

An Intersective Account of Localising Temporal Expressions

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In this paper, I defend the hypothesis that localising temporal expressions localise eventualities by intersecting their content with information coming from TENSE. I will show that in this way, one can straightforwardly account for sentences that seemed to be unanalysable without (necessarily) denying a meaning to the present tense, as proposed by Sauerland.

1 Introduction

Localising temporal expressions seem at first glance a rather dull subject of enquiry, compared to TENSE or ASPECT, since their meaning contribution seems to be quite clear, and crosslinguistically extremely similar. However, as several recent papers have shown (Pratt and Francez (2001); von Stechow (2002); Sauerland (2002)), the interaction of localising temporal expressions with TENSE (and as we will see, ASPECT) can become quite fast quite complicated, and may involve far-reaching conclusions about the semantic contribution of TENSE.

The aim of this article is to address the semantics of localising temporal expressions in the framework of TGQs, and to propose a unified account for all localising temporal adverbials, based on simple intersection. At the same time, this paper constitutes an extended comment on Sauerland (2002), and proposes to keep the PRESENT tense meaningful.

The task of accounting for localising temporal expressions can be broken up into two subparts: i) take a reasonable account of TENSE and ASPECT, and find a semantics for localising temporal expressions that will account for the data; and ii) take a reasonable account of localising temporal expressions, and develop a semantics for TENSE and ASPECT that will account for the data. I will try to be as conservative as possible with respect to both the semantics of TENSE and ASPECT, and the semantics of localising temporal expressions, and unite the most simple, and well-established, existing accounts. Therefore, quite little will be new (with the notable exception of a formal account of what I call Schwager-Sauerland sentences).

Since localising temporal expressions provide a crucial test-case for the accuracy of accounts of TENSE and ASPECT, and vice-versa, I think that this is an appropriate strategy. I will implement the formalisation in a quite particular (although rather standard) version of event-semantics,¹ but I will try to clearly state the underlying intuitions, so that parts of the framework may be easily ported to (or refuted in) other frameworks.

¹Which follows closely von Stechow (2002).

This article is structured as follows: I will first present temporal localising expressions in opposition to measuring expressions, and point out reasons why localising expressions are interesting, after all. Then, I present several subclasses of localising temporal expressions. This is not done in any specific taxonomic aim; I rather wish to point out that it is not that obvious that localising temporal expressions form a semantically homogeneous class, and that they must be dealt with globally in the same way.

In a second section, I will present the theory of temporal generalised quantifiers, in a neo-Reichenbachian framework based on Klein (1994), and which corresponds quite closely to von Stechow (2002). However, I will stress the fact that ASPECT may pose some potential threats to such a theory, and that these problems further illustrate the advantage of TGQ-theory as exposed in Pratt and Francez (2001). The third section addresses problematic issues for TGQ-theory, and in this section the intersecting-theory of localising temporal expressions will be exposed and defended. The fourth section shows how this proposal can be extended to account for the issues pointed out in Sauerland (2002), without requiring the present tense to be semantically vacuous.

1.1 Measuring vs. Localising Eventualities

Traditionally, there has been a distinction between at least two different types of temporal modifiers: *measuring expressions* (like *for X time* or *in X time*), as opposed to *localising temporal expressions*.

Measuring expressions — as their name tells — measure the length of an eventuality, and do not situate it with respect to another point in time or eventuality. Furthermore, the compatibility with measuring expressions is traditionally used as a test in order to determine certain *Aktionsart*-properties of eventualities. For instance, *for X time* is compatible with atelic eventualities (cf. (1a)), and is inappropriate (or leads to coercion effects) with telic ones (cf. (1b)); *in X time* is felicitous with telic events (cf. (2a)), and inappropriate (or leads to coercion effects) with atelic ones (cf. (2b)).

- (1) a. John listened to the radio for an hour. [*listen to the radio*=atelic]
- b. ?*John listened to the radio in an hour.
- (2) a. John sold his car in an hour. [*sell one's car*=telic]
- b. ?*John sold his car for an hour.

Localising temporal expressions (like *yesterday* or *on octobre 12 1492 AD*) behave in a quite different way: they situate an eventuality with respect to another moment in time, and do not (at least in principle) have any impact with respect to the duration of the eventuality, nor with respect to its intrinsic properties.

- (3) a. Yesterday, John listened to the radio.
- b. Yesterday, John sold his car.
- c. Christopher Columbus discovered the New World on octobre 12 1492 AD.

(3a) and (3c) feature a telic eventuality, while the eventuality of (3b) is atelic. This does not affect, however, the acceptability of the sentences.

It is not quite clear for what — if anything — localising expressions may serve as diagnostics. We will see, however, that they pose some interesting problems.

1.2 Why study localising expressions?

According to Comrie (1985), TENSE is the grammaticalised expression of temporal localisation. Therefore, in principle, one can assume that TENSE works quite similarly to localising adverbials. Examples like (4a-b) seem to confirm such a position.

- (4) a. I bought a car. [eventuality in the past]

- b. Yesterday, I bought a car. [eventuality in the past, + . . .]

The PAST tense in (4a) localizes the eventuality before the moment of utterance. The effect of the localizing expression *yesterday* contributes the more precise meaning that the eventuality is not only located anterior to the moment of speech, but within the day preceding the moment of speech. Strictly speaking, since *yesterday* entails the meaning of the PAST, such that the latter is semantically superfluous, and does not contribute anything to the meaning of (4b). Yet, in languages like English, past tense is obligatory in such circumstances.²

Given Comrie’s definition, it is not too surprising that localising temporal adverbials have been argued to be the diachronic source for (at least) parts of the temporal flexion in some languages (for instance, in Greek or Sanskrit, cf. Meier-Brügger et al. (2002: pp. 168, 183)):

- (5) a - gacch - at [sanskrit ‘*imperfect*’ or ‘*anadyatanabhūte lañ*’]³
 a - go.PresStem - 3Sg
 ‘(s)he went/was going’

Meier-Brügger et al. (2002: p. 168) claim that the ‘*a*’-prefix — the so-called ‘augment’ — historically derives from a localising temporal expression ‘**h₁é*’ with the sense of *back then, at that time* (German ‘*damals*’). If this analysis is correct, localising temporal adverbials can be the diachronic source of (at least parts of) temporal morphology. And therefore, a better understanding of localising expressions may contribute to a better understanding of fully grammaticalised temporal localisation, i.e., of TENSE.

After this excursion into the history of language, let us go back to synchronic semantics, and to example (4b). As we have seen, in this case, the temporal adverbial rendered the tense-part redundant. TENSE however is not made redundant by localising temporal expressions in all cases.

Sometimes, the tense may indeed contribute to disambiguate the meaning of a localising temporal expression, as illustrated in (6):

- (6) a. John arrived on Monday. [i.e., first Monday before moment of speech]
 b. John will arrive on Monday. [i.e., first Monday after moment of speech]

Monday provides no unique and unambiguous characterisation for an interval. Even if we assume that *on Monday* refers to a contextually unique Monday (which might be established by a covert iota operator) in (6), we will not be able to narrow down sufficiently the reference of *Monday* in order to get a unique interval. Therefore, we need further information — coming here from TENSE — in order to know in which direction we need to search (i.e., past or future).

As we will see in sections 3 and 4, localising expressions do not all behave in exactly the same way (or, put differently: some are more problematic than others). Therefore, we will need a basic taxonomy of such expressions, which will be undertaken now.

