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THE SEMANTICS OF MOOD, COMPLEMENTATION,
AND CONVERSATIONAL FORCE*

This paper presents a theory of mood which ties together its pragmatic and semantic significance. In the first two sections the subject matter and background assumptions of the study are specified. Section 3 outlines the syntactic distribution and conversational force of the indicative and subjunctive (in English and Italian), infinitives, and 'mood-indicating' modal *may*. Then section 4 gives a formal theory which predicts the operators under which each mood may be embedded. Finally, section 5 shows how the ideas developed thus far yield an improved understanding of non-assertive sentences.

1. PRAGMATICS AND SEMANTICS

Commands, questions, prayers, and acts of wishing affect a conversation in which they are used differently from assertions. While assertions function to add their literal meaning to the information in a discourse, the imperative (1), for example, apparently only adds a somewhat related proposition, that which might have been expressed by (2) in the same context.

- (1) Pull forward to the red line!
- (2) I command you to pull forward to the red line.

Unfortunately it is not clear whether the difference relates to the domains of semantics or pragmatics. Does (1) actually mean (2), and if it does, what is (1)'s relation to the morphologically, syntactically, and semantically similar embedded clause in (3)?

- (3) I demand that you pull forward to the red line.

The meaning of (3) is not 'I demand that I command you to pull forward to the red line'; so, if (1) means (2), it is impossible within a compositional theory to unify the imperative of (1) with the subjunctive in (3).

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However, saying that (1) and the complement clause in (3) are unrelated is not very satisfying, because the imperative is not the only non-assertive clause type with an embedded counterpart. Instead, as we will see, the existence of pairs like (1) and (3) is so common as to require an explanation.

The morphosyntactic categories of subjunctive, infinitive, and imperative are frequently used for non-assertive conversational acts, and have a complex syntactic distribution. This paper argues for several theses about the relation between the pragmatic concept of conversational force¹ and the linguistic category of mood:

- (4) Sentences of whatever mood have propositions as their meanings. CPs (complementizer plus S) are interpreted as propositional functions.
- (5) There are semantic differences among the types of propositions denoted, and these differences restrict the conversational force sentences may have.
- (6) Pragmatics further refines the way propositions of different sorts are integrated into discourse.
- (7) The semantic differences among moods contribute significantly to our understanding of their syntactic distribution.

The view articulated in (4)–(7) is that semantic distinctions are crucial for the understanding of differences in conversational force and syntactic distribution among clause types, but that there are purely pragmatic and syntactic factors at work as well.

Other views are possible. It would appear that in *On Interpretation* Aristotle (McKeon, ed., 1941) takes an extreme pragmatic view of non-assertive constructions, stating that the propositions, the sentences which “have in them either truth or falsity,” are what he is concerned with, “whereas the investigation of the others” – he gives the example of prayers – “belongs rather to the study of rhetoric or of poetry.” Frege’s concept of ‘force’ disallows the possibility of embedded force indicators (Dummett 1981, ch. 10), while Dummett’s reconstruction effectively treats force as a pragmatic notion. One type of intermediate approach is advocated by Lewis (1975), who suggests that a sentence meaning should be a pair of

¹ I should note that this concept of ‘conversational force’ is different from, though related to, that of illocutionary force. For example, (95) in section 4 is a central example of non-assertive conversational force, but is not usually treated within speech act theory.

a conversational force and a proposition. The conversational force would guide the use of the proposition; this seems to make the force a pragmatic object. Hausser (1983) looks at things slightly differently, acknowledging that a nondeclarative mood may add something to the semantics of a clause, but keeping the notion of force completely within pragmatics. In general, it is not clear how these approaches could explain the functioning of clauses both as they contribute to the compositional semantics of phrases they are contained in and as they operate when they stand on their own.

A smoother interface between compositional semantics and meaning-in-discourse results if one follows the recent trend of viewing pragmatics as manipulating essentially semantic objects. We can see many works, especially in the tradition of dynamic semantics (e.g. Kamp 1981, Heim 1982, and Groenendijk and Stokhof 1990), as exemplars of this idea. To accommodate non-assertions like (1), however, our understanding of these objects will have to be enriched. The result will be that a clause has to be interpreted with respect to a parameter, a modal accessibility relation R , which encodes the force of the clause. The nature of this relation will in some cases be left quite open, while in others a particular R will be provided by the linguistic context. A mood establishes which types of relations are appropriate for a clause, and so restrictions on the syntactic distribution of clause types may be predicted from the interaction of the mood's and the context's constraints on its R . Because of the modal nature of the accessibility relation, we will find formal content for the intuition that there is a tight connection between mood and modality.

In the next section of this paper, I will outline the semantic framework, a version of situation semantics, which I believe is necessary for understanding mood. Then, in order to get evidence for the claims expressed in (4)–(7), we must establish some correspondences between embedded propositional phrases that have a semantically analyzable distribution and matrix clause types with a coherent conversational force. This will be taken up in section 3. In section 4 a semantics for the various moods of English and Italian will be given within a general analysis of the nature of mood. Finally, in section 5 I explore what sort of pragmatic theory is needed if we are to have a complete understanding of why clauses have the conversational force they do.

2. PROPOSITIONAL ATTITUDES IN SITUATION SEMANTICS

Before discussing the semantics of mood in the terms of (4)–(7), I need to outline the relationship between two background theories: possible worlds semantics and situation semantics. Subsequent sections of this paper will

argue that the situation semantics framework is necessary for understanding the semantic and pragmatic nature of mood; however, the proposal builds upon the central ideas which possible worlds semantics gives us for the analysis of propositions and propositional attitudes. For this reason, I aim to outline in this section a somewhat novel, though basically conservative, way of looking at propositions and propositional attitudes within situation semantics, leaving for the rest of the paper arguments that this approach is desirable.²

I assume the version of situation semantics introduced by Kratzer (1989). In a sense the relation between it and possible worlds semantics is rather straightforward. In the place of possible worlds, situation semantics utilizes an abstract notion of possible situation. For our purposes, possible situations may be thought of as spatiotemporal parts of possible worlds, giving rise to a natural part-of relation ' \leq '. The maximal possible situations are the worlds.

