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CERCLE LINGUISTIQUE
DE COPENHAGUE

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MICHAEL HERSLUND (ed.)

On Modality
Papers from meetings and discussions in
the linguistic circle of Copenhagen

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MODALITY
A PRESENTATION*

by
MICHAEL HERSLUND

0. INTRODUCTION

The papers in the present volume of the *Travaux du Cercle Linguistique de Copenhague* were, with one exception, read and discussed at a series of meetings at the Linguistic Circle of Copenhagen in the autumn of 1985. The exception is the paper by Finn Sørensen, which was written especially for this volume. Three more papers (by Henning Andersen, Per Durst-Andersen and Svend Erik Rosenberg) were also read and discussed at the meetings, but were not submitted for publication in the present collection of papers on modality, the topic of the meetings.

1. WHAT IS 'MODALITY'?

There seems to exist a fairly general consensus as to what modality is about, as will be apparent from the papers of this volume, with one notable exception however, to which I shall return presently. It is, however, no easy matter to state briefly what modality is. One reason for this difficulty is the fact that this elusive notion nowhere seems to correspond to any single systematic morphological, syntactic or lexical category. But let us assume, as a kind of "entrée en matière", that modality defines the set of linguistic phenomena which signal the presence of man in language. One could imagine that at a certain point of evolution, utterances such as (1) a.-c. are no longer sufficient:

(1) a. There are kangaroos behind those bushes.
b. We live on oysters from the lagoon.
c. It is snowing.

One should of course be careful with evolutionary inferences as the one implied in the preceding statement, but let us assume its validity for the sake of the argument. (Evidence from language acquisition seems to support this view, insofar as children tend to learn to master modality relatively late).[1] Now, such utterances as (1)

* I would like to thank Niels Davidsen-Nielsen for many helpful comments on an earlier version of this paper.

1. For an interesting synthesis, see e.g. Perkins (1983:151 ss.).

express 'objective', or 'categorical', propositions. They state simply – or rather, the speaker states by asserting them – that certain states of affairs obtain. But they do not express man's (or, more precisely, but less generally, the speaker's) attitude towards phenomena of the surrounding world: his wishes, desires, doubts, evaluation of possibilities, etc., are not at all expressed by such utterances. Let us say that they are *unmodalised utterances,* or that they convey *neutral modality*; it would perhaps be methodologically preferable to choose the latter formulation, i.e. to say that utterances always contain a modal component (a similar opinion is expressed in the paper by Nølke). But all languages have, to be sure, at their disposal a number of procedures (morphological, syntactical or lexical) by which utterances such as (1) can be modalised, cf. (2):

(2) a. There may be kangaroos behind those bushes.
b. We have to live on oysters from the lagoon.
c. It must be snowing.

In the examples of (2), the modalisation is translated by the use of modal verbs and expressions (*have to*), but there are numerous other ways. The use of a special class of verbs is, however, a central feature of the European languages, but many languages seem to lack such verbs completely. Two such languages are studied in the contribution by Michael Fortescue, "Modality in West Greenlandic and Japanese": morpho-lexical criteria appear to be lacking in these two genetically unrelated and typologically quite different languages, and modality has, consequently, to be isolated on purely semantic grounds.

We shall not in this context be directly concerned with the values of the modal expressions in (2). It is sufficient to notice that the modalisation of the "objective" propositions of (1) in (2) translates the fact that man puts himself, as it were, between a certain state of affairs and the linguistic expression corresponding to that state of affairs, much in the same way as the change of lens on a camera gives a different view of reality: the ordinary 50 millimeter lens renders reality much as the human eye registers it; but one can intervene between objective reality and the diaphragm (and the film) with telescopic, wide-angle, and what not lenses. Correspondingly, man can intervene in numerous ways between reality and the linguistic expression of it.[2] Let us not strain this metaphor any further, however, but notice that the ordinary meaning of modality in linguistics seems to be somewhat more restricted than the camera metaphor allows for. In the Anglo-Saxon, and Danish, practice at least, modality seems to be reserved to such phenomena as expressions of possibility, necessity, permission and obligation (epistemic and deontic modality).

2. Some caution is called for here; in fact, one risks running into a philosophical crux, since man (and the speaker) also, in an obvious way, belongs to the objective reality, whatever that is. But I think that the distinction between the surrounding world and the speaker is sufficiently clear to warrant its use. Nevertheless one should not be blind to the existence of a philosophical problem here.

In French linguistics, however, the term *modalité* has a wider meaning,[3] which corresponds more closely to our camera metaphor. Whereas the other papers in the volume adhere to the Anglo-Saxon practice, Henning Nølke's paper, "Modality and Polyphony. A Study of Some French Adverbials", takes modality in its wider, French "meaning". This is of course not surprising since the paper is mainly concerned with French adverbial usage, and conceived and written within the recent French school of semantics. The discrepancy between the Anglo-Saxon and the French uses of the term is in no way surprising, however: whereas 'modality' in English is hardly anything but a technical term (in the Webster, the entry *modality* is marked *Logic*), the corresponding French term, 'modalité' is an ordinary noun whose meaning is roughly 'form of appearance', 'way of doing'. So whereas one can speak in French of 'modalités de paiement', one would hardly, in English, refer to one's monthly instalments as 'the payment modalities of the new TV-set'.

2. MODAL LOGIC AND NATURAL LANGUAGE

Logic is traditionally assumed to state the "laws of thought". Since the expression of thoughts obviously constitutes one of the major tasks of language, and since one central aspect of natural language is modality, or modalisation, it is natural that logic should be concerned with modality as with other aspects of thought. But the traditional core of logic, i.e. the predicate calculus, has only been concerned with unmodalised propositions and the laws for assigning truth values to such propositions. The more "modal" aspects of thought, such as epistemic and deontic modality, have been taken care of by other branches of philosophy such as ontology and ethics. But since language can be used to speak about anything, and since logic is supposed to state the laws of thought, and hence crucial aspects of language, logic has to concern itself also with such notions as modality and tense. The paper by Stig Andur Pedersen, "Modalities from a Logical and Philosophical Point of View", accordingly stresses, from the outset, the centrality of modality to language and logic.

Logicians' concern with modality has in fact a long tradition. I shall only mention one example in this context: the treatment of modality in the French 17th century *Grammaire générale et raisonnée* (1660). The authors of this famous treatise, the Jansenists of the convent of Port-Royal des Champs, outside Paris, were also very well versed in logic, so it is small wonder that many notions from traditional logic permeate their grammar. They distinguish very clearly between a) the representation of the subject and the predicate (the proposition), and b) the attribution of the

3. In fact, the term *modalité* has several uses in French linguistics. One of them is the everyday meaning of the word as 'form of appearance'. Thus, a monograph on the noun phrase which appeared some years ago has the title *Les modalités nominales en français* (by M. Mahmoudian, P.U.F., Paris 1970).

latter to the former (the assertion). And they state explicitly that assertion belongs to the same category as desires, commands and interrogation (*Grammaire* 23-24):

> «Et ainsi la plus grande distinction de ce qui se passe dans notre exprit, est de dire qu'on y peut considérer l'objet de notre pensée, et la forme ou la manière de notre pensée, dont la principale est le jugement: mais on y doit encore rapporter les conjonctions, disjonctions, et autres semblables opérations de notre esprit, et tous les autres mouvements de notre âme, comme les désirs, le commandement, l'interrogation, etc.»

Whereas the authors use the terms *forme* and *manière*, which might lead one to think of modality, I think that one could equally well make a case for the view that what they are in fact talking about is speech acts, not modality. These two notions are, however, very close and often interweave in French treatments (see the comments on Nølke's paper below).

In current systems of modal logic, two operators are acknowledged: 'necessity' ($\Box$) and 'possibility' ($\Diamond$). These operators are mutually interdefinable: 'what is necessarily true is not possibly not true', and 'what is possibly true is not necessarily not true' (for the latter formulation, see the paper by Pedersen, p. 19). What this means is that in a system based upon, say, possibility, necessity will receive the following definition:

$$(3)\ \Box\ p = \neg\ \Diamond\ \neg\ p$$

in much the same way as the universal quantifier $\forall$ can be defined in terms of the, more basic, existential quantifier $\exists$, and negation:

$$(4)\ \forall\ x\ :\ p\ (x) = \neg\ \exists\ x\ :\ \neg\ p(x)$$

This "quantification" of modality seems intuitively uncontroversial and straightforward, but it still does not tell us any more about modality, i.e. the content of the operators $\Box$ and $\Diamond$ (or equivalent conventional symbols). If $\Diamond$ is nothing but a translation of the English word 'possible', we have indeed gained little insight from the above equations which will appear as nothing but empty mathematical drills. But this is where the notion of 'possbile world' comes in (see e.g. the papers by Pedersen and Sørensen below). This notion seems to go back to Leibnitz and it is meant to capture the fact that apparently the actual world is only what it is by accident; it might in fact be quite different, and many other worlds or worldstates can be imagined. Here is, of course, a point where modality interferes crucially with tense (cf. e.g. Herslund (1987) and (1988)). In this context it is sufficient to notice that we are now in a position to give some content to our modal operators: 'what is necessarily true is what is true in all possible worlds'.

But one cannot quite help feeling that there is some sort of circularity lurking somewhere: if necessity and possibility are mutually interdefinable and in their turn

definable with reference to 'possible worlds', it would seem that the notion 'possible' appears both in the definiens and in the definiendum. It is of course true that the word *possible* of the expression *possible world* is not identical to the meaning 'possible' ascribed to the symbol $\Diamond$ in all relevant respects, so it would be unfair to denounce the use of 'possible world' as a circularity right away; but the resemblance between the two 'possible's' is striking enough to warrant some caution in their use. And one could hardly claim that the notion of 'possible world' is a crystal-clear one. This is also stressed in the papers by Pedersen and Sørensen. Whereas the two notions, 'possible world' and 'situation', are used as practically equivalent notions in Pedersen's paper, Finn Sørensen argues in "Worlds or Situations? A Case Based on Modal Operatiors as Shifters" explicitly for a model based upon the notion of 'situation' (as this notion is understood in e.g. Barwise and Perry (1983)), as opposed to a model constructed upon the notion of 'possible world'. The different behaviour of deictic expressions of time and place in modalised expressions is taken as an argument in favour of a situation based semantic account of modality, rather than the, current, possible worlds approach.

Let us not, however, elaborate this point. I believe that modal logic is of obvious interest to linguistics and that the mere fact that 'necessity' and 'possibility' can be defined in terms of one another in a way that modal expressions of natural languages cannot, is of some importance.

Linguists often criticise modal logic, but it is unclear on what grounds they really object to it. One criticism that is often levelled at modal logic from linguists, is that modal logic does not provide an adequate rendering of the meaning of sentences of natural languages, and that in particular deontic modality proves troublesome, a question discussed in detail in Pedersen's treatment. But the objection is surely irrelevant because modal logic was never meant to provide such a representation. It is clear that modal logic, like any logic, indeed like any semantic system ever devised, does not provide an adequate semantic "transcription" of sentences, contrary to phonetic transcription which can be said to provide adequate representations of (certain aspects of) the sounds of natural language. I therefore doubt that a transcriptionist view of semantics is tenable, or desirable. One might in fact believe that the meaning of a sentence is the set of relations the sentence entertains with other sentences of the language: relations of paraphrase, inference, entailment, contradiction, etc., and analogously that the meaning of smaller parts, i.e. lexemes, is the set of relations of synonymy, antonymy, hyponymy and so on that individual lexemes entertain with other lexemes of the language. On this view of meaning, it is obvious that meaning could not be conceived as a transcription (a unitary representation) and that modal logic consequently does not transcribe anything. What (modal) logic does, is to isolate certain parts of sentences and restate them in a formalised way thereby making it possible to calculate, and state precisely, the meaning relations between sentences. This view is also advocated by Pedersen, who explicitly states that modal logic does not necessarily mirror natural language, but that important analogies exist. Or, as Weinreich puts it in his description of the basic semiotic design of language: "logic is *congenial* to language" ((1966:149); emphasis added).

It is also stated quite clearly in Pedersen's paper that modal operators do not capture the entire complexity of e.g. deontic expressions: modal logic, strictly speaking, leads to quite paradoxical solutions. The author also points out the well known problems occurring with *belief*-contexts and the *de re/de dicto* distinction, for which modal logic seems to have no ready solution. Quite generally, one of the basic problems is that modal logic hinges on several philosophical assumptions which are not commonly shared.

But briefly stated: it would not be possible, without the equation of (3), or something equivalent, to compute the exact values and relations between expressions of necessity and possibility. To say that modal logic is not an adequate representation of natural language is as much of a commonplace as to say that a black and white reproduction of Van Gogh's painting of the bridge at Arles is not an adequate representation of that physical entity. It may still, however, give some idea of the structure as seen by the painter.

3. MODALITY AND LINGUISTIC CATEGORIES

The characterisation of modality proposed in 1. above is obviously not adequate. If modality is all that manifests the presence of man in language, then phenomena such as tense, aspect, and the more general notion of 'deixis', clearly belong to modality. The inclusion of such categories in a (wide) definition of modality could in fact be a very desirable result. There seems, in particular, to exist a privileged connection between tense and modality. In fact, there have been made proposals, repeatedly, to the effect that e.g. the future tense should really be viewed as a modal category, since what belongs to the future belongs to the realm of the possible. It is a well known fact of natural language that the future tense, where it exists at all, is often, historically, formed by the addition and possbile agglutination of a modal auxiliary verb, cf. English *will*, Scandinavian *ville*, in Romance a modal expression with *habeo*, in some dialects with *volo* (Givón (forthcoming) reports parallel facts from Bantu languages). But here things become rather complicated, because what we observe is not the use of some expression of *epistemic modality*, but expressions of *deontic modality*, i.e. the preferred way of looking at the future seems not to be a description of what is possibly going to be the case, but rather a prescription of what has to be the case. Generally, however, epistemic meanings are often derived from deontic expressions. There are many potentially interesting questions to be asked in this connection, questions which have to do with the relations between epistemic and deontic modality.

The most obvious linguistic expression of modality is of course the category of 'mood'. The modalised status of utterances is signalled in several languages by special verb forms (subjunctive, optative, imperative, etc.) contrasting with the neutral modality verb form (indicative). What is expressed by mood, or by so-called modal uses of tense in some languages, is in others expressed by a special class of verbs, the so-called modal auxiliaries, or by modal particles. Where Latin uses the subjunctive, English will, in many cases, use a modal verb:

(5) a. Credat aliquis ...
b. One could/might believe ...

to take but one of many possible examples. The realm of modal verbs is notoriously one of great complexity, not only within the single language, but also when comparing even closely related languages.

For our purpose, we can tentatively represent the different values of modal verbs, viz. epistemic and deontic modalities, as follows:

(6)

	epistemic	deontic
◇	possibility	permission
□	neccessity	obligation

One could distinguish a third column for alethic, i.e. "pure" logical possibility and necessity, but I shall not pursue this here, just identify alethic modality with the leftmost column (the one with the logical operators). Let us just notice that modal verbs of natural languages characteristically do *not* fit into the table in any one-to-one fashion: they wander to and fro, and it is indeed the normal case that one modal verb is to be found in more than one of the boxes (e.g. Danish *kunne* 'can'). What the table is meant to illustrate is simply the fundamental dimensions of modality (in much the same way as the basic vocalic triangle delineates the dimensions of possible vowel articulations). But what the table also suggests, is that deontic modality constitutes a system which is superimposed, as it were, upon the more fundamental epistemic, or perhaps, alethic, modal system. The deontic compartment is then further complicated by the fact that personal will interferes and operates a distinction between e.g. *I must* and *I will*, a distinction that most languages which have modal verbs seem to draw. In this context, one should also mention the possible distinction between objective and subjective modality (cf. Lyons (1977:793 ss.)), a distinction which in West Greenlandic, a language lacking modal verbs, seems to be correlated with a morphological distinction between verbal and sentential suffixes (see Fortescue's paper). Subjective modality seems to shade imperceptibly into illocution, i.e. the different speech acts performed by means of utterances.