1.3 Kinds of localising adverbials

All localising temporal expressions share the property of situating the temporal trace of an eventuality with respect to some other interval or moment in time. However, they may achieve this in several, quite distinct ways, and which may have an impact on their interaction with temporal or aspectual categories. Underlying the constation of such a diversity is the following question: can — and should we — assume that all these localising expressions work in the same way? The null hypothesis should be

²Actually, it is not entirely obligatory, since ‘historical’ uses of the present tense are possible in such contexts.

³Cf. Goldman and Sutherland Goldman (2004). The name ‘*imperfect*’ given in the western grammatical tradition to this tense clearly is a misnomer.

that a uniform treatment is to be preferred, and only if such a uniform treatment cannot be given, a differentiation should be attempted.

In what follows, I will point out three dichotomies in the domain of localising temporal adverbials — namely *punctual* vs. *duratives*, *deictic* vs. *anaphoric*, and *quantified* vs. *non-quantified* —, and show why and how these distinctions might be pertinent given our aim of establishing a theory of the interaction of tense and aspect with such expressions.

1.3.1 Punctual vs. durative

This first distinction concerns the duration of the interval denoted by the adverbial: some expressions denote a point in time (which, therefore, has a priori no duration, cf. *at midnight*, *at 8 o'clock*, etc.). Other expressions denote an interval, which has a certain extension in time (e.g., *in 1999*, *in the 21st century*, *tomorrow*, etc.)

This distinction is important because it is often assumed that ASPECT expresses a relation of inclusion with respect to some other interval (cf. *infra*), like the following:

- (7) [[perfective]] = the eventuality is properly included in interval X [this will be made more explicit in example (17b), on p. 7]

The crucial point is the following: what happens if the interval X is a point in time, and therefore, if X cannot properly include an eventuality? Empirically, one observes in such cases an inchoative shift (illustrated by the clearly perfective French *passé simple*):⁴

- (8) La Castafiore chanta à huit heures.
The Castafiore sang.Past.Perf at 8 hours.
'The Castafiore started to sing at 8 o'clock'

Interesting as this phenomenon may be, I will not address it any further in this paper.⁵ A successful account of (8) will probably involve some kind of coercion effect on lexical aspect.

1.3.2 Deictic vs. Anaphoric

Just as pronouns, temporal expressions may be calculated with respect to the deictic center, whereas others obtain their reference from elements in the context. The pronoun-like behaviour of localising temporal expressions is also something that TENSE may have inherited (as pointed out in the classic papers by Partee (1973, 1984)).

The denotation of expressions like (9a) can only be calculated with respect to the deictic center, whereas the denotation of expressions like (9b) must be resolved based on the anaphoric resolution of elements in the co(n)text.

- (9) a. today, tomorrow
b. that day, on the next day

Calendar expressions are often treated as a special case of anaphoric expressions.

As we will see later (in section 3, p. 14ff.), expressions like *today* give rise to problems, given an account that seems perfectly reasonable with quantified temporal adverbials. I will discuss below

⁴Generally, if aspect is of crucial importance, I will avoid English and its simple past — which has been argued to be perfective by Smith (1991) — and illustrate the facts in languages with a priori clearer aspectual facts.

⁵I am not aware of any comprehensive explanation of this fact in the literature.

whether it is reasonable to deal anaphoric and deictic localising expressions on a par with quantified expressions.

1.3.3 Quantified vs. non-quantified

The distinction between quantified (cf. (10a)) and non-quantified temporal adverbials (cf. (10b)), or more precisely, the problem caused by quantified localising expressions, has been largely neglected before the seminal paper by Pratt and Francez (2001).

The expressions in (10a) contain explicitly a quantifying element (*a, every, etc.*), whereas the expressions in (10b) do not.⁶ Among the quantified expressions, we find strong and weak, existential and universal quantifiers.

- (10) a. on a Monday, every Monday, on any Monday, etc.
b. today, yesterday, in 1945

Several difficulties in the interaction of localising expressions with TENSE and ASPECT are hidden away as long as one does not consider quantified temporal expressions, and more specifically, universally quantified temporal expressions. Given these difficulties, universally quantified expressions provide a good testing environment for any analysis claiming to address the problems of the interaction between localising temporal expressions and the tense-aspect system of a given language.

In the next section, we will be concerned almost exclusively with accounting for the interaction between TENSE, ASPECT and universally quantified localising expressions. Once having dealt in a satisfactory way with these, we will go back and consider deictic and anaphoric localising temporal expressions.

2 An analysis of quantified localising temporal adverbials

In this section, I will first introduce my basic assumptions concerning the formal semantics of TENSE and ASPECT, and then, in a second time, show how these interact with temporal generalised quantifiers. I will use for the first part the semantics introduced by Pancheva (2003), based by and large on Klein (1994) and Smith (1991), and for the second part, the theory of temporal generalised quantifiers as used by von Stechow (2002), based on Pratt and Francez (2001).

I will show that ASPECT confronts us with problems that have gone unnoticed so far, but that can be resolved in a system which is essentially identical to the one developed by von Stechow (2002).

2.1 Theoretical Background

In order to deal with the interaction between the categories of the tense-aspect and localising temporal adverbials, the assumptions about the denotations of tense and aspect need to be made explicit. In what follows, I will take as a base the system by Klein (1994), and as implemented formally by Pancheva (2003) — even though I do not think that this system is entirely correct (cf. Schaden (2007, 2009) for a discussion). For the moment, I will adopt this system as it is — eventually integrating other elements if they are necessary — and I will try to develop an account of localising temporal expressions based on these assumptions.

In Klein's system, the basic ingredients of tense and aspect are defined as follows:

- (11) a. tense: the relation between the moment of speech and an interval of assertion

⁶At least, they do not contain an overt quantifier. The semantic characterisation of elements in (10b) may involve quantifying elements.

- b. (grammatical) aspect: the relation between the interval of assertion and the temporal trace of the eventuality

Both relations are OBLIGATORY and UNIVERSAL, so the functional structure in any natural language looks like (12):

(12) [Tense [Aspect [Aktionsart]]]

The interval of assertion is the interval for which the speaker makes a claim with respect to a certain state of affairs. The basic idea is that the eventuality is not directly located with respect to the moment of utterance, but with respect to some intermediate point or interval (cf. also Reichenbach (1947/1966); Hornstein (1990)).

Klein gives the following examples in order to illustrate that point:

- (13) a. Ivan rabotal v Moskve.
I. work.Pst.Imp in Moscow.
b. Ivan rabotal, rabotaet i budet rabotat' v Moskve
I. work.Pst.Imp, work.Pres.Imp and AUX.Fut work.Imp in Moscow.

In some contexts, uttering (13a) may convey that Ivan does no longer work in Moscow. However, this is an implicature, as shows the possibility of continuing as in (13b). Therefore, Klein argues, PAST in (13a) cannot be taken to mean that the eventuality is located in the past. It can only mean that there is an interval in the past with respect to which the speaker commits that there is an eventuality such that Ivan works in Moscow. Klein's conclusion is the following: (13a) is not directly about the event, but rather about an interval in the past, at which certain eventuality-properties hold.

Now, what should be done with localising temporal adverbials under such an approach? It seems rather obvious that they should interact with the interval of assertion, and not be directly applied to the event, as analogous argumentation to (13b) can be constructed for temporal adverbials.

- (14) a. Yesterday, my son was extremely happy.
b. Yesterday, my son was extremely happy — like he always is.

(14a) does not mean that the speaker's son's happiness was restricted to the day preceding the utterance; it merely means that the speaker commits only for the duration of that day. The fact that continuations like the one in (14b) do not lead to contradiction is a point in case.

Therefore, a localising expression should be an adjunct at AspP, which will lead to the hierarchical structure as follows:

(15) [TENSE [*localising expression(s)*] [ASPECT [Aktionsart]]]]

Now, we are in position to start an analysis of the interaction of localising adverbials with TENSE and ASPECT.

