

---

TIMES AS DEGREES:  
FRÜH(ER) ‘EARLY(ER)’, SPÄT(ER) ‘LATE(R)’, AND PHASE ADVERBS

ARNIM VON STECHOW, TÜBINGEN

1. INTRODUCTION<sup>1</sup>

*Es ist schon spät,  
es ist schon kalt.  
Kommst nimmermehr  
aus diesem Wald!  
Lorelei*

There is a rich literature about the temporal conjunctions *before/after*, but at the time I gave the talk that underlies this paper I was not aware of any analysis of the temporal comparatives *früher/später* ‘earlier/later’, which may be used to express similar states of affairs, but are constructed differently.<sup>2</sup> Recently I got acquainted with the del Prete’s thesis about It. *prima/dopo*, which analyses *prima* as a comparative and *dopo* as a preposition.<sup>3</sup> This is the only paper known to me that goes into the same direction as the following proposal. Del Prete’s analysis is very different from mine and I must leave the discussion of his theory to another occasion.

The semantics of *before/after* is notoriously controversial and the semantics of the related adjectives is therefore interesting in itself. A study of the adjectives gains additional interest from the fact that they are entirely differently constructed: they are degree adjectives and have a comparative, an equative and a positive variant. I will study each of them.

I will devote particular attention to the positive forms of the adjectives because I have a novel proposal for a positive operator that solves a long standing puzzle in the semantics of degree adjectives, namely the question of how we can give a uniform treatment of the positive form of both poles of antonym pairs such as *tall/short*.

The semantics of my positive operator will shed new light on the analysis of the notoriously difficult phase particles *schon* ‘already’ and *noch/erst* ‘still’/‘only’. I will state their presuppositions in terms of ‘early’ and ‘late’. If I were not concerned with these particles, I could have dealt with English alone in this paper. By and large the relevant facts seem to be the same for English and German. But since my proposal for the analysis of *schon/erst* is different from a recent proposal due to (Condoravdi, 2003), I felt safer with the German examples.

As I said, the comparative variants ‘earlier’/‘later’ are particularly intriguing because they are temporal comparatives, and time is a dimension that has not been studied in the semantics of degree. Times play a double and perhaps confusing role in the semantics of ‘early/late’. They denote the temporal position of an event and they play the role of degrees of earliness/lateness. The classification of the two adjectives as degree adjectives will give us some interesting insights into the conceptual structure of scales, I believe.

---

<sup>1</sup> Previous versions of this article were presented in Stuttgart on December 3, 2005, Saarbrücken on December 16, 2005, and in Frankfurt on June 1<sup>st</sup>, 2006. I want to thank the audiences for helpful comments. Particular thanks are devoted to Doris Penka, who gave me essential insights and corrected a number of flaws.

<sup>2</sup> See (Beaver and Condoravdi, 2003) and the references given there.

<sup>3</sup> (Del Prete, 2005)

Here are some data that illustrate that *früher/später* exhibit the relevant properties of comparative adjectives. The first two examples show that the adjectives have comparative complements.

- (1-1) Alla kam früher/später zur Arbeit als Olga (kam).  
Alla came earlier/later to work than Olga (came).
- (1-2) Alla kam früher/später als wir dachten.  
Alla came earlier/later than we thought.

As we expect, NPIs are licensed in the complement of both *früher* and *später* (as opposed to the complement of *after*).

- (1-3) Alla kam früher/später zur Arbeit als **jemals** zuvor.  
Alla came earlier/later to work than **ever** before.
- (1-4) Alla kam früher/später als **auch nur** irgendjemand von uns gedacht hätte.  
Alla went earlier/later than **anyone** of us would have thought.
- (1-5) Alla gab ihre Arbeit früher/?später ab, als sie sie abzugeben **brauchte**.  
Alla delivered her thesis earlier/?later than she **needed** to deliver it.

There is an important semantic relation between *früh/spät* and the phase adverbs *schon/noch* ‘already/still’:

- (1-6) a. Es ist schon spät  
it is already late  
b. \*Es ist schon früh  
it is already early  
c. Es ist noch früh  
it is still early

The former is fine, the latter is not acceptable. Why is that so? Call this the *Type-1 Puzzle*.<sup>4</sup> The same observation holds for the NPI *mehr*:

- (1-7) a. Es ist nicht mehr früh  
it is no more early  
b. \*Es ist nicht mehr spät  
it is no more late

The contrast should follow from the lexical meanings of the adjectives and the particle. A related puzzle arises with the phase adverbs *erst/schon* ‘only/already’:

- (1-8) a. Alla kam erst um 6 Uhr. (late!)  
Alla arrived only at 6.  
b. Es ist erst 6 Uhr. (early!)  
It’s only 6 o’ clock.
- (1-9) a. Alla kam schon um 6 Uhr. (early!)  
Alla arrived already at 6.  
b. Es war schon 6 Uhr. (late!)  
it was already 6

How is it possible, that the implicatures systematically change in these cases? I will call this phenomenon the *Type-2 Puzzle*. This puzzle, too, has to do with the semantics of *früh/spät* and the meaning of the particles.

<sup>4</sup> The terms Type-1, Type-2,... are introduced in section 9.

The structure of the paper is this. 1. I start with the syntax/semantics of degree adjectives; I am assuming Heim's negation theory of antonymy and introduce overt degree phrases.<sup>5</sup> Antonyms are related by internal negation. Each adjective contains a background variable  $S$  that contextually determines that part of its scale with respect to which the adjective is evaluated. 2. I then introduce a positive operator  $Pos$  that gives a unified semantics for polar opposites.  $Pos$  makes essential use of a contextually given function  $N$  that assigns each adjective  $A$  and its background  $S$  the  $A$ -neutral domain of  $N(S)$ .  $Pos$  is a universal quantifier that is restricted by  $N(S)$ . 3. The next step is to introduce tense into degree constructions. 4. We are now prepared to address the semantics of the temporal adjectives *früh* 'early' and *spät* 'late'. The idea for their analysis is that time plays a double role: as subject of a temporal adjective, a time denotes a position on the time axis, as the object of the adjective the time denotes a temporal degree, the measure for earliness/lateness. 5. The next step will be to introduce the comparative and the equative. The usual analyses are transferred in a straightforward way to the temporal adjectives. The only non-trivial step is to account for the adverbial use of 'early'/'late'. I will have to introduce the perfective operator. 6. I will then describe the presuppositions of the Type-1 particles *schon/noch* 'already'/'still' in a way that solves the Type-1 Puzzle. 7. I will next state the presuppositions for the Type-3 particles *schon/erst* 'already'/'only' in a way that is superior to some scalar analyses. 8. Finally, I will take up the Type-2 Puzzle. To solve it, I will have to analyse *schon/erst* as epistemic modal operators. I will say something about how my analysis is related to other proposals in the literature, notably Löbner's, Krifka's and Condoravdi's.<sup>6</sup>

## 2. 'NORMAL' DEGREE ADJECTIVES

In this section I will recapitulate Heim's version of the semantics of degree adjectives.<sup>7</sup> The basic idea for the semantics of adjectives is taken from (Cresswell, 1976). An adjective like *tall* determines a *scale*  $\Sigma_{\text{tall}}$  of degrees that are measured in meters in a vertical direction. The degrees themselves are abstract objects, say equivalence classes of possible things that have the same height. So  $\Sigma_{\text{tall}}$  is more accurately a structure  $\langle S_{\text{tall}}, m, < \rangle$ , where  $D_{\text{tall}}$  is a set of degrees that are linearly ordered by  $<$  and whose distance is measured by the unit  $m$  (meter). I will assume that  $D_{\text{tall}}$  has a smallest element called 0 and has no upper bound, i.e. it contains arbitrarily high degrees. A further assumption is that the carrier set of a scale is dense, i.e., if  $d$  and  $d'$  are in a scale  $D_{\text{tall}}$  and  $d > d'$ , then there is a  $d''$  in  $D_{\text{tall}}$  such that  $d > d''$  and  $d'' > d'$ .<sup>8</sup>

When used in language, scales are restricted: the scale for classifying dwarfs as *tall* or *short* is much shorter than the scale that provides the background for measuring skyscrapers. So an adjective is relativized to a subset  $\Sigma$  of its scale  $D_A$ . For degree adjectives such as *tall*, this will always be an initial part of  $D_A$ .

The meaning of an adjective  $A$  is based on a measure function  $f_A$  that assigns each individual a degree on its scale  $S_A$ . Let us assume the type  $d$  for degrees together with the usual types  $e$  (individuals),  $i$  (times),  $v$  (events),  $s$  (worlds),  $t$  (truth-values). A measure function is therefore of semantic type  $ed$ . Typical measure functions are these:

<sup>5</sup> (Heim, 2004)

<sup>6</sup> (Löbner, 1999), (Krifka, 2000), (Condoravdi, 2003).

<sup>7</sup> (Heim, 2004)

<sup>8</sup> (Fox and Hackl, 2005) call the assumption "Universal Density of Measurement".

## (2-1) Measure functions

$$\text{HEIGHT} = \lambda x \in D_e. x\text{'s height}$$

$$\text{INTELLIGENCE} = \lambda x \in D_e. x\text{'s intelligence}$$

$$\text{WEIGHT} = \lambda x \in D_e. x\text{'s weight}$$

Measure functions assign unique degrees to individuals.  $\text{HEIGHT}(x)$  is the maximal degree to which  $x$  is tall and so on for different measure functions. Since the height of a person varies with time and world, the functions also depend on time and world. We will add these parameters when we need them.

