The German Perfect
John Nerbonne
The Ohio State University

As part of the inflectional paradigm of each German verb, we find the following analytic Perfect forms:

(1) Aux(Present) - Past Participle   er <u>hat geschlafen</u>
    Aux(Past) - Past Participle   er <u>hatte geschlafen</u>
    Aux(Infinitive) - Past Participle er muss <u>geschlafen haben</u>

If we cared to analyze verden as a future auxiliary, then a further element in the paradigm is predictable:

(2) Aux(Future) - Past Participle   er <u>wird geschlafen haben</u>

But Vater (1969) argues correctly that werden functions just as the other modals semantically and should not be regarded as a future tense. We may therefore concentrate on the forms in (1). Not all verbs use <u>haben</u> as the Perfect auxiliary; the alternative is <u>sein</u>, but the choice between the two has no temporal import.[1] For this reason I will regard the choice of auxiliary as not generally predictable, i.e. as lexically determined. Sample paradigms are given in (3) and (4):

(3) Present   hat geschlafen   hat
    Past   hatte geschlafen   hatte
    Infinitive geschlafen haben haben

(4) Present   ist gestorben   ist
    Past   war gestorben   war
    Infinitive gestorben sein   sein

A Reichenbach-style tense logic will be employed to describe these Perfect tenses. Following Åqvist (1976), Johnson (1977:12), and Dowty (1980), I interpret Reichenbach's speech, event and reference times as based on different contextual parameters, i.e. indices in a tense logic. A three-dimensional tense logic is employed.

Logically, the system will treat all temporal expressions as sentence operators. For this reason, a sentence logic is sufficient to demonstrate the treatment. An interpretation function I assigns truth values to atomic propositions with respect to intervals of time. This is encoded in (5):

(5) for t an interval, p an atomic proposition $I(p,t) \in \{0,1\}$

Note that for these atomic propositions, only one interval of time - not three, as the full system allows - is relevant to the determination of truth conditions:

(6) for atomic p, $\sigma_{t_s} \left\Vert \frac{t_e}{t_r} \right.$ p iff $I(p,t_e) = 1$.

(t_s and t_r range over intervals, too. This is a simplifying and not an essential assumption.) It is important that the intuitively persuasive notion of temporal dependence familiar from simpler tense logics is preserved here, i.e. that basic expressions are still assigned semantic values with respect to a single time. Intuitively clear foundations are required if we are to interpret the formal system and it is not immediately clear how one would interpret a basic expression with respect to pairs or triples of times.

No simple sentences in German are interpreted by atomic formulae, however. All include some temporal modification, viz. tense. We now turn directly to the analysis of the Perfect tenses. These may be formalized within the present system as follows:

(7) $\sigma_{t_s} \left\Vert \frac{t_e}{t_r} \right.$ PERF(p) iff (i) if $t_s \neq t_r$, then $\exists t_e' \leq t_r$, so
    that $\sigma_{t_s} \left\Vert \frac{t_e'}{t_r} \right.$ p.
    and (ii) if $t_s \neq t_r$, then $t_e < t_s$ and
    $\sigma_{t_s} \left\Vert \frac{t_e}{t_r} \right.$ p.[2]

i.e. (i)

    and   as in:

(7') Nächsten Freitag hat er den Brief geschrieben
    next Friday AUX he the letter write(part)
    'He'll have the letter written by next Friday'

(ii)

i.e.

(7'') Er hat den Brief geschrieben
    'He wrote the letter'

    as in:

(8) $\sigma_{t_s} \left\Vert \frac{t_e}{t_r} \right.$ PLUP(p) iff $t_e < t_r < t_s$ and $\sigma_{t_s} \left\Vert \frac{t_e}{t_r} \right.$ p.

(8') Susi hat Rolf gesprochen. Er hatte den Brief geschrieben.
    AUX speak(part)   he AUX the letter write(prt)
    'Susi spoke to Rolf. He had written the letter.'

i.e.

(9) $\sigma_{t_s} \left\Vert \frac{t_e}{t_r} \right.$ PERFIN'(p) iff $t_e < t_r$ and $\sigma_{t_s} \left\Vert \frac{t_s}{t_r} \right.$ p.

i.e.

$$\underset{E\quad\ \ R}{\vdash\!\!\!\!-\!\!\!-\!\!\!-\!\!\!\longrightarrow}$$

, as in:

(9') Er gab zu, den Brief geschrieben zu haben.
he admitted the letter write(prt) to AUX
'He admitted having written the letter'

There is little controversial about the proposed semantics for the Pluperfect and the Perfect Infinitive, so that we may devote the discussion to (7), the analysis of the Perfect.

