Methods for modalities

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ja mues men oder darf men oder cha me mit dir
öpis rede (Werlen 1985: 95–96)

1. Introduction

This chapter deals with the concept of modality.¹ We will show that modality is interesting from both a formal and a semantic point of view, how both form and meaning can be studied in isolation and we will also suggest that the best way is to study meaning and form together.

2. Modalities

The term ‘modality’ is used in more than one way (Werlen 1982, van der Auwera and Plungian 1998, Palmer 1986/2001, Nuyts 2006), but many linguists will agree that the meaning contributed by the word must and may in (1) and (2) is modal.

(1) The prime minister must have thought about the problem.
(2) The prime minister may have thought about the problem.

In (1) must expresses that the speaker considers it highly likely that the prime minister thought about the problem. In (2) may expresses a speaker judgement also, but this time (s)he considers it possible that the prime minister thought about the problem: it is not particularly likely but not unlikely either. The verbs must and may have other uses and there is a further consensus to treat at least the uses in (3) and (4) as modal too.

(3) You must solve the problem.
(4) You may solve the problem.
In (3) *must* expresses that the hearer is obliged to solve the problem. In (4) *may* expresses that the hearer has the permission to solve the problem. As to the relation between the uses in (1) and (2) vs. (3) and (4) opinions differ. One can be of the opinion that the two uses of *must*, respectively, *may* instantiate the same meanings, viz. necessity and possibility (e.g. Perkins 1983, Kratzer 1978) and that the difference is due to context, either linguistic or extra-linguistic or both. But one can also be of the opinion that (1) and (2) versus (3) and (4) instantiate different meanings (e.g. Diewald 1999). *Must* and *may* are then ambiguous or, if one accepts even more meanings, the prefix *ambi-* is not really appropriate and the better term is ‘polysemous’. Independently of whether one opts for monosemy or polysemy, there is a fair amount of agreement on calling the meanings or uses illustrated in (1) to (4) ‘modal’. For the distinction between (1) and (2) vs. (3) and (4) many terms are in circulation, but probably the most common ones are ‘epistemic’ for the meanings or uses illustrated in (1) and (2) and ‘deontic’ for the ones illustrated in (3) and (4).

Why have linguists been interested in modality? There are basically three reasons.

The first is purely conceptual. The question of how to define the concepts already invoked, such as epistemic and deontic modality, is not easy to answer. And more tricky still is the question how these concepts relate to one another. These are concerns about meanings only – concepts, if one likes. And note that there are many other meanings or concepts that come into the picture, whether one can call them ‘modal’ or not. (5) to (9) illustrate some of these, (5) to (7) with English *may*, (8) with the very similar verb *can*, and (9) with the German ‘may’ verb *mögen.*

(5) *May* he live a hundred years.
(6) Whatever he *may* say, do not believe him.
(7) If you want to go to the zoo, you *may* take bus 25.

(8) *I can* speak English [in the reading ‘I am able to speak to English’]

(9) *Magst* du ihn nicht?
may:PRS2SG you him not
‘Don’t you like him?’

(5) expresses a wish, which is neither a speaker’s uncertainty – the epistemic meaning – nor the expression of a permission – the deontic meaning. The
concessive use in (6) is at least very close to the epistemic meaning, but it is arguably not quite the same. In (7) *may* need not express a permission: it may just express a possibility, i.e. a possible strategy of getting oneself to the zoo. In (8) *can* expresses an ability, and in (9) *mögen* means ‘like’. All of these concepts need to be analyzed.

Second, the forms that are regularly used to express modal notions may be interesting from a purely formal point of view. This is the case in English. Most English verbs need the auxiliary *do* for negation and question.

(10)  
  a. I love you.  
  b. I *do* not love you.  
  c. *Do* I love you?

But the modal verbs typically don’t.

(11)  
  a. I *must* go now.  
  b. I *must* not go now.  
  c. *Must* I go now?

Here is another interesting formal property: *may* and *must* can only be followed by infinitives, at least in present-day English. This is different from the Dutch counterparts.

