109 The universality of f-structure: discovery or stipulation? The case of modals

Helge Dyvik

University of Bergen, Norway

Proceedings of the LFG99 Conference

1. Introduction

In this paper I want to discuss the analysis of auxiliaries and modals proposed by Butt, Niño and Segond (1996) and its implications for the theoretical status of f-structures in LFG. The discussion will be based partly on some Norwegian data and partly on more general considerations.

2. Butt, Niño and Segond's analysis of auxiliaries

Butt, Niño and Segond's analysis of auxiliaries and modals is presented first in Butt & al. (1996), and later in a slightly modified form in *A Grammar Writer's Cookbook* from 1999 by themselves and Tracy King. They address the old question whether auxiliaries should be analysed as a special subset of main verbs or as special AUX categories of a more grammatical or functional nature – for instance in examples like the following:

(1)   The driver will have turned the lever
        Der Fahrer wird den Hebel gedreht haben
        Le conducteur aura tourné le levier

As they point out, the traditional analyses within HPSG and LFG treat the auxiliaries as elements that are similar to main verbs, with their own PREDs and XCOMPs. Thus, the English sentence traditionally (i.e., since Falk 1984) gets a c-structure representation roughly like (2) and an f-structure representation roughly like (3):

(2)

(3)

The French example, however, expresses future tense morphologically, and therefore gets representations with one level less:

(4)

The authors' proposal is to discard these traditional analyses and rather give theEnglish, French and German examples the same, flat, f-structure analysis,in which the auxiliaries do not introduce their own PREDs or take their ownXCOMPS, but rather are analysed as functional categories just contributing tense and aspect featuresto the f-structure. Accordingly the f-structure in (5) will do for all three languages. (The feature TENSE with an atomic valuehas been changed to a feature TNS-ASP with a complex value in accordancewith the revision in the *Cookbook*.)

(5)

The authors' arguments why we don't need thetraditional analysis are:

(6)   (i) VP-ellipsis and VP-topicalisation, which presuppose asyntactical hierarchy of the traditional kind, can still be handled in thec-structure, where the hierarchical information remains.

(ii) The restrictions on the form of the complement verbs ('have' takes past participle and 'will' base form in their respective complements, for example), hitherto handledstraightforwardly in the f-structure by restrictions on XCOMPs, can behandled by a new projection called Morphological Structure orm-structure (see (7) below).

The reasons given by Butt & al. for opting for the flatf-structure analysis are (partly in my paraphrases):

(iii) Crosslinguistic evidence indicates that elements bearingonly tense/aspect, mood or voice should belong to a distinct syntacticcategory.

(iv) The structural complexity of the traditional analysis isunmotivated and falsely indicates that there is a deep difference inpredicational structure of auxiliaries like *will* and*have* on the one hand and the French *aura* on the other.

(v) The difference between the analyses of translationallycorresponding structures is not helpful for MT.

(vi) Relegating the constraints on morphological forms to a separatem-structure is an advantage since the information does not really belong inthe f-structure, being mostly unrelated to the grammatical relations andfunction-argumentstructure which are such stuff as f-structuresare made of.

In m-structure the hierarchical information is preserved, and themorphological form of words and their dependents are represented:

(7)

The lexical entries for auxiliaries now specify the required form oftheir dependents in the m-structure rather than adding the same kind ofrestrictions to the f-structure.

In the *Cookbook* it is stated that the "flat" analysis only applies to the future and perfectauxiliaries, while modal verbs like German *müssen* and*können* are still given the traditional hierarchical f-structure analysis. Thusthe analysis involves treating auxiliaries and modal verbs as fundamentallydifferent kinds of categories.

3. Auxiliaries and modals in Norwegian

Before commenting further on Butt & al.'s analysis I would like togive a sketch of the corresponding grammatical phenomena in Norwegian.

Norwegian has a set of modal verbs which includes *ville,kunne, måtte, skulle*. We will consider some examples.