Let us note first that in (il), the meaning of the Perfect does not differ from that of the Preterite. It describes past time. Thus the following inference is expected to hold:

(10) PRET(X)
⊃ PERF(X)

We predict then that the Perfect can replace the Preterite (or Past tense - these terms are used interchangeably here,) without affecting truth value. This might, of course, affect e.g. stylistics, in particular the well-known preference for the Preterite in narrative. This inference does indeed seem to hold.

Case (7i) analyzes the use of the Perfect to describe future time. Three aspects of (i) should be noted. First, it only licenses the future use of the Perfect in contexts where reference time is future. e.g. those in which a future frame adverbials are appropriate. Frame adverbials are introduced by rule (11):
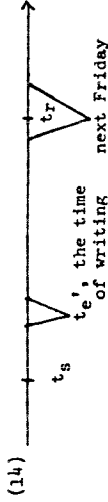
(11) for f a frame adverbial, p a proposition

$$\mathcal{O}_{t_s}\Big|^{t_e}_{t_r}\, f(p) \text{ iff } t_r \subseteq [\![f]\!]_{\mathcal{O}_{t_s},t_r,t_e} \text{ and } \mathcal{O}_{t_s}\Big|^{t_e}_{t_r}\, p$$

'$[\![f]\!]_{\mathcal{O}_{t_s},t_r,t_e}$' stands for the semantic value of f with respect to the model and times indicated. In the case of nächsten Freitag 'next Friday', this obviously depends on speech time. This aspect of the analysis of frame adverbials, viz. that they fix reference time, is taken directly from Reichenbach's conception of reference time as 'the time from which an event is seen.' In fact, Reichenbach exploited this same analysis in his famous treatment of the Present Perfect in English. Cf. Reichenbach (1947:294). Using (11), we can derive the truth conditions for example (7'). 'Frame' adverbials, as the very name suggests, have widest scope. (The term is from Bennett & Partee (1972).) We would thus assign (7') the analysis (12):

(12) n.F.(PERF(er d.B. schreib-)

By (11), this holds in 𝒪 at t_s, t_r, and t_e iff $t_r \subseteq [\![n.F.]\!]_{t_s}$ and PERF(er d.B. schreib-) holds at t_s, t_r and t_e. Since next Friday clearly lies in the future with respect to t_s, we must apply (7i), which yields that (12) iff (13).

(13) $t_r \subseteq [n.F]_{t_s}$ and $\exists t_e' \leq t_r$ and er d.B. schreib- holds at t_e'

(14)

$$\vdash\!\!\!-\!\!\!\underset{t_s}{\wedge}\!\!\!-\!\!\!\underset{t_e'}{\wedge}\!\!\!-\!\!\!\underset{t_r}{\wedge}\!\!\!\longrightarrow$$

t_s $\quad$ t_e', the time $\quad$ next Friday
$\quad\quad$ of writing

The requirement in (7i) that the future use of the Perfect be limited to situations with future reference time explains the distinction between (15) and (16).

(15) T. hat es noch nicht geschrieben, aber nächsten Freitag
AUX it yet not write(prt) but next Friday

hat er es sicher geschrieben
AUX he it surely write(prt)
'T. hasn't written it yet, but he'll have it written by F'

(16)*T. hat es noch nicht geschrieben, aber er hat es sicher
geschrieben

The second conjunct in (15) has a future reference time, as evidenced by the future adverbial, nächsten Freitag. The event time, i.e. the time of his writing, must precede this reference time, but it may still be in the future, as sketched in (14). This is compatible with the first conjunct, i.e. his not having written it to-date. No such future reference time is specified in the second conjunct of (16), which, moreover, may be expected to share the reference time of the first conjunct. This is the time denoted by noch, i.e. here, speech time. (7) specifies that this second conjunct be true iff the atomic proposition holds at some past event time, but this contradicts the first conjunct of (16), and the sentence is nonsensical.

