

## Non-monotonic futures<sup>1</sup>

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**Abstract** The paper defends the thesis that future tensed statements have truth values that can change over time. In relativistic approaches to the evaluation of future contingents (MacFarlane 2003, 2007), only changes in the truth status of such statements from neither-true-nor-false to definitely true (or definitely false) are taken into consideration. More precisely, given the monotonicity property of the model of historical possibilities, for which historical alternatives to a world  $w$  at a time  $t$  increase moving backward and shrink moving forward in time with respect to  $t$  (Thomason 1984), only such changes are predicted to be possible. I will consider the theoretical possibility of truth value transitions for future contingents from true to false and from false to true, as well as some potential linguistic evidence for such transitions - drawn from certain uses of phase adverbs like *still*, *no longer*, and *always* in English and Romance. To deal with the natural language data, I will propose a situation-based version of Branching Time which accommodates partiality of information, and a revision of the Kaplanian notion of truth-in-context.

### 1. Introduction: evaluating tensed statements in context

In the first part of this paper, I focus on the general issue of evaluation of tensed statements in context. By ‘evaluation of tensed statements in context’, I mean the process of ascribing a truth value to statements such as the ones I could have made by uttering (1a,b) on November 13<sup>th</sup> 2009:

- (1) a. Dave came to my talk yesterday.
- b. Dave will go to the workshop on December 14<sup>th</sup>.

Suppose that today is November 13<sup>th</sup> 2009 and I utter (1a,b). Given that it is November 13<sup>th</sup>, and given other relevant features of the context in which I am linguistically acting (in particular, given the space of discourse referents that are accessible to me and to my interlocutors in the working community of which I am currently part), my utterance of (1a) comes to express the proposition that Dave Ripley went to Fabio Del Prete’s talk on November 12<sup>th</sup> 2009. My utterance of (1b) in the same context comes to express the proposition that Dave Ripley will go to the individual level / stage level workshop on December 14<sup>th</sup> 2009. In typical situations of information

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<sup>1</sup> This paper is closely related to work that I conducted with Andrea Bonomi at Università degli Studi di Milano on the formal semantics of future tensed sentences in 2007/2008.

exchange, statements are evaluated by their recipients at the time at which they are made, and in their contexts of production. So, typically, my utterance of (1a) will be evaluated by my hearer in the context in which I produced it. A possible way of looking at this process of evaluation is along these lines: the hearer first looks at those features of the context that enables her to identify the proposition that I expressed by uttering the sentence type in (1a); once she has identified the proposition I thereby expressed, she further looks at another feature of the context, that we may call ‘the world of the utterance’, and she checks whether such world is such as to make that proposition true.

Now, in most situations this process will not actually involve an empirical investigation on the part of the hearer to establish whether the world of the utterance is such as to make the proposition true. If the evaluation were carried out in such a way, it would be too costly in terms of the amount of time that would be required in order to assess the relevant facts out in the world. Most commonly (or perhaps in the most ideal cases), what happens is that the hearer assumes truthfulness of the speaker, and proceeds accordingly to update her representation of what the world is like by just assuming that the world *is* such as to make the proposition true. The fact that this is the way things most often go will make the term ‘evaluation’ appear inappropriate, as it will appear that this process, far from being the process of checking the truth value of a proposition against a possible situation, is rather the process of adequating a situation to the content of a proposition. But there is no real inappropriateness here, as updating one’s representation of the world through the content of a certain proposition crucially implies knowing how the world must be made so as to make that proposition true, so that in the end it is still an evaluation act that the hearer has to make in order to get to the new representation of how the world is like (though the evaluation is most often made not in real terms, but somehow “fictitiously”, given the presumption of truthfulness on the part of the speaker). In the case of the past tensed statement (1a), what the evaluation in context comes down to is to look at the actual course of events, as it has unfolded thus far, and to check whether this course of events contains an event of Dave Ripley’s going to Fabio Del Prete’s talk on November 12<sup>th</sup> 2009. A property of situations that make a past tensed statement like (1a) true or false is that they make it definitely (irreversibly) true or definitely (irreversibly) false. For example, once the hearer has ascertained that the actual

course of events does contain the going-to-the-talk event required for the truth of my statement, that statement of mine is evaluated as definitely true, i.e. along with the truth of my statement, the hearer recognizes that no situation could possibly arise later, that would turn my previous statement into a false one. By this I do not mean to deny the obvious possibility of an error in the evaluation process, by which the hearer would first erroneously evaluate my statement as true (false), and later realize that it was in fact false (true). In other terms, I am not denying that the hearer might first update her representation of what the world is like by accommodating the representation of a past event of the type described by my statement, and then decide to remove the representation of the past event due to some evidence countering my statement. The important observation to make, from a linguistic point of view, is that in such a case the hearer would *not* claim that my utterance of (1a) was true when I made it (or when she first evaluated it), and that it is no longer true at the subsequent point at which the countering evidence comes into play.

## **2. Asymmetries between evaluating past and future tensed statements**

In this last connection, there turns out to be a striking difference between evaluating my statement (1a) and evaluating my statement (1b). In the case of the future tensed statement, the evaluation in context cannot consist in looking at the actual course of events, as it will have unfolded, say, by December 15th, and checking whether this course of events contains an event of Dave Ripley's going to the relevant workshop. The point, very simply, is that in the immediate context of my statement (and also in its immediate temporal vicinity) there is no actual course of events yet which could be looked at to check for the occurrence of the crucial event.

Now, some philosophers will say that there is nothing at all at the time at which my statement is produced, others will say that there are too many possible futures then (maybe, metaphysically possible futures which are open at the time of my statement), on some of which the crucial event occurs, on others of which it doesn't, and yet other philosophers will claim that at the time of my utterance there is exactly one future

waiting out there, as much actual as the past and the present, only (possibly) more enigmatic than the past and the present, or epistemically less accessible. The latter philosophers will presumably say that my statement (1b) is definitely or irreversibly true (false), in strict dependence of how facts are metaphysically settled out there. No matter what philosophical stand we opt for, if we do have a concern for accounting for the evaluation in context of tensed statements such as (1a) and (1b), we do have to recognize a linguistically relevant asymmetry between the evaluation of the past tensed case (1a) and the one of the future tensed case (1b): in the latter case, it *is* possible to have a retraction of a previous evaluation act. A property of those situations that make a future tensed statement like (1b) true or false in its immediate context of production (and I am making the simple assumption that there *are* such situations) is that they make it *defeasibly* (reversibly) true or *defeasibly* (reversibly) false. For example, once the hearer has ascertained that I have a good basis for asserting (1b) (e.g., I assert (1b) on the basis of Dave's publicly committing himself to go to the workshop – Dave being further considered a trustworthy person), that statement of mine can be evaluated as defeasibly true, i.e., along with the truth of my statement, the hearer recognizes that a preventing situation could later arise that would turn my previous statement into a false one. By this I do not mean to refer to the obvious possibility of an error in the evaluation process, by which the hearer would first erroneously evaluate my statement as true (false), and later realize that it was in fact false (true). The important observation to make, from a linguistic point of view, is that in such a case the hearer would be in her own right in claiming that my utterance of (1b) was true when I made it (or when she first evaluated it), but it is no longer true at the subsequent point at which the preventing situation comes into play.