Propositions in situation semantics are sets of possible situations. We may say that p is true in a situation s iff $s \in p$ (we will consider the status of this definition shortly). It is also intuitive to propose, for example, that p entails q iff $p \subseteq q$, but things become more tricky when we try to relate propositions to natural language expressions. Consider the two sentences *The sun is directly overhead in Washington* and *It is dark in Tokyo*. What sets do the two of these denote? If the former denotes the set of situations in which the sun is directly overhead in Washington and the second the set in which Tokyo has no sunlight, it cannot be the case that the first is a subset of the second, since a situation which extends just from where someone stands in Washington up to the sun will be in the former but not the later. There is an entailment relation here, however (so long as we only consider possible worlds in which the two cities have their actual locations), and this means we must define entailment relations between sentences indirectly in terms of worlds. There are at least two alternatives:

- (8) A proposition p entails a proposition q iff
 $\{w: w \text{ is a world} \ \& \ \exists s[s \leq w \ \& \ s \in p]\} \subseteq \{w: w \text{ is a world} \ \& \ \exists s[s \leq w \ \& \ s \in q]\}$
- (9) A proposition p entails a proposition q iff
 $\{w: w \text{ is a world} \ \& \ w \in p\} \subseteq \{w: w \text{ is a world} \ \& \ w \in q\}$

What the practical differences between these two are depends on how precisely the denotations of sentences are defined. If we stick to 'persistent'

² I would like to thank Steve Kuhn for helpful discussion of this section.

propositions as defined by Kratzer, where a proposition is persistent iff it contains every supersituation of a situation in it, the two will be equivalent. In this paper, we will not stick to persistent propositions, however; nonpersistent propositions will be denoted by such elements as infinitives, subjunctives, and imperatives. (Precisely which nonpersistent propositions these kinds of expressions denote need not concern us now; it will be the main matter of investigation in subsequent sections.) Indeed, these propositions will typically contain no whole worlds, other than some bizarre, spatiotemporally gerrymandered ones, as elements. Still, sometimes it appears that such clauses can enter into entailment relations, as with (10).

- (10) John wants for Sue to win, and what he wants entails that Mary loses.

If *for Sue to win* does denote a set of situations containing no (normal) worlds, an analysis of entailment along the lines of (8) will be more appropriate than that of (9).

Despite their ability to be involved in entailment relations, infinitives, subjunctives, and imperatives cannot be judged true or false.

- (11) ??John wants for Sue to win, and what he wants is/will be true.

This fact can be predicted if we restrict the notion of truth and falsity to worlds, as follows:

- (12) a. A proposition p is true in a situation s iff s is a world and $s \in p$.
 b. A proposition p is false in a situation s iff s is a world and $s \notin p$.

In the context of situation semantics, the definitions in (12) make it the case that some propositions are incapable of truth or falsity. Sometimes the ability to be true or false is taken as definitional of the notion of ‘proposition’ (cf. Aristotle’s definition cited in section 1). For this reason, it should be stressed that (12) is meant to present the properties denoted by ordinary language *true* and *false*. It is likely that a more general technical notion of truth-in-a-situation will be required for semantic analysis: ‘element-of’ can continue to function in this role.

The next goal will be to see how the situation semantics theory of propositions can be integrated into a possible worlds analysis of propositional attitudes. As we set about doing this, note that with respect to the concepts of truth, falsity, and entailment, the situation semantics definitions have been, in a sense, parasitic on possible worlds definitions. By

this I mean that the only type of situations relevant for truth, falsity, and entailment are worlds. This should not be totally unexpected, since possible worlds semantics is designed to capture these notions. Situation theory just adds extra primitives to possible worlds semantics, and these extra primitives will not be used where they are unneeded. The theory of propositional attitudes will make other use of the differences between situations and worlds; still, it will only elaborate, and not fundamentally alter, the possible worlds account.

I will begin by outlining the basics of a possible worlds semantics for two of the most well-studied propositional attitudes, belief and desire. After that, I will show how bringing situations into the picture allows us to elaborate upon the possible worlds account. The analysis of such verbs as *believe*, *want*, and *hope (for)* will be a main focus in subsequent sections of this paper, and so working with the notions of belief and desire serves as a link to the body of the paper as well. The most simple way of looking at these attitudes postulates that an agent α is, at any given time, in a belief state and a desire state. These states determine sets of alternative possible worlds: The belief state picks out the set of worlds compatible with all of α 's beliefs, and the desire state picks out the set of worlds which α finds most desirable, given some set of alternatives.³ For the time being, let's assume that the relevant alternatives are those which are determined by the belief state, so the desired worlds are the best ones, from α 's point of view, compatible with what α believes. We'll ignore problems of incompatible beliefs and desires for now. We can summarize these points with the use of an accessibility relation representing α 's beliefs Dox_α (for 'doxastic') and one representing α 's desires Bul_α (for 'buletic'):

- (13) For any world w , $\text{Dox}_\alpha(w) = \{w' : \text{all of } \alpha\text{'s beliefs in } w \text{ are true in } w'\}$
- (14) For any world w , $\text{Bul}_\alpha(w) = \{w' : w' \in \text{Dox}_\alpha(w) \text{ and } w' \text{ satisfies } \alpha\text{'s desires in } w \text{ at least as well as any other world in } \text{Dox}_\alpha(w)\}$

There are essentially two approaches to understanding the nature of these sets. The approaches differ in whether they understand (13) and (14) to define Dox_α and Bul_α in terms of concepts of a belief and a desire, or vice versa.

³ In referring to a 'most desirable' set of worlds, I make what Lewis (1973) calls the 'limit assumption'. Lewis shows how to avoid making this assumption, at least in the context of the analysis of counterfactuals. However, I will continue to base my discussion on it, following Stalnaker (1968, 1987), for the sake of simplicity.

Under the assumption that individuals' minds contain a set of specific, concrete mental representations, which we may label his or her 'belief representations', it is possible to define $\text{Dox}_\alpha(w)$ as the set of worlds in which all of those belief representations in w are true (Field 1978). Let us call this the DISCRETE REPRESENTATIONS APPROACH.⁴ The mental items might be thought of as sentences of a natural language or a language of thought, or they may be drawn from a totally different kind of representational system. Ultimately this approach seems to require a characterization of the contents of mental representations. If they are language-like, it appears that the problem of assigning contents to them is just the same one which the semanticist is engaged in anyway.

Someone who pursued this strategy would typically not be interested in using Dox_α as part of the semantics of belief sentences. Rather, one would say that α *believes* ϕ is true iff ϕ is synonymous with some explicitly represented mental sentence. The set of doxastic alternatives could be useful in other ways, however, for example in describing what it is to implicitly presuppose a proposition or in giving rationality constraints on belief states. Overall, what is crucial about such a theory of belief as mental representation is that it is the beliefs which are basic and $\text{Dox}_\alpha(w)$ which is derived.

The alternative way of understanding (13)–(14) is as providing a definition of what a belief or a desire is in terms of the sets of doxastic and bulletic alternatives. Lewis (1986) and Stalnaker (1987) attempt to ground Dox_α and Bul_α in a dispositional theory of action. A rational agent α in w is disposed to act in ways which tend to reach one of the worlds in $\text{Bul}_\alpha(w)$, given the facts in the worlds in $\text{Dox}_\alpha(w)$. The agent conceives of a set of possibilities for how the world is, and has dispositions to follow courses of action, or plans, which should rule out all but some subset of those possibilities. The set of open possibilities is $\text{Dox}_\alpha(w)$, and the set of worlds not to be ruled out is $\text{Bul}_\alpha(w)$. According to this approach, which I will refer to as the FUNCTIONAL APPROACH, the dispositions constitute the belief and desire states, and are not explained in terms of them. A belief is then a superset of $\text{Dox}_\alpha(w)$, and a desire a superset of $\text{Bul}_\alpha(w)$, and in this way the sets of accessible worlds are used to define the beliefs and desires.⁵

⁴ Other advocates of the discrete representations approach, such as Crimmins (1992), do not analyze propositions in possible worlds terms. For this reason, I don't discuss them here, even though the same sorts of general points apply.