The second important aspect of (7i) to note is that it is not exactly Reichenbach's Future Perfect, reproduce below as (17). It is instead compatible both with (17) and with (18)

(17) $\underset{S\quad E\quad R}{\vdash\!-\!\!\!-\!\!\!-\!\!\!-\!\!\!\longrightarrow}$ $\qquad$ (18) $\underset{E\quad S\quad R}{\vdash\!-\!\!\!-\!\!\!-\!\!\!-\!\!\!\longrightarrow}$

That this is correct is evidenced by the possibility of sentences such as (19):

(19) Ich weiss nicht, ob er es geschrieben hat. Nächsten
I know notwhether he it write(prt) AUX next

Freitag hat er es aber sicher geschrieben.
Friday AUX he it but surely write(prt)
'I don't know whether he has written it (yet), but by next Friday he'll have it written'

The analysis (7i), in claiming that the Perfect may represent (unambiguously) situations (17) and (18), contradicts Hornstein's (1977:522) claim that natural language tenses always represent one such such structure universally. Comrie (1981) make this point quite generally against all interpretations of Reichenbach which, like Hornstein's, insist on an exhaustive specification of S, R and E for each temporal expression.

The third noteworthy aspect of (7i) is that it provides the correct semantics for the Perfect when used in temporal conditional sentences, such as (20):

> (20) Sie gibt es dir, wenn sie es geschrieben hat
> she give it you when she it write(prt) AUX
> 'She'll give it to you when she's written it'

In this case the future reference time is given by the matrix clause. Note that the event time of the conditional, i.e. the time of writing, must precede the reference time, i.e. the time of the giving. This is exactly as foreseen by (7i).

The division of (7) into clauses (i) and (ii) reflects (intentionally) Admoni (1970:185) and his judgement that the Perfect is both an absolute and a relative tense. His absolute tense is reflected in clause (ii), satisfied whenever event time precedes speech time, while his relative tense would be represented here by clause (i), which depends on reference time. At the same time, we should emphasize that the present treatment does not regard the Perfect as ambiguous, neither in the sense of representing various semantic representations, nor in the weaker sense of representing a single disjunctive sort of representation. The two meanings of the Perfect are simply context dependent variants. This treatment thus contrasts with that of Bäuerle (1979:79), who regards the Perfect form as representing ambiguously either Preterite or Present Perfect meaning.

Bäuerle adopts this position in order to maintain an otherwise compositional analysis of the Perfect paradigm. His analysis exploits a seductive aspect of this paradigm, given in (3) and (4) above, which has escaped comment thus far. Both haben and sein, the Perfect auxiliary verbs, exist independently in the language, and their Present, Past and Infinitive forms are identical whether they are used as Perfect auxiliaries or otherwise. This is the significance of the second columns in (3) and (4). Bäuerle's hypothesis is then to analyze all of the Perfect tenses as compound tenses, composed of a single Perfect marker, the participle plus auxiliary stem, to which the various tense or infinitival markings may be added. If his hypothesis could be verified, then the three elements of the Perfect paradigms in (3) and (4) needn't be analyzed as three novel tenses, but rather may be seen as the combination of one Perfect aspect with three independently required tenses. We could then reduce a six element paradigm to a three element paradigm with the Perfect/Imperfect distinction seen as orthogonal to the three-way tense distinction.

(7) - (9) above make it clear what is required of the semantics of Bäuerle's proposal.3) Note that (7i), (8) and (9) all require that event time precede reference time. We take this to be the contribution of the Perfect in all the Perfect tenses. This is formalized in (21):

$$(21)\ \sigma_{t,s} \vdash \frac{t_e}{t_r}\ \text{Perfect Aspect (p) iff } \exists t_e' < t_r\ \&\ \sigma_{t,s} \vdash \frac{t_e'}{t_r}\ p.$$

Note the use of the existential quantifier on the right side of (21). This formulation predicts that all the Perfect tenses are to be interpreted indefinitely, rather than deictically, in the sense of Partee (1973). This is certainly correct in the future use of the Present Perfect, and it may be correct in the cases of the Perfect Infinitive and the Pluperfect. But it would clearly be incorrect about some uses of the Present Perfect as it is used to describe the past. The Present Perfect is normally used deictically. Thus (22) may be used to speak about a contextually salient past time, and its negation (22') may then be interpreted as denying that (22) held at that time.

> (22) Er hat gelacht   (22') Er hat nicht gelacht
> he AUX laugh(prt)   not
> 'He laughed'   'He didn't laugh'

This could not be described using (21). Any attempt to treat the Perfect tenses compositionally must, therefore, grant some special status to the Present Perfect. Bäuerle accomplishes this by allowing the Present Perfect form to function as an analytic realization of the normally synthetic Preterite. The Preterite allows the same deictic interpretation.

This need to posit a second, special and non-compositional meaning for the Present Perfect should count rather heavily against the overall attempt to analyze the Perfect tenses compositionally. We are talking, after all, about a three-element paradigm on the compositional view. The admission that one of the three doesn't combine as predicted is serious.

