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DRS-CONSTRUCTION AND LEXICALLY DRIVEN INFERENCE

In this paper we investigate the role of lexical information, as outlined and exemplified in the first paper of this volume, in inferencing from semantic representations (DRSs) of miniature texts. Besides lexical entries for certain verbs we also study the inferential role of the word *wieder* (again). Since the semantic contributions made by *wieder* are presuppositional in nature, a large part of the paper is concerned with presupposition. Special attention will be given to the subtle connections between presupposition verification and presupposition accommodation.

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1. Introduction*

This essay is a companion to its predecessor in this volume – as we said in the introduction to that paper, the two developed out of a single report. But while the first has been left largely unchanged, the present one differs substantially from the original.[1]

The original aim of the second half of the report (the one which has become the present paper) was to eat, and thus prove, the pudding prepared in the first half – by constructing the semantic representations of certain short sentence sequences and then carrying out certain inferences from those representations we were going to demonstrate the viability of the proposals about form and content of lexical entries that we had made in the first part. But as so often when it may look as if the time for eating has come, it turned out that quite a bit of additional culinary preparation was still needed before the actual feast could begin. Thus much of what the reader will find in this paper is, one might say, more cooking.

But the cooking is of quite a different flavour than can be found in the preceding paper and this is primarily because here we are dealing with rather different ingredients. The primary concern of what follows below is to analyse the contribution made by the word ***wieder*** (*again*) to an inference from a three sentence "text" in which it occurs. That analysis has led us into fairly extensive explorations of how the presuppositions which individual occurrences of ***wieder*** trigger are determined and how verification and/or accommodation of those presuppositions can produce additional information. Thus, to a large extent, this is a paper on presupposition. However, since it approaches presuppositional questions from a textual and inferential perspective, the issues on which it focusses are somewhat different from what is dominant in most current work on presupposition. (In particular, there is nothing here that pertains directly to the so-called projection problem, which is prominent in almost every recent publication on the subject.)

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1 "Remarks on lexical structure, DRS-construction and lexically driven inferences", Arbeitsberichte des Sonderforschungsbereichs 340, Sprachtheoretische Grundlagen für die Computerlinguistik, University of Stuttgart and University of Tübingen.

But presupposition is only one of the topics we discuss. The central concern of the paper is textual inference; this is the thread that runs through it from beginning to end.

If there is any general moral to be drawn from the few cases we explore here, it must be that inferences from natural language texts are almost always more complicated than may appear at first sight and that conscientious analysis keeps revealing previously unnoticed assumptions, which, more often than not, have as much to do with our conception of the world as with what can be regarded linguistic knowledge properly speaking.

There is a sense, therefore, in which this work confirms the widespread opinion that textual interpretation and inference are based on a complicated – in fact, for all we can see at present, a desperately complicated – web of linguistic and extralinguistic knowledge. We admit that we ourselves, as linguists of an essentially rule based persuasion, would have preferred if at least the inferences with which we deal here, and which seemed to us innocuous enough when we started, had proved amenable to a more strictly linguistic analysis than the one to which we have been led in the end. We do not think, however, that all that has been achieved is a long and convoluted proof of a general point that was plain to begin with. For analyses of the kind we attempt here do reveal something of how linguistic and extralinguistic knowledge interact. True, the interaction is extremely complicated, and we are only beginning to understand some of its intricacies. But this is a road along which there is a definite possibility of progress. The complexity of the web is daunting, and often it may drive us to despair. But it is not, we think, ultimately inextricable.

2. Lexically driven inferences, I – easy

In this section we present a very simple example of how deductive relations between sentences and/or texts can be verified via the DRSs these texts and sentences yield.

The general method we will follow is that which has been current within DRT for some time. A declarative text T_2 is said to be *logically entailed by* some other declarative text T_1 iff the DRS K_1 for T_1 is logically equivalent to the DRS K_2 obtained by incorporating T_2 into K_1. (When it is possible to construct different non-equivalent DRSs for T_1, or when the DRS or DRSs for T_1 can be extended to several nonequivalent DRSs

for $T_1 + T_2$, then the question of T_1 entailing T_2 must be relativized to the different possible readings of the texts which these different DRSs express.)[2] Note that this way of adjudicating whether T_2 is entailed by T_1 is appropriate only in those cases where T_1 is made available before T_2, as when someone utters T_1 and then continues with "So/Therefore T_2". There are of course also other situations in which the question of entailment comes up. For instance, one might say "T_2. For T_1." Here the anaphoric connection is the other way round, and indeed, the use of DRSs in the verification of entailment is somewhat more complicated. Even though such cases are common enough, we will restrict attention to the kind where the premises serve as background for the interpretation of the conclusion. One reason for concentrating on this type first is that it has a special importance for question answering systems: The typical situation there is that of a question being asked against the background of assumptions which on the one hand supply the contextual setting for its interpretation and on the other contain the information in terms of which the question can be answered. In the theoretically simplest case, where the question is a yes-no question, answering takes the form of verifying an entailment between the background DRS and the result of incorporating the declarative counterpart to the question into that DRS (or, alternatively, checking entailment between the first DRS and the result of incorporating the negation of the declarative sentence). The case of wh-questions is more complicated, but it too relies on the same use of DRSs in entailment verification.

The first inference we will look at is as simple as they come. Both its premise and its conclusion are single sentences which are variations of sentence patterns which by now are old acquaintances. It is intuitively clear that

(1) Der Arzt heilte Peter mit Penizillin von einer Krankheit.
(The doctor cured Peter with penicillin of his disease)

entails

(2) Das Penizillin heilte die Krankheit.
(The penicillin cured the disease)

Let us see how this entailment becomes formally transparent once we have constructed the relevant DRSs.

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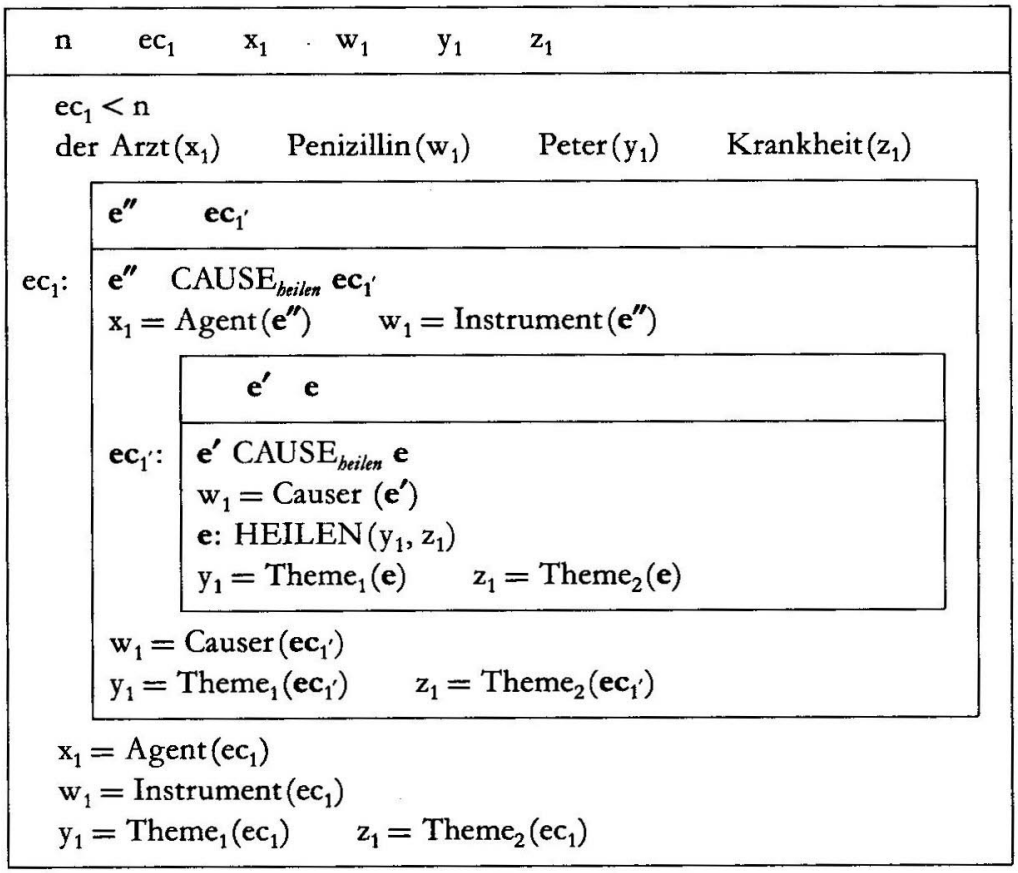
2 For an explicit treatment of the logical consequence relation between DRSs (for a DRS language whose expressive power is that of a language of first order predicate logic) see Kamp & Reyle (1991).

The DRS (3) for (1) is constructed much like that for (43ii) in Kamp & Roßdeutscher (1994, this volume):

(3)



(From what we have said it is not clear precisely how the processing of the optional argument *mit Penizillin* leads to the conditions "w_1 = Causer(**e'**)", "w_1 = Causer(**ec$_{1'}$**)", "w_1 = Instrument(**e''**)" and "w_1 = Instrument(ec$_1$)", as we have not fully specified the general lexical principles which govern instrumental phrases. We let this matter pass.)

In extending (3) with the interpretation of (2) we must take account of the obvious anaphoric connections that are implied by the definite NPs of this second sentence. The second occurrence of *Penizillin* obviously carries the default implication that the same Penizillin is intended as in (1). Similarly the disease referred to by *die Krankheit* is by default the same disease that (1) speaks of. The last anaphoric aspect of (2) concerns its tense: Its past tense is naturally understood as indicating an occurrence time (of the described event) that is closely connected with that of the event described in the premise. Precisely what this connection is understood to be – identity, overlap, immediate precedence – cannot be decided once

and for all, since it heavily depends on the rhetorical relation in which the two describing sentences are perceived to stand. This is not the place for a probing excursion into the subject of rhetorical relations and their bearing on temporal relations. (But see Section 4.5 for more on this topic.) Suffice it to note that when the second of a pair of sentences is understood as a kind of "elaboration" – in the sense that it describes the same event in different terms – then the temporal relation is (evidently) that of simultaneity: Since the event described by the second sentence is the very same that is described by the first, the two occurrence times must be identical too, as they are occurrence times of one and the same event. We take it that the case before us is of this type, i.e. that the conclusion of our inference is to be understood as an elaboration of the premise and thus is about the same event; how this rhetorical relation is actually determined is a matter that does not concern us here.

Let us then, in dealing with the present example, take the intersentential connections between premise and conclusion for granted. What we do not want to take for granted is the selection of the appropriate lexical entry for *heilen*. Evidently the entry we need in connection with (1) is the same that we used when constructing the DRS (61) of Section 11 in Kamp & Roßdeutscher (1994), (see p. 146 this volume). It should be clear how lexical insertion (i.e. insertion of the semantic concept which this entry specifies) gives rise to the extension (4) of (3) (see page 171).

Comparing (3) and (4) we see that any verifying embedding g of (3) can be extended to a verifying embedding g′ of (4): We obtain such a g′ from g by letting it assign to ec_2 and y_2 the same entities that g assigns to $\mathbf{ec}_1$′ and y_1, respectively, and otherwise making it respect the identities which (4) states explicitly (that is, we let g′ assign $g(w_1)$ to w_2 and $g(z_1)$ to z_2). (Note that because it is always possible to extend g by letting g′ assign the same values to ec_2 and y_2 that g assigns to $\mathbf{ec}_1$′ and y_1, the inference from (1) to (2) does not depend on whether in the DRS construction step which incorporates (2) into (3) ec_2 is identified with $\mathbf{ec}_1$′. We make this point, because it will be an identification of this sort that will be crucial to the third and last inference we will look at.)

The semantic entailment between (3) and (4) is grounded in a particularly simple formal relationship between them, one which it ought to be easy to verify mechanically.[3]

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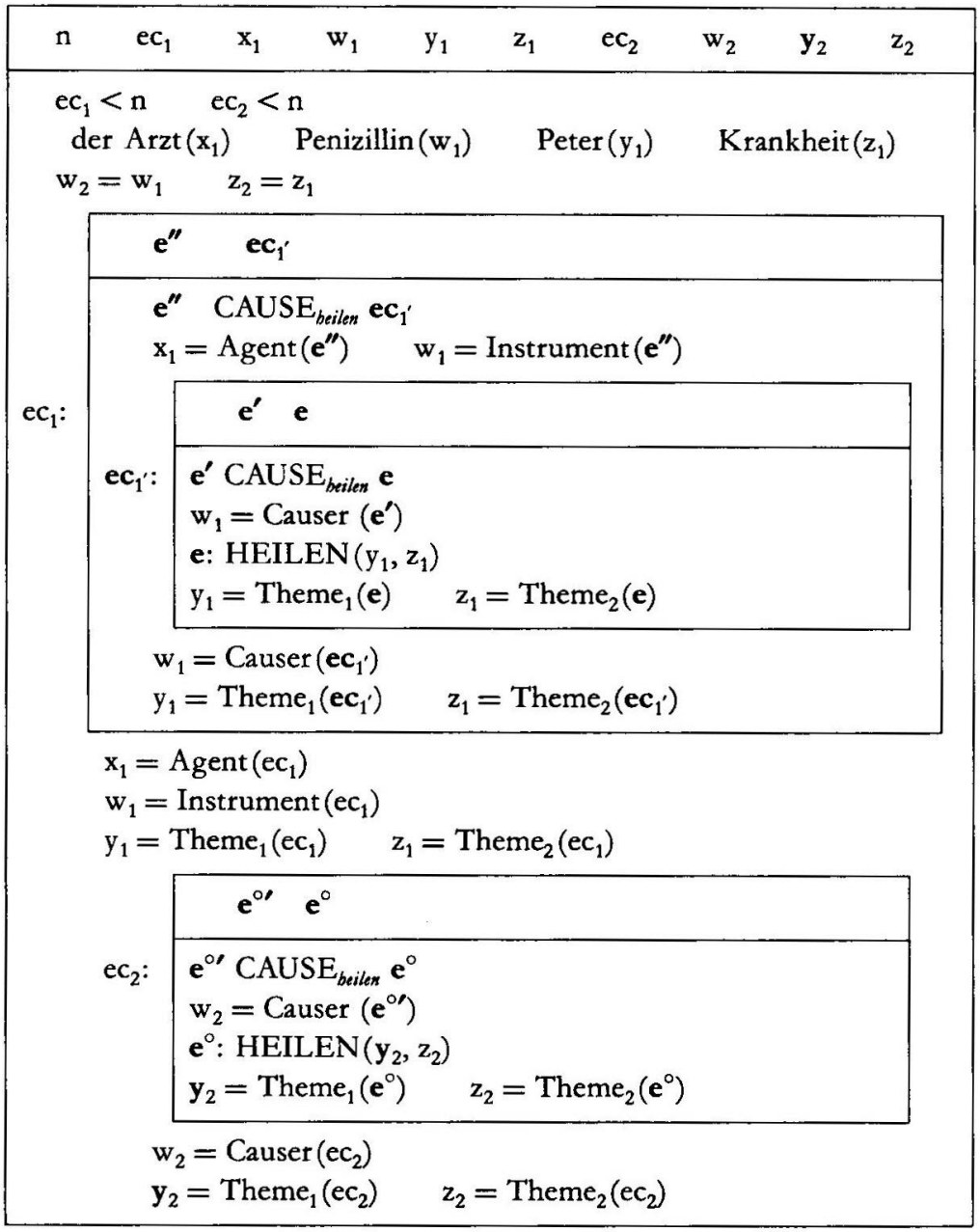
[3] What we need here is an inference rule which introduces a duplicate x′ of a discourse referent x together with a subset of the set of conditions in which x occurs, and

(4)



with the option of adding the identity condition x' = x. Any reasonable deduction system for first order DRS logic should have this principle either as a primitive rule or else as one that can be easily obtained as a derived rule. (In the earlier mentioned inference system defined in Kamp & Reyle (1991) the rule is derivable without much ado!)

3. Lexically driven inferences, II – a little harder

The examples we will study in this and the following sections are more complicated than the one considered in Section 1. Our ultimate goal is to account for the validity of the following inference:

(5) Der Tourist erkrankte an Typhus. Nach drei Wochen war er wieder gesund. Ein Arzt aus Izmir hat ihn geheilt.

Conclusion:

(6) Der Arzt hat ihn vom Typhus geheilt.

(The tourist came down with typhoid. After three weeks he was well again. A doctor from Izmir cured him.
Conclusion:
The doctor cured him of typhoid.)

There are a number of issues on which this inference depends and which we have not yet discussed: The semantic connections between the lexical items *heilen*, *erkranken* and *gesund*; the semantic properties of *wieder*, (in particular, its presuppositions); and the rhetorical connections between the last sentence of (5) and the one preceding it. We will take these issues one by one, showing how they can support inferences which would not have been forthcoming without them. The inferences we will consider as we go along are all, in one way or another, simpler than the one of (6) from (5), to which we will eventually return in section 4.

Premise sets consisting of several connected sentences are rarely felicitous unless they contain some occurrences of discourse particles such as *aber*, *also*, *dennoch*, *wieder*, *noch* and the like. In (5), for instance, it is not really possible to drop the word *wieder*; the result sounds unnatural and the best that could be said for it is that it reminds of the stilted "discourses" familiar from books on formal (or informal) logic. To finesse this problem we begin by considering an inference stated in the style of a riddle, quiz or (yes, indeed) a logic text book, exploiting the tolerance for unmarked rhetorical relations which is distinctive of those genres.

Quiz (beginners):
Is the following inference valid?

(7) Ein Tourist erkrankt an Typhus.
Drei Wochen danach ist er gesund.

Also:
Der Tourist gesundet in diesen drei Wochen vom Typhus.

(A tourist comes down with typhoid.
After three weeks he is well.
So:
The tourist recovers in these three weeks from typhoid.)

Trivial though this inference may seem, it nevertheless depends crucially on the peculiar properties of the lexical items *erkranken*, *gesund* and *gesunden*. To get a sense of the import of the role these words play, compare (7) with the superficially symmetric, but evidently invalid argument (8):

(8) Ein Tourist gesundet vom Typhus.
Drei Wochen danach ist er krank.
Also:
Der Tourist erkrankt in diesen drei Wochen an Typhus.

(A tourist recovers from typhoid.
After three weeks he is ill.
So:
The tourist comes down with typhoid in these three weeks.)

To explain the difference between (7) and (8) we must specify the lexical entries of the crucial words, *erkranken*, *gesund* and *gesunden*.

3.1. Some more lexical entries

We begin with *gesund*. The lexical entry for *gesund* involves some questions that concern the specific relations it bears to other words, such as *heilen* and *gesunden*, but also some much less specific ones, which pertain to the form of adjectival lexical entries generally. We assume – this, we believe, is in agreement with views that have wide currency today – that nouns and adjectives have, like verbs, a referential argument. But while the referential argument of a verb is, as we have seen for the particular lexical entries discussed in the preceding sections, typically an event (or process or state of affairs), the referential arguments of adjectives and nouns can be, literally, just anything. Of course this doesn't mean that the referential argument of some particular noun can be anything whatever. What it can be is restricted by the noun. It is not for nothing that in both the philosophical literature and in AI many nouns are identified as "sortals",

i.e. as classifiers, which impose structure on our universe by partioning it into distinct "sorts" of things. Indeed, the function of nouns in discourse is often precisely that: They identify the things that are spoken of as belonging to certain sorts and thus assist us in operating with a structured ontology, in which the separate sorts are quantifiable domains, but which does not require us to acknowledge a domain quantification in which all sorts are joined together.

The referential arguments of adjectives also span the whole spectrum of possible sorts, but again, the sort to which the referential argument of some particular adjective can belong is usually restricted. With adjectives, however, this restriction is often mediated by an accompanying noun, rather than being conveyed directly by the adjective itself. Yet, inasmuch as it is part of the semantics of the adjective with what nominal sortals it can be combined, it is nevertheless the adjective which determined the range of sorts that its referential argument could possibly belong to.