4. MODALITY AND SPEECH ACTS

As pointed out above, the French term *modalité* has a somewhat wider meaning than English *modality*. In order to describe a number of facts of French adverbial usage, the paper by Nølke distinguishes two kinds of modality: *locutionary modality* (i.e. the "standard" concept of modality) and *illocutionary modality*. This last kind of modality is the modification, not of sentences, but of speech acts. The use of a modal auxiliary in (7):

(7) Pouvez-vous me passer le sel?

is an example of a modalised sentence used to perform a special (derived) speech act. This falls within the "standard" use of modality: instead of imposing an obligation onto the adressee (deontic modality), one inquires about the possibility of the adressee's handing the salt to the speaker (epistemic modality).[4] Since I, tentatively, defined modality as what signals the presence of man in language, it is obvious that modality is connected with the performing of different speech acts. In particular, the connection between deontic modality and different kinds of mands is straightforward. So we could state quite generally that more or less modalised sentences are used to perform different speech acts. But a conservative mind might find it desirable to reserve the term *modality* to what goes on in the sentence, and not stretch it to cover also cases of different modifications of speech acts, as the adverb in (8):

(8) Franchement, ce roman est excellent.

But Nølke has, of course, a point in claiming that essentially the same categories appear at the different levels of linguistic analysis. And, as we have seen above, the extension of modality to cover speech acts is a well established tradition in French linguistics, insofar as it can probably be traced back at least to the Port-Royal grammar.

Nølke's paper offers a direct alternative to modal logic, viz. the notion of 'polyphony'. According to this concept, the speaker (the "author" of the utterance) may stage several "actors" ("enunciators"), each of whom is responsible for certain aspects of the propositional content. A negated sentence will thus be analysed as containing two propositions by two enunciators. The speaker then associates himself with the enunciator of the negative proposition. This analysis is carried over to the description of sentence adverbs, or illocutionary adverbials, which according to this description express illocutionary modality, the modalisation not of propositional contents, but of speech acts. The speaker of the utterance (8) is doubled, as it were, namely as one enunciator asserting (8) and another who comments on this assertion.

What is perhaps most interesting in the present context, is the fact that both approaches, viz. modal logic and polyphony, attempts to circumvent the problems raised by the analysis of modality by a kind of "doubling device": whereas modal logic seeks the answer in terms of possible worlds, or situations, i.e. alternatives to the actual world, or situation, the polyphonic approach operates this doubling somewhere else, namely in the person of the speaker. An ecumenically minded observer might find this convergence encouraging and conclude that the two approaches really aren't all that different.

4. Cases such as (7) should perhaps rather be classified as what certain authors refer to as 'dynamic modality', cf. e.g. Palmer (1979), Perkins (1983).

5. CONCLUSION

In defining modality as all those phenomena which signal the speaker's presence in what he is saying, one immediately faces the problem of delineating modality properly. On the one hand its connection with tense and the more general phenomenon of deixis. However, it is not excluded that such disparate phenomena could in fact be fruitfully studied under the same heading. On the other hand, one has to delineate modality, if one so wishes, with respect to the use of language, i.e. with respect to speech acts. The views expressed in this presentation are rather conservative ones, which restrict modality to what goes on in the sentence, not extending modality to what sentences are actually used for, i.e. the different speech acts they perform. Modality, as a semantic cover term, is then manifested in different linguistic categories and syntactic processes which all have in common that they signal the speaker's attitude towards the propositional content of what he is saying: it is not so much what he is saying, it is the way he is saying it.

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MODALITY FROM A LOGICAL AND PHILOSOPHICAL POINT OF VIEW

by
STIG ANDUR PEDERSEN

Sentences may be embedded in all sorts of modifying constructions. In this paper we shall concentrate on one family of such constructions, viz. those that reveal some modal feature in the logicians' sense of that word. In particular, we shall review the underlying logic of sentences that express moral points of view and those that ascribe knowledge, belief and other forms of mental attitudes.

First, however, a disclaimer; we are not going to touch on the complex grammatical problems about the structure of tense, mood and aspect of natural languages (I am certainly not qualifiifed to do so). Our topic is the logical and epistemological aspects of reasoning involving modal operators. This is a very important part of our linguistic behaviour because thinking about mental attitudes, morality, knowledge, etc., necessarily requires modal constructions. When we put forward theories of conscious behaviour, free action and the role of language in human life we inevitably use such constructions, and it seems impossible to reduce the modal language to a purely non-modal one. Therefore, we need an understanding of the logical structure of modalities.

It is our view that modal sentences have a logical and semantical structure which to a great extent is invariant with respect to grammatical differences. This structure can be studied in a formal language which abstracts from surface differences and reflects the logical and semantical structure of the modal constructions. Such a formal, abstract language does not necessarily mirror the actual structure of any concrete natural language. But there are, we believe, interesting analogies between logical modal operators and tense and mood constructions in natural language.

As an example consider the temporal sentence operators P and F. P is supposed to mean "past" and F "future". If *p* denotes a declarative sentence, for instance:

John smiles.

then Pp and Fp have the following interpretations:

Pp **John smiled.**
Fp **John will smile.**

and PPp, FPp, and PFp:

PPp **John had smiled.**
FPp **John will have smiled.**
PFp **John would smile.**

Of course the two operators P and F are not sufficient to express all possible kinds of tenses in a natural language such as English. For instance, it seems impossible to find combinations of Ps and Fs which are analogies to present perfect and progressive. But the operator system and its semantical models can be (and has been) augmented to reflect more complex grammatical constructions.

Modal logic is the study of formal logical systems with sentence operators, like P and F, modifying the tense and mood of sentences. In the following we discuss some classical modal logics, their merits, shortcomings and epistemological significance.

Usually, modal operators are classified into temporal, alethic, epistemic, doxastic and deontic operators. But today modal logic has found applications in other fields (mathematics, computer science) and in these situations the operators have other meanings (e.g. provability, actual state of a computer program). In this paper we discuss mainly the classical modal operators.

Logical Regularities

The meaning of modal operators is governed by two different forms of constraints reflecting the logical structure of modal sentences. The first form concerns logical provability. Sentences containing modal operators are logically connected with other sentences, and the validity of arguments often depends on the character of the modal operators involved.

As an example consider the following sentences:

p **The temperature of the planet is more than 1000°C.**
q **Life is impossible on the planet.**

Assume furthermore that the following physical law is true:

law: **It is physically necessary that if the temperature on the planet is more than 1000°C then life is impossible on the planet.**

If **law** and **p** are assumed as premises *q* follows as a conclusion.

The formal structure of this argument is revealed when we introduce the modal operators $\Box$ and $\Diamond$. $\Box$ represents physical necessity, and $\Diamond$ physical possibility. *q* is construed as:

q $\neg \Diamond r$

where *r* is the declarative sentence:

r **There is life on the planet.**

So the argument gets the form:

law $\Box (p \Rightarrow \neg \Diamond r)$
p $\underline{\quad P \quad}$
q $\neg \Diamond r$

Furthermore, we are inclined to accept the following relationship between possibility and necessity:

$$\neg \Diamond p \Leftrightarrow \Box \neg p$$

From this it follows that possibility can be defined in term of neccesicy and negation:

$$\Diamond p \Leftrightarrow_D \neg \Box \neg p$$

and the argument above can then be rendered as follows:

$$\Box (p \Rightarrow \Box \neg r)$$
$$\underline{p\quad\quad}$$
$$\Box \neg r$$

It is also possible to define contingent sentences, that is, sentences which are possibly but not necessarily true. Let *C* be the contingency operator, then we have:

$$Cp \Leftrightarrow_D \Diamond p \wedge \neg \Box p$$

and from the relationships between necessity and possibility we get:

$$\begin{aligned} Cp &\Leftrightarrow \neg \Box \neg p \wedge \neg \Box p \\ &\Leftrightarrow \Diamond p \wedge \Diamond \neg p \end{aligned}$$

These and many other relations between necessity, possibility and contingency reflect an underlying logical structure of alethic modal operators. We call such constraints or regularities **proof theoretical relations**, as they govern the deductive structure of arguments involving modal operators.

As an example of proof theoretical regularities in temporal logic consider the following argument:

John smiled.
John will have smiled.

It can be represented formally in this way:

$$\underline{Pp}$$
$$FPp$$

where *p* is the declarative sentence:

p **John smiles.**

According to our intuition, it is a valid argument.

From the proof theoretical relations it is sometimes possible to find a system of axioms which gives a nearly "complete description" of the role of specific modal operators. Opinions differ on this point but minimal axiom systems for several kinds of modal operators have been developed, and most people agree that these systems do reflect the logical structure of the operators to some extent.

The other kind of constraints we have in mind we call **semantic relations**. They concern the truth and falsity of sentences containing modal operators.

As an example consider the following sentences:

a. **John knows that the horse is white.**

Let K denote the modal operator **John knows**, and let p denote the declarative sentence:

p **The horse is white.**

Then a can be formalized as:

$$Kp.$$

Our common conception of knowledge implies that we can only know facts. That is, if we know that p is the case, then p is in fact true. Thus the truth of Kp implies the truth of p. Or formulated in another way:

$$Kp \Rightarrow p$$

is a valid or universally true formula in epistemic logic. But the sentence $p \Rightarrow Kp$ is not universally true, of course.

Consider now the corresponding doxastic sentence:

b. **John believes that the horse is white.**

If B denotes the doxastic operator **John believes** then b can be formalized as:

$$Bp.$$

But in this case the truth of Bp does not imply the truth of p. The horse might be black even though John sincerely believes it is white. Thus the formula:

$$Bp \Rightarrow p$$

is not valid in doxastic logic.

As these examples show the usual truth functionality does not hold for modal logic. The truth of a compound sentence is not a function of the truth values of the constituent sentences. The semantic structure is considerably more complex.

Just as our intuitions concerning arguments involving modal expressions led to modal axiom systems which reflected the proof structure, our intuitions about truth and falsity of modal sentences lead to feasible formal models of the semantical structure of modal expressions.

The most prevalent type of formal semantics of modal logic is the so-called **possible worlds semantics**. We illustrate this semantics in the case of doxastic operators.

Consider again the sentence b. What does it mean that John in a given sitaution believes that a particular horse is white? It means, among other things, that in all possible situations which John can imagine and which are compatible with John's

conception of the world this particular horse is white. John does not accept situations or conceptions of the world in which the horse has another colour, unless, of course, he changes his belief. This leads to the following truth conditions:

1. **John believes that the horse is white** is true in a situation *w* if **the horse is white** is true in all possible situaitons which are compatible with John's belief in w.

and similarly:

2. **John believes that the horse is white** is false in a situation *w* if **the horse is white** is false in at least one situation *v* compatible with John's belief in w.

These conditions suggest a semantic structure in which truth values are relative to situations (possible or actual). These situations are called possible worlds.

Let us introduce the symbol:

$$\models_w$$

for truth relative to *w*, and *R* as the compatibility relation, that is:

wRv means that v is compatible with John's belief in w.

Then the truth conditions are formalized as

1. $\models_w Bp$ if for all v, such that wRv, $\models_v p$
2. $\not\models_w Bp$ if there exists a v, such that wRv, and $\not\models_v p$ ($\not\models_w$ means not true in w)

This semantical construction, which was introduced by J. Hintikka and S. Kripke about 1960 applies to other modal operators as well. In temporal logic the compatibility relation is temporal order and possible worlds are moments or intervals of time.

The various modal operators lead to specific properties of the corresponding compatibility relations. Therefore, many semantical relations can be formulated as properties of compatibility relations. For instance, the logical validity of:

$$Kp \Rightarrow p$$

implices that the epistemic compatibility relation R_K is reflective, that is:

wR_Kw for all possible worlds w;

and the fact that:

$$Bp \Rightarrow p$$

is not logically valid implies that R_B is not reflective.

The various axioms in modal logic reflect properties of the corresponding compatibility relation. Some of these relationships between axioms and properties of the compatibility relation are shown in the following table:

Name of Axiom	Formula	Condition on R
T	$\Box A \Rightarrow A$	wRw for all w
B	$\Diamond \Box A \Rightarrow A$	$wRv \Rightarrow vRw$
4	$\Box A \Rightarrow \Box \Box A$	$wRv \wedge vRu \Rightarrow wRu$
.3	$\Box (\Box A \Rightarrow \Box B) \vee \Box (\Box A \Rightarrow \Box B)$	$wRv \wedge wRu \Rightarrow vRu \vee uRv$
M	$\Box \Diamond A \Rightarrow \Diamond \Box A$	$\forall w \exists v (wRv \wedge \forall u \forall X (vRu \wedge vRx \Rightarrow u = x))$
G1	$\Diamond \Box P \Rightarrow \Box \Diamond P$	$w_1Rw_2 \wedge w_1Rw_3 \Rightarrow \exists w_4: w_2Rw_4 \wedge w_3Rw_4$
GJ	$\Box (\Box (P \Rightarrow \Box P) \Rightarrow P \Rightarrow P$	There is no infinite chain $w_0, w_1 \ldots$ with w_iRw_{i+1} and $w_j \neq w_{i+1}$ for all i
Δ	$\Box A \Rightarrow \Diamond A$	R serial: $\forall w \exists v : wRv$

Meta-theorems

As we have seen, our intuition about the use of modal expressions leads to two kinds of conditions on modal logic. The first kind is concerned with the proof theoretical structure of arguments involving modal operators; and the second kind regulates the truth conditions on modal sentences. It is now natural to ask about the relationships between these two kinds of conditions. This question is about the interaction between the proof structure of a logical system and the semantical interpretation of the logical operators.

There is a number of quite satisfactory results in this area, the so-called **completeness results**. We call a logical system semantically complete if there is total harmony between provability and semantical entailment in the system. To be more precise let us introduce the following notation:

a. $A_1,\ldots,A_n \vdash_L B$ means that, in L, there exists a proof of B from the premises $A_1,\ldots,A_n$.

b. $A_1,\ldots,A_n \models_L B$ means that, in L, if $A_1,\ldots,A_n$ are true in a possible world w then B also is true in w.

With these notations we define that a modal logic L is complete if the following condition is met:

Comp For all formulas $A_1,\ldots,A_n,B$ in L the following condition holds
$A_1,\ldots,A_n \vdash_L B$ if, and only if $A_1,\ldots,A_n \models_L B$.

For fairly many modal logics it is possible to prove completeness with respect to possible worlds semantics. This is true for the most common temporal, deontic, epistemic, doxastic and alethic logics; and it is also possible to establish completeness theorems for more unusual systems, as for instance systems where $\Box$ means provability in arithmetic.

Though an impressive number of modal logics are complete with respect to possible worlds semantics, it is possible to find modal systems which cannot be assigned a natural possible world semantics. That is, there does not exist a set W of possible worlds and a relation R on W satisfying a set of conditions such that the modal system is complete with respect to the frame (W,R). Such systems have been constructed by Thomason, Gerson and others. Gerson even constructed a modal system which is incomplete with respect to the more general neighbourhood semantics. These incomplete systems are rather unnatural and they fail to represent modalities in natural language. But the bare fact that they exist poses the question whether possible worlds semantics is the most adequate formal framework for the semantic study of modalities. This question is also prompted by certain difficulties with the interpretation of possible worlds and the compatibility relation on worlds. What are possible worlds? Are they counterparts of actual worlds? Are they conceptual alternatives to the actual world? How can we make identifications across possible worlds? Etc.

There are some meta-theoretical results, due to van Benthem (1985), which throw some light on why we need possible worlds semantics, as well as on its inherent limitations.

Modal operators are, from a syntactical point of view, sentence modifying operators. Accordingly, they may, from a semantical point of view, be considered as proposition modifying operators. If we identify a proposition with a set of possible worlds, namely the set of worlds which makes the proposition true, then a modal operator is a function which maps sets of possible worlds into sets of possible worlds. More precisely, let $\Box$ be a modal operator and W a set of possible worlds. Then $\Box$ may be construed semantically as a function $f_{\Box}$ which maps a subset U of W into a subset $f_{\Box}(U)$ of W.