(8)	a.	Han	vil		dreie	håndtaket
		he	*will/wants to*.Pres		*turn*.Inf	*the-lever*
	b.	Han	kan		dreie	håndtaket
		he	*may/can/is able to*.Pres		*turn*.Inf	*the-lever*
	c.	Han	må		dreie	håndtaket
		he	*must/is obliged to*.Pres		*turn*.Inf	*the-lever*
	d.	Han	skal		dreie	håndtaket
		he	*is said to/has a duty to*.Pres	*turn*.Inf	*the-lever*

The semantic range of the modals is to some extent parallelled by the corresponding modals in English, French and German, butwe may note the systematicity of the alternatives in Norwegian: Every modalcan be interpreted either as a one-place epistemic modal or as a two-placeroot modal. Under the epistemic interpretations the subject referent is not an argument of the modal,which only takes the entire proposition as an argument: "It is going to be the case that/may be the case that/must be the casethat/is allegedly the case that he turns the lever." Under theroot interpretation the subject referent is an argument of the modal:"He wants to/is allowed to/is able to/is obliged to/has a duty to turn thelever."

The epistemic meaning of *ville* comes close to 'future tense', but considering the systematic relationship between*ville* and the other modals, Norwegian grammar seems to classify this meaning asthe epistemic counterpart of volition, i.e., as a modal rather than as atemporal kind of meaning.

Under the epistemic interpretation the modals meet a universalcriterion of an auxiliary, namely, that it should not impose any semanticrestrictions on the subject, as pointed out by Helge Lødrup (1996). Thus, the modals can occur with formal subjects, but then onlywith the epistemic interpretation:

(9)	a.	Det	vil	komme	noen
		it	*will*	*come*	*someone*
		'Someone will come'			
	b.	Det	kan	komme	noen
		it	*may*	*come*	*someone*
		'Possibly, someone comes'			

    c.   Det   må   komme   noen
          it   must come   someone
          'It must be the case that someone comes'/'May someone come!'
    d.   Det   skal   komme   noen
          it   is said to   come   someone
          'Allegedly, someone is coming'/'Ipromise you that someone will come'

The modals and the perfect auxiliary can be embedded under each otherin complex phrases. The perfect auxiliary in Norwegian is *ha*'have' (and *være* 'be' with"ergative" verbs in the Bokmål variety). When a modal takes the perfectauxiliary as a complement, the reading of the modal is alwaysepistemic:

(10) a.   Han   vil   ha   dreiet   håndtaket
           he   will.Pres   *have*.Inf   *turned*.PerfPtc*the-lever*
      b.   Han   kan   ha   dreiet   håndtaket
           he   may.Pres   *have*.Inf   *turned*.PerfPtc*the-lever*
      c.   Han   må   ha   dreiet   håndtaket
           he   must.Pres   *have*.Inf   *turned*.PerfPtc*the-lever*
      d.   Han   skal   ha   dreiet   håndtaket
           he   is said to.Pres *have*.Inf   *turned*.PerfPtc*the-lever*

However, the modals have infinitive and participle forms and can alsobe complements of the perfect auxiliary and of each other, and then usuallywith the two-place root meanings that take the subject referent as anargument. (11) shows modals as complements of the perfect auxiliary:

(11) a.   Han   har   villet   dreie   håndtaket
           he   has.Pres   *wanted to*.PerfPtc *turn*.Inf   *the-lever*
      b.   Han   har   kunnet   dreie   håndtaket
           he   has.Pres   *been able to*.PerfPtc *turn*.Inf   *the-lever*
      c.   Han   har   måttet   dreie   håndtaket
           he   has.Pres   *been obligedto*.PerfPtc   *turn*.Inf   *the-lever*
      d.   Han   har   skullet   dreie   håndtaket
           he   has.Pres   *had a duty to*.PerfPtc *turn*.Inf   *the-lever*

(12) exemplifies more complex cases:

(12) a.   Han   må   ha   villet   dreie   håndtaket
           he   must have wanted to   turn   the-lever
      b.   Han   vil   ha   måttet   dreie håndtaket
           he   will have been obliged to   turn   the-lever
      c.   Han   må   ha   kunnet ville   dreie håndtaket
           he   must have been able to want to   turn   the-lever

In the previous examples epistemic modals are never complements.Examples were they are seem possible, but then only as a complement ofanother epistemic modal, and most clearly before the perfect auxiliary*ha*:

(13) a.   Han   vil   kunne   ha   reist   imorgen
           he   will   may.Inf   *have travelled   tomorrow*
          'Tomorrow it will be the case that he may have goneaway'

    b. Han vil kunne   reise   imorgen
       he   *will* *be able to/?may*.Inf *travel* *tomorrow*
       'Tomorrow he will be able to go away'/?'Tomorrow it will be the
       case that he may go away'
    c. Han vil ha   kunnet reise imorgen
       he   *will* *have* *been able to* *travel* *tomorrow*
       'Tomorrow he will have been able to go away'

  From these syntactic facts it follows that epistemic modals only occurin finite forms (present and past tense) and the infinitive, while the pastparticiple is reserved for the root modals.