The relevant conceptual distinction that has to be drawn at this point, and to whose reality I commit myself, is a distinction between the notion of countering evidence and the notion of preventing situation: the former is related to the scenario of the error in the evaluation, by which it was an avoidable fault on the part of the hearer that caused a first incorrect evaluation, the latter is related to the scenario of the unpredictable preventing situation, by which there was no avoidable fault on the part of the hearer that led to an incorrect evaluation.

### 3. Future tensed statements and modal statements

Modal statements pattern like future tensed statements from the point of view of their evaluation in context. The former, like the latter, can be evaluated in different ways at different points in time. Here is an example involving the ability modal *can*. The same utterance of the modal sentence (2a) below can be true now and turn to false at a subsequent point at which you will no longer have your current abilities. A possible scenario is this: you utter and evaluate (2a) at a point  $t$  at which you are in such physical conditions to be indeed able to lift the stone, and then you evaluate your utterance of (2a) made at  $t$  again at a subsequent point  $t' > t$ , after you have lifted the stone ten times, so that you have completely exhausted your strength resources. In this case, at the subsequent point  $t'$ , you could say that your previous utterance of (2a) was true when you made it (or when you first evaluated it) but is no longer true at  $t'$ . A related, linguistically relevant fact is that at  $t'$  you could truthfully utter sentence (2b), containing the phase adverb *no longer*:

- (2) a. I can lift this stone.
- b. I can no longer lift this stone.

By using the phase adverb *no longer* in (2b), you presuppose that what you previously said by uttering (2a) was true, and you express that a transition from true to false has occurred, which has affected the alethic status of your previous statement. Another example, with the deontic modal *must*, is given in (3a) below. The same utterance of the modal sentence (3a) can be true now and turn to false at a subsequent point at which your current obligations will no longer be in place. A possible scenario is this: you utter and evaluate (3a) at a point  $t$  at which you have made such commitments with your collaborators as to be indeed obliged to accomplish part 2 of the task, and then you evaluate your utterance of (3a) made at  $t$  again at a subsequent point  $t' > t$ , after the division of labor between your collaborators and you has been revised, so that you are now only in charge of part 3 of the task. In this case, at the subsequent point  $t'$ , you could say that your previous utterance of (3a) was true when you made it (or when you first

evaluated it) but is no longer true at  $t'$ . A related, linguistically relevant fact is that at  $t'$  you could truthfully utter sentence (3b):

- (3)    a. I must accomplish part 2 of the task.  
       b. I must no longer accomplish part 2 of the task.

Once more, by using the phase adverb *no longer* in (3b), you presuppose that what you previously said by uttering (3a) was true, and you express that a transition from true to false has occurred, which has affected the alethic status of your previous statement.

I will return to phase adverbs in the next section, where I will be looking at future tensed sentences modified by such adverbs across different languages. The general point that I want to make is that the evaluation of future tensed statements (and, more generally, of statements whose temporal interpretation is future-oriented – like the modal statements considered above) is sensitive to changes which occur in the world of the utterance, after the utterance has taken place, in a way in which the evaluation of past tensed statements is not. To say the difference between future tensed statements and past tensed statements in a motto: future tensed statements are defeasibly true, past tensed statements are irreversibly true.

#### **4. Truth-value transitions and phase adverbs**

My claim is that the conceptual distinction between countering evidence and preventing situation, which I have drawn at the end of sect. 2, has a linguistic correlate which consists in a certain use of phase adverbs like *still* in English, *toujours* ('always') and (*ne*) *plus* ('no longer') in French, *non più* ('no longer') in Italian, *sempre* ('always') in Portuguese, in which the adverbs do not seem to refer to a concrete eventuality described

in the sentence, but rather to the alethic state of their prejacent proposition.<sup>2</sup> The kind of linguistic data that I am going to consider is exemplified in (4)-(7).<sup>3</sup>

(4) [Context: On Monday it was decided that Dave would go to the workshop on December 14<sup>th</sup>, on Tuesday this decision was threatened by the rising of the unpredicted possibility that Dave might be on a trip to Italy at the time of the workshop, but eventually on Wednesday the possibility of Dave's trip vanishes so that the relative certainty of his going to the workshop on December 14<sup>th</sup> is restored. Given this, on Wednesday, after the vanishing of the possibility of the trip, the following exchange between A and B can take place.]

A- So, Dave might not go to the workshop on December 14<sup>th</sup>.

B- No, he will still go to the workshop, he has just told me that the possibility of his trip to Italy vanished.

(5) [Context: On January 5<sup>th</sup> it was decided that there would be a meeting on January 10<sup>th</sup> at 7 pm, but then a change happens on January 7<sup>th</sup> for which the meeting will still take place on January 10<sup>th</sup> but the time is shifted to 8 pm. After the change has occurred, the following French sentence can be used to make a truthful statement.]

A- La réunion aura toujours lieu le 10 janvier mais plus à 19h00 mais à 20h15.<sup>4</sup>

‘The meeting will still take place on January 10<sup>th</sup>, but no longer at 7pm, but rather at 8:15pm.’

(6) [Context: On Monday it was established that I would go to Milano for Christmas, but on Friday it turns out that I cannot do the trip, and I have to stay in Paris until

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<sup>2</sup> By *prejacent*, I mean the proposition which is expressed by the sentence minus the phase adverb. In this I follow and extend a terminological convention that was established by Horn (1994) in the literature on the focus-sensitive adverb *only*, whereby it is commonly understood that the prejacent is the proposition modified by *only*.

<sup>3</sup> I thank Dave Ripley for his native speaker judgments about the example in (4). Incidentally, I observe that the same data can be reproduced in other languages, at least in Italian and French. This is expected, given that there are no reasons to expect that the basic facts I am pointing at be related to the evaluation of English sentences in a privileged way.

<sup>4</sup> I am thankful to Benoît de Cornulier and Orin Percus, who made me aware of such uses of *ne plus* in French in the occasion of a seminar at Université de Nantes. They both pointed out to me that the French sentence *Tu ne partiras plus demain* (‘You’re no longer leaving tomorrow’, de Cornulier’s own example) presupposes that a previous utterance of *Tu partiras demain* (or a semantically equivalent statement) must have been true at some point in the past.

the end of the year. Given this, on Friday, after the rising of the preventing circumstance, the following exchange between A and B can take place.]

A- Allora, andrai sempre in Italia a Natale?

‘So, will you still go to Italy for Christmas?’

B- No, non partirò più. Devo stare a Parigi fino alla fine dell’anno.

‘No, I’m no longer leaving. I have to stay in Paris until the end of the year.’

(7) [Context: there is an implication that you have thought you wouldn’t do your presentation.]

Sempre vou fazer a apresentação.<sup>5</sup>

‘I’ll still do my presentation.’

