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The semantics of Scandinavian 'when'-clauses

Carl Vikner

The system of temporal connectives in Scandinavian exhibits an interesting variation in that Danish, like e.g. German, is a two-'when' language, i.e. it has two temporal connectives that have divided between them the semantic area covered in English by the single connective *when*. One of the two Danish connectives (*da*) is restricted to past episodic clauses, while the other one (*når*) may be used in past and present habitual clauses and in future clauses. Swedish, on the other hand, like e.g. English, is a one-'when' language: it has only one temporal connective corresponding to the two Danish ones, whereas Norwegian presents an intermediate situation, possibly a stage in the development from a two-'when' to a one-'when' system. This paper proposes a semantic analysis of the two 'when's in Danish: On the one hand, the semantics of *da*-clauses is similar to the semantics of definite DPs in that a *da*-clause presupposes that, in the current discourse situation, there is one and only one eventuality corresponding to the description it conveys. This makes it possible for a *da*-clause to have a reference-setting function with respect to its superordinate clause. On the other hand, *når*-clauses are similar to indefinite DPs in that they contribute propositions with an unbound eventuality argument, and therefore they yield descriptions of eventualities that never get referentially bound, but always occur in the scope of a non-existential quantifier. This restricts the use of *når*-clauses to habitual sentences and future sentences. This analysis involves the elaboration of a novel and more adequate formal semantic description of habitual sentences.

Keywords Danish, habituals, temporal connectives, 'when'-clauses

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1. INTRODUCTION

This paper deals with the semantics of two Danish temporal connectives, *da* 'on the occasion when' and *når* 'on occasions when', which, so to speak, split up between them the semantics of Swedish *när* 'when' (and of English *when*).[1]

The primary difference between Danish *da* and *når* seems to be the following. *Da* may only be used in past episodic clauses, that is, in clauses that describe a unique identifiable eventuality[2] belonging to the past. *Når*, on the one hand, is used in past and present habitual clauses, that is, clauses that describe a generalization over past or present eventualities, and also in future clauses, episodic as well as habitual ones. Thus, *da* has only episodic uses, *når* has mostly habitual uses, exclusively so in

clauses referring to the past or the present, but with future reference it admits also of non-habitual uses.[3]

Pairs with a distribution similar to Danish *da*/*når* are found also in German (*als*/*wenn*) and in Dutch (*toen*/*als*), whereas a similar specialization does not exist in English or Swedish, where *when* and *när* are neutral with respect to this distinction, i.e. they have both episodic and habitual uses. (Swedish has another temporal connective, *då*, which is less frequent than, but otherwise quite similar to, *när*.) Thus, there are one-'when' languages like English, Swedish, French, Italian, etc., and two-'when' languages like Danish, German and Dutch. Norwegian seems to represent an intermediate position between these two possibilities. Norwegian has two temporal connectives orthographically identical to the Danish ones, *da* and *når*, and, in the received norm, with a similar distribution. However, in modern colloquial Norwegian another picture emerges in that *når* tends to be used also in contexts to do with past episodic eventualities. Thus, we have the following rough picture of correspondences:

(1) Connectives in one-'when' and two-'when' languages

<table>
<tr><td>English</td><td colspan="2">when</td><td colspan="2">if</td></tr>
<tr><td>Swedish</td><td colspan="2">när, då</td><td colspan="2">om</td></tr>
<tr><td rowspan="2">Norwegian</td><td colspan="2">når</td><td rowspan="2">hvis</td><td rowspan="2">om</td></tr>
<tr><td>da</td></tr>
<tr><td>Danish</td><td>da</td><td>når</td><td>hvis</td><td>om</td></tr>
<tr><td>German</td><td>als</td><td colspan="2">wenn</td><td>ob</td></tr>
</table>

The left half of the table deals with the temporal domain, the right half is added only for the sake of completeness. In German, the connective *wenn* corresponding to Danish *når* is used both in temporal and conditional clauses, that is, it corresponds partly to English *when* and partly to English *if*. The English *if* introducing indirect questions corresponds to German *ob* and to Norwegian and Danish *om*. As can be seen from the table, Danish is the only one of these languages which has two connectives strictly specialized in episodic and habitual uses, respectively, so it ought to be well-suited for a closer study of episodic and habitual temporal clauses.

In the following sections I first investigate, in section 2, the syntactic structure of Danish sentences with temporal clauses, concentrating on sentences with multiple 'when'-clauses. Section 3 contains a semantic analysis of Danish *da*/*når*-clauses. In section 4 and 5, the syntactic and semantic analyses developed in the two previous

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sections are applied to multiple 'when' clauses and other complex structures. Finally, section 6 sums up and compares the situation in Danish with Swedish and English.

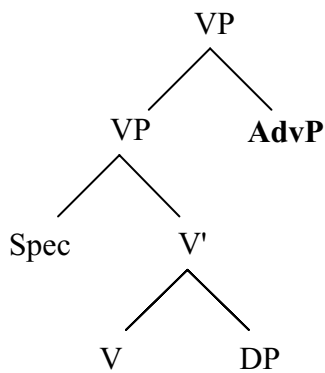
Many of the examples in the following pages are taken from or inspired by examples found in the Danish text corpus DK87-90, published by Henning Bergenholtz, Aarhus Business School, 1991; the Norwegian Oslo Corpus of Bokmål at http://www.hf.uio.no/tekstlab/; and the Swedish PAROLE Corpus at http://spraakbanken.gu.se.

2. SYNTACTIC STRUCTURE OF 'WHEN'-CLAUSES

2.1 Sentences with one 'when'-clause

I assume an underlying syntactic structure for Danish sentences like that presented in Sten Vikner (1999:86). This means that the structure of the VP is as shown in (2).

(2) Underlying syntactic structure of VP



The VP-adjoined AdvP is the canonical position of final adverbials. In Danish the class of final adverbials includes temporal adverbials, which may be instantiated by subordinate temporal clauses. Like all other final adverbials, the temporal ones may be fronted for various reasons, e.g. topicalization:

(3) a. [I går] var hun træt.
'Yesterday she was tired.'
b. [Da hun kom hjem,] var hun træt.
'(On the occasion)[4] when she came home, she was tired.'

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c. [Når hun kom hjem,] var hun træt.
'(On occasions) when she came home, she was tired.'

(Cf. de Swart (1999:340, 344), who also takes the postponed adverbials to be the basic case, and explains the more restricted range of interpretations associated with preposed time adverbials as an effect of topicalization.)

2.2 Sentences with multiple 'when'-clauses

A sentence may contain a sequence of two or more temporal clauses in final position, as shown in (4).

(4) Han blev glad når hun ringede når han var syg.
he became glad when see phoned when he was ill
'He was pleased (on occasions) when she phoned (at times) when he was ill.'

As constructions with multiple 'when'-clauses reveal some interesting differences between *da*- and *når*-clauses, I will investigate their syntactic behaviour in some detail.

When talking about such constructions, I shall, for ease of reference, number the two temporal connectives according to the linear sequence in which they occur in final position:

(5) Han blev glad når$_1$ hun ringede når$_2$ han var syg.
'He was pleased when$_1$ she phoned when$_2$ he was ill.'

Accordingly, I shall use the label CP_1 to refer to the clause introduced by the first connective, and CP_2 to refer to the clause introduced by the second. I ought to stress that I am talking here about the order of the two clauses in the canonical final position. One or both of the clauses may be moved to other positions in the sentence so that their mutual order is no longer the canonical one. In such cases I shall still use CP_1 and CP_2, referring to the clauses in canonical position.

I assume that constructions containing a sequence of two 'when'-clauses may have two possible syntactic structures. In the first structure, which I shall call the 'embedded structure', the second clause (CP_2) is contained within the first (CP_1). In the second structure, which I shall call the 'adjunction structure', CP_2 is outside CP_1. Ignoring irrelevant details, we can sketch the first structure as shown in (6).

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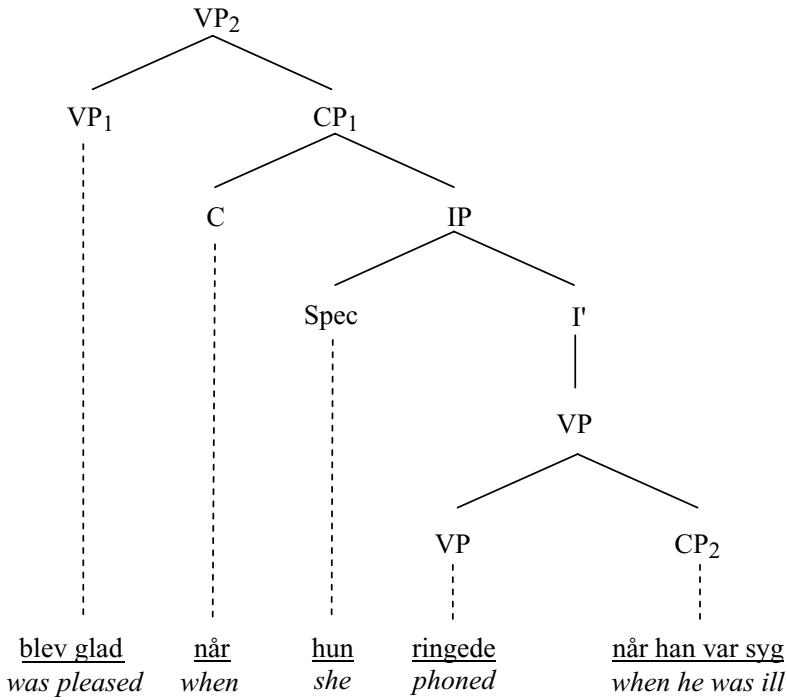
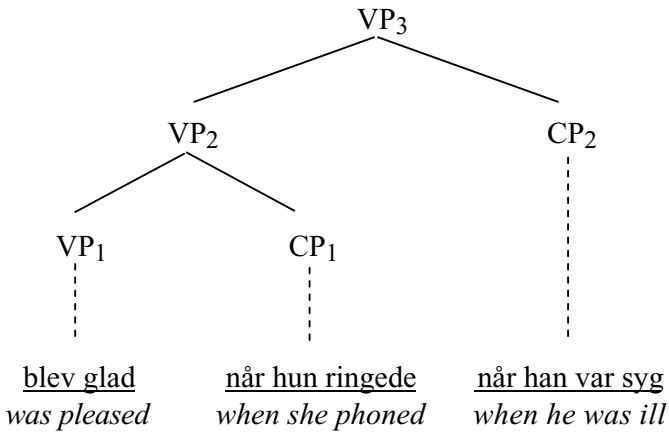
(6) The embedded structure



In this structure the second temporal clause (CP_2) is a modifier of the VP of the first temporal clause (CP_1), i.e. CP_2 is embedded within CP_1.