  How should these phenomena be analysed? Among the questions to beanswered, are:

(14) (i) Should the epistemic and the root varieties be considereddistinct lexemes or alternative readings of single lexemes?

  (ii) If the epistemic varieties are considered distinct lexemes,should they then be classified as a subclass of verbs or as belonging to afunctional 'auxiliary' category without predicational contentof their own?

  Helge Lødrup (1996) discusses question (14.ii) and adduces several arguments why the epistemic modals should beconsidered as a subclass of raising verbs and the root modals as a subclassof control verbs. Among the things he observes is the fact that root modalscan appear not only with verbal complements, but also with NP objects:

(15) Jeg vil/kan/må/skal   dette
   I   *want/am able to do/am obliged to do/have a duty todo* *this*

  He also observes that even the epistemic modals can havepronominalised complements – a fact which (as he points outhimself) poses a slight problem for his analysis of them as *raising* verbs, but which on the other hand supports the assumption that the epistemicmodals, too, are verbs:

(16) (Vil det regne?) Det vil det
   (Will *it* *rain?) It* *will* *that*

  As for question (14.i), Lødrup seems to opt for homonymy ratherthan polysemy and presuppose that the epistemic and the root varieties aredistinct lexemes (although he is not quite explicit on this point). Under such an analysisthe epistemic modals would be slightly "defective"verbs without past participle forms.
  But the analysis of epistemic and root modals as distinct lexemes wouldgive rise to a puzzlingly systematic homonymy linking pairs of epistemicand root modals in Norwegian, a systematicity which would then beunaccounted for. The formal identity of allmorphosyntactic forms which they both have, combined with their obvioussemantic relatedness, would appear accidental. In fact, the modal meaningsare not simply 'related' –one might claim that there is a semantic continuum linking the epistemicand the root meanings. Usages may frequently be vague and difficult toclassify along such a scale. Thus, *kunne* can be said tohave 'possibility' as its central mening, with 'epistemic', 'deontic' and 'individual property' as possible furtherspecifications. Deontic possibility would equal 'permission', and possibility as an individual property would equal 'ability':

(17) a. Han kan være syk [epistemic]

| | | he | may | be | ill |

		he	*may*	*be*	*ill*
b.	Han	kan	komme inn [deontic: permission]
	he	*may*	*come in*
c.	Han	kan	svømme [individual property: habilitative]
	he	*can*	*swim*

Contextual factors determine the possibilities – thus,permission and habilitative are possible only with agentive verbs.Furthermore, permission and habilitative associate 'possibility' specifically with the subject referent, with the result that thesemeanings correspond to two-place relations among the grammaticalised participants in the situation: the subject referent and astate of affairs. The epistemic meaning, on the other hand, only takes astate of affairs as argument among the entities referred to in thesentence. One might say thatepistemic possibility is conceived as ability abstracting away from theable participant.

The situation with *ville* and the other modals is quiteparallel and provides no reason to give epistemic *ville* aseparate treatment as a special future tense auxiliary. To put it alittle impressionistically: one of the ways in which 'future' is expressed inNorwegian is as volition abstracting away from the willing participant.Grammatically this is not a tense category at all.

The indicated solution, therefore, is to bring the epistemic and the rootmeanings together by deriving the epistemic varieties from the rootvarieties by lexical rules operating on semantic forms and XCOMPconstraints. The constraints on complements cannot be entirely relegated to a separate m-structure, since in Norwegianthese constraints are not limited to morphological form. We also need tostate, for instance, that the complements of root modals and the perfectauxiliary *ha* can only be root modals or main verbs and not epistemic modals or theauxiliary *ha* itself, while epistemic modals can take allkinds of complements.