With this conception at our hands it is possible to pose some structural questions concerning the behaviour of modalities. A natural constraint on a modal operator is that it should be "world neutral", that is, if the worlds contained in a subset U are replaced with others in a uniform manner, it does not affect $f_{\Box}$. This may be formulated mathematically by the following principle:

w-n For all permutations p of the set W of possible worlds we have $p(f_{\Box}(U)) = f_{\Box}(p(U))$.

Consider now the modal logic T, which is classical propositonal logic augmented with the axioms:

$$\Box A \Rightarrow A$$
$$\Box (A \Rightarrow B) \Rightarrow (\Box A \Rightarrow \Box B)$$

and the rule of necessitation:

$$\frac{A}{\Box A.}$$

van Benthem has shown that the only modal operators which satisfy the T- axioms and which are world neutral are (i) the trivial identity operator, where f(U) = U (and $\Box$ p $\Rightarrow$ p), and (ii) S5-necessity, where:

$$f(U) = \begin{cases} w & \text{if } U = w \\ \phi & \text{uf } Y \neq w. \end{cases}$$

So, if the principle of world neutrality (w-n) is imposed on our semantical structure, there are very few modalities.

Consider temporal operators. It is a common assumption that time can be measured by real numbers and that points of time are ordered by the usual ordering of reals. This suggests a semantical interpretation of temporal operators where possible worlds are reals and the compatibility relation is the usual ordering of real numbers. A temporal operator may then be interpreted semantically as a function from sets of reals into sets of reals. The temporal operators P and F above correspond to the functions *pa* and *fu* defined by:

pa $\quad pa(X) = \{y \in \mathbb{R} \mid \exists x \in X : x < y\}$

fu $\quad fu(X) = \{y \in \mathbb{R} \mid \exists x \in X : y < x\}$ $\qquad X \subseteq \mathbb{R}$

and the operator Pr representing present corresponds to *pr*:

pr $\quad pr(X) = X, \; X \subseteq \mathbb{R}$

Assume now that the principle of world neutrality (w-n) holds for temporal operators. Assume, furthermore, that every temporal operator *f* satisfies the following technical principle of continuity:

c For all families $\{Xi \mid i \in I\}$ of sets of points of time:
$f(\cup Xi) = \cup(f(Xi))$.

Under these assumptions it can be shown that in a sense P, F, and Pr are the only tenses. Formally, the theorem says that if *f* satisfies our assumptions (w-n,c), then *f* is some union of the tenses *pa*, *fu*, and *pr*. Thus, if our formal semantics meets the requirements above we have a very precise characterization of tenses. They have to be combinations of P, F, and Pr.

Another meta-theoretical question is to which extent the compatibility relation is indispensable. Usually, when a modal operator *o* is interpreted as a proposition modifying operator (i.e., a function from sets of possible worlds to sets of possible worlds) there exists a relation R on possible worlds such that f_o is defined by:

o $\quad f_o(X) = \{w \mid \forall v : wRv \Rightarrow v \in X\}$

However, there is a comprehensive class of functions which cannot be defined by a formula like (o).

Why are these functions not usable as interpretations of ordinary modal operators? It is a well known result that if the function f_o is monotonic and conjunctive, i.e.:

mon $X \subseteq Y \Rightarrow f_O(X) \subseteq f_O(Y)$
conj $f_O(\cap Xi) = \cap f_O(Xi)$

then there exists a relation R_O such that (o) holds. Most modal operators which occur in connection with formal semantics of natural language are monotonic and conjunctive. Therefore, in a natural way they lead to a compatibility relation.

As a final example of meta-results we consider a result by Montague (1963) which has both syntactical and semantical implications. Critics of intensional logic and possible worlds semantics have tried to construe modal expressions not as sentence modifying opeators but as properties of sentences. An outstanding representative of such a theory is W.V.O. Quine (1981). According to his theory a modal expression as:

b **John believes that the horse is white.**

should not be construed as Bp. Rather John's belief is a predicate which takes names of sentences as arguments. That is, *b* is logically equivalent to the construction:

b' **John believes ('the horse is white').**

Quine thought that this interpretation of modalities would eliminate all major difficulties connected with intensional and modal contexts.

In an analogous way some philosophers have tried to construe truth as a property of sentences, i.e. a predicate taking sentences or names of sentences as arguments. D. Davidson's famous theory of truth (1967) is of such a kind. So, if we could construct a formal theory with sentence predicates corresponding to modalities, truth, and other important but troublesome expressions in our language, we would have a general formal framework for logical and semantical studies of natural languages. The result of Montague demonstrates, however, that such an endeavour cannot succeed unless severe restrictions are observed.

Montague's result is closely connected with Gödel's classical incompleteness results and rests heavily on logical reflexivity. A formal system is reflexive if it can express its own syntax. Since natural language is reflexive a formal system which pretends to represent the structure of a natural language must be reflexive. Let L be such a reflexive logical system with a sentence predicate V. If the following formulae are theorems in L:

$V(p) \Rightarrow p$
$V(V(p) \Rightarrow p)$
$V(p \Rightarrow q) \wedge V(p) \Rightarrow V(q)$
$V(p)$, if p is a logical axiom

then L is inconsistent.

Many modal expressions, the truth predicate, the provability predicate, and many other important expressions would validate the formulae above if they were construed as sentence predicates. Thus, they would lead to inconsistent or trivial formal

theories. The programmes of Quine and Davidson are subject to rather overwhelming difficulties.

Even though Montague's result shows that it is impossible to define many common modal operators as relations between names of persons and sentences within classical logic, we get new possibilities if we relax some classical semantical ideas. Montague's proof rests on the fact that sentence predicates are total, that is, defined for all sentences in the language. If we allow partial predicates the situation will change. This is a well known technique in computability theory where the class of algorithms necessarily includes partial algorithms. Recently this possibility of partial constructions has been subject of detailed study in connection with truth predicates, provability predicates and comprehension axioms in set theory. These studies show that, contrary to the situation with classical total predicates, truth and provability predicates can be introduced into very rich languages without inconsistencies (Kripke (1975), Feferman (1984)). There does not seem to be any a priori reasons why it should not be possible to construe various modalities as sentence predicates in these formal systems. However, such theories will not eliminate problems with intensional contexts, but they may lead to entirely new formalizations of modalities.

Another way to bypass Montague's argument is to put restrictions on the class of sentences which may enter as arguments in sentence predicates. This possibillty has been worked out by Jim des Rivieres and Hector J. Leverque (1986). They define modalities as sentence predicates ranging over a suitable subset of sentences of the language. That leads to a consistent formalism. The problem is then to justify the restrictions on the domains of sentence predicates.

These meta-theoretical results seem to be rather far away from the concrete task of constructing formal analyses of modalities in natural languages. Evidently, they do not lead to straightforward formal representations of modalities. But they give very important information about our possibility of developing feasible formal systems. They reveal connexions between various constraints which a formal theory of modalities has to meet. Thus, if our system of tenses is neutral with respect to permutation of time points (w-n above) all tenses must be combinations of P, F and Pr; if we require sentence predicates to be total then quite many modalities cannot be construed syntactically as relations, etc. Meta-theoretical results inform us that certain combinations of constraints necessarily lead to futile or inconsistent constructions, whereas others are consistent and may lead to feasible analyses.

As will be shown below it is very difficult to find coherent analyses of concrete modalities in natural languages which meet some perfectly natural requirements. As a consequence, we cannot claim to have a formal framework which satisfies all our intuitions about modalities. It is still an open question which framework is most suitable for formal semantics. Therefore it is extremely important to study the relationships between various constraints, their empirical justification, and formal structures with which they are compatible. This may, one may hope, prevent futile work with inadequate formalisms.

Formal logic and concrete modalities

As mentioned, existing formal systems do not lead to altogether satisfactory analyses of actual modalities in natural languages. This is true of all kinds of modalities, and the inadequacies are most clearly displayed when modal expressions are used in argumentation. These anomalies have resulted in a number of paradoxes.

It will be clear from the examples below that these difficulties are not purely logical. They are connected also with ontological and epistemological issues. So, it seems that theories of modalities cannot be purely logical, semantical or syntactical. They involve further philosophical hypotheses about knowledge, belief, norms, etc., and the way in which these things are represented in our minds. As Michael Dummett has expresed it we cannot have a neutral logic: "When logic is taken in the broad sense in which it comprises the theory of meaning, understoood as a branch of philosophy, the idea of a logic that has no metaphysical, that is, no ontological, component is a delusion. There cannot be an aseptic logic that merely informs us how language functions and what is the structure of the thought which it expresses without committing itself to anything concerning reality, since reality is what we speak about – the realm of reference – and an account of language demands an account of how what we say is about a reality and is rendered true or false by how things are in reality" (1981:431).

A deep and fundamental difficulty of modal logic is the fact that modal expressions are *opaque*. Fundamental logical principles seem to break down when applied to modal sentences. As an example consider Leibniz's principle which says that we are allowed to substitute one singular term for another which denotes the very same object. This principle fails when terms are within the scope of a modal operator.

The problem with Leibniz's principle becomes apparent when we try to represent inconsistent beliefs. Consider Quine's famous example (1971). Quine tells us that there is a man in a brown hat whom Ralph has glimpsed several times under questionable circumstances, so Ralph suspects he is a spy. Also there is a grey-haired man, vaguely known to Ralph as rather a pillar of the community, whom Ralph is not aware of having seen except once at the beach. The men are one and the same, but Ralph does not know it. Call the man mentioned Ortcutt. Assuming this story the following sentences are true:

(1) **Ralph believes that the man in the brown hat is a spy.**

(2) **Ralph does not believe that the man seen at the beach is a spy.**

(3) **the man in the brown hat = the man seen by Ralph at the beach = Ortcutt.**

If Leibniz's principle could be used on belief contexts we could infer the following paradoxical sentence:

(4) **Ralph believes both that Ortcutt is a spy and that he is not a spy.**

Basically, this problem (and similar ones concerning quantification into modal contexts) is about the identity relation. Even though Ortcutt in fact is identical with

both the man at the beach and the man in the brown hat the two definite descriptions used in (1) and (2) to represent the content of Ralph's belief do not pick out Ortcutt in the possible worlds compatible with Ralph's belief. Looking at the situation from Ralph's state of belief the man at the beach and the man in the brown hat are not identical. Identity, considered from Ralph's state of belief, is different form metaphysical identity (i.e. identity in the "real world"). If Ralph had believed that the man at the beach and the man in the brown hat were identical he would not have asserted (1) and (2) at the same time, and (4) could not have been inferred.

We can cope with these problems in several different ways. But none of them are entirely satisfactory and they all rest on more or less controversial philosophical assumptions. Syntactically the problems occur when variables, names or definite descriptions are inside the scope of modal operators, that is, when we have, say, expressions of the form:

dr $\quad \Box A(x)$

If the variable x were bound in A(x) such that we had an expression of the form:

dd $\quad \Box \forall x A(x)$

or:

dd' $\quad \Box \exists x A(x)$

we would not have difficulties with substitution. Modal expressions with free variables inside the scope of a modal operator are called **de re modalities**, whereas expressions in which a modal operator acts on a sentence are called **de dicto modalities**.

One possible solution to these problems is to eliminate *de re* modalities. When $\Box$ means necessity *de re* modalities reflect essentialism because (dr) says that the object *x* necessarily has the property A, i.e. A is an essential property of *x*. As essentialism is unacceptable to empiricists they prefer to eliminate *de re* modalities.

If we could prove that every *de re* modality were equivalent to a *de dicto* form, then we would be able to avoid substitution problems simply by exchanging *de re* by *de dicto* sentences. This would amount to showing that for every *de re* sentence *p* there exists a *de dicto* sentence *q* such that:

. elm $\quad p \Leftrightarrow q$

is provable in our formal system. Actually, it is possible to prove that this property holds under reasonable anti-essentialist conditions.

The main idea behind anti-essentialism is the negative requirement that a property A may not be essentially true of some individual *a*. An obvious way of construing this is that if A is true of *a* then it is possible that A also is true of any other object *x* in the domain (cf. Cocchiarella (1984)). Formally this amounts to requiring the validity of:

$$\exists x \Diamond A(x) \Rightarrow \forall x \Diamond A(x)$$

Or, if there are several free variables in A:

$$\exists x_1 \ldots \exists x_n \ (\#(x_1,\ldots x_n) \wedge \Diamond A(x_1,\ldots,x_n))$$
$$\Rightarrow \forall x_1 \ldots \forall x_n \ (\#(x_2,\ldots,x_n) \Rightarrow \Diamond A(x_2,\ldots x_n))$$

where $\#(x_2,\ldots,x_n)$ is a conjunction of one but not both of the formulae $xi \neq xj$ or $xi = xj$, $1 \leq i < j \leq n$. Under this condition of anti-essentialism the *de re* elimination property (elm) can be proved.

For alethic modalities this *de re* elimination result is philosophically quite reasonable. It shows that an anti-essentialist analysis of logical necessity is possible. However, it has a rather serious side effect. It implies that our logical system must be semantically incomplete (i.e. comp does not hold). So, an anti-essentialist solution of the substitution problems in alethic modal logic seems not possible without renouncing on semantical completeness.

In the case of *doxastic* and *epistemic modalities* the situation is quite different. It does not make sense to eliminate *de re* constructions. In our actual use of doxastic and epistemic expressions we, in fact, claim belief and knowledge about certain objects rather than others. As Quine says, we are scarcely prepared to sacrifice the relational construction "there is someone whom Ralph believes to be a spy", and this is one main reason why Quine proposes the syntactical analysis of modalities. Unfortunately, the syntactical analysis is only possible if classical bivalent logic is given up (cf. Montague's result), or if we make other ad hoc adjustments.

These difficulties lead us to an essentialist solution of the substitution problems. The idea is here that substitution of one term, x, for another, y, into a modal context is allowed if the terms refer to the same object in all worlds compatible with the actual one. That is, the following formula is logically valid:

$$\Box (x = y) \wedge \Box A(x) \Rightarrow \Box A(y)$$

So, if a term t satisfies the condition:

rig $\quad \exists x \Box (t = x)$

we are allowed to substitute t inside the scope of $\Box$. Semantically this means that the term t picks out the same reference in all possible worlds compatible with the actual one. A term which satisfies (rig) is called a **rigid designator**. According to Saul Kripke (1980), who introduced the concept of rigidity, proper names and natural kind terms (i.e. terms like "water", "tiger", etc.) are rigid.

The easiest way to realize that names are rigid designators is to consider counterfactual statements. We would not accept a claim such as:

> **If you had invented the printing press you would have been Johan Gutenberg.**

We can imagine a situation where Johan Gutenberg has other qualities than he in fact had. But it seems senseless to imagine a situation where Johan Gutenberg is different from Johan Gutenberg. Thus, the reference of the name Johan Gutenberg is fixed across all possible worlds. In the same way it can be shown that natural kind

terms are rigid designators. Therefore, our formalism must have means to distinguish between rigid and non-rigid terms. But for the moment being there does not exist a formalism which accomplishes this and which is also widely accepted.

We shall not go further into the delicate problem of reference in modal contexts. There is another group of issues we want to discuss. They may be illustrated by *deontic operators*. Let O and P denote obligation and permission respectively. It is easy to find some apparently sound principles which seem to underlie our ethical argumentation.

Assume that everybody is obliged to tell the truth and that nobody is allowed to lie. For an arbitrary person, John say, the following statements must be true:

\+ **John is obliged to tell the truth.**
\+ + **John is not permitted to lie.**

Let *p* be the sentence:

p **John tells the truth.**

then the negation of p is equivalent to:

$\neg$ p **John lies.**

Applying O and P we can render (+) and (++) formally as:

+' Op
++' $\neg$ P $\neg$ p

Intuitively (++) follows from (+). Therefore, we are inclined to accept the following formula as true:

op $Op \Rightarrow \neg P \neg p$

Furthermore, it is natural to assume that if an implication is obligatory, i.e. $O(p \Rightarrow q)$, and if the antecedent is obligatory, i.e. Op, then the consequent is obligatory. Formally, this leads to the principle:

oi $O(p \Rightarrow q) \Rightarrow (Op \Rightarrow Oq)$

Finally, if a sentence *p* is a tautology we assume that it is obligatory (this seems a harmless assumption because a tautology does not give any information about reality). Therefore, we get the following rule of inference:

o-rule $\dfrac{\vdash p}{\vdash Op}$

The principles (op) and (oi) together with the o-rule constitute the axiomatic base of **minimal deontic logic** (cf. Hilpinen (1970) and Gabbay and Guenthner (1984)).