A further difference between verbs on the one and nouns and adjectives on the other hand concerns their non-referential arguments. The verb entries which we have considered so far all have such arguments and this appears to be the rule rather than the exception.[4] With nouns and adjectives the tendency is in the opposite direction. There are "relational" nouns, such as *father*, *friend* or *salary*, which arguably have besides their referential argument also an additional, semantically obligatory argument: to be a father is to be *someone's* father, etc. And similarly there are relational adjectives, such as *related*, *opposite*, *former*. But with nouns and adjectives this is the exception rather than the rule. (In a sense, the class of relational adjectives is very large, since it includes all comparatives and superlatives. But such adjectives are best analysed as complex predicates; in fact, the study of comparatives has usually been practiced as part of compositional, not lexical semantics.)

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4 In fact, it is a hotly debated question whether there exist any verbs at all which have only referential arguments. It has been argued that for some intransitive verbs the referential argument is represented by the subject phrase and that the concept expressed by the verb has in fact no further arguments. But this is a matter we will not pursue in this report. That there are such verbs is one of the central theses work by Kratzer which maintains that verb phrases expressing so called "individual level predicates" have no implicit event or state variables. Besides the many verbs that fall under their criteria there is also a much more restricted class, consisting of verbs like *last* and *occur*, whose subjects typically are events.

The referential argument of an adjective is that of which the adjective is being *predicated*. Thus in

(9) Fritz ist gesund.
(Fritz is healthy.)

the referential argument of *gesund* is identified with the subject *Fritz*; in general, the referential argument of *gesund* is the individual who is said to be healthy. Does *gesund* have any other arguments? We believe not. This is not altogether obvious. For we have argued that the concept HEILEN has two arguments, the individual to whom the cure applies and the thing from which he is cured. As *gesund* is used to describe states that are typically (if not invariably) the result of processes instantiating this concept, one might have expected that the Theme_2 of HEILEN also figures as a role of the concept expressed by *gesund*. But this is not, it seems, the way it is. *Gesund* functions as an absolute predicate: whoever is *gesund*, is so, in essence, without qualification.[5]

The upshot of all of this is that the lexical characterization of *gesund* that we adopt involves comparatively little information. Since it has no semantically obligatory arguments and does not seem to be ambiguous either, *gesund* has only one lexical entry. The syntactic part of this entry specifies an empty set of (non-referential) argument phrases, while its conceptual part specifies that its referential argument satisfies the concept expressed. This concept is, as we have seen, closely related to the concept HEILEN. But it cannot be identified with the concept of being the result of a HEILEN process, first, because of the absoluteness we noted above and, second, because to be healthy one does not have to be in the state resulting from a preceding cure – one could have been healthy from the beginning.

As a non-relational adjective, *gesund* has a lexical entry which resembles that of most nouns (which are also non-relational). One potential difference between adjectives and nouns is that the lexical entry for an adjective should contain information about the sorts to which the adjectival concept can be applied. So one part of its lexical entry should specify the set of sortal concepts with which the adjective is compatible. This, however, is not a difference between adjectives and nouns generally but, at best,

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5 To forestall objections we note that *gesund* is not absolute in the strictest possible sense. Often a person will be considered healthy, even though there may be certain things wrong with him. We return to this issue on page 177.

between adjectives and some special class of nouns that act as "maximal" sortals. For instance, it seems natural to take it to be part of the semantics of a noun such as *Arzt* that the concept it expresses applies only to persons. On such a view the nouns that can do without any specification of the concepts with which they are compatible would constitute a comparatively small set of "basic sortals" and the others would require a specification of compatible sortal concepts just like the adjectives.

The view that is commonly taken of nouns in contemporary AI is a somewhat different one. There one assumes that one place concepts are arranged in a *subsumption hierarchy*, a partial order $\leq$, where $C \leq C'$ means that the extension of C is included in that of C'. It is part of the architecture proposed here that this hierarchy should be part of the theory LT. And once the hierarchy has been included in LT, there is no need to specify application restrictions as part of the individual lexical entries. Here we simply assume that the hierarchy is in place without worrying about the details.[6]

Given this assumption the lexical entry for *gesund* may be given in the following (10)

(10) *gesund* { }
GESUND(x)

As it stands this entry will not help us much in verifying the inference with which this section is concerned. What we need is the conceptual connection between GESUND and HEILEN, but that is still missing. Unfortunately, the connection is not so easy to state because of the already noted fact that *gesund* is absolute in a respect in which *heilen* is not. Consequently, it cannot be maintained in general that whenever y is the Theme_1 of a process which instantiates HEILEN, then x satisfies GESUND when this process is completed. The problem is to articulate the conditions under which such processes result in states in which the Theme_1 can be said to be *gesund*. Intuitively the conditions are fairly clear. An analogy will help. Curing someone of an ailment is in certain respects much like taking something out of a container, where the container corresponds to the patient and the thing taken out to the ailment from which he suffered. Now, the

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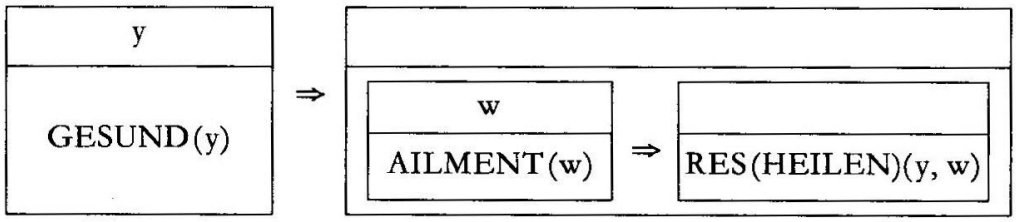
6 The selectional restrictions on *gesund* are exactly the same as those for the verb *gesunden*. In the absence of an explicit hierarchy for adjectives and nouns we could have added these restrictions to the entry for *gesund*. However, nothing in the examples considered in the remainder of this paper depends on this.

result of taking something out of a container is sometimes that the container is empty, but not always. The container ends up empty if and only if the something was the only thing in it (and nothing else was put into the container at the same time). Similarly with HEILEN: If the ailment from which the patient is cured was the only one he had when the cure began (and he hasn't attracted some new ailment during the cure) then he will be truly healthy by the end of the cure. We can formalize this connection with the help of the concept RES(HEILEN) introduced in section 6, Kamp & Roßdeutscher (1994), this volume. That is, we have the following meaning postulate:

(11) 

There are two complications. The first is that sometimes we are prepared to call someone "gesund" even though he suffers from something comparatively minor. For instance, we might say of someone who has just been cured from a tumor of which it had generally been supposed that it would kill him, that he is "wieder gesund", even though he is still suffering from a mildly peptic stomach.

Such examples clearly show that *gesund* can be used in situations where the bearer of the property nevertheless suffers from something. However, in such cases the context must determine which ailments are irrelevant – in the sense that having one of those does not disqualify him from being GESUND. Consider for instance the sentences

(12) (i) Nur gesunde Bewerber werden in den Schuldienst eingestellt.
(Only healthy applicants will be appointed as teachers.)

(ii) Der Reaktionstest soll nur mit gesunden Probanden durchgeführt werden.
(The reaction speed experiment must be performed with healthy subjects only.)

The contexts in which these two sentences are typically used differ in how they "define" the concept GESUND: in order to qualify as satisfying the concept one should not suffer from *any* of a specific list of physical disorders – anyone suffering from as much as one disorder on the list thereby does

not count as GESUND. But the lists need not be the same for the two contexts.

In the sequel of this article we will ingore the context-sensitive aspects of GESUND and treat it as absolute: to satisfy GESUND one must be free of all ailments whatsoever.

The second complication has to do with an aspect of the German verb *heilen* to which we have not yet drawn attention. As we have seen, *heilen* is sometimes used with and sometimes without an explicit argument representing its Theme_2. (The former use being possible only with transitive *heilen*.) These two uses differ with regard to the nature of the implied result state. When *gesunden* is used with an explicit Theme_2, the result implied is only that the Theme_1 no longer suffers from the ailment or ailments referred to by the Theme_2 phrase; he may still be suffering from something else and so does not need to be healthy. When *heilen* or *gesunden* is used without a Theme_2 there appears to be a tendency to infer that the Theme_1 is cured absolutely and thus satisfies the concept GESUND. This is another subtlety that we will ignore.

The next entry we must consider is that for the adjective *krank*. The lexical entry for this adjective looks just like the one for *gesund* and is equally uninformative:

(13) *krank* { }
KRANK(y)

But there is more to be said. *Krank*, we take it, is the antonym of *gesund*: To satisfy the concept denoted by *krank* – call this concept "KRANK" – means that there is *some* ailment which one does *not* not have, some ailment from which one is not separated; in other words, for some ailment w the bearer of KRANK stands in the relation PRE(HEILEN) to w. Thus we have (14).

(14)

y		w
KRANK(y)	⇒	AILMENT(w) PRE(HEILEN)(y, w)

Next on our shopping list is the entry for the verb *erkranken*. After all that has been said, this entry presents no further problems. *Erkranken* denotes the process concept which is antonymous to the concept HEILEN, in the sense that the precondition states of processes instantiating the one concept are the result states of processes instatiating the other, and vice versa. We

assume that with any concept C of change of state processes there is associated a concept ANT(C) the instantiations of which are processes which are the inverses of processes instantiating C. The concept of being a pre-state for a process instantiating ANT(C) coincides with that of being the result state of a process instantiating C and conversely. Thus

(16) (i) $\mathrm{PRE}(\mathrm{ANT}(\mathrm{C})) \equiv \mathrm{RES}(\mathrm{C})$
(ii) $\mathrm{RES}(\mathrm{ANT}(\mathrm{C})) \equiv \mathrm{PRE}(\mathrm{C})$
(where $\equiv$ expresses conceptual identity)

We encode the connection between the verb *erkranken* and the concept HEILEN (and therewith the connection between the verbs *erkranken* and *gesunden*) by specifying, in the lexical entry for *erkranken*, the denoted event concept as ANT(HEILEN). *Erkranken* also resembles *gesunden* in being subject to the same selection restrictions.

With these last observations we have all the information needed to write the lexical entry for *erkranken*. It looks as follows:

(17) *erkranken*	$\{\langle\theta 1, \mathrm{Nom}\rangle$	$(\langle\theta 2, an + \mathrm{Dat}\rangle)\}$
e: ANT(HEILEN)	Theme_1	Theme_2
(y_{th1}, z_{th2})	SEL. RESTR.	SEL. RESTR.
	organism	ailment or disease

It follows from (17) and (16(i)) that the precondition state of a process described by *erkranken* is one where the patient and the disease which he is about to catch stand in the relation RES(HEILEN), of "not having" or "separation" as we have also called it. (See (16), Sec. 6 in Kamp & Roßdeutscher (1994), this volume). We cannot infer from this, however, that the patient satisfied the concept GESUND at that time; for all we know he may have been suffering from some other disease already.

3.2. A second inference

Equipped with these entries we return to our "quiz" (7). The first sentence of (7) yields a DRS of the form (18)[7]:

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[7] We have represented the temporal information conveyed by the present tense as simply fixing some time or other, which will then act as reference time for the following sentences. This reflects the intuition that in the genre to which (7) and (8) belong the present tense – which is the tense typically used there – introduces a time which bears no clearly defined relation to the time of speech. As this is an issue tangential to our present concerns we do not go into further detail.

(18)

e_1 t y z
$e_1 \subseteq t$ Tourist(y) Typhus(z) e_1: ANT(HEILEN)(y, z) $y = \text{Theme}_1(e_1)$ $z = \text{Theme}_2(e_1)$

Incorporation of the second sentence of (5) into (18) yields, using the LT axiom (11) for GESUND, the DRS (19)[8].

(19)

e_1 t y z t_{e1} t′ s_2 y_2
$e_1 \subseteq t$ $t_{e1} = \text{dur}(e_1)$ $\lvert(t_{e1}, t')\rvert_{\text{weeks}} = 3$ $t' \subseteq s_2$ Tourist(y) Typhus(z) $y_2 = y$ e_1: ANT(HEILEN)(y, z) $y = \text{Theme}_1(e_1)$ $z = \text{Theme}_2(e_1)$

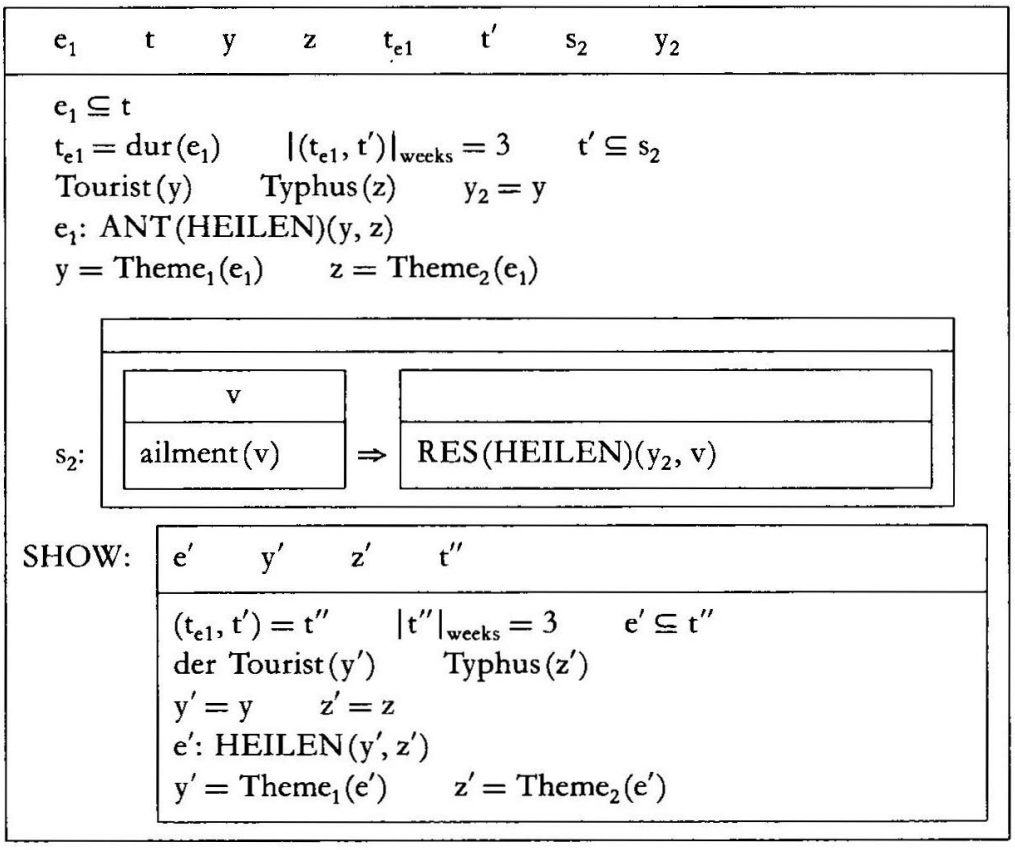
s_2: [v | ailment(v)] ⇒ [| RES(HEILEN)(y_2, v)]

8 We assume that the discourse referent s_2 is introduced by the copula *ist*. Like other stative verbs, the verb *be* introduces a discourse referent for a state of affairs, which the tense temporally relates to the context DRS. The predicate with which the copula combines provides the descriptive content of the represented state, with the provision that the referential argument of the predicate is identified with the referent of the copula's subject. (A full account of this identification mechanism would require a detailed analysis of the syntax and semantics of copular constructions, something which we will not undertake here.) Note that by admitting on the one hand conditions such as the last one of (19) and on the other hand conditions such as (11) and (14) means that a concept such as, say, GESUND is treated as systematically ambiguous. When GESUND occurs in a condition like "GESUND(y)" it functions as a "tensed" predicate of individuals, which may be true of a given individual at some and false of it at other times; when it is part of a condition such as "s: GESUND(y)", it functions as an eternal relation between individuals and states. The model theory for such a "hybrid" DRS language must account for the systematic connections between these two uses. One fairly straightforward way of accomplishing this is to consider the states of any model as uniquely characterized by (i) their duration and (ii) a characterizing tenseless predication. We omit the details.

We must show that this DRS entails the conclusion of (7). We formulate this problem in the manner of Kamp & Reyle (1993): The putative conclusion is incorporated into the premise DRS, but marked with an uncancelled "Show". To demonstrate that the inference is valid one must expand the premise DRS (through the application of inference principles) in such a way that the DRS following "Show" is "included" in the extension. (To be precise: that there is an embedding f of the universe of the "Show" line DRS K into the universe of the extension, such that f(K) is included in the extension.)

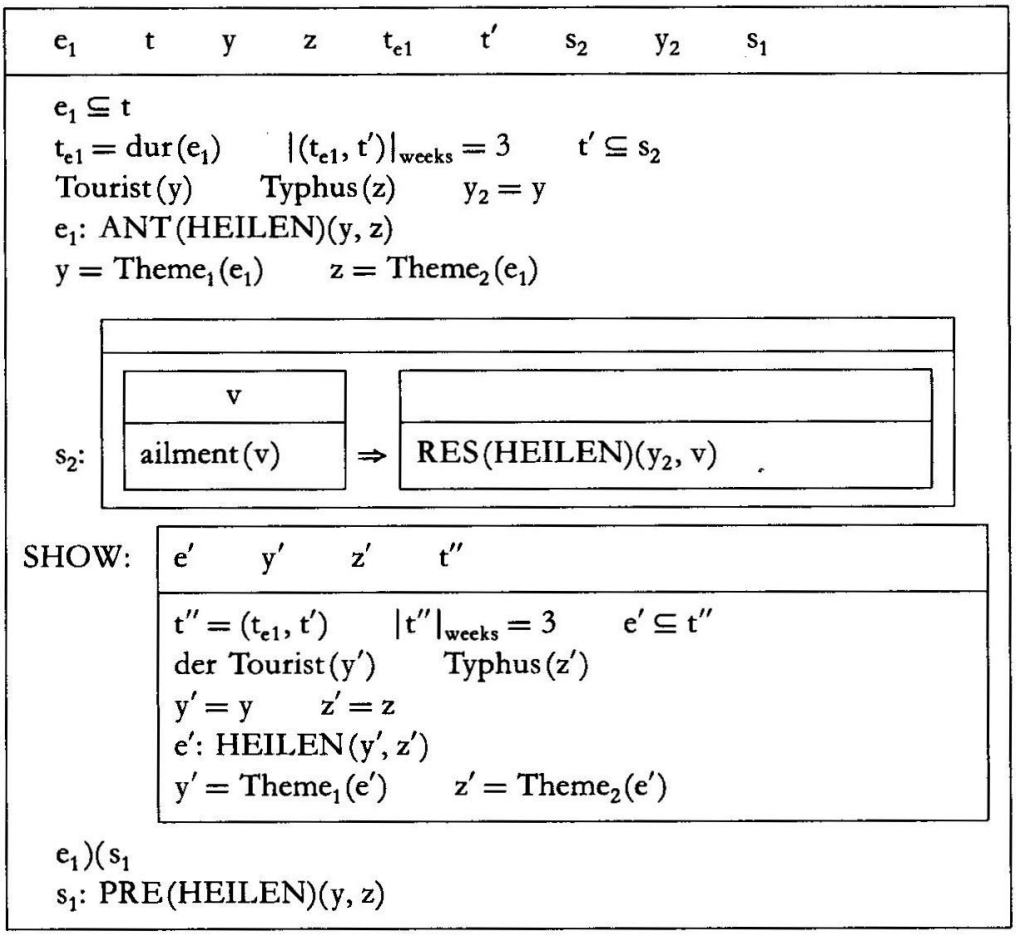
Incorporation of the last sentence of (7) as putative conclusion into (19) produces (20).