The unorthodox aspect of this analysis will be the derivation of theepistemic relation from the root relation within the semantic forms –i.e., having lexical rules operate on the semantic relations themselves,which would hence have to be decomposed along the lines already sketched. Without goinginto this problem, let us assume that the perfect auxiliary, the epistemicmodals and the root modals carry the features PERF, MOD1 and MOD2,respectively. We would then have lexical entries like the following. First, the perfectauxiliary *ha* would contain the specifications in(18):[1]

(18)   ha   V   (↑ PRED) = 'PERF<XCOMP>SUBJ'
                            (↑ PERF) = +
                            (↑ SUBJ) = (↑ XCOMPSUBJ)
                            (↑ XCOMP FORM) = PASTPTC
                            (↑ XCOMP MOD1) = -
                            (↑ XCOMP PERF) = -

Each modal verb would have pairs of entries like (19a-b), inwhich the epistemic b-entry is assumed to be derivable from the roota-entry:

(19)
a.   <modvrb>   V   (↑ PRED) = 'ROOTREL<SUBJ,XCOMP>'

[1] For simplicity the PRED introduced by *ha* is called"PERF" in (18), although this glosses over a semantic analysis not relevant to thepresent discussion. The Norwegian perfect is semantically very close to theEnglish perfect, and less close to the French and German perfects, which can be used to refer to specific past times ("Ich habeihn gestern gesehen" 'I saw him yesterday'). Themeaning of Norwegian (and English) perfect is neither deicticpast tensenor perfective aspect, but rather non-referential relative past – the category existentiallyquantifies over times preceding the time indicated by the tense of thefinite verb: "Jeg har sett ham" 'I have seenhim' – 'There exists a time in the past such that I saw him then'

$$(\uparrow \text{MOD2}) = +$$
$$(\uparrow \text{SUBJ}) = (\uparrow \text{XCOMPSUBJ})$$
$$(\uparrow \text{XCOMP FORM}) = \text{INF}$$
$$(\uparrow \text{XCOMP MOD1}) = -$$
$$(\uparrow \text{XCOMP PERF}) = -$$

b. <modvrb'> V $(\uparrow \text{PRED}) = \text{'EPISTREL<XCOMP> SUBJ'}$
$$(\uparrow \text{MOD1}) = +$$
$$(\uparrow \text{SUBJ}) = (\uparrow \text{XCOMPSUBJ})$$
$$(\uparrow \text{XCOMP FORM}) = \text{INF}$$

For a sentence like *Han vil ha villet dreie håndtaket* 'He will have wanted to turn the lever' we would then get ac-structure along the lines of (20)[2] and an f-structure like (21):

(20)

---

[2] In (20) functional categories are used in accordance with Bresnan (1996). I assume some language specificvariation in the interpretation of the category I, head of IP: in English,I comprises the finite forms of the special class of AUX items, whereas in Norwegian I comprises thefinite forms of all verbs, i.e., I = V: $(\uparrow \text{FORM})=_c \text{FIN}$.

(21)

4. f-structures, semantic representations and universality

The claim made here, then, is that this traditional type of analysis captures the linguistic facts of Norwegian better than the flat analysis suggested for at least English, French and German by Butt & al.: in Norwegian the perfect auxiliary and the epistemic modals have the properties of complement-taking verbs, and future time is grammaticalised by a modal verb as the epistemic counterpart of volition, and not as grammatical tense.

Still, it would no doubt be technically possible to provide an alternative analysis of the Norwegian constructions along the lines suggested by Butt & al., with a flatter f-structure in which epistemic *ville* is treated as a future tense auxiliary only contributing a tense feature, and *ha* is treated similarly as a perfect auxiliary only contributing an aspectual feature. Such an analysis certainly captures a certain relationship between the Norwegian constructions and the corresponding constructions in English, French and German, not captured by the analysis proposed here. However, the alternative would carry different implications with respect to the theoretical status attributed to f-structures in LFG. Ultimately the chosen analysis reflects a certain view of what f-structures are meant to be.

So what *are* f-structures meant to be? In Bresnan (1996) Joan Bresnan discusses the principles of variability and universality across languages, and relates the principle of universality especially to f-structures:

(22)
The internal structure of a language represents the meaningful grammatical relations of sentences (how their syntactic functions are associated with semantic predicate argument relations); this structure is determined by generalizations about case government, pronominal binding, and agreement relations among the predicators and arguments of a sentence. The principle of universality states that **internal structures are largely invariant across languages.** The formal model of internal structure in LFG is the **f-structure,** 'functional structure'. (1996:34 f.)

As we have already seen in Ch. 3, the principles of completeness and coherence require full representation of grammatical relations in f-structure. Full representation might be thought of as a universal *iconicity* requirement between syntax and semantics at f-structure. (1996:83)

The basic question to be asked here is whether the assumption that f-structure captures what is universally invariant is to be treated as a definition, i.e., as a stipulation dictating how f-structures should be constructed, or as an empirical hypothesis to be tested against f-structures constructed at least partly on independent grounds. I believe there are reasons to opt for some version of the second alternative.