(12)  
  Ik *moet/mag* naar huis.  
  *I must/may* to home  
  ‘I must/may go home.’

The third and the most important reason for why modality is interesting concerns the relation between meaning and form. Studying the conceptual relations between deontic and epistemic modality, wish, concession and ability is one thing. Studying which markers express which meanings and why is another thing. In English, for instance, *can* is very similar to *may*, but they are not quite the same. And how much variation is there between languages? English *can* is similar to Dutch *kunnen* and German *können*, but they are not quite the same. When studying the relation between meaning and form, we also find interesting questions on compositionality. Thus modal markers enter into larger modal constructions in not strictly predictable ways. Consider the combinability of *may* with negation.
(13) The prime minister *may* not have thought about the problem.

(14) You *may* not solve the problem.

(13) has epistemic *may*. When it is followed by *not*, the modal element has wide scope: (13) means that it is not certain that the prime minister has thought about the problem. In (14) *may* is also followed by *not*, but here *may* is deontic and in the resulting meaning *may* has narrow scope, at least in its default reading, without an intonation break between *may* and *not*. (14) normally means that the hearer is not allowed to solve the problem, in which case its meaning is close to that of (15).

(15) You *must not* solve the problem.

(15) has a deontic modal, too, but this time the modal has wide scope.

Another compositionality problem is that complex constructions may have modal meanings, even though their components are not in any obvious way modal. Why is it, for instance, that *have to* in (16) and *are to* in (17) express meanings close to that of *must*?

(16) You *have to* go now.
(17) You *are to* go now.

Then there is again a cross-linguistic dimension. To illustrate the latter, the Dutch counterpart to (15) has two readings.

(18) Je *moet* het probleem *niet* oplossen.

‘You mustn’t solve the problem.’ or ‘You needn’t solve the problem.’

In the meaning – form interface area the question of distinguishing between monosemy and polysemy becomes a crucial issue. At what point do we say that two uses instantiate two meanings? For some constructions the question is bound to be easier than for others. For *must* and *may*, illustrated in (1) to (4), we have already alluded to the fact that monosemy and polysemy accounts exist side by side. But in the case of German *dürfen* one would more readily opt for polysemy. Consider (19) and (20).
Issues relating to both the meaning and the form of modality is its grammaticalization. Grammaticalization is defined as a process whereby, in the course of time, lexical entities develop grammatical functions, or where elements already displaying grammatical functions develop further or more central grammatical functions. This common core of grammaticalization studies is emphasized in the following definition:

Grammaticalization consists in the increase of the range of a morpheme advancing from a lexical to a grammatical or from a less grammatical to a more grammatical status, e.g. from a derivative formant to an inflectional one. (Kuryłowicz 1964: 52)

As in the above classical definition, grammaticalization research usually takes the perspective of the individual form (or a syntagmatic combination – a construction – of individual forms) undergoing this process. However, as this process is always concerned with a change of the basic semiotic
category of the item in question, i.e. from a symbolic linguistic sign (lexical sign) to an indexical linguistic sign (grammatical sign), grammaticalization studies are also concerned with meaning change and functional change (Diewald 2011). This complex interaction is alluded to by Lehmann:

> Grammaticalization is a process leading from lexemes to grammatical formatives. A number of semantic, syntactic and phonological processes interact in the grammaticalization of morphemes and of whole constructions.

(Lehmann 1995 [1982]: viii)

This general process is often described in terms of grammaticalization paths. A path applying to modal elements is given in (21a) (from Lehmann [1982] 1995: 37, simplified). (21b) and (21c) show paths from Bybee, Perkins and Pagliuca (1994: 240).

(21)  
a. full verb > modal verb > auxiliary verb > mood marker  
b. desire > intention > future > imperative  
c. ability > root possibility > epistemic possibility > concessive

As a result of the intense research during the past decades, a number of facts and assumptions on (the grammaticalization of) modals have become widely accepted. Conversely, work on the grammaticalization of modal verbs has provided paradigm cases of the kinds of questions arising in the investigation of grammaticalization.