Descriptively, it seems that *still* in (4) conveys that the possibility of a preventing situation was salient for a while, and from the content of the utterance we infer that the preventing situation has now been neutralized; on the other hand, *toujours* ‘always’ et *(ne) plus* ‘no longer’ in the French example (5) convey that it was previously established that the meeting would take place on January 10<sup>th</sup> at 7 pm, and from the content of the utterance we infer that this previous decision is in part no longer valid: the date is still (*toujours*) valid, but the time is no longer so. Analogous considerations can be made concerning the Italian example in (6), involving the adverb *sempre* ‘always’ and the construction *non più* ‘no longer’, and the Portuguese example in (7), which contains the adverb *sempre* ‘always’.

Before proceeding to the presentation of my philosophical proposal, let me briefly pause to make a linguistic observation. There are interesting differences between languages with respect to what phase adverbs are allowed by each particular language in contexts such as (4)-(7) above (let’s call them ‘revision contexts’). For example, while English allows for *still* in revision contexts with unnegated future tensed sentences, as shown in (4B) above, Italian, French, and Portuguese require their counterparts to *always* in the same kind of revision contexts, as shown in (5)-(7) above. Notice that replacing *still* with *always* in (4B) would give rise to unacceptability, as is shown in (8):

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<sup>5</sup> I thank Patrícia Amaral for giving me this example from European Portuguese.

- (8) ??Dave will always go to the workshop, he has just told me that the possibility of his trip to Italy vanished.

On the other hand, while French and Italian allow for their counterparts to *no longer* in revision contexts with negated future tensed sentences, as shown in (5A) and (6B) above, English does allow for *no longer* in this kind of revision contexts, but only with the future tense marker *be going to*, not with *will*. For example, to express a revision of the kind exemplified in (4)-(7) above, in English one has to use (9a), while (9b) is not acceptable:

- (9) a. Dave is no longer going to the workshop on December 14<sup>th</sup>.  
b. Dave will no longer go to the workshop on December 14<sup>th</sup>.

Notice that no such uses of the phase adverbs *still* and *no longer* are possible with past tensed sentences. For example, on December 20<sup>th</sup>, after the individual level / stage level workshop has taken place, one of the two sentences (10a,b) will be true, the other false, and the one which will be true will be susceptible of being used to make a definitely true statement.

- (10) a. Dave went to the workshop on December 14<sup>th</sup>.  
b. Dave did not go to the workshop on December 14<sup>th</sup>.

Thus, the point is the following: if on December 20<sup>th</sup> (in fact, at any time following December 14<sup>th</sup>) we can utter (10a) to make a true statement, a situation cannot possibly arise later in which we could use the negation (10b) to make a true statement. Correlatively, there is no possible use of sentence (11) in this context to make a true statement, which would parallel the assertion that we can truthfully make by uttering (5A) in the context described under (5) above.

- (11) Dave did no longer go to the workshop on December 14<sup>th</sup>.

And analogously: if on December 20<sup>th</sup> (in fact, at any time following December 14<sup>th</sup>) we can utter (10b) to make a true statement, a situation cannot possibly arise later in which we could use (10a) to make a true statement. Correlatively, there is no possible use of sentence (12) in this context to make a true statement, which would parallel the assertion that we can truthfully make by uttering (4B) in the context described under (4) above.

- (12) Dave still went to the workshop on December 14<sup>th</sup>.

## 5. A formal model for the notion of evaluation in context

In order to cope with these data, I will propose the semantic model that I describe below. First, I propose a notion of evaluation of a proposition in context which differs from the Kaplanian notion in one important respect, that I explain below. In Kaplan (1989), the context for a given utterance  $u$  is represented as a package of values that correspond to those features of the utterance situation which are relevant for fixing the semantic values of indexical expressions such as *I*, *here*, *now*, and *actually*, to mention those ones which receive the greatest attention in that work. More formally, an utterance  $u$  is associated with a sequence of contextual parameters  $c = \langle a_c, l_c, t_c, w_c \rangle$  which models the context of the utterance  $u$  (where  $a_c$  is the agent of the context – usually the speaker, for cases of phonetic utterances –,  $t_c$  is the time at which the utterance occurs,  $l_c$  is the location where the utterance takes place, and  $w_c$  is the world in which the utterance happens). A crucial assumption that Kaplan makes, and that subsequent scholars have generally endorsed, is the following:

### *Uniqueness of the Utterance Context*

For any given utterance  $u$ , one and only one context of utterance can be specified for  $u$ .

This assumption can be shown to be a corollary of a more primitive assumption, according to which any one of the features that can be ascribed to a particular utterance event  $u$ , in particular the *world* of  $u$ , can take on no more than one value (hence, each one of the coordinates of the sequence which represents the context of  $u$  can get only one value).

In the Kaplanian picture, the meaning of an expression  $E$  of semantic type  $\alpha$  is modeled as a character, a function  $ch(E)$  that applies to a context  $c$  and returns the intension  $ch(E)(c)$  expressed by  $E$  in  $c$ , where the intension  $ch(E)(c)$  is modeled in turn as a function that applies to a possible world  $w$  and returns an object  $ch(E)(c)(w)$  of type  $\alpha$ , which is the denotation of  $E$  relative to  $c$  and  $w$ . The Kaplanian recipe for computing the

denotation-in-context of  $E$  is straightforward: just apply the intension  $ch(E)(c)$ , which  $E$  expresses in the relevant context  $c$ , to the world  $w_c$  of the same context  $c$ .

*Kaplanian denotation-in-context for a linguistic expression  $E$*

The denotation of an expression  $E$  in a context of utterance  $c$  is the value  $ch(E)(c)(w_c)$ .

The case of a sentential  $E$  is a straightforward application of this general rule: just take the intension (proposition) expressed by  $E$  in  $c$  and apply it to the world of the context  $w_c$ .

*Kaplanian truth-in-context for a sentence  $S$*

The truth value of a sentence  $S$  in a context of utterance  $c$  is the value  $ch(S)(c)(w_c)$ .

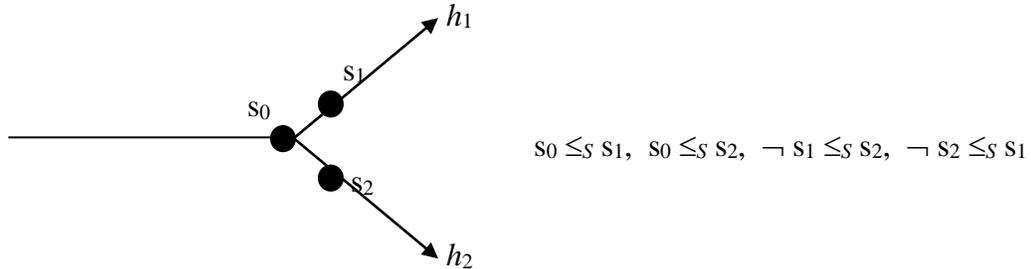
The problem with this approach, as pointed out in MacFarlane (2003, 2008) in connection with the specific problem of future contingents, and in Bonomi & Del Prete (2008) in a broader perspective, is that it cannot account for variations in the truth-in-context status of future tensed statements, and for related data such as (2) and (3) above, in which the English and French phase adverbs *still*, *toujours*, and *(ne) plus* intuitively refer to transitions between polarly opposite alethic states, rather than to transitions between polarly opposite phases of some concrete eventuality (as in perhaps more familiar cases like *Dave is still running* and *Dave is no longer running*). This directly follows from Uniqueness of the Utterance Context: given that only one world can be assigned as world of the utterance, and given further that the only way to establish the truth-in-context status of some sentence  $S$  is by applying the intension expressed by  $S$  in the context  $c$  where  $S$  is uttered to the world  $w_c$ , it follows that no variation can result in the truth-in-context status of  $S$ . My contention is that a change in the truth-in-context status of *DP will VP* in the examples *DP will still VP*, *DP will no longer VP* is exactly what is referred to in these adverbially modified statements: basically, by asserting *DP will still VP* at  $t$ , the speaker implies that it was expected that a transition from true to false in the truth-in-context status of a previous relevant utterance of *DP will VP* would occur by  $t$ , and that at  $t$  that previous utterance would no longer be true, and by the same