For (Cresswell, 1976), an adjective  $A$  relates an individual  $x$  to the unique degree  $d$  it occupies on the scale  $D_A$ , i.e., there is precisely one  $d$  such that  $A$  holds of the pair  $(x,d)$ . Heim builds a monotonicity condition into the meaning of  $A$ : when an adjective  $A$  is true of the pair  $(x,d)$ , then it is true also of every  $(x,d')$  where  $d' < d$ . If we take into account everything we have said so far, the meaning of degree adjectives can be described in the following way.

## (2-2) Degree adjectives

$$\llbracket \text{talls} \rrbracket^g = \lambda d: d \in g(S) \ \& \ g(S) \subseteq S_{\text{tall}}. \lambda x \in D_e. \text{HEIGHT}(x) \geq d$$

$S$  is a variable ranging over sets of degrees of tallness. It gives us the relevant contextually determined scale that is used for a particular occurrence of the adjective. The variable assignment  $g$  plays the role of the context. In the following discussion I will usually omit the variable assignment, but it should be there.

Following (Heim, 2004), antonym pairs such as *tall/small* are related via internal negation.<sup>9</sup>

## (2-3) Adjective Negation (internal negation)

$$\llbracket \neg_{(\text{det})(\text{det})} \rrbracket = \lambda R_{\text{det}} \lambda d. \lambda x. \neg R(d)(x)$$

This is a sloppy definition. We will have to make sure that the presupposition of an adjective, i.e., the information about the contextually given scale  $\Sigma$ , is preserved under negation. We may define the negative pole by means of the positive pole plus negation, or we may do it the other way round. So the antonyms of the adjectives considered so far are defined in the following way:

- (2-4) a. **short** :=  $\neg$  **tall**  
 b. **stupid** :=  $\neg$  **intelligent**

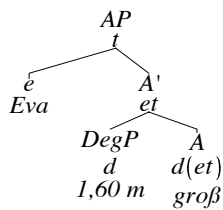
Degrees of adjectives can sometimes be made explicit by overt degree phrases as in the following example.

- (2-5) Eva ist 1,60 m groß.  
 Eva is 1.60 m tall.

The most straightforward LF is the following:

- (2-6) LF without tense

<sup>9</sup> A related, but only axiomatic, proposal has been made in (von Stechow, 1984b).



HEIGHT(Eva)  $\geq$  1,60 m

Note that this LF contains no positive operator although the morphology of the adjective is positive. The semantics predicts the following two implications, which seems correct.

- (2-7) a. Eva is not 1,60 m tall  $\implies$  Eva is smaller than 1,60 m.  
 b. Eva is 1,60 m tall  $\implies$  Eva is 1,56 m tall

What does not follow immediately is cross-polar anomaly (cf. (Kennedy, 2001)). Why is the following deviant?

- (2-8) #Eva is 1,56 m short.  
 HEIGHT(Eva) < 1,56 m

(von Stechow, 1984b) says that degree phrases play a double role: they name the top of an interval and measure the length of the interval. Negative poles don't have a length because they are unbounded at one side.<sup>10</sup> Therefore measure phrases only combine with positive poles.

- (2-9)  
 [.....Eva 1,56 m tall.....](.....Eva 1,56 m short.....)  
 |+++++++1,56----->  $\infty$

The explanation is perhaps not entirely convincing because in a particular context we consider only intervals of finite length say up to 2.50 meters. Then the interval '1,56-short' would be (1.56, 2.50] and closed at the right side. Still it is an open interval at the left side. If we assume that intervals of degrees are dense, the interval doesn't have a smallest element and its length cannot be measured. In order to account for cross-polar anomaly, we therefore type-lift degree phrases and stipulate that they are only defined for closed intervals.

- (2-10) Measure phrases are of type (dt)t.  
 $\llbracket 1,56\text{ m} \rrbracket = \lambda D_{dt}: D \text{ is a dense closed interval. } 1,56\text{ m} \in D.$

This makes (2-8) undefined. For a related account, see (Kennedy, 2001). For different proposals, see (Klein, 1980), (Bierwisch, 1987), (Schwarzschild, 2004) among others.

### 3. A NEW POSITIVE OPERATOR

The positive operator I will propose is based on the assumption that a degree scale  $S$  like that for *tall* is divided into three parts, a part that contains the short things, a part that contains the tall things, and a neutral part  $N(S)$  that contains the things that are neither short nor tall.

- (3-1)  $S \quad |-----[-----]-----\rightarrow|$

<sup>10</sup> For a more elaborated account of this idea, see (Meier, 2003).

short    Neutral    tall

The Positive Operator can be defined as the following universal quantifier:

(3-2) The Positive Operator

$$\llbracket \mathbf{Pos}_{N,S} \rrbracket^g = \lambda A_{dt}. (\forall d \in N(S)) A(d)$$

The operator depends on two parameters, the contextually relevant initial segment of the tallness scale and a function  $N$  that gives the neutral segment of the scale. In other words, the Pos-operator is a universal quantifier over degrees that is restricted by the neutral degrees of the contextually relevant scale.

To see the effect of the operator, consider the analyses of some relevant examples.

(3-3) Ede is tall.

$$\llbracket \mathbf{Pos}_{N,S} \lambda d. tall_S(d)(Ede) \rrbracket \text{ iff } (\forall d \in N(S)) HEIGHT(Ede) \geq d$$

|-----[-----E-----]----->|

In the picture, “E” stands for the height of Ede.

(3-4) Ede is not tall.

$$\llbracket \neg \mathbf{Pos}_{N,S} \lambda d. tall_S(d)(Ede) \rrbracket \text{ iff } \neg (\forall d \in N(S)) HEIGHT(Ede) \geq d$$

|-----[-----E-----]----->|

or

|----E--[-----]----->|

The syntactic negation always has wide scope with respect to *Pos*. A negation that has narrow scope with respect to *Pos* is morphologically realised as the negative pole of the antonym pair. I leave it to the reader to draw diagrams for the examples involving the adjective *short*.

(3-5) Ede is short.

$$\llbracket \mathbf{Pos}_{N,S} \lambda d. short_S(d)(Ede) \rrbracket \text{ iff } (\forall d \in N(S)) HEIGHT(Ede) < d$$

(3-6) Ede is not short.

$$\llbracket \neg \mathbf{Pos}_{N,S} \lambda d. short_S(d)(Ede) \rrbracket \text{ iff } \neg (\forall d \in N(S)) HEIGHT(Ede) < d$$

And, of course, we can express the idea that Ede’s height is in the neutral area of the scale.

(3-7) Ede is neither short nor tall:

$$\llbracket \neg \mathbf{Pos}_{N,S} \lambda d. short_S(d)(Ede) \ \& \ \neg \mathbf{Pos}_{N,S} \lambda d. tall_S(d)(Ede) \rrbracket$$

$$\text{ iff } \neg (\forall d \in N(S)) HEIGHT(Ede) < d \ \& \ \neg (\forall d \in N(S)) HEIGHT(Ede) \geq d$$

The positive operator gives a unified semantics for the positive and the negative pole of an antonym pair. As far as I know this had not yet been accomplished so far. The point certainly deserves a more detailed discussion.<sup>11</sup>

---

<sup>11</sup> Earlier approaches to the positive can be characterised as follows.

1. The positive is the basic notion. The comparative is derived from the positive via universal quantification over contextually given delineations ((Lewis, 1972), (Kamp, 1975), (Klein, 1980)). A delineation  $s^+_c$  for ‘tall’ separates the tall objects from the non-tall objects. We can define  $tall(c)$  as the set of objects that are at least  $s^+_c$ -tall. Obviously, we need a different delineation  $s^-_c$  for the polar opposition ‘short’. Given the two delineations, the equative and the comparative can be defined as appropriate quantifications over contexts. For example, the equative would be this:

Monika Rathert asked me how *sehr* ‘very’ is treated in this approach. The ‘very’ interval must be a superinterval of the neutral interval of  $N(S)$  that symmetrically includes both bounds or  $N(S)$ . The very-operation can be iterated. *very* stands in complementary distribution with the POS-operator.

(3-8) **very**<sub>N,S</sub>  $\lambda d$ .short<sub>s</sub>(**d**)(Eva)

The following lexical entry states the meaning of **very**:

(3-9)  $\llbracket \mathbf{very}_{N,S} \rrbracket = \lambda D_{dt:c}$  specifies an Interval I that symmetrically includes  $N(S)$  and is considerably bigger than  $N(S)$ . ( $\forall d \in I$ ) $D(d)$ .

The reader may check for himself that this semantics gives the correct readings for *not very short*, *not very tall* and *neither very short nor very tall* as well. The fact that we can express the meaning of **very** so easily supports the present approach to the positive.

#### 4. INTRODUCING TENSE

I will assume a referential theory of tense; cf. (Heim, 1994), (Kratzer, 1998), but the choice is not really important. Most other theories of tense that are on the market would do as well.

(4-1)  $\llbracket \mathbf{Pres} \rrbracket^c = t_c$  (the speech time)  
 $\llbracket \mathbf{Past} \rrbracket^c = \lambda t:t < \text{now}.t$

In other words,  $\llbracket \mathbf{Past}_i \rrbracket^{cg}$  is only defined, if  $g(i) < \text{now}$ ; if defined,  $\llbracket \mathbf{Past}_i \rrbracket^{cg} = g(i)$ ; cf. (Heim, 1994). Here is a tensed LF for a very simple sentence:

---

Ede is as tall/short as Mary:  
 Every  $c$ :  $\text{Mary} \in \text{tall/short}(c) \rightarrow \text{Ede} \in \text{tall/short}(c)$

A theory of this kind is possible, but it requires “monstrous” quantification over contexts and is conceptually complicated. The concept monster is understood in the sense of (Kaplan, 1979).

