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Epistemic Modality and Tense in German

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This study investigates why an epistemic interpretation of modal verbs is possible only in the present or preterit, not in the perfect. Epistemic modals are argued to be predicates of propositions; they are not associated with a time variable and therefore cannot be tensed. The tense in which an epistemic modal appears is either a pleonastic tense or a tense determined by the discourse context. This analysis, unlike the analyses provided by Diewald (1993), Zifonun et al. (1997), and Wurmbrand (1998), automatically predicts the scope of temporal adverbials in sentences with modals. It also has implications for two additional issues related to the study of modal verbs: the classification of evidential modals and the grammaticalization of modals.[*]

1. Introduction.

Studies that deal with the semantics of modal verbs in German typically make a distinction between epistemic (subjective) and nonepistemic (objective) meaning (e.g., Fourquet 1970, Duden 1973, Öhlschläger 1989, Buscha et al. 1993).[1] Epistemic modality involves a speaker's judgment about the probability of the truth of a proposition (Coates 1983:18, Palmer 1990:5–8). In uttering the sentence in 1, for example, the speaker uses the modal *müssen* 'must' to conclude, on the basis of the

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[1] The terms "epistemic" ("subjective") and "nonepistemic" ("objective") are probably the most widely used in the literature. These are by no means the only terms, however, as Öhlschläger 1989:28 documents. The definitions of these terms differ as well; one author's use of the term "epistemic," for example, is not necessarily equivalent to another's use of the term "subjective." See also section 6.1 for further discussion.

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available evidence, that the proposition *das ist schön* 'that is beautiful' is very likely to be true (under the circumstances referred to).[2]

(1) Schön muss das sein—wenn man heimkommt—und Kinder hat.
'It must be beautiful—when one comes home—and has children.'
(attested; Laetz 1969:76)

Modal verbs are also used in German to express what is said to be true.[3] The modals *wollen* 'claim' and *sollen* 'be said' have this function:

(2) rechtfertigt der Schock, den Teddy Kennedy erlitten haben will, tatsächlich die Wartezeit von 8 Stunden
'does the shock that Teddy Kennedy claims to have suffered really justify the waiting time of eight hours' (attested; Raynaud 1977:25)

(3) Einmal im Spaß, etwas angetrunken, soll der verschollene Stiller in einem Freundeskreis gesagt haben: "Ich habe eine wunderbare Frau."
'Once, as a joke, somewhat tipsy, the missing Stiller is supposed to have said among a circle of friends, "I have a wonderful wife."'
(attested; Maxwell 1964:108)

This "evidential" use of modals is often treated as a type of epistemic or subjective modality. According to Palmer (1990:12), the epistemic modality of evidentials "consists not of making judgments, but of giving the evidence for what is stated—that someone said so, that there is evidence of the (fallible) senses, that it can be deduced etc. ... The reason for treating this as epistemic modality is that both judgment and evidential systems present speakers with the means of indicating that they do not guarantee the truth of their statements, so that, if the statements prove to be untrue, they cannot be accused of lying." I argue

[2] Rather than provide the original source of the attested examples in this study (those occurring in natural discourse), I simply provide the reference to the linguistic study in which they appear. I label the attested examples "attested" to distinguish them from those that have been constructed for the purposes of exemplification. Where appropriate translations for the examples are provided, I repeat them essentially unchanged.

[3] A number of studies of German modals deal with the issue of monosemy versus polysemy: Do modals have one basic meaning (Kratzer 1976), or do they have different, concrete meanings (Öhlschläger 1989)? This issue will not be dealt with here.

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below (section 6.1), however, that evidentials cannot be included under epistemic modality.

Nonepistemic modality in its broadest sense involves the notions of obligation, permission, ability, and volition. In general, modal verbs in German can be used to express nonepistemic modality as well as epistemic modality.[4] The nonepistemic sense of *müssen,* for example, involves the notion of obligation; in 4, *müssen* is used to indicate that the subject, *er* 'he', is obligated to report for duty in Kolberg.

(4) Er muss sich in Kolberg stellen.
'He has to report for duty in Kolberg.' (attested; Laetz 1969:31)

Because modals in German can express epistemic as well as nonepistemic meaning, utterances that contain modals are potentially ambiguous.[5] Although the most likely reading of the sentence in 5, for example, is epistemic (5a), this sentence also has a nonepistemic interpretation (5b).

(5) Er muss mindestens 1,80 m sein.
he must at-least 1.80 meters be
a. '(On the basis of the available evidence I am led to conclude that) he must be at least six feet tall.'
b. '(They are looking for a new goalkeeper;) he has to be at least six feet tall.' (Heine 1995:21)

[4] Although the modals *sollen* and *wollen* do not have an epistemic use, they do have a nonepistemic use that is distinct from their evidential use:

(i) Jedenfalls soll man nicht seine Freunde mit einer traurigen Geschichte belasten.
'In any case, one ought not to burden one's friends with a sad story.'
(attested; Maxwell 1964:142)

(ii) ich weiß schon, was du sagen willst
'I already know what you want to say' (attested; Bech 1949:5)

[5] If evidentials are not epistemic (as I argue below), then the potential ambiguity of utterances that contain the modals *sollen* and *wollen* is one of evidential versus nonevidential modality rather than epistemic versus nonepistemic.

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In general, the context in which an utterance is placed can help to disambiguate it.[6] This context can be extra-linguistic and involve known or observable facts; the context can also be linguistic.

A number of studies of modal verbs in German have identified specific linguistic features that are associated, to a greater or lesser extent, with either epistemic or nonepistemic modality. One feature is the Aktionsart of the main verb.[7] Verbs of action associate predominantly with nonepistemic modality (Heine 1995:25); stative predicates tend to favor an epistemic reading (Brünner and Redder 1983:60; but see Heine 1995:25). A second feature that correlates strongly with the interpretation of modals is tense. Whereas a nonepistemic interpretation is possible with modals regardless of tense, epistemic modality is limited to modals in the present and preterit. In particular, a modal in the perfect cannot be interpreted epistemically. The modal in the sentence in 6, for example, which appears in a present perfect form (*hat ... müssen*), can only be interpreted nonepistemically.[8]

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[6] Coates (1983:47) notes examples from her English corpus that cannot be disambiguated—not by syntactic features, contextual evidence, or stress patterns. Consider, for example, the following sentence:

(i) rising production and a steadily growing national income must provide the resources for improving the social services and the environment in which we live (attested; Coates 1983:47)

This sentence can mean either 'it's obligatory that rising production and income provide the resources' or 'it's inevitable that rising production and income will provide the resources'. It is not possible to decide which of these two meanings is intended.

[7] The term "Aktionsart" refers to the aspectual character of a verb qua lexical item (or a verb and its complements), that is, inherent lexical aspect, the nature of the situation that the verb describes.

[8] In German, the perfect is a compound tense consisting of a finite auxiliary (a form of *haben* 'have' or *sein* 'be') and a past participle. For example, the present perfect of *singen* 'sing' is *hat gesungen* 'sang/has sung'; the present perfect of *kommen* 'come' is *ist gekommen* 'came/has come'. If a modal verb occurs with a dependent infinitive, the infinitive form of the modal is used in the perfect instead of the past participle. In 6, for example, the infinitive *müssen* 'must' is used rather than the participle *gemusst*.

