pointed towards grouping standard past counterfactuals with mismatched past counterfactuals rather than with non-past subjunctive conditionals. On the other hand, the pair in (i)-(ii) briefly discussed in footnote [17] points towards the ambiguity thesis.

clauses. This guarantees the completeness of our paradigm.

- (78) a. Had Lucy met him for the first time yesterday, she would not have married him.
- b. If Lucy had met him for the first time yesterday, she would not have married him.

If Past were always interpreted outside the proposition and within the accessibility relation as suggested above, we would not expect a difference in meaning between (78a) and (78b).

In any event, we are now left with the task of deriving the implicature of falsity generally associated with past counterfactuals and, consequently, finding the right competitor.²⁰ In addition, we must also derive the fact that such an implicature is weaker than the one we find in mismatched past counterfactuals, as it can be more easily canceled (for example in Anderson-type examples). Future research will hopefully provide thorough answers to the issues this paper has raised.

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²⁰ The competitor would have to be the indicative past conditional because it is the only one that can talk

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