Certain properties of f-structures are basic and probably beyond dispute:

(23)   (i) F-structures abstract away from constituent order and to some extent from the hierarchical embedding relations of c-structures.

(ii) F-structures represent the predicates that are lexicalised and grammaticalised in the language and their complete set of linguistically expressed arguments, as well as the syntactical relations contracted by the constituents expressing such arguments.

Universality does not follow from (i) and (ii). Hence it emerges as an empirical question whether f-structures with these properties will also be universal in some interesting sense. We may here disregard the weak sense of 'universal' by which it simply means that f-structures are constructed within a universal format, i.e., using terms and formal properties that are not tied to particular languages but defined language-independently. Such 'universality' is true of c-structures as well and a precondition for even raising the question of

universality in a stronger sense. One such stronger sensewhich sometimes seems to be presupposed is the following:

(23)   (iii) F-structures are universal in the sense that translationallycorresponding expressions across languages are assigned the same (orclosely similar) f-structures.

Universality – property (iii) – as an empiricalhypothesis could then be the hypothesis that properties (i) and (ii)generally lead to property (iii) – something which does not followlogically and which would be an interesting discovery if true.

Universality as a stipulation, on the other hand, would mean that(iii) would be taken not as a hypothesis, but as one of the criteria to bemet when grammars are written and f-structures constructed. One possibleconsequence would clearly be that it might sometimes be impossible to meet all three criteria atonce. If we then let (iii) win over the other two criteria in such cases,we arrive at the situation which motivates my claim that takinguniversality as a stipulation is a bad idea. For then f-structures would be pure *semanticrepresentations*, and their universality would be trivialised. Havingidentical f-structures for expressions in different languages would thenjust amount to stating the rather boring factthat the same things can be said in different languages; there would be noimplied claim that the same things are also said *in the same way*on some level of abstraction.

F-structures are generally taken to be *syntactic*representations. A syntactic representation represents some of theproperties of a linguistic expression that one has to refer to in order tojustify that the expression is a well-formed expression of the language in question. Hence a syntacticrepresentation cannot be universal *by definition* (in sense(iii) of 'universal').

A *semantic* representation, on the other hand, isexactly that: universal, or at least cross-linguistic, by definition(possibly restricted to a limited set of languages). If we assume thatthere is a discoverable relation of 'literal translation' among expressions of different languages, onecould approach a comparatively theory-neutral characterisation of semanticrepresentations based on such a translational relation. That is, ratherthan saying that a semantic representation denotes entities in a model, or cognitive structures, or someother highly theory-dependent objects, one could say that it denotes a setof linguistic expressions that is held together by a relation of literaltranslation. The language of semantic representations is then conceived as a kind oftheoretical interlingua. Such a characterisation accords well with the waywe normally treat semantic representations in a multilingual context, for instance in the context of machine translation. Thus, if we are only dealing with a set of closely-related languages, suchas, say, Norwegian and Swedish, then our formal language of semanticrepresentations need not draw very fine-grained distinctions of tense andaspect. Since the grammatical categories of the languages are in a very closecorrespondence with each other semantically, the semantic terms can bealmost isomorphous with the grammatical ones and need not be much morefine-grained than they are. Include a significantly different language, however – such asRussian – and the semantic representations of Norwegian and Swedishexpressions immediately need to be more fine-grained in order to capturethe new set oftranslational relations. This common experience in the field of machinetranslation gets a principled basis if we assume that the task of semanticrepresentations simply is to keep sets of translationally correspondingexpressions apart – in other words, if we assume that the semantic analysis reflected in asemantic representation will always be implicitly or explicitly relative toa presupposed set of possible languages.

Hence, in the semantic representation of an expression *e* in a language L a given distinction means that such a distinctionis drawn by lexical or grammatical means *in some relevantlanguage*, but not necessarily in L itself, which may be more coarse-grained.Including more languages in the set of relevant languages may thereforelead to new distinctions being introduced in old semantic representations.In a *syntactic*representation of *e*,

on the other hand, a given distinctionmeans that such a distinction is drawn by lexical or grammatical means*in L itself*. Hence the syntactic representation of *e* does not change with the introduction of new languages in the field ofvision.[3] I am therefore skeptical tothe argument advanced for a certain f-structure analysis in the Cookbook byButt & al., where they write:

(24)
This treatment of tense/aspect information was found to be inadequate as itwas difficult to devise a standardized system that properly reflected theinterplay between tense and aspect in all three languages. It was thereforedecided to separate thedimensions of tense and aspect. (1999:74)

This kind of argument is perfect if f-structures are taken to besemantic rather than syntactic representations – but then, as wehave seen, their universality has no empirical content, and furthermorethere would be no representation showing how a particular language structures thetemporal and modal content.