2.2 The Interaction of TGQs with Tense and Aspect

2.2.1 The base system without localising adverbials

In our examples, we will at first only deal with past tense. I will assume the formalisation by Pancheva (2003), in which past simply denotes an anteriority relation with respect to the time of utterance.⁷

⁷We will need eventually to modify this very simple assumption.

- (16) $\llbracket \text{past} \rrbracket = \lambda P \exists i [i \prec n \wedge P(i)]$
 where i is the interval of assertion, and n ('now') the moment of utterance

Additionally, we will need a definition for perfective and imperfective aspect, also taken from Pancheva (2003).

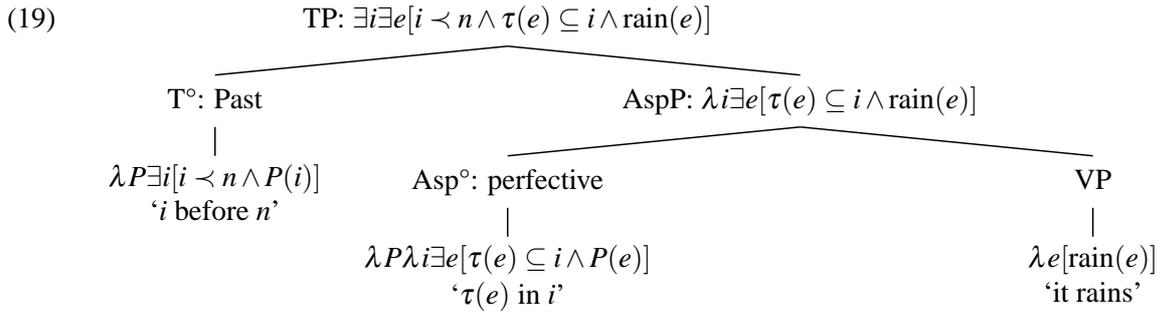
- (17) a. $\llbracket \text{imperfective} \rrbracket = \lambda P \lambda i \exists e [i \subseteq \tau(e) \wedge P(e)]^8$
 b. $\llbracket \text{perfective} \rrbracket = \lambda P \lambda i \exists e [\tau(e) \subseteq i \wedge P(e)]$
 where $\tau(e)$ is the temporal trace of the eventuality, and P a variable for an eventuality-predicate.

Perfective aspect encodes the relation that the temporal trace of the eventuality is included in the interval of assertion i , and that therefore, the eventuality is globally visible. Imperfective aspect tells us that the interval of assertion i is included in the temporal trace of the eventuality $\tau(e)$, and that therefore, there is only a partial assertion on the eventuality.

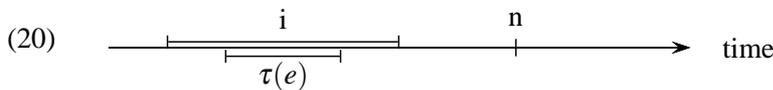
In order to show a complete derivation, we will take one of the simplest eventuality predicates available: *to rain*, which is a set of eventualities as defined in (18).

- (18) $\llbracket \text{it rain} \rrbracket = \lambda e [\text{rain}(e)]$

The derivation tree for PAST(PERFECTIVE(IT RAIN)) is then the one in (19):



The result of (19) can also be depicted graphically as in (20):

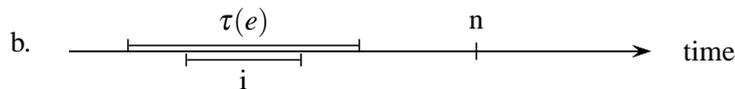


(20) shows the two main points of (19): i (the interval of assertion) is located before the moment of utterance n ; and second, the temporal trace $\tau(e)$ is located within i . Therefore, we have a global assertion with respect to the eventuality, and this means that the eventuality is asserted to be over at n .

If we had imperfective aspect, we would obtain the following configuration (by simply switching places between i et $\tau(e)$):

⁸Technically, (17a) is not sufficient, since it entails that there exists an eventuality of type P . The modal dimension is lacking. However, correcting this would needlessly complicate the calculus, so I will neglect this problem.

(21) a. $\exists i \exists e [i \prec n \wedge i \subseteq \tau(e) \wedge \text{rain}(e)]$



Here, the temporal trace $\tau(e)$ goes beyond the interval of assertion i , which means that there is no assertion with respect to the end of the eventuality at n . This is indeed what we need, as show the following examples from French:

- (22) a. Il y avait un bar au coin ... [imparfait \approx imperfective]
 It there was a bar at the corner ...
 ‘Back then, there was a bar at the corner ...’
 (i) ...et il y est toujours.
 ...and it there is still.
 (ii) ...mais il n’ existe plus.
 ...but it NEG exists anymore.
- b. Il y a eu un bar au coin ... [passé composé \approx perfective]
 it there has been a bar at the corner ...
 (i) #...et il y est toujours.
 ...and it there is still.
 (ii) ...mais il n’ existe plus.
 ...but it NEG exists anymore.

With an imperfective, one can continue either way, which shows that there is no assertion with respect to the end of the eventuality; with a perfective, a continuation stating the continuing existence of the bar leads to a contradiction.

2.2.2 Adding a localising temporal adverbial

According to the hierarchy in (15), the localising expression needs to apply at the level of AspP, which will lead to the hierarchy in (23b). For the examples, I will switch here to French, since English does not provide a clear-cut perfective tense.⁹

- (23) a. Un lundi, il a plu.
 A monday, it has rained.
 b. [past [*a lundi* [perfective [*it rain*]]]]

Following Pratt and Francez (2001) and von Stechow (2002), I assume that *a Monday* denotes a generalised temporal quantifier, as illustrated in (24).

⁹Smith (1991) claims that the simple past in English is perfective. However, there are some problems with this hypothesis; especially, when the simple past is applied to atelic eventualities, it does not conform to Smith’s criteria for the behaviour of a perfective tense-form.

$$(24) \quad \llbracket \text{un lundi} \rrbracket = \lambda Q \lambda i' \exists i [\text{Monday}(i) \wedge i \subseteq i' \wedge Q(i)]^{10}$$

The representation in (24) has two ingredients: first, the denotation of the noun *Monday* (cf. (25a)), and then, the quantificational part. In (25b), I have illustrated the quantificational part of a universal quantifier.

- (25) a. $\llbracket \text{lundi} \rrbracket = \lambda x. [\text{Monday}(x)]$
 b. $\llbracket \text{every}_{\text{temp}} \rrbracket = \lambda P \lambda Q \lambda i' \forall i. [P(i) \wedge i \subseteq i' \rightarrow Q(i)]$
 c. $\llbracket \text{every} \rrbracket = \lambda P \lambda Q \forall i. [P(i) \rightarrow Q(i)]$

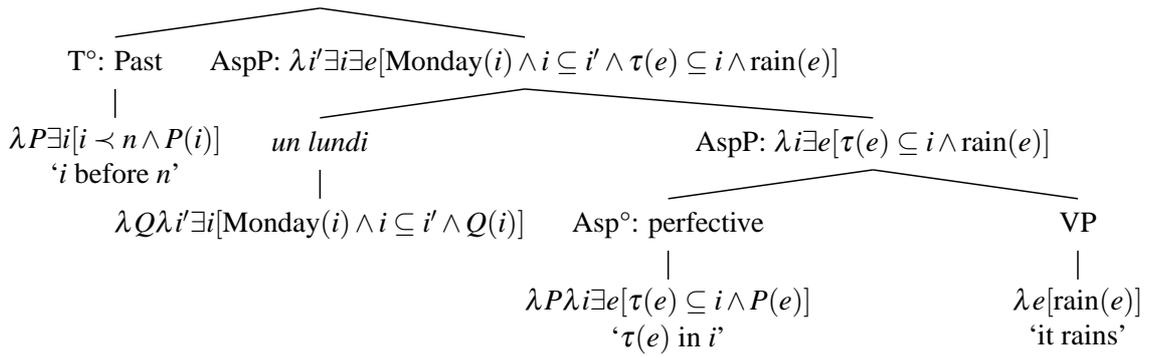
A generalised temporal quantifier (TGQ) like in (25b) is nearly the same as a standard generalised quantifier (cf. (25c)), with the exception that the former incorporates explicitly a domain restriction (on the temporal domain), which is left implicit — yet very often present — in the ‘normal’ version of the generalised quantifier.