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(6) Unser geliebtes Vaterland hat in diesen Stunden die gewaltigste Heimsuchung erfahren müssen, die bisher jemals die Menschheit zu bestehen hatte.
'Our beloved fatherland has had to experience in these hours the worst affliction that has ever come upon mankind.'
(attested; Laetz 1969:17)

Although many studies make note of the incompatibility of epistemic meaning and the perfect in German, very few offer an explanation for this restriction. The only three explanations that I am aware of are provided by Diewald (1993), Zifonun et al. (1997; henceforth GDS), and Wurmbrand (1998).

The purpose of this paper is to look more closely at the relationship between tense—in particular, the perfect—and the epistemic interpretation of modals in German. The main question I address is why modal verbs in the perfect cannot have an epistemic interpretation. Although I focus on modals in German, evidence from English suggests that the issues involved are not language-specific. The perfect of the English semi-modal *have to,* like its German counterpart *müssen,* cannot have an epistemic interpretation; the sentence in 7, for example, can only be interpreted nonepistemically.[9]

(7) The administration has had to make unpopular decisions.
(Quirk et al. 1985:145)

The incompatibility of the perfect and epistemic modals has also been noted in languages other than English (e.g., in Catalan [Picallo 1985, 1990] and Italian [Giorgi and Pianesi 1997]).

I begin the discussion by reviewing the explanations provided in Diewald 1993, GDS, and Wurmbrand 1998 for the incompatibility of the perfect and epistemic modality (see sections 2, 3, and 4). I argue that none of these accounts provides a satisfactory explanation for the data. In section 5 I present an alternative proposal, which is based on Iatridou's (1990) analysis of predicates like *evident* and *obvious* versus those like *possible* and *probable*. I argue that epistemic modals are predicates of propositions and that they are not associated with a time variable; epistemic modals cannot be tensed. The tense in which an epistemic modal appears is thus either a pleonastic tense or a tense determined by

[9] By pointing out this similarity between English and German I do not mean to imply that the English perfect is equivalent to the perfect in German.

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the discourse context. I show that this analysis, unlike the analyses provided by Diewald, GDS, or Wurmbrand, automatically accounts for the scope of temporal adverbials in sentences with modals.

The account proposed here has implications for two additional issues related to the study of modal verbs: the classification of modals and the grammaticalization of modals. I discuss these issues in section 6. I argue that evidential modals (see examples 2 and 3 above) cannot be classified as a type of epistemic modal. I also argue that the interaction of modals and the perfect cannot be used as evidence on which to base the (defensible) claim that epistemic modals are more grammaticalized than nonepistemic modals.

2. Diewald's Account.

Diewald (1993:230–231) focuses on the incompatibility of an epistemic interpretation of modals and the perfect, and takes essentially a functional approach to the problem. She argues that the speaker's goal when making an epistemic statement like 8, for example, is to assign a factuality value to the verbal relation, *sie macht den Abwasch* 'she is doing the dishes', which is embedded under the modal relation, expressed using the modal *muss* 'must'.

(8) Sie muss den Abwasch machen.
'She must be doing the dishes.' (Diewald 1993:230)

According to Diewald, the verbal relation, *sie macht den Abwasch,* is neither factual nor nonfactual; it has not yet been assigned a factuality judgment. Diewald uses the view that the epistemic modal relation is the attempt at a factuality judgment to explain the impossibility of an epistemic reading of modals in the perfect. She argues that the in-progress attempt at a factuality judgment, which is the speaker's intent when making an epistemic statement, is incompatible with the perfective (completion) component of the perfect.

Crucial to Diewald's account is the assumption that the perfect in German involves a *Vollzugskomponente* 'completion component'. Although many analyses of the German tense system claim that the perfect expresses *Vollzug* 'completion' or *Abschluss* 'end' (e.g., Brinkmann 1962, Glinz 1970, Wunderlich 1970, Ballweg 1988), Erich and Vater (1989) take issue with this claim. They argue that the perfect in German does not include a component of meaning that involves completion. Thus, their analysis of the perfect in German provides evidence that Diewald's account is based on an untenable assumption.

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2.1. The Perfect in German.

The interaction of tense and Aktionsart plays an important role in Erich and Vater's (1989) account of the perfect in German. In their classification of Aktionsarten, Erich and Vater distinguish between properties and events. Properties are temporally independent and in principle unlimited in their duration (*blond sein* 'be blond', *groß sein* 'be tall'). Events are temporally dependent; they have a definite duration and temporal limit that can either be inherent or dependent on external factors. Erich and Vater distinguish different types of events using the features [±resultative] and [±durative].[10] Events that are [+resultative] and [+durative], for example, are *ein Haus bauen* 'build a house' and *genesen* 'recuperate'; events that are [-resultative] and [+durative] are *tanzen* 'dance' and *arbeiten* 'work'.[11]

Following Reichenbach (1947), Erich and Vater recognize three different times that are relevant to understanding the semantics of tense: E, event time; S, speech time; and R, reference time. Event time is the time at which an episode that is being described takes place; speech time is the time of an utterance; and reference time is the time from which an event is seen (Reichenbach 1947:289). Using the notions of event time, speech time, and reference time, Erich and Vater characterize the perfect as specifying that the event time precedes the reference time (E < R) and that speech time and reference time are simultaneous (S,R).[12]

According to Erich and Vater, the core meaning of the perfect is that event time precedes reference time. They argue that any notion of completion that might be associated with the perfect is due either to the Aktionsart of a verb or to temporal adverbials used together with the perfect—not to the meaning of the perfect itself. The perfect of a verb that is [+resultative] (*genesen* 'recuperate' in 9, for example) depicts a closed situation because the verb itself depicts a closed situation. As the example in 9 shows, a person cannot have recovered from an illness and still be suffering from that illness.

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[10] Verbs that are "resultative" under Erich and Vater's classification of Aktionsarten correspond to accomplishments and achievements under Vendler's (1967) system of classification.

[11] See Erich and Vater (1989:116–119) for further details of their classification of Aktionsarten.

[12] See Table 1 in section 3 for Erich and Vater's characterization of the other tenses in German in terms of the relationships among E, R, and S.

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(9) Sie ist von einer langen Krankheit genesen. #Und sie leidet immer noch an der Krankheit.
'She has recuperated from a long illness. And she is still suffering from the illness.'

The perfect of a predicate that is [-resultative], a predicate like *Klavier spielen* 'play piano', depicts a closed situation only if it is modified by a frame or limiting adverbial. It does not follow from the sentence in 10, for example, that Peter is no longer playing the piano.

(10) Peter hat eben Klavier gespielt.
'Peter has just been playing piano.' (Erich and Vater 1989:125)

The sentence in 11, on the other hand, with the limiting adverbial *bis fünf Uhr* 'until five o'clock', suggests that for some period of time after five o'clock Peter did not play the piano.[13]

(11) Peter hat bis fünf Uhr Klavier gespielt.
'Peter played piano until five o'clock.' (Erich and Vater 1989:125)

If the notion of completion is not inherent in the meaning of the perfect, as Erich and Vater's analysis shows (see 10), then Diewald cannot be correct when she claims that the perfect's component of completion is incompatible with the epistemic interpretation of modals.

3. GDS's Account.

GDS's explanation for the incompatibility of the perfect and an epistemic interpretation of modals is presented within a Reichenbachian approach to tense.[14] GDS argues that the perfect in German is a compound tense (not a simple tense like the present or preterit) with two expressions that contribute to temporal meaning: the finite auxiliary (*hat* 'has' in 12) and the perfect participle (*berichtet* 'reported' in 12).