Thus we hope to have conveyed a sense of why modality is interesting. The question that will occupy us in the rest of this article is how one should study modality, i.e. the methodological question.

3. **Methods**

The methods that are necessary for the analysis of modality are not different from those employed in the study of similar domains, such as those of time (tense) or aspect. The methodology also depends on the particular issue. If one is interested in the conceptual issue, then introspection (intuition) will suffice. If one is only interested in the form of modality or in the relation between form and meaning, then there are various options. If the modal constructions are those of one’s native language, then native speaker intuition will again be useful. But a language is more than a speech repertoire of one person, judgments will vary from one person to the next, and
individuals do not necessarily have a good sense of what is more or less frequent. Hence corpus study comes in, especially if one is studying diachrony. There are, in principle, two types of corpus approaches. One either studies comparable texts for different periods or one studies the ‘same’ text in its renderings in different periods – the comparable text vs. the parallel text methods. If one is comparing different living languages, then there are two options. Either one questions native speakers or one again studies corpora and in the latter case one can again either use comparable or parallel texts. A variant of the questionnaire method is the ‘specialist consultation’ method: often one does have not access to native speakers but only to grammarians, who themselves had access to native speakers. In consulting grammars, dictionaries or linguists, one still tries to question the native speakers, but in a most indirect way. As current corpus approaches use electronic bases and more or less automatic search tools, corpus approaches can be differentiated further in terms of the role attributed to the computer. Either the computer merely serves to find and count things faster than humans or it is allowed into undertake more complex tasks of hypothesis testing and even hyphthesis formation, in which case the machine is arguably not just faster but also better than humans, at least in some respects.

Not all issues have to date been studied with all relevant methods. We do not, for instance, know of any cross-linguistic study of modality that is based on a questionnaire addressed to native speakers. In the rest of this paper we will illustrate some of the issue–method combinations. In Section 4 we illustrate the role of introspection in a ‘meaning only’ approach. In Section 5 we illustrate the role of a comparable corpus approach for a diachronic ‘form only’ issue. Section 6 illustrates studies that deal with both form and meaning. Each time we will again try to convey a sense of why the issue is interesting.

4. **Meaning only: introspection**

Modality essentially concerns interesting concepts conveyed through interesting forms. Maybe the earliest study of modality or at least one of the early interesting studies of modality focuses on the conceptual issues, without (much) regard of the form. The so-called Aristotelian Square, the idea but not the representation of which goes back to Aristotle, is a configuration designed to capture relations between selected sets of categories and negation. One of these category sets involves necessity and possibility.
Figure 1. The Aristotelian square for modality

The A-I axis is the positive one and the letters ‘A’ and the ‘I’ are those of Latin *Affirmo* ‘I affirm’, The E-O axis is the negative one and the ‘E’ and ‘O’ are those of Latin *nEgO* ‘I deny’. The A-E axis captures the universal values and the I-O the particular ones. The universal values imply the particular ones. Thus if something is necessary, it is also possible. The values that are diagonally opposed to one another are contradictory: they cannot hold true or false together: something cannot be both necessary and not necessary and it is impossible for something to be neither necessary nor not necessary. The relation between A and E is one of contrarity, which means that an A and an E proposition cannot be true together. When something is necessary, then it cannot also be the case that it is impossible. The A and E propositions can both be false though: it is perfectly fine for something to be neither necessary nor impossible and, in that case, one would say that it is possible. The relation between I and O, finally, has been called ‘subcontrarity’. The idea is that I and O cannot be false together, but that they can be true together. This is not self-evident and it has caused problems, apparently already for Aristotle (Horn 1990: 454), but the details need not concern us here.