(26) All students [of my class in 2010] passed the exam.

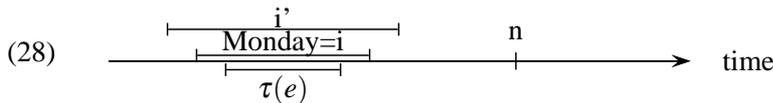
(26) could be uttered without the material in square brackets, however, this would normally not be taken to quantify over the students of the whole inhabited universe. Therefore, context (or tense) may act as an additional (possibly covert) restrictor of the quantifier. In TGQ, there is a compositional temporal restrictor, which will allow tense to restrict the domain suitably.

This is illustrated in (27):

$$(27) \quad \text{TP: } \exists i' \exists i \exists e [i' \prec n \wedge \text{Monday}(i) \wedge i \subseteq i' \wedge \tau(e) \subseteq i \wedge \text{rain}(e)]$$



The result of the derivation in (27) can be depicted graphically as in (28):



(28) represents essentially correct truth conditions for sentence (23a): PAST restricts the domain of *a Monday* such that it is some Monday before the moment of utterance, and the event falls somewhere into that day.

Whereas the TGQ seemingly resolves the interaction with tense in a quite clean way, there is a problem lurking when we turn to aspect. A satisfactory interaction with ASPECT has often been acknowledged as an essential criteria to judge an account of temporal adverbials (cf., e.g., Artstein (2005)), yet most often, when it comes to the analysis, little interest is taken in that interaction. At this point, we will see that aspect is most relevant, and quite problematic. This will bring us to a scope-paradoxon that has been noted by Pratt and Francez (2001) and von Stechow (2002), but from a different point of view.

2.3 The problematic interaction with aspect

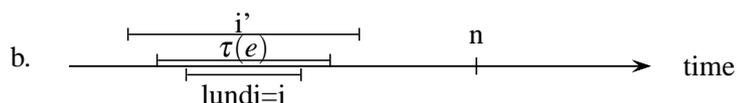
2.3.1 Facing a contradiction, and one way of getting out

A basic observation is that neither (29a) nor (29b) entail that it rained throughout the whole day of Monday. This is not a fact that would be restricted to English; French behaves in exactly the same way (cf. (30)), and this is possibly a fact about imperfective aspect more in general.¹¹

- (29) a. It rained on Monday. (30) a. Le lundi, il a plu.
 b. It was raining on Monday. b. Le lundi, il pleuvait.

We have seen that the correct truth conditions for (29a) and (30a) can be derived. Yet, the problem are our predictions for (29b) and (30b), the imperfective versions. According to our formulæ up to now, PAST(*le lundi*(IMPERFECTIVE(IT RAIN))) should have the truth conditions of (31), and therefore, we predict as truth conditions for such a sentence that it rained (at least) the whole day long.

- (31) a. $\exists i' \exists i \exists e [i' \prec n \wedge \text{Monday}(i) \wedge i \subseteq i' \wedge i \subseteq \tau(e) \wedge \text{rain}(e)]$



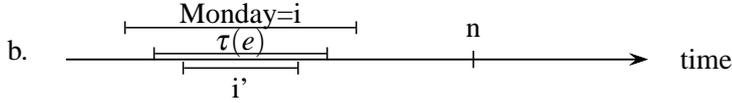
A quick and dirty solution to this problem would be to simply change the denotation of *le lundi* (‘the Monday’):

- (32) a. before: $\llbracket \text{le lundi} \rrbracket = \lambda Q \lambda i' \exists i [\text{Monday}(i) \wedge i \subseteq i' \wedge Q(i)]$
 b. after: $\llbracket \text{le lundi} \rrbracket = \lambda Q \lambda i' \exists i [\text{Monday}(i) \wedge i' \subseteq i \wedge Q(i)]$

First of all: what would change if we accepted (32b)? Instead of having “the monday is somewhere in the past”, we would switch to “there is a Monday such that the interval of assertion is in it”. We would thus obtain the truth condition of (33):

- (33) a. $\exists i' \exists i \exists e [i' \prec n \wedge \text{Monday}(i) \wedge i' \subseteq i \wedge i \subseteq \tau(e) \wedge \text{rain}(e)]$

¹¹I do not claim hereby that English progressives and French *imparfaits* are the same; I merely do not think that there are many tense-forms that can be characterised as imperfectives, and which would entail that it rained throughout the whole day.



Now, (33) would be compatible with a state of affairs where it rained all day long, but it does not entail that it rained all day long. Intuitively, these would be the correct truth conditions for a sentence like (30b). Should that sentence have a perfective tense, we would also obtain the correct truth conditions.

Yet, modifying the denotation of the temporal adverbial in this way is really a non-starter, because we run into serious trouble once we consider universally quantified temporal expressions.

2.3.2 Universal temporal quantification

The formula (32b) departs from the principle of a generalised temporal quantifier, which has been formulated as it is for a good reason: at least in some contexts, it is TENSE which has to give the restriction for the quantifier, and not the other way round.

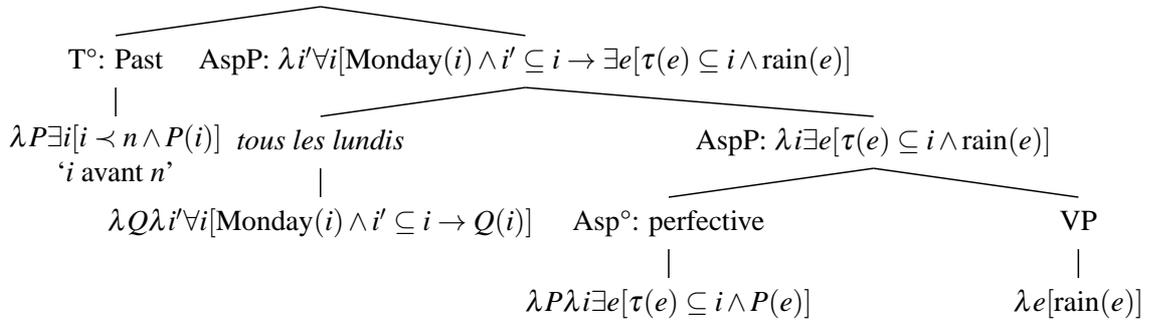
With existentially quantified expressions, this does not make any noticeable difference. Yet, it will become painfully clear once we look at cases of universal temporal quantification:

(34) Every Monday, it rained.