Minimal deontic logic (MDL) is complete with respect to a possible worlds semantics (W,R_o) where R_o fulfills the condition:

ro $\forall w \exists v : wR_ov$

The intuition behind this semantics is the idea that an act described by a sentence *p* is obligatory in a world *w* if, and only if, *p* holds in all worlds which are morally most perfect when seen from *w*.

When presented in this way MDL looks reasonable and acceptable. But when applied to concrete deontic arguments it soon leads to paradoxes. Two of the most well-known paradoxes in deontic logic have been formulated by A. Ross (1947) and M. R. Chisholm (1963) respectively.

In order to formulate Ross's paradox consider the sentence:

John ought to mail the letter.

It can be formalized as:

c Or

where *r* is the sentence:

r **John mails the letter.**

As is well-known:

$$r \Rightarrow r \vee s$$

is logically valid, and by using (oi), (c) and modus ponens we infer that:

d $Or \Rightarrow O(r \vee s)$

and:

e $O(r \vee s)$

are valid for any sentence *s*. But let *s* be the sentence:

s **John burns the letter.**

Then we get that the following sentence should be true

John is obliged either to mail the letter or to burn it.

However, it is very counterintuitive to claim that an obligation to mail a letter should imply an obligation either to mail it or to burn it. If John is obliged to post a letter but burns it, then he certainly acts contrary to his obligation.

A widespread reaction to Ross's paradox is to say that it only looks like a paradox, and that more careful reading of the formula (d) will show no more paradoxical than:

$$r \Rightarrow rvs$$

For (d) means, semantically, that if (r) is true in a morally perfect world *v* then certainly *rvs* will be true in *v*: "In the case of Ross's example, it may be more appropriate to speak of deontically perfect sequences of events than of deontically perfect worlds. It should be clear that if every deontically perfect sequence of events

satisfies the description "a mails a letter or burns it" is also satisfied by such sequences of events" (Føllesdal and Hilpinen (1970:22)).

It seems to us that this attempted solution to Ross's paradox only bypasses the real problem. The formal system does not without further assumptions rule out the possibility that John meets his obligation to mail the letter by burning it. What Ross's paradox really suggests is that modal operators like O and P do not capture the entire complexity of deontic expressions. Føllesdal's and Hilpinen's attempted solution would be correct if we could restrict the future to a fixed series of possible worlds where every choice has been made. But the obligation to post the letter has to be met in a future situation in which John is free either to burn the letter or to post it. Burning it is in conflict with posting it. It is only retrospectively, when the future is closed, that the disjunction of mailing and burning does not harm.

The complex structure of deontic expressions becomes even more obvious when we analyse Chisholm's paradox of contrary-to-duty imperatives. Consider the following sentences:

(1) **John ought to help his neighbours.**
(2) **If John helps, he ought to tell his neighbours that he is coming.**
(3) **If John does not help, he ought not to tell them.**
(4) **John does not help.**

This set of sentences expresses a consistent system of moral obligations. (1) is an unconditional actual obligation, whereas (2) and (3) are conditional. All of them are of the ought-to-do variety, demanding John to do some action in the near future. Furthermore, the sentences are logically independent of each other, i.e. you cannot derive one of them from the others. An acceptable formal representation of these sentences must reflect these facts. It must at least reflect the facts that (i) the sentences (1) – (4) are mutually consistent, and that (ii) they are logically independent of each other.

In order to find the most natural formalization of (1) – (4) in MDK let *p* and *q* be the sentences:

p **John helps his neighbours.**
q **John tells his neighbours that he is coming.**

The most natural candidates as formalizations of (1) – (4) are, it would seem, the following four sets of sentences:

	a.	b.	c.	d.
(1)	Op	Op	Op	Op
(2)	$p \Rightarrow Oq$	$O(p \Rightarrow q)$	$p \Rightarrow Oq$	$O(p \Rightarrow q)$
(3)	$\neg p \Rightarrow O \neg q$	$\neg p \Rightarrow O \neg q$	$O(\neg p \Rightarrow \neg q)$	$O(\neg p \Rightarrow \neg q)$
(4)	$\neg p$	$\neg p$	$\neg p$	$\neg p$

These sets differ with respect to how the conditional obligations in (2) and (3) are represented. The scope of the deontic operator may be wide, as in (2b.), (2d.), (3c.), and (3d.), or it may be narrow, as in (2a.), (2c.), (3a.), and (3b.). At any rate

it is a great problem how to formalize conditional obligations, and we return to that problem below.

Unfortunately, none of the formalizations above meet our adequacy requirements (i) and (ii). The possibility b. leads directly to an inconsistency as we can derive both Oq and O¬q from (1b.) – (4b.). From (3b.) and (4b.) O¬q follows by modus ponens:

$$\frac{\neg p \ , \ \neg p \Rightarrow O \neg q}{O \neg q}$$

and (1b.), (2b.), modus ponens, and the axiom of distribution of obligation (oi) lead to Oq:

$$\frac{\dfrac{O(p \Rightarrow q) \ , \ O(p \Rightarrow q) \Rightarrow (Op \Rightarrow Oq)}{Op \Rightarrow Oq} \ , \ Op}{Oq}$$

The other formalizations are consistent but none of them meet the requirement (ii). In case a. and b. we have the following derivation of $p \Rightarrow Oq$ from $\neg p$ and the tautology $\neg p \Rightarrow (p \Rightarrow Oq)$:

$$\frac{\neg p \ , \ \neg p \Rightarrow (p \Rightarrow Oq)}{p \Rightarrow Oq}$$

And in case d. we can prove (3d.) from (1d.) by use of the o-rule and the tautology $p \Rightarrow (\neg p \Rightarrow \neg q)$:

$$\frac{\begin{array}{c} p \Rightarrow (\neg p \Rightarrow \neg q) \\ Op \ , \ Op \Rightarrow O(\neg p \Rightarrow \neg q) \end{array}}{O(\neg p \Rightarrow \neg q)}$$

Therefore, we are inclined to conclude that there does not exist an adequate formalization of Chisholm's sentences (1) – (4) within minimal deontic logic.

There seems to be two main reasons why (1) – (4) cannot be satisfactorily represented within MDL. First, MDL does not have means to express conditional obligation. The combination of O and material implication is not a workable representation of conditional obligation. Second, the sentences (1) – (4) have a temporal structure. The obligations involved are about future actions, and, as will be shown below, the temporal structure is crucial for a correct interpretation of the sentences.

The problem of conditional obligation has been dealt with in two different ways. One method is to assume that conditional obligations cannot be formalized in standard systems of deontic logic. Condition obligation is then introduced as a new primitive notion:

$$OqP$$

which may be read as "*p* is obligatory under circumstances *q*". The other method consists in a strengthening of the implication involved in conditional obligation. On

the formal level these two methods are interrelated. For many deontic systems the unconditional deontic operators can be defined from conditional operators by:

$$Op =_D O_T P$$
$$Pp =_D P_T p \quad \text{(where T is some fixed tautology)}$$

And the other way around the dyadic operators:

$$OqP \text{ and } PqP$$

can be defined as follows:

$$OqP =_D \Box (Qq \Rightarrow p)$$
$$PqP =_D \Diamond (Qq \wedge p)$$

where $\Box$ and $\Diamond$ are the alethic necessity and possibility operators respectively, and Q is a monadic operator. The semantical meaning of Q is, that Qp is true in a possible world *w* if, and only if, *p* is morally optimal, that is, as perfect as possible. The usual monadic deontic operators are then defined in the following way:

$$Op =_D \Box (Q_T \Rightarrow p)$$
$$Pp =_D \Diamond (Q_T \wedge p)$$

It is still an open question which of these approaches leads to the most acceptable formalizations of conditional obligation. But at the present state of development none of them are satisfactory. We want to discuss briefly why this is so.

Recently it has been shown that it is possible to extend MDL in such a way that (1) – (4) can be given formalizations which meet the adequacy requirements (i) and (ii). This is possible both in a framework with dyadic operators and in one only with monadic operators. An interesting example of the last type is given by P. L. Mott (1973). He construes conditional obligation $O_q p$ as:

$$q \boxdot\!\!\rightarrow Op$$

where $\boxdot\!\!\rightarrow$ is counterfactual implication. That is, in this interpretation $O_q p$ means:

"if q were the case, then p would be obligatory."

This idea has been further discussed by J. W. Decew (1981) who introduced the wide scope reading of $O_q p$ as:

$$O(q \boxdot\!\!\rightarrow p)$$

These interpretations of conditional obligation lead to several possible formalizations of Chisholm's paradoxical sentences. The following was proposed by Mott:

$$Op$$
$$p \boxdot\!\!\rightarrow Oq$$
$$\neg q \Rightarrow O\neg p$$
$$\neg q$$

and the following by Decew:

$$Op$$
$$O(p \boxdot\!\!\rightarrow q)$$
$$O(\neg q \boxdot\!\!\rightarrow \neg p)$$
$$\neg$$

Both formalizations meet the adequacy requirements (i) and (ii). But, still, they do not solve Chisholm's paradox.

As shown by Decew the analysis proposed by Mott has a very unfortunate consequence. It is possible to derive the unconditional obligation $O\neg q$, that is, John ought not to tell the neighbours that he is coming. This fact was emphasized by Mott as a virtue of his solution. But we agree with Decew that Mott is mistaken on this point. John only has one unconditional obligation, namely to help his neighbours. His obligation to tell whether he is coming or not is dependent on his decision to help or not to help. Thus, neither Oq nor $O\neg q$ should be derivable. Decew accepts the derivability of Oq, but we cannot see why this is more acceptable than the derivalibility of $O\neg q$. This is connected with the temporal structure of the sentences (1) – (4). There is a temporal distance between the obligation to help and the obligation to tell. As long as John has not decided whether to help or not the problem about telling is not actual. This temporal distance is, at least in an implicit way, captured by (2) and (3).

Chisholm's paradox reveals a very common structure of systems of obligations. Usually one has unconditional obligations to do something together with some conditional obligations which do not become imposed until the unconditional obligations either have been fulfilled or violated. Therefore, it will always be a problem to detach unconditional obligations without paying proper respect to the temporal structure. This is not only a problem for monadic deontic logic, it reapperars in dyadic systems. R. Thomason has developed a deontic logic based on tense logic in which future contingent statements are neither true nor false. As Decew says, Thomason's system is complex and raises new worries. But if we want an adequate deontic logic we are forced to work with complex systems.

We claimed above that theories of modalities cannot be purely logical. They usually involve additional philosophical hypotheses which are not logically justifiable. The problems of deontic logic support this claim. In order to determine the truth value of Op in a world *w* we must consider deontic alternatives to *w*. Thus, the truth value of an obligation in the actual world depends on fulfillment of actions and requirements in deontic alternatives, and not, for instance, on the agent's actual motives and dispositions in this world. So, this semantical analysis supports a view of morality where rightness and wrongness of actions are determined independently of the agent's motives and dispositions. Therefore, utilitarianism is more in harmony with this semantics than Kantian deontological ethics. Furthermore, as shown by G. Sayre-McCord, it is impossible to maintain even very weak deontic logics without imposing substantial moral principles. Consequently, it is impossible to construct

formal models of expressions involving deontic modalities without presupposing substantial ethical principles: "Our moral theory must determine our deontic logic; not the other way around. In deciding which deontic logic to adopt, substantive ethical arguments are not only relevant, they are indispensable" (1986:194).

Conclusion

In the last few decades modal logic has grown into a very comprehensive field. Many important results with applications in epistemology, ethics, computer science and philosophy of language have been obtained. In spite of all this, the logical analysis of modal expressions has not yet reached full maturity. There does not exist one paradigm which is likely to gather consensus in the near future.

A main reason for this is that logical theories of modal expressions seem to involve substantial philosophical assumptions about which we disagree. As examples we refer to issues of essentialism in epistemic logic and lack of ethical neutrality in deontic logic.

Another essential reason concerns the complexity of modal expressions. As shown above deontic expressions involve both deontic and temporal operators together with several forms of entailment. For the time being, it is not clear how to develop a formalism which combines these operators to form an adequate theory of deontic expressions.

In order to make decisive progress in this field it is important to explore in further details the various philosophical assumptions which tacitly underlie our formal systems and to change these systems accordingly. Furthermore, it is necessary to intensify the empirical study of how modal expressions function in natural languages. A fairly large number of formal systems have their origin in mathematical logic and are as such not apropriate to the study of natural language. Unprejudiced observations of actual uses of language may lead to new and perhaps more suitable formal analyses.

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WORLDS OR SITUATIONS?

A CASE BASED ON MODAL OPERATORS AS SHIFTERS

by
FINN SØRENSEN

1. INTRODUCTION

In this paper I will accept the model-theoretic approach to the study of semantics as it is presented in Dowty, Wall and Peters (1981). The basic aim of such an approach is the construction of a model[1] containing all the semantic entities which are necessary in order to assign appropriate meanings to expressions in a language. One of these entities is a possible world.[2] A possible world is intended to be an idealized theoretic entity which captures the relevant semantic features of states of affairs, and the prototype of a possible world is our own world, i.e. the actual world, cf. Hughes and Cresswell (1968:75-76) and Lewis (1986). Another way of constructing this notion is to say that a possible world is a totality of states of affairs, and that one such totality happens to be the one we are living in, cf. Sommers (1982:159) which attributes this idea of a world as a totality to Wittgenstein. For the rest of this paper I will assume that a possible world is a totality of states of affairs, and that a model contains a set[3] W of possible worlds (w_0, w_1, w_2,..., w_n) one of which is our world, i.e. w_0. I will not consider the possibility of letting the actual world vary through all values of i, $0 \leqslant i \leqslant n$, in order to distinguish between the factual world w_0 and the actual world relative to which indexicals (or deictic expressions) are to be interpreted. For such a framework, see Lewis (1970), and Isard (1974).

The set W of possible worlds is not the only set which can be constructed on the basis of states of affairs. One could also arrive at the notion of a situation. A situation is also a totality of states of affairs, but a totality which is less inclusive and which has as its prototype a proper subpart of our world, for example the situation in which a speaker produces an utterance. This is, as far as I can see, the position taken in Reichenbach (1947:15) where situations are taken to be the denotata of sentences and in Barwise and Perry (1983:21) where the reference of statements is

1. Normally a model consists of both semantic entities and a set of statements relating these entities to expressions in a language. This degree of precision is not needed in this paper. Neither is the possibility of talking about different models for the same language.
2. As far as I know the notion of a possible world was introduced in modern formal semantics by logicians such as Kripke and Montague.
3. Some authors claim that the set of possible worlds and what I presently refer to as the set of situations is to be taken not as a set but as a collection in the technical sense of set theory, cf. Lewis (1986), Barwise and Perry (1983), and Barwise (1985). I will not go into details which draw on this distinction, and I am thus ignoring it.

the situations described by a specific assertion of a sentence. Instead of possible worlds we could thus take a set S of situations (s_0, s_1, s_2,..., s_n) as the basic set of semantic entities in a model.