(20)



The first of the steps which must be performed in order to verify this inference uses the principle that the process is immediately preceded by a state of the type RES(ANT(HEILEN)) (See principle (18) of sec. 6. Kamp & Roßdeutscher (1994), this volume). According to (16.ii) this type is the same as PRE(HEILEN). So we may extend (20) to (21).

(21)



From the condition characterizing s_2 in (21) (and from $y_2 = y$) we can infer by universal instantiation that s_2 is a state of the type RES(HEILEN)(y, z). Note, however, that the relationship between s_2 and the condition RES(HEILEN)(y, z) is different from that between s_2 and the condition GESUND(y_2). The latter relation, which has always been expressed by a colon, obtains when the state is fully characterized by the condition, so that the state type determined by the condition is, so to speak, the strongest of all types to which the state belongs. The relation between s_2 and RES(HEILEN)(y, z) is weaker, since RES(HEILEN)(y, z) is a weaker condition, determining a more inclusive type, than GESUND(y_2). We will see presently that it is important to keep these two relations distinct. To do so we need a new notation for the new, weaker relation. We will use the combination ":>". In particular the condition that s_2 is, in the relevant sense, a state of the type RES(HEILEN)(y, z) will take the form "s_2:> RES(HEILEN)(y, z)". ":>" is weaker than ":" in the sense that for any s and C "s: C" entails "s:> C". Where necessary, we will keep

the two relations distinct by referring to the stronger relation as that of the condition *characterizing* the state.

With the additional condition "$s_2 :> \text{RES}(\text{HEILEN})(y, z)$" we have all the information that is needed for the inference that $s_1 < s_2$. This inference can be justified as follows: s_1 and s_2 are states which instantiate the incompatible concepts PRE(HEILEN)(y, z) and RES(HEILEN)(y, z). Therefore they cannot overlap; that is, either s_1 completely precedes s_2 or s_2 entirely precedes s_1. Which precedes which is decided by the fact that s_1 obtains at a time immediately following the time t_{e1} and s_2 obtains at the time t' which comes three weeks after t_{e1}. So s_1 obtains at a time preceding some time at which s_2 obtains. This means that s_2 cannot wholly precede s_1. So s_1 precedes s_2.[9]

The effect of these two inferences is shown in (22).

(22)

e_1	t	y	z	t_{e1}	t'	s_2	y_2	s_1

$e_1 \subseteq t$
$t_{e1} = \text{dur}(e_1)$ $\quad |(t_{e1}, t')|_{\text{weeks}} = 3$ $\quad t' \subseteq s_2$
Tourist(y) $\quad$ Typhus(z) $\quad y_2 = y$
e_1: ANT(HEILEN)(y, z)
$y = \text{Theme}_1(e_1)$ $\quad z = \text{Theme}_2(e_1)$

s_2: [v | ailment(v)] $\Rightarrow$ [| RES(HEILEN)(y_2, v)]

SHOW: [e' y' z' t'']

$t'' = (t_{e1}, t')$ $\quad |t''|_{\text{weeks}} = 3$ $\quad e' \subseteq t''$
der Tourist(y') $\quad$ Typhus(z')
$y' = y$ $\quad z' = z$
e': HEILEN(y', z')
$y' = \text{Theme}_1(e')$ $\quad z' = \text{Theme}_2(e')$

$e_1)(s_1$
s_1: PRE(HEILEN)(y, z)
$s_1 < s_2$
$s_2 :>$ RES(HEILEN)(y, z)

9 We assume that a special purpose inference module is responsible for time-related inferences of this kind. Several such inference mechanisms can be found in the literature. See e.g. Allen (1983), Schultz (1986).

The conditions $s_1 < s_2$, s_1: PRE(HEILEN)(y, z) and $s_2 :>$ RES(HEILEN)(y, z) can then be combined in an application of a principle we have not yet introduced. This is the principle that when a state s_1 which is characterized by the type PRE(C), where C is some process concept, is followed by a state s_2 of (but not necessarily characterized by) the type RES(C), then s_1 has been abrogated by a process e of type C; this process will have come to its conclusion no later than the onset of s_2. We can represent this principle formally as (23):

(23)

s_1 s_2 u v		e
s_1: PRE(C)(u, v) $s_2 :>$ RES(C)(u, v) $s_1 < s_2$	⇒	e: C(u, v) $\text{Theme}_1(e) = u$ $\text{Theme}_2(e) = v$ $s_1)(e < s_2$

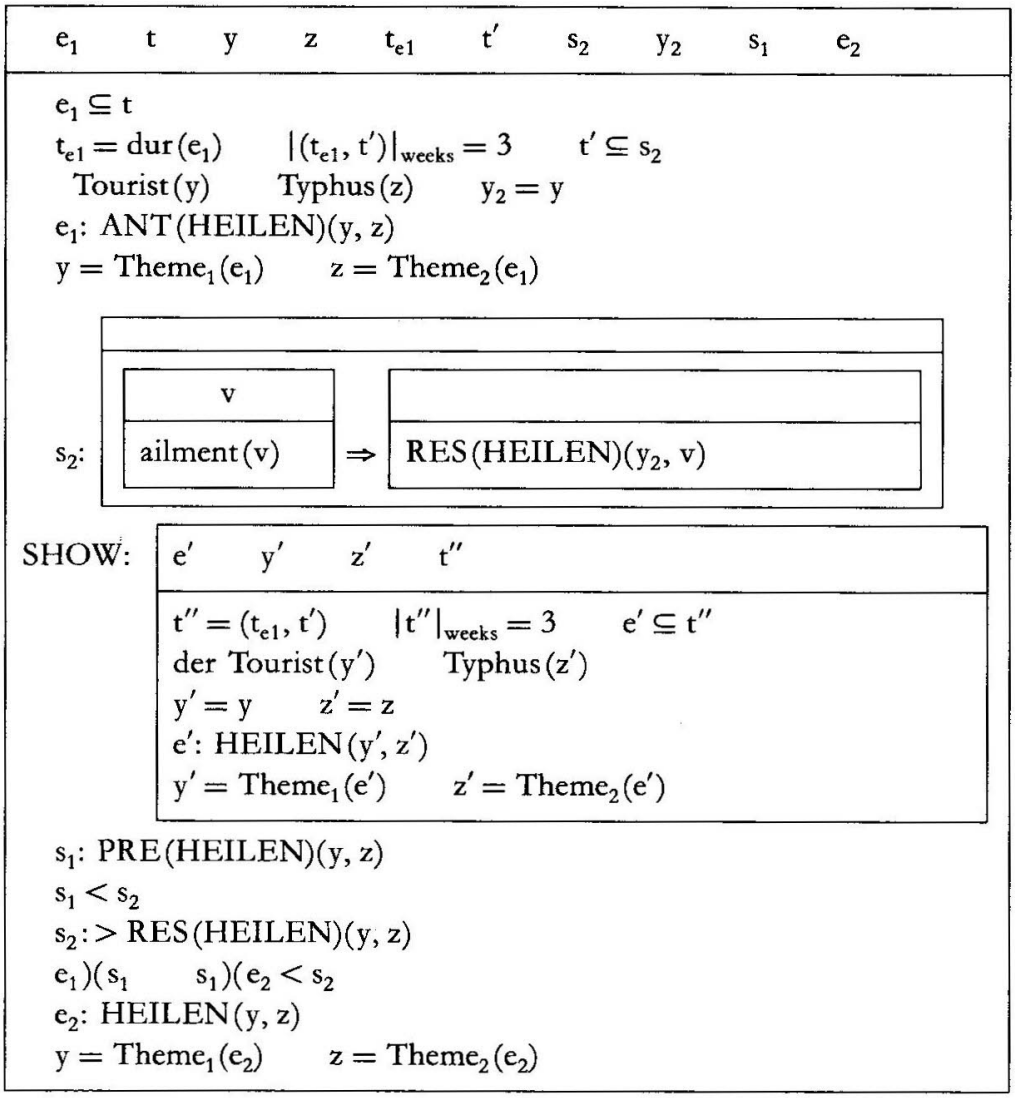
(23) has a companion principle (23′) which says that when s_1 is of the type PRE(C), s_2 is characterized by RES(C)(u, v) and $s_1 < s_2$, then there must have been a process e that starts after s_1 and results in s_2.

(23′)

s_1 s_2 u v		e
$s_1 :>$ PRE(C)(u, v) s_2: RES(C)(u, v) $s_1 < s_2$	⇒	e: C(u, v) $\text{Theme}_1(e) = u$ $\text{Theme}_2(e) = v$ $s_1 < e)(s_2$

We do not need this principle here. But it will be needed in our reconstruction of the inference (6) from (5) in Section 4. Applying this principle to the mentioned conditions yields an instantiation of HEILEN which has y for its Theme_1 and z for its Theme_2, see (24) on the next page.
It remains to show that e_2 lies in the interval referred to by the phrase *innerhalb dieser drei Wochen*. This follows by purely temporal reasoning from the conditions $e_1 \subseteq t$, $t_{e1} = \text{dur}(e_1)$, $|(t_{e1}, t')|_{\text{weeks}} = 3$, $t' \subseteq s_2$, $e_1)(s_1$ and $s_1)(e_2 < s_2$. That is, we may extend (24) with a discourse referent t''' representing the interval (t_{e1}, t') and infer that e_2 is included in t'''. The result is (25) (see page 186).

(24)



It is evident that the DRS of the show line is included in the remainder of (25), if we identify e′, y′, z′, and t″, with e_2, z, y, and t‴, respectively.

Note that we have not shown that the process e_2 results in the state s_2. In fact, this inference cannot be drawn from the premises as given. From the fact that y has typhoid at some time t and does not have typhoid at some later time t′ we are only entitled to conclude that the earlier state came to an end before t′; and that this can have happened only through a process of type HEILEN. But this process need not have led to the state obtaining at t′; y could have fallen ill one or more times between the end of this first cure and t′.

It ought to be fairly clear where the parallel reasoning fails in the case of (8). The crucial difference is the characterization of the state described by the second sentence. In the case of (8) the decisive condition has the form

(25)

e_1	t	y	z	t_{e1}	t′	s_2	y_2	s_1	e_2	t‴

$e_1 \subseteq t$
$t_{e1} = \text{dur}(e_1)$ $\quad |(t_{e1}, t')|_{\text{weeks}} = 3$ $\quad t' \subseteq s_2$
Tourist(y) $\quad$ Typhus(z) $\quad y_2 = y$
e_1: ANT(HEILEN)(y, z)
$y = \text{Theme}_1(e_1)$ $\quad z = \text{Theme}_2(e_1)$

s_2:

v	
ailment(v)	⇒ RES(HEILEN)(y_2, v)

SHOW:

e′	y′	z′	t″

$t'' = (t_{e1}, t')$ $\quad |t''|_{\text{weeks}} = 3$ $\quad e' \subseteq t''$
der Tourist(y′) $\quad$ Typhus(z′)
$y' = y$ $\quad z' = z$
e′: HEILEN(y′, z′)
$y' = \text{Theme}_1(e')$ $\quad z' = \text{Theme}_2(e')$

$e_1)(s_1$
s_1: PRE(HEILEN)(y, z)
$s_1 < s_2$
$s_2 :>$ RES(HEILEN)(y, z)
$s_1)(e_2 < s_2$
e_2: HEILEN(y, z)
$y = \text{Theme}_1(e_2)$ $\quad z = \text{Theme}_2(e_2)$
$t''' = (t_{e1}, t')$ $\quad e_2 \subseteq t'''$

(26)

s_2:

w
AILMENT(w) PRE(HEILEN)(y, w)

That is, the state has an *existential*, not a *universal* characterization. From this characterization we cannot infer that y stands in the PRE(HEILEN) relation to the typhoid mentioned in the first sentence. We show the DRS (27) for the premises of (8), at the point where this (impossible) inference should be drawn if one were to arrive at a conclusion similar to the one we reached in (7).

(27)

e_1	t	y	z	t_{e1}	t′	s_2	y_2	s_1

$e_1 \subseteq t$
$t_{e1} = \text{dur}(e_1)$ $\quad |(t_{e1}, t')|_{\text{weeks}} = 3$ $\quad t' \subseteq s_2$
Tourist(y) $\quad$ Typhus(z) $\quad y_2 = y$
e_1: HEILEN(y, z)
$y = \text{Theme}_1(e_1)$ $\quad z = \text{Theme}_2(e_1)$

s_2:

w
AILMENT(w)
PRE(HEILEN)(y_2, w)

SHOW:

e′	y′	z′	t″

$t'' = (t_{e1}, t')$ $\quad |t''|_{\text{weeks}} = 3$ $\quad e' \subseteq t''$
der Tourist(y′) $\quad$ Typhus(z′)
$y' = y$ $\quad z' = z$
e′: ANT(HEILEN)(y′, z′)
$y' = \text{Theme}_1(e')$ $\quad z' = \text{Theme}_2(e')$

$e_1)(s_1$
s_1: RES(HEILEN)(y, z)
$s_1 < s_2$

4. Lexically driven inferences, III – try again

We now come to the inference we mentioned at the beginning of Section 3. We recall:

(5) Der Tourist erkrankte an Typhus. Nach drei Wochen war er wieder gesund. Ein Arzt aus Izmir hat ihn geheilt.
The tourist fell ill with typhoid. Three weeks later he was healthy again. A doctor from Izmir cured him.

Conclusion:

(6) Der Arzt hat ihn vom Typhus geheilt.
The doctor cured him of typhoid.

To analyse this inference in depth we need to address two issues which we have not touched upon so far. First there is the contribution that is made by the word *wieder*. The token of *wieder* in (5) is an instance of what

is known as "restitutive" *wieder*. Restitutive *wieder* says of the state described in the sentence containing it that it is the result of a "restituting" process, a process which restores the state after another, "converse", process had previously transformed it into its opposite. In the present case: that the state of being healthy described in the second premise was the result of a process of getting healthy which reversed the effects of an earlier process of falling ill.

The semantic contributions which *wieder* makes are always in the form of presuppositions. (Something that is clearly shown by the negation test.) This is so in particular for the case at hand: That the new state of health is the restitution of an earlier such state, which had previously been turned into a state of illness by a process whose effects have now been reversed, is a *presupposition* of the second sentence of (5); there is a presumption that this presupposition is satisfied in the context in which the sentence is used. The interpreter of the sentence will, acting on this presumption, assume that the coming down with typhoid that was mentioned in the first sentence is the very process whose effects have been undone by the process which led to the state described in the *wieder*-sentence. If that is so, however, then the second process must have been a cure from the particular state of illness that the first process led to, and thus a cure from typhoid.

The other issue is the rhetorical relationship between the second premise and the one that follows it, *Ein Arzt aus Izmir hat ihn geheilt*. It seems intuitively clear that the third premise acts as an explanation of what is observed by the second sentence: It offers an explanation of the tourist's restored health by mentioning the event which led to this state. But if it was the event mentioned in the third sentence which led to the return of the tourist's health, then that event must have been identical with the second of the two processes that figure in the presupposition that is carried by *wieder*. So the cure by the doctor from Izmir was a cure from typhoid.

In the remainder of this paper we will be almost exclusively concerned with the first of these issues. We will return to the rhetorical relation between the third and second sentence in section 4.5. As the determination of rhetorical connections falls outside the scope of our present concerns, the return will be a brief one, which will leave all the hard questions in this area untouched.

4.1. Presupposition and inference

To argue that the contribution of ***wieder*** to the meaning of the premise set of (5) is as we have just sketched it is not as easy as we should have liked. It would have been nice to be able to say: "Just eliminate ***wieder*** from the second premise of (5) and you will find that it is no longer possible to infer that the event of the tourist's falling ill and his restored state of health are connected in the way we indicated, so that there is no basis for concluding that the cure producing that state was a cure from typhoid." But unfortunately we cannot argue this way. For when ***wieder*** is eliminated from (5) we get a discourse that appears to be ill-formed; and inasmuch as the discourse can pass as acceptable, it too might be thought to support the conclusion that the doctor cured the tourist from typhoid. In fact, it seems a reasonable hypothesis that the connection between the falling ill described by the first sentence and the recovery mentioned in the second follows from conventions of narrative economy: if there had been an intermediate recovery, followed by another time of illness, then that ought to have been mentioned since no such events have been mentioned, it is fair to conclude that they didn't occur.[10]

In the light of this observation it may seem dubious whether the presence of ***wieder*** is at all essential to the inference of (6). Its primary function in (5) appears to be, rather, that of explicitly confirming a connection which the interpreter is led to infer on independent grounds. This function – of acting as explicit witness to the presence of a certain rhetorical relation between the sentence containing it and the discourse context in which that sentence appears – is one that ***wieder*** shares with a number of other words (such as, for instance, the particle ***auch*** (also), which we will consider presently). The need for such explicit witnesses of discourse relations that are evident independently is an intriguing property of natural language.[11] There is much about this phenomenon that still requires investigation, but this is not the task of the present paper. Our present concern is solely that of assessing the role, if any, that ***wieder*** plays in inferences such as the one from (5) to (6).

That ***wieder*** can make unequivocal semantic contributions to a sentence or discourse in which it occurs is not hard to show. (28. i, ii) is a

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10 For a detailed discussion of the role that such principles play in supporting default inferences involving temporal reasoning, see in particular Lorenz (1993).

11 An insightful discussion of this phenomenon can be found in Sæbø (1991).

pair of examples which is "minimal" in that the only difference between them is the presence of *wieder* in (28.i) and its absence in (28.ii).

(28) (i) Als ich Fritz kennenlernte, war er gerade nach Paris umgezogen. Jetzt wohnt er wieder in Stuttgart.
(When I first met Fritz, he had just moved to Paris. Now he is living in Stuttgart again.)

(ii) Als ich Fritz kennenlernte, war er gerade nach Paris umgezogen. Jetzt wohnt er in Stuttgart.
When I first met Fritz, he had just moved to Paris. Now he is living in Stuttgart.

Clearly both (28.i) and (28.ii) are perfectly well-formed. However, (28.i) permits the inference that Fritz lived in Stuttgart at some previous time. (In fact, it seems to us that it supports even the stronger conclusion of Fritz having lived in Stuttgart before his time in Paris. We will come back to this later.) (28.ii) does not support such a conclusion.

A first comparison of (5) and (28) leads to two questions which a theory of *wieder* should answer:

1. What are the mechanism or mechanisms responsible for the inference that is supported by (28.i) but not by (28.ii)?
2. What is it that the occurrences of *wieder* in (5) and (28.i) have in common?

It has long been argued[12] that *wieder* has two uses, known as its *restitutive* and its *repetitive* use. An unequivocal example of the restitutive use of *wieder* is found in (29):

(29) Ein Windstoß hatte das Fenster geöffnet. Weil es zog, hat Maria es wieder geschlossen.
(A gust of wind had blown the window open. Because of the draft Maria closed it again.)

According to the (apparently) natural interpretation of (29) the force of *wieder* is that the earlier state of the window being closed, which obtained before the wind blew it open, is "restituted" through Maria's action. But the action itself, that of Maria closing the window, may, for all the discourse conveys, have been the first of its kind. Contrast this with the sentence (30)

12 See Fabricius-Hansen (1980).

(30) Jetzt hat Fritz wieder geklingelt.
(Now Fritz has rung the bell again.)

In (30) *wieder* can only be interpreted as conveying that there was a previous event of the type the sentence describes, i.e. an earlier ringing of the bell by Fritz. This is an example of the repetitive use of *wieder*: The event described in the sentence in which *wieder* occurs is presented as a "repetition" of the type the sentence defines. With verbs such as *ring*, which are not conceptualized as bringing about a change of state, *wieder* will always get its repetitive interpretation. But with "change-of-state" verbs such as *open* or *cure* this is not so; here both uses are possible. For instance, the sentence (31)

(31) Nach drei Wochen gesundete er wieder.
(After three weeks he recovered again.)

can be read both as expressing that the subject regained his state of health (he might have been ill for the very first time; this is the restitutive interpretation) or as expressing that he had a second (or more generally: another) recovery – this would be the repetitive interpretation.