(12) Über die Vorstellungen Prof. Dittrichs hat 'Die Norddeutsche' bereits gestern ausführlich berichtet.
'Already yesterday the *Norddeutsche* reported in detail on Professor Dittrich's ideas.' (attested; GDS:1703)

[13] The inference that the event of piano playing does not continue into the present is an implicature of 11, not an entailment, since it is defeasible; 11 can be followed by *und er spielt immer noch* 'and he's still playing'.

[14] GDS's analysis of tense is based on Ballweg 1988.

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Each of these expressions has its own reference time (*Betrachtzeit*). In addition, the reference time of the perfect participle lies before the reference time of the auxiliary. Because a modal in the perfect will appear in its infinitive form rather than as a participle if another infinitive is present in a clause (see footnote 8), the nonfinite verb form that is important for the temporal interpretation of such a clause is the modal infinitive (*können* in 13).

(13) Er hat nicht mehr ganz nüchtern sein können.
he has no longer completely sober be can
'He has no longer been able to be completely sober.' (GDS:1268)

The view that the perfect involves two reference times lies at the heart of GDS's explanation for the impossibility of an epistemic modal in the perfect. According to GDS, the infinitive of the modal in the perfect has its own reference time. This is the reference time relative to which an epistemic context of interpretation is constructed. However, a reference time other than speech time is unnecessary for an epistemic judgment, since epistemic judgments are made on the basis of what the speaker knows, and this knowledge is available at speech time (GDS:1268).

GDS argues that temporal adverbials provide evidence for two reference times in the perfect. A temporal adverbial in the present perfect, for example, can be interpreted either with reference to the present tense of the auxiliary or with reference to the nonfinite portion of the main predicate. In 14, for example, the temporal adverbial *heute* 'today' modifies the auxiliary *ist* 'is (has)', which is in the present tense.

(14) Das Fliegen beispielsweise, das für Ikaros eine Vermessenheit war, ist heute eine vertraute Möglichkeit geworden.
'Flying, for example, which for Icarus was an act of presumptuousness, has today become a well-known possibility.'
(attested; GDS:1703)

In 15, the temporal adverbial *gestern* 'yesterday' modifies the nonfinite portion of the main predicate, the past participle *gesagt* 'said'.

(15) Sie haben übrigens gestern auch etwas Merkwürdiges gesagt.
'By the way, you also said something strange yesterday.'
(attested; GDS:1703)

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In contrast, a sentence in the preterit in combination with a temporal adverbial is unambiguous:

(16) Damals eroberte Napoleon halb Europa.
'At that time Napoleon conquered half of Europe.' (GDS:1703)

The preterit is a simple tense and thus has only one reference time to which the adverbial can refer.[15]

Contrary to GDS, the evidence from temporal adverbials does not necessarily lead to the conclusion that the perfect is associated with two reference times. The evidence is equally compatible with the view that the perfect is associated with only one reference time, in which case GDS's explanation for the incompatibility of the perfect and an epistemic interpretation of modals cannot be viewed as compelling.

If we adopt Erich and Vater's analysis of the tense system in German, for example (outlined in Table 1), we can account for the temporal adverbial facts automatically if we assume that temporal adverbials can refer to both event time and reference time: Two different interpretations of the scope of a temporal adverbial are possible only when event time and reference time are not identical (E < R); when event time and reference time overlap (E,R), only one interpretation is possible.[16]

	S,R	R < S
E,R	present	preterit
E < R	present perfect	past perfect

Table 1.
(E = event time; S = speech time; R = reference time)

[15] GDS contrasts the sentence in 16 with its present perfect counterpart (i) to illustrate the potential ambiguity of temporal adverbials in present perfect contexts:

(i) Damals hat Napoleon halb Europa erobert.
'At that time Napoleon has conquered half of Europe.' (GDS:1703)

See GDS:1703 for further discussion.

[16] A comma between two times in Table 1 means that the two times are simultaneous. A less-than sign between two times means that the left time temporally precedes the right time.

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In the present perfect, event time is before reference time; there are thus two possibilities for the scope of a temporal adverbial. The adverbial can modify the event time. An example of this is the sentence in 15, where the adverbial *gestern* 'yesterday' refers to the time (in the past) when something strange was said. It can also modify the reference time, as in 14. The adverb *heute* 'today' in 14 modifies the reference time, which overlaps with speech time. In the present perfect it is even possible (although not common) to have two different adverbials in the same sentence, with each referring to a different time interval. In 17, for example, *heute* 'today' modifies the reference time, which is simultaneous with speech time; *früher als Sie* 'earlier than you' refers to the event time, the time at which *kennen lernen* 'become acquainted', takes place.

(17) Ich muss Ihrer Auffassung widersprechen, dass heute kein noch aktiver Journalist Konrad Adenauer früher kennen gelernt hat als Sie.
'I have to disagree with your view that today no still-active journalist became acquainted with Konrad Adenauer earlier than you.' (attested; GDS:1704)

In the preterit, on the other hand, event time and reference time overlap (see Table 1); there is thus only one time interval to which a temporal adverbial can refer.

If there is only one reference time associated with the perfect, not two, as GDS claims, then GDS's explanation for the incompatibility of the perfect and an epistemic interpretation of modals cannot stand as is. Note that GDS's account claims only that a second reference time is not necessary for an epistemic interpretation of a modal; it does not say that a second reference time is impossible: "es [gibt] keinen Bedarf für eine zusätzliche zwischengeschobene Betrachtzeit" (GDS:1268) 'there is no need for an additional, squeezed-in reference time'. In theory, then, a second reference time ought to be possible, in which case an epistemic interpretation of a modal in the perfect ought to be possible as well. Although GDS claims that an epistemic interpretation of a modal in the perfect is impossible, the explanation offered does not in fact rule out such an interpretation.

An additional weakness of GDS's account involves the scope of temporal adverbials in sentences with modals. GDS points out that a temporal adverbial cannot modify a modal verb with an epistemic interpretation. In 18, for example, the adverbial *um fünf Uhr* 'at five o'clock' does not modify the modal *muss* 'must', which is interpreted

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epistemically; it can only modify the dependent infinitive *nüchtern gewesen sein* 'have been sober'.

(18) dass Hans um fünf Uhr noch nüchtern gewesen sein muss
that Hans at five o'clock still sober been be must
'that Hans must have still been sober at five o'clock' (GDS:1269)

Modals that are interpreted nonepistemically, on the other hand, can be modified by temporal adverbials. In 19, *um fünf Uhr* 'at five o'clock' modifies the modal and identifies the time when Hans desired something; *noch morgen* 'yet tomorrow' modifies the dependent infinitive *nüchtern bleiben* 'remain sober'.

(19) dass um fünf Uhr Hans noch morgen nüchtern bleiben wollte
that at five o'clock Hans still tomorrow sober remain wanted
'that at five o'clock Hans wanted to still be sober tomorrow'
(GDS:1269)

GDS offers no explanation for the inability of temporal adverbials to modify modals that are interpreted epistemically. This is simply an observation that is included in the general discussion of the special characteristics of modal verbs with epistemic meaning.

4. Wurmbrand's Account.

Wurmbrand (1998) offers a syntactic account for the incompatibility of the perfect and epistemic modals in German. Her approach falls within a line of research (e.g., Picallo 1985, 1990; Cinque 1999) that attributes the interaction of modals and tense (among other things) to ordering relations. Wurmbrand assumes that modals are auxiliary-like elements that appear in INFL. In a language like German, which allows a split IP (a TP and one or more ModPs), the two heads are associated with different interpretations. If a modal is generated under T^0, it receives an epistemic interpretation; if it is generated under Mod^0, it receives a root (nonepistemic) interpretation (see Figure 1).