For the second structure I assume the following configuration:

(7) The adjunction structure



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In (7) the second temporal clause (CP_2) is a modifier of VP_2, i.e. the VP containing the first temporal clause (CP_1).

The syntactic difference between the two structures set out in (6) and (7) corresponds to both a phonetic and a semantic difference. Phonetically, the adjunction structure is marked by a slight pause or intonational break before CP_2, which does not go naturally with the embedded structure.

Semantically, the difference corresponds to two different interpretations of a sentence like (4) above, even though the difference between the two is only a subtle one. The first interpretation, the one which corresponds to the embedded structure, may be paraphrased as (8).

(8) Her calls during his illnesses made him happy.

On this interpretation, it is likely that his illnesses are the reason why she calls him. This fact fits nicely with the assumption that CP_2, i.e. 'when he was ill', is a modifier of the VP 'phoned'. The second interpretation, the one corresponding to the adjunction structure, may be paraphrased as (9).

(9) Her calls made him happy during his illnesses.

On this interpretation, it is likely that his illnesses are the reason why he is glad of her calls, cf. the assumption that now CP_2 modifies VP_2, i.e. 'was pleased when she phoned'. In section 4 below, it will be shown how the two syntactic structures determine two different semantic analyses which reflect the difference between (8) and (9).

I will return shortly, in section 2.3, to a discussion of the syntactic arguments that support the distinction between the embedded structure and the adjunction structure, but first I want to point out that these two structures are not arbitrarily distributed among the different combinations of *da*-clauses and *når*-clauses.

A priori, four different canonical two-member sequences of *da*-clauses and *når*-clauses, each with two different syntactic structures, are possible. This gives a total of eight possibilities. However, two of these possibilities are not realized. The canonical sequence *da . . . når* always realizes the embedded structure, and the canonical sequence *når . . . da* always realizes the adjunction structure. Only the sequences *da . . . da* and *når . . . når* may realize both the embedded structure and the adjunction structure. These structural possibilities can be illustrated as in the table in (10).

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(10) Structuring of *da*/*når* sequences

	Embedded structure	Adjunction structure
da . . . når	+	*
da . . . da	+	+
når . . . når	+	+
når . . . da	*	+

The impossible combination in the first column shows that a *da*-clause cannot be embedded in a *når*-clause. The impossible combination in the second column shows that a *når*-clause cannot be adjoined to a VP containing a *da*-clause. Together, these two restrictions suggest that *da*-clauses must be placed higher in the structure than *når*-clauses.

2.3 Syntactic restrictions

I still have to provide arguments supporting the two structures for sentences with two 'when'-clauses proposed in (6) and (7), and their distribution on different canonical sequences of *når*- and *da*-clauses presented in (10). Such arguments may come from considering restrictions on the possibilities of moving the temporal clauses around. A number of movements and restructurings are conceivable, some of which are possible only with one of the two structures, thus giving a suggestion about the difference between them.

The two structures may be summarized as follows:

(11) a. Embedded structure: $[_{VP2}\ VP_1\ [_{CP1} \ldots CP_2]]$
b. Adjunction structure: $[_{VP2}\ VP_1\ CP_1]\ CP_2$

I shall restrict myself to three of the possible alterations of the canonical form, namely fronted CP_2, clefted CP_2, and pseudo-clefted small VP_2. By a small VP_2 I mean a VP_2 containing CP_1, but not CP_2, i.e. a small VP_2 is a VP_2 in the adjunction structure. These three alterations are excluded with the embedded structure, but acceptable with the adjunction structure, as shown in (12) and (13).

(12) Embedded structure: *da . . . når*
a. Canonical form
Hun [$_{VP2}$ arbejdede i et supermarked [$_{CP1}$ da hun havde mareridt [$_{CP2}$ når hun sov]]].
'She worked in a supermarket (at the time) when she had nightmares (on occasions) when she slept.'

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b. Fronted CP_2
*[$_{CP2}$ Når hun sov], arbejdede hun i et supermarked [$_{CP1}$ da hun havde mareridt].
'When she slept, she worked in a supermarket when she had nightmares.'

c. Clefted CP_2
*Det var [$_{CP2}$ når hun sov], at hun arbejdede i et supermarked [$_{CP1}$ da hun havde mareridt].
'It was when she slept that she worked in a supermarket when she had nightmares.'

d. Pseudo-clefted small VP_2
*Det hun gjorde [$_{CP2}$ når hun sov], var [$_{VP2}$ at arbejde i et supermarked [$_{CP1}$ da hun havde mareridt]].
'What she did when she slept was to work in a supermarket when she had nightmares.'

(13) Adjunction structure: *når . . . da*

a. Canonical form
Hun [$_{VP2}$ gik direkte i seng [$_{CP1}$ når hun kom hjem]] [$_{CP2}$ da hun boede i Frankrig].
'She went straight to bed (on occasions) when she came home (at the time) when she lived in France.'

b. Fronted CP_2
[$_{CP2}$ Da hun boede i Frankrig], gik hun direkte i seng [$_{CP1}$ når hun kom hjem].
'When she lived in France, she went straight to bed when she came home.'

c. Clefted CP_2
Det var [$_{CP2}$ da hun boede i Frankrig], at hun gik direkte i seng [$_{CP1}$ når hun kom hjem].
'It was when she lived in France that she went straight to bed when she came home.'

d. Pseudo-clefted small VP_2
Det hun gjorde [$_{CP2}$ da hun boede i Frankrig] var [$_{VP2}$ at gå direkte i seng [$_{CP1}$ når hun kom hjem]].
'What she did when she lived in France was to go straight to bed when she came home.'

These restrictions follow directly from the two structures I have posited and assumptions about movements commonly adhered to in the generative syntactic community. The prohibition on fronting and clefting CP_2 in (12b) and (12c) follows if we assume the underlying embedded structure indicated in (12a). CP_1 and CP_2 are both adjunct clauses, and fronting and clefting CP_2 in this structure means extracting an adjunct from an adjunct, which is excluded by the theory of barriers and the

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Empty Category Principle (Haegeman 1991:498f.; cf. also Chomsky 1986:66). In the adjunction structure, on the other hand, CP_2 does not form part of another adjunct, so there is nothing to prevent it from being fronted or clefted, and this is presumably the reason why (13b) and (13c) are fine.

Pseudo-cleft sentences with *gøre* 'do' are generally taken to provide criteria for the existence of VP-structures, i.e. only VPs are assumed to be admitted in the focus position of structures like the following:

(14) Det hun gjorde . . . var at FOCUS.
'What she did . . . was to FOCUS.'

This means that the acceptability of (13d) can be taken as an indication that in this sentence *gå direkte i seng når hun kom hjem* 'go straight to bed when she came home' constitutes a VP. That is, the CP_2, *da hun boede i Frankrig* 'when she lived in France', does not form part of the CP_1, which consists solely of *når hun kom hjem* 'when she came home', and this is in accordance with the assumed adjunction structure in (13). On the other hand, the unacceptability of (12d) can be explained if we assume that the underlying structure in (12) is the embedded one, because this means that the CP_2, *når hun sov* 'when she slept', is part of the CP_1, and therefore the segment *arbejde i et supermarked da hun havde mareridt* 'work in a supermarket when she had nightmares' does not constitute a VP in this case.

(12) is an example of a canonical *da . . . når* sequence. According to my assumption, a sentence with such a sequence may only have the embedded structure. (13) presents a *når . . . da* sequence, and such a sequence is only possible in an adjunction structure. In sentences with *da . . . da* and *når . . . når* sequences, both structures seem to be possible, and in many cases it is difficult to tell the structures apart because there is only a slight semantic difference between them, and this may sometimes give the impression that all movements and restructurings are equally possible. However, I think that the sentences in (15)–(18) are perspicuous examples of unambiguous structuring yielding fairly clear-cut data when submitted to the tests used in (12) and (13).

(15) Embedded structure: *da . . . da*
Canonical form
Han [$_{VP2}$ blev forskrækket [$_{CP1}$ da lyset gik ud [$_{CP2}$ da sikringen sprang]]].
'He became frightened (on the occasion) when the light went out (on the occasion) when the fuse blew.'

(16) Adjunction structure: *da . . . da*
Canonical form
Hun [$_{VP2}$ snakkede uafbrudt [$_{CP1}$ da hun kom tilbage]] [$_{CP2}$ da hun endelig havde besøgt sin mor].
'She talked incessantly (on the occasion) when she came back (on the occasion) when she had at last visited her mother.'

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(17) Embedded structure: *når . . . når*
Canonical form
Han [$_{VP2}$ blev glad [$_{CP1}$ når hun livede op [$_{CP2}$ når han havde blomster med til hende]]].
'He was pleased (on occasions) when she cheered up (on occasions) when he brought her flowers.'

(18) Adjunction structure: *når . . . når*
Canonical form
Hun [$_{VP2}$ slappede ikke engang af [$_{CP1}$ når hun sov]] [$_{CP2}$ når hun havde rigtig travlt].
'She didn't even relax (at times) when she slept (at times) when she was really busy.'