assertion the speaker says that the expected transition has not taken place (or, to give a more accurate description of the scenario reported in (2) above, that it has been followed by a counter-transition that has restored the truth for the relevant utterance of *DP will VP*); on the other hand, by asserting *DP will no longer VP* at  $t$ , the speaker implies that it was expected that the value True for the truth-in-context status of a previous relevant utterance of *DP will VP* would persist up to  $t$ , and by the same assertion she says that the expected persistence of True has not obtained and that a transition from true to false for the truth-in-context status of the relevant utterance of *DP will VP* has taken place by  $t$ .

Given all this, I propose a modification of the Kaplanian model along these lines: I maintain that the linguistic meaning of a sentence can be represented as a function from contexts to propositions, and that propositions can be represented as functions from possible circumstances of evaluation to truth-values, but I propose to represent circumstances of evaluation in a way that distinguishes them from informationally complete possible worlds and accommodates partiality in some respects. On this proposal, a circumstance of evaluation is a possible situation, where a situation comes with a certain past and a certain future. The notion of possible situation that I make use of is closely related to Kratzer's (1989). Like Kratzer, I subscribe to the view of situations as pieces of possible worlds. A situation is different from an instantaneous world-slice in at least two salient respects: it can have a temporal duration, i.e. be non-instantaneous, and it need not contain information about all facts from the world of which it is part which occur within its temporal duration. Usually, situations relevant to semantic evaluation do have a temporal duration greater than zero and contain information only about a very restricted set of facts. Besides this, the past and the future of a given situation are also made up of possible situations partially ordered by a relation of temporal precedence  $\leq_S$ . This relation is partial in two senses, one interesting and the other uninteresting. The uninteresting case is the one in which two situations  $s, s'$  are not related by  $\leq_S$  because  $s$  and  $s'$  overlap with each other, so that neither of them can be said to temporally precede the other. In order to have  $s \leq_S s'$ , the *whole* situation  $s$  must come before the *whole* situation  $s'$ . The interesting case is the one in which two situations  $s, s'$  are not related by  $\leq_S$  because  $s$  and  $s'$  are on two alternative futures for a certain situation  $s_0$ , namely they are both related to  $s_0$  by  $\leq_S$ , in particular we have both  $s_0 \leq_S s$  and  $s_0 \leq_S s'$ ,

but  $s$  and  $s'$  are not temporally ordered with respect to each other because they belong to different possible histories. The interesting case can be depicted as in Fig. 1:

**Fig. 1**



The state of affairs represented in Fig. 1 corresponds to the working hypothesis that people represent their future as open: a speaker located in a situation  $s_0$  will normally represent the future of  $s_0$  as not uniquely predetermined at  $s_0$ , namely as made up of a number of alternative possibilities.

Another assumption concerning the partial relation  $\leq_S$  is the following: if we have both  $s \leq_S s_0$  and  $s' \leq_S s_0$ , and further  $s$  and  $s'$  do not overlap, then we must also have either  $s \leq_S s'$  or  $s' \leq_S s$ . In informal terms, if both  $s$  and  $s'$  are in the past of some  $s_0$ , and  $s$  and  $s'$  do not overlap, then  $s$  and  $s'$  must be related by temporal precedence, i.e. they must belong to the same history. This assumption corresponds to the working hypothesis that people represent their past as closed: a speaker located in a situation  $s_0$  will represent the past of  $s_0$  as uniquely determined at  $s_0$ , namely as made up of a linear sequence of situations.

Let me clarify how the working hypotheses that I have mentioned before should be understood. Concerning the latter hypothesis, I am not assuming that people ever have complete information about the situations in the past of the situation they find themselves in, even granted the partiality of situations; quite to the contrary, it would be fair to assume that people normally know very little about their past, so that, from an epistemic point of view, one might find it reasonable to have models in which multiple past histories were given for any situation  $s$ , i.e. multiple temporal paths all leading up to  $s$ . Thus, the hypothesis that people represent their past as closed is rather to be understood in this sense: they think that, however things might have gone in the past, only one history must have been realized. Concerning the former hypothesis, namely that people would represent their future as open, it must not be construed epistemically either. What

is meant in this case is not that people have scarce information about the situations in the future of the situation they are in, so that there would be multiple ways of filling in the gaps in their knowledge of the future, which would correspond to different ways in which the future might unfold. The hypothesis at issue has to be understood in the sense that people, in whatever situation they are located, represent different futures as objective possibilities from the perspective of the situation they are located in.

I propose to define circumstances of evaluation as follows:

### *Circumstances of evaluation*

A circumstance of evaluation is a situation  $s$  given along with its unique past and its possible futures. The situation  $s$  represents the temporal location of the evaluator  $E$ , and also what could be described as  $E$ 's location in modal space: we imagine  $E$  as temporally located at  $s$ , which simply means that  $s$  provides the temporal coordinate of the evaluation, and we also imagine  $E$  as modally located at  $s$ , in the sense that  $E$  lives in each one of the histories that are open at  $s$ .

Let me introduce a terminological convention which will be useful in the following discussion. For  $s$  a possible situation, we can always consider the circumstance of evaluation  $w$  which consists of  $s$  along with its unique past and its possible futures. I will say that the circumstance  $w$  is *centered* on the situation  $s$ .

I assume, as Kaplan (1989) does, that a context of utterance has a circumstance parameter, where the circumstance of such a context, like any other possible circumstance, is a situation given along with its past and its possible futures. Unlike Kaplan, however, I do not assume Uniqueness of the Utterance Context; in particular, I give up the basic assumption according to which, for a given utterance  $u$ , only one circumstance can be associated with  $u$ . I replace the latter assumption with the following (from Bonomi & Del Prete 2008):

### *Openness of the Circumstance Parameter (OCP)*

Given an utterance  $u$  and circumstances of evaluation  $w \neq w'$ , both  $w$  and  $w'$  can be associated with  $u$  as the circumstance of the utterance, provided that  $w$  and  $w'$  are

centered on situations  $s \neq s'$  which are related by  $\leq_s$  and are such that  $u$  occurs either at the situation or in the past of the situation.