But are there any good reasons to choose W or S in the context of a research program[4] where it is the semantic properties of languages such as Danish we want to capture by the constructed model? This is the problem I want to discuss on the next few pages. The principal aim of my discussion is to show that the treatment of modal expressions in possible world semantics is inadequate when taken as representations of the corresponding modal expressions in Danish such as *skal* (= *must*), *nødvendigt* (= *necessary*), *kan* (= *might*) and *muligt* (=*possible*). The hard core of my argument is the hypothesis that modal expressions in Danish (and other natural languages) do not allow an interpretation which makes the modalized expressions true at the location they are uttered, which ought to be the case, given the shifting power of possible world semantics. In situation-based semantics[5] such a case is rather natural, and that is the reason why I think the arguments to be presented point in the direction of situations and away from possible worlds.[6]

2. THE POSSIBLE WORLD APPROACH

Such sentences as (1) and (2) are represented in possible world semantics by the expressions given in (3) and (4) respectively:

(1) Det er nødvendigt at John gør en anstrengelse.
'It is necessary that John makes an effort'[7]
(2) Det er muligt at John gør en anstrengelse.
'It is possible that John makes an effort'
(3) Np (or N [gør (j, a)])
(4) Mp (or M [gør (j, a)][8]

4. A research program is a description of a program to be executed by scientists in order to find out whether the program is fruitful or not. As such it does not carry the strong authoritarian character of a Kuhnian paradigm. My notion of a research program is close to what linguists call schools with the important difference that I am forcussing on the content while the notion of a school focusses on the sociological relation between scientists. The notion of paradigm is presented in Kuhn (1972). A critical discussion of it can be found in Suppe (1974).
5. I use the expression 'situation-based semantics' in order to stress two points. First in order to make a distinction between models containing either situations or possible worlds. Second in order not to be forced into the whole framework of situation semantics as described in Barwise and Perry (1983).
6. I am using the espression 'points in the direction of' in order to convey the information that I am not trying to prove or disprove anything. I am only making a proposal.
7. The English version of this and all following examples are glosses rather than translations.
8. The alternative representations are mentioned in order to indicate that my remarks on modal operators apply whether modal logic is considered an extension of the propositional calculus or the predicate calculus.

The semantic value of these expressions are given in (5) and (6) respectively:

(5) If p is a formula then the value of Np is true at ‹w_i, t_j› iff p is true at any ‹w_k, t_l› for all w_k in W and for all t_l in T.

(6) If p is a formula then the value of Mp is true at ‹w_i, t_j› iff p is true at some ‹w_k, t_l› for all w_k in W and for all t_l in T.[9]

where W is the set of possible worlds and T a set of points in time ordered by the relation 't preceeds t''. The pair ‹w, t› is called an index, a reference point or a worldstate. The intuitive interpretation of this notation is that you are looking at the possible world w at the point of time t, and what you see are those states of affairs which are part of w and which hold at t. The formulation of (5) and (6) follows the standard view of necessity and possibility in the Montague tradition, cf. Montague (1974:259) and Dowty, Wall and Peters (1981:158). In this tradition, the essence of (5) and (6) is said to be the fact that modality is quantification over possible worlds, cf. Montague (1974:108) and Lewis (1986:5).

This property of N and M implies that the evaluation of modalized expressions involves worldshifts, i.e. from w_i to w_k. In the case of necessity the worldshift is obligatory, and in the case of possibility it is only permitted.

In some of the Montagovian treatments of modality the reference point of an expression is just a possible world, cf. for example Montague (1974:108). In such a treatment of the modal operators their interpretations involve only worldshifts. But (5) and (6) involve also a timeshift, i.e. from t_j to t_k, or more precisely a worldstate shift, that is from ‹w, t› to either ‹w', t› or ‹w, t'›. In the case of necessity the worldshifts involved imply obligatorily both a worldshift and a timeshift because of the universal quantification of the reference points. In the case of possibility the shifts might involve only a worldshift or a timeshift.

It is the adequacy of these different types of shifts I want to examine in some detail in relation to natural languages, exemplified by modal expressions in Danish. From my presentation of (3)-(6) it could be inferred that I am going to talk only of alethic properties. This inference is not true. I have used (3)-(6) in order to illustrate the shifts which are an integrated part of the valuation rules of possible world semantics and which is a consequence of the view that modality is quantification over possible worlds. But all types of shifts referred to so far are characteristic not only of alethic necessity and possibility, but also of other types of modal logic properties, and especially of the corresponding epistemic and deontic properties, cf.

9. The semantic value of modalized expressions is often formulated in terms of an accessibility relation R which states that the world w_i is accessible from the world w_j, iff $R(w_j, w_i)$, cf. Montague (1974:109) and Hughes and Cresswell (1968:77). This relation can be used to restrict the range of the quantifiers in (5) and (6), i.e. to those worlds which are accessible from the world w_j. I will not introduce this complication in my discussion as I do not find it important for the issues I shall raise.

Hintikka (1962), Montague (1974:75 and 110), and Piéraut-le Bonniec (1980:25-38). What I am going to talk about is thus modal properties in this extended sense and the shifts they are claimed to produce between worlds, worldstates and points in time. As it is these shifts I am focussing on, and not the possibility of making a distinction between different types of modal properties, I will use the notions of possibility and necessity without making the more precise distinctions between 'alethic necessity', 'epistemic necessity', 'deontic necessity' and so forth.

3. PROBLEMATIC CASES

(7) a. John kommer derhenne.
'John comes over there'
b. Det er nødvendigt at John kommer derhenne.
'It is necessary that John comes over there'
(8) a. John kommer imorgen.
'John comes to-morrow'
b. Det er nødvendigt at John kommer imorgen.
'It is necessary that John comes to-morrow'.

I take these sentences to be assertions about John's coming. In (7a) this event is located in space relative to the location l_s of the speaker by means of the deictic expression *derhenne* ('over there'). In (8a), John's coming is located in time relative to a time-interval today containing the time dimension of l_s. (Notice that I am using l_i as a variable over specific spacetime locations). A modalized version of (7a) and (8a) is given in (7b) and (8b) respectively, and the modal expression *nødvendigt* ('necessary') is supposed to assert the necessity of John's coming at the indicated locations. However, while (8b) is quite natural, (7b) is semantically impossible (henceforth: unacceptable), given the intended sense. This kind of unacceptability is not restricted to contexts containing the word *nødvendigt* ('necessary'). The same problem arises with (9) and (10):

(9) John må komme derhenne.
'John must come over there'
(10) John skal komme derhenne.
'John shall come over there'

Both (9) and (10) should be taken as assertions which assert some kind of necessity of an event located close to l_s, in fact so close that the speaker could have used (7a). In this interpretation (9) and (10) are just as unacceptable as (7b).

Let us now look at the possible worlds account of necessity given in (5). This account says that the reference point of a modalized expression is a specific world-state ‹w,t›. In terms of my account of (7)-(10) we can say that w is w_0 and that t is the time of l_s, i.e. ‹w_o, t_s›. Such a modalized expression is true if and only if the unmodalized expression is true at: ‹w_o, t_s›, ‹w_o, t'›, ‹w', t_s›, and ‹w', t'› where w' is any member of W except w_o and t' any member of T except t_s. But given the facts

pointed out in relation to the unacceptability of (7b), (9), and (10), this characterization of the evaluation points is too inclusive. The first and the third case, where t_s is identical with the point of time in 1_s, do not correspond to an acceptable interpreation of the modalized sentences.

The point just made in relation to (7)-(10) can also be made of (11)-(13):

(11) Jeg indrømmer hermed at jeg tog fejl.
'I hereby admit that I was wrong'
(12) Det er nødvendigt at jeg hermed indrømmer at jeg tog fejl.
'It is necessary that I hereby admit that I was wrong'
(13) Det er muligt jeg hermed indrømmer at jeg tog fejl.
'It is possible that I hereby admit that I was wrong'

If (11) is true at $\langle w_o, t_s \rangle$ it is an assertion about an event happening at $\langle w_o, t_s \rangle$. The fact that this event is of a rather special type which is described by a performative verb does not matter in this context. What is more interesting is the fact that neither (12) nor (13) is interpretable if the evaluation point of the embedded sentence is $\langle w_o, t_s \rangle$, that is, the same point as the index of the modalized sentences. And the evaluation point cannot be shifted because of the strong relation between 1_s and the adverb *hermed* ('hereby'). Thus (12) and (13) have no interpretation at all if they are taken as assertions about the necessity/possibility of a particular state of affairs.

So far, I have argued that if a modalized sentence is asserted to be true at $\langle w_o, t_s \rangle$, then there are at least some sentences which do not allow a reading in which the unmodalized embedded sentence is true at either $\langle w', t_s \rangle$ or $\langle w_o, t_s \rangle$. Such cases should be explained, if possible, by a good semantic theory of natural language. However, it is not an explanatory theory I would like to defend on the basis of the restricted type of shifts described in this section. I only want to use them as part of an argument in favour of situations and thus against possible worlds. This argument is presented in the next and last section of my paper.

4. WORLDS OR SITUATIONS

One of the basic ideas of world semantics is that intensions are accounted for by assignments of multiple reference to the same expression, cf. van Benthem (1985). That is the reason why modalized expressions are allowed to range over a set of evaluation points. It is however not clear why the multiple reference should be formulated in terms of worlds and not in terms of any other kind of entity, e.g. a situation.

As far as I can see, the cases discussed in section 3 point in the direction of situations. In the case of (12)-(13) the unacceptability is clearly not due to the structure of w_o or any other world. It is also clear that (11) can be used at any point in time and that it describes a situation which is part of the region defined by 1_s. One might think that it is the type of situation described by the performative verb which makes the modalized expressions unacceptable. However, a sentence like (14) is acceptable:

(14) Det er nødvendigt at jeg indrømmer det.
'It is necessary that I admit it'

So, a performative verb can be used in a sentence embedded under modal operators. But if the index of (14) is $\langle w_o, t_s \rangle$, then this point is not included in the evaluation points of the embedded sentence. (14) can only be understood in a way such that the act of admittance happens at a later point in time than that which is part of 1_s. It could still be argued that it is the performative properties of (11) which make (12)-(13) unacceptable. However, as I pointed out in relation to (7)-(10) the problem exists in cases where the verb has nothing to do with a performative verb. (11) is thus just an extreme case of a general constraint, a constraint which should disallow a modalized expression to be evaluated at 1_s. Such a constraint is however rather strange in a world account of modalized expressions because the multiple reference needed in order to account for intensions is claimed to be worlds. As I have just argued it is not the reference to some world which has to be disallowed, it is the reference to a part of any world having speakers in it. And the part which has to be excluded is not any particular kind of state of affairs, but any state of affairs which is located in a particular way to 1_s. If this analysis is accepted it should also be evident that the notion of a world is not necessary to capture the factual referential power of the modalized expression discussed in section 3. What matters is a located entity, i.e. a situation. That is the reason why the problematic cases point in the direction of situations.

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MODALITY AND POLYPHONY
A STUDY OF SOME FRENCH ADVERBIALS

by
HENNING NØLKE

0. INTRODUCTION

Since Aristotle, modality has been subject to numerous studies by philosophers, logicians, semioticians and linguists. Human beings are not satisfied with reporting cold facts about the world. By various means, they comment on what they are saying, they show it in a certain light: they use modalities.

It has often been pointed out that the so-called sentence adverbials modify different aspects of the sentence or the utterance. My aim in this contribution is to study this modal function. A first and necessary task will be, however, to delimit the very notion of modality. Not every linguist, and especially not every logician, is likely to think of sentence adverbials as expressing modalities. It is in fact interesting to notice how much linguists' – often intuitive – conceptions of modality may diverge. In the first section, I shall therefore discuss some definitions of modality which have been suggested, in order to specify my own standpoint. I propose to distinguish *illocutionary modality* from *locutionary modality*. Operating a further distinction between asserted and non-asserted modality, I shall, in the two following sections, outline a polyphonic analysis of each of the two categories in their non-asserted variants as they are expressed by French sentence adverbials. This approach may be seen as an alternative to more logically based descriptions. Presumably, many details in the linguistic realization of the modalities will show considerable deviation from one language to another (even between closely related languages), but the principles of the analyses should be universal.

1. MODALITY IN LINGUISTICS

Interestingly enough, linguists speak rather often about a given notion as if everybody knew exactly what it covered, even when a superficial examination would disclose fundamental disagreement. This is also true of the linguistic notion of modality. Maybe linguistics is not a natural science (Hjelmslev would not have been glad to hear that), yet one should attempt to be as precise as possible in what one is talking about. This is what I shall try to do in this section.

1.1 SOME DEFINITIONS OF MODALITY

Although most linguists do not define their use of 'modality', they seem to adhere to an idea of it as a sort of projection of the logical notion of modality (as defined in modal logic). But sometimes modality has also been closely connected with grammatical mood (subjunctive, indicative, etc.), more or less directly with speech acts or even with speech act conditions in a broad sense (e.g. the "Text Modalities"). This conception is reflected for instance in the definitions of the notion given by some French dictionaries. Thus *Le petit Robert* defines "la modalité" in this way: "Forme particulière d'un acte, d'un fait, d'une pensée, d'un être ou d'un objet". Even linguists who actually have endeavoured to characterize their use of the notion tend to differ in opinion. Let us glance at some definitions.

In his comprehensive work on semantics, Lyons (1977) mentions the term *modality* in many different connections. He seems to agree with Kuryłowicz, for whom linguistic modality is characterized by the fact that it involves subjectivity (glossed by Lyons as "the expression of the speaker's attitude" (p. 792)). Lyons operates with three modality scales, namely 'wish/intention', 'necessity/obligation' and 'certainty/possibility', but he also talks about 'command' and 'interrogation' as modalities. He does not always distinguish modality and *mood,* and he has a chapter that treats "Tense as modality" (17.3). Finally, the last chapter of his book is devoted to a discussion of the locutionary modalities. It seems to me that Lyons' rather heterogeneous treatment of modality mirrors the state of the art. The relation between the different points of view is far from clear.

We find a more recent and exhaustive analysis of modality in Perkins (1983). Perkins focuses on linguistic forms in English capable of expressing modality. He provides a systematic and theoretically coherent explanation for the use of a wide range of modal forms (including "Modal Adverbs" and tense). His basic definition of modality is borrowed from the logician Rescher who writes: "When ... a proposition is ... made subject to some further qualification of such a kind that the entire resulting complex is itself once again a proposition, then this qualification is said to represent a *modality* to which the original proposition is subjected" (Rescher 1968:24, quoted from Perkins 1983:8). Perkins discusses the relationship between modality and speech acts in Searle's sense and shows some affinities. His conclusion is however that modality should be kept theoretically apart as a "single conceptual system which takes on different characteristics according to the various other semantic and pragmatic systems with which it intersects" (ibid. 18). Thus for Perkins modality is basically a logical concept.

In the French linguistic tradition, modality is clearly connected with speaker attitude. Thus Benveniste, whose definition has become classic, defines the category of modality as an "assertion complémentaire portant sur l'énoncé d'une relation" (1974:187). In Anscombre's interpretation of this definition, the idea of speaker attitude is quite clear:

> "Si on entend par *modalité* toute marque linguistique indiquant l'attitude du locuteur par rapport à sa propre énonciation, on peut alors classer les modalités en trois grandes classes, selon ce qu'elles modifient dans l'énoncé" (1980:94).

In this spirit, Anscombre is calling e.g. the adverbial *ouvertement* a constituent modality. Here we are far from the logical definition, and furthermore one should notice that modality has become a syntactic category in Anscombre's pen. We are actually faced with another widespread obscurity in linguistic treatment of modality. Is it to be conceived of as a lexical, a syntactic or a semantic category?

1.2 MODALITY AS A LINGUISTIC CATEGORY

A few authors have analysed the different linguistic approaches to modality. Parret (1976) distinguishes four "levels" of modality theories. First the "lexical level" which is the one with the classical grammatical approach. The modalities are identified with the modal auxiliaries (*can, may, must, will, shall*) and eventually the so-called secondary modals (*could, might,* etc.). A deeper level is the propositional one. This is where we find e.g. Perkins' work (cf. *supra*). Then we have the illocutionary level, and finally a fourth level superimposed on the three others, which Parret calls the "axiological level". This seems to be his personal invention, and does not show any clear correspondences with more widespread treatments. It is supposed to explain observations on the three other levels.

In a recent article, the logician Gardies has paid special attention to the problem of defining the linguistic category of modality. His conclusion is rather discouraging. He shows that neither the narrow Aristotelian definition nor the broad speaker oriented one which defines modality as "any modification of a propositional content", makes possible a rigorous demarcation of the linguistic facts normally referred to as instances of modality. I find it very interesting to notice that Gardies seems tacitly to presuppose the existence of a certain consensus between linguists as to the extension of the notion of modality. In fact, what he is saying is that no equivalence can be established between this (supposed) factual extension of modality and the extension generated by any existing theory.