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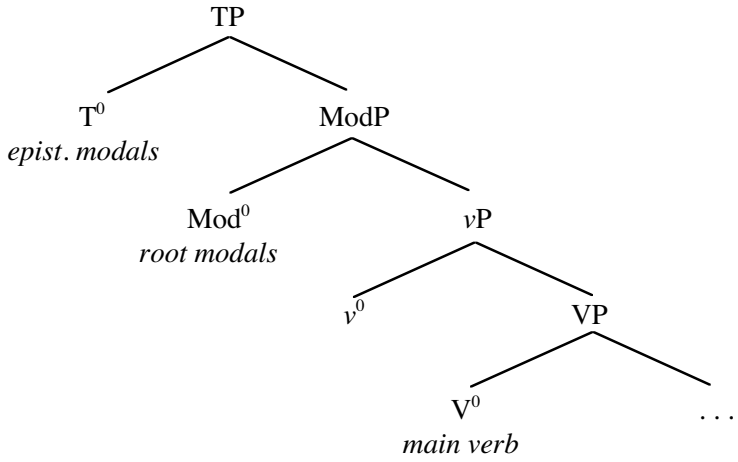


Figure 1. Epistemic modals versus root modals (Wurmbrand 1998:264).

In addition, Wurmbrand assumes that auxiliaries in German can appear in any inflectional position. This yields the hierarchy illustrated in Figure 2.[17]

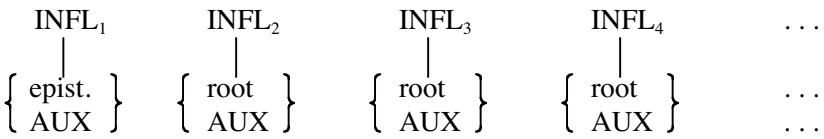


Figure 2. Ordering between modals and auxiliaries (Wurmbrand 1998:267).

Given this hierarchy, epistemic modals can precede (i.e., take scope over) auxiliaries, but auxiliaries cannot precede epistemic modals. This ordering of auxiliaries and modals accounts for the fact that the perfect of a modal cannot receive an epistemic interpretation. A modal within the scope of a perfect auxiliary can only have a root (nonepistemic) interpretation. Wurmbrand's approach has an advantage over Diewald's and GDS's in that it also provides an account of the inability of epistemic modals to appear in the future tense: a modal within the scope of any

[17] Wurmbrand does not provide details about the ordering of the various root modals and auxiliaries beyond those in Figure 2.

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auxiliary (future or perfect) can only have a nonepistemic interpretation.[18]

Although Wurmbrand provides a straightforward account of the lack of an epistemic reading of modals in the perfect and future tenses, she runs into difficulties when dealing with the epistemic interpretation of modals in the preterit. She claims (1998:265) that "the situation is not clear" for examples like 20.

(20) Sie musste die Oliven gestohlen haben.
she must-PAST the olives stolen have
a. 'She was obligated to have stolen the olives.'
b. %'It [had to be] the case that she had stolen the olives.'[19]
(Wurmbrand 1998:265)

Wurmbrand claims that "[m]ost speakers would not use the modal in the PAST to express an epistemic reading," but says that "it also does not seem to be impossible." She goes on to say that "[i]f sentences like [20] are indeed possible under an epistemic reading, it would suggest that epistemic modals are not actually in T but rather in a separate Mod-node lower than T." Wurmbrand leaves the issue unresolved; for the sake of simplicity, she continues to use the structure illustrated in Figure 1.

Given the large number of attested examples of epistemic modals in the preterit, there should be no question that such sentences are possible. Laetz's (1969) corpus-based study yields seventy-five examples of epistemic *müssen* in the preterit:[20]

[18] Although GDS (1268) provides an explanation for the incompatibility of the future and epistemic modals, the explanation is independent of the account of the perfect.

[19] Wurmbrand uses the symbol "%" to indicate systematic variation (e.g., dialects, personal preferences); see Wurmbrand 1998:17. I have substituted 'had to be' for Wurmbrand's 'must have been' to emphasize the preterit form of *musste* in 20.

[20] I have changed Laetz's translations in 21 (and 40 below) to emphasize the preterit form of *musste* (and in some cases the form of the infinitive).

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(21) a. Er begriff Jürgen Schiemann nicht, aber es musste wohl eine große Liebe sein, die ihn zu Helene trieb.
'He did not understand Jürgen Schieman[n], but it [had to be] a great love, indeed, which drove him to Helen[e].'
(attested; Laetz 1969:75)

b. Aber mitten auf der Landstraße vor uns kugelten ein Paar taufrische grüne Salatköpfe: Ein Lastauto auf dem Wege von Imperial Valley her musste sie verloren haben.
'But in the center of the highway in front of us a few dewy fresh lettuce heads rolled along: A truck coming from [the] Imperial Valley [had to] have lost them.' (attested; Laetz 1969:77)

Allard's (1975) study yields twenty attested examples of epistemic *mögen* in the preterit (*mochte*):[21]

(22) a. Große Freude oder großer Schmerz—es war schwer zu unterscheiden. Übrigens mochte es beides sein.
'Great joy or great pain—it was difficult to distinguish. Moreover it was possible that it was both.'
(attested; Allard 1975:73)

b. Den einen Lederball fand er nach langem Suchen unterm Farn; den anderen mochten die Waldameisen verschleppt haben.
'He found one leather ball after a long search under the fern. Perhaps wood ants had carried the other one away.'
(attested; Allard 1975:77)

Grammars and other reference works also provide examples (and in some cases discussion) of epistemic modals in the preterit (e.g., Duden 1973:72; Buscha et al. 1993:20–21; Durrell 1996:341, 343; GDS 1269).

Although Wurmbrand's ordering approach to tense and modality may be capable of expressing the facts involving epistemic modality and the perfect and future, it does not provide an explanation for these facts. It does not explain why epistemic modals must be ordered before perfect and future auxiliaries. It also fails to provide a conclusive treatment of the role of the preterit in the use of epistemic modals.

[21] Example 22a is from *Der geteilte Himmel,* by Christa Wolf; example 22b is from *Hundejahre,* by Günter Grass.

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5. An Alternative Analysis.

Iatridou (1990) observes that in a number of languages, adjectives taking propositional complements separate into two classes in terms of their ability to fit into the frame in 23.

(23) It was/will be AP that S. (Iatridou 1990:123)

Adjectives like *evident* and *obvious* are perfectly acceptable in this context (24); adjectives like *possible* and *probable* are not (25).

(24) It was/will be evident/obvious that John stole the tapes. (Iatridou 1990:123)

(25) #It was/will be possible/probable that John stole the tapes. (Iatridou 1990:123)

Iatridou argues that the oddness of 25 lies in the presence of the past or future tense; she notes that 25 becomes perfectly acceptable if the present tense is substituted for the past or the future:

(26) It is possible/probable that John stole the tapes. (Iatridou 1990:123)

Iatridou points out (1990:123) that there is a context in which a past tense is acceptable with an adjective like *possible* or *probable*. However, this is a situation where the past "is not a 'real' tense but a tense imposed by the 'sequence of tenses' phenomenon characteristic of indirect speech, among other contexts."

(27) Columbo said that it was possible that John had stolen the tapes. (Iatridou 1990:123)

Iatridou claims that *was possible* in 27, for example, does not anchor its clause in time and therefore cannot be viewed as a contradiction to the generalization that adjectives like *possible* and *probable* are not compatible with the past tense.