OCP is based on the idea that the actuality of events is preserved across time, in the following sense: if an event  $e$  occurs at a situation  $s$ , it becomes actual with respect to  $s$ , and it is actual with respect to all those situations  $s'$  which follow  $s$ . Therefore, not only can we look at the circumstance  $w$  which is centered on  $s$  as a circumstance of  $e$ , but we can take any other circumstance  $w'$  which is centered on an  $s'$  such that  $s \leq_s s'$  as a circumstance of  $e$ .<sup>6</sup>

The model with partially ordered situations that I have just described is what I will call *Partial Branching Time* (PBT). The main difference with respect to a Branching Time model like the one in Belnap et al. (2001) is that the latter uses moments, i.e. instantaneous events maximally extended through space, whereas PBT uses Kratzerian situations. An explicit definition of a PBT-structure is given in sect. 6 below.

## 6. Partial Branching Time

A PBT-structure is an 8-tuple  $S = \langle U_s, \oplus_s, \text{Inst}_s, \text{LB}_s, \text{RB}_s, \leq_s, \subseteq_s, \infty_s \rangle$  such that:

- (a)  $U_s$  is a non-empty set of entities called *situations*
- (b)  $\oplus_s$ , the *sum operation*, is a function from  $U_s \times U_s$  to  $U_s$  that is idempotent, commutative, and associative, that is:

$$\forall x \in U_s [x \oplus_s x = x] \quad \text{[idempotence]}$$

$$\forall x, y \in U_s [x \oplus_s y = y \oplus_s x] \quad \text{[commutativity]}$$

$$\forall x, y, z \in U_s [x \oplus_s (y \oplus_s z) = (x \oplus_s y) \oplus_s z] \quad \text{[associativity]}$$

- (c)  $\text{Inst}_s$  is a one-place predicate which is true of  $x \in U_s$  just in case  $x$  is an instantaneous situation

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<sup>6</sup> OCP would be compatible with a theory of utterances such as the one advocated by Israel and Perry (1994). According to these authors, utterances are events defined by essential features like *agent*, *position*, and *time*; but crucially, neither the addressee nor the world count as essential features of utterances. Israel and Perry's view that the world is not an essential feature of the utterance strictly corresponds to the thesis expressed in OCP.

- (d)  $LB_S$  and  $RB_S$  are functions from  $U_S$  to  $U_S$  that are idempotent, and whose interpretations are as follows:  $LB_S(x)$  is the instantaneous situation which is the left boundary of  $x$  and  $RB_S(x)$  is the instantaneous situation which is the right boundary of  $x$

$$\forall x \in U_S [LB_S(LB_S(x)) = LB_S(x)] \quad [\text{idempotence}]$$

$$\forall x \in U_S [RB_S(RB_S(x)) = RB_S(x)] \quad [\text{idempotence}]$$

- (e)  $\leq_S$  is a partial order over  $U_S$  whose restriction to instantaneous situations is tree-like, and whose interpretation is temporal precedence:

$$\forall x, y, z \in U_S [[x \leq_S z \wedge y \leq_S z \wedge \text{Inst}_S(x) \wedge \text{Inst}_S(y)] \rightarrow [x \leq_S y \vee y \leq_S x]]$$

- (f)  $\subseteq_S$  is a partial order over  $U_S$  whose interpretation is temporal inclusion:

$$\forall x, y \in U_S [x \subseteq_S y \leftrightarrow [LB_S(y) \leq_S LB_S(x) \wedge RB_S(x) \leq_S RB_S(y)]]$$

- (g)  $\infty_S$  is a reflexive and symmetric relation over  $U_S$  whose interpretation is temporal overlap:

$$\forall x, y \in U_S [x \infty_S y \leftrightarrow \exists z \in U_S [z \subseteq_S x \wedge z \subseteq_S y]]$$

Histories are defined as in Branching Time, modulo the distinction between moments and situations. That is, histories are maximal chains of situations.

### *Histories*

A set  $X \subseteq U_S$  is a history in  $U_S$  iff  $X$  satisfies the following conditions:

- (i)  $\forall x, y \in X [x \leq_S y \vee y \leq_S x \vee x \infty_S y]$  (*temporal connectedness*)  
(ii)  $\forall Y \subseteq U_S [[\forall x, y \in Y [x \leq_S y \vee y \leq_S x \vee x \infty_S y] \wedge X \subseteq Y] \rightarrow X = Y]$  (*maximality*)

Here are some further formulas which are valid in PBT-structures:

$$\forall x, y, z \in U_S [[x \subseteq_S y \wedge y \leq_S z] \rightarrow x \leq_S z]$$

$$\forall x, y \in U_S [x \subseteq_S y \rightarrow LB_S(x) \subseteq_S y]$$

$$\forall x, y \in U_S [x \subseteq_S y \rightarrow RB_S(x) \subseteq_S y]$$

$$\forall x, y \in U_S [x \subseteq_S y \leftrightarrow [LB_S(x) \subseteq_S y \wedge RB_S(x) \subseteq_S y]]$$

$$\forall x, y \in U_S [[x \leq_S y \wedge x \neq y] \rightarrow \neg[x \infty_S y]]$$

## 7. Semantic analysis of the future

It is standard in modal approaches to the semantics of future tensed sentences to see ‘will’ as a universal quantifier over possible worlds, hence as a kind of necessity modal (e.g. Condoravdi 2003). The intuition at the basis of such approaches is that (13a) would bear to (13b) a similar relation to the one that (14a) bears to (14b):

- (13) a. John may be at home now.  
b. John will be at home now.
- (14) a. John may go on vacation.  
b. John must go on vacation.

Sentence (14a) expresses a permission, which is standardly represented as truth in some of the possible worlds compatible with the relevant rules. Sentence (14b), on the other hand, expresses an obligation, which is standardly represented as truth in all the possible worlds compatible with the relevant rules. Evidence for the  $\exists$ -analysis of ‘may’ and for the  $\forall$ -analysis of ‘must’ comes from the (in)consistency of a continuation like ‘but he may also stay at home if he prefers’, as shown in (14'a, b) below.

- (14') a. John may go on vacation, but he may also stay at home if he prefers.  
[consistent]
- b. John must go on vacation, but he may also stay at home if he prefers.  
[inconsistent]

Analogously, (13a) expresses a possibility which is “permitted” by the relevant state of information (according to what the speaker knows, John being at home now is a possible state of affairs), and this can be represented as truth in some of the possible worlds compatible with that information state. Sentence (13b), on the other hand, would express a necessity which is determined by the relevant state of information, and could be represented accordingly as truth in all the possible worlds compatible with that information state. The relevant intuition is thus that (13b) expresses the same kind of epistemic necessity as would be expressed by the modal verb ‘must’ in (15):

- (15) John must be at home now.