3. SEMANTIC STRUCTURE OF 'WHEN'-CLAUSES

3.1 Simple episodic sentences

An episodic (or particular) sentence expresses a statement about a particular eventuality, e.g. about a particular event or group of events (Krifka et al. 1995:2f.). In the neo-Davidsonian theory, it is assumed that sentences contain underlying reference to eventualities which may be represented by adding an eventuality argument to the main predicate, and it is common practice to represent the meaning of episodic sentences by means of an existential quantification over this argument.[5] I shall use the variable e_D to represent this Davidsonian argument as shown in (19):[6]

(19) Hun gik i seng.
'She went to bed.'
$\exists e_D$[go-to-bed(e_D)]

Partee (1973, 1984) argues that a sentence in the simple past like (20) refers to an understood particular time.

(20) I didn't turn off the stove.

In sentences like this one the past tense 'is not understood as meaning "at some time in the past", but as referring to some relatively definite past time' (Partee 1984:245). It is an open question whether this 'definite past time' is indeed a time interval or whether it should rather be taken to be an occasion or a situation.[7] Anyway, it is important to note that (20) can only be properly interpreted if it is related to a specific time or

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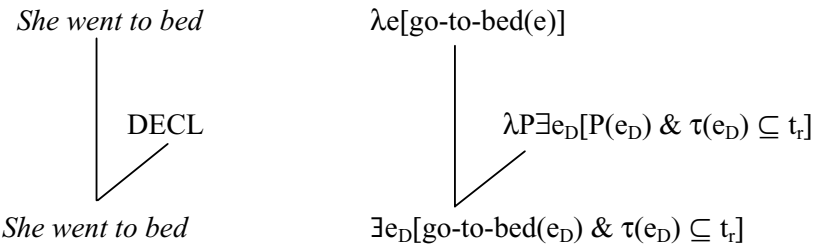
situation, i.e. a time or situation which is unique in the discourse universe and which the speaker and the hearer are able to identify somehow. If the hearer cannot identify this time or situation, the sentence will often be perceived as weird or unintelligible. In this respect a past-tense sentence behaves like an anaphoric pronoun[8] or a definite DP, such as, for instance, *the stove* in (20), which refers to a particular entity that the hearer must be able to identify in the past situation referred to.

I shall follow Krifka (1989:103), who uses the standard time variable t_r to denote the reference time and assumes that this variable is introduced at the level of the declarative operator DECL, which is translated as follows:

(21) $\lambda P \exists e_D[P(e_D) \,\&\, \tau(e_D) \subseteq t_r]$

Here P is a variable over eventuality predicates, i.e. of the type <e,t>, and τ represents Krifka's (1989:97) temporal trace function, i.e. if e is an eventuality, τ(e) is the time interval occupied by e.[9] In Krifka's framework, the declarative operator is applied to 'sentence radicals', the preterminal level of representation at which a sentence is taken to express predication over eventualities. This can be illustrated as in (22).

(22)



3.2 *Episodic* da-*clauses*

The reference time may be specified or constrained by different means. Often it will be given by the context of use or by the preceding discourse, i.e. the discourse topic is a specific past situation, but often the constraints are expressed by linguistic means in the sentence itself, e.g. by temporal frame adverbials. One very common type of frame adverbial are episodic 'when'-clauses, i.e. in Danish *da*-clauses, and their function is just to constrain the reference time. Therefore I propose the following semantic analysis of Danish sentences with a *da*-clause:

(23) Hun gik direkte i seng da hun kom hjem.
'She went straight to bed (on the occasion) when she came home.'

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$\exists e_D[\exists e_1[\text{go-to-bed}(e_D) \,\&\, \text{come-home}(e_1) \,\&\, \forall e'[\text{come-home}(e') \rightarrow e' = e_1] \,\&\, \text{WHEN}(e_1,e_D)] \,\&\, \tau(e_D) \subseteq t_r]$[10]

The representation in (23) states that there must be one and only one eventuality e_1 satisfying the predicate *come-home*, i.e. the description given in the temporal clause. Evidently, this uniqueness constraint should be restricted to a contextually relevant time interval, e.g. by placing suitable constraints on the variable e'. For ease of reading, I will, however, omit in what follows the explicit statement of the uniqueness restriction altogether, and content myself with the existential quantification over e_1.

The temporal location of the main clause eventuality e_D relative to the eventuality described by the temporal clause e_1 is represented in (23) by means of the operator WHEN. This operator is meant to represent a relation of temporal linking corresponding to the English connective *when*, i.e. the relation which is asserted to hold between two eventualities when the clauses describing them are joined by means of the connective *when* such that the first argument of WHEN represents the *when*-clause eventuality, and the second argument represents the superordinate clause eventuality. The rationale for using this operator is that the temporal relations expressed by the English connective *when* and its equivalents in other languages have been extensively studied by a number of scholars, including Olsson (1971), Heinämäki (1978), Ritchie (1979), Partee (1984), Hinrichs (1986), Borillo (1988), Moens & Steedman (1988), Hamann (1989), Sandström (1993), de Swart (1993), Bonomi (1997) and Steedman (1997). These studies contain a wealth of knowledge of the WHEN-relation. Among other things, it has been noted that the temporal relation may vary with the aspectual types of the eventualities involved. Thus, for instance, with the combination WHEN(state,event), the default relation is one of temporal inclusion: event $\subset$ state, and with the combination WHEN(event1, event2), the default case is simultaneity or immediate sequence: event1 $<$ event2.

In (23), the temporal clause eventuality e_1 is only indirectly related to the reference time t_r through the conjoined constraints on e_D: WHEN(e_1,e_D) and $\tau(e_D) \subseteq t_r$. A number of semanticists (e.g. Parsons 1994:227) analyse temporal clauses as constraining directly the reference time, e.g. by means of a condition equivalent to $\tau(e_1) \subseteq t_r$. However, this introduces a redundancy, which I prefer to avoid.

I thus assume the following semantic representation of the Danish episodic temporal connective *da* '(on the occasion) when':

(24) *da* $\lambda Q[\lambda P[\lambda e[\exists e_1[P(e) \,\&\, Q(e_1) \,\&\, \forall e'[Q(e') \rightarrow e' = e_1] \,\&\, \text{WHEN}(e_1,e)]]]]$

The derivation of the representation in (23) can now be carried out as shown in (25), where the uniqueness constraint $\forall e'[Q(e') \rightarrow e' = e_1]$ is left out.

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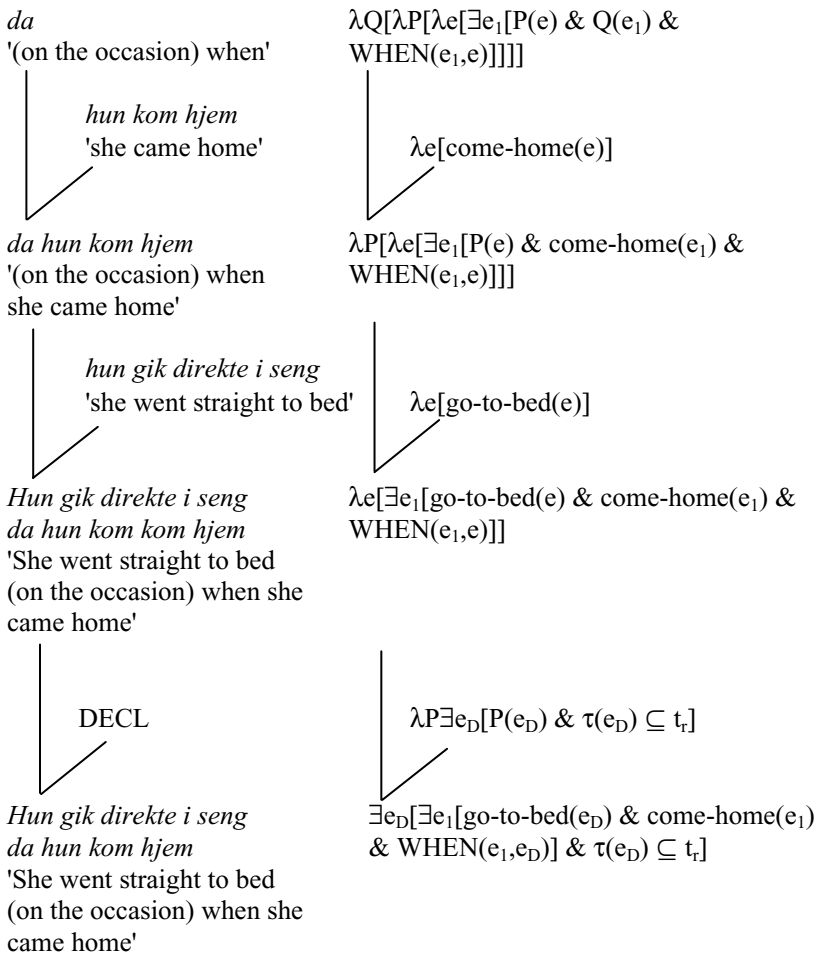
(25)



3.3 Simple habitual sentences

3.3.1 Habitual states

Habitual sentences are a subtype of generic (or characterizing) sentences (Krifka et al. 1995:36). The predicate of a habitual sentence is morphologically related to an episodic predicate. Thus, the habitual *Mary smokes* contains the verb *smoke*, which may also be used to form an episodic sentence such as *Mary is smoking*. The latter sentence describes an instance of Mary's smoking, whereas the former, the habitual, generalizes over such episodic eventualities.