Iatridou's analysis of these two types of adjectives proves to be useful for explaining the incompatibility of the perfect and the epistemic use of modals. Note the similarity between 26 and the following sentence, which contains an epistemic modal:

(28) John may have stolen the tapes.

Iatridou assumes that predicates like *possible* and *probable* are predicates of propositions and are temporally independent; they lack a

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time variable. Iatridou represents the semantics of predicates like *possible* and *probable* as in 29.

(29) $P(p)$: It is possible that p. (Iatridou 1990:125)

This hypothesis (the absence of a time variable) explains why such predicates are incompatible with tense. Predicates like *evident* and *obvious,* on the other hand, are sensitive to time and do have a time variable. Iatridou represents the semantics of predicates like *evident* and *obvious* as in 30.

(30) Obvious(x, p, t) : It is obvious to x at time t that p.
(Iatridou 1990:125)

Such predicates also have an experiencer (represented with the variable x in 30), which may be expressed or simply implied, as we see in 31.

(31) It was evident/obvious (to Max) that John stole the tapes.
(Iatridou 1990:125)

Note that no such experiencer is available with predicates like *possible* and *probable*:[22]

(32) *It is possible to Max that John stole the tapes.

If we assume an analysis like 29 for epistemic modals in German, we can account for the unavailability of an epistemic reading of a modal in the perfect. Consider the sentence in 33, which contains the modal *können* with the epistemic meaning 'be possible'.

(33) Er kann noch auf dem Sportplatz sein.
he can still on the sports-field be
'He could still be on the sports field.' (Buscha et al. 1993:21)

Given 29 as a representation of this sentence (where *P*, the modal predicate, is *möglich* 'possible', and *p*, the proposition, is *er ist noch auf dem Sportplatz* 'he is still on the sports field'), no temporal alteration of the modality (*P*) is possible because no time variable is associated with this modality. The modality simply cannot be tensed. The perfect of the modal in this sentence is therefore impossible.

[22] As the discussion of example 43 in section 5.2 shows, the presence of an experiencer is an important diagnostic for identifying nonepistemic predicates.

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Iatridou does not go into any detail about the nature of the time variable *t* that is associated with predicates like *evident* and *obvious,* but not with predicates like *possible* and *probable*. I simply assume that *t* is equivalent to event time (E), the time at which a "situation" (Comrie 1985:5) takes place. If, as I argue, epistemic modality is not associated with a time variable, then it cannot be located in time, that is, there is no time at which the modality "takes place." It is in this sense (location in time) that epistemic modality cannot be tensed. (Although no event time is associated with epistemic modals, reference time and speech time do play a role in the interpretation of sentences with epistemic modals. See section 5.2 for further discussion.)

If the modal in 33 is given a nonepistemic interpretation ('be able'), it can appear in the perfect:

(34) Er hat noch auf dem Sportplatz sein können.
'He was still able to be on the sports field.'

Because the modality in this sentence involves ability (predicated of an individual), which can change with time, the clause that contains it is sensitive to time; it contains a time variable. We can represent this modal relation as in 35; that is, as a three-place predicate that involves a relation among individuals, propositions, and time:[23]

(35) C(*x*, *S*(*x*), *t*), where *C* stands for *can* 'be able' and *S* stands for 'be on the sports field'

Because this (nonepistemic) modal relation contains a time variable, any tense, including the perfect, is possible.

5.1. Tense Forms.

Note that the present tense form in the sentence in 33 is not to be interpreted semantically; in Iatridou's (1990:128) terms, it is essentially pleonastic. In German, the pleonastic use of the present tense is not

[23] The formulation in 35 is similar to Iatridou's representation (in ii) of the sentence in i (Iatridou 1990:124):

(i) It is/was/will be possible for John to steal the tapes.
(ii) *C*(*x*, *x* to VP, *t*), where *C* represents *possible* in the sense of 'can'

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limited to epistemic modals. Timeless propositions like those in 36, for example, are expressed using the present.[24]

(36) a. Zwei mal zwei ist vier.
'Two times two is four.' (Vater 1991:48)

b. Wissenschaft ist im eigentlichen Sinne Muße.
'Science is really leisure.' (attested; GDS:1692)

The present tense forms in 36, like those in sentences with epistemic modals (33), serve to satisfy the (formal) requirement that German sentences have a tensed verb.

If, as I argue here, epistemic modality cannot be tensed, and if present tense morphology on epistemic modals is capable of satisfying formal tense requirements, why should we find sentences like 37, with epistemic modals in the preterit (recall also the examples in 21 and 22)?

(37) Er schuftete, dass ihm heiß sein musste.
'He was slaving away, so he had to be hot.'
(attested; Durrell 1996:343)

Although modals in the preterit can have an epistemic interpretation, this does not contradict the claim that epistemic modality cannot be tensed. The narrative (as opposed to conversational) context of the discourse within which this epistemic judgment is expressed requires the preterit. The preterit is a signal, in a sense, of this narrative context. It is not a signal that the epistemic modality itself is located at some particular point in time. (The only thing that is located in time is the event that has a probability value assigned to it; see below for further discussion.) If the context within which an epistemic judgment is expressed is not conversational, but narrative, then the "neutral" tense of conversation, the present, is replaced by the "neutral" tense of narration, the preterit (see Weinrich 1993:207).[25] According to Weinrich (1993:219), the

[24] Although the present tense functions in German as a pleonastic tense, the present is not the universal pleonastic tense. Iatridou points out that in Basque, for example, in which there is a three-way distinction in tense morphology (present tense, past tense, and irrealis), epistemic modality is expressed using irrealis morphology (which lacks temporal reference). Present tense morphology is not used for this purpose. See Iatridou (1990:128–129) for examples and further discussion.

[25] The backward-looking (*Rückschau*) tense of conversation is the present perfect; the corresponding tense in narration is the past perfect (see Weinrich

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difference in meaning between the present (of conversation) and the preterit (of narration) is one of viewpoint (*Einstellung*), not necessarily one of time.[26]

If we look at the attested examples of epistemic modals in the preterit, we see that they occur in a narrative context, not in a conversational one. This narrative context is signaled by the preterit of the verbs in the surrounding text (e.g., *schuftete* 'slaved away' in 37; *begriff* 'understood' and *trieb* 'drove' in 21a; *kugelten* 'rolled' in 21b; *war* 'was' in 22a; *fand* 'found' in 22b).[27]

The shift from conversation to narration in German is similar to the shift from direct speech to indirect speech in English. Both involve a shift in the way in which an event (a situation) is reported; both also involve a shift in tense.[28] The tense shift in English is termed "backshift" (Quirk et al. 1985:1026), and, like the tense shift in German, involves a shift from the present to the past.[29] In backshifting in English, the present tense of quoted speech becomes past in reported speech.

1993:208; see also Schipporeit and Strothmann 1970 for further discussion of the use of tenses in conversation and narration).

[26] For further discussion of the differences between the world of conversation (*die besprochene Welt*) and the world of narration (*die erzählte Welt*) see Weinrich 1964, 1993:198–222.

[27] In conversation, the preterit of *sein* 'be' (*war* 'was') is typically substituted for the present perfect (*ist gewesen* 'has been'). The *war* in 22a, however, is a narrative form, as the larger context of this passage indicates:

(i) Da stieß sie auf eine kleine Menschengruppe, die den Weg versperrte und ganz in ihre Gefühlsäußerungen verstrickt war. Große Freude oder großer Schmerz—es war schwer zu unterscheiden.
'There she ran into a small group of people who blocked the path and were completely caught up in the expression of their emotions. Great joy or great pain—it was difficult to distinguish.' (attested; Wolf 1965:268)

Note the preterite forms *stieß* 'ran' and *versperrte* 'blocked'.