Note however, that when (31) is spoken, the ambiguity disappears: we get the restitutive reading if the stress falls on the verb; when the stress falls on *wieder*, we get the repetitive reading. There appears to be a similar ambiguity when *wieder* combines with a stative verb phrase, as in the following sentence (32)

(32) Nach drei Wochen war er wieder krank.
After three weeks he was ill again.

The *wieder* of this sentence can be interpreted as conveying that the present state of illness is the restitution of an earlier one, which was at some point interrupted – this is the restitutive interpretation and it parallels the interpretation which we have offered for the second sentence of (5). But the *wieder* of (32) can also be interpreted as conveying that the present state of illness is a repetition of an earlier such state. Once again, when (32) is spoken, this difference of interpretation correlates with the stress pattern: When *wieder* is stressed, it is the repetitive interpretation that is called for; when the stress falls on *krank*, the interpretation should be restitutive.

It might seem that with stative verbs the distinction between the repetitive and the restitutive interpretation of *wieder* is less straightforward than it is with change-of-state verbs. For instance, according to the repetitive

interpretation in (32) there was an earlier state of the subject being ill and this state is separated from the state which the sentence asserts by a period during which the subject was not in a state of being ill. So the asserted state is after all the restitution of an earlier state of illness. From this consideration it appears as if the difference between the restitutive and the repetitive interpretations of *wieder* collapse into one in this case.

It is our view that, superficial appearance notwithstanding, there exists a difference between the two interpretations of *wieder* also when it combines with a stative verb phrase. However, in order to explain our position we will first have to say certain things about the nature of presupposition in general.

It is a common tenet, we believe, of all significant accounts of presupposition that the occurrence of a presupposition-inducing word or construction – henceforth a "presupposition trigger" – in a sentence or clause induces a certain proposition, the "presupposition triggered", and that the sentence or clause is felicitous only insofar as the context in which it is used satisfies this presupposition. But accounts have differed over what it is for the presupposition to be "satisfied in the context". One tradition, strongly associated with the work of Stalnaker[13], identifies the context with a set of propositions, which the speaker assumes to be part of the *common ground* and that a presupposition is satisfied in this common ground iff it is entailed by it. Moreover, the common ground is supposed to include all that speaker and audience would consider common knowledge. On this view it is difficult to discern a difference between a restitutive and a repetitive interpretation of *wieder* in (32). For, as we have just seen, any common ground that will entail the presupposition triggered by restitutive *wieder* in (32) will also entail the presupposition triggered by repetitive *wieder* and conversely.

In recent years, however, this way of understanding what it is for a presupposition to be "satisfied in the context" has come in for a lot of scrutiny. An early challenge was launched by Kripke. (See e.g. Soames (1989), fn. 54; Heim (1987)). Among the examples considered by Kripke are sentences such as (33):

(33) John lives in New York too.

It would generally be agreed that the *too* of (33) generates the presupposition that someone other than John lives in New York. Thus according to the

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13 See Stalnaker (1974), (1979).

view just outlined, (33) ought to be felicitous so long as this proposition is part of the common ground which speaker and hearer share. But this cannot be right. For that there are people living in New York besides John (whoever he may be), that much is part of the knowledge of any two normal persons have in common. So one would expect that (33) would be more or less always felicitous. But in fact it is not. In order that its *too* does not sound misplaced the fact that there are individuals different from John who live in New York must be *contextually salient*.

Of course, replacing "satisfied in the context", or "part of the common ground", by "salient in the context" does little more than hint at the problem so long as we do not say more about what "salient" exactly means. Unfortunately, a proper explication of this notion is more complicated than appears at first sight. Certainly a presupposition will qualify as contextually salient if it has been explicitly asserted immediately before the sentence that triggers it. For instance in (34)

(34) Mary lives in New York. John lives in New York too.

the *too* of the second sentence is perfectly justified. (It is even obligatory, in the sense that leaving it out renders the discourse strange; see Sæbø (1991). But besides this direct and explicit way of making a proposition salient there are others as well. It will be enough, for instance, if attention has been drawn to a particular person or persons of whom both speaker and hearer know that they live in New York and whose living there is somehow relevant to the topic of discussion. Thus

(35) I cannot think why Mary should find it so difficult to make friends. After all, John lives in New York too, and he never appears to have had any difficulties of this sort.

seems felicitous if it is part of the common ground that Mary lives in New York and that her living there might be relevant to her social problems.

In the light of examples such as (35) it might be thought that the contextual salience of the presupposition generated by *too* is connected with the salience of some individual x such that x is different from John and it is part of the common ground that x lives in New York. In general, however, this need not be so. Consider (36):

(36) Ten people were at the party. John was there too.

(36) seems perfectly acceptable and its strongly preferred interpretation is that John was one of the ten people mentioned in its first sentence. Since

(36) is felicitous, the presupposition that someone other than John was at the party must have been contextually salient. Well, this proposition is made salient by the first sentence insofar as this sentence entails, for any individual y whatever, that there were individuals x at the party other than y. So it entails this in particular for the case where y is John. But it does not entail a proposition of the form "x was at the party" for any particular contextually salient x distinct from John.

Nevertheless the case illustrated by (35), where the presupposed proposition is salient in virtue of the fact that the context instantiates that proposition for some particular contextually salient individual, is very common. In particular it is this type of case, we shall argue, which is exemplified by the *wieder* of (5). And, we will argue, it is in virtue of the kind of presupposition verification exemplified in (35), where an existential presupposition $(\exists y)P(y)$ is verified by finding in the context a salient x such that $P(x)$, that the *wieder* of (5) makes the semantic contribution we discussed in the introduction to the present section. To see the connection between (5) and (35), let us first look at another example involving *wieder*, in which the contributing effect of contextual verification is more easily recognized. The following example (37) is also due to Kripke:

(37) (i) We will have pizza on Mary's birthday. So we should not have pizza on John's birthday.

(ii) We will have pizza on Mary's birthday. So we should not have pizza again on John's birthday.

The point of this example is that (37.ii) allows the inference that John's birthday is later than Mary's birthday, but that (37.i) does not. Why? In (37.ii) *again* is used in its repetitive sense. This means that *again* induces the presupposition that there was an earlier event of the type described in the sentence, i.e. an event of the type "we have pizza". Second, the context set by the first sentence of (37.ii) contains an event of the type in question, although there is no independent information to the effect that this event precedes the one mentioned in the second sentence. Apparently, however, the opportunity of seeing the presupposition as contextually verified by this event is an invitation to the interpreter to assume that it does precede the event of having pizza on John's birthday. Ergo, John's birthday comes after Mary's birthday. In (37.i), where *again* is absent and presupposition verification does not arise, this additional assumption is not made, so that the question whether John's birthday is before or after Mary's remains unresolved.

The contribution made by *wieder* to the information conveyed by (5) derives from a similar source as the contribution made by *again* to (37. ii), but the difference is that, as we have already noted, the *wieder* of (5) is not repetitive but restitutive. We already remarked that the presuppositions generated by restitutive and repetitive *wieder* are distinct. But there is more to be said about the presuppositions triggered by restitutive *wieder* than we have done so far. The central conception conveyed by restitutive *wieder* is that the process which is implicitly or explicitly asserted by the sentence in which it occurs was preceded by an opposite process whose effects the later process undoes, thereby restoring the state of affairs which obtained when the first process began.[14] Thus in general the presupposition generated by restitutive *wieder* has the following schematic form (38).

(38) $s_{0^\circ})(\, e_{0^\circ})(\, s_{1^\circ})(\, e)(\, s$

The schema applies both to cases like (5), where the *wieder*-sentence describes a result state and to cases like (31), where the described eventuality is the state changing process. But there is nevertheless one difference between these two cases. When the *wieder*-sentence describes the state s, the discourse referent for this state is shared between the DRS representing the assertion and the one representing the presupposition, while the discourse referent for the event initiating s is privy to the presupposition DRS. When the sentence describes the process, it is this process that assertion DRS and presupposition DRS have in common.

(38) claims that e was preceded by an event e_{0° whose result state s_{1° is identical with the pre-state of e. In particular the restitutive presupposition triggered by the second sentence of (5), (39), is as in (40):

(39) Nach drei Wochen war er wieder gesund.
(After three weeks he was healthy again.)

14 See Fabricius-Hansen (1980), (1983).

(40)

s_{0° e_{0° s_{1° e°
$s_{0^\circ})(e_{0^\circ})(s_{1^\circ})(e^\circ)(s$ s_{0°: PRE(ANT(HEILEN))(y, z) e_{0°: ANT(HEILEN)(y, z) $y = \text{Theme}_1(e_{0^\circ})$ $z = \text{Theme}_2(e_{0^\circ})$ s_{1°: RES(ANT(HEILEN))(y, z) s_{1°: PRE(HEILEN)(y, z) e°: HEILEN(y, z) $y = \text{Theme}_1(e^\circ)$ $z = \text{Theme}_2(e^\circ)$

Here s is the state described by the sentence, e° the process that produced that state, y is the referent of the pronoun *er* and z represents the disease from which y recovers during e°.

When this presupposition is verified in the context produced by the first sentence of (5), the possibility arises of identifying the discourse referent e_{0° with the one that was introduced for the event of falling ill described by the first sentence. In this way we obtain a representation for the two sentences of (5) in which the result state of the event introduced by the first sentence continues up to the point where a subsequent cure converts it into the state of health described in the second sentence.

Before moving on we want to emphasize the conceptual difference between restitutive and repetitive ***wieder*** as we have presented them. The presupposition generated by repetitive ***wieder*** is that an eventuality of the type described in the ***wieder***-sentence happened before the one whose occurrence this sentence asserts. Here the emphasis is on the sameness of what is asserted to be the case and what is presupposed to have been the case earlier. With restitutive ***wieder*** the emphasis lies on the opposition between the state or process described by the ***wieder***-sentence and the state/process which is presupposed to have preceded it. It is important in this connection to see the close similarity between the cases where a restitutive ***wieder***-sentence ostensibly describes a state, as in (28) or (39), and those where it ostensibly describes a state-changing process, as in (29). In either case the state s and the process e that produced it (or the process and the state resulting from it) should be seen as a single structure, like the "nucleus" for accomplishment verbs proposed by Moens (1987).[15] The force of the

15 A *nucleus* is defined as a structure consisting of a preparatory process, a culmination, and a result state.

presupposition induced by restitutive *wieder* is that this structure was preceded by a process e_{0° which produced the pre-state s_{1° of e and whose own pre-state s_{0° is restored by e, and thus is of the same type as s. Thus it is a crucial part of this conception that the period between the end of e_{0° and the beginning of e is seen as the duration of a single state s_{1°.[16, 17]

4.2. wieder: *Presupposition construction*

An account of the presuppositions carried by *wieder* must accomplish two things which it is important to keep distinct. First, we need a way of determining, for each occurrence of *wieder* in a sentence s, a semantic representation of the presupposition it triggers. The computation of this representation will depend on (i) which parts of s are within the scope of *wieder*; (ii) aspects of the semantic representation for the sentence s without *wieder* and (iii) whether *wieder* does or does not receive stress (in case this information is available).

Second, we need to articulate the sense in which the computed presupposition is to be related to the given context. This part of the account will have to specify how elements of the computed presupposition should be linked to elements that are present in the context representation and how those discourse referents from the presupposition which remain without links, as well as conditions from the presupposition which the links fail to verify in the context, are to be "accommodated".

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16 Recall: In our examples the state s_{1° is: a state of illness in (31); a state of the window being open in (29); a state of Fritz not living in Stuttgart in (28.i); and a state of the tourist being ill with typhoid in (5).

17 It appears that the original meaning of *wieder* was restitutive and that the repetitive meaning developed out of it. How this might have happened is not our concern here (although we would guess that this development involved two stages, first a shift away from the restitutive interpretation as we have described it here towards the sameness of the asserted state s and the original, restored state s_{0°, and then a generalization of this shifted perspective to eventualities other than states. (See Fabricius-Hansen (1980)) The literature contains a number of efforts to explain the restitutive and the repetitive interpretations of *wieder* on the basis of a single semantics, which then yields one or the other interpretation through interaction with other syntactic and semantic processes. While we share the view that such an account of *wieder* would be attractive in principle, we have found no way of formulating a unified analysis of *wieder* along these lines. Thus we cannot do better than treat *wieder* as genuinely ambiguous.

From what we have said about the difference between restitutive and repetitive *wieder* it appears that the presuppositions triggered by restitutive *wieder* are a good deal more complex than those triggered by repetitive *wieder*. For instance, while the presupposition generated by the restitutive interpretation of *wieder* in (32) has the same over-all structure as (40), the presupposition triggered by the repetitive interpretation will have the much simpler form:

(41)

s_{0°
$s_{0^\circ} < s$ s_{0°: KRANK(y)

Nevertheless, the matter of presupposition computation for repetitive *wieder* involves one complication which plays little or no role in the computation of the presuppositions for restitutive *wieder*. This is the matter of scope. Consider the following sentences:

(42) (i) weil wieder ein Assistenzarzt einen Patienten von
(because again an intern a patient of
einer Krankheit geheilt hat.
a disease cured has.)

(ii) weil ein Assistenzarzt wieder einen Patienten von einer Krankheit geheilt hat.

(iii) weil ein Assistenzarzt einen Patienten wieder von einer Krankheit geheilt hat.[18]

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18 Lest the reader be puzzled why we haven't included a fourth variant in which *wieder* stands immediately in front of the verb, as in (42.iv)

(42.iv) Weil ein Assistenzarzt einen Patienten von einer Krankheit wieder geheilt hat.

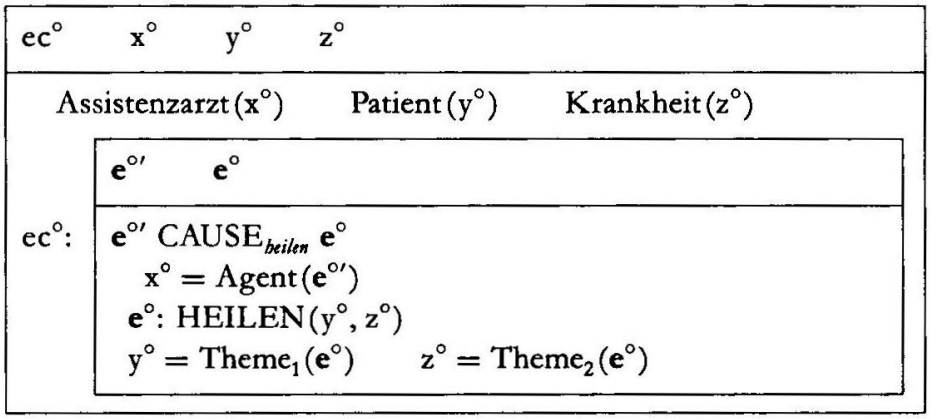
here a quick comment on that fourth sentence. The main problem we have with (42.iv) is that it does not seem to be a particularly good sentence. We suspect that the order in which *wieder* and the *von*-phrase appears in (42.iv), with the first preceding the second, is at variance with some principle or principles of syntax, although we do not know what the right syntactic explanation of this fact is. Sentences following this pattern improve considerably when the *von*-phrase is a definite, as in (42.v)

(42.v) Weil ein Assistenzarzt einen Patienten vom Typhus wieder geheilt hat.

or when it is an indefinite that is easily interpreted as a specific indefinite, as we have for instance in (42.vi)

In each of these sentences *wieder* allows for a repetitive interpretation. But the presuppositions which repetitive *wieder* triggers in these sentences are nevertheless distinct. In (42. i) the presupposition is that there was an earlier event of *some* intern curing *some* patient from *some* disease. Thus the event type of which the presupposition claims that there was an earlier instantiation has the form (43).

(43)



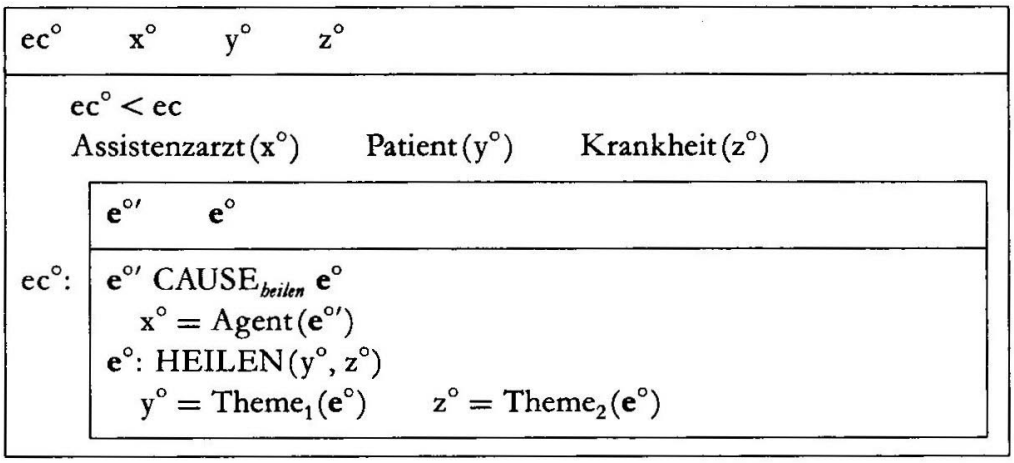
All constituents of the clause (42. i) enter into this characterization. The lambda binder "λec°" to the left of the DRS indicates that the structure identifies an *event type*, whose instances are the possible values for the variable ec°.

(43) represents the event type an earlier instantiation of which is presupposed. This representation must be distinguished from the representation of the presupposition as a whole, i.e. of the proposition that the asserted event was preceded by an instance of this type. This second representation will have the form (44).

(42. vi) Weil ein Assistenzarzt einen Patienten von einer gefährlichen, erst neuerdings identifizierten tropischen Krankheit wieder geheilt hat.
Because an intern has again cured a patient from a dangerous tropical disease which has only recently been identified.

Since sentences like (42. iv) are not optimally grammatical in the first place, it is difficult to be confident about their exact meaning (or so at any rate it seems to us). Consequently we have excluded them from the present explorative discussion.

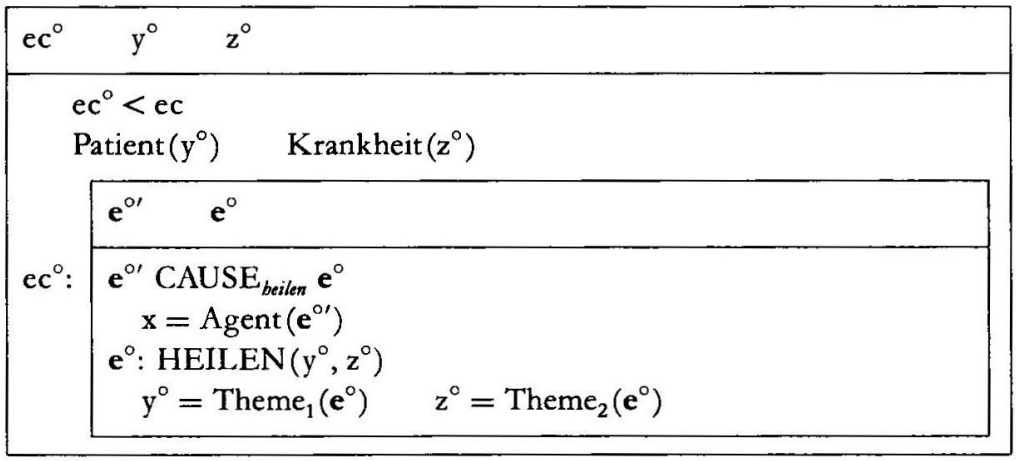
(44)



In this structure ec represents the event whose occurrence is asserted by (42. i) and ec° the presupposed event.