2. The positive and the comparative apply to the AP and are in complementary distribution: (Cresswell, 1976), (von Stechow, 1984b), (Bierwisch, 1987). (Kennedy, 2001), among others. The approaches assume a unique standard  $s_c$ , which is in the centre of the interval that separates the negative from the positive pole. The positive and the ‘negative’ are defined with respect to  $s_c$ . The definitions of the Positive operator in (von Stechow, 1984a)/ (Kennedy, 2001) are something like this:

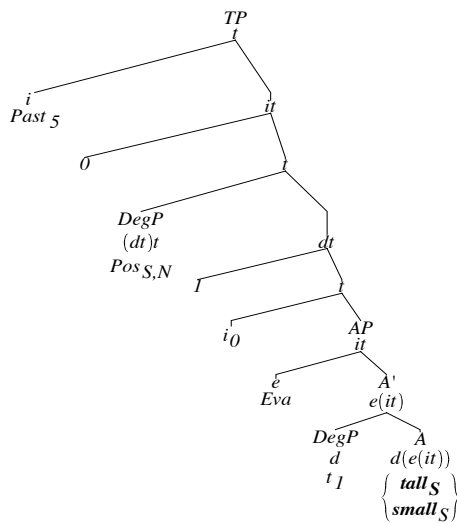
$\exists d[\text{Ede is } d\text{-tall \& } d \text{ considerably } > s_c]$

For the negative pole we need the converse scale:

$\exists d[\text{Ede is } d\text{-short \& } d \text{ considerably } < s_c]$   
 $d_c$  a contextually given standard

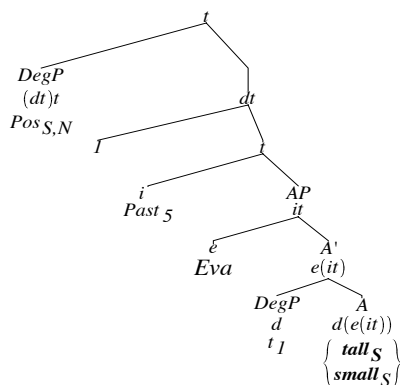
All these approaches must therefore have access to an ordering relation  $>$  and its converse  $<$ . The degree semantics given here doesn’t have access to either of these relations for compositionality. Our operator fits the architecture of the semantics of antonyms very naturally. The new theory is simple.

(4-2) Eva was small.



At s-structure, the sentence has a copula, which is semantically empty. Therefore it must be deleted at LF by Chomsky's Principle of Full Interpretation (FI).<sup>12</sup> The positive operator has to be QR-ed for type reasons. In order to make the AP-type simple, we have added a provisional time variable  $t_0$ , which is abstracted away when the sentence applies to the semantic tense, which is located in SpecTP. Since  $Past_5$  is of type  $i$ , we can reconstruct it to the position of the variable  $i_0$  and obtain the following transparent LF:

(4-3)



$$(\forall d \in N(S)) \text{HEIGHT}_{\text{past}}(\text{Eva}) \geq d.$$

The LF presupposes the tensed version of degree adjectives, which is this:

(4-4) Tensed degree adjectives, type  $d(e(it))$

<sup>12</sup>(Chomsky, 1986)

$[[\mathbf{tall}_S]] = \lambda d: d \in S \ \& \ S \subseteq S_{tall}. \lambda x \in D_e. \lambda i \in D_i. HEIGHT_i(x) \geq d$   
 $[[\mathbf{short}_S]] = \lambda d: d \in S \ \& \ S \subseteq S_{tall}. \lambda x \in D_e. \lambda i \in D_i. HEIGHT_i(x) < d$   
 $HEIGHT_t(x) = \text{the height of } x \text{ at time } t$

We are now prepared to introduce the temporal adjectives *früh* ‘early’ and *spät* ‘late’.

## 5. FRÜH ‘EARLY’/SPÄT ‘LATE’

Let us transfer the semantics of degrees to the temporal adjectives *spät/früh* ‘late/early’. The analytic idea is that *spät* ‘late’ is the positive and *früh* ‘early’ is the negative pole. This is obvious from the fact that German temporal questions use the adjective ‘late’ and not ‘early’:

- (5-1) a. Wie spät ist es?  
 how late is it  
 ‘What is the time?’  
 b. #Wie früh ist es?  
 how early is it

Times play a double role: since they are ordered, they may play the role of a temporal degree:  $t > t'$  if  $t$  is later than  $t'$ . On the other hand, qua location on the time axis, a time may also play the role of the subject of the adjective. So, what does “late” mean?

Suppose this adjective did relate an event  $e$  to the degrees with respect to which  $e$  is late. The relevant degrees are obviously the time points in an interval  $I$  given by the context. In analogy to a degree adjective like “tall”, the lexical entry for ‘late’ would be expected to be the following:

(5-2)  $[[\mathbf{spät}_I]] = \lambda d \in I \subseteq T. \lambda e \in D_v. \lambda t \in T. TIME(e)(t) \geq d.$  (first attempt)

$TIME$  is a measure function that assigns each event  $e$  its temporal degree. What is that? It could be the duration of  $e$ . But this would not be correct. If we say of two events  $e_1$  and  $e_2$  that  $e_2$  is later than  $e_1$  we don’t mean that  $e_2$  has a longer duration than  $e_1$ . We rather mean that  $e_2$  occurs at a later time than  $e_1$ . We obtain this result if we say that the running time of  $e_2$  is after the running time of  $e_1$ . The standard notation for the running time of an event  $e$  is  $\tau(e)$ .<sup>13</sup> Therefore, we can rewrite the rule in the following way:

(5-3)  $[[\mathbf{spät}_I]] = \lambda d \in I \subseteq T. \lambda e \in D_v. \lambda t \in T. \tau(e)(t) \geq d.$  ( $TIME = \tau$ )

Since the running time of  $e$  is the same for each time, we can omit the time argument of the  $\tau$ -function. Recall further that degrees of lateness are times. Therefore we can replace the degree argument by a time argument and rewrite the rule in a simpler way as:

(5-4)  $[[\mathbf{spät}_I]] = \lambda t \in I \subseteq T. \lambda e \in D_v. \tau(e) \geq t.$  (simplification)

A problem with this rule is that it is not clear how to hook up the event time to the reference time, which is given by the tense of the sentence. We are assuming a framework in which an aspectual operator like Perfective (PF) maps the event time into a reference time (see below). In other words, the temporal localisation of the event is not performed by the adjective ‘late’ but by an aspectual operator. But then ‘late’ can simply denote a two-place relation that applies to the reference time and its temporal degrees of lateness. Hence our entry for the adjective ‘late’ is the following.

<sup>13</sup> Cf. (Krifka, 1989) among many others.

- (5-5) ‘late’ :type i(it) (official rule)  
 $[[\text{spät}_t]] = \lambda t' \in I \subseteq T. \lambda t \in I. t \geq t'$ .

The first time argument – the object – plays the role of the degree of lateness, the second time argument – the subject of the adjective – is the reference time of the sentence. We are now in a position to analyse the following sentence (which has kept puzzling me for a long time):

- (5-6) Es war spät ‘It was late’  
 $\text{Pos}_{I,N} \lambda_2 [\text{Past}_5 t_2 \text{late}_1]$   
 $(\forall t \in N(I)) \text{Past}_5 \geq t$   
 |.....(.....).....Past<sub>5</sub>.....>|  
 early N(I) late

This means that the reference time is in a contextually determined frame  $I$  but after the neutral time interval  $N(I)$ , which counts as neither early nor late.

The negative pole *früh* ‘early’ is of course defined in terms of internal negation, i.e.,  $[[\text{früh}]] = \neg[[\text{spät}]]$ . Therefore the sentence

- (5-7) Es war früh ‘It was early’

means that the reference time is before the neutral time  $N(I)$ . I leave it to the reader to check for himself that the sentences involving negation all get the correct reading:

- (5-8) a. Es war nicht spät. ‘It was not late’  
 b. Es war nicht früh. ‘It was not early’  
 c. Es war weder früh noch spät. ‘It was neither early nor late’

## 6. TEMPORAL ADJECTIVES AS ADVERBS

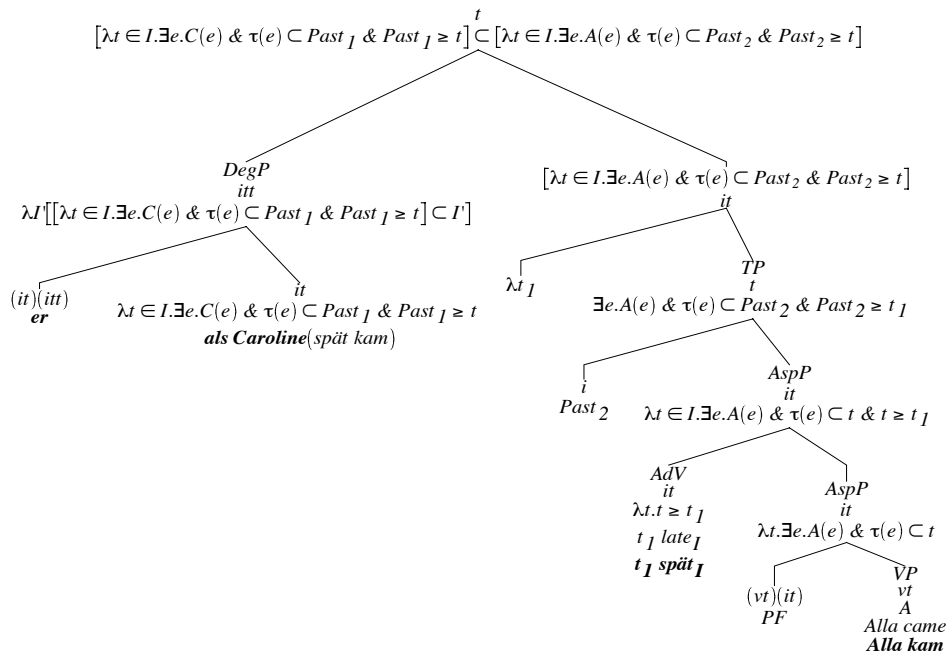
In comparative constructions our temporal adjectives are used as adverbs. So we have to say something about the interpretation of the adverbial construction. The default interpretation for modification is set-theoretical intersection. *Cecile is a charming woman* means that Cecile has the property of being a woman and of being charming. Similarly, *Alla came late* means that a particular past time has the property of being late and of being the time containing a coming of Alla. This sounds simple but is somewhat tedious to spell out.