By analogy with the case of (14a,b), one should be able to find evidence for the  $\exists$ -analysis of ‘may’ and for the  $\forall$ -analysis of ‘will’ in (13a,b) by considering the (in)consistency of a continuation like ‘but he may be in his office as well’. This should be ok after (13a), but should produce an inconsistent discourse after (13b). This seems to be the case, as shown by the acceptability of (13'a) and the unacceptability of (13'b):

- (13') a. John may be at home now, but he may be in his office as well.  
[consistent]
- b. John will be at home now, but he may be in his office as well.  
[inconsistent]

The universal quantifier force of ‘will’ (hence, its nature of necessity modal), however, is not as obvious as it would seem from the examples discussed above. For one thing, a future tensed sentence with epistemic reading, unlike a corresponding sentence with ‘must’, can be modified by adverbs of epistemic possibility like ‘perhaps’ (a point which is also made by Kissine 2008; see Bertinetto 1979 and Pietrandrea 2005 for parallel claims about Italian), as shown in (16a):

- (16) a. John will perhaps be at home now.  
b. #John must perhaps be at home now.  
c. John must necessarily be at home now.

If we assume that ‘will’ is a modal, it seems plausible to assume that the relation between ‘will’ and the adverb ‘perhaps’ in (16a) should be one of modal concord (see Zeijlstra 2008, Geurts & Huitink 2006).<sup>7</sup> The relation between ‘will’ and ‘perhaps’ in (16a) would

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<sup>7</sup> As Zeijlstra (2008) puts it:

Modal Concord (MC) is a phenomenon where two modal expressions do not yield a cumulative reading, but yield only one modal operator at LF. Geurts & Huitink (2006) have first observed this phenomenon:

- (1) a. You *may possibly* have read my little monograph upon the subject.  
‘The speaker thinks that it is possible you read his little monograph’  
b. Power carts *must mandatorily* be used on cart paths where provided.  
‘It is obligatory that power carts be used on cart paths where provided’

According to Geurts & Huitink, “There appear to be two main constraints on modal concord. First, two expressions can only participate in a concord construction if they are of the same modal type, i.e., if they are both deontic, epistemic, or whatever. [...] so (7) [*John might have to work on Sunday.*] contains one epistemic and one deontic modal. Consequently, the sentence doesn’t have a concord reading. [...] The second constraint on modal concord is that the modals involved have to have the same, or at least similar, quantificational force. This constraint entails that sentence (8) [*There may certainly have been weapons of mass destruction in Iraq.*] has no concord interpretation, but rather expresses the speaker’s certainty that there is a possibility that there were weapons of mass destruction in Iraq”.

be analogous to the one between ‘must’ and ‘necessarily’ in (16c), which is a paradigmatic example of modal concord: the interpretation of (16c) indeed involves just one operator of modal necessity (in spite of the occurrence of two words denoting modal necessity), as it can be expressed through the paraphrase ‘It is necessarily the case that John is at home now’. Given that modal concord requires the two items in the concord relation to have the same quantificational force, and given further the existential force of ‘perhaps’ (as opposed to the universal force of modal adverbs like ‘necessarily’ and ‘certainly’), we are inclined to conclude from (16a) that ‘will’ has existential force (at least in this particular context). To reinforce this conclusion, at a descriptive level, we can observe that (16a) globally conveys the same modality as (13a) (repeated below), in which the possibility modal ‘may’ occurs.

(13) a. John may be at home now.

Furthermore, epistemic ‘will’ can occur with other quantifying adverbs, as shown in (17a-c) below. No one of the adverbs in (17a-c) seems to have the force of a universal quantifier. Accordingly, if the interpretation of each of these sentences is seen as involving a form of modal quantification (along the lines of the paraphrases reported below), the corresponding quantificational force in the sentence is never universal, but rather a *most*-force in (17a), a pure *existential* force in (17b), and a *few*-force in (17c).

(17) a. John will probably / most likely have left the apartment.

‘In most of the possible circumstances compatible with what I know, John has left the apartment.’

b. John will possibly have left the apartment.<sup>8</sup>

‘In some of the possible circumstances compatible with what I know, John has left the apartment.’

c. John will hardly have left the apartment.<sup>9</sup>

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<sup>8</sup> Here is a naturally occurring example from the web (the relevant occurrence of ‘will possibly’ is reported with its full context, to facilitate understanding of the intended reading, which turns out to be an *existential epistemic* reading):

(i) Pause, too, to think for a moment about “Infant Mortality” – the probability that a child will die between birth and his or her first birthday. Some of us here today *will possibly* have lost infants and young children from our own families. So I hope we can all readily identify with the awful tragedy of lost hope and love that underpins our collective, global, commitment to reduce both the infant and the under five mortality rates.

‘In few (if any) of the possible circumstances compatible with what I know,  
John has left the apartment.’

Based on the foregoing, my first observation is that ‘will’ should not be analyzed as a necessity modal. If it is a modal at all, it does not have a specific quantificational force on its own (be it universal, existential, or else), but the type of quantification over alternative possibilities comes from a different source – in the examples overviewed here, from a quantifying adverb co-occurring with ‘will’. My second observation is that a bare future tensed sentence is interpreted by default in such a way as to have the temporal variable of the future tense instantiated on every accessible future. The default interpretation of a future tensed sentence is thus a universal quantification over a domain of accessible futures. If the event reported by such a sentence occurs at some values of the temporal variable while it does not occur at some other values of the same variable, the statement cannot be evaluated as true, since the event may fail to occur at the relevant time, nor can it be evaluated as false, since the event may occur then.<sup>10</sup> The situation we

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<sup>9</sup> Here is a couple of naturally occurring examples from the web involving ‘will hardly’:

- (i) The angry Merseyside response to Hicks' revelation that he had approached Jürgen Klinsmann about the manager's job will hardly have left him "in love" with Liverpool and DIC [Dubai International Capital] may also find encouragement in Hicks' saying in the interview that he finds partisan Liverpool fans an alien entity.
- (ii) It will hardly have gone unnoticed that Step 9 has been crammed with do's and don'ts, all worthy of close revision [...]

<sup>10</sup> The same situation arises in natural language whenever a potential multiplicity of objects relevant to the semantic evaluation is present. For example, we face one such situation when we use sentences containing vague predicates. Consider the following pair:

- (i) Mount Everest is a high mountain.
- (ii) Gran Sasso is a high mountain.

There is a difference between (i) and (ii). No matter what standard of height for mountains we select, sentence (i) is certain to wind up true; accordingly, we are inclined to evaluate it as true, regardless of how the context of utterance is. The truth of sentence (ii), however, is contingent on what standard of height for mountains counts as the most relevant standard in the context; accordingly, if we face a multiplicity of potentially relevant standards, we may be unable to evaluate the sentence as true or false, insofar as the standards may vary significantly with respect to each other, and, consequently, the sentence may turn out to be true relative to some standards and false relative to others.

There is an intuitive fact that can be adduced to corroborate the above claims concerning the difference between (i) and (ii). If we look at sentences (i) and (ii) out of context, we feel hesitation to accept (ii) as true, but with (i) we don't have a similar vacillation.