The presupposition triggered in (42. ii) is not that there was an earlier cure by some intern or other, but rather that *the same* intern performed a previous cure (though one involving presumably a different patient and/or a different disease). The presupposition is given in (45).

(45)



Here x is the discourse referent introduced by the NP *ein Assistenzarzt* in the representation of the assertion made by (42. ii).[19]

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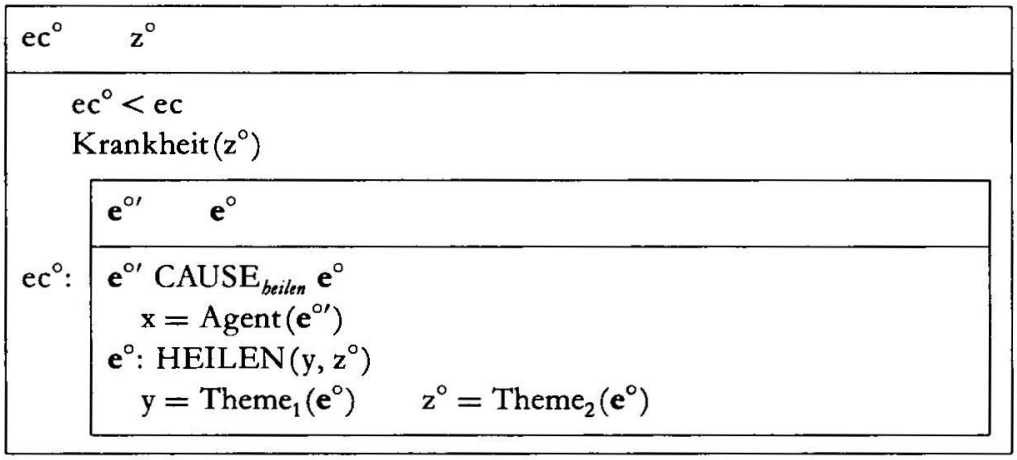
19 It might be thought that besides the interpretation given in the text there is also one where the presupposition is the same as that which we have given for (42. i). It seems that this interpretation is only available when (42. ii) is read with a certain marked intonation, in which the subject phrase *ein Assistenzarzt* receives stress. The availability of such special intonation patterns renders judgements of the semantics of this sentence a delicate matter; and the same goes for some of the other sentences we will have to consider in the remainder of this paper. We have tried to follow a policy of ignoring the readings associated with such marked intonation patterns and to pay attention

The repetitive interpretation of *wieder* in (42.iii) follows the pattern suggested by the two preceding cases. This time the presupposition is to the effect that the same doctor previously cured the same patient from some disease:

(46)



Here both x and y are discourse referents introduced in the course of processing the assertoric content of the sentence.

The general pattern should be clear from these examples: the constituents which enter into the representation of the presupposition which *wieder* triggers are those that occur to its right. We will refer to the constituents which enter into the representation of the presupposition generated by a given occurrence of *wieder* as *(belonging to) the scope of* that occurrence.[20]

So much for the repetitive interpretations of *wieder* in (42.i–iii). What about restitutive readings? The first point to note is that a restitutive reading is possible only in (42.iii). This observation relates to the restriction on restitutive interpretations which we noted above, when we remarked that such an interpretation is possible only in clauses whose VP describes either a "change-of-state" process or a state that can be understood as the result of such a process. Recall[21] that such state changes are always changes in

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only to the effects of stressed and unstressed occurrences of the word *wieder* itself. It need no comment that this policy cannot be wholly satisfactory and that it will eventually be replaced by one that takes full account of intonational nuances.

20 We conjecture that the proper syntactic characterization of what belongs to the scope of *wieder* involves some configurational relation such as c-command. This conjecture is compatible with the cases we have looked at, given widely shared assumptions about the structure of the German clause. We feel however that more work is needed before we could make this claim with confidence.

21 See Sec. 6 in Kamp & Roßdeutscher (1994), this volume.

the "theme" affected by the process. The restitutive reading of *wieder* generates the presupposition that the described state, i.e. the result state of the described process[22], is a condition *of* the theme; that the process resulting in the state *brought about* this condition of the theme from a previous state in which it (the theme) was not in this condition; and that this previous state was in its turn the result of a converse process which eliminated the condition that the theme satisfied at the very outset. Throughout this succession of states and processes the theme remains fixed. In particular, the presupposition must share the theme with the assertion that the sentence makes. This shared identity will be guaranteed only when the theme phrase is outside the scope of *wieder*.

Among the sentences (42.i–iii) that we have just been looking at, there is only one, viz. (42.iii), for which this is the case. So it is only in (42.iii) that we encounter an ambiguity between a restitutive and a repetitive interpretation of *wieder*.[23] For good measure we give in (47) the presupposition for its restitutive reading.

(47)

s_{0° e_{0° s_{1° z°
$s_{0^\circ})(e_{0^\circ})(s_{1^\circ})(e)(s$ Krankheit(z°) s_{0°: PRE(ANT(HEILEN))(y, z°) e_{0°: ANT(HEILEN)(y, z°) $y = \text{Theme}_1(e_{0^\circ})$ $z^\circ = \text{Theme}_2(e_{0^\circ})$ s_{1°: RES(ANT(HEILEN))(y, z°) s_{1°: PRE(HEILEN)(y, z°)

Here e represents the process of the patient's getting better which is part of the causative event described by (42.iii) and s represents the state resulting from that process.

Both the presupposition given in (46) and that given in (47) seem to suggest that the presupposed process of getting ill may involve a different

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22 As stated before, the process is either described explicitly, viz. when the *wieder*-sentence has a process verb or its causative for its main verb, or it is implicit, when the main verb describes the result state.

23 As we noted in connection with (31) and (32), spoken versions of (43.iii) are disambiguated by stress: Stressed *wieder* gets the repetitive, unstressed *wieder* the restitutive interpretation. Precisely why there should be this correlation between stress pattern and the choice between restitutive and repetitive readings is addressed in Roßdeutscher (ms).

disease than the one from which (42.iii) asserts the patient has just been cured; for the discourse referent z° is a new variable, which the presupposition does not share with the assertion. This would seem to conflict with our intuitions, according to which the disease of which the patient has been cured is the same as the one which the presuppositions claim he previously contracted. The explanation of this apparent conflict is not hard to come by. It has to do with the specific properties of the concepts of getting ill and getting better. As we noted in section 3.1. these concepts stand to each other roughly as the concept of filling (a glass, say) stands to that of emptying: emptying is a "universal" concept in that the result state is naturally characterized by a universal condition – when the glass is empty, it is true for all relevant things (e.g. all liquids) that they are not in the glass. *Fill* in contrast is "existential" in that its result state can be existentially defined – the glass is full if there is something that is in it. Similarly being ill is existential in that it is having some ailment; being healthy is universal (or negative existential) in that it amounts (roughly) to being free from all ailments. From these characterizations it is easy to see the difference between on the one hand going first from a universal to an existential state and then back to the universal one (e.g. going from empty to full and then back to empty, or going from health to illness and then back to health), and on the other hand going from existential to universal state and then back to the existential state (as one does when going, say, from ill to healthy and back to ill). In the former case, the liquid or disease which goes in during the first transition has to come out during the second part; otherwise the final universal state could not be. When the transition is from existential to universal to existential, there is no such requirement: A glass can be emptied of one thing and then filled with another; or one gets better from one disease and then succumbs to the next one.

Indeed, it is easy to test this explanation by comparing (42.iii) with sentence (48) in which *heilen* is replaced by *erkranken* (falling ill)

(48) weil Fritz wieder an einer gefährlichen Krankheit erkrankt ist
(because Fritz again with a dangerous disease came down)

For the repetitive interpretation of *wieder* in (48) it is entirely clear that the asserted event and the presupposed event of Fritz's falling ill may have involved different diseases. But (48) also allows for a restitutive reading, according to which his falling ill constituted a return to the condition of illness that obtained previously and which was, all too shortly, interrupted

by a spell of good health. But here too it is possible that he ends up suffering from a different disease than he had at first.

We have dwelt on this point, as it shows how questions of lexical structure, such as the distinction between universal and existential concepts, may interact with the structural aspects of presupposition determination to produce the interpretations which speakers actually get. Here as elsewhere in natural language semantics some of the puzzles that confront the linguist are created by often unexpected synergies between syntax and the lexicon.

(42.i–iii) illustrate the scopal interactions between *wieder* and noun phrases. However, a systematic account of the computation of *wieder*'s presuppositions must also deal with other questions of scope. The following examples show that where *wieder* interacts with other scope bearing elements such as modals, the problem seems less tractable than our discussion of (42) may have suggested. Consider the following two sentence pairs (49.i, ii)

(49) (i) Vor drei Jahren konnte Fritz 10 Kilometer an einem Stück schwimmen. Dann war er lange krank. Heute aber kann er wieder so weit schwimmen.
(Three years ago Fritz could swim 10 kilometres in one go. Then he was ill for a long time. But today he manages to swim this far again.)

(ii) Wer einmal in Berlin war, der will wieder in Berlin sein.
(Anyone who has been in Berlin once wants to be in Berlin again.)

We will not discuss these two examples in depth. The only observation we want to make about them is that in the natural interpretation of (49.i) the presupposition carried by *wieder* has it that there was an earlier state of affairs consisting in Fritz' *being able* to swim 10 kilometres. In other words, the modal *kann* is incorporated into the presupposition. According to the natural reading of (49.ii) the presupposition is that the subject has been to Berlin before, not that he wanted to be to Berlin before; there the modal is *not* taken as incorporated into the presupposition. What governs these differences – the particular modals involved, certain aspects of word order, pressure from the context in which the sentence occurs – we do not know. This too is a topic for further research. For the remainder of this paper we will make the simplifying assumption that the scope of *wieder* consists of the constituents occurring to its right.

4.3. wieder*: presupposition justification*

In the last two sections we have discussed the general form of the presuppositions triggered by repetitive and restitutive *wieder* and we have looked at some of the problems that must be handled by an algorithm which computes those presuppositions from a syntactic representation of the triggering sentences. In this section we will apply the results of those discussions in a reconstruction of certain inferences to which *wieder* makes a tangible contribution. The first example we consider is a variant (50) of Kripke's example (37), which we have adapted for our purposes by choosing a German counterpart, which for the most part involves verbs whose lexical entries we have given already.

(50) (i) Die Vorhersage eines Wahrsagers für das kommende Jahr: Du wirst zu Ostern an Typhus erkranken. An Deinem Geburtstag wirst Du wieder an Typhus erkranken.
Some fortune teller's prediction for the coming year: You will come down with typhoid at Easter. You will come down with typhoid again on your birthday.

(ii) Du wirst zu Ostern an Typhus erkranken. An Deinem Geburtstag wirst Du auch an Typhus erkranken.
You will come down with typhoid at Easter. You will also come down with typhoid on your birthday.

As in Kripke's original example (37) the presence of *wieder* (in the second sentence of (50.i)) permits the inference that the addressee's birthday is after Easter. In (50.ii), from which *wieder* is absent, this inference is not sustained. The reason for the difference is exactly as we explained for (37) in section 3.1. Since we are at this point interested only in reconstructing the inferential contributions made by *wieder*, we will only confine our attention to (50.i).[24]

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[24] Arguably (50.ii) carries a mild encouragement to infer that the addressee's birthday is after Easter, inasmuch as it is prima facie somewhat more natural to present several predictions about the future in their chronological order. But this rhetorical support for the conclusion that the birthday comes after Easter is certainly much weaker than the support provided by *wieder* in (50.i). Another difference between (50) and (37) is that the second sentence of (50.ii) differs from that of (50.i) in that *wieder* has not simply been excised, but rather in that it has been replaced by the word *auch*. (If *wieder* is left out without replacement, then (50) becomes infelicitous. This is yet

The first sentence of (50.i) yields the DRS (51). Within the period t described by *zu Ostern* (at Easter) there is the event of falling ill with typhoid.

(51)

n e t y z
$e \subseteq t$ $n < e$ addressee(y) der Typhus(z) Ostern(t) e: ANT(HEILEN)(y, z) $y = \text{Theme}_1(e)$ $z = \text{Theme}_2(e)$

To process the second sentence we first construct a representation of the sentence which we obtain from it when *wieder* is removed. This representation captures the assertoric contribution that the second sentence makes. It is given in (52). As usual in DRT, the sentence is processed with reference to the "context" DRS (51) provided by the first sentence and the discourse referents for the addressee and the typhoid are linked to the corresponding discourse referents which (51) already contains. Thus (52) must be seen as a part of the larger DRS that is obtained by merging it with (51).

(52)

n e′ y′ z′ t′
$e' \subseteq t'$ $n < e'$ $y' = y$ $z' = z$ y′ 's Geburtstag(t′) e′: ANT(HEILEN)(y′, z′) $y' = \text{Theme}_1(e')$ $z' = \text{Theme}_2(e')$

Like the *again* of (37), the *wieder* of (50) only has a repetitive reading. Earlier, when discussing (37), we let this pass without comment. But now that we are concerned with sketching a representation algorithm for sentences containing *wieder*, the question how one chooses between its repetitive and its restitutive reading can no longer be ignored. There is much more to be said about this problem than we can say here. But at least a short remark seems in order. Often the choice between repetitive and restitutive *wieder* is determined by the possibilities of verifying the corresponding presup-

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another instance of the need for explicit witnesses to certain kinds of discourse-structural relations to which we draw attention in Section 4.5.) *Auch* is, like *wieder*, a presupposition trigger. But although the comparison of *auch* and *wieder* is, we believe, of considerable interest, this is not the place ot go into such a comparison.

positions in the context in which the *wieder*-sentence appears: When the context contains an earlier eventuality of the type described in the *wieder*-sentence, but does not contain an earlier opposite state or opposite process, the repetitive presupposition will be verified, while there is no contextual basis for verifying the restitutive presupposition. So the repetitive reading is forced upon us. If on the other hand the context does contain an earlier opposite state or earlier opposite process or both, but does not contain an earlier eventuality of the type the *wieder*-sentence describes, then only the restitutive presupposition is verifiable and it is the restitutive interpretation that is selected. In (37) and (50.i) we evidently have contexts of the first kind. Consequently *wieder* gets the repetitive reading.

In this and the following sections we will make things easier for ourselves by ignoring the question how the readings of *wieder* are selected.

The next step is to construct the presupposition generated by the repetitive *wieder* of (50.i). In view of the syntactic position of *wieder* in the second sentence of (50.i), its scope consists of the words *am Typhus erkranken.* Consequently the presupposition will be as in (53).

(53)

e° z°
$e^\circ < e'$
$z^\circ = z'$
e°: ANT(HEILEN)(y', z°)
$z^\circ = \text{Theme}_2(e^\circ)$

To verify this presupposition we must check whether it is satisfied by the DRS (54) which we obtain by expanding the context DRS (51) with the assertoric content of the second sentence, DRS (52).

(54)

n e t y z e' t' y' z'
$e \subseteq t$ $n < e$ $e' \subseteq t'$ $n < e'$
addressee(y) Typhus(z) Ostern(t)
$y' = y$ $z' = z$ y' 's Geburtstag(t')
e: ANT(HEILEN)(y, z)
$y = \text{Theme}_1(e)$ $z = \text{Theme}_2(e)$
e': ANT(HEILEN)(y', z')
$y' = \text{Theme}_1(e')$ $z' = \text{Theme}_2(e')$

We see that if we identify the discourse referents e° and z° of (53) with the discourse referents e and z, then all conditions of (53) are verified in

(54), except for the last one, $e^{\circ} < e'$. This is as close as we can get to a verification of the presupposition (53) in the "context" (54). So, strictly speaking the presupposition is *not* verified in this context; and so, to the extent that the second sentence of (50.i) can be regarded as felicitous in the context created by its predecessor, the presupposition must be *accommodated.* It appears to be a common feature of presupposition accommodation, however, that in a case such as we have here, where a particular mapping of the discourse referents in the universe of the presupposition onto discourse referents in the universe of the context comes close to complete verification, the missing parts are accommodated so as to *render* verification complete. In the present case, the missing part is the condition $e < e'$; by accommodating this condition we arrive at a context which fully verifies the presupposition of *wieder.*

This way of establishing harmony between context and presupposition, where a presupposition is partly verified and partly accommodated, seems to be quite common. Cases of presupposition verification in the traditional sense, where an embedding of the presupposition into the context verifies all its conditions, and cases of pure accommodation, where the entire presupposition is newly added to the context, are merely two extremes of a spectrum that includes many intermediate cases as well. We will refer to all these ways, whether they involve only verification, only accommodation or both, as cases of *presupposition justification.*

Having justified the presupposition of the second sentence of (50.i) in the manner indicated, we may now add its assertoric content (52) for real, thus obtaining for the whole of (50.i) the representation (55).

(55)

n e t y z e′ y′ z′ t′
$e \subseteq t$ $e' \subseteq t'$ $n < e < e'$
addressee(y) Typhus(z) Ostern(t)
$y' = y$ $z' = z$ y′ 's Geburtstag(t′)
e: ANT(HEILEN)(y, z)
$y = \text{Theme}_1(e)$ $z = \text{Theme}_2(e)$
e′: ANT(HEILEN)(y′, z′)
$y' = \text{Theme}_1(e')$ $z' = \text{Theme}_2(e')$

Obviously this representation supports the inference that the addressee's birthday is after Easter.

The next inference we consider is the one licensed by the occurrence of *wieder* in (28.i). This occurrence, we saw, is a case of restitutive *wieder.*

We repeat the example:

(28) (i) Als ich Fritz kennenlernte, war er gerade nach Paris umgezogen. Jetzt wohnt er wieder in Stuttgart.
When I first met Fritz, he had just moved to Paris. Now he is living in Stuttgart again.

The representation of this pair of sentences involves, apart from the issue that concerns us, a couple of other problems, the treatment of the past perfect and the lexical entries for the relevant verbs, especially *umziehen* (move, in the sense of move house) and *wohnen in* (live in).

For a treatment of the past perfect see e.g. Kamp & Reyle (1993). As regards the verbs, all that really matters here is that when e is an event of y moving (in the relevant sense) from a to b, then y must have lived in a just before the move and must have been living in b just after.

We don't go into these problems here, but give the representation of the sentence without further ado.[25] It has the form given in (56).

(56)

n e_k t e s i x l
$e_k \subseteq t$ $t < n$ $t \subseteq s$ e)(s RES(e, s) *gerade* (e, t) speaker(i) Fritz(x) Paris(l) e_k: *kennenlernen*(i, x) e: *umziehen nach*(x, l) x = Theme(e) l = Goal(e) s: *wohnen in*(x, l)

As in the preceding section we next compute the representation (57) of the second sentence of (28.i) without *wieder*:

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25 When we leave a lexical item unanalyzed, as here the verbs *kennenlernen*, *umziehen* and *wohnen* and the adverb *gerade*, we indicate this by placing the lexical items italicized into the DRS condition which represents it. Such DRS conditions should be considered provisional, to be replaced when proper entries for the items concerned will be available.
Admittedly we have not been entirely consistent with this policy, insofar as we have not followed it in the case of nouns, none of which have been given a semantic analysis in this paper.

(57)

n s′ x′ l′
$n \subseteq s'$ $x' = x$ Stuttgart(l′) s′: *wohnen in*(x′, l′)

Adding this representation to (56) gives us the context (58) in which the presupposition triggered by *wieder* must be justified.

(58)

n e_k t e s i x l s′ x′ l′
$e_k \subseteq t$ $t < n$ $t \subseteq s$ $n \subseteq s'$ e)(s RES(e, s) *gerade* (e, t) speaker(i) Fritz(x) Paris(l) Stuttgart(l′) $x' = x$ e_k: *kennenlernen*(i, x) e: *umziehen nach*(x, l) $x = \text{Theme}(e)$ $l = \text{Goal}(e)$ s: *wohnen in*(x, l) s′: *wohnen in*(x′, l′)

The presupposition which *wieder* carries in (28.i) specifies the state s′ as the result of an event of moving to Stuttgart which restitutes an earlier living in Stuttgart. This earlier state is presupposed to have been terminated by an event of the type antonymous to the type *umziehen nach Stuttgart* (move to Stuttgart). We will denote this antonymous type using the German verb *wegziehen aus* (Engl. to move away from). The presupposition is represented by (59).