Here is first what the Perfective Aspect does: it says that the event time is included in the reference time:

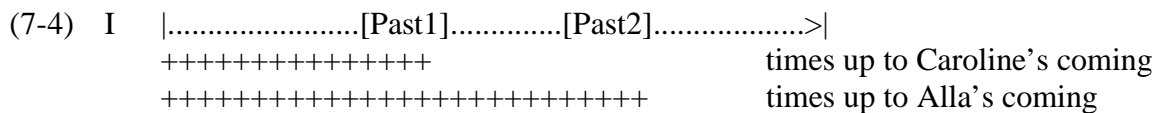
- (6-1) Perfective Aspect (type (vt)(it))  
 $[[\text{PF}]] = \lambda E. \lambda t. \exists e [E(e) \ \& \ \tau(e) \subseteq t]$ .

The sentence *Alla kam spät* ‘Alla arrived late’ would then have the following LF, where “E” stands for Alls’s coming:





It is useful to have a contextually given frame in this case, because then we have sets of times that can stand a proper subset relation. It is not so clear what would happen if the times to be compared were not finite: the two times should have then either a beginning or an end. If time were infinite at both ends, our semantics of the comparative would not work. Note that it is essential that the two semantic tenses in the construction are different. One indicates the time of Alla’s coming, the other that of Caroline’s coming. The two tenses are the upper limits of the intervals that are compared. Here is a picture, which illustrates that the truth-condition given by the LF is correct.



*Früher* ‘earlier’ is, of course, analysed exactly in the same way with APs that have **spät** as their head. The reader may check for himself that the following equivalences are predicted by our semantics.

- (7-5) Caroline kam früher als Alla ↔ Alla kam später als Caroline  
 Caroline came earlier than Alla ↔ Alla came later than Caroline

If we now assume Ladusaw’s (1980) theory of NPI-licensing, the occurrence of NPIs in the complements of *früher/später* is explained because the comparative induces a downward entailing context. It doesn’t matter whether we consider the positive or the negative pole of the pair.

### 8. EQUATIVE: AN INTERESTING IMPLICATURE

It has often been noticed that the negative pole of an antonym pair carries a ‘positive’ implicature when it is used in comparative and equative constructions.

- (8-1) a. Angelika is as short as Sveta >> Both are short

b. Sveta is as tall as Angelika (no implicature)

In many comparative constructions the implicature arises as well.<sup>14</sup>

(8-2) Xaver ist blöder als Sepp >> Both are stupid  
Xaver is more stupid than Sepp

For certain antonym pairs both poles carry implicatures when used in an equative construction.

(8-3) Sveta ist so intelligent wie Alla >> Both are intelligent

The temporal adjectives *früh/spät* both carry the earliness/lateness implicature in an equative construction:

(8-4) a. Alla kam so spät wie Caroline >> Both were late  
'Alla came as late as Caroline'  
b. Alla kam so früh wie Caroline >> Both were early  
'Alla came as early as Caroline'

I don't want to go into the question of why certain positive poles carry the implicature and others do not. What I find interesting is the fact that the present theory allows us to formulate the implicature. The adjectives in question are modified by means of an equative operator that is relativized to the two contextual parameters N and I which we have used for the semantics of the Positive.

Consider the unrestricted equative operator first and see what it does to the sentence. Its meaning is this:

(8-5) Equative morpheme (German *so*)  
[[*as*]] =  $\lambda P \in D_{dt}. \lambda Q \in D_{dt}. P \subseteq Q$

The truth-condition of (8-4a) is given by the following formula and illustrated below.

(8-6)  $\lambda t \subseteq I. \exists e [C(e) \ \& \ \tau(e) \subseteq \text{Past}_1 \ \& \ \text{Past}_1 \geq t] \subseteq \lambda t \subseteq I. \exists e [A(e) \ \& \ \tau(e) \subseteq \text{Past}_1 \ \& \ \text{Past}_1 \geq t]$   
I: |-----C-----A-----|  
or  
I: |-----C,A-----|

The two comings are correctly localized in the frame I, but the neutral time doesn't play any role so far. So one coming might be early and the other late, both might be early or both might be late. In other words, the lateness implicature of the sentence is not captured. What is wanted is the following scenario:

(8-7) Alla kam so spät wie Caroline  
I: |-----[////////N(I)////////]-----C--A----|  
or  
I: |-----[////////N(I)////////]-----C,A----|

Sentence (8-4b) describes the scenario where both came before the neutral time. The temporal equative that does the correct job is the following:

(8-8) The temporal Equative (German *so*)  
[[*as<sub>N,I</sub>*]] =  $\lambda P_{it}: \text{POS}_{N,I}(P). \lambda Q_{it}: \text{POS}_{N,I}(Q). P \subseteq Q$

I leave it to the reader to check the adequacy of this semantics.

<sup>14</sup> cf. (Bierwisch, 1987).

## 9. THE PHASE ADVERBS ERST ‘ONLY’/SCHON ‘ALREADY’

### 9.1. Terminology

There is a rich literature about German phase adverbs (or aspectual adverbs, as some say). I cite (Löbner, 1989, Löbner, 1990), (Michaelis, 1996), (König, 1991), (Krifka, 2000), (Condoravdi, 2002, Condoravdi, 2003), (Klein, 2006) for many others. Most authors analyse phase adverbs in terms of alternative semantics. The present proposal interprets phase adverbs strictly in terms of ‘early/late’ but it is compatible with alternative treatments, especially Krifka’s. The hardest problem is the analysis of Type-2 uses. It will involve an epistemic perspective and hence a treatment of *erst/schon* as modal operators. Another difficult problem is to give a treatment for the particles that covers the uses of the different types of particles in a uniform way.

Löbner distinguishes between four uses of phase adverbs:

- (9-1) Type-1: the scope/focus is a stative
- [Es regnete]<sub>F</sub> schon ‘it was raining already’
  - [Es regnete]<sub>F</sub> noch/\*erst ‘it was still raining’
- (9-2) Type-2: the adverb has a degree focus
- Hans ist schon drei<sub>F</sub> Jahre alt ‘
  - Hans ist erst drei<sub>F</sub> Jahre alt
- (9-3) Type-3: the focus is a temporal adverb and the scope is a perfective clause
- Alla kam schon am Mittwoch<sub>F</sub> ‘Alla arrived already on Wednesday’
  - Alla kam \*noch/erst am Mittwoch<sub>F</sub> ‘Alla came only on Wednesday’
- (9-4) Type-4: the focus is a temporal adverb and the scope is a stative
- Alla war schon am Mittwoch<sub>F</sub> hier ‘Alla arrived already on Wednesday’
  - Alla war erst am Mittwoch<sub>F</sub> hier ‘Alla came only on Wednesday’

I localised the focus feature *F* where it is usually placed in the literature. I will stick to this terminology, but in my treatment the talk about focus won’t even make sense.

### 9.2. schon/noch: The Type-1 Puzzle

To solve the Type-1 puzzle, let us start with an analysis of the sentences in (9-1). A first approximation to Löbner’s semantics for the Type-1 adverbs in my terms is this:

- (9-5) The PPIs **schon** ‘already’/**noch** ‘still’ : type (it)(it) (first attempt)
- $[[\mathbf{schon}_I]] = \lambda P_{it}.\lambda t: t \subseteq I \ \& \ I \text{ is a } \neg P/P\text{-phase: } P(t)$
  - $[[\mathbf{noch}_I]] = \lambda P_{it}.\lambda t: t \subseteq I \ \& \ I \text{ is a } P/\neg P\text{-phase: } P(t)$

*I* is a contextually given frame interval. A  $\neg P/P$ -phase is an interval that can be split in a first part at which  $\neg P$  holds throughout and a second part at which *P* holds throughout. Both *schon* and *noch* are PPIs, i.e., \**nicht schon* and \**nicht noch* are ill formed. ‘*nicht noch*’ is lexicalised as *nicht mehr*.