When giving the semantic representation of habitual sentences, some semanticists use universal or generic quantification over the Davidsonian argument or over

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the argument representing the reference time, i.e. my e_D and my t_r, respectively. Thus, Chierchia (1995:101), having presented the Davidsonian argument e goes on to state that '[t]he event argument, besides being existentially closed . . . , can also be quantified over by a Q-adverb' (see also Chierchia 1995:119), and then gives the following translation of the sentence *When Pavarotti sings, I am always happy* (cf. also Kratzer 1995:130):

(26) $\forall e\,[\text{sing}(\text{Pavarotti},e)]\,[\exists e'\,[\text{overlap}(e,e') \wedge \text{happy}(\text{I},e')]]$

Parsons (1994:210) proposes a comparable analysis of the habitual sentence *At noon, Mary always runs*, where '"always" has turned the default existential quantifier over periods of time into a universal'. But Parsons has a second type of analysis of habitual sentences, which gives a representation with a wide-scope existential quantifier and in the scope of that existential quantifier a universal quantification over times, i.e. the quantifier pattern is $\exists I \ldots \forall t$ (Parsons 1994:215, 227). Bonomi's (1997:484, 486) analysis of habitual sentences is similar to this pattern; in fact, he uses a wide-scope existential quantification over intervals of times followed by a universal quantification over eventualities, that is, his analysis has the pattern $\exists i \ldots \forall e$. Such analyses are more in line with what I would like to propose in that they maintain a top level existential quantification even in the case of habituals.

It is generally agreed that habitual sentences describe states (see, for example, Vikner & Vikner (1997:274) and the literature cited there). Krifka et al. (1995:16f., 36) also argue for this point of view but, at the same time, they claim that habitual statements 'do not report on specific situations' (Krifka et al. 1995:36). This is consistent with their use of wide-scope universal, or rather generic, quantification in the semantic representation of habitual sentences.

I would like to argue that habitual statements do report on specific situations. A sentence like *Mary smoked* (taken in its habitual reading) does not report on specific smoking situations, but it reports on a specific habitual state, and consequently a specific eventuality. It says that at a particular past time Mary had the habit of smoking. An argument for this view is that habitual sentences can be modified by temporal adverbials such as *for three months* or *last year* or *from 1997 to 1999*. Such adverbials clearly modify the habitual state. I therefore assume that habitual sentences are like all other declarative sentences in that at the topmost level they describe a single eventuality, which here happens to be a habitual state.

In section 4 below I present data concerning complex structures involving habituals which seem very difficult to account for in a systematic way without such an assumption.

3.3.2 Semantic representation

In order to give an adequate semantic representation of a habitual sentence, we therefore need to be able to represent the habitual state in such a form that it constrains

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the existentially bound Davidsonian argument e_D, and this is not straightforward. Let us begin by looking at the generic quantification itself. Here I will adopt the analysis of generic sentences developed in Krifka et al. (1995:23ff.), which builds on the theory of adverbial quantification worked out by Lewis, Kamp, Kratzer, Heim and others. Adverbs of quantification are adverbs such as *always*, *usually*, *sometimes*, *seldom*, etc. Generic sentences that do not contain such an adverb are analysed as if they contained an implicit quantificational adverb, close in meaning to *usually* or *typically*, and represented by a dyadic generic quantifier GEN in a so-called tripartite structure, i.e. a structure that comprises three parts, an operator part, a restriction (or restrictive clause) and a matrix (or nuclear scope).

Habitual sentences express generalizations over eventualities. My simplified Krifka-style representation of habituals looks as follows:

(27) $\text{GEN}e_1[\textbf{Restriction}(e_1); \exists e[\textbf{Matrix}(e) \,\&\, \text{WHEN}(e_1,e)]]$

GEN symbolizes the generic operator, which is dependent on a modal background that makes appeal to normality. (27) says that for any eventuality e_1 that satisfies **Restriction** and that is somehow 'normal', there is an eventuality e that satisfies **Matrix** and that occurs when e_1 occurs. (See Krifka (1995:255f.) and Krifka et al. (1995:23–36) for more detailed presentations.)

As a matter of fact the WHEN-operator is not used with the generic quantifier in Krifka et al. (1995). They use a notation *in s*, meaning 'in the situation *s*', as shown in (28), reproduced from Krifka et al. (1995:30).

(28) Mary smokes when she comes home.
GEN[s,x;](x = **Mary** & x **comes home** in s; x **smokes** in s)

This notation does not state exactly the temporal relation between the coming home eventualities and the smoking eventualities (which one comes first?). However, in habituals we have exactly the same sort of temporal linking between the two eventualities as with episodic 'when' discussed in section 3.2 above, and presenting the same range of aspect-dependent variation of the temporal relation. This is also the case when there is no overt 'when'-clause in the habitual sentence, i.e. when the restriction is left implicit. Consider the following example:

(29) Drengene var bange for Anne. Hun slog altid igen.
'The boys were afraid of Anne. She always hit back.'

In such a case the quantifier *altid/always* presupposes a restriction like 'when someone hit Anne'. And there is a clear relation of immediate temporal sequence between the two hitting eventualities. That means that we can represent the generic quantification expressed in a sentence such as *Anne slog igen* 'Anne hit back', without an overt adverb of quantification, but taken in its habitual reading, as shown in (30).[11]

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(30) Anne slog igen.
'Anne hit back.'
$\mathrm{GEN}e_1$[someone-hit-Anne(e_1); $\exists e$[Anne-hit-back(e) & WHEN(e_1,e)]]

That is, I assume, like Krifka et al. (1995), that habitual sentences always come with a quantificational adverb, which may be left implicit, and that this quantifier always comes with a restriction, which may also be left implicit, and I shall further assume, unlike Krifka et al. (1995), that, when the restriction is not stated explicitly, there is always a WHEN-relation between the implicit restriction eventuality and the matrix eventuality.

The generic quantification in (30) specifies the conditions which must be fulfilled in order for the habitual state to hold, and the habitual state lasts exactly as long as these conditions are fulfilled. However this is not the whole story. The representation of the top eventuality still remains to be elaborated. This I propose to do by introducing a notation $e : \phi$, where e is an eventuality and ϕ a generic quantification, and which should be understood as 'e may be described as ϕ' or 'e is a state that holds if and only if ϕ'. It is by no means straightforward to give a formal definition of this notation. The best proposal I can come up with is the following:

(31) Definition of $e : \phi$

$$
\begin{aligned}
&\mathrm{e} : \mathrm{GEN}e_1[\mathrm{Restriction}(e_1); \exists e_2[\mathrm{Matrix}(e_2) \,\&\, \mathrm{WHEN}(e_1,e_2)]] \\
&\Leftrightarrow_{\mathrm{Def}} \\
&\mathrm{GEN}e_1[\mathrm{Restriction}(e_1) \,\&\, \tau(e_1) \subset \tau(\mathrm{e}); \\
&\exists e_2[\mathrm{Matrix}(e_2) \,\&\, \mathrm{WHEN}(e_1,e_2)]] \,\& \\
&\forall e_3[\Box[\mathrm{GEN}e_1[\mathrm{Restriction}(e_1) \,\&\, \tau(e_1) \subset \tau(e_3); \\
&\exists e_2[\mathrm{Matrix}(e_2) \,\&\, \mathrm{WHEN}(e_1,e_2)]]] \rightarrow e_3 = \mathrm{e}]
\end{aligned}
$$

(31) is intended to state that $e : \phi$ is true if and only if it is generally the case that when an eventuality e_1 satisfying the restriction occurs during the e-interval, i.e. at a time where the habitual state holds, then an eventuality e_2 satisfying the matrix also occurs. The universal quantification part of (31) is intended to ensure that e is uniquely determined by the satisfaction of the generic statement, i.e. that e is in fact the habitual state, and not just any eventuality accidentally co-temporal with it.

However, Jan Tore Lønning has pointed out to me that there are considerable unsolved problems connected with the incorporation of eventualities into modal logic. Thus we need answers to a number of important questions, including the following: Is the part–whole relation between eventualities world-dependent or is it constant across worlds? Is the temporal trace function world-dependent or not? Are there any properties of eventualities that hold in all possible worlds? As yet, there is no standard model providing a uniform solution to all the essential problems raised by combining possible worlds and eventualities. My definition (31), therefore, suffers from severe weaknesses and can only be taken to be a tentative suggestion of what I mean by a habitual state e described by means of a generic quantification ϕ.

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Making use of the notation $e : \phi$, we can now state the representation of the habitual sentence in (30) as follows:

(32) Anne slog igen.
'Anne hit back.'
$\exists e_D[e_D : GENe_1[someone\text{-}hit\text{-}Anne(e_1); \exists e[Anne\text{-}hit\text{-}back(e) \&$
$WHEN(e_1,e)]] \& \tau(e_D) \subseteq t_r]$

3.4 *Habitual* når*-clauses*

3.4.1 *The influence of focus structure*

Armed with the notational machinery presented in the previous section, we can now give the semantic representation of a *når*-construction:

(33) Hun gik direkte i seng når hun kom hjem.
'She went straight to bed (on occasions) when she came home.'
$\exists e_D[e_D : GENe_1[come\text{-}home(e_1); \exists e[go\text{-}to\text{-}bed(e) \&$
$WHEN(e_1,e)]] \& \tau(e_D) \subseteq t_r]$

When uttering a sentence containing a *når*-clause, such as the one in (33), one still talks primarily about just one eventuality, and the sentence says that this eventuality consists in her having the habit of going straight to bed when coming home. That is, properly speaking, sentences containing a *når*-clause do not describe repetitions of events, they describe a single habitual state, where the description of this state then makes use of repeated single events, but this is another story, of secondary importance. This phenomenon is found also in sentences like (34), which – just like the *når*-constructions – describe a state that, on a secondary level, involves repeted events.

(34) She was a heavy smoker.

On the basis of examples like (33), it may seem tempting to ascribe the habitual meaning directly to the connective *når* and assume a semantic representation for *når* that contains the generic operator and places the content of the *når*-clause in the restriction of a generic quantification. This would, however, be too simplistic for at least two reasons. First, *når*-clauses often combine with adverbs of quantification which give rise to a quantifier other than GEN, e.g. *sommetider* 'sometimes', *sjældent* 'seldom', *aldrig* 'never'. Second, the content of the *når*-clause does not always provide the restriction, it may also provide the matrix of a quantificational structure although, as a matter of fact, it is not *når* that decides this; it is the focus structure of the sentence. To see this consider the following examples:

(35) Når Anne kom til Silkeborg, gik hun til tandlæge.
'(On occasions) when Anne went to Silkeborg, she saw a dentist.'