Another argument adduced by Butt & al. in favour oftheir flat f-structure analysis is that it facilitates machine translation(1996:2, 5). As far as I can see, the engineering advantage of flat, commonstructures could just as well be attained by deriving semantic representations alongsidethe f-structures. I would be a little wary of using the MTargument at the f-structure level, because I believe that such an argumentruns the risk of undermining the basic motivation behind linguistic approaches to language engineering.

The assumption behind linguistic approaches to language engineeringsuch as the PARGRAM project (as opposed to purely statistical approaches,for instance) is that in the long run linguistically motivated language descriptions will turnout to yield the most generalisable, robust and sophisticated practicalsolutions to a range of language engineering problems.If we consider this belief a hypothesis, the question arises what it takesto give it empirical content. At least one thing seems clear: if thehypothesis is not to be tautologically true and hence empirically empty,then the concept 'motivated by linguistic considerations' must somehow be distinctfrom the concept 'motivated by engineering considerations'.Granted, considerations of language processing have been valuable sources ofmotivation for linguistic theories in the pastcouple of decades,and linguistic theories must obviously be allowed to be motivated also by some processing insights and stillremain linguistic theories. Still, for the reasons I have discussed Isuggest that the MT argument for the flat f-structure may be a case offavouring efficient processing of a limited set of cases by *disregarding* linguistic insights.

One might perhaps question my assumption that property (22.iii)– universality – does not follow from property (22.ii), whichstates that f-structures represent predicates and arguments – whathas been called the *predicational structure* of an expression. Aren'tpredicational structures of sentences universal, in a translational sense,so that translationally corresponding sentences are assigned the samepredicational structure?

Not necessarily, if we take into account the way this concept is oftenunderstood in the context of f-structures. Bresnan speaks about "a universal *iconicity*requirement between syntax and semantics at f-structure" (1996:83). I take this to mean,intuitively speaking, that f-structure represents the particular way agiven language carves up denoted reality. The format in which to representthis common reality in a language-independent way is the format of the semanticrepresentations – in practice (I claim) only graspableas denoting a set of translational relations among languages. Thef-structure predicates must hence be analysable as complexes of the more basic predicates of the semanticrepresentations, predicates which have been

---

[3] It is a different matter that one's*syntactic meta-theory*, andas a consequence of that one's representations, may change with sucha widened field of vision. That is the way research progresses and insightgrows – it is a 'once-and-for-all' change whichdoes not imply that a given syntactic representation continues to berelative to a given set of languages.

factored out byapplying the 'prisms' of other languages to thelinguistically encoded predicates of the f-structures. But the predicates of thef-structures themselves need not correspond one-to-oneto each other in translationally corresponding sentences.

5. References

Bresnan, Joan. 1996. *Lexical-Functional Syntax*. Draft version (quoted with theauthor's permission).

Butt, Miriam, María-Eugenia Niño and Frédérique Segond. 1996.Multilingual Processing of Auxiliaries within LFG. In: *Proceedingsof KONVENS 96*.

Butt, Miriam, Tracy Holloway King, María-Eugenia Niño andFrédérique Segond. 1999. *A Grammar Writer'sCookbook*. = CSLI Lecture Notes no. 95. CSLI Publications, Center for the Study ofLanguage and Information, Stanford, California.

Dyvik, Helge. 1998. A translational basis for semantics. In: Stig Johanssonand Signe Oksefjell (ed.): *Corpora and Cross-linguistic Research.Theory, Method and Case Studies*. Amsterdam - Atlanta: Rodopi.

Dyvik, Helge. 1999. On the complexity of translation. In: HildeHasselgård and Signe Oksefjell (ed.): *Out of Corpora. Studiesin Honour of Stig Johansson*. Amsterdam - Atlanta: Rodopi.

Falk, Yehuda N. 1984. The English auxiliary system. *Language*vol. 60.3: 483-509.

Lødrup, Helge. 1996. Properties of Norwegian Auxiliaries. In: *The Nordic Languages and Modern Linguistics. Proceedings of the NinthInternational Conference of Nordic and General Linguistics, University ofOslo, January 11-12, 1995*, 216-229. Oslo: Novus.