- (9-6) The NPI **mehr**  
 $[[\mathbf{mehr}_I]] = [[\mathbf{noch}_I]]$

The sentence in (9-1a) would have the following LFs:

- (9-7) a. **Past**<sub>5</sub> [<sub>it</sub> **schon**<sub>I</sub> **regnen**<sub>it</sub>]

b. **Past<sub>5</sub> [it noch<sub>I</sub> regnen<sub>it</sub>]**

Consider first the effect of the semantics for the sentence **Past<sub>5</sub> [schon<sub>I</sub> regnen<sub>it</sub>]** ‘it was raining already’:

- (9-8) It was raining already<sub>I</sub>  
 I: |-----| Past<sub>5</sub> |  
 Rain: |  
 ¬Rain: |

The meaning of **[schon<sub>I</sub> regnen<sub>it</sub>]** is  $[\lambda t: t \subseteq I \ \& \ I \text{ is a } \neg\text{Rain/Rain-phase.Rain}(t)]$ . This meaning is predicated of Past<sub>5</sub>. The picture represents such a scenario.

The reader may convince himself that the picture for the truth-condition of the LF **Past<sub>5</sub> [noch<sub>I</sub> regnen<sub>it</sub>]** is the following, converse one:

- (9-9) I was still<sub>I</sub> raining  
 I: | Past<sub>5</sub> |

In other words, I must be a Rain/¬Rain-phase, and Past<sub>5</sub> must be in the Rain-part.

If we try to combine this version of **already** with the adjective ‘early’ in (1-6b) we will run into problems, as we will see shortly. Try to build an LF for the sentence in (1-6a) first. For type reasons, it has to be this:

- (9-10) Es ist schon spät ‘it is already late’ (first attempt)  
**Pres already<sub>I</sub> λ<sub>0</sub> Pos<sub>N,I</sub> λ<sub>1</sub> [t<sub>0</sub> t<sub>1</sub> late]**

Choose any interval  $I$  which meets the presupposition of **already<sub>I</sub>**. It must have the following form:

- (9-11) Es ist schon<sub>I</sub> spät ‘it is already late’  
 I: |-----| Pres+++  
 (---) = N(I) = the times that are neither late nor early w.r.t. I  
 +++ =  $\lambda t: t \subseteq I \ \& \ (\forall t' \in N(I)) \ t \geq t'$ . =: P  
 ---- =  $\lambda t: t \subseteq I \ \& \ \neg(\forall t' \in N(I)) \ t \geq t'$ . =: ¬P

The entire presupposition for **already<sub>I</sub>** says that  $I$  is a  $\neg P/P$ -phase. There are many such intervals, and the truth-condition of the LF states that Pres is in the +++-part. The analysis of sentence (1-6c) proceeds in a parallel fashion:

- (9-12) Es ist noch<sub>I</sub> früh<sub>I</sub> ‘it is still early’  
 I: | Pres+++ |  
 (+++) = N(I) = the times that are neither late nor early w.r.t. I  
 +++ =  $\lambda t: t \subseteq I \ \& \ (\forall t' \in N(I)) \ t < t'$ . =: P  
 ---- =  $\lambda t: t \subseteq I \ \& \ \neg(\forall t' \in N(I)) \ t < t'$ . =: ¬P

The entire presupposition for **still<sub>I</sub>** says that  $I$  is a  $P/\neg P$ -phase. There are many such intervals, and the truth-condition of the LF states that Pres is in the +++-part.

Next consider the analysis of the LF the sentence in (1-6b):

- (9-13) \*Es ist schon früh ‘it is already late’  
**Pres already<sub>I</sub> λ<sub>0</sub> Pos<sub>N,I</sub> λ<sub>1</sub> [t<sub>0</sub> t<sub>1</sub> early]**

There is no interval that can meet the presupposition required by the LF **already<sub>I</sub> λ<sub>0</sub> Pos<sub>N,I</sub> λ<sub>1</sub> [t<sub>0</sub> t<sub>1</sub> early]**, which is the following:

- (9-14) I is a  $\neg[\lambda t: t \subseteq I \ \& \ (\forall t' \in N(I)) \ t < t'] / [\lambda t: t \subseteq I \ \& \ (\forall t' \in N(I)) \ t < t']$ -phase

This means that the first half of  $I$  consists of times that are in the neutral part of  $I$  or after that part  $N(I)$ , whereas the second half of  $I$  consists of times that are before  $N(I)$ . This is an impossibility, because the first part of  $I$  is by definition the earlier part. So the meanings generate a presupposition failure for (9-12), which explains the Type-2 Puzzle. The reader may check for himself, that the contrast in (1-7) is explained in the same way.

This works, but I don't think that we can be happy with the account. One of the reasons for my uneasiness is that the syntax of Type-1 particles would be quite different from that of the other types, which will be introduced below. On conceptual grounds, we would prefer a unified analysis.

Another objection comes from empirical considerations. Löbner's original proposal is more complicated. He stipulates that the instantiation of a temporal property modified by Type-1 may never start at the beginning of  $I$ .<sup>15</sup> We observe a continuation effect with **noch**<sub>I</sub>. When we say *Es regnet noch* at time  $t$ ,  $t$  should not be the starting time of a rain. I accept this observation. Löbner further assumes that the change to the complementary phase is a conversational implicature that can be cancelled. He gives the following example:

(9-15) I'm still living here and will go on living here forever (Löbner, 1999: p. 60).

As (Klein, 2006) observes, there are uses where the transition to the opposite phase cannot be cancelled at all. He gives the following example:

(9-16) 1797 war Mozart schon tot, aber Haydn lebte noch.  
'In 1797, Mozart was already dead but Haydn was still alive'

If **noch**<sub>I</sub> could be used for an interval  $I$  whose final part is not a  $\neg P$ -phase, the following sentence should be acceptable:

(9-17) \*1797 war Mozart noch tot.  
'In 1797 Mozart was still dead'.

The sentence is not acceptable in worlds without resurrection. This suggests that the transition is rather a presupposition. Löbner further assumes that the assertion point of  $P$  should never be the first point of an interval. Under my assumptions,  $I$  is a contextually given frame. This enables us to choose  $I$  always in a way that is compatible with Löbner's observations and still maintaining the presupposition formulated above.

I conclude from Klein's example that transition to the  $\neg P$ -phase is rather a presupposition. The example (9-15) requires modalisation: the appropriate intervals  $I$  are such that there is a transition to a  $\neg P$ -phase in the worlds that fulfil our expectations. I will not treat this case but I will be concerned with another type of modalisation when I will take up the Type-2 Puzzle.

Here is my revision for Type-1 particles, which takes care of these observations. Phase particles always take a time as their argument and say about this time that it is early or late with respect to the property the particle + time modify.

(9-18) *Type-1 schon/noch (official proposal): type i((it)t)*  
 a.  $\llbracket \text{schon}_{I,N} \rrbracket = \lambda t. \lambda P_{it}: t \subseteq I \ \& \ I \text{ is a } \neg P/P\text{-phase} \ \& \ (\forall t' \in N(P,I) \ t < t'. P(t))$   
 b.  $\llbracket \text{noch}_{I,N} \rrbracket = \lambda t. \lambda P_{it}: t \subseteq I \ \& \ I \text{ is a } P/\neg P\text{-phase} \ \& \ (\forall t' \in N(P,I) \ t \geq t'. P(t))$

$N$  is a contextually determined function that assigns to the interval  $I$  and the temporal property  $P$  the the neutral time for  $P$  in  $I$ , the time for which instantiation of  $P$  is expected.

The revised LFs for our sentences are these:

<sup>15</sup>(Löbner, 1999: p. 59, Def. (15))

- (9-19) a. [**schon**<sub>I,N</sub> Pres] **regnet**
- b. [**noch**<sub>I,N</sub> Pres] **regnet**

In other words, the first argument of the particle is the semantic tense. The pictures illustrating the new truth conditions are now these:

- (9-20) Es regnet schon<sub>I</sub>      ‘It is raining already’
- I: |-----|/////Pres/////((/////))//////////|
- = ¬Rain
- ////////// = Rain
- ((/////)) = neutral time in I with respect to Rain

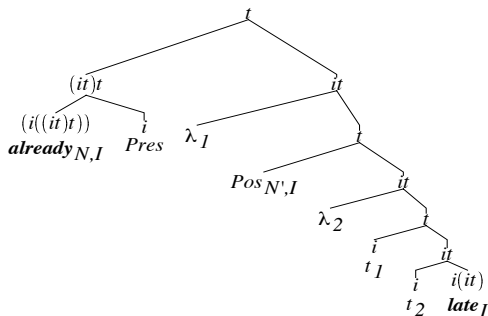
The prediction is that Pres may very well be located at the beginning of the rain period in I.

- (9-21) Es regnet noch<sub>I</sub>      ‘It is still raining’
- I: |/////////((/////))/////Pres/////////|-----|

The prediction is that Pres may not occur at the beginning of *I*, because Pres is a late time which occurs after the neutral rain period. So we have derived Löbner’s continuation effect from the semantics.

It is straightforward to transfer the new, refined semantics for the particles to the sentences in (1-6). For concreteness, I indicate the LF for (1-6a) with a picture that illustrates a situation described.

- (9-22) Es ist schon spät      ‘it is already late’



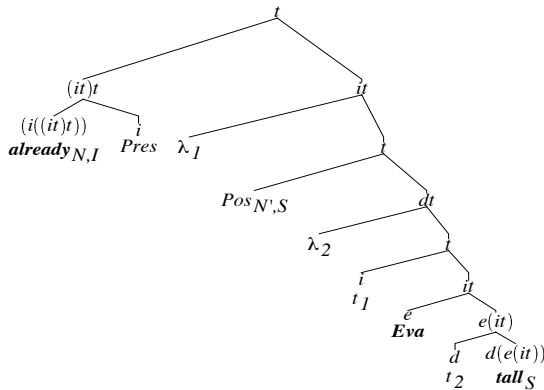
- |-----|++Pres+++((+++))++++++|
- = ¬Pos late
- +++ = Pos late
- ((+++)) = expected time for Pos late

Given that Pres is located before N(I, Pos late), the sentence conveys the information that it is later than we would have expected. The reader may convince himself that the Type-1 Puzzle, i.e., the oddity of (1-6b) is explained exactly as before.