⁵ Lewis suggests that we might not want to call every superset of $\text{Dox}_\alpha(w)$ a belief. Perhaps only the supersets which are the denotations of natural language sentences, or some other such smaller class, count.

As both Lewis and Stalnaker acknowledge, viewing belief and desire functionally does not specify a single pair of a belief and a desire state. Given that they are interlinked in how they connect to behavior, changes in one could always be neutralized by compensating changes in the other. Both authors nevertheless argue that there is a fact of the matter of what an individual's belief state and desire state are. Lewis suggests that what is needed is a theory of which belief states and desire states are reasonable; presumably he has in mind a psychological theory. Stalnaker, in contrast, proposes to independently characterize $\text{Dox}_\alpha(w)$ in terms of which aspects of the agent's dispositions have been caused in a certain way by prior experience. The idea is that our beliefs are caused by our interactions with the world. Though this point seems intuitively right, it is not clear how to define the required type of causation. After all, desires can be externally caused as well; furthermore, it may be that not all beliefs are caused, if one supposes that there are innate beliefs.

It is not my goal here to come to any conclusion about which of the two above approaches is the correct foundation for the semantics of propositional attitudes. We should simply have the possibilities in mind as we now go on to consider the effect of introducing situations into the picture. We begin by construing Dox_α and Bul_α as functions from situations to sets of possible worlds.

- (15) For any situation s , $\text{Dox}_\alpha(s) = \{w: \text{all of } \alpha\text{'s beliefs in } s \text{ are true in } w\}$
- (16) For any situation s , $\text{Bul}_\alpha(s) = \{w : w \in \text{Dox}_\alpha(s) \text{ and } w \text{ satisfies } \alpha\text{'s desires in } s \text{ at least as well as any other world in } \text{Dox}_\alpha(s)\}$

It is possible to derive the fact that $\text{Dox}_\alpha(s)$ is a set of worlds. According to Kratzer's version of situation semantics, there are a variety of propositions which are only true in whole worlds, such as counterfactuals, and some of these will be accepted by any rational agent.⁶ Thus, the only situations compatible with all of any agent's beliefs will be whole worlds. Another argument to the same end has to do with *de re* beliefs about the whole world.⁷ If an agent believes, for instance, of the world that it is very large, familiar accounts of *de re* belief will entail that only situations to which the agent stands in the same 'acquaintance relation' as he or she does to the real world will be doxastically accessible (cf. Lewis 1979; Cresswell

⁶ I thank Irene Heim for pointing out this fact to me.

⁷ I thank Steve Kuhn for pointing out this argument to me.

and von Stechow 1982). It seems plausible that this relation is simply that of inhabiting the world in question, and so only whole worlds will be accessible. Finally, it is also possible to argue independently of any particular constructions that the situations in $\text{Dox}_\alpha(s)$ are anyway quite large (cf. Portner 1992). All normal individuals have beliefs about things far away and events in the distant past and future, for example that many stars exist or that the universe, when it first came into being (assuming it hasn't always been around), was a rather different place from what it is now. The only situations in which all of these propositions can be true must be spatiotemporally quite extensive. While this does not show that only whole worlds are in $\text{Dox}_\alpha(s)$, it demonstrates that only situations which are, in an intuitive sense, quite world-like, are.

Putting together these two observations lets us conclude that doxastic alternatives are all spatiotemporally extensive whole worlds. This is a stronger conclusion than either piece alone, since there exist both odd worlds which are spatiotemporally truncated and large, world-like situations which are mere parts of their worlds. Leaving aside for the moment the logical possibility that someone could have beliefs compatible with other sorts of situations, because they have atypical beliefs not conforming to the points above, let us call this kind of potential doxastic alternative a *NORMAL WORLD*. In what follows, the fact that some propositions contain only normal worlds will be quite important, and it will be convenient to have a term for them. For reasons to become clear in the next section, I will label them the *EXPANDABLE* propositions.

Given that $\text{Dox}_\alpha(s)$ contains only worlds, (16) entails that $\text{Bul}_\alpha(s)$ does too. This means that we can, if we like, ignore situations other than worlds when theorizing about propositional attitudes. Thus, we could give a perfectly ordinary semantics for propositional attitude sentences:

$$(17) \quad s \in \|\alpha \text{ believes } \phi\| \text{ iff } \text{Dox}_\alpha(s) \subseteq \|\phi\|$$

$$(18) \quad s \in \|\alpha \text{ wants } \phi\| \text{ iff } \text{Bul}_\alpha(s) \subseteq \|\phi\|$$

It is crucial to the purposes of this paper, however, that we do not leave it at that. As mentioned above, the proposal given in section 1 under (5) is going to be worked out by proposing that certain propositions are not persistent, and indeed do not contain any worlds. In particular, I will claim that the infinitival complement of *want* denotes such a proposition. According to (18) it should be impossible to want this kind of proposition.

In order to allow a semantics compatible with the existence of propositions not containing worlds, I will argue for the following sort of elaboration to (16):

- (19) For any situation s ,
 $Bul_{\alpha}(s)$ = the set of worlds in $Dox_{\alpha}(s)$ in which α most
 successfully carries out his or her plans in s .

This principle is a first step towards making explicit in the semantics the functional analysis' definition of desire. As we will see, (19) ultimately draws on both of the general approaches mentioned above to the foundations of the possible worlds semantics for propositional attitudes. As it stands, the principle is rather vague, but before getting into details it is worth trying to elucidate its motivation. The principle relies on the idea that rational agents have not just an overall buletic state, but a set of individual desires. These desires are associated with complex dispositions to try to reach some end, if conditions are right. So for instance, my desire to drink a coffee involves my disposition to leave the office, go to the café, buy, and drink a coffee once I both have no higher priority disposition and believe that conditions allow the action sequence to be successfully completed. These relevant conditions involve, for example, my no longer wanting to stay in my office, and my believing that the café is open. I will assume that such dispositions are to be identified with states, following Armstrong's (1973) argument that all dispositions are states; each of these states is a part of the agent's full buletic state. For convenience, let us call the complex dispositional state here a 'wanting' situation and the sequence of actions (however that notion is to be formalized) the 'execution of a plan', or a 'plan' for short.

Treating desire in terms of fulfilling plans seems to entail that one can only want what one gets in some belief world. Though this may be true as a default, it is certainly possible to want things which one believes to be impossible. The solution, suggested by Stalnaker (1987), is to allow the use of a background set of alternatives other than the agent's doxastic set Dox_{α} . If I want to jump to the moon, my desire must be construed relative to a set of worlds compatible with my doing so. One might refer to this background set as worlds of 'hypothetical contemplation'. The problem of determining how such alternative background sets are constructed in particular cases is quite difficult, and I will not go into it here.