[28] German typically uses a shift from indicative to subjunctive (rather than a shift in tense) to indicate indirect speech in the written language. In the spoken language, the indicative tends to be used rather than the subjunctive. Although the tense of the original utterance is usually retained in such cases, it is sometimes shifted. See Durrell 1996:321–327 for examples and further details.

[29] Other tenses are shifted as well. In German, the present perfect of conversation is shifted to the past perfect in narration (see Schipporeit and Strothmann

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(38) a. Direct speech: "I am being paid by the hour," she said.
(Quirk et al. 1985:1027)

b. Indirect speech: She said she was being paid by the hour.
(Quirk et al. 1985:1027)

Just as past forms in reported speech in English can be interpreted as backshifted versions of present forms in quoted speech, epistemic modals in the preterit can be viewed as backshifted versions of the present forms found in conversational discourse.

While the use of the preterit to express an epistemic judgment sometimes involves an epistemic judgment made in the past (see 39), it can also represent a present judgment (see 40). In 39 we have an example of represented thought (*erlebte Rede* 'inner monolog'), where *Sie musste ihn in der U-Bahn vergessen haben* 'She had to have forgotten it in the subway' corresponds to the actual thought (the epistemic judgment) *Ich muss ihn in der U-Bahn vergessen haben* 'I must have forgotten it in the subway'. (Note the pronoun shift from *ich* 'I' to *sie* 'she' as well as the shift in tense from *muss* 'have to' to *musste* 'had to'—both characteristics of represented thought).[30]

(39) Sie suchte schon zehn Minuten nach ihrem Schirm. Er war nicht da. Sie musste ihn in der U-Bahn vergessen haben.
'She had been looking for her umbrella for ten minutes. It wasn't there. She had to have forgotten it in the subway.'
(Diewald 1993:228)

The epistemic judgment in 39 was made in the past, before the "present" time of the narrative, that is, before the time at which the narrative is

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1970). In English, the past or present perfect of direct speech is shifted to the past perfect in indirect speech (Quirk et al. 1985:1026–1028).

[30] Represented thought (or speech) in English also involves backshifting and pronoun shift:

(i) Quoted speech: "Can I try it again?" he asked his mother.
(Fillmore 1981:154)

(ii) Represented speech: Could he please try it again, he asked his mother.
(Fillmore 1981:155)

See Fillmore 1981 and Quirk et al. 1985:1032 for further discussion of represented speech in English; see GDS:1775–1777 for discussion of represented speech in German.

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related—before the "coding time" of the narrative text (Levinson 1983:73).

In 40, on the other hand, which is not an example of represented speech but rather of simple narration (note the absence of pronoun shift, for example), the epistemic judgment is made at coding time, at the time at which events are being narrated, not at the time of the events themselves.

(40) Jemand, der an meinem Fenster vorüberging, musste es ausgesprochen haben.
'Someone walking by my window [had to] have spoken it.'
(attested; Laetz 1969:76)

In 40, the narrator is saying that it is possible (from what the narrator knows at the time of narration) that a certain situation occurred in the past. The sentence in 40 is particularly revealing because it shows that the preterit (a past form) does not necessarily identify the time at which an epistemic judgment is made (the judgment is not past relative to coding time).[31] It also shows that the preterit does not necessarily identify the time for which the epistemic judgment (the epistemic modality) is valid. This example can thus be viewed as one piece of evidence that epistemic modality is not located in time. Certainly the tense of the modal has nothing to do with locating it in time.

Diewald, GDS, and Wurmbrand all concentrate on the interaction of specific tenses and epistemic modality in German (Diewald focuses on the perfect; GDS and Wurmbrand focus on the compound tenses). What all three analyses fail to capture is the incompatibility of epistemic modality and (semantic) tense in general. Although epistemic modals can appear in the present and preterit, these tense forms do not serve to modify the modality in any temporal sense. The present tense is pleonastic; it simply satisfies the formal requirement that German sentences have a tensed verb. Preterit forms are dictated by the rules of discourse: verbs that appear in the present in conversation are shifted to the preterit in simple narration or in represented speech/thought.

[31] Buscha et al. (1993:21) claim that the preterit of an epistemic modal indicates an assumption in the past (*Vermutung in der Vergangenheit*). The example in 40, however, indicates that the preterit does not always have this function.

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5.2. Location in Time.
The only thing that is located in time in an epistemic statement is the event that is assigned a probability value by the modal. This event is expressed by the infinitival portion of the statement and is located in time as follows: A simple infinitive (e.g., *sein* 'be' in 41a; *liegen* 'lie' in 42a) indicates that the event overlaps with the reference time of the statement (this reference time is supplied by the modal); a perfect infinitive (e.g., *getroffen haben* 'have hit' in 41b; *geredet haben* 'have talked' in 42b) indicates that the event precedes the reference time. This holds for epistemic statements with modals in the present (those used in conversational mode; see 41) as well for those with modals in the preterit (those used in narration; see 42).

(41) Epistemic modal in the present tense (conversation): S,R
   a. simple infinitive: E,R,S
      Man fühlt sofort, dass der Autor ein guter Koch sein muss.
      'One senses at once that the author must be a good cook.'
      (attested; Laetz 1969:76)

   b. perfect infinitive: E < R,S
      Aber ich muss sie (die Katze) doch getroffen haben, denn sie hat geschrien, nur ein einziges Mal, aber so wie ein Kind.
      'But I must have hit it (the cat), because it cried out, only once, but just like a child.' (attested; Laetz 1969:73)

(42) Epistemic modal in the preterit (narration): R < S
   a. simple infinitive: E,R < S
      Die Anhöhe hatte eine leichte Senke, und hinter der Senke mussten die Amerikaner liegen.
      'The hill had a slight valley, and the Americans had to be lying behind the valley.' (attested; Laetz 1969:75)

   b. perfect infinitive: E < R < S
      Er musste noch mehr vor sich hin geredet haben, denn der Rechtsanwalt, der zwar nicht Felber war, aber es gut hätte sein können, sagte zu den übrigen: "Der Herr phantasiert."
      'He had to have talked to himself some more because the lawyer who was, to be sure, not Felber, although he could have been, said to the others: "The man is delirious."'
      (attested; Laetz 1969:77)

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In the examples in 41 we are dealing with the world of conversation, where speech time and reference time overlap.[32] In 41a, the simple infinitive *sein* 'be' locates a situation (the author's being a good cook) at the time of the utterance itself (since the present indicates that reference time overlaps with speech time); the modal indicates that the probability that this situation obtains is quite high. In 41b, the perfect infinitive *getroffen haben* 'have hit' locates a situation (the narrator hitting a cat) prior to the time of the utterance; the modal assigns a high degree of probability to this situation having obtained.

In the examples in 42, the only thing that changes is reference time. Because we are dealing with the world of narration, reference time is some time prior to the utterance (coding) of the narrative itself. The simple infinitive in 42a (*liegen* 'lie') identifies a situation as overlapping with this past reference time; the perfect infinitive in 42b (*geredet haben* 'have talked') identifies a situation as occurring prior to this past reference time. In both sentences, the epistemic modal assigns the situation a certain degree of probability of having been realized.