(35) $\llbracket \text{every Monday} \rrbracket = \lambda Q \lambda i' \forall i [\text{Monday}(i) \wedge i' \subseteq i \rightarrow Q(i)]$ ¹²

When included in a derivation, it turns out that (35) will lead to a contradiction:

(36) TP: $\exists i' [i' \prec n \wedge \forall i [\text{Monday}(i) \wedge i' \subseteq i \rightarrow \exists e [\tau(e) \subseteq i \wedge \text{rain}(e)]]]$



(36) could only be true iff there is an interval i in the past such that i is a subinterval of every Monday. This however, is impossible. Therefore, we predict sentences containing universally quantified temporal expressions to be inherently contradictory. This, of course, is not appropriate.

However, if one assumes that the denotation of *every Monday* is (37) rather than (35), one obtains intuitively correct truth conditions (as exemplified in (38)):

(37) $\llbracket \text{every Monday} \rrbracket = \lambda Q \lambda i' \forall i [\text{Monday}(i) \wedge i \subseteq i' \rightarrow Q(i)]$ ¹³

¹²(35) established in analogy with (32b).

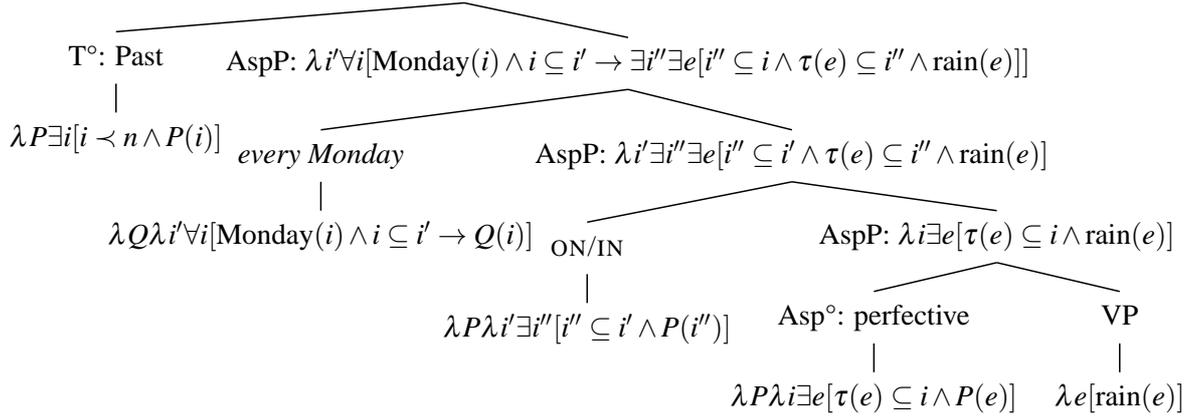
¹³(37) is a universally quantified version of (32a).

While (42) is certainly syntactically preferable, I will continue to use the simpler (41), since the only difference in function of the lifted (42) with respect to (41) is that (42) moves the TGQ past the preposition, in order to get back the scope relations we have in (40). So in a sense, (42) obscures the (semantic) fact that the semantic contribution of the preposition is below the TGQ, and not above (as its surface position might suggest).

2.4.2 Derivations in the modified system with prepositions

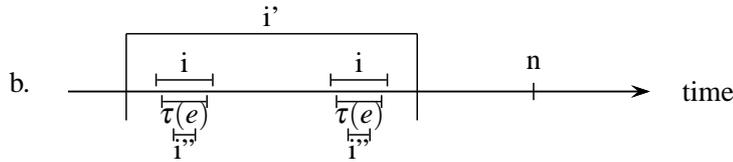
So here is now a derivation with the covert or overt preposition integrated:

$$(43) \quad \text{TP: } \exists i' [i' \prec n \wedge \forall i [\text{Monday}(i) \wedge i \subseteq i' \rightarrow \exists i'' \exists e [i'' \subseteq i \wedge \tau(e) \subseteq i'' \wedge \text{rain}(e)]]]]$$



(43) derives correct truth conditions for perfective sentences, but — and this is new — we also get correct truth conditions with imperfective sentences:

$$(44) \quad \text{a. } \exists i' [i' \prec n \wedge \forall i [\text{Monday}(i) \wedge i \subseteq i' \rightarrow \exists i'' \exists e [i'' \subseteq i \wedge \underline{\tau(e)} \wedge \text{rain}(e)]]]]$$



Intuitively, the temporal preposition introduces an additional interval within each element on which is quantified. This avoids the inference on the rain going on for the entire day. The preposition guarantees that the weather does not need to be too bad.

Let us sum up what we have seen so far. First, we can derive correct truth conditions, no matter what aspect there is, if we have temporal generalised quantifiers and — possibly covert — temporal prepositions. Second, the existence of TGQs is a progress, since it allows to treat interval-denoting nouns just like any other common noun — as a set of entities.

Finally, I would like to stress once again the intuitive idea behind the temporal generalised quantifier: tense gives us an explicit domain restriction on the TGQ; or put the other way: the localisation of the entities denoted by the TGQ is restricted by TENSE. And while this is exactly the right way of considering things with quantified temporal adverbials, this will cause us problems with a subtype of non-quantified localising expressions.

3 Towards new problems: Dowty-Bäuerle sentences and beyond

3.1 The problem: (seemingly) inverse scope

Up to now, TENSE always restricted the TGQ, and reversing the order led to a scope paradoxon. But this need not always be the case. Let us look now at the following set of sentences, called ‘Dowty-Bäuerle sentences’ by von Stechow (2002):

- (45) a. John arrived today.
 b. It rained this year.
 c. I will finish the article this week.

What makes these sentences problematic? First of all, the pattern is always the same: i) the localising temporal adverbial contains the moment of utterance; and ii) the tense-form is not a present. Under our preceding assumptions, TENSE will restrict the TGQ, which gives the following prediction for the truth conditions of sentences like (45):

- (46) a. [PAST [TODAY [ON/IN [PERFECTIVE [*it rain*]]]]]
 b. $\exists i' \exists i \exists i'' \exists e [i' \prec n \wedge \text{today}(i) \wedge i \subseteq i' \wedge i'' \subseteq i \wedge \tau(e) \subseteq i \wedge \text{rain}(e)]^{15}$

(46) would be true iff *today/this year/this month* were situated as a whole in the past (or the future). Now, by definition, those expressions need to overlap the moment of utterance. Thus, (46) is inherently contradictory.

But the scope-problem is not all that is wrong with (46). If one looks at the interaction of tense and the localising adverbial, one notices that the localisation of the temporal trace of the eventuality is determined solely by the temporal adverbial (whose localisation is then determined by TENSE — and this does not work). However, this basic assumption does not guarantee in the context of Dowty-Bäuerle sentences that the eventuality ends up in the past, since the only thing we would know is that it is within *today*. So, even the formula (46b) were not inherently contradictory, it would not produce the correct truth conditions.

Let us compare what the truth conditions of that sentence look like ((47a)), and what we predict (cf. (47b)):

- (47) a. $\exists i' \exists i \exists e [i' \prec n \wedge \text{today}(i) \wedge \underline{i \subseteq i' \wedge \tau(e) \subseteq i'} \wedge \text{rain}(e)]$ [\approx correct truth conditions]
 b. $\exists i' \exists i \exists i'' \exists e [i' \prec n \wedge \text{today}(i) \wedge \underline{i \subseteq i' \wedge i'' \subseteq i} \wedge \underline{\tau(e) \subseteq i} \wedge \text{rain}(e)]$ [wrong prediction=(46b)]

The problem is the following: precisely the construction that gave us wrong truth conditions with quantified localising expressions fails here: intuitively, for Dowty-Bäuerle sentences, TENSE must pick out a subinterval of the denotation of the localising temporal expression, and it must not be the other way round, like with quantified temporal adverbials.