A related problem arises in instances where one wants something which one has no control over, for instance if I want for it to be cooler tomorrow. This difficulty is inherited from the functional theory, as it is due to the fact that there are no actions one could take which would tend to cause it to be cooler tomorrow (and thus there are no corresponding dispositions). One way to solve this problem is to reduce it to the last one, saying that

I want for it to be cooler tomorrow can only be true relative to a set of alternatives where I might have control over tomorrow's weather. If that set represented my beliefs, the story would go, I would be disposed to try to make it cooler. This kind of approach might work, but I am not fully convinced it is plausible. Some desires seem totally idle, simply reflecting a judgment that things would be better if such-and-such, without requiring any dispositions, even hypothetical ones, which could fulfill them. Still, I will assume that this difficulty is to be fixed in the same terms as the last one.

In (20)–(22) I give an initial formulation of this conception of the nature of desire. The buletic accessibility relation Bul_α is characterized in terms of an auxiliary function 'want $_{\alpha,b}$ '. In (20), $\text{want}_{\alpha,b}(s)$ gives the set of plans which could satisfy α 's wanting state s , relative to the belief state b of α . A plan is modeled as a situation which follows the agent through a course of actions that ultimately results in the desired state. If we are considering a plan P which α has in s , intuitively P must be compatible with α 's beliefs in s (clause 20i), and must begin just like s (clause (20ii)); additionally, α must act in P so as to get to the result state (clause (20iii)) and must have formed the disposition to carry through the plan already at s (clause (20iv)).

- (20) For any wanting situation s of α and belief state b of α , $\text{want}_{\alpha,b}(s)$ = the set of plans which would satisfy α 's desire in s , relative to his or her beliefs in b =
- { s' :
- (i) for some $w \in \text{Dox}_\alpha(b)$, $s' \leq w$, and
 - (ii) s' begins with a dispositional counterpart s'' of s ,
 - (iii) α acts in s' in ways which tend, given $\text{Dox}_\alpha(b)$, to bring it about that s'' develops into s' , and
 - (iv) α is disposed in s to act in those ways}⁸

Clause (20ii), " s' begins with a dispositional counterpart s'' of s ," is meant to indicate that, in a situation in which α 's plan is carried out, α begins with the same relevant dispositions as in s . In addition, I assume that this relation is a subrelation of the ordinary counterpart relation, so that s' and s'' must be sufficiently close to playing the same roles in their respective worlds that we would intuitively refer to them as "the same situation"; 'dispositional counterpart' is simply an auxiliary counterpart notion of the general type discussed by Lewis (1986).

(21)–(22) now define the set of buletic alternatives in terms of $\text{want}_{\alpha,b}$.

⁸ I will assume for the time being that an individual only has a single belief state at a time. See below for discussion.

As we shall see, the function Bul_α thus defined is identical to that which is required by the functional approach of Lewis and Stalnaker.

- (21) For any worlds w, w' , situation s , and belief situation b of agent α , $w \text{B}_{s,b} w'$ iff
 [The number of wanting situations $x \leq s$ such that there is a $y \leq w$ such that $y \in \text{want}_{\alpha,b}(x)$] is greater than
 [the number of wanting situations $x \leq s$ such that there is a $y \leq w'$ such that $y \in \text{want}_{\alpha,b}(x)$].
- (22) For any situation s and belief situation b of agent α ,
 $\text{Bul}_\alpha(s, b) = \{w: \text{there is no world } w' \text{ such that } w' \text{B}_{s,b} w\}$

(21) defines a relation between worlds. When $w' \text{B}_{s,b} w$, more of α 's desires in s (relative to his or her beliefs in b) are brought to realization by a successful plan in w' than in w . Then (22) gives the set of buletic alternatives for α in s as the worlds in which the most of α 's plans in s (relative to his or her beliefs in b) are carried out. The number of α 's plans which are carried out in a world is taken to be a measure of how good a world it is from α 's point of view; the measure may be somewhat crude, since it may be that some of α 's desires are stronger than others. Nevertheless, for simplicity we will stick with simply counting fulfilled plans, rather than proposing some more complex function for measuring the desirability of worlds.

Suppose I am in my office and I want to drink a coffee. Situation s is the particular wanting state in question, a complex dispositional state. Following (20), then, in some worlds compatible with my beliefs, I am sitting in my office with the same dispositions as I actually have in s , and these dispositional counterparts of s develop in the following way: I do get a coffee in that world, and I act in ways which lead to my getting the coffee. My plan may involve waiting, for example for the café to open or for some more urgent task to be finished. It may involve a large number of steps. What is crucial is that I eventually get myself into the condition of drinking a coffee. Only worlds of this sort will be in $\text{Bul}_{pp}(s^*, b)$, where s^* is the overall desire state of which s is a part and b is my belief state (so long as getting the coffee does not ruin the possibility of fulfilling other desires).

This approach contrasts in two ways with the general definition of the buletic accessibility relation in (16). First of all, it claims that the overall desire state s^* , with respect to which each of the desire worlds in $\text{Bul}_\alpha(s^*, b)$ is accessible, is actually constituted of numerous more specific parts, the individual wanting situations. This is a feature it shares with the discrete

representations approach to understanding propositional attitudes, but without accepting that the wanting situations must be representations (though they might be). Instead, it draws quite crucially on the explanation of rational action in terms of belief and desire states which comes from the functional approach. Wanting states are connected, organized dispositions. The functional approach crucially needs to talk about desire in terms of what actions, courses of action, or plans an agent is disposed to undertake (cf. in particular Lewis 1986, p. 37f.). What (20)–(22) do is clarify, in a way which I believe to reflect the intuition of the functional theory, how these things cause a particular world to be buletically accessible.

The formulation in (20)–(22) also differs from (16) in that it is a function not just of a desire situation s but also of a belief state b . This too just makes explicit a feature implicit in the original functional theory. As has been discussed, the identification of some alternatives as ‘best’ must always be done relative to some background set of open possibilities. This is what b provides; the set of alternatives relevant for the desire-ranking is the one accessible from b . We noted earlier that in cases of unachievable desires it is sometimes necessary to consider other background sets of worlds. Formally we can model this shift from one set of background alternatives to another by considering the situation b in the definition of buletic alternatives to be a contextually supplied parameter of interpretation. In the case of a desire to jump to the moon, for instance, in the place of a belief state b must be another *belief-like* state of α (of ‘hypothetical contemplation’) from which worlds are accessible in which α jumps to the moon. This means that the accessibility function Dox_α must have all sorts of belief-like states in its domain.

Precisely what would make a mental state belief-like is a difficult question for the functionalist. It should be a state which is connected to dispositions to action in a way similar to the belief state; see Stalnaker (1987) for discussion. Within the discrete representations approach, matters are simpler. A belief-like state would be constructed out of a set of mental representations of the same type as belief representations, though these mental representations would not be accepted in the way that true beliefs are. (Explaining what ‘acceptance’ of a belief-type representation amounts to is one of the primary challenges facing the discrete representations approach.) One way or another, however, any theory of propositional attitudes is going to have to have an account of belief-like states other than belief, and the present analysis should be able to accommodate whichever one is ultimately found most acceptable.