A point worth mentioning is that the N-function that figures as parameter of the Pos-operator is different from the N-function that is the parameter of **already**. This becomes particularly clear when we look at the LF for sentence (9-23a)

- (9-23) a. Eva is already tall.
- b. \*Eva is already small.

- (9-24) Eva is already tall



The picture illustrating the scenario described is more or less the same as before. **already** is relativized to a neutral time, the time for which it is expected that Eva is tall. **Pos** is relativized to a neutral degree interval, i.e., the degrees for which Eva is neither tall nor short. Clearly the two functions are different.

I think that my proposal solves the Type-1 Puzzle.

### 9.3. Type-3: *erst* ‘only’/*schon* ‘already’

Before I take up the Type-2 Puzzle, I want to present my treatment of Type-3 particles. Type-4 particles are treated alike and I will not discuss them. I will first present my own analysis and subsequently add some remarks on earlier treatments in the literature. As before, I say that the first argument of the particle is a time  $t$  and the second argument is a temporal property  $P$ . The  $P$  is predicated of  $t$  and the presupposition is that  $t$  is early or late for the instantiation of  $P$ . The difference to Type-1 particles is that the focus is not a semantic tense but a temporal term that figures as the object of a temporal PP at  $s$ -structure. Furthermore, the presupposition contains no phase transition.

(9-25) *Type-3 erst/schon*: type  $i((it)t)$

- a.  $\llbracket \text{erst}_{I,N} \rrbracket = \lambda t. \lambda P_{it}. (\forall t'' \in N(I)) t \geq t''. P(t)$
- b.  $\llbracket \text{schon}_{I,N} \rrbracket = \lambda t. \lambda P_{it}. (\forall t'' \in N(I)) t < t''. P(t)$

We will assume that the modified temporal property is a perfective statement. We will be concerned with the Type-2 use in the next section.

- (9-26)   Alla kam schon am Mittwoch  
           Alla arrived already on Wednesday

Consider the sentence without adverb first. Its truth-condition is indicated below.

- (9-27) Alla kam am Mittwoch  
 $\exists t[t \text{ on the Wednesday of Past}_5 \ \& \ \exists e[A(e) \ \& \ \tau(e) \subseteq t]]$

The transparent LF is the following and the meanings assumed for the constituents can be read off from the tree directly:

- (9-28)



discussion are Wednesday, Thursday, Friday, in that temporal order. The particle ‘already’ carries the presupposition that Wednesday is the first, i.e. the earliest of the alternatives. For (9-30), the alternatives under discussion are Monday, Tuesday, Wednesday, in that order. The presupposition induced by the ‘only’ is that Wednesday is the last, i.e., the latest of these alternatives. The truth-condition for both sentences is that Alla arrived on Wednesday.

This analysis yields the same truth-condition as my proposal, but it doesn’t relate *schon/erst* in a principled way to the meaning of ‘late’ and ‘early’. I think the definition of the meanings of these particles using ‘late’ and ‘early’ is the core case and other uses like the scalar one should be derived by a sort of metaphoric process, but only in cases where the standard semantics doesn’t work. Note further that my approach allows to say

(9-32) Alla kam schon am Dienstag  
Alla arrived already on Tuesday

in a scenario where Alla was expected to arrive on Thursday. This is so because any temporal position within *I* but before *N(I)*, i.e. Thursday, is a good one according to my theory. Krifka would have to say that in this case the context provides the alternatives Tuesday, Wednesday in that order, i.e., the context changes. Furthermore, I can say that ‘Alla arrived already on Thursday’ is undefined in the above scenario. Krifka has to say that Thursday doesn’t belong to the alternatives. In other words, he has to assume a different context again. So there is always a way out in Krifka’s approach.

(Condoravdi, 2003) analyses the Type-3 use in terms of scalar implicatures as well, but not exactly as Krifka does. Let us consider (9-26) again. According to Condoravdi, *schon* has the effect of making the truth-condition very weak. The sentence means this:

(9-33) Alla arrived between the beginning of Past<sub>5</sub> and the end of Wednesday.

So the sentence might be true if Alla came on Monday. In addition, the adverbial ‘already on Wednesday’ introduces the following alternatives:

(9-34) {Alla arrived between the beginning of Past and the end of *d* :  $d \in \{\text{Monday, Tuesday, Wednesday}\}$ }

Among these alternatives, the truth-condition of the sentence is the weakest, i.e., it is entailed by every alternative. By Gricean reasoning (“Be informative”), we conclude that the truth condition is the strongest true alternative. Therefore Alla did not come earlier than Wednesday. So she came on Wednesday.

A similar story can be told about *erst* ‘only’. Here we speak about the interval starting with Wednesday and ending with the end of Past.

The account is very similar to Krifka’s: Wednesday is the latest alternative in the case of ‘already’. It is the earliest in the case of *erst* ‘only’.

Condoravdi’s approach is very ingenious, but it doesn’t make the correct predictions for German. Conversational implicatures can be cancelled, and Condoravdi claims that this is possible for the German sentences as well. For instance, the following texts should be acceptable:

(9-35) a. Alla kam schon am Mittwoch. Tatsächlich kam sie am Montag.  
Alla arrived already on Wednesday. In fact arrived she on Monday  
b. Alla kam erst am Mittwoch. Tatsächlich kam sie am Freitag.  
Alla arrived only on Wednesday. In fact she arrived on Friday

For me these texts are contradictory and so they are for any German speaker I have asked. Therefore this account is not tenable for German.

#### 9.4. *schon/erst*: the Type-2 Puzzle

Recall that the Type-2 Puzzle means that the early/late-implicatures are reversed if the focus of *schon/erst* is a degree phrase. Here is the repetition of some relevant sentences:

- (9-36) a. Es ist schon 6 Uhr. (late!)  
it's already 6 o'clock  
b. Alla kam schon am Mittwoch. (early)  
'Alla came already on Wednesday'
- (9-37) a. Es ist erst 6 Uhr. (early!)  
it is only 6 o'clock  
b. Alla kam erst am Mittwoch. (late!)  
'Alla came only on Wednesday'

The puzzle has been discussed in (Krifka, 2000) and my solution is related to Krifka's but it is quite different. My proposal, which is due to discussions with Doris Penka, can be read off from the following paraphrases:

- (9-38) a. "It's already 6" is true if it is early for being 6.  
>> It's late  
b. "It's only 6" is true if it is late for being 6.  
>> It's early

The analysis carries over to most of the other Type-2 uses.

- (9-39) a. Ich habe schon/erst 10 Kalender verkauft.  
I have already/only 10 calendars sold  
= It's early/late for having sold 10 calendars  
>> I have sold many/few  
b. Lydia ist schon/erst 3 Jahre alt.  
Lydia is already/only 3 years old  
= It's early/late for Lydia's being 3 years old  
>> this is much/little  
c. Valentin ist schon/erst 65 cm groß  
Valentin is already/only 65 cm tall  
= It's early/late for Valentin's being 65 cm tall  
>> this is much/little  
d. Ich wiege schon/erst 73 Kilo  
I weigh already/only 73 kilos  
= It's early/late for my weighing 73 kilos

The paraphrases state the presuppositions/implicatures of the sentence. The non-trivial part of the analysis is to make precise what it means to be late or early for a property. We will see that we will have to say two things:

- *schon/erst* are modal operators of a special kind.
- Despite of usual analyses in the literature, the degree phrases are not the associated foci of the particles. If there are foci at all in these constructions, then they are the semantic tenses. In other words, (9-36a) really means 'It is already now 6 o'clock'.

The idea for the solution of the puzzle is that the adverbs *erst/schon* introduce an epistemic perspective, viz. the expected time for being 6. This can't be a rigid designator, because 6 can't be earlier than 6. It rather has to be an egocentric description. A possible scenario for

(9-36) is the following:

(9-40) Es ist schon 6 'it is already 6'

Subjective world-time:

$now_s$  = our subjective temporal location  
= the time we believe to be our time = 5

5      6      7

I in  $w'$  |-----|-----|-----|

expected time for 6  
= one after our time  
=  $N_{w',5}(I, \text{being } 6) = 6$

Real world-time

$now_r$  = our real temporal location

5      6      7

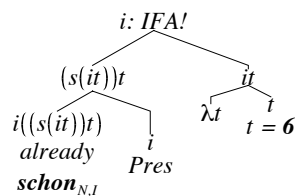
I in  $w_0$  |-----|-----|-----|

expected time for 6  
= one hour after our time  
=  $N_{w_0,6}(I, \text{being } 6) = 7$

We think we are temporally located at 5, i.e., our subjective now is 5. The expected time for being 6 is one hour after the time at which we are located. In reality we are located at 6 =  $now_r$ . So the expected time for 6 in the real world  $w_0$  happens to be 7. Since 6 is earlier than 7, this justifies the use of *schon* 'already'. On the other hand, the time at which we are (=  $now_r$ ) is later than the time at which we localized ourselves (=  $now_s$ ). This gives us the insight that we are late.

Here is the formal spell-out of the analysis. The LF for (9-36a) is the same as that for Type-1 particles. The difference comes from the N-function, which is a modal one.