Although, as I argue here, epistemic modality cannot be located in time, it is not the case that epistemic modality (epistemic judgments) cannot change over time. An epistemic modal expresses a judgment that depends on the speaker's state of knowledge at a particular time, and this state of knowledge is subject to change. To express this change in judgment, the speaker's state of knowledge can be linked to a particular point (or points) in time. The modality itself, however, is not located in time. The sentence in 43 shows how this change in judgment can be expressed.[33] It contains the verb *scheinen* 'seem', which shares a number of formal characteristics with modals and is similar in meaning to epistemic modals (GDS:1283).[34]

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[32] Note that speech time overlaps with reference time for both of the tenses that are used in conversation—the present and the present perfect. Similarly, reference time is prior to speech time for both of the tenses used in narration—the preterit and the past perfect (see Table 1).

[33] The sentence in 43 was brought to my attention by an anonymous reader.

[34] Like epistemic modals, the verb *scheinen* 'seem' cannot appear in the perfect. I suspect that this is a syntactically conditioned constraint having something to do with the presence of the *zu*-infinitive. The verbs *drohen* 'threaten' and *pflegen* 'be in the habit of; usually', which also take a *zu*-infinitive, are incompatible with the perfect (GDS:1283):

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(43) Gestern schien er mir noch krank gewesen zu sein, heute bin ich mir da nicht mehr so sicher.
'Yesterday, he still seemed to me to be/have been sick, today I'm not so sure about that anymore.'

The sentence in 43 says something about the belief of the speaker at two different points in time. It says 'Yesterday I thought he was sick, but today I'm not so sure anymore.'

Although the temporal adverbial in 43 (*gestern* 'yesterday') modifies the verb *scheinen,* this sentence cannot be viewed as a counterexample to the claim that epistemic modality has no associated time variable. The presence of an experiencer, *mir* 'to me', shows that *scheinen* in 43 is not an epistemic predicate. It is not used in this sentence to express a simple epistemic judgment. It cannot be represented as $P(p)$, that is, as a predicate of a proposition that is temporally independent (see 29). It is a predicate like *obvious* (see 30), which is sensitive to time and thus has a time variable as well as an experiencer:

(44) Seem (x, p, t) : It seems to x at time t that p.

The sentence in 43 reports a judgment (it does not directly express a judgment) and the temporal adverbial identifies the time at which this judgment was made.

5.3. Scope of Temporal Adverbials.

If we assume an analysis like 29 (repeated below) for sentences with modals that are interpreted epistemically, we can account for more than the inability of these modals to bear tense. We can also account for their inability to be modified by temporal adverbials.

(29) $P(p)$: It is possible that p. (Iatridou 1990:125)

Let us abstract away from the different degrees of probability expressed by the various modals in German that are used epistemically and assume that P in the expression $P(p)$ in 29 represents epistemic modality

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(i) *Der Fluss hat über die Ufer zu treten gedroht.
'The river has threatened to burst its banks.'
(ii) *Der Fluss hat über die Ufer zu treten gepflegt.
'The river has usually burst its banks.'
(iii) *Der Fluss hat über die Ufer zu treten geschienen.
'The river has seemed to burst its banks.'

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regardless of the particular modal used and the degree of probability it expresses.[35] Consider now the sentence in 18 (repeated here).

(18) dass Hans um fünf Uhr noch nüchtern gewesen sein muss
'that Hans must have still been sober at five o'clock' (GDS:1269)

The temporal adverbial in 18, *um fünf Uhr* 'at five o'clock', cannot modify the epistemic modal because the modal is not associated with any time variable, as indicated in 29. The proposition embedded under the modal predicate, however, can contain a time variable. (Iatridou does not include this time variable in 29 because she is concerned only with the tense of the modal predicate, not the tense of the embedded proposition.) In 18, then, it is the time variable that is associated with the embedded proposition (*Hans noch nüchtern sein* 'Hans still be sober') that is modified by the temporal adverbial *um fünf Uhr* 'at five o'clock'.

Diewald's analysis cannot account for the adverbial facts illustrated in 18. Her analysis claims to rule out a specific tense and epistemic modal combination; it has nothing to say about the scope of adverbials in sentences with modals. GDS simply states that temporal adverbials must be within the scope of epistemic modals; no explanation is given for this ordering, however. Although Wurmbrand does not discuss the interaction of temporal adverbials and modals, the data could be accommodated within her ordering approach. However, such an approach fails to address the motivation behind this ordering. The analysis proposed here, unlike those of Diewald, GDS, and Wurmbrand, automatically predicts the scope of temporal adverbials in clauses with epistemic modals. Temporal adverbials cannot modify epistemic modals because these modals express a type of modality that cannot be located in time and therefore lacks an associated time variable.

5.4. Excursus.
Iatridou uses the term "epistemic" to describe predicates like *evident* and *obvious* and "metaphysical" to describe predicates like *possible* and *probable*. While her analysis of these predicates is insightful and captures crucial differences between them (see 29 and 30), her use of the terms "epistemic" and "metaphysical" is problematic.

[35] The different degrees of probability expressed by modals in German range from virtual certainty (*müssen* 'must') to uncertainty (*können* 'can') (Buscha et al. 1993:21). Thus the expression $P(p)$ in 29 can range in meaning from 'It is virtually certain that p' to 'It is possible that p'.

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In the context of epistemic modality and modal verbs, Iatridou's choice of terms is unusual. Under her analysis, the predicates *possible* and *probable* do not express epistemic modality (they express metaphysical modality), yet these predicates express the same meanings that modals express—meanings that are typically characterized as epistemic. This is not just an unusual use of terminology, however.

Iatridou claims that her distinction between epistemic and metaphysical modality is the same as Lyons's distinction between subjective and objective epistemic modality (1977:chap. 17). If we apply Lyons's characterization of subjective epistemic modality to the predicates that Iatridou identifies as being epistemic (*evident* and *obvious*), we see that the distinction Iatridou makes between epistemic and metaphysical modality is not equivalent to Lyons's. According to Lyons (1977:793–809), statements that express subjective epistemic modality are nonfactive; the utterance of such a statement does not commit the speaker to the truth or the falsity of the proposition embedded under the modal predicate. In uttering the sentences in 45 through 47, for example, which Lyons characterizes as expressing subjective epistemic modality, the speaker is not committed to the truth or falsity of the proposition *he went to Paris* (Lyons 1977:796):

(45) He may have gone to Paris.

(46) Perhaps he went to Paris.

(47) It's possible that he went to Paris.

Compare these sentences with the example in 48, which contains the additional nonfactive predicates *believe* and *think*. The utterance of 48 does not commit the speaker to the truth or the falsity of the proposition *Edinburgh is the capital of Scotland*.

(48) He believes/thinks that Edinburgh is the capital of Scotland.
(Lyons 1977:795)

Consider now the predicates *evident* and *obvious* in 24 (repeated here).

(24) It was/will be evident/obvious that John stole the tapes.
(Iatridou 1990:123)

Iatridou characterizes these predicates as epistemic; according to Iatridou, they would be characterized as expressing subjective epistemic modality in Lyons's terminology. If these predicates did express

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subjective epistemic modality, they would be nonfactive predicates. However, they are not; they are factive. In uttering 24, the speaker is committed to the truth of the embedded proposition *John stole the tapes*. Compare 24 with 49, which contains the factive predicate *be amazing*.

(49) It is amazing that they survived. (Lyons 1977:795)

Just as with 24, the speaker uttering 49 is committed to the truth of the embedded proposition (*they survived*).