Issues relating to the Aristotelian Square have been discussed by logicians, philosophers and linguists from Aristotle until today (see Horn 1990, van der Auwera 1996, van der Auwera and Van Alsenoy 2011). Their method is essentially intuition. One explores concepts, their implications, the consistency of the system, and the plausibility. The important point here is that a good part of the research is not concerned with form. It does not
matter whether and how a language expresses the four concepts. Necessity will imply possibility, no matter whether necessity is expressed with the verb *must* or the adjective *necessary*. The concern is only with the conceptual relations. Of course, the starting point is form. Even for philosophers and logicians, it is only because they are aware of words like *must* and *necessary* in contrast with *may* and *possible* that the conceptual analysis will engage them. And the conceptual issues easily lead to interesting questions about form. We will come to this in Section 6.1.

It is important also to stress that the ‘meaning only’ orientation is by no means restricted to work on the Aristotelian Square. This orientation is present in the wide field of modal logic. Portner (2009) describes the goal of the latter as follows:

> Modal logic is concerned with better understanding the concepts of implication, necessity, obligation, and the like, especially as they occur in patterns of reasoning. It’s not about the meanings of the natural language expressions like *must*, *possible*, and *ought*. In fact, in doing logic we often forget about the words we normally use to express these concepts, since doing so allows us to better focus on the system of reasoning itself. (Portner 2009: 10–11)

This does not mean, according to Portner (2009), that modal logic is irrelevant for linguistics. On the contrary, as a formal semanticist, he wants his linguistic analysis to be as close as possible to modal logic in order to arrive at a ‘linguistically realistic version of modal logic’ (Portner 2009: 29).

### 5. Form only, one language, diachrony: comparable corpora

Can one study form independently of meaning? The answer is positive. We have earlier illustrated two formal features for English modals: the absence of *do* periphrasis and the presence of a bare infinitive. This and other features can be studied in isolation from semantic concerns. No doubt the decision to consider verbs such as *must* and *may* but not *like* and *see* as modal is essentially a semantic one. But apart from identifying the objects of the study of modality as including *must* and *may* but excluding *like* and *see*, one can focus on formal matters. Van der Auwera and Taeymans (2009) is such a study. It is furthermore a diachronic one and it is based on comparable corpora. Their formal issue is the alternation illustrated in (22) and more particularly its history.
Van der Auwera and Taeymans (2009: 324) argue, for British English, that *need to* was once as fond of negative polarity as *need* is now. This is shown in Figure 2: in late Middle English *need to* was predominantly positive polar, as it is now, but in early Modern English it was 100% negatively polar, the way *need* is now.

![Figure 2. need to in positively and negatively polar contexts (IME ‘late Middle English’, eModE ‘early Modern English’, lModE ‘late Modern English’, lPdE ‘late Present-Day English’; eModE, lModE and IPdE are split up in subperiods; there are no data for early Present-Day English)](chart.png)

Figure 3 illustrates another corpus-based ‘form only’ claim: the absolute frequency, whether in positive or negative polarity context, of *need* vs *need to* shows a marked rise and fall of *need*.

Their findings are based on research on corpora deemed representative – and therefore comparable – for the relevant states of the English language. The computer has a minor role. It serves as a machine for fast finding and counting. The study only deals with form: nowhere in this study do the authors discuss whether or not the patterns illustrated in (22) are perhaps not quite synonymous. That the two *need* verbs are not synonymous is not denied either (see e.g. Duffley 1994, Duffley and Larrivée 1998 for some interesting proposals), but the study by van der Auwera and Taeymans (2009) abstracts from this issue. As such, though, these tables may thus only show part of the story: what steers the developments visualized.
6. Meaning and form

However valuable the study of meaning and form in isolation could be, for linguists such studies are inherently incomplete. The reason is simple: the linguistic sign combines meaning and form. So most linguistic studies focus on both meaning and form.