(9-41)



As the type of the adverb shows, *schon* 'already' has become a modal operator. We have to intensionalize the language, i.e., every node will now denote an intension. The combination of *schon* + *Pres* with a complement of type (it) requires Intensional Functional Application (IFA); cf. (Heim and Kratzer, 1998: ch. 12). The necessity to analyse the adverb as an intensional functor comes from the meaning of the parameter N 'neutral time', on which the meaning of 'already' depends. N assigns to a world  $w$ , a time  $t$ , an interval  $I$ , and an intensional property  $P$  the set of times in  $I$  of which we believe in  $w$  at  $t$  that  $P$  is or will be instantiated.

(9-42) The epistemic version of the neutral time N

$N_{w,t}(I_{it}, P_{s(it)}) = \lambda t'[t' \subseteq I \ \& \ \forall w'[w' \text{ satisfies our expectations for } P \text{ in } w \text{ at } t \rightarrow P(w')(t')]$

In the normal case,  $N_{w,t}(I_{it}, P_{s(it)})$  is the time interval in  $I$  for which we expect  $P$  to be realised. The accessibility relation might be a different one, for instance, "appropriate time for some purpose". The modal versions of our phase adverbs are therefore the following ones:

(9-43) *Type-2 erst/schon* : type (i(s(it)))t

a.  $\llbracket \text{erst}_{N,I} \rrbracket = \lambda w. \lambda t. \lambda P_{s(it)}: (\forall t' \in N_{w,t}(I,P)) t \geq t'. P(w)(t)$

b.  $\llbracket \text{schon}_{N,I} \rrbracket = \lambda w. \lambda t. \lambda P_{s(it)}: (\forall t' \in N_{w,t}(I,P)) t < t'. P(w)(t)$

For the evaluation of the LF (9-41), let us assume that  $N_{w_0, \text{Pres}}(I, \text{being } 6) = \lambda t. t \subseteq I \ \& \ t$  is one hour after Pres. It follows that the LF is true in the actual world  $w_0$  if the speech-time is 6. It presupposes that 6 is early with respect to that time in  $I$  which is one hour later than 6. This is correct. Recall that the feeling that 6 is a late comes from the fact that the actual now is later than the time of which we have been thinking that we are located at that time.

Let us consider next the interpretation of sentence (9-37a) on the background of the following scenario:

(9-44) Es ist erst 6. ‘it’s only 6’

Subjective world-time:

5      6      7

now<sub>s</sub> = the time we believe to be our time = 7

I in w' |-----|-----|

expected time for being 6

= one hour before our time

=  $N_{w',6}(I) = 6$

Real world-time

now<sub>r</sub>

5      6      7

I in w<sub>0</sub> |-----|-----|

expected time for 6

= one hour before our time

=  $N_{w_0,6}(I) = 5$

We think we are temporally located at 7, i.e., our subjective now is 7. The expected time for being 6 is one hour before the time at which we are located. In reality we are located at 7 = now<sub>r</sub>. So the expected time for 6 in the real world  $w_0$  happens to be 5. Since 6 is later than 5, this justifies the use of *erst* ‘only. On the other hand, the time at which we are (now<sub>r</sub>) is earlier than the time at which we localized ourselves (now<sub>s</sub>). This gives us the earliness effect.

The approach carries over to the other sentences with a stative in the scope of the particle. Recall that in my analysis it is not the degree phrase that is in focus but the semantic tense. Take (9-39a) for example. The LF is something like this:

(9-45) [already<sub>N,I</sub> Pres ] [have [I sold 10 calendars]]

The LF is true if Pres is an early time for having sold 10 calendars. This meaning generates the implicature that I have sold many calendars. Or take (9-39d) with a loosing-weight scenario, one of Krifka’s favourite examples. The LF is the same:

(9-46) [already<sub>N,I</sub> Pres] [I weigh 73 kilos]

The LF is true if Pres is an early time for weighing 73 kilos. Thus the implicature is conveyed that I have lost more weight than expected for now.

I therefore think that the Type-2 puzzle is solved.

Here is a remark on earlier treatments of the Type-2 Puzzle. (Krifka, 2000) takes up an idea by Löbner according to which Type-2 uses generate the presupposition that the background is the fastest development among possible alternative developments. Let me sketch the theory. Krifka discusses sentence (9-39b). For him, the degree phrase “**3 years**” is the focus of the particle. Note first that the example makes it quite clear that an analysis in terms of focus has no basis in the intonation of the sentence. We don’t say (9-47a), we rather

say (9-47b).

- (9-47) a. Lydia ist schon drei(\) Jahre alt.  
 b. Lydia ist schon drei(/) Jahre(\) alt.

If *drei* were the associated focus, it should have a falling intonation. But it has a rising intonation. In fact, the degree phrase *drei Jahre* has the ordinary head contour, which realises the nuclear stress of the sentence. Therefore *drei* is not the focus of *schon*, but for the sake of argument let us assume it were the focus.<sup>17</sup> In a structured meaning approach<sup>18</sup> the LF is something like this:

(9-48)  $ALREADY_{w,t} \langle \lambda n \lambda w' \lambda t'. \text{Lydia is } n \text{ years old in } w' \text{ at } t', 3, \{1,2,3\} \rangle$

$ALREADY$  takes a structure as its argument. The first component, the background  $B$ , is Lydia's age, the second component  $F$  is the focus, here '3'. The third component  $A$  contains the focus alternatives, i.e.,  $A = \{1,2,3\}$ . The content of the LF is obtained by applying the background to the focus:  $B(F)$ . We obtain the proposition that Lydia is 3 years old, i.e.,  $\lambda w' \lambda t'. \text{Lydia is } 3 \text{ years old in } w' \text{ at } t'$ .

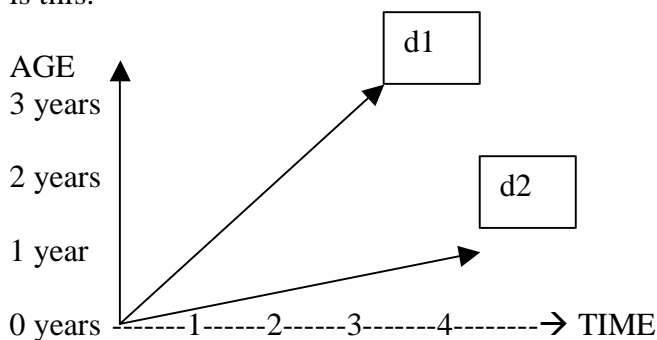
As in my proposal,  $ALREADY$  is a modal operator that depends on the background and the alternatives. It takes the background and the alternatives as its argument. It has the following meaning:

(9-49)  $ALREADY_{w,t}(B, F, A) = 1$  iff  
 $\forall n \forall w' \forall t' [n \in A \ \& \ B(n)(w')(t) \ \& \ B(n)(w')(t') \rightarrow t' \leq t]$

Applied to our sentence, we obtain the following prediction:

$ALREADY_{w,t} \langle \lambda n \lambda w' \lambda t'. \text{Lydia is } n \text{ years old in } w' \text{ at } t', 3, \{1,2,3\} \rangle = 1$  iff  
 $\forall n \forall w' \forall t' [n \in \{1,2,3\} \ \& \ \text{Lydia is } n \text{ years old in } w' \text{ at } t$   
 $\ \& \ \text{Lydia is } n \text{ years old in } w' \text{ at } t' \rightarrow t' \leq t].$

According to Krifka, this means that the function  $[\lambda t. \text{AGE}_{w,t}(\text{Lydia})]$  grows at least as fast in the actual world as in any other world. Normally, the slope of this function is even steeper than in any other of the competing functions. Krifka's picture for the AGE-function is this:



$d1$  is the function that gives us Lydia's age in the actual world. Lydia is 3 years old at time 3.  $d2$  is a function in an alternative world. At time 3 Lydia is only half a year old. The adverb  $ALREADY$  makes it clear that the age function in the actual world is  $d1$ . Any alternative "age development" grows slower.

The intuition behind this account is fine, but it makes no sense for this example. Let us see why. What is the AGE at a time? It gives us the length of the time in terms of years, i.e.

<sup>17</sup> (Klein, 2006), too, expresses reservations against analyses in terms of focus.

<sup>18</sup> Cf. (von Stechow, 1991) among others.

the distance of the actual time from the time of the birth. What is the distance between two times? The distance between times is measured in years (or some other relevant unit, it doesn't matter). The distance from time 0 to time 3 is three years in the actual world and in any other! So there is only one age function for every world, viz.  $d_1$ . You cannot get 3 years old in a time that is shorter than 3 years.

Note that this criticism of Krifka's explanation does not depend on the assumption that there is an absolute time, which is the same for every world. Let us assume relativity. Think of worlds as sausages whose slices are times. Take two sausages  $w_1$  and  $w_2$ , each consisting of three slices.  $w_1$  is 90 cm long, and  $w_2$  is 3 cm long. Each slice is a year. So a year in  $w_1$  is 30 cm long in  $w_1$  while it is 1 cm long in  $w_2$ . There are counterparts of Lydia in both worlds, say long, string-like pieces of bacon reaching from one end of the sausage to the other one. The counterpart of Lydia has a length of 90 cm in  $w_1$ , and it has a length of 3 cm in  $w_2$ . Now, what does it mean to have an age of 3 years? It means that your length equals the length of three slices. This is 90 cm in  $w_1$  and 3 cm  $w_2$ . Does this mean that Lydia's age grows faster in  $w_1$ ? Not at all. It doesn't make sense to compare the temporal length of Lydia in  $w_1$  with the temporal length of Lydia in  $w_2$  in absolute terms because that presupposes an absolute time. But there is no such thing in our scenario. The absolute measure in cm makes only sense "from outside", but not "from inside". Units like cm or m can only be defined with respect to the length of one existing object in the world, say that bar in Paris. There is a one-to-one-mapping between the two worlds, and that is all what we need. After three years you are three years old in  $w_1$  and in  $w_2$ . There is no world where you are half a year old after three years. But this is what Krifka seems to assume.