The truth-status of (ii) becomes much clearer as soon as a definite standard of height is referred to, or a restricted class of standards is isolated (in this case the sentence will be evaluated as true if it turns out to be true relative to the strictest standard in the class, hence relative to *any* standard therein).

These considerations on the evaluation of sentences with vague predicates make it clear that the situation we face when we evaluate future tensed sentences is not new.

face when we evaluate future tensed sentences is as follows. We have a plurality of entities that are relevant to the semantic evaluation, and it would be arbitrary for the evaluator to select one of such entities as the right input for the evaluation. So, the evaluator's strategy is "supervaluational": evaluate as true (or false) just in case the choice of the entity relevant to the evaluation (the future world-history) does not make any difference in the resulting value. In the case of the future, the plurality of entities relevant to the semantic evaluation is an ineliminable fact: there is no way for the evaluator to single out a definite world-history as the relevant future in a non-arbitrary way. Moreover, whenever "pure" future contingents are concerned, such as future tensed sentences used to make bets or in contexts in which the hearer puts into question the speaker's ground for making the assertion, the evaluator, according to the "supervaluational" strategy described above, is unable to assign a truth-value to the sentence at the moment of utterance, since she faces a plurality of possible futures which make a difference in the resulting truth-value.

Based on the preceding observations, my proposal for a semantic analysis of the future can be summarized with the following main claims:

- (C1) The future tense has no quantificational force (Q-force) *per se*.
- (C2) The Q-force in future tensed sentences comes from the linguistic context in which the future tense is embedded.
- (C3) The future tense introduces a temporal (situation) variable at Logical Form. There is a presupposition that the variable has to be instantiated in the future of the utterance situation. (As the utterance situation faces many futures, the issue arises on what future the variable has to be instantiated.)
- (C4) Natural language is sensitive to the distinction between closed past and open future. More exactly, speakers are sensitive to the asymmetry between the unique past and the multiple futures: they have a conceptual representation of this asymmetry in their cognitive systems, and their language systems interface with this representation, in particular in correspondence of the Tense and Modality sub-systems.

- (C5) Due to the multiplicity of open futures, a variable introduced by a future tense requires multiple instantiations, i.e., it requires to be instantiated on *every* possible future by default.

The type system contains the basic semantic types: **e** (individuals), **t** (truth values), **i** (situations), **v** (events), **s** (histories). Here are some assumptions I'll make with regard to the notation:

- (a) ' $h$ ', ' $h_i$ ' are used as variables ranging over histories;
- (b) ' $c$ ' denotes a context of utterance, i.e. a sequence of parameter values such as the moment of utterance  $c(t)$ ;
- (c) ' $g$ ' denotes a two-place function which assigns a temporal value – i.e. a situation – to any variable of type **i** relative to any world-history: given variable  $k$  of type **i** and world-history  $h$ ,  $g(k, h)$  is a situation belonging to  $h$ ;
- (d) ' $\wedge$ ' is reminiscent of Montague's cap operator: it denotes an operator that takes an expression  $E$  and yields an expression denoting a function from world-histories  $h$  to the extension of  $E$  relative to  $h$ ;
- (e) the symbol ' $\forall^*$ ' in the leftmost position of an LF denotes the default operation of universal quantification over accessible histories which is triggered by a future tense.

The evaluation function  $[[ \ ]]$  is relativized to a context, an assignment function, and a circumstance of evaluation. The metalinguistic expression  $[[ E ]]^c, g, w$  has to be read as 'the denotation of  $E$  relative to context  $c$ , assignment  $g$ , and circumstance  $w$ '. When the circumstance of evaluation  $w$  is set up by the context, i.e. when  $w$  is the circumstance of the context, then we have the case of *denotation in context*, which for sentential utterances coincides with *truth in context*.

To illustrate my analysis, consider the simple example (18), whose surface structure and LF are given in (19) and (20), respectively:

- (18) Mary will come.
- (19)  $[_{TP} \text{Mary}_i [_T [_T \text{will}_k] [_{VP} t_i [_V \text{come}]]]]$
- (20)  $\forall^* \wedge [_{TP} \text{will}_k [_{VP} \text{Mary come}]]$

The subscript ‘ $k$ ’ on the tense marker ‘will’ is the situation variable introduced by the future tense. In the following, I adopt Heim & Kratzer’s (1998) notational convention for which the lambda-term ‘ $\lambda x: \phi. \psi$ ’ represents a partial function  $f$  which is defined for an object  $x$  if and only if condition  $\phi$  is satisfied (here  $\phi$  is the *domain condition* of Heim & Kratzer); if  $f$  is defined for  $x$ , then the value it assigns to  $x$  is whatever value is described by  $\psi$ . I further introduce a notation that enables one to represent the result of applying a partial function  $f$  to an object  $x$ , while keeping track of the definedness condition of  $f$  in the description of the output: if ‘ $\lambda x: \phi[x]. \psi[x]$ ’ represents the partial function  $f$ , then the result of applying  $f$  to an object denoted by a constant ‘ $a$ ’ is described by the notation ‘ $\{\phi[a]\} \psi[a]$ ’, which means that we get  $\psi[a]$  *provided that*  $\phi[a]$  is satisfied.

The derivation of (18)’s truth conditions is provided in (21) below. Notice that the lambda-terms which are associated with ‘will $_k$ ’ and ‘ $\forall^*$ ’ correspond to partial functions: the domain condition ‘now  $\leq_S g(k, h) \wedge h \in w$ ’ in the clause for ‘will $_k$ ’ is the presuppositional requirement that the value of the temporal variable ‘ $k$ ’ be a future situation on history  $h$ , where  $h$  is presupposed to be a history in the circumstance of evaluation  $w$ ; the domain condition ‘ $\forall h [h \in w \rightarrow P(h)] \vee \forall h [h \in w \rightarrow \neg P(h)]$ ’ in the clause for ‘ $\forall^*$ ’ is the presuppositional requirement that the predicate of histories which is the argument of the function either be true of all histories in the circumstance of evaluation  $w$  or be false of all such histories (this is called *settledness condition* in Bonomi & Del Prete 2008).

$$\begin{aligned}
 (21) \quad & [[\text{Mary}]]^{c, g, w} = \text{Mary} \\
 & [[\text{come}]]^{c, g, w} = \lambda e_v. \lambda x_e. [\text{come}(e) \wedge \text{theme}(e) = x] \\
 & [[\text{Mary come}]]^{c, g, w} = \lambda e_v. [\text{come}(e) \wedge \text{theme}(e) = \text{Mary}] \\
 & [[\text{will}_k]]^{c, g, w} = \lambda P_{\langle v, t \rangle} : \text{now} \leq_S g(k, h) \wedge h \in w. \exists e [P(e) \wedge \tau_E(e) \subseteq_S g(k, h)] \\
 & [[[\text{TP will}_k [\text{VP Mary come}]]]]^{c, g, w} = \\
 & \qquad = (\lambda P_{\langle v, t \rangle} : \text{now} \leq_S g(k, h) \wedge h \in w. \exists e [P(e) \wedge \tau_E(e) \\
 & \qquad \subseteq_S g(k, h)])(\lambda e_v. [\text{come}(e) \wedge \text{theme}(e) = \text{Mary}])
 \end{aligned}$$