1.3 MODALITY AS SPEAKER ATTITUDE

I shall adopt the broad definition of modality emanating from the French linguistic tradition. To me *modality* is thus a semantic category which may have different lexical (and syntactical) manifestations, i.e. it may be lexicalized. As we know, the lexicalization may follow different patterns from one language to another, but the modalities themselves are supposed to be universal. This seems to be the common conception of the ontological status of modality. Thus Perkins talks about "modal expressions" for the linguistic realizations of modality. I shall adopt this terminology.

But "speaker's attitude to what he is saying", properly speaking, what does this formulation signify? To avoid a vicious circle, we must obviously presuppose the existence of some kind of unmodalized content, namely the "what he is saying". However, then we have to make a crucial decision: What is the status of this unmodalized expression? Does it have empirical reality? Or is it just a theoretical construct within the frames of our model? This is a question that any theory of modality would have to answer. However, since it is not my purpose in this article to create a complete theory of modality, I shall opt for the latter solution without argumentation.[1] Consequently, I take any utterance to be modalized. Thus it may be analysed recursively into some kind of "content" (which is a theoretical construct) and a modality applied to this content. The general formula is:

(1) M(p)

where M symbolizes the modality and *p* the content.[2] We may allow for "neutral modality", for instance in mathematical theoremes,[3] but the general hypothesis is:

(2) The speaker always indicates an attitude towards what he is saying, and thereby he modifies (or modalizes) his *act of saying.*

1.4 A FUNCTIONAL CLASSIFICATION OF MODALITIES

Obviously this characterization of modality relates it to the notion of *speech act,* and there seems in fact to be a mutual influence between these two phenomena. One can look at this relationship from different angles. In a cogent theoretical approach, Durst-Andersen (to appear) has shown how the notion of modality may be seen to have explanatory power in an analysis of speech acts. My concern is different, what is important to me is the fact that modal expressions may modify speech acts in a number of different ways.

It turns out to be relevant to distinguish two categories of modalities according to their manner of influencing the speech act. I shall label them *locutionary* and *illocutionary* modalities, respectively. The former category depends on the notion of truth-value and corresponds, roughly speaking, to the modalities of modal logic (or

1. Perkins seems to take it for granted that this "unmodalized expression" has some kind of empirical status. After a discussion of its nature, he concludes: "We have now established that the kind of 'thing' which can be seen as being subject to modality is either an event or a proposition" (1983:8).
2. Note that this formula, due to the built-in recursiveness, allows for the existence of modalized arguments in the logical structure. Incidentally, it also appears to be compatible with Rescher's definition (see 1.1).
3. Even though I am not convinced that this is necessary.

more precisely to their linguistic counterparts). The illocutionary modalities, on the other hand, have to do with the communication conditions.[4]

It appears to be essential to operate with a further division which cuts across the first one, and which has often been neglected. Speaker may in fact present his attitude to what he is saying in two different ways. He may assert it, thus presenting it as a new fact which he is ready to defend, i.e. to discuss,[5] or he may just add it as a sort of extra commentary. It is characteristic of non-asserted attitudes that they cannot be brought in as the direct focus. This is a fundamental property of sentence adverbials which distinguishes them from their sentential paraphrases:

(3) a1. Peter has probably left Paris.
a2.* Peter has not probably left Paris.
b1. It is probable that Peter has left Paris.
b2. It is not probable that Peter has left Paris.

All too often philosophers and linguists who have dealt with modalities have overlooked this difference. Most analyses have in fact concentrated on asserted (locutionary) modalities, and sentences like a1. and b1. have been considered as mere paraphrases. However, as pointed out by Lang (1979), the difference in status of the sentence adverbials and their paraphrases have many important implications, and neglecting these differences may lead to doubtful analyses.

By combining these divisions, we arrive at the following classification of modalities based on their functional properties vis-à-vis the speech act:

(4)

Modality	+ asserted	− asserted
Locutionary	modal verbs and so on	adverbials .....
Illocutionary	? ? ?	adverbials .....

Whereas a vast number of morphemes seem to cater for asserted locutionary modality, I am not sure that there are any asserted illocutionary modalities. Some uses of the future tense as in (5):

4. Jacques (1983), who works in a "socio-pragmatic" framework, has suggested a similar distinction. He talks about *"modalités d'énoncé"*, which "déterminent à tout moment comment A et B situent ce qu'ils disent par rapport à la vérité, la fausseté, le doute ou la certitude" and *"modalités d'énonciation"*, which "correspondent à la relation interlocutive".
5. Or as Galmiche puts it: "De manière schématique: faire une assertion, transmettre une proposition, c'est s'engager dans un processus qui a pour but de changer le *savoir* de l'interlocuteur, savoir que l'on peut se représenter comme un univers de croyance c'est-à-dire un ensemble de propositions" (1985:64).

(5) Ça fera 100 francs.[6]

and phrases like the ones underlined in the following samples:

(6) *Si tu as soif,* il y a de la bière au frigidaire.
(7) *J'en mettrais ma main au feu que* tu reviendras.

might be candidates. If under closer analysis these illocutionary modalities turn out to be non-asserted, a hierarchical classification would be more appropriate. This would not affect my main point, which is that the two distinctions must be made in a functional description of modality.

I shall concentrate on the non-asserted modalities as they manifest themselves in French adverbials. First, I propose a polyphonic analysis of illocutionary modality, and then I shall sketch an analysis of the locutionary modalities, using the same theoretical framework. Finally, I briefly discuss an extension of this analysis to covering asserted locutionary modalities as well. We thus end up with the outlines of a new and purely linguistic approach to modality.

2. ILLOCUTIONARY MODALITY

Illocutionary modality lends itself to pragmatic analysis. Also, there exist some studies in the field already. In fact, two good reasons for starting with this type.

2.1 SOME EXAMPLES

An essential property of natural language is its faculty of referring to itself. Speakers have at their disposal a variety of means for commenting not only on what they are saying but also on their own speaking action. Insofar as this commenting modifies the speech acts, we are faced with modalities according to the characterization given above (in (2)).

A certain group of adverbials seem to have specialized in modifying the illocutionary act. Here are some examples:

(7) *J'en mettrais ma main au feu que* tu reviendras.
(8) *Franchement,* ce roman est excellent.
Blague à part, tu es un chic type.
(9) *Entre nous,* tu as eu tort de refuser.
Entre nous, quel âge me donnez-vous?

6. Developing an idea from Nef (1986), Nølke (1987a) discusses a distinction between locutionary and illocutionary uses of "le futur" in French.

(10) Comment se servir d'Oil of Olaz?
A mon avis, le mieux est de l'appliquer chaque matin et chaque soir sur le visage, sans oublier le cou.
(11) *frankly*
sincerely
in my opinion
(12) *schliesslich* (German: 'after all')
übertrieben gesagt ('to put it bluntly')
meiner Meinung nach ('in my opinion')
(13) *mezdu nami govorja* (Russian: 'between us')
po moemu ('in my opinion')
pravdû skazat' ('to tell the truth')
(14) *a dir vero* (Italian: 'to tell the truth')
secondo me ('according to me')
(15) *ærligt talt* (Danish: 'frankly')
rent ud sagt ('honestly')
når alt kommer til alt ('after all')

All the emphasized words and phrases in these examples are used to modalize the act of saying and are examples of illocutionary modalities. Text (7) illustrates the fact that not only adverbial constructions can express illocutionary modality.

2.2 ILLOCUTIONARY ADVERBIALS (IAS)

Lingusts working on adverbials have proposed more or less elaborate descriptions of examples like (7) through (15). Most of them simply say that these adverbials qualify the act of saying and not what is actually said. This is surely right, but what exactly does it mean? In two studies on these adverbials (Nef and Nølke (1982), Nølke (1985a)), Nef and I have shown that one should distingush carefully between locutionary and illocutionary modification. The remarks and examples in this section (2.2) are based on these two studies. Contrary to what most linguists have (or seem to have) thought, it appears to be a question of *illocutionary* modification in the above examples. As we shall see, these modalities work on the illocutionary conditions, and consequently I have proposed to call them *illocutionary adverbials* (IAs).

But first we should attempt to be more precise about the extension of the category. We may qualify our act of saying in at least three different ways:

(8) *Franchement,* ce roman est excellent.
(16) *En deux mots,* ce roman est excellent.
(17) Je l'ai vue à la gare. Elle n'est *donc* plus malade.

While *franchement* modifies the illocutionary act, *en deux mots* applies to the presentation of the utterance, and *donc* rather to the locutionary act. All three adverbials work on the act of saying, so to speak, but only the first one expresses illocutionary modality. *Donc* is an example of a connector. These have been the subject of intense studies quite recently. It has been shown that, as a general rule, they take speech acts as their scope. Their main function, however, is to bind the discourse together, and a possible modal function will always be secondary (cf. Nølke (1985a)). A fourth adverbial category might be taken into consideration:

(18) *Stylistiquement,* ce roman est excellent.

Stylistiquement is a domain adverbial. It produces the thematic dimension of the speech situation (in Bartsch's sense, see Bartsch (1984)), but has no direct influence on the illocutionary act. In French (and probably most other languages), the four adverbial categories represented in the above examples show slight syntactic and distributional differences, which constitutes a further argument for keeping them separate.

In order to account for the illocutionary modification carried out by the IAs, Nef and I have introduced a two level model. At the first stage, the abstract sentence (made up by grammatical rules, and evaluated in terms of grammaticality) is equipped with a *locutionary marker* which provides the locutionary context including information about location, time, speaker and hearer. The result is the "raw utterance". This is the place where truthvalue can be decided. At the second state, the *illocutionary marker* is attached to the "raw utterance". It provides the illocutionary situation with all the situational components (including co-text and (other) information about the illocutionary force). The result is the utterance, evaluable in terms of acceptability. Evidently, the IAs are treated in connection with the illocutionary marker.

A scrutiny of the IAs now reveals that they are never able to change the illocutionary type. On the other hand, they only accompany some of the types. Normally they combine without problems with statements, questions and most performatives, but they very rarely accept directives. These constraints, as well as the modal function of our adverbials, can be adequately described by appealing to the notion of instruction. In this terminology, every language atom is equipped with a set of instructions concerning its syntactic, semantic and pragmatic use. The IAs only work at the second level of our model. They give instructions about how the ("already created") illocutionary act is to be interpreted. It has been shown that in most cases these instructions are intimately connected with the principles governing the interpretation. It is even possible to make a subcategorization of the IAs based on Grice's maxims (cf. Nef and Nølke (1982:48), Nølke (1985a:116-117)). Thus *franchement* emphasizes the sincerity, whereas *tout bien considéré* is concerned with evidence. A small group (including *entre nous, à mon avis,* etc.) have a slightly different function. They comment on the relation between the author and/or the addressee and the illocutionary act. Let me terminate this brief survey of our former

analyses with an example of an instruction quoted from Nef and Nølke (1982):

(19) En disant *"Entre nous, ph"* l'énonciateur présente le destinataire comme réduit au seul allocutaire.

This formulation actually makes use of polyphonic terminology, although we did not provide a real polyphonic analysis in that article. Roughly speaking, what (19) says is that *entre nous* specifies that the utterance of *ph* is meant only for the addressee's ears, i.e. in all confidence.

2.3 THE CONCEPT OF POLYPHONY

I shall try to elaborate this insight by reinterpreting our analyses in a genuinely polyphonic framework. In order to do so, I shall first have to introduce some polyphonic terminology. Inspired by some of Bakhtin's writings, O. Ducrot and his disciples have recently developed a linguistic theory of polyphony. The basic idea[7] is that they give up the oneness of the speaker person, which for most linguists (and philosophers, for that matter) is an axiom. According to Ducrot, the author of an utterance, the *speaker* ("le locuteur"), may put several "actors", called *enunciators* ("les énonciateurs"), on the stage, each one communicating a certain act, i.e. a (propositional) content presented in a particular way. By doing so, the speaker pursues his own discursive aims. He has a series of different tactics at his disposal. He may for instance associate himself with or dissociate himself from each particular enunciator, or he may merely let this relation remain vague. The syntactic negation gives us a simple example of how this works:

(20) Peter is not tall; on the contrary, he is very small.

Certainly, the fact of Peter's being very small is in no way "contrary" to his not being tall. The polyphonist would say that the utterance of 'Peter is not tall' contains two assertions due to the presence of *not*. One actor, e_1, asserts that Peter is tall, another, e_2, refutes this assertion. Evidently the speaker of (20) associates himself with e_2 and dissociates himself from e_1. It is now a noteworthy property of the connector *on the contrary* that it connects to the underlying assertion, so to speak. Incidentally, this analysis may also explain some pragmatic properties of the negation. Since the speaker presents 'Peter is tall' as asserted by someone else, very often the adressee will suspect that this 'someone else' might be him.

It is important to note that the polyphonic theory does not respect the traditional division of linguistic analysis in lexical, syntactic, semantic and pragmatic levels. It permits us to describe existing relations between these levels in a very precise manner. Nevertheless, the theory is entirely linguistic insofar as it deals with the analysis of purely linguistic phenomena. Many such phenomena seem in fact to

7. For a more detailed account, see Ducrot (1984:ch.VIII).

exhibit polyphonic properties. To mention but a few, this is true of most connectors and of some aspects of the grammatical mood system in French. As we shall see (cf. (24)), even the interrogative speech act has received a polyphonic analysis, which appears to explain in a surprisingly simple way most of the observations we find in the linguistic literature about questions and answers.

2.4 A POLYPHONIC ANALYSIS OF THE IAS

Let us now have another look at the IAs. What exactly do they modify? Certainly not the utterance itself. Nor do they influence the illocutionary type:

(21) a. Franchement, ce roman est excellent.
b. Ce roman est excellent.
(22) a.Entre nous, quel âge me donnez-vous?
b. Quel âge me donnez-vous?

(21) is an assertion with or without *franchement,* and *entre nous* does not change the question in (22) into another illocutionary type. But the IAs modify the illocutionary situation, or more precisely they work upon the felicity conditions in Searle's sense. This is why they influence the *intensity* of the act. As we have shown (Nef and Nølke (1982), Nølke (1985a)), some of the IAs (like *franchement* 'frankly') intensify it, whereas others (like *si j'ose dire* 'if I may say so') attenuate it. In this respect, they differ radically not only from connectors but also from adverbials like *bref* ('in brief'), whose function is to comment on the form of the utterance and also on its function in the argumentative chain. None of these adverbials modify the illocutionary conditions.

On the other hand, what all these adverbials have in common is their status as not asserted. Sentence adverbials are in fact the main means at speaker's disposal for conveying not asserted comments on his own speech act. One important corollary of this status is that IAs cannot perform independent illocutionary acts. This means that our formula permits only one act in this case:

(1) M(p),

where M symbolizes the adverbial and p the "what it is working upon". It follows from our discussion of the examples in (21) and (22) that *p* is an illocutionary act when M is an IA.

How can this insight be described in a polyphonic framework? To simplify, we shall first consider the case where *p* is a simple statement. Take (8):

(8) Franchement, ce roman est excellent.

The speaker, L, of (8) presents two enunciators, namely e_p, who asserts *p*, and e_M, who comments on e_p's assertion. Both enunciators are associated with L, but not in

the same manner. Non-asserted attitudes are void of time and author indications (cf. Doherty (1985:22)), and these coordinates therefore depend conventionally on speaker identity. Hence, it is by virtue of M being not asserted that e_M is directly associated with L. One may say that M provides a direct representation of the speaker subject in the text. E_p, on the other hand, is associated with L due to what seems to be a general rule about assertions. When an utterance conveys just one simple assertion, i.e. without any special polyphonic markers,[8] the enunciator of the assertion is always associated with L. E_M and e_p are thus associated with L for different reasons. But this is not all that there is to it. Scrutiny would reveal that even their manner of association is different. A deeper analysis would have to distinguish different kinds of 'speaker' and would thereby be able to explicate our intuition of e_M putting the speaker subject more directly on the stage.