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(36) Anne gik til tandlæge når hun kom til Silkeborg.
'Anne saw a dentist (on occasions) when she went to Silkeborg.'

(35) gives information about the course of Anne's visits to Silkeborg, and we are told that usually on such a visit she went to see a dentist. This interpretation can be represented as follows:

(37) $\exists e_D[e_D : GENe_1[go\text{-}to\text{-}Silkeborg(e_1); \exists e[see\text{-}a\text{-}dentist(e) \& WHEN(e_1,e)]] \& \tau(e_D) \subseteq t_r]$

(36), on the other hand, has two readings. The first is natural if the sentence is an answer to the question *What did Anne do during her visits to Silkeborg?*, i.e. Silkeborg-visits constitute the topic and dental visits the focus. This reading is identical to the one just given for (35). The second reading may occur if the sentence is an answer to the question *How did Anne manage to see a dentist?* With this reading, we are told that usually a dental visit is made during a trip to Silkeborg, i.e. dental visits constitute the topic and Silkeborg visits the focus. This reading can be represented as follows:

(38) $\exists e_D[e_D : GENe[see\text{-}a\text{-}dentist(e); \exists e_1[go\text{-}to\text{-}Silkeborg(e_1) \& WHEN(e_1,e)]] \& \tau(e_D) \subseteq t_r]$

Thus, the content of a *når*-clause sometimes provides the restriction, (37), and sometimes the matrix, (38), of a generic quantification. This variation is linked systematically to the focus structure: the topic contributes to the restriction, the focus to the matrix (Partee 1991:174). The reason why (35) appears to have only one reading whereas (36) has two, is that in (35) the *når*-clause is fronted, and this usually indicates topicalization, the result being that unless the context or intonation gives clues to the contrary, the dental visits will be understood as being in focus. In (36), on the other hand, the temporal clause is in canonical position, and this is neutral with respect to the topic/focus difference; thus, seen in isolation and in the absence of explicit focus marking, a sentence like (36) ends up being ambiguous.[12]

3.4.2 Semantic derivation

What is common to the two *når*-structures in (37) and (38) is that the main clause eventuality, e, is temporally linked to the *når*-clause eventuality, e_1, by the relation WHEN(e_1,e). Consequently, I assume the following semantic representation of *når*:

(39) *når* $\lambda Q[\lambda P[\lambda e[\lambda e_1[P(e) \& Q(e_1) \& WHEN(e_1,e)]]]]$

(39) says, roughly, that there is a WHEN-relation between (an unspecified number of) eventualities of type Q and eventualities of type P.

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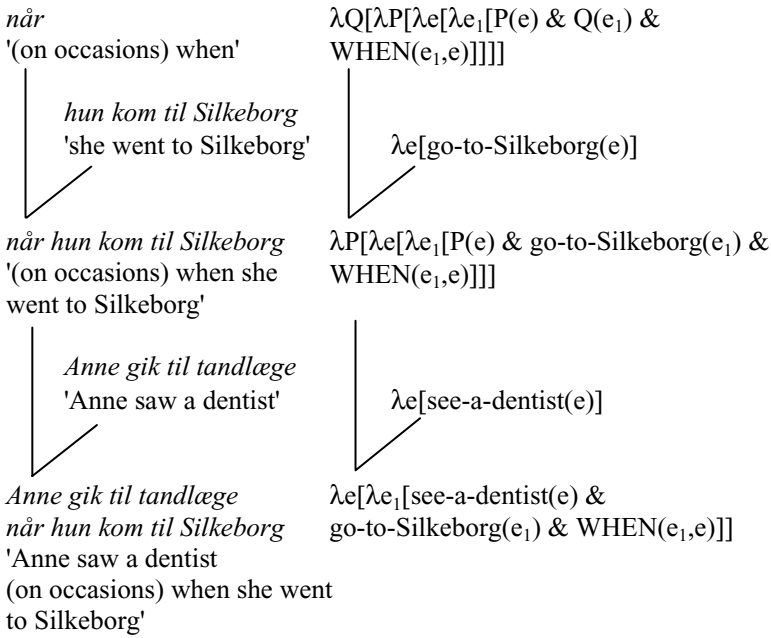
The first steps of the derivation of the semantic representations (37) and (38) are shown in (40).

(40)



For the variable e_1 to get bound, the final representation in (40) must occur in the scope of a generic quantification, covert or overt. As a matter of fact, a generic quantification structure may be derived on the basis of this representation, provided that the representation specifies which part of it belongs to the focus. Several formal semantic analyses for carrying out such a derivation have been proposed (e.g. Rooth 1985, 1995; Krifka 1995, 1999; von Fintel 1995). I will not go into details of this here, but simply assume some system of rules which can convert representations like the result of (40) into appropriate generic quantifications. Depending on the focus structure, we end up with two different results. If the main clause, *Anne gik til tandlæge*, i.e. *see-a-dentist*(*e*), is in focus, we get a representation like the following (I use the variable e_h to represent the habitual state):

(41) $\lambda e_h[e_h : GEN e_1[\text{go-to-Silkeborg}(e_1); \exists e[\text{see-a-dentist}(e) \& \text{WHEN}(e_1,e)]]]$

Now the DECL-operator (cf. (21)) is applied to (41), and this results in the representation (37). If, on the other hand, the *når*-clause is in focus, a similar procedure will result in (38).[13]

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3.4.3 Focus sensitivity

The behaviour of *når*-clauses discussed in connection with (35) and (36) above contrasts with the *da*-facts. Consider the following examples:

(42) Da Anne kom til Silkeborg, gik hun til tandlæge.
'(On the occasion) when Anne went to Silkeborg, she saw a dentist.'

(43) Anne gik til tandlæge da hun kom til Silkeborg.
'Anne saw a dentist (on the occasion) when she went to Silkeborg.'

In these sentences there is no variation of meaning corresponding to the one detected in the *når*-constructions. Both (42) and (43) say that Anne's seeing the dentist occurs during her unique visit to Silkeborg.[14] The sentences may have varying focus structure, but this has no influence on their truth conditions.

This contrast between (habitual) *når* and (episodic) *da* must be attributed to the focus sensitivity of the generic operator GEN (and of overt adverbs of quantification such as *always*, *usually*, *never*, etc.; cf. Rooth 1985:164). Habitual *når*-clauses must always occur in the scope of a (generic) quantifier, and therefore *når*-constructions present the ambiguity in question. *Da*-clauses cannot occur in the scope of such quantifers (cf. the discussion in section 4 below), and therefore they do not admit of this ambiguity.[15]

3.5 Semantic difference between da and når: 'definite' and 'indefinite' 'when'-clauses

Both *da*-clauses and *når*-clauses have a temporal-linking function represented by the WHEN-operator, i.e. they both temporally link the eventuality described by the superordinate clause to the eventuality described by their own clause.

The most conspicuous distinguishing feature of *da*-clauses is that they describe one specific eventuality. For a clause of the form *da p* to be used felicitously it must be the case that the current discourse situation contains one and only one eventuality satisfying the description *p*. This is reflected in the representation proposed in section 3.2 above for *da*-clauses:

(44) *da hun kom hjem* '(on the occasion) when she came home'
$\lambda P[\lambda e[\exists e_1[P(e)$ & come-home(e_1) & $\forall e'[$come-home $(e') \rightarrow e' = e_1]$ &
WHEN$(e_1,e)]]]$

Thus, *da*-clauses strikingly resemble definite DPs. Therefore it is tempting to conclude that *da*-clauses are akin to definite DPs, and *når*-clauses to indefinite DPs, and, as a matter of fact, there are a number of similarities.

It has often been noted in the literature that indefinite DPs have no quantificational force of their own but are subject to quantificational variability, so that they depend on quantifiers in their context. For instance, quantificational adverbs such as *usually* and *seldom* can make indefinite DPs vary in quantificational force, as can be seen in

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the following examples (adapted from Diesing 1992:5), where the b-examples give paraphrases of the a-examples:

(45) a. A cellist usually plays too loudly.
b. Most cellists play too loudly.
(46) a. A cellist seldom plays out of tune.
b. Few cellists play out of tune.

In this respect, *når*-clauses are like indefinite DPs. They have no quantificational force of their own, but vary with the quantifier they combine with in a way exactly parallel to that observed in (45) and (46). Here are two examples:

(47) a. Når hun spillede cello, spillede hun som regel for højt.
'(On occasions) when she played the cello, she usually played too loudly.'
b. Ved de fleste lejligheder spillede hun for højt på cello.
'On most occasions she played the cello too loudly.'
(48) a. Når hun spillede cello, spillede hun aldrig falsk.
'(On occasions) when she played the cello, she never played out of tune.'
b. Ved ingen lejligheder spillede hun falsk på cello.
'On no occasions she played the cello out of tune.'

Motivated by observations like the above about the quantificational variability of indefinite DPs, Kamp (1981) and Heim (1982) independently proposed theories which claim that there is no inherent quantification associated with indefinite DPs. Indefinites merely introduce unbound variables into the semantic representation, and these variables are then bound by some other quantificational operator in the sentence (see Diesing (1992:5–8) for a clear and succinct exposition of the Kamp-Heim theory).

I have assumed a similar approach to the semantics of *når*-clauses in section 3.4 above:

(49) *når hun kom til Silkeborg*
'(on occasions) when she went to Silkeborg'
$\lambda P[\lambda e[\lambda e_1[P(e)$ & go-to-Silkeborg(e_1) & WHEN$(e_1,e)]]]$

What a *når*-clause contributes to the semantic representation, then, is an open proposition in the sense that its eventuality argument e_1 is unbound. Now, operators like quantificational adverbs must have access to such structures. In the words of Partee (1991:180), such operators are 'semantically looking for an open proposition or property to quantify over'. That is why a *når*-clause can go into the restriction or the matrix of a quantificational structure.