If there is a distinction to be made between the two types of predicates (adjectives) that Iatridou identifies—distinctions other than those she outlines in 29 and 30—it should be a distinction between factive (*evident, obvious*) and nonfactive (*possible, probable*) predicates. A distinction involving modality is not appropriate, since *evident* and *obvious* are not modal predicates; the sentences that contain them are not modalized.

6. Related Issues.

The discussion here of the interaction of tense and epistemic modality has implications for two further issues in the study of modal verbs. The first issue involves the relationship of evidential modals to epistemic modals. The second issue involves the grammaticalization of modals.

6.1. The Classification of Modals.

As noted in section 1, the evidential use of modals is often treated as a type of epistemic or subjective modality. Duden (1973), for example, characterizes the use of modals as either objective or subjective, and treats evidential *sollen* and *wollen* in 50 and 51 as examples of modals used subjectively (1973:72):[36]

(50) Er soll sehr klug sein.
'He is said to be very smart.'

(51) Er will dort gewesen sein.
'He claims to have been there.'

[36] A different approach to the semantics of the German modals is taken in the fourth and fifth editions of Duden (1984, 1995). Rather than treating the objective use of all modals and then the subjective use, as in the third edition (1973), each modal is listed separately with all of its basic meanings (see, for example, Duden 1984:95–105). This approach appears to be strongly influenced by Bech 1949, one of the works on which it is based.

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According to Duden, in using a modal subjectively, speakers indicate how they are subjectively judging what they are expressing with the infinitive about the subject of the sentence.

GDS treats the evidential use of *sollen* and *wollen* as essentially epistemic, but expresses some reservations in the absoluteness of this characterization. For example, GDS speaks of "epistemic *sollen*" and "*sollen* in epistemic use" (1897), yet admits that the characterization of evidential *sollen* as epistemic is controversial (1893) and notes that a special category, assertion (*Behauptung*), is sometimes used instead (for evidential *wollen* as well as *sollen*).

I maintain that evidential modals cannot be classified as a type of epistemic modal. To begin with, evidential *sollen* and *wollen* do not behave like epistemic modals in their interaction with tense. Epistemic modals are limited to the present and preterit. Evidential *sollen* and *wollen* are not; they can appear in all tenses. In particular, they can appear in the perfect and future (unlike epistemic modals):

(52) a. man hat später wissen wollen, dass
'one later claimed to know that' (attested; Leirbukt 1988:178)

b. Er wird es wieder nicht gehört haben wollen.
'He will claim again that he didn't hear it.' (Curme 1952:322)

(53) a. Er hat krank sein sollen.
'They claimed that he was sick.'

b. Ich werde es wieder getan haben sollen.
'It will be said again that I did it.' (Curme 1952:322)

These tense facts thus show a clear difference between evidentials and epistemic modals.

In addition, if we consider the basic semantics of sentences with evidential *sollen* and *wollen* (see 50 and 51), we see that they are not simple predicates of propositions. That is, the meaning of evidentials cannot be represented as $P(p)$, as can epistemic statements (see 29). Instead, evidentials are three-place predicates that involve a relation among individuals, propositions, and time. The meaning of 54a, for example, with evidential *wollen* 'claim', can be represented as in 54b.[37]

[37] The sentence in 54a also has a nonevidential reading: 'He wants to be rich.'

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(54) a. Er will reich sein.
'He claims to be rich.'

b. $A(x, R(x), t)$, where A stands for 'assert' and R stands for 'be rich'

That is, the meaning of sentences with evidential modals can be represented in the same way that the meaning of sentences with nonepistemic modals can (see 35, for example). In this respect, evidentials (*sollen* and *wollen*) belong to the class of nonepistemic rather than to the class of epistemic modals.

Finally, note that a temporal adverbial in a sentence with an evidential modal (*später* 'later' in 52a, for example) can modify the modal; it is not limited in scope to the embedded proposition. Once again, evidentials differ from epistemic modals, which cannot be modified by temporal adverbials.

The tendency to put evidential *sollen* and *wollen* in the same category as epistemic modals can be explained by the fact that both evidentials and epistemic modals are used by speakers to express less than complete certainty in the truth of a proposition (see the discussion of sentences 2 and 3 in section 1). However, the doubt in the truth of the proposition that is expressed by using an evidential modal is only a secondary meaning of the evidential expression; it is not the primary meaning. It is the result of embedding a proposition under a predicate of reporting (saying) rather than stating the proposition as fact. The doubt expressed is not inherent in the meaning of the predicate of reporting itself. With an epistemic modal, on the other hand, the doubt in the proposition is inherent in the meaning of the modal.

6.2. The Grammaticalization of Modals.

The conclusions reached here regarding the interaction of tense and the epistemic interpretation of modals have implications for a second issue in the study of modals, namely, the grammaticalization of modals. In general terms, grammaticalization can be defined as "[a] variation affecting a linguistic unit . . . [that] is directed towards subjecting that unit more to rules of grammar" (Lehmann 1991:493).[38] Using Lehmann's

[38] There are of course other definitions of grammaticalization (see, for example, those in Heine et al. 1991, Traugott and Heine 1991, Hopper and Traugott 1993, Pagliuca 1994, and Ramat and Hopper 1998).

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(1985) parameters of grammaticalization, Diewald argues that the epistemic variant of the modal verbs in German exhibits a clearly stronger degree of grammaticalization than the nonepistemic variant, and that one can thus speak of two distinct modal verb systems.

Diewald argues that Lehmann's parameter of paradigmatic variability brings out the clearest differences between epistemic and nonepistemic modals. Paradigmatic variability deals with the paradigmatic substitutability and optionality of an element. Less grammaticalized elements can be used or not depending on communicative needs; strongly grammaticalized elements exhibit certain restrictions and follow grammatical rules in their distribution. Diewald points out, for example, that some modals allow only one or two forms to be used epistemically. Only one form of the verb *dürfen,* for example (the past subjunctive form), can be given an epistemic interpretation:

(55) Er dürfte/*darf/*dürfe/*durfte nicht mehr ganz nüchtern sein.
'He may no longer be completely sober.' (Diewald 1993:228)

When discussing this parameter of grammaticalization, Diewald also points to the fact that epistemic modals cannot be used in the perfect. Although the claim that epistemic modals are more grammaticalized than nonepistemic modals is defensible, the interaction of modals and the perfect cannot be used as evidence on which to base this claim. In the case of the perfect, one cannot talk about a rule being imposed on epistemic modals that is not imposed on nonepistemic modals. There is no rule independent of epistemic meaning and the meaning of the perfect that brings about the incompatibility of the two. As I argue in section 5, the incompatibility is due to the lack of a time variable associated with epistemic modality.

7. Conclusion.

The multiple functions of the different tenses (tense forms) in German have undoubtedly played a role in obscuring the relationship between the epistemic interpretation of modals and tense. What has long appeared to be an incompatibility of epistemic meaning and the perfect turns out to have nothing to do with the perfect per se. Modals with epistemic meaning typically appear in the present tense, the tense used in German to satisfy formal tense requirements in sentences that have no semantic tense. An epistemic modal can also appear in the preterit, but the use of the preterit has no effect on the epistemic meaning expressed by the modal. It is simply dictated by the relationship of the modalized

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utterance to the discourse context. The preterit is required in a narrative context or when the discourse is presented as represented speech or thought. All tense forms other than the present or preterit are incompatible with an epistemic interpretation of modals because epistemic meaning is temporally independent. To say that a particular proposition is possible (or probable, etc.) is to say this in absolute terms, without assigning the probability itself to some point or period in time.

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