6.1. One language: introspection

The Aristotelian Square, we stressed in Section 4, is an account of the relations between two concepts, viz. necessity and possibility, and their negations. As such, it implicitly already tells us something about the kinds of expressions languages use for these notions. For example, the notions of possibility and impossibility are contradictory: that should mean that if a language has expressions for both, then negating one should be equivalent to the other. English has the adjectives *possible* and *impossible*. Thus one would expect that *not impossible* is the same as *possible*. This expectation is partially borne out, but not quite. Perhaps *possible* and *not impossible* are equivalent on a semantic level, but not on a pragmatic level, see Horn (1991). This very linguist is also well-known for a ‘conjecture’ called
‘Horn’s conjecture’ by Moeschler (2006, in print), which says that languages tend not to lexicalize the O value (Horn 1989: 256, 1990: 458). For at least some categories, English gives this claim some plausibility.

Table 1. The missing O phenomenon

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For the sets of concepts in Table 1 – interestingly all of them actually non-modal – English indeed lacks one word O expressions. One might have imagined O words such as *nall*, *nalways*, *noth* or *nand*, but they do not exist. For Horn this is reason enough to express sympathy for those linguists (and philosophers) that propose three term categorizations instead of the four term categorization inherent in the Square. Put in geometric parlance, for the lexicon one would not need a square but just a triangle. And Horn furthermore tries to reconcile the quadrangular and triangular views within a Gricean framework. The essential idea, applied to the basic quantifiers, is that there is no need for a *nall* word, for its ‘not all’ meaning is a scalar implicature of ‘some’. Horn can thus propose a Square with three corners, at least for the lexicon.

Figure 4. A three-cornered square

But is it true that O concepts tend not to lexicalize and is it only O that has this property? For the first question, it suffices to go to the English modal auxiliaries to find a special O lexicalization, i.e. the *need* auxiliary, as already illustrated in (22a), repeated below.
Different from the lexical need, as in (22b), the auxiliary need does not have an A use, so it is fairly dedicated to the O value.\(^5\)

One might, of course, retort that needn’t is not quite one word, but the same observation can be made about the E constructions mustn’t and can’t. If these count as lexicalizations, then needn’t will also count. And since not is very selective in cliticizing to words and, in effect, forming a new word with its host, there is a good argument for accepting them. However, if the forms with -n’t don’t count, then this is interesting too, for then we are answering the second question. If mustn’t and can’t do not count, then we have to conclude that the English modal auxiliary system does not lexicalize the E corner either. In any case, discussions of this kind (e.g. Löbner 1990, van der Auwera 1996 or van der Auwera and Bultinck 2001) clearly deal with both meaning and form. O is supposed to be a meaning, a concept, and we then check whether English has a word for it or not.

Note that Horn’s conjecture is not just about English. It is actually a very strong cross-linguistic claim and, since older stages of a language count as languages too, it also has diachronic implications. So the really interesting test of the conjecture will have to go beyond introspection, and target native speakers, grammars, dictionaries and specialists. There are anecdotal claims about non-English left and right, but the systematic cross-linguistic study remains to be done. We ‘meta-conjecture’ that Horn’s conjecture is quite plausible, at least as a statement about a tendency, but we fear that it is too simple.

6.2. One language, synchrony: one mono-lingual corpus

Wärnsby (2006) is a study of modality in English and Swedish. What she undertakes for both languages is to take a set of modal verbs, e.g. must and may for English, and provide them with a semantic analysis. The latter goes along two lines. First, she determines whether the modality is epistemic or not. Second, she analyses the sentences containing the modal verbs in terms
of semantic features of the verb (aspect, polarity, and voice) and the animacy of the subject. This is interesting because it has been claimed that values for the latter features are associated with the distinction between the epistemic and the non-epistemic reading. A perfective or progressive lexical verb is, for instance, strongly associated with an epistemic reading for *must*.

(24) He *must* have read a book. [typically epistemic]
(25) He *must* be reading a book. [typically epistemic]

And non-perfective non-progresssive *must* is strongly associated with a deontic reading.