There is, however, one point where *når*-clauses differ from indefinite DPs. With indefinite DPs there is a default existential quantification. That is, if there is no other quantificational operator around, the variable introduced by the indefinite DP

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is bound by an implicit existential quantifier (Diesing 1992:6). This will not do for *når*-clauses. A *når*-construction without an explicit adverb of quantification in the main clause receives a habitual interpretation, not an existential one. This means that in the default case the eventuality argument of a *når*-clause is bound by the generic operator, GEN.

Most sentences that are not explicitly marked for an episodic or a habitual reading are simply ambiguous with respect to this distinction. In the semantic representation the difference is expressed by the absence or the presence of the generic operator, but this difference is not brought about by the *da*-clause or the *når*-clause; it is already there, so to speak. I assume that it is encoded in every independent sentence. The semantics of the *når*-clause is such that in a past or present context it must combine with a main clause containing an operator quantifying over eventualities (at least in the purely temporal use of *når*), and therefore the presence of a *når*-clause signals habituality, but in fact it is not *når* which contributes the habituality, *når* is only a symptom.

4. COMPLEX HABITUAL STRUCTURES

In section 3.4 above it was illustrated that *når*-clauses can be involved directly in habitual structures, i.e. in generic quantifications over eventualities, in the sense that they provide semantic material for the restriction or the matrix of such a quantification. *Da*-clauses are very different in this respect, they can never be internal parts of such quantificational structures.

However, both *da* and *når* may interact with habitual structures in other ways. Like other subordinating connectives, *da* and *når* combine two clauses, a main clause and a subordinate clause, and each of these clauses may itself be a habitual description. This gives rise to different complex structures, in which the dissimilar semantics of the two connectives manifests itself. The habitual structure may constitute the main clause or it may contribute the content of the temporal clause. The restriction of the habitual structure may be implicit or it may be expressed explicitly by means of a *når*-clause. These latter cases are identical to the different types of *når*-bearing multiple 'when'-clauses presented in section 2.

In the present section I would like to show that the syntactic and semantic analyses proposed in sections 2 and 3 can account for the possible interpretations of all the *når*-bearing constructions, except for the puzzling case of (65) in section 4.2.2 below. Cases with implicit restriction can be described in a way parallel to the *når*-constructions, with the only difference that the representation of the lower *når*-clause is replaced by the representation of an implicit restriction.

4.1 Habitual structure in the main clause

Constructions with the habitual structure in the main clause correspond to multiple 'when'-constructions with the adjunction structure, i.e. constructions where CP_2 is adjoined to the VP_2 containing the lower *når*-clause.

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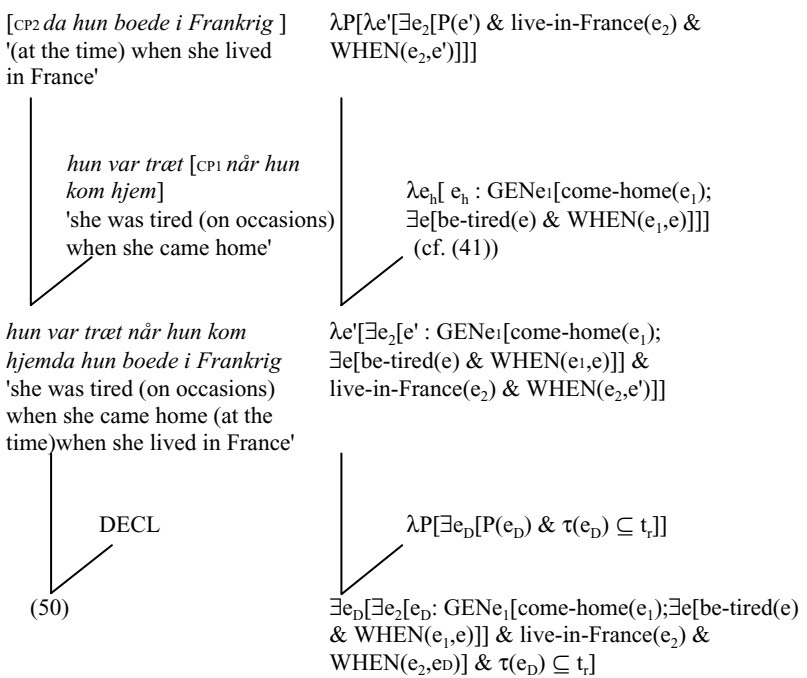
4.1.1 Da-*clause + habitual structure*

A *da*-clause may be combined with a main clause containing a habitual structure. If the restriction of the habitual structure is provided by a *når*-clause, we have an instance of a *når . . . da* sequence. As mentioned in section 2, constructions with a *når . . . da* sequence always have an adjunction structure, cf. example (13) in section 2 above. A similar example is shown in (50).

(50) Hun [$_{VP2}$ var træt [$_{CP1}$ når hun kom hjem]] [$_{CP2}$ da hun boede i Frankrig].
'She was tired (on occasions) when she came home (at the time) when she lived in France.'

In such a structure the *da*-clause yields a temporal linking of the eventuality described by VP_2, that is, of the habitual state. The semantic derivation for (50) looks as shown in (51). In this and the following semantic representations in this section, I use the type of representation shown in (41) for the clause containing the lower *når*-clause.

(51)



This derivation results in the desired representation for (50), with the eventuality e_2 of CP_2, i.e. of the *da*-clause, temporally linking the habitual state e_D.

Consider now an example such as (52) with implicit restriction in the habitual structure:

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(52) Hun var ofte træt da hun boede i Frankrig.
'She was often tired (at the time) when she lived in France.'

In (52) the *da*-clause specifies a unique situation characterized by her living in France, and the whole sentence says that in that situation there were many occasions where she was tired. So here *ofte* 'often' does not quantify over living-in-France eventualities, because the *da*-clause says that there is one and only one such eventuality. That is, the *da*-clause does not provide a restriction for the quantifier OFTEN. This restriction is left implicit, as it would be in the corresponding sentence without the *da*-clause:

(53) Hun var ofte træt.
'She was often tired.'
$\exists e_D[e_D : \text{OFTEN}e'[\text{normal-being-tired-situation}(e')$;
$\exists e[\text{be-tired}(e) \,\&\, \text{WHEN}(e',e)]] \,\&\, \tau(e_D) \subseteq t_r]$

What happens when the *da*-clause is added to (53) to give (52), is that a temporal frame is provided for the habitual state described by (53), so we get the following semantic representation of (52) above:

(52′) $\exists e_D[\exists e_1[e_D : \text{OFTEN}e'[\text{normal-being-tired-situation}(e')$;
$\exists e[\text{be-tired}(e) \,\&\, \text{WHEN}(e',e)]] \,\&\, \text{live-in-France}(e_1) \,\&$
$\text{WHEN}(e_1,e_D)] \,\&\, \tau(e_D) \subseteq t_r]$

This representation shows that the *da*-clause does not occur in the scope of the OFTEN-quantifier, it is completely outside the quantification structure.

In many cases the combination of a *da*-clause and a habitual structure is impossible or results in sentences that are difficult to interpret. Consider (54).

(54) ?Videokameraet var ofte tændt da mødet begyndte.
'The video camera was often on (on the occasion) when the meeting began.'

Again OFTEN cannot quantify over the eventuality described by the *da*-clause, because there is only one such eventuality in the given situation, i.e. we are talking about a single meeting. There is nothing else for OFTEN to quantify over in (54), and it is difficult to figure out what an implicit restriction could be, so the sentence is simply odd.

4.1.2 Når-*clause + habitual structure*

If a *når*-clause is combined with a main clause containing a habitual structure with the restriction provided by another *når*-clause, we have an instance of a *når . . . når* sequence with an adjunction structure, cf. the example (18) in section 2 above. (55) presents a similar example.

(55) Hun [$_{VP2}$ var træt [$_{CP1}$ når hun kom hjem]] [$_{CP2}$ når hun boede i Frankrig].
'She was tired (on occasions) when she came home (at times) when she lived in France.'

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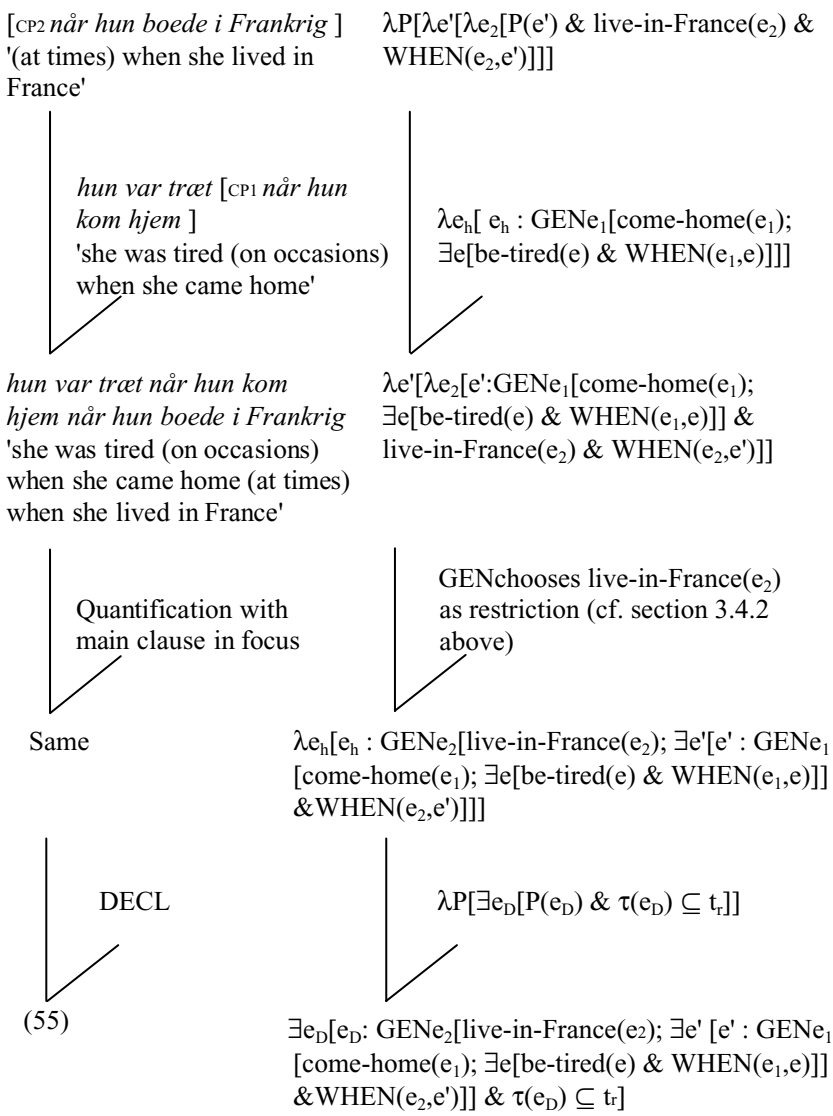
This is an example of a complex habitual structure involving two habits. The main clause in (55) describes the habit of being tired when coming home. This is exactly identical to the habit described in the example (50) above. The entire sentence in (55) describes another habit, namely the habit of having the main clause habit when living in France.[16]