It may seem that the present proposal differs from the previous functional ones in one other subtle respect: In the standard accounts, summarized by

(16), the members of $\text{Bul}_\alpha(s)$ are the worlds which α 's dispositions in s are directed toward, but nothing seems to require that those are worlds in which α 's plans are carried out. In contrast, (20)–(22) explicitly identify the desire worlds as those in which some of α 's plans are carried out (except in the limiting case of an individual all of whose desires are incompatible with his or her beliefs). Nonetheless, I don't think there is a difference here; (16) yields the same set as (20)–(22). Suppose I have a disposition to follow a certain plan (which would result in my having a coffee, for example), and w is a desire world because this disposition is directed toward realizing worlds like w ; then clearly w will have to be a world in which I have followed the plan. It would be impossible for a plan to be directed toward realizing worlds in which it was not followed (unless there is time travel, perhaps). This indicates that the definition of buletic alternatives in (20)–(22) is equivalent to that in (16).

A simple example may help clarify. Joan is disposed in s to move her hand back and forth in front of her face. In virtue of some facts about how the world works which she is aware of, doing so will tend to cause a breeze which she can feel on her face. According to the standard functional theory, this means that only worlds in which she feels a breeze on her face are in $\text{Bul}_\alpha(s)$. But the present account notes that her disposition will cause both her hand's movement back and forth and the breeze which she will eventually feel on her face. So according to this view, $\text{Bul}_\alpha(s)$ must only contain worlds in which she both moves her hand and feels the breeze. But clearly, what she is disposed to do in s only tends to bring about worlds of this type anyway. Thus the conditions in (20)–(22) yield the set of accessible worlds which proponents of the functional theory require.

Finally there are a couple of potential problems with the conception of desire given by (20)–(22) which I would like to consider. This paper is not the place to give a full-scale philosophical justification for this kind of situation semantics for desire and belief, since my goal is to motivate the approach in linguistic terms, but it is important to look at some key issues. The first has to do with what it means to say in (20iii) that " α acts in s' in ways which tend, given $\text{Dox}_\alpha(s)$, to bring it about that s'' develops into s' ." What is it for one situation to "develop into" another? I think that the relevant notion is 'part-of'; in other words, α acts in s' in ways which tend, given $\text{Dox}_\alpha(s)$, to bring it about that s'' is a part of s' . But within counterpart theory, whether a situation is part of another is not a contingent fact, since situations, like ordinary individuals, exist in only one world. Our theory seems to require that α cause something which is either necessarily the case or not. It is thus important to consider precisely what this clause is meant to assert.

The statement in (20iii) should be understood as true in the following circumstances: α is the agent of some events E which are part of s' . In the worlds in $\text{Dox}_\alpha(b)$ most similar to $w_{s'}$ in which counterparts of the events in E occur, a counterpart of s' occurs; and in the worlds in $\text{Dox}_\alpha(b)$ most similar to $w_{s'}$ in which counterparts of the events in E don't occur, no counterpart of s' occurs.⁹ In such a case, we may say that the actions E of α cause s' to exist.

The other problem is a bit more subtle. What happens if my wanting situation s (not the plan, but the wanting itself) is incompatible with what I believe? This would be a case in which I believe myself to have different beliefs or desires from the ones I actually have. Such a situation would be problematic because it would mean that there are no doxastic alternatives which contain a dispositional counterpart of the wanting situation. I think the best way of understanding this kind of case is to consider it analogous to examples of an individual's having incompatible beliefs. Stalnaker (1987) and Lewis (1986) have argued that when an individual has incompatible beliefs, these are compartmentalized into separate doxastic states. The belief component of the individual's dispositions would no longer be correctly characterized by a single set of possible worlds; instead, he or she may show ambivalence between two sets of dispositions, reflecting the two underlying doxastic sets. Similarly, I would like to suggest that if an individual α believes in s that he or she wants/believes p , then α does want/believe in s that p . Surely if Jack thinks he wants to marry Joan, he will show at least some dispositions which would tend to bring it about that he marries her. So according to the functional account, he does want to marry her. If, as we say, he does not *really* want to do so, this must be reflected in another, subconsciously realized set of dispositions. He will show ambivalence between two sets of incompatible dispositions. This is the mark of there being two underlying attitude states. If this is the right way of looking at the matter, there is no longer any special difficulty for the present proposal.

This section has aimed to show how a reasonable foundation can be provided for propositional attitudes within situation semantics. Though clearly there are many important issues which I have been unable to address, the goal has been to sketch the fundamental ideas that such a project requires. I hope to have demonstrated that a situation semantics for attitudes builds in an interesting but not too radical way on the familiar possible worlds accounts. So far, however, I have not provided any positive arguments that analyzing propositional attitudes in terms of situation semantics

⁹ Once again we make the limit assumption, for simplicity.

is likely to have any advantages over its alternatives. As we shall now go on to see, I believe that mood provides just such an argument.

3. MOODS AND RELATED CATEGORIES

We need terms to distinguish the grammatical category of mood from the semantic/pragmatic one. When confusion could arise, I will refer to the latter as ‘notional mood’, while the plain term ‘mood’ will refer to the morphosyntactic category. I refrain from using a more theoretically committing expression than ‘notional mood’ because this is the very concept which the present paper will attempt to elucidate. The firmest definition it can be given is as concerning aspects of meaning (broadly construed) which contribute to the conversational force of a clause or which constrain the attitude someone has toward what it expresses. Nothing more uniform is possible because those aspects involve both semantic and pragmatic factors, and only these factors have theoretical status.

To explore notional mood, then, we may look at more than the semantics of grammatical mood. Below we will consider *for*-infinitives, imperatives, and (notional) mood-indicating modals in addition to the indicative and subjunctive (in English and Italian). In section 3.1, I will concentrate on indicatives and *for*-infinitives, using them to illustrate, in a semi-formal way, the mode of explanation I propose. Then, in sections 3.2 and 3.3, the important properties of the other clause types will be outlined. This prepares the way for a more rigorous and systematic presentation of the analysis in section 4.

3.1. *The English Indicative and For-Infinitive*

The most well-studied of all moods is the indicative, though it hasn’t really been examined as such, but rather as the default clause type. Some of its relevant properties are listed in (23) and illustrated in (24).

- (23) *The Indicative*
- a. In matrix clauses ((24a)), may be used to add information to a discourse.
 - b. In subordinate clauses, occurs with verbs of mental judgment ((24b)) and assertion ((24c)), some verbs of desiring ((24d)), and verbs of imagination ((24e)).¹⁰

¹⁰ In categorizing the embedding contexts for various clause types, I have made extensive use of Quirk et al. (1985) and Rudanko (1989).

- (24) a. The bird landed in the tree.
 b. Sarah believes that the bird landed in the tree.
 c. Sarah said that the bird landed in the tree.
 d. Sarah hopes/*wants that the bird landed in the tree.
 e. Sarah dreamed that the bird landed in the tree.

Under appropriate circumstances, an utterance of (24a) will add to a conversational context the information that the bird landed in the tree. The analysis of the pattern in (24) will amount to understanding what a conversational context has in common with the attitudes of belief, saying, hoping (but not wanting), and dreaming.