(59)

s_{0° e_{0° s_{1° e_{1°
s_{0°)(e_{0°)(s_{1°)(e_{1°)(s′ s_{0°: *wohnen in*(x′, l′) e_{0°: *wegziehen-aus*(x′, l′) $x' = \text{Theme}(e_{0^\circ})$ $l' = \text{Source}(e_{0^\circ})$ s_{1°: ¬ [*wohnen in*(x′, l′)] e_{1°: *umziehen nach*(x′, l′) $x' = \text{Theme}(e_{1^\circ})$ $l' = \text{Goal}(e_{1^\circ})$

Identification of discourse referents from (59) with discourse referents from (58) does not get us very far. But there is nevertheless a sense in which (58) contains part of what the verification of (59) requires. The condition "s: *wohnen in* (x, l)" of (58) entails the conditions "s: ¬ [*wohnen in* (x, l')]"[26] Therefore, it is possible to see the state s as part of the presupposed state s_{1°. Thus we can get some of the way towards justification of (59) in (58) if we accommodate, as a first step, the condition $s \subseteq s_{1^\circ}$.

There is still quite a bit that accommodation must deliver: two events e_{0° and e_{1° and a state s_{0° with the conditions characterizing them and conditions which temporally relate them to each other and to s_{1°. After cheerfully accommodating all this we are equipped with the DRS (60).

(60)

n s_{0° e_{0° s_{1° e_k s i x l t e_{1° s' x' l'
$e_k \subseteq t$ $t < n$ $t \subseteq s$ $n \subseteq s'$
e)(s RES (e, s) *gerade* (e, t)
s_{0°)(e_{0°)(s_{1°)(e_{1°)(s'
$s \subseteq s_{1^\circ}$
speaker (i) Fritz (x) Paris (l) Stuttgart (l')
$x' = x$
s_{0°: *wohnen in* (x', l')
e_{0°: *wegziehen aus* (x', l')
$x' = \text{Theme}(e_{0^\circ})$ $l' = \text{Source}(e_{0^\circ})$
s_{1°: ¬ [*wohnen in* (x', l')]
e_k: *kennenlernen* (i, x)
e: *umziehen nach* (x, l)
$x = \text{Theme}(e)$ $l = \text{Goal}(e)$
s: *wohnen in* (x, l)
e_{1°: *umziehen nach* (x', l')
$x' = \text{Theme}(e_{1^\circ})$ $l' = \text{Goal}(e_{1^\circ})$
s': *wohnen in* (x', l')

26 Using the modest bit of world knowledge that living in Paris entails not living in Stuttgart. This is in turn a consequence of the lexical properties of *wohnen* and the fact that Paris and Stuttgart are distinct cities (neither of which is part of the other).

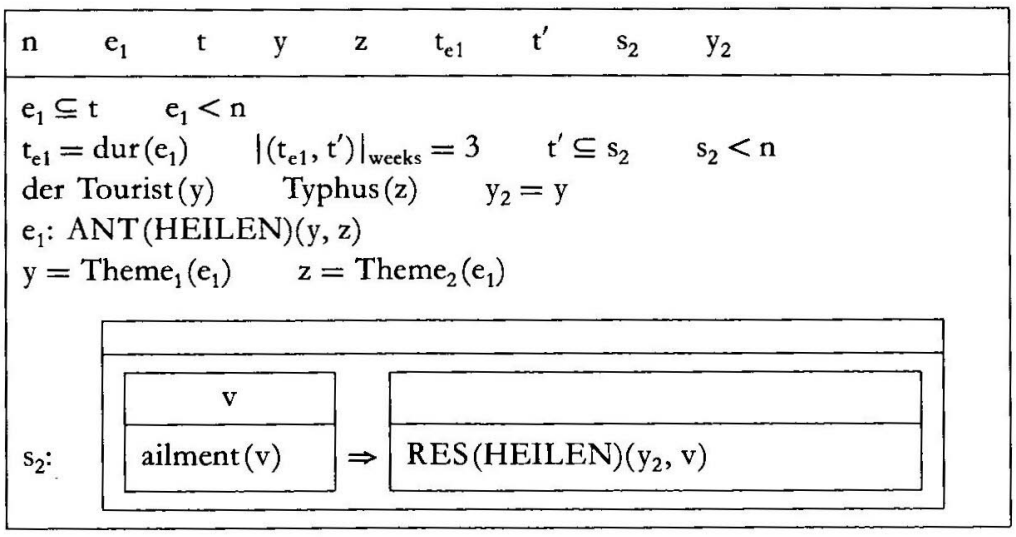
It can be seen that this DRS supports the inference that Fritz lived in Stuttgart at some time before the mentioned time he spent in Paris, and that after this time in Paris he moved to Stuttgart only once.

It is an interesting fact about discourse cohesion that even in the present case, where the mere identification of (part of) the state s_{1° with s gets us only a small part of the way to full justification of the presupposition, this identification seems obligatory. The reason, we presume, is the pressure to interpret the presupposition trigger *wieder* as establishing a significant link between its sentence and the context. Since, in (28. i) such a connection is possible only if the identification between s_{1° and s is made, the identification must be made.

As a matter of fact it would be possible to impose a further identification on the interpretation of (28. i) – of e_{0° with e (and thus of s_{0° with the prestate of e). In this way we obtain the interpretation that Fritz moved from Stuttgart to Paris and then back to Stuttgart. It is our impression that some speakers of English get this stronger interpretation.

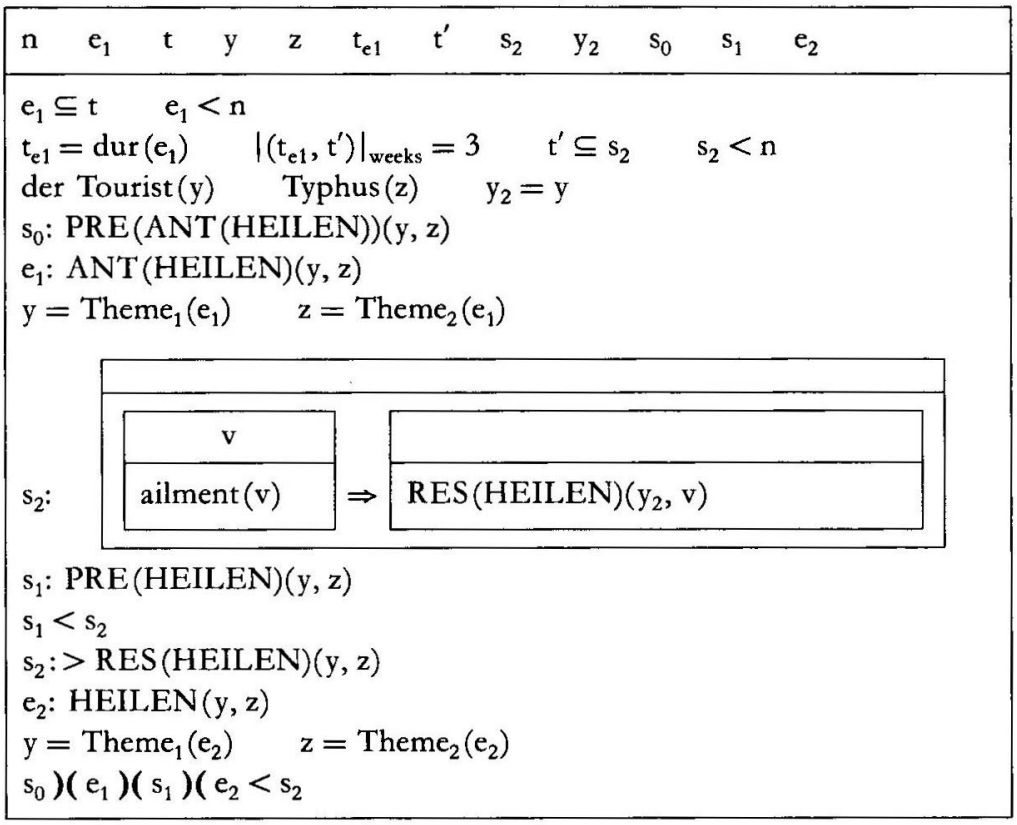
At last we return to our original problem, the inference of (6) from (5). The DRS of the first sentence of (5) together with the second sentence without *wieder* is virtually identical with the one constructed in Section 2 for the premises (19) of our "quiz" (7). It is given in (61).

(61)



Using the axioms (23) of Section 3.1. and instantiating the quantified conditional characterizing s_2 to the discourse referent z, (61) can be expanded to the DRS (62) (compare (24) on p. 185).

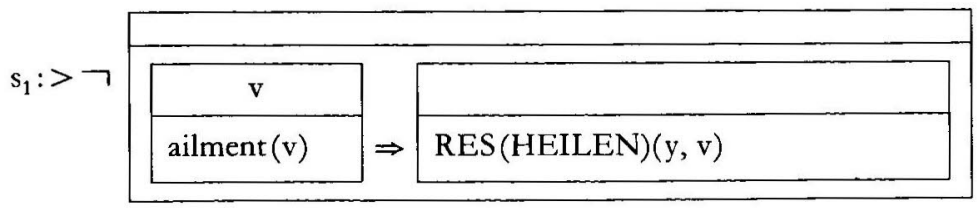
(62)



Note in particular the very last condition, $e_2 < s_2$. This condition is inferred with the help of Axiom (23), using the fact that $s_1 < s_2$ and the evident incompatibility between the characterization of s_1 and the partial characterization of s_2. That $s_1 < s_2$ follows from this incompatibility together with the facts that (i) s_2 overlaps t', (ii) s_1 abuts an event included in t and (iii) t precedes t' by three weeks. We do not go into the logic behind such temporal inferences. It should be fairly obvious what the underlying principles are and how they could be built into a proof system.

By similar reasoning (62) can be extended to the DRS (64) below. The characterization of s_1, i.e. PRE(HEILEN)(y, z) for some z, logically entails the following DRS-Condition (63).

(63)



From the universal condition on s_2, i.e. that the tourist is separated from all (relevant) ailments, the condition (63) on s_1 and the condition "$s_1 < s_2$", we can infer via Axiom (23′) that there was an event e_3 which resulted in s_2.

e_3, being the process resulting in the state s_2, must have had a prestate s_1, of a type incompatible with the characterizing type of s_2. That is, s_1, must satisfy the condition PRE(HEILEN)(y, z') for some ailment z' and the process e_3 must have been a getting better from this ailment, i.e. e_3 is of the type HEILEN(y, z').

Adding this information to (62) we get the DRS (64).

(64)

n e_1 t y z t_{e1} t' s_2 y_2 s_0 s_1 e_2 e_3 z'
$e_1 \subseteq t$ $\quad e_1 < n$
$t_{e1} = dur(e_1)$ $\quad \lvert(t_{e1}, t')\rvert_{weeks} = 3$ $\quad t' \subseteq s_2$ $\quad s_2 < n$
der Tourist(y) $\quad$ Typhus(z) $\quad y_2 = y$ $\quad$ ailment(z')
s_0: PRE(ANT(HEILEN))(y, z)
e_1: ANT(HEILEN)(y, z)
$y = Theme_1(e_1)$ $\quad z = Theme_2(e_1)$
s_2: [v | ailment(v)] ⇒ [| RES(HEILEN)(y_2, v)]
s_1: PRE(HEILEN)(y, z)
$s_1 < s_2$
s_2:> RES(HEILEN)(y, z)
e_2: HEILEN(y, z)[27]
$y = Theme_1(e_2)$ $\quad z = Theme_2$
e_3: HEILEN(y, z')
$y = Theme_1(e_3)$ $\quad z' = Theme_2(e_3)$
s_0)(e_1)(s_1)($e_2 < s_2$
$s_1 < e_3$)(s_2

Note that we are not (yet) in a position to assume that z' is identical with the mentioned typhoid, represented by z.

We saw in section 4.1. that restitutive occurrences of *wieder* in sentences describing result states trigger presuppositions of the schematic structure given in (38), where s_2 is the state whose occurring the *wieder* sentence

27 The exact temporal relation between the event e_2 in which y recovered from his typhoid and the event e_3 leading up to s_2 is not fully defined. In fact, the principal difficulty in verifying the conclusion of our argument is to show that the two events coincide.

asserts. The presupposition which *wieder* triggers in (5) has the schematic form given in (38′).

(38′) $s_{0^\circ})(e_{0^\circ})(s_{1^\circ})(e_{3^\circ})(s_2$

As we noted before, this schema does not fully capture the relations between the successive states and events it mentions. For instance, e_{3° is the process resulting in s_2, not just any event which happens to end just when s_2 starts, and likewise for the other pairs of abutting states and events. To construct a full representation of the presupposition, which also makes these "resultative" relationships explicit, we have to take as our point of departure the characterizing type of the described state s_2. When this type is a result state type RES(C) – as it is in the present case, where s_2 is of the type RES(HEILEN) – then the process resulting in the state is of the type C. This, by the way, is also what we have just assumed for the event e_3 in (64). Moreover, again as we assumed for e_3, the presupposed process, being of the type HEILEN, must have been a process of the theme y getting better from some ailment z°.

The types of the other eventualities in (38) can be computed in similar ways. In this computation we work our way backwards, as it were: the type of the state s_{1° is determined as that characterizing the prestate of e_{3°, thus as the state of having the ailment z°, and the event e_{0° as the event resulting in s_{1°, thus as the process of contracting z°. The type of the state s_{0° is the same as the characterizing type of s_2. Note that it is the same discourse referent z°, which figures in the characterizations of e_{3°, s_{1° and e_{0°.

The full representation of the presupposition is given in (65) (see page 216).

When we compare this presupposition with the DRS (64) we see that the process resulting in s_2 occurs twice, as e_3 in (64) and again as e_{3° in (65). Clearly these discourse referents represent the same process and may thus be identified. This gives us the first constraints for the justification of (65) in (64): e_{3° must be mapped onto e_3, and, for the same reason, the theme_2 of e_{3°, z°, onto the theme_2 of e_3, z'.

How is the presupposition in (65) justified w. r. t. (64)? We first give, in (66) on page 216, what in our opinion is the effect of this justification process. The justification of the justification will be given below.

This DRS provides the necessary basis for the inference of (6) we want to carry through. But how do we get to (66)? (66) may seem problematic especially when compared with the result of presupposition accommodation in our last example, as given in (60). There accommodation only

(65)

s_{0° e_{0° s_{1° e_{3° z°

$s_{0^\circ})(e_{0^\circ})(s_{1^\circ})(e_{3^\circ})(s_2$
ailment(z°)

s_{0°:

v	
ailment(v)	⇒ RES(HEILEN)(y_2, v)

s_{0°: PRE(ANT(HEILEN))(y_2, z°)
e_{0°: ANT(HEILEN)(y_2, z°)
$y_2 = \text{Theme}_1(e_{0^\circ})$ $z^\circ = \text{Theme}_2(e_{0^\circ})$
s_{1°: RES(ANT(HEILEN))(y_2, z°)
s_{1°: PRE(HEILEN)(y_2, z°)
e_{3°: HEILEN(y_2, z°)
$y_2 = \text{Theme}_1(e_{3^\circ})$ $z^\circ = \text{Theme}_2(e_{3^\circ})$

(66)

n e_1 t y z t_{e1} t′ s_2 y_2 s_0 s_1 e_2

$e_1 \subseteq t$ $e_1 < n$
$t_{e1} = \text{dur}(e_1)$ $|(t_{e1}, t')|_{\text{weeks}} = 3$ $t' \subseteq s_2$ $s_2 < n$
$s_0)(e_1)(s_1)(e_2)(s_2$
der Tourist(y) Typhus(z) $y_2 = y$

s_0:

v	
ailment(v)	⇒ RES(HEILEN)(y_2, v)

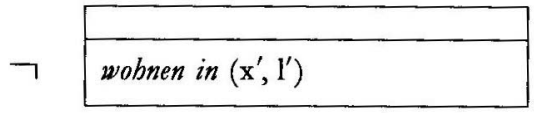
e_1: ANT(HEILEN)(y, z)
$y = \text{Theme}_1(e_1)$ $z = \text{Theme}_2(e_1)$
s_1: RES(ANT(HEILEN))(y, z)
s_1: PRE(HEILEN)(y_2, z)
e_2: HEILEN(y_2, z)
$y_2 = \text{Theme}_1(e_2)$ $z = \text{Theme}_2(e_2)$

s_2:

v	
ailment(v)	⇒ RES(HEILEN)(y_2, v)

s_2: RES(HEILEN)(y_2, z)

yielded the new information that the prestate s_{1° of the process e_{1° of moving back to Stuttgart temporally includes the previously mentioned state s of living in Paris. In (66) the connections between presupposition and context are much tighter: the presupposed prestate s_{1° has been *identified* with the previously mentioned state. As part of this identification the ailment z° has been identified with the typhoid z and, moreover, the event e_{3° has been identified with the terminating process e_2 of s, so that this latter event also gets identified with the event e_3 that initializes s_2. Whence this discrepancy between (66) and (60)? Let us, in a first attempt to explain the difference, note the formal difference between the presuppositions (65) and (59). In (59) the prestate s_{1° of the restoring process e_{1° is characterized as being of the "negated" type



whereas the corresponding prestate s_{1° in (65) has the characterization

PRE(HEILEN)(y, z°)

involving the discourse referent z° that was newly introduced into (65). This last discourse referent too carries an invitation to identify it with an element already represented in the context, and the natural candidate for identification is evidently the discourse referent z. Once this identification has been made, the identity between s_{1° and s (as opposed to the weaker condition that the latter is included in the former) follows, since the condition PRE(HEILEN)(y, z) is now the characterizing type of both s and s_{1°.

But this is not very convincing as it stands. For why could we not have proceeded along just the same lines when representing and justifying the presupposition of our previous example? After all, as the presupposed event of (59) is an event of moving to Stuttgart, it must have been an event of moving to Stuttgart from some particular place l''. From what we have said there would appear to be just as much justification for the introduction of l'' into (59) and subsequent identifications of it with l' as there is for the introduction and subsequent identification of z° into (65)[28].

All this is true and it shows that the difference between (60) and (66) cannot be explained in the simple formal terms we used two paragraphs above. The intuitive reason why adding l'' to (59) does not really help in

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28 By the same token of course we could already have introduced l'' into the DRS (58).

getting a stronger incrementation through justification of the presupposition is this. The state antonymous to the state described in the second sentence of (28.i) is the state of not living in Stuttgart, just as (59) has it. This is a state that can be realized in a great variety of different ways, i.e. by living in any one of the innumerable places that are different from Stuttgart and it is a state in which one persists when moving from one such place to another. Inasmuch as this is the natural way of conceiving the state of someone not being in some given place, it is natural to see the mentioned state of Fritz living in Paris as a part of that state without necessarily being all of it.

With our conceptualization of health and illness it is not quite like this. It is true that being ill is the state type antonymous to that of being healthy. But it does not seem to be part and parcel of our understanding of what it is to be in a particular state of illness that one can remain in it by "changing" diseases in the way that it does seem perfectly consistent with our conceptualization of location that one can change one's place of living. Therefore the notion that the state implied by the first sentence of (5), that of the tourist having typhoid, is part of the presupposed state of his being ill without being identical with it is not very plausible. To the extent that this possibility is not considered plausible, inclusion is taken to entail identity. And with the identity of the states goes the identity of the diseases the having of which constitutes their characterizations.