The semantic representation of (55) can be derived as shown in (56).

(56)



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The main clause may describe a habitual state on its own with the restriction left implicit, exactly as in the example (52):

(57) Hun var ofte træt når hun boede i Frankrig.
'She was often tired (at times) when she lived in France.'

This is a two-habit construction just like (55) and its semantic representation is like the one shown in (56), except that the 'come-home' predicate is replaced by the predicate 'normal-being-tired-situation'.

On the surface, (57) looks very much like a normal one-habit *når*-construction, such as (33). In fact, such constructions have two possible interpretations. Either the normal one-habit interpretation (discussed in section 3.4 above), where the *når*-clause provides the restriction or the matrix of the habitual structure, or the two-habit interpretation, which is the subject of the present section.

In most cases this ambiguity is not felt by the language user, because contextual or common-sense knowledge tells us something about the typical relative lengths of the eventualities involved. If it is plausible that only one matrix eventuality occurs during one restriction eventuality, the one-habit interpretation is the preferred one:

(58) Når Anne var syg, flyttede Peter ofte ind og boede hos hende.
'(At times) when Anne was ill, Peter often moved in and stayed with her.'

If, on the other hand, it is most plausible that several matrix eventualities occur during one restriction eventuality, the two-habit interpretation will be felt as the natural one:[17]

(59) Når Anne var syg, strøg Peter hende ofte over håret.
'(At times) when Anne was ill, Peter often stroked her hair.'

4.2 Habitual structure in the temporal clause

Constructions with a habitual structure in the temporal clause correspond to multiple 'when'-constructions with the embedded structure, i.e. constructions where CP_2 constitutes the lower *når*-clause, which forms part of CP_1.

4.2.1 Da + habitual structure

Constructions with a *da . . . når* sequence always have an embedded structure, i.e. a structure where the *når*-clause is embedded in the *da*-clause, cf. the example in (12) in section 2.3 above. (60) below presents a similar example:

(60) Anne [$_{VP2}$ havde ingen børn [$_{CP1}$ da hun joggede [$_{CP2}$ når hun kom hjem]]].
'Anne had no children (at the time) when she jogged (on occasions) when she came home.'

In such a structure the *når*-clause enters into a generic quantification which constitutes the content of the *da*-clause. That is, the *da*-clause describes a habitual state.

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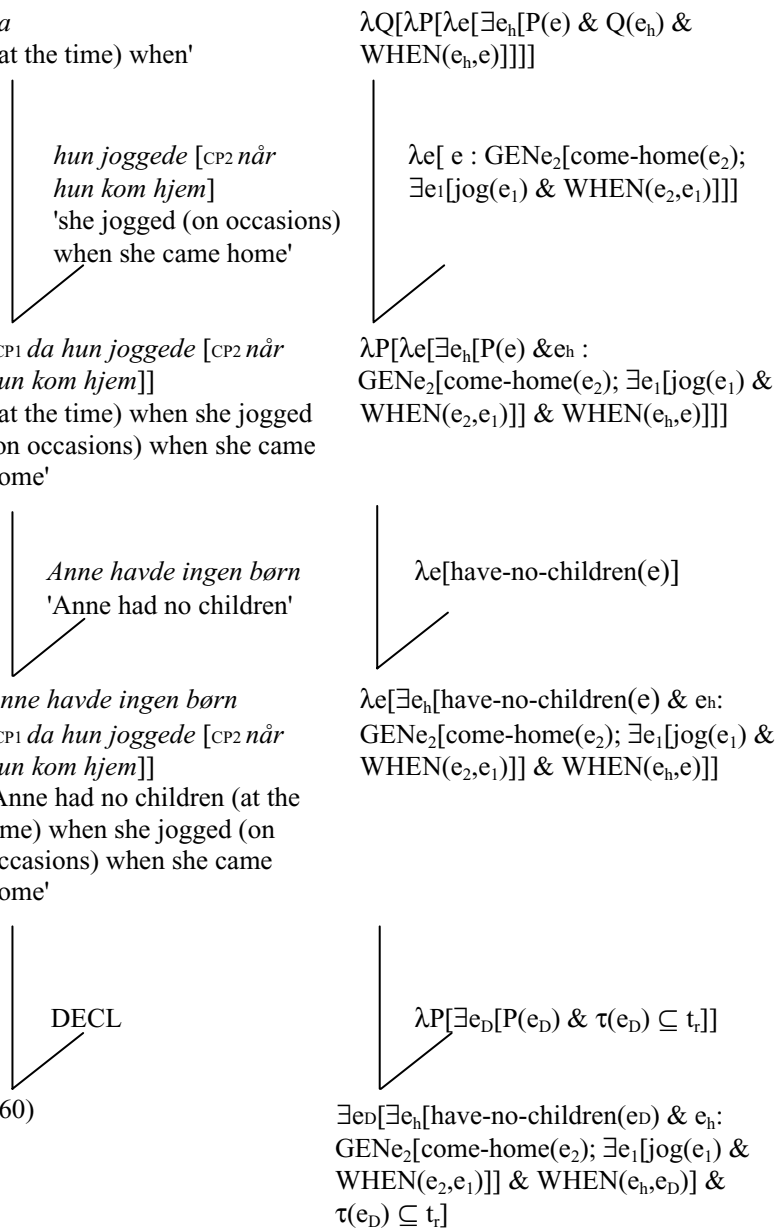
The derivation of the semantic representation for (60) is shown in (61).

(61)



The restriction of the habitual structure in the *da*-clause may be left implicit as in the following example:

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(62) Anne havde ingen børn da hun sommetider joggede.
'Anne had no children (at the time) when she sometimes jogged.'

4.2.2 Når + *habitual structure*

In section 4.1.2 above I discussed *når . . . når* sequences with an adjunction structure, which are associated with a two-habit interpretation. *Når . . . når* sequences may also have an embedded structure (as shown in connection with example (17) in section 2), and this gives rise to another kind of two-habit structure. Consider the following example:

(63) Anne [$_{VP2}$ havde en bedre kondi [$_{CP1}$ når hun joggede [$_{CP2}$ når hun kom hjem]]].
'Anne was more fit (on occasions) when she jogged (on occasions) when she came home.'

In (63) CP_1 describes the habit of jogging when coming home, and the entire sentence describes another habit, namely the habit of being more fit when having the CP_1 habit.

The semantic representation of (63) is shown in (63′). As in the previous cases, it can be derived compositionally, but I will omit the details here.

(63′) $\exists e_D[e_D : \text{GEN}e_h[e_h : \text{GEN } e_2[\text{come-home}(e_2); \exists e_1[\text{jog}(e_1) \ \&$
$\text{WHEN}(e_2,e_1)]]; \exists e[\text{more-fit}(e) \ \& \ \text{WHEN}(e_h,e)]] \ \& \ \tau(e_D) \subseteq t_r]$

The restriction of the habitual structure in CP_1 may be left implicit, as shown in (64):

(64) Anne havde en bedre kondi når hun joggede.
'Anne was more fit (on occasions) when she jogged.'

However, in many cases embedded *når . . . når* structures receive an interpretation that involves only one habit. This is the case, for instance, with the example (17) in section 2.3, repeated here as (65).

(65) Han [$_{VP2}$ blev glad [$_{CP1}$ når hun livede op [$_{CP2}$ når han havde blomster med til hende]]].
'He was pleased (on occasions) when she cheered up (on occasions) when he brought her flowers.'

Surprisingly, (65) only talks about one habitual state, namely his habit of being pleased on certain occasions. That is, the semantic representation of (65) should only contain one generic quantification structure, as shown in (65′).

(65′) $\exists e_D[e_D : \text{GEN}e_2[\text{bring-flowers}(e_2) \ \& \ \exists e_1[\text{cheer-up}(e_1) \ \&$
$\text{WHEN}(e_2,e_1)]; \exists e[\text{pleased}(e) \ \& \ \text{WHEN}(e_1,e)]] \ \& \ \tau(e_D) \subseteq_T t_r]$

The restriction of the generic quantification in (65′) is *(bring-flowers(e_2) & $\exists e_1$[cheer-up(e_1) & WHEN(e_2,e_1)])*. It describes the occasions on which he was pleased, namely occasions when he brought her flowers and she cheered up. I have no proposal for a compositional analysis of this kind of interpretation.