(26) He *must* read a book. [typically deontic]

What Wärnsby then does is to check to what extent this hypothesis holds true. What is most interesting in this endeavor is her use of the ‘Data Mining’ method and the study thus interestingly differs from Coates (1983), the ground breaking study on English modality that contains the generalizations just mentioned in a very clear way. Coates used the computer as a search and count machine. The claim about the relation between perfective or progressive aspect and epistemic *must* is one of the generalizations that Coates arrives at it on the basis of the observations and the numbers that the computer helped her with. Wärnsby (2006) gives the computer a more important role. The computer is fed with the relevant features and it is then instructed to find co-occurrence patterns such that we see to what extent the epistemic vs. non-epistemic distinction follows from the values of the features. At least for English, it appears that the computer will indeed make predictions that confirm Wärnsby’s own intuitions. While Coates’ computer was a data gatherer, Wärnsby’s is a hypothesis tester.

6.3. More languages: parallel corpora

Van der Auwera, Schalley and Nuyts (2005) is a study of the difference between verbal and adverbiaal strategies of the expression of uncertainty. In English one can use the verbs *may, might* and *could*, but one can also the adverbs *maybe* and *perhaps*.
(27) She *may/might/could* have seen me.
(28) *Maybe/perhaps* she saw me.

The meanings of these verbal and adverbial expressions are at least very close and we do not know how they would differ or even whether they differ at all (see Nuyts 2001). In van der Auwera, Schalley and Nuyts (2005) all the epistemic occurrences of *may, might, could, maybe* and *perhaps* in one of the Harry Potter novels were collected. The authors then analyzed how these sentences were translated in the Slavonic languages. The main question, deemed interesting on the basis of earlier work, was whether the translations used a modal verb or a modal adverb or yet something else. The results for the various Slavonic languages were then compared with each other, and also with English. The computer had a minimal role. It helped find and count the occurrences.

Interestingly, the succession of formal and semantic analysis is a little complex, even for this simple a study. The starting point of this study was form (five constructions), then there was semantic analysis (the identification of the epistemic uses), then analysis of the Slavonic translations, involving both form and meaning (the search for the translational equivalents). Yet note that the point of the exercise was a formal one. The authors wanted to know whether Slavonic languages differed in their preferences for one of the other strategy, independently of semantic factors, for they assumed that the Slavonic verbal and adverbial strategies were as semantically close to one another as the English ones. But in fact, we do not really know whether they differ in meaning, not for English, the language whose modal expressions have been studied most intensively, and even less so for the Slavonic languages. So one could set it as a goal to look at the semantic issue once more: do the various verbal and adverbial strategies have different semantics? The chances that the relatively small data set for English will allow us to see something that has not been noticed yet are small. But now the English data are coupled with translational data and the entire data set could then be the input for what is called ‘multi-dimensional scaling’, already undertaken for other domains of meaning (e.g. Cysouw and Wälchli 2011, compare also Levinson and Meira 2003). This is again a more advanced use of the machine, one that remains to be undertaken for modality.
6.4. One language, diachrony: comparable corpora

The diachronic study of language poses a number of particular methodological problems, which become even more pressing, when form and meaning of such complex an issue like modal elements are concerned. Here, seemingly instrumental decisions about the best approach to and processing of data become highly relevant as they predetermine possible research results. Among the most important general conditions and factors for diachronic research are the following ones.

Even when focusing on only one language and its development through time, we are dealing with distinct linguistic systems: Old High German, for example, though being the (remote) ancestor of Modern German, is a distinct language, different from – if closely related to – the language of today. In sharp contrast to comparative studies of modern languages, no living speaker, and not the researcher either, has native speaker competence of linguistic systems of the past. Due to this trivial but important fact, several methods available for studies of modern languages are not employable here (the armchair method, questionnaires, qualitative interviews etc.). Instead, the researcher has to rely on corpora and on his or her secondary (compensatory) competence in the older stages of a language. The latter, which must include linguistic as well as philological and sociohistoric knowledge, is dependent on the available diachronic testimony of the language. This means that diachronic corpora play an extremely important role in the investigation of diachronic questions (the term ‘diachronic corpora’ is used here to refer to corpora of older stages of a language in general, independent of whether they are diachronic, i.e. comprising a chronological dimension in themselves, or whether they just represent one historic layer of synchrony). The situation is even more aggravated by the fact that diachronic testimonies are typically insufficient with respect to several parameters, and typically non-improvable. They represent the written register only and display a very restricted number of text types and registers. Their dialectal and chronological distribution is completely arbitrary and non-homogeneous and does not meet empirical validity standards set up by modern corpus linguistics in any way. These deficiencies are of course correlated with the temporal distance of the investigated stage, the degree of standardization and further contingent historical facts (loss of documents through fire etc.). As a rule of thumb, we may say that the older the language, the more deficient the available corpus data.
Notwithstanding these problems, there is no way around the use of adequately laid-out corpora for diachronic linguistics. In particular, it is not sufficient to rely on a number of selected illustrative phrases, which have been handed down by philologists and quoted in every textbook or grammar for decades, to set up hypotheses on a diachronic linguistic situation.