I conclude that Krifka's method of explaining the Type-2 Puzzle doesn't work. Nevertheless, the principal idea behind the explanation is sound. ALREADY and ONLY must be modal operators. It should be clear that my account doesn't run into the problem mentioned. For tense semantics, we may safely think of times in absolute terms. Time is the same for each world and therefore the same time has the same duration in each world, but we might be wrong about the time at which we are, and mostly we are wrong.

### 9.5. Summary

I have interpreted the temporal adjectives 'early' and 'late' as degree adjectives and I have shown that the analysis accounts for some hitherto puzzling phenomena. I started with the observation that 'earlier'/'later' require a comparative analysis. Both comparative adjectives license NPIs in their complements. The adjectives engender two puzzles in connection with phase adverbs, which I dubbed the Type-1 Puzzle and the Type-2 puzzle.

The particular ingredients of my analysis are these.

1. Every scale of degrees is contextually restricted to an interval  $S$  that might be called the frame of the adjective. The context determines a function  $N$  that gives us the neutral degrees within  $S$ .

2. I have introduced a new positive operator  $Pos$ , which is a universal quantifier over degrees that is restricted by  $N(S)$ . This operator works equally well for the positive and the negative pole of an antonym pair.

3. I gave a semantics for the temporal adjectives 'early' and 'late' in terms of degrees. Times play a double conceptual role here. Qua subjects of the adjectives, they are locations on time axis, qua objects they are degrees. 'early' expresses the temporal relation  $<$ , 'late' expresses the relation  $\geq$ .

4. I analysed the comparative adjectives 'earlier'/'later' in the standard way and showed that NPIs are licensed in the complement. The analysis is not entirely trivial, because

we have to consider adverbial uses of the two adjectives. This necessitates the introduction of the perfective operator.

5. I analysed the presuppositions of the Type-1 phase particles *schon/noch* ‘already’/‘still’ in terms of ‘early’ and ‘late’ and showed that this solves the Type-1 Puzzle.

6. I stated the semantics for the Type-3 phase particles *schon/erst* ‘already’/‘only’ and showed that it is empirically superior to scalar alternatives, at least for German.

7. I took up Type-2 uses of the particles and analysed *schon/erst* as epistemic modal operators. I argued that the analysis solves the Type-2 Puzzle.

8. The logical types for all four types of the particles are almost the same. The first argument of the particle is a time, the second argument is a temporal property. The variation in usage has two sources: (a) Type-1 particles induce special presuppositions that are formulated in terms of negation of the temporal property modified; (b) Type-2 particles take a modalised N-function and thus introduce an epistemic perspective. (c) While Type-1 and Type-2 particles take the semantics tense as their first argument, Type-3 (and 4) particles take an overt time name as their first argument.

As a final remark I have to add some caveats. The semantics of adjectives on which my proposal is based is rather conservative. It works for the purposes discussed in this paper, but it cannot explain the scope puzzles arising with quantifiers in comparative clauses, which have been discussed in (Schwarzschild and Wilkinson, 2002), (Heim, 2001, Heim, 2003) among others. For instance, why is it that the quantifier *everyone of us* in *Irene is more intelligent than everyone of us is* has wide scope with respect to the comparative operator? For equatives, the present semantics can’t even express the correct truth-condition for a sentence like *Eva is as pretty as no one of us is* (= Eva is prettier than everyone of us). A treatment of these requires more elaborate methods. I think that the perspective opened in (Schwarzschild and Wilkinson, 2002) will ultimately turn out to be the most promising one: the adjective ‘tall’ doesn’t relate Ede to the degrees *d* to which Ede is tall, but to the sets *D* of degrees that contain Ede’s height. Such an account will complicate the issues considerably and will lead to a revision of the semantic rules presented her. I think that the main results obtained in this paper for the positive and the comparative can be conserved under revisions of the approach, but we will have to say something different about the equative. These issues are topics for another paper.

#### REFERENCES

- Beaver, David, and Condoravdi, Cleo. 2003. A uniform analysis of "before" and "after". In *Proceedings of SALT 13*, 37-54. Cornell, Ithaca: CLC Publications.
- Bierwisch, Manfred. 1987. Semantik der Graduierung. In *Grammatische und konzeptuell Aspekte von Dimensionsadjektiven*, eds. Manfred Bierwisch and Ewald Lang, 91-286. Berlin: Akademie-Verlag.
- Chomsky, Noam. 1986. *Knowledge of Language*. New York: Praeger.
- Condoravdi, Cleo. 2002. Punctual 'Until' as a Scalar NPI. In *The Nature of the Word*, eds. Sharon Inkelas and K Hanson. Cambridge, Mass.: MIT Press.
- Condoravdi, Cleo. 2003. Temporal Scalarity. Ms. Stanford.
- Cresswell, M. J. 1976. The Semantics of Degree. In *Montague Grammar*, ed. B. Partee, 261-292. New York: Academic Press.
- Del Prete, Fabio. 2005. *Prima e Dopo*, Department of Philosophy, University of Milan.
- Fox, Daniel, and Hackl, Martin. 2005. The universal density of measurement. Ms.
- Heim, Irene. 1994. Comments on Abusch's theory of tense: Manuscript, MIT.
- Heim, Irene, and Kratzer, Angelika. 1998. *Semantics in Generative Grammar*. Oxford: Blackwell.

- 
- Heim, Irene. 2001. Degree Operators and Scope. In *Audiatur Vox Sapientiae. A Festschrift for Arnim von Stechow*, eds. Caroline Féry and Wolfgang Sternefeld, 214 - 239. Berlin: Akademie-Verlag.
- Heim, Irene. 2003. On Quantifiers and NPIs in Comparative Clauses. Talk given at Tübingen University.
- Heim, Irene. 2004. Remarks on the negation theory of antonymy. Ms. Tübingen.
- Kamp, Hans. 1975. Two Theories about Adjectives. In *Formal Semantics of Natural Language*, ed. E. Keenan, 123 - 155. Cambridge: Cambridge University Press.
- Kaplan, David. 1979. On the Logic of Demonstratives. *Journal of Philosophical Logic* 8:81 - 98.
- Kennedy, Christopher. 2001. Polar Opposition and the Ontology of 'Degrees'. *Linguistics and Philosophy* 24:33-70.
- Klein, Ewan. 1980. A semantics for positive and comparative adjectives. *Linguistics and Philosophy* 4.1:1-45.
- Klein, Wolfgang. 2006. About the German particles *schon* and *noch*. Ms. Nijmegen.
- König, Ekkehard. 1991. *The meaning of focus particles: A Comparative Perspective.*: Routledge.
- Kratzer, Angelika. 1998. More Structural Analogies Between Pronouns and Tenses. In *SALT VIII*, eds. D. Strolovitch and A. Lawson. Cambridge, Mass.: Ithaca: CLC-Publications.
- Krifka, Manfred. 1989. *Nominalreferenz und Zeitkonstitution: Studien zur Theoretischen Linguistik*. München: Wilhelm Fink.
- Krifka, Manfred. 2000. Alternatives for Aspectual Particles. *BLS* 26.
- Ladusaw, William. 1980. *Polarity Sensitivity as Inherent Scope Relations*. New York: Garland Publishing.
- Lewis, D. 1972. General Semantics. *Synthese* 22:18-67.
- Löbner, S. 1989. German *schon-erst-noch*: An Integrated Analysis. *Linguistics and Philosophy* 12:167-212.
- Löbner, Sebastian. 1990. *Wahr neben Falsch. Duale Operatoren als die Quantoren natürlicher Sprache*. vol. 244: Linguistische Arbeiten. Tübingen: Niemeyer.
- Löbner, Sebastian. 1999. Why German *Schon* and *Noch* are Still Duals: a Reply to van der Auwera. *Linguistics and Philosophy* 22:45-107.
- Meier, Cécile. 2003. The meaning of *too*, *enough* and *so...that*. *Natural Language Semantics* 11:69-107.
- Michaelis, Laura. 1996. On the meaning of *already*. *Linguistics and Philosophy* 19:477-502.
- Schwarzschild, Roger, and Wilkinson, Karina. 2002. Quantifiers in Comparatives: A Semantics of Degree Based on Intervals. *Natural Language Semantics* 10:1-41.
- Schwarzschild, Roger. 2004. Scope Splitting in the Comparative. Ms. MIT Colloquium.
- von Stechow, Arnim. 1984a. Comparing Semantic Theories of Comparison. *Journal of Semantics* 3:1-77.
- von Stechow, Arnim. 1984b. My Reaction to Cresswell's, Hellan's, Hoeksema's and Seuren's Comments. *Journal of Semantics* 3:183-199.
- von Stechow, Arnim. 1991. Current issues in the theory of focus. In *Semantik - Ein internationales Handbuch zeitgenössischer Forschung*, eds. Arnim von Stechow and Dieter Wunderlich, 804-824. Berlin/ New York: de Gruyter.
- von Stechow, Arnim. 2002. Temporal Prepositional Phrases with Quantifiers: Some Additions to Pratt and Francez (2001). *Linguistics and Philosophy* 25:40 pages.