Next we turn our attention to the *for*-infinitive, a construction which turns out to be extremely important for this study, though it seemingly involves a moodless type of clause. That there is a semantically coherent class of *for*-infinitives has been argued by Bresnan (1972), Stowell (1982), Pesetsky (1992), and Portner (1992), among others. What are called *for*-infinitives are not simply those infinitives which have the complementizer *for*, but rather are a group which displays a characteristic future-oriented, irrealis semantics. The class is named as it is because it occurs in contexts in which *for* appears whenever the infinitive has an overt subject. The infinitive in (25a) is not a *for*-infinitive, while those in (25b) are.

- (25) a. James believes Richmond to be several hours away.
 b. James hopes for the plane to arrive in Richmond soon.
 James hopes to arrive in Richmond soon.

In (26)–(27) properties of the *for*-infinitive are summarized and illustrated.

- (26) *The For-Infinitive*
 a. In matrix clauses, may be used, somewhat awkwardly, to express a desire ((27a)) or a regret ((27b)).
 b. In subordinate clauses, occurs with verbs of desiring, planning, or expectation ((27c)) and some factives ((27d–e)), but with the factives only when a modal or quantificational operator is present.
- (27) a. Oh, to someday meet her!
 b. To have suffered so long and had it come in the end to this!
 c. James hopes/wants/plans/expects to arrive in Richmond soon.
 d. James would like to arrive in Richmond soon.
 e. James liked to arrive in Richmond early in the day.

Example (27e) is only possible if given a generic, i.e. quantificational, reading.

With the above data in mind, I would now like to illustrate the method by which I am proposing to explain the conversational force and distribution of clause types. The goal is to find interpretations for the indicative and *for*-infinitive which allow an explanation of the data in (23)–(24) and (26)–(27). We begin with facts concerning unembedded clauses: indicatives may be used to add information directly to the conversation, while *for*-infinitives may not. Following Stalnaker (1978), the information present in a discourse at a given time can be modelled as a proposition. In situation semantics terms, this means that a conversational context is the set of situations compatible with all of the mutually recognized presuppositions of the participants in the conversation. Adding the information in a sentence to the context is accomplished by intersecting the interpretation of the sentence with it (subject to the assertion being felicitous in the context). Thus an important constraint on the meaning of indicative clauses is that they must be compatible with the sort of information that is entailed by all typical conversational contexts. Observe that the conversational context will typically be an expandable proposition, in the sense defined in section 2: It will contain only whole worlds, because some mutually presupposed propositions, such as counterfactuals, will be true only in worlds, and it will contain only normal worlds, since it is typically presupposed that there was a distant past, that faraway things like stars exist, and so on. Therefore, to be usefully intersectable with a conversational context, at least some of the situations in an indicative clause's denotation must be normal worlds. To ensure that this requirement is met, I suggest that an indicative clause always denotes a persistent proposition. Toward this end, I propose that there is an indicative operator with the following semantics:

$$(28) \quad \|\text{indic}(\phi)\| = \{s: \text{for some } s' \leq s, s' \in \|\phi\|\}$$

For example, I assume that (24a) (repeated below) minus its mood and tense denotes the set of minimal situations in which the bird lands in the tree.

(24) a. The bird landed in the tree.

The indicative (24a) itself, then, denotes the set of situations which have as a part a past situation of the bird landing in the tree. This set contains normal worlds, and because of this (24a) is appropriate to be added to a conversational context.

Next we turn our attention to *for*-infinitives. A crucial fact about *for*-infinitives is their future-orientation. For instance, in (29) the wanted arrival is future with respect to the time of wanting:

(29) James wants for Joan to arrive in Richmond soon.

To encode this futurity, the wanting time must somehow be available when the infinitive is interpreted, and we can accomplish this by utilizing a new parameter of interpretation, the REFERENCE SITUATION (cf. Reichenbach 1947). The reference situation for the embedded clause of (29) is the wanting situation. Then the infinitive can be given the denotation in (30), where F is an operator which introduces the characteristic semantics of the construction (cf. Stowell 1982).

- (30) $\|F(\phi)\|^r = \{s: s \text{ has as its initial segment a dispositional counterpart of } r \text{ and for some } s' \leq s, s' \in \|\phi\|^r\}$

Recalling that, for present purposes, we can think of situations as spatio-temporal chunks of worlds, what (30) gives us for the embedded infinitive in (29) is a set of situations which (speaking loosely) begin with James's wanting and extend into the future, eventually including a situation of Joan arriving in Richmond soon after the wanting.

Independent support for the formulation in (30) comes from the discussion of aspectual verbs, such as *begin*, *stop*, or *continue*, of ter Meulen (1990) (see also Portner 1992). Ter Meulen asserts that these verbs can have infinitival complements if they describe an event-external change. I believe the proper way to understand this idea is the following: an aspectual verb may have a *for*-infinitive complement if it describes an event's coming into existence. Consider:

- (31) a. Mary began to eat her pizza.
 b.* Mary stopped to eat her pizza.
 c. Mary continued to eat her pizza.
 d.* Mary resumed to eat her pizza.

Example (31a), in contrast to (31b), is acceptable because it describes the initiation of an eating event; (31c) is possible, according to ter Meulen, because *continue* describes the starting of an event as well, in this case one which builds upon a previous event of pizza eating. *Resume* differs in denoting the 'restart' of a previously existing event of eating the pizza. If ter Meulen's analysis of the aspectual verbs is correct, then, we conclude that *for*-infinitives can only occur when the situations denoted start with the infinitive's reference situation. This point is in accord with (30).

Now we can see why *for*-infinitives cannot be used assertively: it is normally impossible to use their interpretation to update a conversational context. Let's consider (27a) again.

- (27) a. Oh to someday meet her!

It appears that this sentence's reference situation must be the utterance situation, since it is futurate with respect to the time of utterance. Thus (27a) denotes a set of situations as follows:

- (32) {s: s has as its initial segment a dispositional counterpart of the utterance situation u and for some $s' \leq s$, s' is a situation of my meeting her}

The denotation of (27a) has a null intersection with an expandable conversational context. No situations in (32) extend into the past, while every situation in such a conversational context does. Thus if the grammar allowed (32) to be interpreted as making an ordinary assertion, it would always reduce the context to the empty set. Instead, if (27a) is to be informative its use must be different. In section 4.1 we will see how it is possible to grammatically encode the fact that a *for*-infinitive cannot be used assertively, and in section 5 we will concentrate on how examples of this type are to be interpreted.

Thus far I have demonstrated how it is possible to explain in semantic terms the fact that indicatives may be used in unembedded contexts to make assertions while *for*-infinitives may not. Now I would like to discuss the differences between embedded examples of these two clause types. The basic facts which I will concentrate on here are the following: *for*-infinitives are always possible with verbs of desire, while indicatives may always be used with verbs of assertion, mental judgment, and imagination. Indicatives are compatible with some, but not all, verbs of desire, while *for*-infinitives can never be used with verbs of assertion, mental judgment, and imagination.

<i>Verb Type</i>	<i>Complement Type</i>	
	<i>Indicative</i>	<i>For-Infinitive</i>
<i>Belief, Assertion,</i>		
<i>Imagination</i>	All	None
<i>Desire</i>	Some	All

The other distributional data for indicatives and *for*-infinitives will be considered in subsequent sections.