However, instead of developing this point here, I would like to consider some more complicated examples. What if *p* is not a simple statement but a complex illocutionary act? We have seen that e_M comments on the illocutionary act taken as a whole. In general, the adverbial is attached to the completed utterance by modifying its illocutionary conditions. Therefore, if *p* is complex, L uses e_M to comment on the roleplay he has started up himself. But what exactly is the scope of this commentary?

Before we answer this question, a proviso might be in order. Apparently, the IAs do not really accept such complex structures in general. This might be one of the reasons for the distributional constraints we have observed (cf. Nef and Nølke (1982), Nølke (1985a)). Text (23a), for instance, (where the 'conditionnel' creates polyphony, see note 7), demands a rather special context:

(23a) Franchement, le président serait parti.

However, I shall argue that this fact is rather due to inherent semantic properties of the IAs. (23b) is much easier to imagine:

(23b) Entre nous, le président serait parti.

It is also noteworthy in this connection that IAs combine without problems with questions, which are polyphonically complex. According to Anscombre and Ducrot, any 'yes'/'no' question – *p*? – presents three enunciators (1983:130):

(24) a_1 : e_1 asserts *p* in advance.
a_2 : e_2 expresses incertitude with respect to *p*.
a_3 : e_3 demands the interlocutor to choose between giving an answer of the type *p* or giving an answer of the type *non-p*.

8. The French 'conditionnel' is an example of a polyphonic marker:
(i) Le président serait parti.
The speaker of (i) rather reports someone else's assertion.

What are the IAs apt to modify in this complex? Crude considerations of space forbid me to give this problem the treatment it deserves,[9] but I would like to draw attention to some data which appear to constitute supporting evidence for the polyphonic approach. Consider (25):

(25) Franchement, la trouves-tu belle?

When combined with assertions, *franchement* signifies that the speaker is frank. In (25), however, L adds the adverbial as a request to his interlocutor of giving a frank answer. Why is that so? In a certain sense, the three acts in (24) are hierarchically ordered, a_3 being outermost.[10] Now, obviously only a_3 is relevant to the analysis of *franchement*, which is a sort of manner adverbial entering this act. An appropriate gloss could be: "Answer frankly!".

What we have observed here may apparently be generalized. In most cases (or always?) polyphonic structures turn out to display a hierarchic order, and non-asserted modalities seem always to work upon the outermost act. This should not surprise us, for non-asserted modalities will generally tend to be the outermost elements because of their direct dependence on the speaker coordinates. This is why they normally do not accept semantic subordination, e.g. in presupposed fragments (see also 3.2).

To sum up, IAs are not overt polyphonic markers. But they interact directly with the polyphonic structure of the utterance. Because they are not asserted, they are always associated with the speaker, and they always work upon the outermost act in a complex polyphonic structure. Their semantic function is to modify the intensity of the illocutionary act, and they do so by modifying the felicity conditions via an explicit appeal to already implicitly existing conversational principles. Thus they exploit a quite fundamental and well-known principle governing all speech: By making an explicit reference to some (normally) granted condition, you make its validity doubtful. When you say "no doubt", it is just because what you say may be doubtful.

3. LOCUTIONARY MODALITY

It will not be possible here to mention the numerous studies that locutionary modality has been subject to. I shall confine myself to sketching a possible polyphonic analysis of non-asserted locutionary modality and to hinting at an extension of the treatment to covering asserted modality too.

9. The problem of non-asserted modalities in questions is examined in Nølke (1987b; in preparation).
10. This is my personal interpretation, but one might note that linguists who (mistakenly) have analysed 'yes'/'no' questions as being equivalent to alternative questions (giving no preference to either of the two anticipated responses), have actually only analysed this outermost act.

3.1 NON-ASSERTED LOCUTIONARY MODALITY: SOME EXAMPLES

It is primarily the so-called modal sentence adverbials (henceforth the MAs) that convey non-asserted modality. Here are some examples:

(26) *de toute évidence*
sans doute
nécessairement
probablement
peut-être
(27) *obviously*
hopefully
surely
perhaps
(28) *selbstverständlich* (German: 'of course')
vermutlich ('probably')
vielleicht ('perhaps')
(29) *konečno* (Russian: 'of course')
možet byt' ('perhaps')
navernoe ('probably')
(30) *forse* (Italian: 'perhaps')
senza dubbio ('no doubt')
probabilmente ('probably')
(31) *selvfølgelig* (Danish: 'of course')
sikkert ('to be sure'/'probably')
måske ('perhaps')

All these adverbials in some way (to be specified) modify the truth value of the utterance into which they enter. They should be kept apart from the "factive" or "expressive" adverbials like *heureusement*, which presuppose the propositional content of the utterance:

(32) Paul est heureusement revenu.

(32) presupposes that Paul has come back.

3.2 MODAL SENTENCE ADVERBALS (MAS)

For Greenbaum (1969), who was the first to present an exhaustive syntactic analysis of sentence adverbials, the MAs belong to the more general class of "attitudinal disjuncts". Since Greenbaum's now classic analysis, many linguists have studied the syntactic and semantic properties of the MAs. The interested reader may consult works like Bartsch (1976), Bellert (1977), Lang (1979), Melis (1983), Mørdrup (1976) and Schlyter (1977), to mention but a few. Here, I shall only point to some distributional properties of the MAs, which distinguish them from the IAs.

MAs and IAs of course share essential properties of sentence adverbials. They take all the sentence as their scope, their position is fairly free, they cannot constitute the (primary) focus of the utterance and so on. But unlike the IAs, the MAs can form an integral part of the sentence insofar as they do not necessarily influence the smooth intonation contour. In fact, a special position in the sentence structure near the verb seem to be predestinated for the MAs:

(33) Pierre est certainement revenu d'Afrique.

This observation has actually led some linguists to generate the MAs in this position (cf. e.g. Schlyter 1977). Note, however, that, apart from a small group including *nécessairement, forcément,* etc.,[11] the MAs always precede the negation in this position.

Most MAs have a semantic function close to that of the operators in modal logic. Most linguists have used them to exemplify their use of modal operators. In this vein, (33) may be given the (semi)formal interpretation in (34):

(34) CERTAINEMENT (Pierre est revenu d'Afrique)

However, whereas (34) may be a suitable interpretation of (35):

(35) Il est certain que Pierre est revenu d'Afrique.

it is certainly not adequate to (33). As a matter of fact, this formula does not account for essential characteristics of this sentence. Thus, the modality cannot be negated in it, and it cannot enter a presupposed clause:

(33a)* Quand Pierre revint certainement, nous étions déjà partis.[12]

(35a) Quand il fut certain que Pierre était revenu, nous étions déjà partis.

In brief, (34) should only be used to translate *asserted* modalities.

Perkins has suggested a much more sophisticated, logically based, linguistic analysis of the MAs. He states that they "all primarily express epistemic modality" (1983:89). This is in fact an important point to make. Perkins then shows that furthermore the MAs are characterized in comparison with other (locutionary)

11. Schlyter (1977), who has proposed an exhaustive generative analysis of the French adverbs ending in *-ment,* calls these adverbs "les adverbes sous la négation".
12. Note that (33) is not completely excluded from those (normally) presupposed clauses which are capable of receiving a "reported interpretation":
    (ii)? Je retrette que Pierre soit certainement revenu.
    It would be interesting to investigate why some normally presupposed clauses lend themselves to this special use more easily than others.

modal expressions by their being explicitly objective (apart from *perhaps* and *maybe*) and by their faculty of being "thematized, interpolated, or adjoined" (ibid. 104).

Perkins does not explain these findings. I shall argue that at least the two last-mentioned faculties follow from a more general property of the MAs: They are focus sensitive. This has been shown by Lang (1979) to be true of German sentence adverbials, and it can be demonstrated to hold for French adverbials too, although it is sometimes more difficult to spot the focus in the Romance languages, since the intonation is less operative there (the stress is not an automatic focus marker). Consider (36):

(36) a. Pierre n'a peut-être pas compris la question.
b. Pierre, peut-être, n'a pas compris la question.
c. Peut-être que Pierre n'a pas compris la question.
d. Pierre n'a pas compris la question, peut-être.

Unlike the three other examples in (36), b. would let it be inferred that other persons are likely to have understood the question.[13] But this kind of paradigmatic inference is always attached to the focus, so it seems fair to say that *Pierre* is in focus in this interpretation of b.

We now see that the interpolation and the adjoining of the MAs permit them to be placed close to the segment they are supposed to focalize. And it is surely not a mere coincidence that we so often find the MAs in elliptic constructions, which virtually consist of the bare focus.

3.3 A POLYPHONIC ANALYSIS OF THE MAS

The fact that MAs are focus sensitive has another important corollary. If we accept the widely held point of view that special focus assignment of the kind in question is not to be treated at the propositional level, then the MAs cannot be directly attached to the proposition. Consequently, any logical analysis that does not take into account the utterance act seems doomed to give only a partial explanation of their function in the linguistic context. On the other hand, the MAs clearly interact with the notion of truth value. In the two-level model introduced in 2.2, we can capture these properties by treating the MAs in connection with the *locutionary* marker, whereby they can be said to modify the locutionary act.

How can these ideas be spelled out in a polyphonic framework? Our basic formula:

(1) M(p)

13. See Nølke (1987b, in preparation) for the subtle differences between the three other examples, as well as for more evidence for the focus sensitivity of the MAs.

now symbolizes the "raw utterance" (see 2.2), which has not yet been subject to the illocutionary marker. M is a modal adverbial and *p* is a locutionary act. By definition, the speaker, L, is responsible for the utterance act, but he need not be the author of the individual acts conveyed by the utterance. This is the very idea of polyphonic theory. As a consequence, when M is a modal adverbial in (1), L is not necessarily associated with e_p. We shall see some cases where L exploits the possibility he has of modalizing an assertion more or less "put into the mouth" of someone else.

On the other hand, as M is not asserted, e_M is always associated with L. If first time round we stick to statements – in other speech acts, MAs are quite rare and have rather special uses – we end up with the following polyphonic description:

(38) A raw utterance of the type M(p), where M is a modal adverbial, presents two enunciators:
e_p asserts *p* and is not necessarily associated with L,
e_M comments on the assertion of *p* and is always associated with L.

Incidentally, (38) is just another way to say that M conveys an epistemic attitude.

To see how this works, let us consider *peut-être*, which is a particularly tricky MA.[14] Often, *peut-être* contributes in a pretty subtle manner to the discourse structure. For example, in concessive structures:

(39) a. Pierre est peut-être bête, mais il est riche.
b. Pierre est bête, mais il est riche.
c. Pierre est bête, soit, mais il est riche.

One of the functions of *peut-être* in a. is to allow L not to assume the responsibility of 'Pierre est bête'. If somebody should reproach him for thinking that Peter is foolish, then having uttered a. does not prevent him from retorting: "I never said that". This reply would scarcely be possible after b. In this respect, a. is close to c., where 'Pierre est bête' is explicitly conceded to the addressee. Hence, (39a) is an example of an utterance in which e_p is not associated with L.

As a matter of fact, *peut-être* seems often to call for a concessive continuation, even when this is not actually provided. We may say that polyphonic properties take over in these cases, where the bare logical value becomes secondary.

Text (40) is an even more striking example of polyphony:

(40) Peut-être que tu n'es pas sorti hier soir, mais, en tout cas, je t'ai vu au café.

This type is indeed quite frequent.

14. This adverbial is studied in Nølke (1987b).

Finally, the behaviour of *peut-être* in questions seems to produce supporting evidence for the polyphonic approach.[15] Consider (41):

(41) Pierre viendra peut-être demain?

Which of the three acts conveyed by the question is modified by *peut-être* in this example? Recall that the illocutionary adverbials work on the outermost act (a_3), namely on the request for an answer. Obviously, this is not the case of *peut-être*. Nor does this adverbial modify a_2 (the expression of incertitude). Consequently, to save the polyphonic analysis, we have to say that it modifies the "assertion in advance" (a_1). Does this fit our perception of the function of *peut-être* in (41)? Intuitively, what *peut-être* does in (41) is to mark out one of the two anticipated answers ('yes' or 'no'), but which one depends entirely on intonation and context. In the hypothesis that *peut-être* applies to a_1, this effect may be calculated by appealing to discourse principles. By showing doubt as regards the underlying assertion, L in effect queries the relevance of the very act of asking the question. For this reason, he appears to know the answer already, and the question tends to be rhetorical.

3.4 POLYPHONY AND ASSERTED MODALITY

These observations are by no means conclusive, but it seems to me that the explanatory power of the polyphonic approach justifies its introduction as an alternative to "classical" logical analyses.

Would it be possible to extend the unique account we have given of non-asserted modalities to cover the asserted modalities too? Of course, I cannot even think of providing here an answer to this overwhelming – albeit extremely relevant – question. What I would like to do, however, is to draw the attention to some evidence which seems to support this idea. In French, the use of the subjunctive mood is often triggered by the presence of asserted locutionary modalities. Consider the following examples:

(42) a. Peut-être que Pierre viendra demain.
b. Il se peut que Pierre vienne demain.
c. Il est possible que Pierre vienne demain.

In b. and c. the modality of 'possibility' is asserted, and the subjunctive is obligatory in these constructions. However, a general function of the subjunctive is to be the marker of a special form of polyphony, which, among other things, demands the presence of two assertions in the same utterance (see Nølke (1985b)). In a., we have

15. As a matter of fact, most MAs do not combine with question acts, and *peut-être* seems to have an "exotic" function in this context. Nevertheless, it gives food for thought that, whereas this marginal case does not seem to cause any problems to a polyphonic approach, no "classical" analysis has succeeded in explaining it.

only one assertion, and the subjunctive is excluded, but as soon as we have two assertions as in b. and c., the subjunctive appears. Is this a result of mere coincidence? Of course other demands must be fulfilled in order to obtain the subjunctive (*il est sûr que*, for instance, does not provoke it), but it seems to me that this observation stimulates further investigations in the outlined direction.

4. CONCLUDING REMARKS

After a discussion of different approaches that we find in the immense literature on the subject, I settled for a rather broad definition of modality as an expression of speaker's attitude to what he is saying. I proposed to distinguish four categories along two parameters: Modalities may be illocutionary or locutionary, and they may be asserted or non-asserted. The remainder of the article was devoted to the study of non-asserted modality as it finds expression in the French sentence adverbials.

But first I had to solve a methodological problem, because the logical apparatus generally adopted in most previous studies, which have concentrated on asserted, locutionary modalities, proved to be incapable of giving a satisfactory account of essential properties of non-asserted modalities. Starting with illocutionary modality, I proposed a pragmatic analysis using the polyphonic framework which at present is being developed in France by O. Ducrot and his disciples. As it seemed to give valuable new insight in the function of this type of modality, the study was extended to cover (non-asserted) locutionary modality as well. Finally, I hinted at a possible further expansion of the approach to cover all types of modality.

Obviously, this study has in no sense been conclusive. Many problems have just been grazed (e.g. the nature of the illocutionary acts within a polyphonic framework), and some kinds of modality have not even been touched. Take for example (43):

(43) Heureusement que Paul est toujours là.

Factive adverbials like *heureusement* probably express locutionary modality, but their function clearly differs from the one scrutinized in the third section. But, however sketchy, we have given the contours of an entirely new and purely linguistic approach to modality; an approach which, by its taking into account the traces left by the speaker in the text, may provide a unitary analysis of all the different modal expressions in human language. And it should be emphasized that the polyphonic framework resorted to is by no means *ad hoc*, since it has been elaborated for quite other purposes than ours. Only its application to modality is new.[16]

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MODALITY IN WEST GREENLANDIC AND JAPANESE

by
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1. INTRODUCTION

It has been tacitly assumed that 'modality' is a universal category in natural language. The direct or indirect connection between this semantic category and the subject-matter of modal logic has proved to be a more controversial question. When considering the morpho-lexical expression of modality it needs to be pointed out, however, that most of the natural languages discussed in this context have been Indo-European ones displaying clear-cut systems of modal verbs or their equivalent. Many other languages do not display such a morpho-lexically distinct category, and these include West Greenlandic Eskimo and Japanese.[1] The question I would therefore like to address here is as to the criteria that can be applied in delimiting the boundaries of the means for expressing this category when clear-cut morpho-lexical ones are lacking. In doing so I shall illustrate how distinctions of a modal nature in these two languages cut across those discussed by modal logicians and draw rather upon nuances of social validation (as regards deontic modality) and of different kinds of perceptual/inferential evidence (as regards epistemic modality). The position of alethic – and other kinds of 'objective' modality – within these natural languages is less than clear. Whether these nuances should be the concern of modal logicians must remain an open question.