Some remarks on diachronic research on modal verbs and their grammaticalization may illustrate what is meant here. As mentioned in earlier sections, it has become common knowledge that modal verbs (or their pre-modal ancestors) undergo a unidirectional change from non-epistemic to epistemic functions, whereby the latter become integrated into closed set paradigms encoding factuality judgments and even functions typically associated with verbal mood (optative, hortative, directive, subjunctive, conditional etc.). These results have been attained cumulatively by a number of detailed corpus studies, e.g. the study on the grammaticalization of the German modals by Diewald (1999). Only through a thorough investigation based on a sufficiently large selection of diachronic texts was it possible to show that the present-day system of the six modals dürfen, können mögen, müssen, sollen and wollen was built up only gradually during the history of German, and received its basic outline as late as at the end of the Early New High German period. In earlier stages, we are confronted with different oppositions between the members of the respective modal systems. Furthermore, the number of the members in those systems of (pre-)modal elements was by no means identical with one of the present-day system consisting of the above mentioned six modals. Thus, in Old High German, the system was composed by three to four members (i.e. mugan, sculan, wellen and – peripherally muozzan), representing contrasts between subtypes of none-epistemic modality. Kunnan and thurfan were extremely rare at that period, were mainly restricted to their lexical meaning and did not participate in the modal system This statement could only be arrived at by extensive corpus-driven study of the Old High German data (see Diewald 1999: 295-431). In contrast to this, earlier investigations based on a very limited number of handed down text book examples, which were adopted without testing, assumed that the present-day system was a mere succession of a similar older system, the only difference being that individual modals, due to semantic change, occupied different places in the respective system-internal oppositions. Even an otherwise illuminating study on the development of the German modals like the one by Bech (1951), due to lack of corpus research, erroneously assumes a six-member system of (non-epistemic) modals for Old High German.
Thus the necessity of working with corpora in diachronic linguistics is undeniable, and the methodological challenges confronted with when setting up diachronic corpora are to be taken very serious. The case of German is particularly interesting, in this respect, too. Though German is a well studied language, the availability of diachronic corpora is still not satisfactory. Even though historical texts have been digitized, and there are a number of text collections of different sizes and formats, there are neither common standards for digitization, meta-information, or text annotation; nor are there commonly used, unified search interfaces. Furthermore, many of the digitized texts are not available to the general public. A large project called DeutschDiachronDigital (DDD) aims at creating a generally available, unified resource with common standards and search programs (cf. e.g. Lüdeling et al. 2004), but its resources are not yet available. To compensate for this gap at least partially, a (new) small diachronic text corpus, called ‘kali-korpus’ (http://www.gabrielediewald.de/index.php/kali-korpus), was set up recently, which focuses on research questions in grammaticalization studies, and is oriented towards common standards and formats of digitizing and annotation. Leaving aside technical details, some features of that corpus are mentioned here as an illustration of typical questions and problems (and their solution) in diachronic corpora.