The key to the analysis I wish to propose is that there is a strict analogy between the role the conversational context plays with unembedded sentences and that of a modal accessibility relation for complement clauses. With a belief sentence like (24b), repeated here, the proposition that the bird landed in the tree is added to our understanding of what Sarah believes.

(24b) Sarah believes that the bird landed in the tree.

This is parallel to the use of the unembedded (24a) to add information to the conversational context. In the latter case, the proposition that the bird landed in the tree is intersected with the conversational context to yield a new, smaller one; similarly, (24b) results in a reduction of the set of situations which are taken to be doxastically accessible for Sarah. In general, I will label the information state to which the proposition expressed by a clause is added the MODAL CONTEXT for that clause. Section 4 lays out the technicalities of how this concept is formally implemented.

It is now straightforward to see why *for*-infinitives are impossible as the complements of verbs of assertion, mental judgment, and imagining. The reason is that the modal contexts for the complements of any of these are typically expandable, and so infinitives will be no more able to be combined with them than with the conversational context. For example, when people talk, they presuppose a wide variety of propositions; among them are some which are only true in whole worlds and others which concern things which are spatially or temporally distant. Thus, in all normal contexts, the set of alternatives giving the content of a conversation reported with *say* will be expandable.

Similar points hold for the verbs *believe* or *dream*. As was discussed in section 2, humans can be counted on to believe some of the sorts of propositions which require the set of doxastic alternatives to be expandable. Likewise, it seems to me, even a bizarre dream is still ultimately grounded in a commonsense view of reality. The set of alternatives compatible with a dream, that is, the modal context provided by *dream*, will entail that some counterfactuals are true and that spatiotemporally distant things exist. Thus, a dreaming modal context will be expandable as well. (At least this is typically the case; the *logical* possibility that conversations, belief states, or dreams could be so odd that the modal contexts they give rise to are non-expandable will be discussed below.)

Next we consider verbs that can embed *for*-infinitives, such as verbs of desiring. If they are to provide modal contexts for *for*-infinitives, those modal contexts must not necessarily be expandable. At first, this point seems problematic. The buletic accessibility relation defined in section 2 gives rise to a set of alternatives which is a subset of the agent's doxastic alternatives; thus the set of buletic alternatives will itself be expandable. However, I propose that when a verb of desiring is used with an infinitive, the semantics is not given directly in terms of α 's buletic alternatives. Instead, the semantics is to be understood in terms of the set of plans which α has for realizing a desire. Recall that the set of plans associated

with α 's wanting situation s , relative to α 's belief state (or belief-like state) b , is represented by $\text{want}_{\alpha,b}(s)$. I am therefore proposing that the semantics of (33) is to be understood along the lines of (34).

(33) James wants to get a coffee.

(34) $\{s: \text{want}_{\text{James},b}(s) \subseteq \|(\text{for James}) \text{ to get a coffee} \|^s\}$

(33) is therefore true in s if all of James' plans in s ultimately lead to him getting a coffee.

There is no problem in utilizing James's set of plans as the modal context for the infinitive *to get a coffee*. For each situation s , the set of plans associated with s all begin with (a dispositional counterpart of) s itself. In this way, the plans are like the situations in the infinitive's denotation. Informally, then, (34) describes a wanting situation s if the plans which James has for realizing that desire lead to his getting a coffee. This seems pretty far along the way toward correctly describing the truth conditions of (33). The general view of *for*-infinitives, then, is that they occur with future-oriented, non-expandable modal contexts. Such modal contexts are provided by *want* and other verbs which embed this form. In contrast, a verb like *believe* typically will not provide the appropriate context.

It is a bit more of a puzzle why indicatives typically cannot occur with desire verbs. There is no reason in principle why a semantics for (35) parallel to that for (33) shouldn't work.

(35) *James wants that he got a coffee.

(36) $\{s: \text{want}_{\text{James},b}(s) \subseteq \|\text{James got a coffee}\|^s\}$

The set of plans which realize James's desire in each s to get a coffee is indeed a subset of the set of situations in which James gets a coffee. So (35) could be unproblematically true. I propose, therefore, that the English indicative not only is compatible with an expandable modal context, but that it moreover requires one. Such a proposal will rule out (35).

There remain the exceptional cases in which a verb of desire can occur with an indicative.

(37) James hopes/*wants that Joan arrives in Richmond soon.

Within the present framework, the natural way to describe the contrast between *hope* and *want* is to postulate that when *hope* embeds an indicative, its semantics is to be given directly in terms of the set of bulletic alternatives, which is expandable, rather than in terms of plans.

(38) $\{s: \text{Bul}_{\text{James}}(s, b) \subseteq \|\text{Joan arrives in Richmond soon}\|^s\}$

The difference between *hope* and *want* is simply an idiosyncratic lexical one.

One issue that arises at this point is the following:¹¹ I have been discussing the typical or normal properties of *believe* and similar verbs. Of course it is logically possible to believe, imagine, or say that there was no past. Similarly, one can construct conversational contexts which are non-expandable. Even in such unusual cases, the *for*-infinitive will be impossible. For this reason, the proposal should be seen as providing a semantic basis for a grammaticalized categorization of modal contexts. *For*-infinitives are licensed only when their modal context is of a sort that is *typically* future-oriented and non-expandable. Modal contexts introduced by *want* have these properties, while those representing what is believed or said in the vast majority of cases do not. Thus, *want* is able to license *for*-infinitives, but *believe* and *say* are not.¹² Similarly, indicatives are only licensed when they have a modal context which is *typically* expandable. Such a condition links them to the appropriate class of verbs as well.

This treatment of modal contexts can be seen as akin to the categorization of ordinary entities which underlies the semantics of gender. In semantically-based nominal classification systems, nouns are typically placed into classes on the basis of prototypical or stereotypical properties of what they denote, and will frequently remain there even in exceptional situations in which the property does not hold. For example, Dixon (1982) discusses that case of Yidiny, where the classifier *bana* ('drinkable liquid') applies to salt water (*birriny*) despite its being recognized as unsuitable for drinking. It is considered to still be a form of water, a substance which is prototypically drinkable. A less clear but perhaps similar case may be the use of masculine agreement in such nonspecific contexts as questions and generics, sometimes even, as with Russian, when the domain of quantification is comprised completely of women (Corbett 1991, 218–223). (Here, of course, it is a stereotypical property that is at issue.) Parallel to these examples, I propose that a doxastic modal context introduced by *believe* will be of the sort which supports an indicative, even if it is atypically non-expandable. See Portner (1994) for elaboration of this analogy.

In this section I have outlined in a semi-formal way how the present approach is able to link the semantics and pragmatics of clause types with their syntactic distribution. But note that I don't claim to be able to account

¹¹ Thanks to two anonymous reviewers and the editors for input on this point.

¹² When *say* occurs with an infinitive, as in *John said to leave*, I assume that a secondary meaning of 'told x to' is at issue.

for every aspect of clausal selection. For instance, I will not present an explanation for the impossibility of (39), which ought to mean the same as (40).