Yet, this assessment is not entirely correct. Evidence comes from the fact that we may have universal quantification also in such circumstances:

¹⁵I treat here ‘*today*’ as a predicate, i.e., of type $\langle e, t \rangle$. This may not be correct, but I believe that this will not affect the general problem, under the assumption that localising temporal expressions behave in one, consistent way.

(48) Every Tuesday this month, I fasted.¹⁶

Should we just turn around the direction of the restrictor in the TGQ, we would have the same problem as above: sentences such as (48) (let us call these Schwager-Sauerland sentences¹⁷) would be predicted to be contradictory, since there would have to be a single interval in the past such that it is included in every Tuesday in this month. So, reversing the direction is not possible. What can be done about this?

3.2 The intersective hypothesis

There are several conceivable strategies in order to deal with quantified localising expressions, Dowty-Bäuerle and Schwager-Sauerland sentences. One might think that the problem stems from the fact that I assumed that something like *this month* behaves similarly to a generalised temporal quantifier. Now clearly, *this month* (and the other expressions giving rise to the problematic sentences) are rather deictic/anaphoric than quantified, and therefore, one simply might switch the polarity of the interval-inclusion in their restrictions, which would give rise to a position like the following:

- (49) a. $\llbracket \text{every Monday} \rrbracket = \lambda Q \lambda i' \forall i [\text{Monday}(i) \wedge \underline{i} \subseteq i' \rightarrow Q(i)]$
 b. $\llbracket \text{today} \rrbracket = \lambda P \lambda i' \exists i [\text{today}(i) \wedge \underline{i'} \subseteq i \wedge P(i')]$

The direction of the underlined element in (49b) does not seem to be problematic, given that there will never be a risk of seeing universal quantification on such items.¹⁸ This fact gives us some latitude in order to deal with possible scope problems.

This is a possible solution, but I take it to be preferable to find a more general way of accounting for the interaction of TENSE with localising temporal adverbials. I suggest that there is a quite natural and general way of accounting for this interaction, namely *intersection*.

The observation we had until now is the following: with quantified expressions, it was TENSE that chose a subinterval or a subset of intervals of the TGQ; in Dowty-Bäuerle sentences, we have the contrary. Yet, in any case, the observations is the same: the temporal trace of the eventuality is located in the intersection of the two (sets of) intervals denoted by TENSE and the localising temporal adverbial. Intuitively, the localisation of the eventuality has to fulfil both conditions: be in the, say, PAST, and be on a *Monday*, or within *today*. Logical *and* is of course easily captured by set intersection.

Therefore, I propose the following:

- (50) a. $\llbracket \text{every Monday} \rrbracket = \lambda Q \lambda i' \forall i [\text{Monday}(i) \wedge \underline{i \cap i'} \rightarrow Q(i \cap i')]$
 b. $\llbracket \text{today} \rrbracket = \lambda P \lambda i' \exists i [\text{today}(i) \wedge \underline{i \cap i'} \wedge P(i \cap i')]$

This will give us the correct truth conditions both for straightforward TGQ-cases, and for Dowty-Bäuerle sentences. Let us start first with a simple case of universally quantified past sentences:

- (51) a. Every Monday, it rained.
 b. $[\text{PAST} [\text{every Monday} [\text{ON/IN} [\text{perfective} [\text{it rain}]]]]]$
 c. $\exists i' [i' \prec n \wedge \forall i [\text{Monday}(i) \wedge i \cap i' \rightarrow \exists i'' \exists e [i'' \subseteq (i \cap i') \wedge \tau(e) \subseteq i'' \wedge \text{rain}(e)]]]$

¹⁶Example from Sauerland (2002).

¹⁷As far as I am aware of, sentences of this type have been first mentioned in Sauerland (2002), who attributes them to Magdalena Schwager.

¹⁸In the internet one finds sometimes quantified deictic expressions of this sort, yet, they lose in the process their deictic properties (both examples in (i) from the internet:

- (i) a. Every today was a tomorrow.
 b. II apprenait chaque aujourd'hui à trouver Dieu.
 he learned every today to find God

(51c) represents the correct truth conditions for (51a): for each Monday i such that it intersects with an interval in the past i' , there will be a subinterval i'' of this intersection such that an event of raining is properly included within i'' .

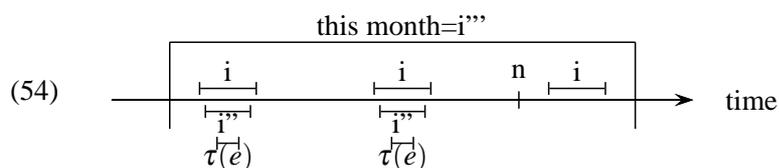
Similarly, one can deal easily in this way with Dowty-Bäuerle sentences:

- (52) a. Today, it rained.
 b. [PAST [*today* [ON/IN [*perfective* [it rain]]]]]
 c. $\exists i'[i' \prec n \wedge \exists i[\text{today}(i) \wedge i \cap i' \wedge \exists i''\exists e[i'' \subseteq (i \cap i') \wedge \tau(e) \subseteq i'' \wedge \text{rain}(e)]]]$

(52c) gives the correct truth conditions for (52a) as well. And, it can deal with Schwager-Sauerland sentences of type (48) as well.

- (53) a. Every Monday this month, it rained.
 b. [PAST [*this month* [*every Monday* [ON/IN [*perfective* [it rain]]]]]]
 c. $\exists i'[i' \prec n \wedge \exists i'''[\text{this.month}(i''') \wedge i''' \cap i' \wedge \forall i[\text{Monday}(i) \wedge i \cap (i''' \cap i') \rightarrow \exists i''\exists e[i'' \subseteq (i \cap (i''' \cap i')) \wedge \tau(e) \subseteq i'' \wedge \text{rain}(e)]]]]]$ ¹⁹

In order to make things easier, I will represent (53c) graphically:²⁰



So, it seems that we derive correct truth conditions for the problematic examples so far.²¹ However, I have not yet addressed the central point of the article of Sauerland (2002), claiming that sentences like (55) show that PRESENT tense is semantically vacuous:

- (55) Every Tuesday this month, I fast.

¹⁹Here is a partial derivation of (53c):

- (i) a. $\lambda i' \forall i[\text{Monday}(i) \wedge i \cap i' \rightarrow \exists i''\exists e[i'' \subseteq (i \cap i') \wedge \tau(e) \subseteq i'' \wedge \text{rain}(e)]]$ [= *every Monday on etc.*]
 b. $\lambda Q \lambda i''' \exists i''''[\text{this.month}(i''') \wedge i''' \cap i'''' \wedge Q(i'''' \cap i''')]$ [= *this month*]
 c. $\lambda i'''' \exists i''''[\text{this.month}(i''') \wedge i''' \cap i'''' \wedge \forall i[\text{Monday}(i) \wedge i \cap (i'''' \cap i''') \rightarrow \exists i''\exists e[i'' \subseteq (i \cap (i'''' \cap i''')) \wedge \tau(e) \subseteq i'' \wedge \text{rain}(e)]]]$
 d. $\lambda P \exists i'[i' \prec n \wedge P(i')] = \text{PAST}$
 e. $\exists i'[i' \prec n \wedge \exists i'''[\text{this.month}(i''') \wedge i''' \cap i' \wedge \forall i[\text{Monday}(i) \wedge i \cap (i''' \cap i') \rightarrow \exists i''\exists e[i'' \subseteq (i \cap (i''' \cap i')) \wedge \tau(e) \subseteq i'' \wedge \text{rain}(e)]]]]]$

²⁰As the alert reader will have noticed, the month under consideration contains only three Mondays, and can represent therefore only October 1582.

²¹Actually, there might be a slight problem with this representation, analogous to what we will see with example (59) in section 4, but I do not see how any reasonable account could not run into this problem.