Ignoring this gap, the compositional paradigm is otherwise fairly straightforward. We simply have to guarantee that the Preterite requires that reference time be past and that the Present requires that reference time be non-past. If we suppose that tense has wider scope than aspect, then the rest of the semantics given in (7) - (9) above follows automatically.

But this is just to say that the semantics is coherent on the compositional view. It is another matter to show that any positive virtue adheres to this approach. There is, after all, no great gain in simplicity in reducing a six-element paradigm to a three-element with an aspect distinction and one exceptional element. What evidence might be brought to bear on this decision? The most convincing semantic argument in favor of the compositional view would be to show that there are elements with scope interme-

diate between tense and Perfect. We should like to find an element which would adopt the position of X in (23):

(23) PRES(X(PERF(p)))

This would confirm the compositional hypothesis quite to anyone's satisfaction. Hendricks (1981:34) suggests that duratives have exactly this scope, citing (24) (his (4)) as proof:

(24) Erika hat diese Schlange schon lange getötet
     AUX this snake already for-a-long-time kill(prt)
     'This snake has been dead for quite some time now and
     Erika killed it'

Schon lange in combination with Present tense always specifies that the sentence modified has held 'for a long time now'. If the Perfect denotes the state resulting from Erika's killing the snake, then the temporal semantics of (24) follows from the compositional view where schon lange has the scope of X in (24). The example is flawed, however, in that schon lange doesn't function here as a durative. No clear example of duratives can replace lange here, as (25) indicates:

(25)*Erika hat diese Schlange schon tagelang   getötet
                                    zwei Stunden

If (25) is at all interpretable, then only in the sense that the act of killing, not its results, lasted the specified length of time. Thus lange in (24) doesn't mean 'for a long time', but rather 'a long time ago.'

Bäuerle (1979:79) cautiously suggests that the compositional treatment provides an approach to the semantics of the Perfect in sentences such as (26):

(26) Seit zwei Stunden hat er seine Jacke ausgezogen
     since 2   hours AUX he his jacket off-take(prt)
     'He took his jacket off and he's had it off for 2 hr.'

In (26), as in (24), the adverbial is understood to specify the duration of the state resulting from his removing his jacket. This might naturally be captured by assigning seit zwei Stunden the scope of X in (23). We might then explain how it is that the adverbial functions here exactly as it would in a Present tense sentence and not at all as it would in a Past tense sentence.

The real explanation for this, and the source of error in the above argument, lies in the fact that (26) is simply a Present tense sentence, and not a Perfect at all. Ausgezogen haben is a compound, but Non-Perfect infinitive. The best proof of this is the fact that it has the paradigm of a Present tense form; in particular, it forms a regular Pluperfect, ausgezogen gehabt

hatte; this can be used in sentences such as (27).

(27) Als ich ihn beim Abendessen traf, hatte er seine Jacke
     when I   him at   supper   met   AUX he his jacket

     schon eine Stunde ausgezogen gehabt
     already a hour   off-take(prt) have
     'When I saw him at supper, he'd had his jacket off for
     an hour'

This form is anomalous under the view that ausgezogen haben is (exclusively) a Perfect form. Of course, it may, in other sentences, represent a genuine Perfect. (26) is deceptive for this very reason.

The construction in (26) is clearly the product of a lexical rule of limited productivity. Its lack of productivity can be demonstrated directly by attempting to substitute other verbs, e.g. genäht haben 'to have sewn', or verb-object combinations, e.g. mir das Geld gegeben haben 'to have given me the money' for ausgezogen haben bzw. seine Jacke ausgezogen haben in (26). Most of these are (i) ungrammatical or (ii) understood differently, viz. so that the action is understood to have lasted two hours. The construction is not limited to haben - participle, but is possible with other adjectives and predicatives, as (28) illustrates:

(28) Er hat es   an   on
                 ausgezogen off
                 nötig   necessary (i.e. he needs it)
                 gern   dear (i.e. he likes it)
                 etc.

Since past participles may be used as adjectives in construction with sein 'to be', there is likewise a Present tense construction which has exactly the same form as those Perfects which take sein as auxiliary. An example of one of these is provided:

(29) Er ist seit zwei Stunden abgefahren
     he AUX since 2   hours away-drive(prt)
     'He drove away and he's been away for two hours'

The existence of these genuine Present tense forms which are homophonous with Perfects may be a source for the lingering intuition among speakers of German that there is something "present or immediate" about the Perfect, at least in contrast to the Preterite. For example, Gelhaus (1969:14) defines the Perfect as a "continued command over a completed action." ("ein nicht abgeschlossenes Verfügen über ein abgeschlossenes Tun") There is no reflection of this intuition in the rule of Perfect interpretation (7ii) above, but it may be the sense of the homophonous Present tense constructions which Gelhaus and others

have articulated.