2. WEST GREENLANDIC

As with all other varieties of Eskimo, 'modality' and 'mood' are two quite distinct matters in West Greenlandic: the former is an optional category expressed principally by derivational suffixes indicating degree of certainty/authority for assertion on the one hand and obligation/permission on the other. The latter category is grammatically obligatory and involves the choice of inflectional paradigm, as determined largely by the speech-act type being performed (though with the choice of subordinate moods being essentially a syntactic matter). What follows is, with few exceptions, strictly limited to modality as such.

1. Languages other than Indo-European ones may however display systems strikingly similar to the modal verbs of English and Danish: see Egerod (1984), for the case of Mandarin Chinese.

TABLE 1.

Epistemic modality in West Greenlandic:
1) Enclitic:
iserpo-rooq 'They say he has come in'
2) Adverbs/particles:
immaqa 'perhaps'; *tassaqa* 'hardly (sceptical)'; *taannaqa* 'as expected'; *sunaaffa* 'why (surprise)', etc.
3) Suffixes:
nille-runnar-poq 'it looks cold/must be cold'
qama-junnarsi-voq 'he is presumably out hunting seals'
kaman-naviannqil-aq 'sure he won't be angry'
api-nnguatsiar-poq 'it's probably snowing'
tamma-qqooqa-aq 'he must have got lost'
Københavnimii-ssa-aq 'he must be in Copenhagen'
Københavnimiis-sima-voq 'he's supposed to be/have been in Copenhagen'

atussannqit-sora-ara 'I don't think it can be used'
pingasuu-tip-pakka 'I thought they were three'
pitsaa-rpalup-poq 'it looks good'
palase-rpalup-poq 'he sounds/acts like a priest'
ane-rpallap-poq 'he could be heard going out/they say he has gone out'
ani-gu-joq 'at last he came out (as expected)'
qerrute-quna-aq 'watch out/there's danger that it might freeze solid'
tikik-kaluar-poq 'he has arrived all right, but ...'
pissa-ner-punga 'I wonder if I should do it?'
orlu-llassa-aq 'he's going to fall, just you wait and see'.

TABLE 2.

Deontic modality in West Greenlandic:
1) Suffixes:
iser-tariaqar-poq 'he must go in'
iser-tariaqa-nngil-aq 'he mustn't/need not go in'
Nuummukar-tussaa-vunga 'I am to go to Nuuk'
neri-ssa-atit 'you must/will eat'
nere-qqusaa-vunga 'I have been told to/asked to eat'
neri-tinneqar-punga 'I have been allowed to eat/fed'
2) Inflection:
iser-langa 'may I come in?/let me go in'

As can be seen from the examples on tables 1 and 2, the morpho-lexical means for expressing modality in West Greenlandic are fairly diverse, though suffixation dominates (all verbal forms cited – with one exception in the optative – are in the indicative mood). The translations are only approximate and do not always fully do justice to the nuance a particular suffix introduces. Thus *gunar*, the first epistemic suffix given, can either indicate inference from sensory perception (usually sight) or from more indirect and heterogenous evidence, and may refer to the present (first sense) or to the not too distant past (second sense). *junnarsi*, the second such suffix

given, indicates the second, less direct kind of inference but is limited by and large to on-going, present actions or states the speaker is not witnessing. Other dimensions of difference among the first group of suffixes here concern the speaker's degree of certainty and self-distancing from responsibility for the reliability of the assertion. Word-internally such suffixes must follow any tense suffix and form a coherent, more or less closed set filling a morphologically definable 'sentential affix' slot (see Fortescue (1980)).

The other suffixes illustrated do not form any coherent morphological sub-set. The first two are 'double transitive' relation-shifters, while the following two, *(r)palug* and *(r)pallag*, belong to a group of suffixes expressing appearances (through sight, hearing or verbal report) and attachable, with varying meaning, to both nominal and verbal stems. These all enter into the complex verbal base as part of the propositional content being expressed. In contrast to these, the last four suffixes illustrated are again 'sentential' but involve senses only partially overlapping with 'core' modal ones. They concern, for example, expectation (and futurity), warning, tentativeness and contrastive presupposition. The suffixes expressing deontic senses are all of the non-sentential type, except for *ssa*, whose principal function is to indicate futurity; *tinneqar* is for instance the regular combination of causative *tit* plus passive *neqar*. The distinction between *tussaa* and *ssa* is that the former indicates a 'planned' future event. In sum, we may say that it is not at all clear where to draw the line and state categorically that these suffixes and no others express modality in West Greenlandic – one could argue that at least fifty productive suffixes express some element of a modal nature (not to mention semilexicalized combinations of these elements amongst themselves). Even the epistemic sense of the coherent first sub-group of suffixes given on table 1 overlaps with that of certain enclitics and adverbials (the latter an open class) as illustrated.

Clearly then any attempt at delimiting the phenomenon in West Greenlandic must be made on semantic grounds – especially when one considers the intrusion of an item from the mood system (the optative form of the last deontic example), and the possibility of further drawing in the imperative mood here. But we have said nothing so far about 'alethic' modality, the concern with necessary as opposed to contingent/possible truth in which modal logic finds its historical source. Here I would follow Lyons and suggest that the expression of 'objective' modality of this sort is the product of long standing literate societies, especially those with traditions of philosophical/scientific investigation, and in many if not most natural languages cannot be morpho-lexically distinguished from subjective modality (see Lyons (1977), section 17.6, for a discussion of the distinction). Certainly West Greenlandic has numerous suffixes and constructions for expressing ability and the like such as *sinnaa* 'can' and, as is the case with deontic *sariaqar*, etc., these can doubtless be used in statements corresponding in sense to ones in English or Danish expressing 'objective' necessity or possibility devoid of any indication of specific subjective validation (authority for assertion/obligation). However, this is a rather open class containing such suffixes of potentiality as *ja* 'be liable to' and *juminar* 'be easy to' and syntagmas such as *-neq saperpoq* 'cannot/dare not' and *-neq artorpoq* 'cannot

(physically)' and is again a matter of propositional content rather than the illocutionary force of the utterance.[2] Perhaps Lyons is right when he suggests that alethic modality cannot be distinguished from objectively interpreted epistemic modality in natural language (which in turn he relates back to subjective deontic modality). What children learning West Greenlandic – as any other language – need to acquire here is the ability to express internal uncertainty and externally imposed obligation. The question is whether the adult language has *systematized* the means it disposes of to express these fundamental functions. In the case of West Greenlandic we may conclude that this is only marginally so, with a wide peripheral zone – largely consisting of suffixes – containing meaning elements that partake of these core functions but also overlap, with wider senses of potentiality. 'Objectivity' may be a scalar matter, more objective modal morphemes being absorbed into the verbal base (modifying the propositional content), and more subjective ones being expressed by 'sentential' suffixes later in the verb-form, indicating the speaker's attitude towards his utterance. In a sense the most 'subjective' expression choices of all, directly linked to illocutionary force, take place verb-finally, where mood is expressed by inflection.

3. JAPANESE

When we turn now to Japanese, a typologically quite different language, we nevertheless find a similar situation, with a still wider range of morpho-lexical means available for expressing modality. Again there is a broad peripheral area where modality shades into other functional categories. Table 3 illustrates the commonest means of expressing epistemic modality, while table 4 illustrates deontic modality.

Once more I should stress that these are not exclusive listings – the same problem of distinguishing 'core' constructions from more peripheral ones arises. The means for expressing epistemic modality are particularly varied, with pragmatic particles playing an interesting – though arguably peripheral – role (factors of sex, dialect and politeness are involved). There are again no modal verbs as such, certain syntagmatic constructions being the nearest equivalent to these in English. The construction I have labelled 'enclitic-adjectival' involves a small closed set of morphemes to do with appearances/authority for assertion, but, like their Greenlandic correlates (*(r)palug*, etc.) can be said to enter directly into the propositional content of utterances. The inflectional category represented is the so-called 'future', and the syntagmatic constructions can be literally glossed, respectively, as 'it is necessary', 'it is not even the case', 'there is no doubt' and 'who knows?'.

2. Generativists distinguish between epistemic and 'root' senses of modal verbs (see for example Jackendoff (1972:100)); the latter covers both deontic senses and ones of ability (for instance physical). Lyons does not discuss this last sense of certain modal verbs, which clearly seems to lie within the domain of propositional content rather than modality as such.

TABLE 3.

Epistemic modality in Japanese:
1) Inflection:
ikimash-ō 'shall we go?'
iku desh-ō 'he will probably go'
2) Syntagmas:
mō tsuite iru **hazu da** 'he must have arrived by now'
ame ga furu **mono de mo nai** 'perhaps it is raining (though I doubt it)'
Tōkyō ni iru **ni chigai nai** 'he must (certainly) be in Tokyo'
Tōkyō ni iru **ka mo shiranai** 'he may be in Tokyo'
3) Enclitic-adjectival:
ame ga furu **yō da** 'it looks like rain'
dekita-**rashii** 'it seems to have succeeded'
mō jiki ki-**sō da** 'he should come soon (they say)'
4) Particles:
ne, ga, no, wa, yo, etc. (final particles of speaker attitude)
kita **no sa** 'he has indeed come' (spoken by man, familiar speech)
konakatta **'tte** 'he has apparently not come' (spoken by woman)
5) Adverbs:
tabun 'perhaps', etc.

TABLE 4.

Deontic modality in Japanese:
Syntagmas:
*sō shi***nakute wa ikenai/naranai** 'he/one must do it'
sō shite **wa ikenai/naranai** 'he/one must not do it'
kasa o motte iku **to yokatta** 'you should have brought an umbrella'
sō suru no **wa yoku nai to zonjimasu** 'I (respectfully) don't think you should have done it'
haitte **mo ii da** 'you may come in'
*isoga***naku to mo ii da** 'you needn't hurry'
Ōsaka de nori-kaeru **no desu ka**? 'should I change trains in Osaka?'
sō hayaku yaru **wake ni wa ikanai** 'there is no need to do it so quickly'
*sō shi***nai wake ni wa ikanai** 'you must do it (there's no getting out of it)'
sō suru **beki/hazu da** 'you should do it'
sō suru **bekarazu/hazu wa nai** 'one must not do it' (the former on public notices)
*sō sur***eba ii da** 'it would be nice if you did it'
ikanai **hō ga ii** 'it would be better if you didn't go'
harau **gimu da** 'I am obliged to pay'
okane o karita **giri de wa nai** 'he cannot in all conscience loan money'
*haiken sa***sete itadakitō gozaimasu** 'may I take a look?'

As regards the deontic expressions the situation is thoroughly heterogeneous, since this is entirely a matter of syntagmas. Moreover – not surprisingly in the light of the complex social background of Japan – there are very subtle distinctions between constructions according to type of social validation/source of obligation, broadly interacting with factors of politeness, deference and social standing. Indirectness is of the essence in this semantic area and one cannot simply peel away the more flowery elaborations and hope to find a simple set of objective 'core' expres-

sions of deontic modality. Certain lexical items involved here require considerable knowledge of Japanese social values – in fact whole books have been written about the concepts of *gimu* and *giri* and related items glossable as 'duty'. The most common construction of obligation illustrated in the first two examples can be glossed as 'it won't do if you don't –' (and its converse 'it won't do if you –'). The most common expression of permission (fifth example) can be glossed 'even if you – it's all right'. The final example, a highly deferential request for permission (roughly 'I would graciously beg to receive permission to cast a humble eye upon it'), brings us right into the intricate 'politeness' system of the language, and one is tempted to continue into the area of imperative mood expressions so highly bound up with this system. This essential notion of 'system' will be returned to in the following section.

As is the case with West Greenlandic, Japanese also has various other 'root' modal expressions of ability and potentiality, including a 'potential' mood (*yomeru* 'he can read') alongside various syntagmatic constructions such as *yomu koto ga dekiru*, literally 'reading succeeds'. The expression of objective, in particular alethic, modality again seems a secondary development – significantly, perhaps, the commonest expression of necessity here is with *hitsuyō(da)* 'is necessary', a 'learned' loan-word from Chinese. Expressions with *hazu* 'obligation' (see tables 3 and 4) and *wake*, literally 'reason' (see table 4), may also approach the logical alethic sense of necessity. It should be realized, however, that the culturally determined parameter of (subjective) deference and distancing lies very close indeed to that of objective depersonalization: extremes meet. At all events we can state that expressions of modality in Japanese, as in West Greenlandic, do not form a systematic morpho-lexical category.

4. CONCLUSION

My conclusions are of a somewhat negative nature, for it would appear that the two languages under discussion – and doubtless many others – do not systematize the expression of modality, although clearly they are both capable of expressing a great many nuances of a modal nature in the absence of a closed system of modal verbs such as is found in most Indo-European languages. This is of course not just a peculiarity of language-specific expressions of modality. Also in other semantic domains what one language may systematize in terms of closed sets of (binary) oppositions may be expressed in another by open sets of morpho-lexically heterogeneous items. In West Greenlandic, for example, aspect constitutes such an open category, involving up to 50 or 60 individual suffixes (depending on how one defines 'aspect'). This situation is no more exotic than, to take the opposite case, the highly structured politeness system of Japanese already alluded to.

If we are to attempt drawing a boundary around expressions of modality in West Greenlandic and Japanese we must clearly rely on semantic and not morpho-lexical criteria, a viewpoint that can be maintained also in relation to Indo-European languages. It would seem, however, that the problem of the peripheral areas of overlap with other 'core' semantic functions can not be side-stepped, whatever

abstract semantic approach one might take. This is surely because modality in natural language can never be totally dissociated from language use. Even such an analysis as Lyons' (based on Hare (1970)), which draws upon pragmatic parameters (the speech-act 'topic', etc.), does not really get us much closer to the subtle functioning of modal expressions in language such as those we have examined. The principal problem is how to relate hypothesized underlying logical relationships to surface exponence in any useful way. Observe for example, the negative expressions of obligation in Japanese on table 4 (... *ikenai*, etc.). There is indeed a certain system to the constructional choices here, the corresponding double negative expression (*-nakute ikenai*) having the expected converse sense of negative obligation/permission. However, the logic here is the exact opposite of that of Lyons' abstract analysis: his '.!~p' turns up on the surface with a positive expression, whereas the corresponding negative expression must be analysed as '.!p'. In other deontic expressions the latter will however surface as a positive expression. Such purely surface idiosyncracies may be shrugged off by the theoretician more interested in underlying logical relations, but the fact remains that the expression of modality in natural language – especially in ones like West Greenlandic and Japanese – are subject to considerable lexicalization, serving highly nuanced social (and perceptual) functions. The logical manipulation of propositions is, after all, only one thing human beings do with natural language: there are other, socially determined functions which expressions of modality may serve. A distinction should surely be made between the semantic abstractions that interest logicians and the functions of natural language that include the expression of uncertainty, evidence and authority for assertion, obligation and the like; these shade off into yet broader functional areas and may or may not be morpho-lexically systematized in a given language.[3]

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3. Lyons' distinction between 'mood' – a purely grammatical (e.g. inflectional) category and 'modality', an underlying semantic area concerned with uncertainty and obligation and ultimately analysable with reference to language function (including but not limited to various types of inferencing and presupposing), seems to me a useful one (see Lyons (1977:841 ff.)). As Lyons concludes: "... modality as it operates in a good deal of everyday language behaviour cannot be understood or properly analysed otherwise than in terms of the indexical and instrumental functions of language."

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