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5. COMPLEX EPISODIC STRUCTURES

For the sake of completeness, it should be mentioned that *da . . . da* sequences result in complex episodic structures. With *da . . . da* sequences there are two possible syntactic structures, an embedded and an adjunction structure.

The example in (15), repeated here as (66), has the embedded structure, i.e. the da_2-clause is embedded in the da_1-clause.

(66) Han [$_{VP2}$ blev forskrækket [$_{CP1}$ da lyset gik ud [$_{CP2}$ da sikringen sprang]]].
'He became frightened (on the occasion) when the light went out (on the occasion) when the fuse blew.'

A derivation along the lines proposed in the previous sections results in the following semantic representation:

(66′) $\exists e_D[\exists e_1[\text{become-frightened}(e_D) \,\&\, \exists e_2[\text{light-out}(e_1) \,\&\, \text{fuse-blow}(e_2) \,\&\, \text{WHEN}(e_2,e_1)] \,\&\, \text{WHEN}(e_1,e_D)] \,\&\, \tau(e_D) \subseteq t_r]$

This representation says that the topmost eventuality of his becoming frigthened is temporally linked to the unique eventuality of the light going out, which in its turn is temporally linked to the unique eventuality of the fuse blowing. This is the desired result.

The adjunction structure with a *da . . . da* sequence is exemplified by the sentence in (16), repeated here as (67).

(67) Hun [$_{VP2}$ snakkede uafbrudt [$_{CP1}$ da hun kom tilbage]] [$_{CP2}$ da hun endelig havde besøgt sin mor].
'She talked incessantly (on the occasion) when she came back (on the occasion) when she had at last visited her mother.'

The semantic derivation for (67) results in the following representation:

(67′) $\exists e_D[\exists e_2[\exists e_1[\text{talk}(e_D) \,\&\, \text{come-back}(e_1) \,\&\, \text{WHEN}(e_1,e_D)] \,\&\, \text{have-visited}(e_2) \,\&\, \text{WHEN}(e_2,e_D)] \,\&\, \tau(e_D) \subseteq t_r]$

That is, the top eventuality of her talking incessantly is temporally linked both to the CP_1 and to the CP_2 eventuality. This seems to be a satisfactory result.

6. CONCLUSION: ONE-'WHEN' LANGUAGES AND TWO-'WHEN' LANGUAGES

As already stated in section 3.5 above, a clause introduced by the Danish temporal connective *da* 'on the occasion when' has a 'definite' character. It always describes a specific eventuality, i.e. it is always episodic, and always confers a specific temporal

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anchoring to its main clause. This means that the eventuality argument of a *da*-clause must be existentially bound and is prevented from occurring in the scope of a non-existential quantifier over eventualities, and therefore a *da*-clause cannot be an internal part of a habitual construction and cannot be embedded in a *når*-clause.

In contrast to this, a clause introduced by the Danish temporal connective *når* 'on occasions when' has an 'indefinite' character. It cannot refer to a specific eventuality. The eventuality argument of a *når*-clause is therefore unbound and able to occur in the scope of a non-existential quantifier. This is what happens when a *når*-clause forms part of a past, present or future habitual structure, and probably also in non-habitual future sentences, where the eventuality argument of the *når*-clause presumably occurs in the scope of some sort of future/modal operator.

Temporal 'when'-clauses, then, come in two varieties, a 'definite' and an 'indefinite' variety, each with its characteristic referential and quantificational properties. The two varieties are overtly marked by two lexically distinct connectives in two-'when' languages like Danish and German, but not in one-'when' languages like Swedish and English.

I assume that the semantic representation I proposed for the 'indefinite' Danish *når* is the general case, so that it is valid also for Swedish *när*, English *when* and Norwegian *når*:

(68) *när/when/når* $\lambda Q[\lambda P[\lambda e[\lambda e_1[P(e) \& Q(e_1) \& WHEN(e_1,e)]]]]$

Now, one can account for the different situations in these languages in the following way. In one-'when' languages like Swedish and English, one of two things may happen: either the unbound e_1 of the temporal clause may be bound by a pragmatically induced existential closure, which results in the episodic reading (the *da*-reading) or, as in Danish *når*-derivations, a focus-determined quantification takes over and places both the e and the e_1 argument in the scope of a generic quantifier. In two-'when' languages like Danish, there is an obligatory choice between *når* and *da*, the latter being associated with its unescapable 'definite' reading, and this seems to result in some sort of blocking effect which prevents the *når*-representation from being subject to existential closure. In Norwegian, which is intermediate between the Swedish one-'when' and the Danish two-'when' pattern, *da* is also associated with the 'definite' reading, but the blocking effect is in the process of relaxing its grip and this gives rise to the particular Norwegian situation described in section 1.

The difference between one-'when' and two-'when' languages resembles the one involving definite and indefinite DPs. Languages like most modern Germanic and Romance languages have distinct definite and indefinite articles, but other languages such as Russian and Latin have no such articles, and therefore in many cases the distinction between definite and indefinite DPs remains non-overt in these languages. This does not mean that the referential and quantificational differences corresponding to definite and indefinite DPs do not exist in article-less languages. They are there,

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but they are not systematically marked morphologically in the DPs – they must be read off from contextual and other clues. I suppose that something similar must be the case with 'when'-clauses in one-'when' languages. In Swedish and English the *da*/*når*-distinction must be read off by other means, e.g. by aspectual, contextual or common-sense information in the context. In section 4.1.1, I explained why the *da*-reading is hopeless in connection with the example (54). For the same reason, the *when*-clauses in sentences like the English *The video camera was often on when the meeting began* or its Swedish counterpart, *Videokameran var ofta på när mötet började*, will spontaneously be interpreted as 'indefinite'. Similarly, the clause *when Anne was thirty years* can only have a 'definite' reading, because common-sense knowledge tells us that an eventuality like a person's being thirty may, unfortunately, only occur once.

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NOTES

1. Earlier work on this subject is reported in my two NORDSEM papers, Carl Vikner (1999, 2000).
2. I follow Bach (1981) in using the term 'eventuality' as a general designation for the states-of-affairs that sentences may describe, and in using 'event', 'state' and 'process' to denote the different subtypes of eventuality (for more details, see Bach 1981:67–72 and also Carl Vikner 1986:61–74, Vikner & Vikner 1997:269–271).
3. It must be emphasized that, in this paper, I am talking exclusively about *da* and *når* in their use as temporal connectives. Both *da* and *når* have non-temporal uses, e.g. as connectives with causal meanings, and *da* may be used as a temporal relative and as an adverbial. In such uses *da* and *når* have properties that do not match the description just given. For instance, relative *da* can be used not only with past but also with present and future reference, cf. e.g. *Hun frygter den dag da bossen mangler en yngre model* 'She fears the day when the boss needs a younger model'.
4. In the translations I have inserted a paraphrase with *occasion/time* to help the reader identify the correct interpretation of the two Danish connectives, *da* being paraphrased by *on the occasion when* or *at the time when*, and *når* by *on occasions when* or *at times when.*

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5. See, for instance, Davidson 1980, Parsons 1994, Chierchia 1995. Krifka (1989:90) traces a similar idea back to Austin (1950).

6. For simplicity, I disregard the representation of tense, e.g. PAST(e), and that part of the subsentential semantic structure which is not directly relevant to the investigation of 'when'-semantics. I also disregard, for the time being, the possible habitual reading of the sentence in (19).

7. Cf. Kratzer (1995:155), reporting Partee's idea: 'We are talking about a particular occasion here'; see also Klein (1994:25f.) for a discussion of this problem.

   Here and in the rest of this paper I am using the term 'situation' in the way 'situation', 'occasion' and 'case' are used by Schubert & Pelletier (1989:193f., 215ff.) and by Krifka et al. (1995:30ff.), i.e. a situation is a collection of roughly co-temporal eventualities.

8. As a matter of fact, Partee's 1973 paper was intended to bring out the parallelism between the anaphoric uses of pronouns and the English past and present tenses.

9. Cf. also Link (1998:248, 257).

10. I will adopt the following conventions for the use of variables in the final semantic representations of sentences: e is used to represent the main clause eventuality (when it is not represented by e_D), and e_1 and e_2 are used to represent the CP_1 and CP_2 eventualities, respectively.

11. For the sake of argument, I have chosen the predicate *slå igen* 'hit back', where it is very clear what would constitute a 'normal hit-back situation', namely a situation where someone hits you. For many habitual sentences with no overt restriction, it is unclear what should count as the restriction. Krifka et al. (1995:31) assume that in such cases the restriction must be derived pragmatically and use predicates like, for example, 's **is a normal situation with respect to smoking**' to represent the restriction in the representation of a sentence like *Mary smokes*.

12. For discussions of this problem see e.g. Rooth (1985:179–183) and de Swart (1993:266–277, 1999:345–347).

13. To avoid unnecessary complications, I will assume that all examples with *når* in the rest of the paper have the main clause in focus, i.e. are of the same type as (37).

14. As a matter of fact the main clauses in (42) and (43), about Anne's seeing a dentist, may refer either to a single eventuality or to a habit. For a disussion of the latter reading, see section 4.

15. Note that both episodic and habitual temporal adverbials, i.e. both *da*-clauses and *når*-clauses, may occur in the scope of other focus-sensitive elements, such as *kun* 'only'. In such cases focus-dependent ambiguities may arise also with *da*-clauses, cf. de Swart (1999:343–347).

16. See de Swart (1993:284–286) for a discussion of examples similar to (55).

17. I owe to one of my referees the observation that the relative order of quantification adverbial and 'when'-clause may restrict the interpretational possibilities. Thus, the sentence *Ofte, når Anne var syg, strøg Peter hende over håret* 'Often, (at times) when Anne was ill, Peter stroked her hair' does not allow the two-habit interpretation of (59). I think that whenever the temporal clause immediately follows a fronted quantificational adverbial as in this example, the clause must be interpreted as providing the restriction of the quantifier.

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