There are then, to my knowledge, no temporal items with scope intermediate between tense and Perfect aspect, and there seems to be no strong semantic evidence for the compositional treatment.

Evidence for the non-compositional view may be adduced from the "special uses" of some tense forms. Latzel (1974) has noted that a small class of German verbs, including sein and the passive werden may be used in the Preterite to speak of future time. This is illustrated in (30):

(30) Warte, bis er hier war = Warte, bis er hier gewesen ist
     wait until he here was   wait until he here be(prt) AUX
     'Wait until he's been here'

     ≠ Warte, bis er hier ist
       wait until he here is
       'Wait until he's here'

The important point for the present purposes is that the Preterite form in (30) clearly has the expected Perfect meaning, i.e. it replaces neither what would be tense nor what would be aspect on the compositional view, but, apparently, the single Perfect element. This indicates that the Perfect is a single tense in the same sense in which the Preterite is.

NOTES

1) To a certain extent the choice between haben and sein is temporally determined, of course. With the exception of bleiben and sein, all unprefixed intransitives which denote telic Aktionsarten use the auxiliary sein, and all other intransitives and all transitives use haben. Thus telic intransitive sterben, gestorben sein; atelic intransitive schlafen, geschlafen haben; and transitive essen, gegessen haben. Verbs which are ambiguously telic or atelic have Perfects with both auxiliaries (in den Fluss) schwimmen, geschwommen sein, but (in Fluss)schwimmen, geschwommen haben. Prefixed verbs use the auxiliary of their unprefixed stem, even if this contradicts the semantic indicatio, thus herumgehen 'to walk around' is clearly atelic (and is used with duratives.) The expected herumgegangen haben is wrong due to the telic stem gehen, 'to go', which has the expected gegangen sein. This picture is slightly more complicated in the South where the atelics liegen, stehen and sitzen unexpectedly use the sein form. Back.
2) Clause (ii) has been simplified slightly. In temporally connected discourse, such as narration, it must also be required that e = tr, but this is irrelevant in the analysis of data here.
3) What follows in the text is not simply a presentation of Bäuerle's semantics for the Perfect, but rather my sketch of what any semantics with similar ambitions must be like. Bäuerle's rules are flawed in not showing how the Perfect index is affected by the tenses. This criticism is developed in Herbonne (in progress)

REFERENCES

V.Admoni 1970 Der deutsche Sprachbau Munich (C.H.Beck).

L.Aqvist 1976 "Formal Semantics as Analyzed by Reichenbach" In: T.van Dijk Pragmatics of Language and Literature Amsterdam.

M.Back to appear "Zum System des HABEN-Perfekts" Freiburg.

R.Bäuerle 1979 Temporale Deixis, temporale Frage: zum propositionalen Gehalt deklarativer und interrogativer Sätze Tübingen

M.Bennett & B.Partee A Guide to the Logic of Tense and Aspect in English IULC, 1972.

B.Comrie 1981 "On Reichenbach's Approach to Tense" CLS 17, pp.24-30.

D.Dowty 1980 "Tenses, Time Adverbs and Compositional Semantic Theory" paper presented at the fourth annual Groningen conference.

H.Gelhaus 1969 "Zum Tempussystem der deutschen Hochsprache" In: Der Begriff Tempus - Eine Ansichtssache? Wirkendes Wort, Beiheft 20, Düsseldorf (Schwann), pp. 5-22.

R.Hendricks 1981 Aspect and Adverbs In German Diss, Cornell University.

N.Hornstein 1977 "Towards a Theory of Tense" In LI 8, pp.521-57.

M.Johnson 1977 A Semantic Analysis of Kikuyu Tense and Aspect Diss, OSU.

S.Latzel 1974 "Zur temporalen Bezugspunktsetzung" In: H.Gelhaus & S. Latzel Studien zum Tempusgebrauch in Deutschen Mannheim, pp.277-348.

J.Herbonne in progress On Temporal Reference In German Diss, OSU.

B.Partee "Some Structural Analogies Between Tenses and Pronouns in English" In: Journal of Philosophy 70, pp.601-609.

H.Reichenbach 1947 Elements of Symbolic Logic New York.

H.Vater 1969 "Werden als Modalverb" In: J.Calbert & H.Vater Aspekte der Modalität (Studien zur deutschen Grammatik 1) Tübingen, (Gunter Narr), pp.71-148.