$$\begin{aligned}
 &= \{ \text{now} \leq_S g(k, h) \wedge h \in w \} \exists e [\text{come}(e) \wedge \text{theme}(e) = \\
 &\quad \text{Mary} \wedge \tau_E(e) \subseteq_S g(k, h)] \\
 [[ \wedge_{\text{TP will}_k} [\text{VP Mary come}] ] ]^{c, g, w} &= \\
 &= \lambda h: h \in w. \{ \text{now} \leq_S g(k, h) \wedge h \in w \} \exists e [\text{come}(e) \wedge \\
 &\quad \text{theme}(e) = \text{Mary} \wedge \tau_E(e) \subseteq_S g(k, h)] \\
 [[ \forall^* ] ]^{c, g, w} &= \lambda P_{\langle s, t \rangle}: \forall h [h \in w \rightarrow P(h)] \vee \forall h [h \in w \rightarrow \neg P(h)]. \forall h_1 (\lambda h: h \in \\
 &\quad w. P(h))(h_1) \\
 [[ \forall^* \wedge_{\text{TP will}_k} [\text{VP Mary come}] ] ]^{c, g, w} &= \\
 &= \{ \forall h [h \in w \rightarrow \{ \text{now} \leq_S g(k, h) \} \exists e [\text{come-Mary}(e) \\
 &\quad \wedge \tau_E(e) \subseteq_S g(k, h)]] \vee \forall h [h \in w \rightarrow \neg \{ \text{now} \leq_S g(k, \\
 &\quad h) \} \exists e [\text{come-Mary}(e) \wedge \tau_E(e) \subseteq_S g(k, h)]] \} \forall h \{ h \in \\
 &\quad w \} \{ \text{now} \leq_S g(k, h) \} \exists e [\text{come-Mary}(e) \wedge \tau_E(e) \subseteq_S \\
 &\quad g(k, h)]
 \end{aligned}$$

From the last line of (21), we see what truth conditions are predicted for (18): the sentence is true if and only if every history  $h$  belonging to the circumstance of evaluation  $w$  is such that an event of Mary coming occurs at some future point in  $h$ , *provided that* histories in  $w$  do not make a difference with respect to the future occurrence of the event of Mary coming (settledness condition).

## 8. Back to truth-value transitions and phase adverbs

In sect. 4 above we have considered cross-linguistic data involving the interaction of phase adverbs like *still* and *no longer* with future tense markers, and we have pointed out that the interpretation of such data gives intuitive support to the idea that transitions from true to false and from false to true can occur in the truth-status of future tensed utterances.

Now, concerning those cases in which a future tensed utterance is perceived to hold true against the threat of an impeding factor (see the examples in [4] through [7] from sect. 4, involving the adverbs *still* and *always*), the way we can account for the intuition of the persistence of truth in the present model is by letting the contextual circumstance  $w$  to which the evaluation function is relativized shift forward in the branching time model, what can always be done – given Openness of the Circumstance Parameter.<sup>11</sup> Suppose that at  $s_0$  you utter *Mary will come*. If in the transition from the original circumstance  $w_0$  (centered on the situation  $s_0$  at which your utterance took place) to the forward-shifted circumstance  $w_1$  (centered on a situation  $s_1 \geq_S s_0$ ) we don't have a revision of information that was accessible at  $s_0$  but only a monotonic increase of that information, what we have in  $w_1$  is a subset of the histories that were already in  $w_0$ . Given our analysis of the future tensed utterance *Mary will come* as triggering default universal quantification over histories, and given further the downward monotonicity of the universal quantifier  $\forall$ , our analysis ends up predicting persistence of utterance-truth in the transition from  $w_0$  to  $w_1$ . If some impeding factor was salient at some point between  $s_0$  and  $s_1$ , which could have prevented the future event of Mary coming, then the conditions would be met to felicitously utter *Mary will still come* at  $s_1$ . This observation pertains to the proper characterization of the presuppositional contribution of *still* in such revision contexts, a problem that I will not address in this paper, confining myself to making the informal remark that *still* requires persistence of truth beyond a phase during which the truth-value of the utterance was the False.

Concerning those cases in which the truth-status of a future tensed utterance is perceived to change from true to false, after the emergence of a preventing situation (see the examples in [5] and [6] from sect. 4, involving the adverb *no longer*), the way we can account for the intuition of the true-to-false transition in the present model is, once more, by letting the contextual circumstance  $w$ , to which the evaluation function is relativized,

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<sup>11</sup> For ease of reference, I repeat OCP here:

*Openness of the Circumstance Parameter*

Given an utterance  $u$  and circumstances of evaluation  $w \neq w'$ , both  $w$  and  $w'$  can be associated with  $u$  as the circumstance of the utterance, provided that  $w$  and  $w'$  are centered on situations  $s \neq s'$  which are related by  $\leq_S$  and are such that  $u$  occurs either at the situation or in the past of the situation.

shift forward in the branching time model, according to Openness of the Circumstance Parameter. Suppose that at  $s_0$  you truthfully utter *Mary will come* – i.e., in  $w_0$  only such histories are accessible that contain a future event of Mary coming. The case that we are considering now is one in which the transition from the original circumstance  $w_0$  (centered on the situation  $s_0$  at which your utterance took place) to the forward-shifted circumstance  $w_1$  (centered on a situation  $s_1 \geq_S s_0$ ) crucially involves a revision of the information that was accessible at  $s_0$ , not a monotonic increase of that information. As a consequence of such non-monotonic change of information, what we have in  $w_1$  is not a subset of the histories that were already in  $w_0$ , but a set of histories which were not in  $w_0$  and do not contain an event of Mary coming. Given our analysis of the future tensed utterance *Mary will come* as triggering default universal quantification over histories in the circumstance of evaluation, we end up predicting a true-to-false transition in the transition from  $w_0$  to  $w_1$ . In this scenario, the conditions would be met to felicitously utter *Mary is no longer coming* at  $s_1$ . This observation pertains to the proper characterization of the presuppositional contribution of *no longer* in such revision contexts, a problem related to the previous one about *still*, that I will also leave aside in this paper. Here I confine myself to making the informal remark that *no longer* requires that a transition has occurred from a phase during which the truth-value of the utterance was the True to a subsequent phase during which it was the False.

## 9. Conclusion

In this paper I have presented a non-modal analysis of future-tensed statements, in which the effect of universal quantification over historical alternatives is not triggered in the semantics of the future tense itself, but is due to a supervaluation-like strategy that evaluators resort to in order to overcome the plurality of possible futures which are equally relevant for the evaluation. I have argued for the theoretical possibility of transitions in the truth status of future-tensed statements from true to false and from false to true, for which I have suggested that linguistic evidence might be provided by certain previously unnoticed uses of phase adverbs in English and Romance. In order to deal

with the full range of truth value transitions, and to provide an analysis of the revision contexts considered at the outset, a BT semantic model has been proposed which incorporates the ideas of partiality of information and non-monotonic change of information.

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