Sauerland reasons as follows: he assumes a slightly different denotation of tense than I do here, based on Abusch (1997), cf. (56).²²

- (56) a. PRESENT(t): presupposes that t isn't before the time of utterance
 b. PAST(t): presupposes that t is before the time of utterance

Which t does tense apply to in sentences like (55)? Sauerland considers two options, namely *this month* and the intervals denoted by *every Tuesday*. First, one needs to note that the past tense is acceptable in such sentences:

- (57) Every Tuesday this month, I fasted.

Therefore, assuming that TENSE applied to *this month*, the semantics of PAST according to (57b) would predict that (57) is contradictory — which is not — and that in such sentences, the present tense is obligatory. Therefore, Sauerland concludes that PAST must apply to *every Tuesday*. This, however, provides a problem for the proposed semantics of the PRESENT, since in a sentence like (55), there may be intervals preceding the time of utterance.

So, either assumption leads to a contradiction, and Sauerland proposes to drop the assumption that the present tense comes with any kind of inherent meaning, and that it acquires meaning only by contrastive reasoning with other tense-forms.²³ While this position is certainly defensible (and has been argued for in papers like Jakobson (1932/1971)), I will try to show here that the argument from Schwager-Sauerland sentences is not conclusive evidence to the semantic voidness of the present tense.

Therefore, I will provide in section 4 an analysis of such sentences while assuming that present tense contributes to the truth-conditional meaning of the sentence.

4 Schwager-Sauerland sentences and the meaning of tense

(55) is also problematic on my account, although not for the reasons Sauerland invokes. I will assume the following semantics for PRESENT tense:

- (58) $\llbracket \text{present} \rrbracket = \lambda P \exists i' [n \subseteq i' \wedge P(i')]$

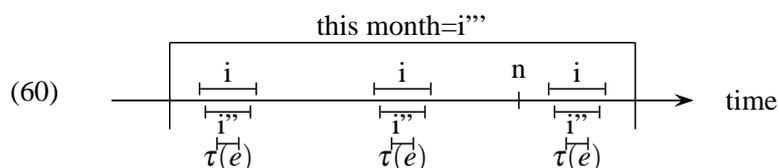
The truth conditions the intersective approach predicts for (59a) are given in (59c):

- (59) a. Every Monday this month, it rains.
 b. $[\text{PRESENT} [\textit{this month} [\textit{every Monday} [\text{PERFECTIVE} [\textit{it rain}]]]]]$
 c. $\exists i' [n \subseteq i' \wedge \exists i''' [\textit{this.month}(i''') \wedge i''' \cap i' \wedge \forall i [\text{Monday}(i) \wedge i \cap (i''' \cap i') \rightarrow \exists i'' \exists e [i'' \subseteq (i \cap (i''' \cap i')) \wedge \tau(e) \subseteq i'' \wedge \textit{rain}(e)]]]]]$

(59c) tells us that the eventuality of raining is located in a subinterval of the intersection of the intervals denoted respectively by i) present tense (that is, an interval that overlaps the moment of speech); ii) *every Monday*; and iii) *this month*. This may look perfectly reasonable at first glance, but actually, it might turn out not to be. Once again, this can be shown most easily with a graphical representation:

²²The question whether TENSE contributes a presupposition or not does not really matter for us here.

²³This conclusion embeds the features PAST vs. PRESENT within Sauerland's far more general theory of markedness, which needs not concern us here.



(60) should differ from (54) insofar as here, the Mondays that are not located in the past are also taken under consideration, and must exhibit an eventuality of *raining* within their boundaries. (59c) is compatible with such a situation, however, we cannot a priori guarantee that we will obtain the correct truth conditions.

Here is why: in (60), I have not specified the boundaries of the interval of assertion i' . The only thing we know about for sure is that i' overlaps n . However, we do not know how long will last i' . Assume now for the sake of the argument that we are a Friday morning, and that the speaker chooses i' to denote the interval lasting from $n-5$ minutes to $n+5$ minutes. Clearly, in such a case we have $n \subseteq i'$. But as all other intervals have to intersect this i' , there might now be a problem: assume that it never rained a single drop on any Monday in that month overlapping n . However, as i' does not overlap any Monday — and we just consider the intersection of all intervals here — the sentence would be nevertheless true. So, there is no guarantee whatsoever that (59c) could ever be false. Now, this is quite the opposite of Sauerland's conclusion about these kinds of sentences, but it is a serious problem. Let us check whether we can track down more precisely the problem.

4.1 Tense freely intersecting other intervals?

Before we consider if we might get away with the truth conditions as established above, let us briefly consider why things get wrong this way. The problem is that we allow TENSE to be one ingredient and to intersect autonomously on its own — that is: TENSE may contribute to restricting the temporal localisation of an eventuality *within* the denotation of a localising temporal expression. Without this property, we would not have the problem for sentences like (59). If *this month* gave the frame that could not be diminished by any ingredient, we would be save. However, without the property of TENSE picking out a subinterval of such localising expressions like *this month*, we would not be able to account for Dowty-Bäuerle sentences. In general, therefore, it does not seem to be possible to avoid the problem.

The other possibility would be to try to differentiate sub-types of localising expressions (quantified vs. non-quantified ones) in order to try and avoid the problem. This would not be a successful solution: whatever problem the intersective account has, a solution that can deal with Dowty-Bäuerle will face them for Schwager-Sauerland sentences as well. The reason is quite simple: if one can pick out with TENSE an arbitrary subinterval of expressions like *this month*, there is no way of assuring that this subinterval has some length rather than another.

Therefore, Sauerland's solution looks quite promising: PRESENT tense simply has no semantic contribution, and therefore, we will have no problem. However, this cannot be the solution, either, at least if we do not modify profoundly our assumption about TGQs and TENSE.

First of all, the TGQ introduces a λ -bound interval intersecting with the element quantified over. We would need to get rid of that interval; simple existential closure would not do the trick. This would

impose even less restrictions on the localisation of the interval of assertion. Pure existential closure does not even assure that it overlaps the moment of utterance.

Second, our problem is not limited to the present tense. In order to see this, consider (61):

(61) Every Monday last February, it rained.

I will give the argument only informally. We have got three ingredients that contribute under our assumptions to the temporal localisation: *every Monday*, *last February*, and PAST. The problem is once again PAST. It might happen that PAST is the smallest of the intervals, and that therefore, the sentence turns out to be true even if it did not rain at every Monday in that month.

So generally, it seems to be the case that if there are two localising expressions,²⁴ which additionally localise the eventuality with respect to the moment of utterance (like ‘*last February*’ in (61)), TENSE — be it PRESENT, PAST or FUTURE — does not seem to have any real impact on the temporal localisation.

One way of seeing the problem is that in such cases, TENSE is rather a case of purely morphosyntactic agreement, than of a semantically meaningful entity.

4.2 The meaning of tense

I have tried to give a unified account of the semantics of localising temporal expressions, given the theory of TGQs (cf. Pratt and Francez (2001); von Stechow (2002)) and certain assumptions about the semantics of the tense-aspect system of natural languages (cf. Klein (1994); Pancheva (2003)). Until now, the accommodations made concerned exclusively the semantics of the localising temporal expressions, and not the semantics of the tense-aspect system. At this point, it will be necessary to investigate the tense-aspect side of the problem, since we seem to be stuck with respect to the localising expressions.

Indeed, the semantics of TENSE — but also of ASPECT — I have used are extremely simplified, and cannot pretend to be appropriate formalisations of what TENSE in a natural language is about. And arguably, some of these simplifications do influence the results we get from our theory of the semantics of localising temporal expressions.