The upshot of this is that the extra information which distinguishes presupposition justification in the present case from that in the case of (28.i) depends on quite subtle conceptual distinctions. Much more work is needed before it will be possible to state the precise effects of presupposition justification processes in reasonably general terms. To indicate some of the complexities that such an investigation will have to deal with, we note two further points. By identifying the disease whose disappearance led to the state of the tourist being healthy again with the typhoid he has been described as having previously contracted we exclude two alternative possibilities. First the identification excludes the situation where the tourist succumbs, before or after contracting typhoid, to yet another disease, say, malaria, and that he recovers from his typhoid before recovering from his malaria, so that the final transition to health is his getting rid of the malaria, not the typhoid. The second possibility that is excluded is that the typhoid turns into a different disease, in the way a cold is sometimes said to have turned into a bronchitis. What justifies the interpreter in ignoring either of these alternatives? We conjecture that the principles on the strength of

which he tends to discard these two alternatives are not only different from each other but in fact relate to very different aspects of the "knowledge" on which interpretation rests. The first possibility is ignored, we think, since it is a principle of felicitous discourse that contextually relevant events which the speaker knows to have occurred but which cannot be assumed to be part of the common ground should be mentioned explicitly.[29] When such events are not mentioned, the interpreter feels entitled to assume that there were no such events. The second possibility, that of the typhoid turning into something else, is excluded for a quite different reason, not because of a principle that if this had happened, then it should have been said, but because diseases are, or so we think, not thought to be capable of such transformations. Or, at any rate, a disease like typhoid isn't. This is a principle of ontology, not of discourse felicity.[30]

In the form (65) at which we have now arrived, the semantic representation of (5) supports the information required for the conclusion we are aiming for – that the doctor cured the tourist from typhoid. Of course we cannot derive this conclusion yet, as the sentence in which the doctor is mentioned – *Ein Arzt aus Izmir hat ihn geheilt.* – hasn't yet been interpreted. It should be intuitively clear what this sentence will contribute. By an interpretational mechanism which we will discuss in the last section, the cure referred to in this sentence will be identified with the process e_3 that leads up to the state of health mentioned in the second sentence of

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29 See for instance Lorenz (1993), Kamp (1993), Roßdeutscher (this volume). In this last paper this principle is called the *principle of narrative closure.*

30 To appreciate the role of this last principle, it may help to compare the case we have discussed in this section with one which, as we argued in Section 4.1., shares many structural properties with it, that of a glass that is first filled and then empty again. Consider the following analogue of (5).

(1) Vor einer Stunde hat Fritz das Glas mit Eis gefüllt. Jetzt ist es wieder leer.
An hour ago Fritz filled the glass with ice. Now it is empty again.

Here too the presupposition triggered by *wieder* implies that the present emptiness of the glass resulted from an event e_2 of its being emptied, and there exists considerable pressure towards the assumption that what was thrown out was the stuff that according to the first sentence Fritz had put in. But did whoever emptied the glass empty it of ice? Possibly not. It may be that the ice was taken out of the glass before it melted, but it is also possible that it first turned into water. Even in the second case we would be inclined to say that it was the same substance – the same ice, if you like – whose removal led directly to the glass's restored emptiness. What we would not say is that emptying it was a case of emptying if *of ice.* This points towards yet another complication: whether the state resulting from Fritz' action can be said to have persisted until the event e_2 depends on the precise way in which it is characterized.

(5). But this identification will produce the conclusion we want only if the process e_3 is represented as a cure from typhoid. Thus it is essential to the inference we are after that in the case of (5) presupposition accommodation can be pushed beyond the point where we left off in the interpretation of (28.i).

Before turning to the third sentence of (5), however, we first want to relate our observations about the meaning and function of *wieder* to the general concern that ties this and the first paper in this volume together: the form and content of lexical entries and their use in discourse interpretation. What, after all we have said about *wieder*, can we say about the form of its lexical entry?

4.4. *Towards a lexical entry for* wieder

This is a paper about the form and use of lexical entries. We have addressed this topic in a somewhat anecdotal way by proposing entries for a few verbs and adjectives and showing how these support a small sample of inferences. One of these inferences turned out to depend not only on the lexical properties of certain adjectives and verbs but also on the contribution made by *wieder*. We have spent much space and time in order to clarify that particular contribution, an exploration that forced us to take a careful look at the problem of presupposition. What we have not yet done is to draw conclusions from this exploration about the form and content of an entry for *wieder*. In the light of the general purpose of this article it is natural to round this investigation off with some reflections on what such an entry might be like.

What should it be like? It is plain – and what we have seen in the preceding sections only confirmed this – that an entry for *wieder* must be very different from those entries that we have already encountered. In this respect *wieder* is of course not alone. Lexical specifications for other "functional" words – among them the "logical operators" *and*, *if*, *every*, *the*, ..., discourse particles such as *also*, *only*, *however*, *although*, *indeed*, to name just a few – will also have to be quite different from the entries which have preoccupied us so far. In fact, in view of this specifying the lexical entry for *wieder* would not just be a matter of adding one more entry to our little sample lexicon, it will also be a first step towards a better understanding of the great diversity that a lexicon must encompass if it is to be up to the tasks we have stipulated for it.

As we saw, the interpretation of *wieder* can be divided into two main parts, (i) the construction of a semantic representation for the presupposition which *wieder* generates, and (ii) the justification of that presupposition in the given context. We believe – this should have been transparent from the way in which the previous sections have been structured – that (i) and (ii) should be seen as belonging to two quite different parts of the interpretation process. Presupposition justification may involve, much like anaphora resolution, inferential processes which make use of world knowledge as well as linguistic knowledge. So, inasmuch as there is any plausibility at all to the idea that text interpretation can be factored into a language driven stage and one that further elaborates the fruits of that stage by exploring their implications against the background of extra-linguistic information, presupposition justification should belong to the second stage.

Not so for presupposition construction. The construction of presupposition representations makes use of the same syntax driven construction principles that are required for DRS construction generally. It seems reasonable therefore that the DRS construction for the assertion part and that for the presupposition should both belong to the first stage, at which general logic and world knowledge do not yet come into play, and that the result of both these construction processes is then passed to the second stage.

Dealing with presupposition in this two-tier fashion carries certain consequences. As we have seen, the scope of *wieder* often does not include all material of the clause of which it is part. (This of course is a general property of presupposition triggers.) In section 4.2. we argued this point by looking at examples like

(42) (iii) weil ein Assistenzart einen Patienten wieder von einer Krankheit geheilt hat.
(because an intern a patient again of a disease cured)

In (42.iii) the discourse referents for *ein Assistenzarzt* and *einen Patienten* are shared by the DRS for the assertion and that for the presupposition. If the constructions of both assertion DRS and presupposition DRS are to belong to the first stage, and presupposition justification and integration of the assertion part into the context representation belong to the second – then we need, as output of the first and input to the second stage, a representational structure in which these two DRSs occur jointly as part of a larger structure, whose universe contains the discourse referents for *ein Assistenzarzt* and *einen Patienten* that are shared between them.

The need for such complex representational structures, in which presupposition and assertion occur side by side, arises even more clearly when a *wieder* clause occurs as part of a larger sentence, e.g. as the consequent of a conditional. Consider the following variant of Kripke's example (37)

(67) If we have pizza on Mary's birthday, we should not have pizza again on John's birthday.

Here the combination of presupposition and assertion must occur at the subordinate level that is occupied in the representation by the consequent of the conditional, not at the level of the conditional as a whole.[31]

The need for representations in which presuppositions may be adjoined at subordinate levels was first clearly and explicitly recognized in the work of Van Der Sandt.[32] There presupposition adjunction is graphically displayed by surrounding the presupposition DRS with a dotted line, a device which we adopt here. By way of example consider (68), the output from the first interpretation phase for (42.iii), when *wieder* is taken in its repetitive sense and the complementizer *weil* is ignored.

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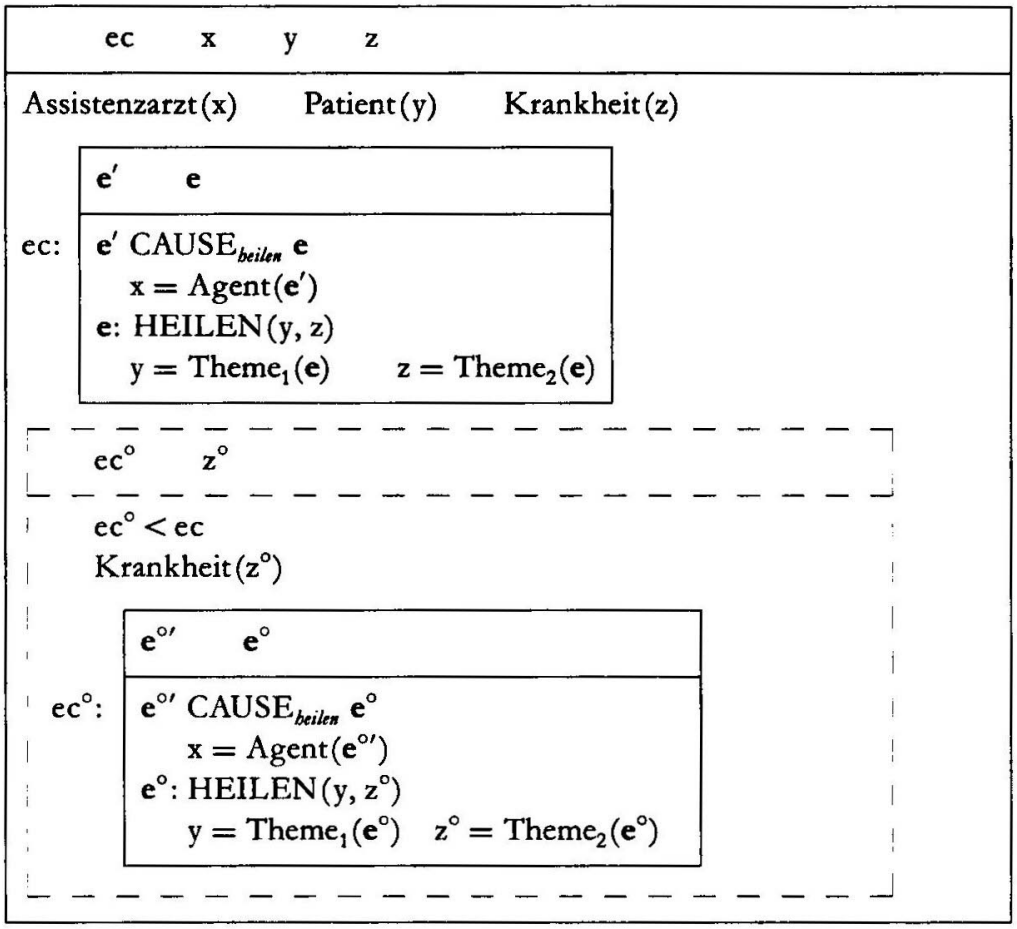
31 Those who are familiar with the presupposition literature will know that the justification of a presupposition which belongs to such a subordinate part of a representation raises problems of a different sort than what has been discussed in this paper. Accommodation and justification of embedded presuppositions are affected by the so-called "projection problem": They can occur either "globally", i.e. at the top level of the representation, or "locally", i.e. at some subordinate level. It is worth observing that the choice between global and local accommodation and that between global and local justification need not coincide. For instance, if (67) is interpreted along the same lines as Kripke's example (37), then justification will be at the level of the conditional's antecedent (and thus local), whereas accommodation – of the proposition that John's birthday is after Mary's – takes place at the top level, and thus is global. As this is not a paper on the projection problem we will not pursue this matter further.

32 see Van Der Sandt (1990), (1992)

(68)



Given our assumption that the interpretation of *wieder* can be divided into a construction stage and a justification-cum-integration stage, it is natural to relate the question of its lexical entry to each of these stages in turn. About the second stage there is little we can say. It is a topic of current debate in the presupposition literature whether or not accommodation and justification are uniform phenomena, with presuppositions underlying the same constraints irrespective of their triggers. Whether the lexical entry of *wieder* ought to contain any information pertaining to presupposition justification clearly depends on the outcome of this debate – if justification is a uniform phenomenon, then there is no need; if it is not, then the entry will have to convey what is special about the justification of *wieder*- presuppositions, as opposed to presuppositions triggered by certain other sources. As the uniformity debate has not been settled, any speculation on this point would be premature.

That *wieder*'s entry should contain information pertaining to the construction of its presuppositions seems quite plain. For clearly it is through the form of the presuppositions it triggers that the word makes its specific

semantic contributions. But precisely what sort of information is this and how should the entry represent it?

Though the question we are facing here is not particular to the DR-theoretic framework we have been using, this framework throws a particular light on it, through the separation it enforces between DRS construction and the model theory for completed DRSs. In DRT meaning is captured through an interplay between these two theory components. This is true in particular for the meanings of words. For words belonging to the major lexical categories it seems plausible that their meaning could be identified with the DRS conditions which they contribute to the Discourse Representations of sentences and texts containing them – or, if one prefers, with the truth conditions that are determined by those DRS conditions. For other words, such as for instance "logical" particles like *and*, *if* or *every*, such an identification is not possible, as there are no particular DRS-conditions which they contribute. Their meaning seems to reside, rather, in the DRS-construction rules associated with them, which impose a certain structure upon the resulting DRS that affects its truth conditions, but not in the "local" manner of the conditions introduced by, for instance, most verbs.

This is not to say that verbs have no construction principles associated with them. For instance, as we have seen in Appendix 1 of Kamp & Roßdeutscher (1994), see this volume, pp. 148–159, the use of such entries in DRS construction involves rather specific checking and transfer mechanisms, which ensure that the argument structure specified in the entry is properly "projected" into the structure of the sentence. So, inasmuch as there is a difference between the meaning of, say, a transitive verb and that of a word like *and* or *if*, it is primarily this, that the construction rules which govern the use of the entries for transitive verbs can be stated once and for all, in a schematic form which contains a parameter for the specific contributions made by the individual verb entries, whereas the "logical" words each have a rule to themselves.

What does this imply for the lexical entry of a word such as *and* or *if*? At a minimum, it would seem, the entry should specify the particular construction rule or rules that the word can trigger. For someone who expects of a lexical entry that it tell him a complete story about the meaning of a lexical item this won't be enough, as it omits the truth-conditional impact which the rules have on the DRSs that result through their application. For our purposes, however, an entry that does no more than encode the construction procedure might well be adequate – whether it is, will

depend on whether the logic which supports the inferences from DRSs succeeds in capturing the consequence relation which the truth conditions for the DRSs generate.

Within the context of DRT it is the existence of construction rule *schemata* that is distinctive of the so-called "open" word classes. It is, we take it, quite generally assumed that ***wieder*** does not belong to such an open class. If this is indeed so, then its lexical entry should include the construction procedure which generates the presuppositions which it triggers.

There still remains a question of the form in which this procedure should be specified. This is a question which depends in large part on how the DRS construction algorithm is formulated in general. As we have avoided a detailed formulation throughout this paper and have no intention of providing one now, we can do nor more at this point than to summarize the procedure for presupposition construction in hum-drum fashion. Even such a hum-drum specification of how the target representations are to be obtained is not without its problems. First there is more to be said about the meaning of restitutive ***wieder*** than we have done here. Since saying more now would lead us too far afield, we have decided to postpone discussion of the restitutive part of the lexical entry to a later paper and to confine ourselves here to the construction procedure for repetitive ***wieder***.

The steps of this construction procedure are given in (69).

(69) Construction of presupposition for repetitive ***wieder***

(i) eliminate from U_K all discourse referents which, in the construction of K, were introduced for those constituents which designate thematic roles (obligatory or optional) of the described eventuality and which do not belong to the scope of ***wieder***. (This entails in particular that the eventuality discourse referent e itself is ***not*** eliminated!)

(ii) eliminate all conditions in Con_K which contain no discourse referents from the thus reduced DRS universe.

(iii) replace all discourse referents of the reduced universe by new discourse referents, both in this universe and in all the conditions of K.

(iv) add the condition "$e' < e$", where e is the discourse referent representing the eventuality described by the clause and e' is the discourse referent by which it has been replaced in step (iii).[33]

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33 This specification is a direct generalization of the examples we analyzed in section 4.2. But it has at least two shortcomings. In the first place it fails to account correctly

It is patent from these remarks that a very great deal of work will be needed before a definitive proposal for the entry of *wieder* can be made, let alone, before we will have a well-supported overview of the variety of entries that a complete lexicon will contain. Evidently there is work here not just for one, but for many future projects. Here we leave it at the few observations just made and return to the missing link in our reconstruction of the inference of (6) from (5).

4.5. *Discourse relations and inference*

We now come to the third sentence of our premise set (5)

(5) Der Tourist erkrankte an Typhus. Nach drei Wochen war er wieder gesund. Ein Arzt aus Izmir hat ihn geheilt.

This sentence must be incorporated into the DRS (66) we have constructed for the first two premises, which we repeat (see next page).
It is intuitively clear how the information contributed by the third sentence of (5) should be integrated into (66), if the inference to

(6) Der Arzt hat ihn vom Typhus geheilt.

is to go through. Processing the third premise relative to the DRS (66) according to the familiar principles of DRS construction will produce (69) (see next page). (69) must be incorporated into (66).

---

for cases of embedded presuppositions as we found for instance in (67). To obtain a construction recipe that deals with such cases as well as it does with those we have considered in this paper, it is desirable to build DRSs not "top down" (in the style of Kamp & Reyle (1993)), but "bottom up" Bottom up procedures have been proposed by several people, among them Asher (1993), Johnson & Kay (1992), Pinkal & Millies (1993). The particular version that we are thinking of here is the one advocated in Kamp (forthcoming).

The second caveat concerns the condition "$e' < e$". It is at present unclear whether all sentences can be analyzed as descriptions of eventualities. For instance, the sentence *John didn't hand in a paper.* seems to say of some temporal interval t that there was no event of John handing in a paper during t and thus it suggests an analysis as a description of an interval and not of an event or state. When such a sentence contains *wieder*, as in *Karl hat wieder kein Papier eingereicht*, the presupposition representation should secure that the presupposed state of affairs is before the asserted one via a condition of the form "$t' < t''$, rather than "$e' < e$".

(66)

n e_1 t y z t_{e1} t' s_2 y_2 s_0 s_1 e_2
$e_1 \subseteq t$ $e_1 < n$ $t_{e1} = \text{dur}(e_1)$ $\lvert(t_{e1}, t')\rvert_{\text{weeks}} = 3$ $t' \subseteq s_2$ $s_2 < n$ $s_0 \,)(\, e_1 \,)(\, s_1 \,)(\, e_2 \,)(\, s_2$ der Tourist(y) Typhus(z) $y_2 = y$ s_0: $\boxed{\boxed{v \mid \text{ailment}(v)} \Rightarrow \boxed{\text{RES(HEILEN)}(y_2, v)}}$ e_1: ANT(HEILEN)(y, z) $y = \text{Theme}_1(e_1)$ $z = \text{Theme}_2(e_1)$ s_1: RES(ANT(HEILEN))(y, z) s_1: PRE(HEILEN)(y_2, z) e_2: HEILEN(y_2, z) $y_2 = \text{Theme}_1(e_2)$ $z = \text{Theme}_2(e_2)$ s_2: $\boxed{\boxed{v \mid \text{ailment}(v)} \Rightarrow \boxed{\text{RES(HEILEN)}(y_2, v)}}$ s_2: RES(HEILEN)(y_2, z)

(69)

ec u l z′
Arzt(u) Izmir(l) u aus l ec: $\boxed{\mathbf{e'} \quad \mathbf{e''} \mid \mathbf{e'}\ \text{CAUSE}_{heilen}\ \mathbf{e''}$ $u = \text{Agent}(\mathbf{e'})$ $\mathbf{e''}$: HEILEN(y, z′) $y = \text{Theme}_1(\mathbf{e''})$ $\mathbf{z'} = \text{Theme}_2(\mathbf{e''})$

In particular, the HEILEN process $\mathbf{e}''$ implicated by the third premise[34] must be identified with the process e_2 of (66). Since the latter process is one involving typhoid as its Theme_2, we can infer that the entire causal complex introduced by the third premise, which contains $\mathbf{e}''$ as a component, represents the information that the doctor cured the tourist of typhoid.