In the kali-korpus, the (partial) morphological annotation, which focuses on verbal categories, encompasses all verbal units (finite and infinite) in their occurrences through all documented periods. The morphological annotation parameters determine a hierarchical tag-set containing the grammatical categories of finiteness, inflection, tense, mood, person, and number (cf. Diewald, Lehmberg and Smirnova 2007). Each verbal token is analyzed and tagged with information regarding person, number, tense and mood. In addition to this the matching headwords and translation terms – we are dealing with different, diachronically separated languages – are added to each token. With this homogeneous morphological and semantic annotation, all forms and meanings of verbal elements can be easily found and diachronically compared.

While the study on the grammaticalization of modal verbs (Diewald 1999), still had to resort to the traditional, time-consuming method of extracting and counting each token manually, more recent studies on the rise of evidential markers in German (Diewald and Smirnova 2010) were able to make use of this research tool, which proved extremely useful for finding and counting relevant forms, and, in addition, it helped identifying linguistic contexts for the developments under investigation.
7. Conclusion

Modality, so we hope to have shown, is interesting and difficult. The issues concern meaning and form, they are language-specific and cross-linguistic, and they relate to synchrony as well as diachrony. A variety of methods offer themselves. They can take the linguist from the armchair to the computer screen, to questionnaires, grammars, dictionaries, to ready-made corpora and to texts to be treated for corpus inclusion.

Notes

1. Both authors are grateful to the Belgian Federal Government (IAP-grant P6/44 on grammaticalization and (inter)subjectification).
2. In addition to monosemy and polysemy, there is also homonymy and indeterminacy (gradiences) and even if one is of the opinion that these distinctions are not that important (as in the semantic map approach, e.g. van der Auwera and Plungian 1998), one has to say why they would not be that important. So it remains an issue.
3. As Bernhard Wälchli points out, rightly so, historical linguists also engage in reconstructing forms and meanings. The work they are doing is not corpus linguistics in the modern sense, but they always start from corpus attested form meaning correspondences.
4. The representation is taken to have introduced by 2nd century Apuleius of Madaura (see Londey & Johanson 1987).
5. It should be kept in mind that there is a fundamental functional difference between lexical signs on one hand and grammatical signs on the other. This means that even if there is little difference in meaning between an adverbial expression of epistemic meaning and a grammaticalized epistemic modal, the semiotic status of the signs in question, and thus their function, differs markedly (Diewald 1999: 13-19, 46f.).
6. The adverbs may or may not grammaticalize from verbal constructions, as is the case for maybe, but not for perhaps. This distinction is irrelevant for our point though.

References

Bech, Gunnar
Bybee, Joan L., Revere D. Perkins, and William Pagliuca  

Coates, Jennifer  

Cysouw, Michael, and Bernhard Wälchli  
2011 Lexical typology through similarity semantics: Toward a semantic map of motion verbs. Manuscript.

Diewald, Gabriele  


Diewald, Gabriele, Timm Lehmberg, and Elena Smirnova  

Diewald, Gabriele, and Elena Smirnova  

Duffley, Patrick J., and Pierre Larrivée  

Duffley, Patrick J.  

Horn, Laurence R.  


Kratzer, Angelika  
Kuryłowicz, Jerzy

Lehmann, Christian

Levinson, Stephen, and Sérgio Meira

Lübner, Sebastian

Londey, David, and Carmen Johanson

Lüdeling, Anke, Emil Kroymann, Sebastian Thiebes, and Ulf Leser

Moeschler, Jacques
In print  Pourquoi n’y a-t-il pas de particuliers négatifs? La conjecture de Horn revisitée. *Actes du colloque sur la quantification*. Caen: Université de Caen.

Nuyts, Jan

Palmer, Frank R.

Perkins, Michael R.

Portner, Paul

van der Auwera, Johan
van der Auwera, Johan, and Bert Bultinck

van der Auwera, Johan, and Vladimir Plungian

van der Auwera, Johan, Ewa Schalley, and Jan Nuyts

van der Auwera, Johan, and Martine Taeymans

van der Auwera, Johan, and Lauren Van Alsenoy

Wärnsby, Anna
2006 (De)coding modality: The case of must, may, måste, and kan. Lund: Lund University.

Werlen, Iwar