First of all, it has been long known that TENSE behaves with respect to some criteria like pronouns (cf. Partee (1973, 1984); Kratzer (1998)). So, the “*choice*” of a speaker with respect to the extent of the interval of assertion is not as free as I may have suggested in what preceded. More specifically, authors like Abusch (1997) assume that TENSE is actually presuppositional. Taken together, this may provide us part of a clue to what is going on with Schwager-Sauerland sentences.

The idea can be spelt out as follows: if there is some interval with the correct TENSE-properties, TENSE will be identified with that interval rather than float freely according to the parameters it encodes. Let us take (62) as example:

(62) Last Monday, it rained.

(62) contains a PAST-tense marked verb, and also a unequivocally past localising temporal expression, namely *last Monday*. The idea would be that the denotation of PAST in (62) is identified with the overt

²⁴Actually, the effect might obtain already with one localising expression, although it is impossible to show. Consider (i):

(i) Last February, it rained.

In (i), the raining-event needs to hold for an arbitrary subinterval of *last February*. Now, I assume a covert preposition, and this will make it undecidable whether TENSE intersects with the localising expression, and we get a subinterval of the month in this way, or whether the covert preposition is the only responsible.

temporal expression *qua* its anaphoric properties, and not in virtue of an inherent instruction contained by *last Monday*. Therefore, even if the instruction would be to intersect the denotation of TENSE with the denotation of the temporal localisers, the inconvenient effects of such a move would be neutralised here.

Let me give a second illustration with the Schwager-Sauerland sentences like (63):

- (63) a. This month, it rains on every Monday.
 b. [PRESENT_i [every Monday [this month_i [IN/ON [it rain]]]]]

We construct the intersection of the denotations of *every Monday* and *this month* just as we did before, however, PRESENT-tense will now not be allowed to intersect freely and autonomously, but will have to check for available compatible intervals in the context. The available interval is here *this month*, so the denotation of PRESENT will be identified to this interval. In this way, we obtain the correct truth conditions for a sentence like (63).

While the anaphoric or context-dependent nature of TENSE may be the clue to a solution to the problems the intersective account runs into, as it stands, it cannot resolve all the problems. We need notably to consider Dowty-Bäuerle sentences, where TENSE-features are in conflict with the properties of the interval denoted by the localising temporal expression. Reconsider (64):

- (64) a. This month, it rained.
 b. Every Monday this month, it rained.

Here, PAST cannot be simply identified with the interval denoted by *this month*, since parts of *this month* will always be present, or future. Therefore, straightforward binding cannot solve the problem posed by (64), and it seems that we are back at our problem of the beginning: we need a procedure that makes sure that the interval of assertion is big enough, and that a sentence like (64a) does not turn out to be false, simply by virtue of not containing the appropriate subinterval. Conversely, (64b) might also be trivially true, simply because the intersection does not contain any Monday.

These problems are due to a further problematic feature of our formalisation: the assumption that PAST simply means *some* interval before the moment of utterance. Intuitively, it is quite clear that in order to evaluate sentences like (64), the interval that should be taken into consideration is the *entire* space (or formulated differently: the maximal interval) such that it utterance. The question is how this maximality requirement can be is within *this month and* before the moment of derived.

I see basically two ways of doing this, one rather semantic — that is, encoding the maximality requirement directly in the forms —, another one rather pragmatic. It seems to me that it would be preferable to have a semantic (i.e., grammatical) mechanism to take care of it, although it might turn out that in certain circumstances, pragmatics will need to do additional work. I will spell out the semantic mechanism, and sketch a pragmatic procedure deriving the required maximality of the interval.²⁵

The semantic account might be called one of “partial binding”, making again use of the anaphoric nature of TENSE. Partial binding would integrate maximality into the grammatical mechanism underlying tense, and is a procedure that is quite similar (and probably identical) to bridging — a well-known phenomenon in the domain of the anaphoric properties of definite determiners.

According to this hypothesis, TENSE — by its anaphoric nature — requires to locate a suitable antecedent — in the simplest case, one that completely complies with the features encoded in TENSE (e.g., with PAST, an interval that lies entirely before the moment of utterance, as *last year* or *yesterday*). How-

²⁵It is out of the scope of this paper to try and figure out which approach would make more sense generally, equally regarding problems of sequence of tense and other phenomena. There is one simple prediction associated to both approaches: should the semantic approach be correct, it should apply without exception; should the pragmatic approach be more suitable, certain contexts should allow to override the maximality requirement.

ever, if the search for such an interval should fail, one would check whether there is a suitable subpart of an existing interval that complies with the restrictions provided by TENSE. In example (64), that would be the maximal subinterval of *this month* anterior to the moment of utterance.²⁶

According to the pragmatic hypothesis, maximality would emerge as a result of the speaker-hearer interaction (or: of a speaker-hearer game), which would be then up to some degree responsible for the extension and localisation of the interval of assertion. Maximality would in any case not be part of the grammatical encoding of TENSE.²⁷ The underlying reasoning goes roughly as follows: it is an illusion to think that the speaker may simply ‘choose’ the localisation of the interval of assertion; he is bound by an agreement with the hearer. Assume a case like (65a), with the (in principle insufficient) truth conditions of (53c), repeated in (65b):

- (65) a. This month, it rained on every Monday.
 b. $\exists i'[i' \prec n \wedge \exists i'''[\text{this.month}(i''') \wedge i''' \cap i' \wedge \forall i[\text{Monday}(i) \wedge i \cap (i''' \cap i') \rightarrow \exists i''\exists e[i'' \subseteq (i \cap (i''' \cap i')) \wedge \tau(e) \subseteq i'' \wedge \text{rain}(e)]]]]]$ [= (53c)]

Assume furthermore that the speaker has to defend the truth of (65a), and that the hearer tries to contradict him on this. So, it is in the interest of the hearer to choose the interval that offers the greatest chances of falsifying the claim, which is the maximal intersection of PAST, *every Monday* and *this month*, and to make the speaker provide evidence for a raining event on all Mondays in the past-period of the month. Therefore, we get maximality here as well.

Whereas the precise wording of the pragmatic procedure probably would need more working out, notice that maximality implicatures (or exhaustification) are often used in pragmatics (cf., e.g., Schulz and van Rooij (2006)), such that it is reasonable to assume that the maximality we need here might also be accounted for in an analogous way.

5 Conclusions

In this paper, I have proposed an intersective analysis of localising temporal expressions, building on TQG-analyses by Pratt and Francez (2001) and von Stechow (2002), while pointing out the additional difficulty of dealing with imperfective aspect in universally quantified sentences.

I have tried to work out a solution to the problem posed by the seeming opposite directions of restriction in Dowty-Bäuerle sentences with respect to sentences in which the localising expression is completely embedded in the interval denoted by TENSE, and where TENSE may provide no direct contribution to the temporal localisation at all. I have also shown that such an account of the nature of the interaction between tense, aspect and localising expressions may account for Schwager-Sauerland sentences, without the need to assume that the meaning of the PRESENT tense is necessarily vacuous.²⁸

²⁶This is what it makes similar to bridging anaphora, like the one in (i):

- (i) On the street, we saw a dead cat. The head was covered in dirt.

We do not have a straightforward antecedent for *the head*, but it is a subpart of an available antecedent, namely *a dead cat*.

²⁷Therefore, according to the pragmatic hypothesis, one would expect maximality to be cancelable under some circumstances, whereas it wouldn't be cancelable under the partial binding hypothesis. It should be therefore empirically testable which version is the right one.

²⁸The results are certainly compatible with the position that the present tense is semantically vacuous, but do not require it.

Acknowledgements

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