What justifies the identification of e'' with e_2? Here we must appeal to an aspect of discourse interpretation which has not so far been mentioned in this article. It is a necessary feature of a coherent bit of discourse that each of its sentences (except the very first) must be construed as standing in one of an apparently small number of possible rhetorical relations to the sentence or sentences immediately preceding it. There exists no full agreement on what rhetorical relations there are – or, better perhaps, what families of rhetorical relations should be brought into play for what discourse-theoretical ends. It may well be that there is no unique set, that different explanatory purposes require different ways of carving the spectrum of rhetorical possibilities up into finite families of relations.

In the present context rhetorical relations matter because of the way they correlate with the temporal relations between events described by those sentences. What we have to say about rhetorical relations here ought to be seen in this light. Rhetorical relations interact with the temporal information that is conveyed through tense. The tenses of two successive sentences determine the possible temporal relations between the events or states they describe to a considerable extent. But in general they do not determine those relations completely. Rhetorical relations often resolve the remaining indeterminacies. In the present case we have a simple past tense in the second premise and a present perfect in the third. It is a general fact about the German tense system that this combination imposes comparatively few constraints on the temporal relationship between the events or states described by two sentences with these respective tenses: the event or state described by the second sentence will sometimes be understood as following the one described by the first, sometimes as being simultaneous with it and sometimes as preceding it.

Each of these three possibilities corresponds to one or more particular rhetorical relations:

---

34 Recall the event complexes introduced by transitive *heilen*, as for instance in the DRS (30) in Kamp & Roßdeutscher (1994), this volume.

(i) The second eventuality, e_2, can be understood as following the first eventuality, e_1, only if the second sentence is understood either as describing a consequence of e_1, or else as simply continuing a chronological narration of which both the first and the second sentence are constituents.

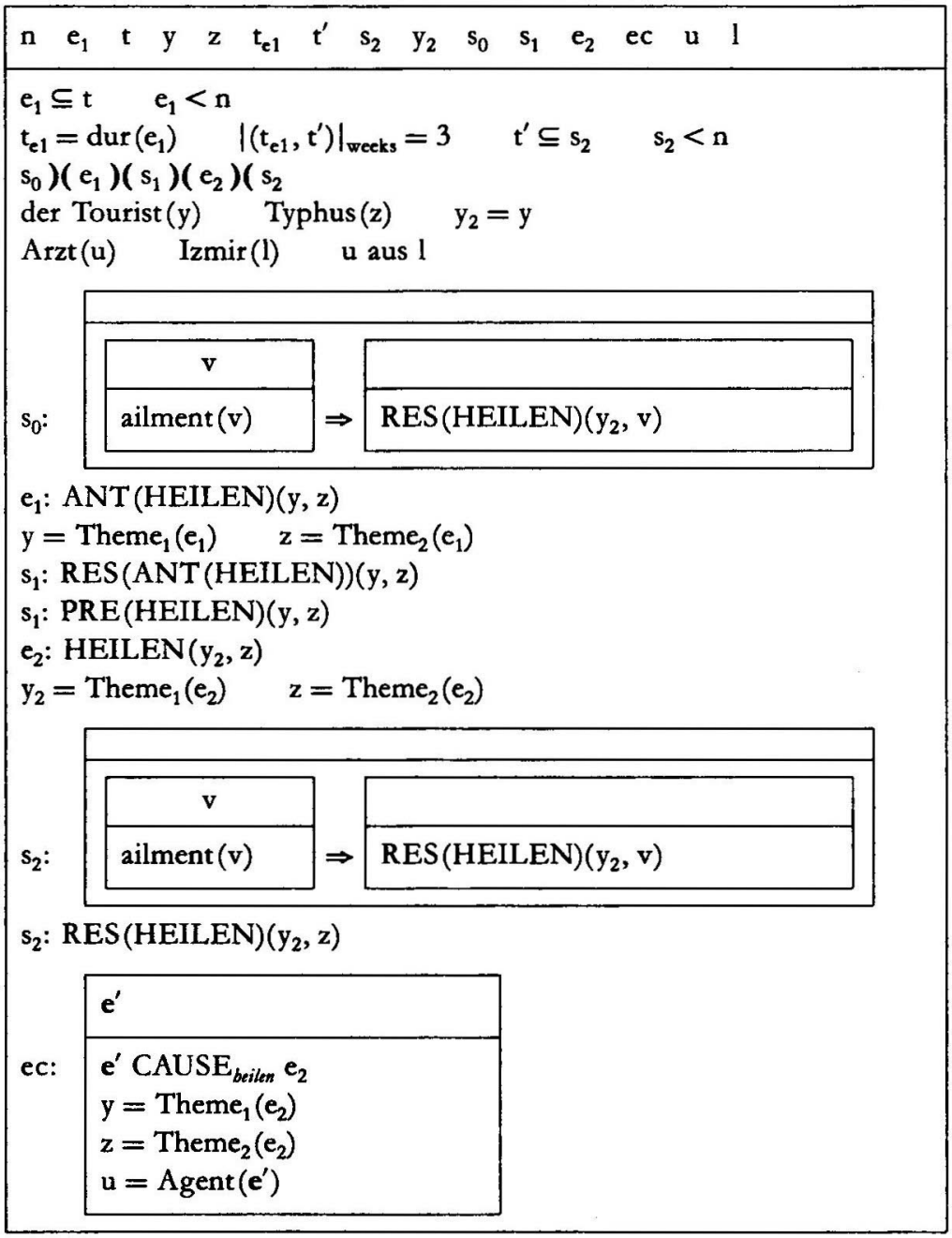
(ii) In order that e_2 can be understood as simultaneous with e_1, the two sentences must again stand in one or two distinct rhetorical relations. The first relation involves the distinction between foreground and background. It arises when one or both of e_1 and e_2 are states. When one is a state and the other it not, the one that is provides (part of) the background for the one that is not; when both are states, then they both belong to the background for some event which was mentioned farther back or for one that is still to be mentioned later on. The second type of rhetorical relation compatible with simultaneity is that of elaboration. In this case e_1 is identical with e_2; the second sentence says additional things about it.

(iii) It is possible to interpret e_2 as preceding e_1 only if the second sentence is understood as giving some kind of explanation of e_1. Often this explanation is a direct causal explanation of e_1 from e_2: e_2 is offered as a cause of e_1. In other cases, as in the one at hand, it is not to e_1 itself that e_2 stands in a relation of direct causation; rather, e_2 is presented as the direct cause of a third eventuality, which in its turn stands to e_1 in a relationship which transfers the causal connection in which it stands to e_2 onto e_1.

Thus, in the present case the event complex described in the third premise can be seen as an elaboration of the event e_2 of (66) which is not itself the eventuality described by the second premise (i.e. the state s_2), but has been inferred as the process that led to this state.

That this is the only possible interpretation can be argued as follows: Each of the first two possibilities (i) and (ii) is ruled out. (i) If the event $\mathbf{e''}$ introduced by the third premise were to follow the state s_2 introduced by the second premise, then s_2 ought to fulfill the preconditions of events of the type of $\mathbf{e''}$. (For if not, then there should have been between s_2 and $\mathbf{e''}$ an event which terminated s_2, converting it into the pre-state of $\mathbf{e''}$. But this would violate the *principle of narrative closure* – see fn. 29, p. 219). Thus, it should be compatible with the characterization of s_2 that there be some ailment of which the tourist is suffering and of which the doctor then cures him. But this is not so: s_2 is a state of y being healthy, and this condition contradicts the precondition of HEILEN. The second possibility, that of $\mathbf{e''}$ being simultaneous with s_2, is ruled out for much the same reason. If y is being cured over the period t, then y will be healthy only at the end

(70)



of t, not while t is going on; any period of overlap between s_2 and e'' would be one where on the one hand y is healthy already while on the other he is still on his way towards full recovery. Evidently this cannot be.

So we are left with the third possibility. According to what we said about the correlation between temporal and rhetorical relations this implies that the third premise offers an explanation of s. In the present case this is a causal explanation – the doctor's action is offered as the cause of the tourist's return to health. But the details of how this causal explanation

(71)

n e_1 t y z t_{e1} t′ s_2 y_2 s_1 e_2 s_0 ec u l
$e_1 \subseteq t$ $e_1 < n$ $t_{e1} = \text{dur}(e_1)$ $\lvert(t_{e1}, t')\rvert_{\text{weeks}} = 3$ $t' \subseteq s_2$ $s_2 < n$ $s_0)(e_1)(s_1)(e_2)(s_2$ der Tourist(y) Typhus(z) $y_2 = y$ der Arzt(u) Izmir(l) u aus l s_0: [v | ailment(v) ⇒ RES(HEILEN)(y_2, v)] e_1: ANT(HEILEN)(y, z) $y = \text{Theme}_1(e_1)$ $z = \text{Theme}_2(e_1)$ s_1: RES(ANT(HEILEN))(y, z) s_1: PRE(HEILEN)(y, z) e_2: HEILEN(y_2, z) $y_2 = \text{Theme}_1(e_2)$ $z = \text{Theme}_2(e_2)$ s_2: [v | ailment(v) ⇒ RES(HEILEN)(y_2, v)] s_2: RES(HEILEN)(y_2, z) ec: [e′ | e′ CAUSE_{beilen} e_2; $y = \text{Theme}_1(e_2)$; $z = \text{Theme}_2(e_2)$; $u = \text{Agent}(e')$] Show: [ec′ e_3 e_4 w r p | w = u r = y p = z; ec′: e_3 CAUSE_{beilen} e_4; $r = \text{Theme}_1(e_4)$; $p = \text{Theme}_2(e_4)$; $w = \text{Agent}(e_3)$]

engages with the context structure (66) deserve close attention. The specifically causal connection, in virtue of which what the third premise contributes qualifies as a *causal* explanation, is the one holding between the two events that make up the lexical entry of transitive *heilen*. This complex comes to provide a causal explanation of the state s_2 through identification of the second event of the complex – the process which instantiates the concept HEILEN – with the event e_2 of (66), the process which results in s_2. In the present case the rhetorical connection between the third premise and (66) can therefore be classified as a case of elaboration just as well as it can be seen as a case of explanation: the causal explanation of s_2 is mediated by the elaboration of e_2.

These identifications of $\mathbf{e}''$ of (69) with e_2 of (66) and of z' in (69) with z in (66) yield the DRS (70) (see page 230).

It is not hard to see that this DRS entails the conclusion (6). To be precise, suppose that we process (6) relative to (70) and insert it into (71) (see page 231) as showline. The DRS following "Show" can be embedded in the remainder of (71).[35] This proves that the conclusion follows.

APPENDIX

Some (more) Lexical Entries

(E1.iv) (= 15.i, Kamp & Roßdeutscher (1994, this volume)

heilen

ec:

e' e
e' CAUSE$_{heilen}$ e
x = Agent(e')
e: HEILEN(y_{th1}, z_{th2})

$\{d\langle\theta_1, f_1\rangle$,	$\langle\theta_2, f_2\rangle$,	$(\langle\theta_3, f_{von}\rangle)\}$
Agent	Theme$_1$	Theme$_2$
SEL RESTR	SEL RESTR	SEL RESTR
capable of intention to cure	**organism** or **body part** or	**ailment disease**

Instance: Der Arzt heilte den Patienten (von der Krankheit)

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35 See Kamp & Reyle (1991).

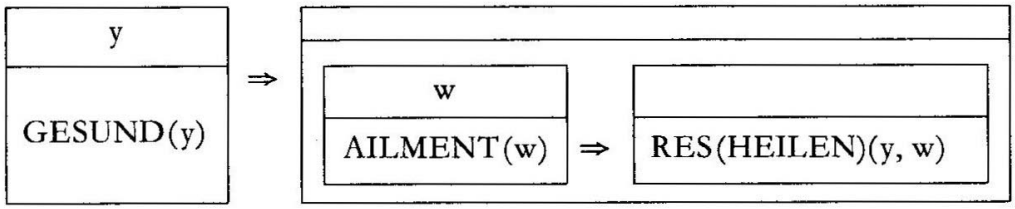
(E2)	*erkranken*	$\{\langle\theta 1, f_1\rangle$	$(\langle\theta 2, f_{an}\rangle)\}$
	e: ANT(HEILEN)	$Theme_1$	$Theme_2$
	(y_{th1}, z_{th2})	SEL RESTR	SEL RESTR
		organism	disease

(E3) (= 10) *gesund* { }
GESUND(x)

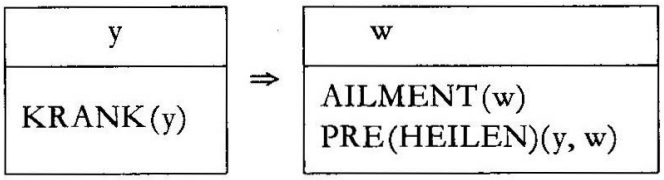
(E4) (= 13) *krank* { }
KRANK(x)

Some axioms of a lexical theory
Meaning postulates for particular concepts:

(M3) (= 11)



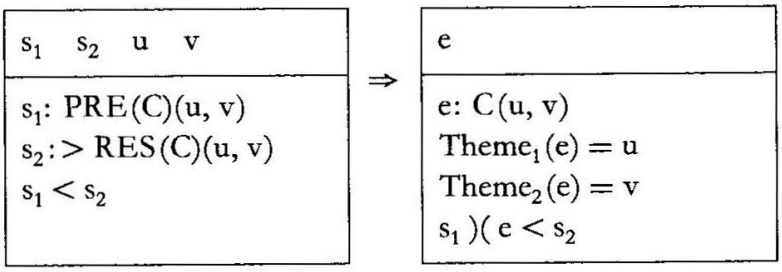
(M4) (= 14)



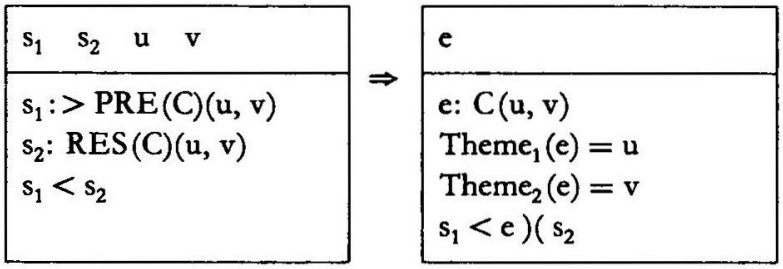
Axioms for change of state concepts

(74) (i) PRE(ANT(C)) ≡ RES(C)
(ii) RES(ANT(C)) ≡ PRE(C)

(23)



(23′)



REFERENCES

ALLEN, J. (1983). Maintaining knowledge about temporal intervals. *Comm. ACM*, 26, pp. 832–843

ASHER, N. (1993). *Reference to Abstract Objects in Discourse*. Dordrecht: Kluwer

BEAVER, D. (1993). *What Comes First in Dynamic Semantics*. Dissertation. University of Amsterdam

DOWTY, D. (1978). *Word Meaning and Montague Grammar*. Dordrecht: Reidel

FABRICIUS-HANSEN, C. (1980). Lexikalische Dekomposition, Bedeutungspostulate und *wieder*. Ein Beitrag zu einer Montague-Grammatik des Deutschen. In: KASTOVSKY, D. (ed). *Perspektiven der lexikalischen Semantik* (pp. 26–40). Bonn: Bouvier Verlag

FABRICIUS-HANSEN, C. (1983) Wieder ein *wieder*? Zur Semantic von *wieder*. In: BÄUERLE, R., SCHWARZE, CH. & STECHOW, A. von (eds.) *Meaning, Use, and Interpretation* (pp. 97–120). Berlin, New York: de Gruyter

HEIM, IRENE (1987). Presupposition projection. In: *Presupposition, Lexical Meaning and Discourse Processes*. Workshop of the Esprit Working Group 3315 on Dialogue and Discourse, December 1990

KAMP, H. (1993). Disambiguation in discourse. In: ARNAGUE ET AL. (eds). *Semantics of Time, Space, Movement and Spatio-Temporal Resoning* (pp. 218–308). Working papers of the 4th Workshop, Chateau de Bonas, 1992

KAMP, H. (forthcoming). Variable binding in DRT

KAMP, H. & REYLE, U. (1991). A calculus for first order Discourse Representation Structures. Arbeitspapiere des Sonderforschungsbereichs 340, Nr. 16. Universität Stuttgart und Tübingen

KAMP, H. & REYLE, U. (1993). *From Discourse to Logic, Vol. I*. Dordrecht: Kluwer

KAMP, H. & ROSSDEUTSCHER, A. (1992). Remarks on lexical structure, DRS-construction lexically driven inferences. Arbeitspapiere des Sonderforschungsbereichs 340, Nr. 21. Universität Stuttgart und Tübingen

KAMP, H. & ROSSDEUTSCHER, A. (1994). Remarks on lexical structure and DRS-Construction, this volume

JOHNSON, M. & KAY, M. (1992). Parsing and empty nodes. Arbeitspapiere des Sonderforschungsbereichs 340, Nr. 25. Universität Stuttgart und Tübingen

LASCARIDES, A. & ASHER, N. (1993). Temporal interpretation, discourse relations, and Common Sense Entailment. *Linguistics and Philosophy*, 16, pp. 437–493

LORENZ, S. (1993). *Temporales Schließen unter Standardannahmen bei der Verarbeitung natürlicher Sprache*. Dissertation. Arbeitspapiere des Sonderforschungsbereichs 340. Nr. 32, Universität Stuttgart und Tübingen

MOENS, M. (1987). *Tense, Aspect and Temporal Reference*. PhD. Thesis, University of Edinburgh

PINKAL, M. & MILLIES, S. (1993). Linking one semantic interpretation system to different syntactic formalisms. In: PINKAL, M., R. SCHA & SCHUBERT, L. (eds.). *Semantic Formalisms in Natural Language Processing*. Wadern, Germany, IBFI GmbH, Dagstuhl-Seminar-Report 57, 1993

ROSSDEUTSCHER, A. (1994). Fat child meets DRT. A semantic representation of the opening lines of Kaschnitz' "Das dicke Kind", this volume

ROSSDEUTSCHER, A. (ms). Three dimensions of *wieder*: focus, scope, presupposition. Ms. University of Stuttgart

SÆBØ, K. (1991). Discourse Particles. Ms. Institutt for humanistik informatikk. Universitet Oslo

VAN DER SANDT, R. (1990). Anaphora and Accommodation. In: *Presupposition, Lexical Meaning and Discourse Processes*. Workshop of the Esprit Working Group 3315 on Dialogue and Discourse, December 1990

VAN DER SANDT, R. (1992). Presupposition Projection as Anaphora Resolution. *Journal of Semantics 9*, pp. 333–378

SCHULZ, K. (1986). An Exact Algorithms for Interval-based Temporal Information. FNS-Bericht 9, Forschungsstelle für natürlichsprachliche Systeme, Universität Tübingen

SOAMES, S. (1989). Presupposition. In: GABBAY, D. & GUENTHNER, F. (eds.). *Handbook of Philosophical Logic, Volume IV* (pp. 553–616). Dordrecht, Reidel

STALNAKER, R. (1974). Pragmatic presuppositions. In: MUNITZ, K.M. & UNGER, K.P. (eds). Semantics and Philosophy. New York: New York University Press

STALNAKER, R. (1979). Assertion. In: COLE, P. (ed.). *Syntax and Semantics 9* (pp. 315–332). London: Academic Press

STECHOW, A. VON (1992). Lexical decomposition in syntax. Arbeitspapier der Fachgruppe Sprachwissenschaft der Universität Konstanz