(39) *Bill said that John go.

(40) Bill said for John to go.

The ungrammaticality of (39) is, I believe, an idiosyncratic syntactic fact; however, this point does not destroy the appeal of a semantic account which explains a substantial proportion of the phenomena. Thus, after accumulating some more data in sections 3.2 and 3.3, I'll go on in section 4 to give a more precise, compositional treatment of the ideas just outlined.

3.2. *Other Varieties of Clauses in English*

Besides the indicative and *for*-infinitive, we will be concerned in this paper with the subjunctive and notional mood-indicating modals. In this section and the next I will informally outline the key properties of each. First, as a representative of the mood-indicating modals, let us look at *may*. Mood-indicating *may* does not carry modal force of its own, but simply indicates that its clause has a particular conversational use or is in a certain kind of semantic context.

(41) *Mood-Indicating May*

- a. In a formal style, occurs inverted in matrix clauses ((42a)) to express a wish.
- b. Occurs embedded under certain operators which express desires ((42b–c)) or epistemic possibility ((42d)).

- (42) a. May you have a pleasant journey!
 b. Jack wishes that you may be happy.
 c. I pray that God may bless you. (from Palmer 1990)
 d. It is possible that Sue may win the race.

In (42d) for example, *may* does not have modal force of its own: the sentence does not mean that it's possible that it's possible that Sue wins the race. Indeed, the embedded *may* seems redundant. In all the examples of (42), I will argue, *may* indicates properties of modal context for its clause.¹³

One sort of English subjunctive is the one I will refer to as the 'manda-

¹³ There are other types of mood-indicating modals, such as the first *would* in *If you would come, I would be happy*, which will not be discussed here.

tive subjunctive'. Seen in (3) at the beginning of this paper, it seems to be related to the imperative.

- (43) *The Mandative Subjunctive*
- a. May exist subjectless in matrix clauses ((44a)), where it is known as the imperative.
 - b. Occurs embedded under verbs of commanding ((44b)).
- (44) a. Join us downstairs at 3 p.m.
 b. Mary demands that you join us downstairs at 3 p.m.

I will claim that the mandative subjunctive as well must always be related to a particular kind of modal context, and that this goes a long way toward explaining both its meaning when unembedded and its distribution.

There is another type of subjunctive in English, the counterfactual subjunctive.

- (45) *The Counterfactual Subjunctive*
- a. Is possible in the antecedents of conditionals ((46a, b)), giving rise to the so-called subjunctive, or counterfactual, conditional.
 - b. Occurs as a verbal complement in only two contexts: under the verb *wish* ((46c)) and under *suppose* when used in the expression of a command or wish ((46d–f)).
 - c. Occurs in *as though/as if* clauses ((46g)).
- (46) a. If Sue did a dance later, everyone would enjoy watching it.
 b. Were Jill at the party, everyone would be laughing.
 c. Jack wishes that Tom were happier.
 d. Suppose Jill were at the party.
 e. Let's suppose for a moment that Sue did a dance later.
 f. I demand that you suppose that Jill were at the party.
 g. He acted as though/as if he were leaving.

I will not attempt to analyze this form. Throughout this paper, the primary means of examining the semantics of mood has been to investigate the interpretation of the verbs and adjectives which select it. Since only two such elements occur with the counterfactual subjunctive, *wish* and mandative/imperative *suppose*, I do not feel it is possible to get enough information through this means to understand it properly. Further investigation is certainly in order, however.

3.3. *The Indicative and Subjunctive in Italian*

The Italian subjunctive has a much broader distribution than its English counterparts. While the present project does not claim that there is a universal notion of ‘indicative’ and ‘subjunctive’ to be uncovered, it is committed to the idea that all mood-related phenomena may be analyzed using the tools developed here. Thus, it is important to at least make a start in crosslinguistic investigation, even though I am not yet in a position to offer anything like a full analysis of the Italian mood system. Here I will attempt to analyze only the distribution of indicatives and subjunctives embedded under verbs and adjectives, relating this to unembedded uses; I specifically ignore for the time being prepositions which trigger the subjunctive, infinitives, and so forth.

In (47)–(49) the distribution of the subjunctive is outlined.

(47) *The Italian Subjunctive*

- a. Unembedded, expresses an order (much like the imperative (48a)), wish ((48b)), supposition ((48c)), or doubt and astonishment ((48d)).
- b. May be present under operators expressing attitudes other than certainty, such as opinion ((49a, b)) and desire ((49c)).
- c. Occurs with verbs and adjectives of certainty or assertion in negative sentences ((49d)), and occasionally in positive ones ((49e)) to emphasize uncertainty concerning what the complement clause says.

- (48) a. Tenga le mani a posto.¹⁴
 hold-subj-3sg the hands in place
 ‘Keep your hands in place.’ (C. Cassola, *La ragazza di Bube*)
- b. Il Signore ci protegga.
 the Lord us protect-subj-3sg
 ‘May the Lord protect us.’ (G.T. di Lampedusa, *Il Gattopardo*)
- c. L’avesse anche detto lui.
 it-have-subj-3sg also said he
 ‘Suppose he had said it too.’ (Moretti and Orvieto 1978)

¹⁴ The examples are from Moretti and Orvieto (1978), where they have been compiled from various works of modern Italian literature. With (48a), I am working under the assumption that Italian ‘imperative’ forms which are morphologically identical to subjunctives are synchronically analyzable as subjunctives. Matters may turn out to be more complex.

- d. Che sia nel bagno?
that be-subj in bath
'She is in the bath?' (C. Cassola, *Una relazione*)
- (49) a. Riteneva che in quella zona fosse facile
thought-3sg that in this area was-subj easy
ritrovare qualche rivoltella.
to-find a revolver
'He thought that in this area it would be easy to find a revolver.'
(G. Comisso, *Giorni di guerra*)
- b. Neppure egli si meravigliò ch'io lo intervistassi.
not even he refl was-astonished that-I him interviewed-subj
'Not even he was astonished that I interviewed him.'
(M. Bontempelli, *Miracoli*)
- c. Spero che non sia andato a raccontarlo.
hope-1sg that not went-subj-3sg to tell-it
'I hope that he didn't go to tell it.' (C. Cassola, *Una relazione*)
- d. Non dico che non avesse le sue ragioni.
not say-1sg that not had-subj-3sg the his reasons
'I don't say that he didn't have his reasons.'
(L. Sciascia, *A ciascuno il suo*)
- e. I ragazzi dicono che il suo farmacista genitore
the children say that the their pharmacist father
stia sperimentando in corpore di lui gli effetti
be-subj experimenting in body of him the effects
di un nuovo sciroppo purgativo.¹⁵
of a new syrup purgative
'The children say that their pharmacist father is experimenting
on his body with the effects of a new purgative syrup.'
(E. Vittorini, *Il garofano rosso*)

¹⁵ This example is not fully acceptable for reasons irrelevant to mood selection. The sentence in (i), provided by Raffaella Zanuttini, corrects the difficulties.

- (i) I ragazzi dicono che suo padre, il farmacista, stia
the children say that their father, the pharmacist, be-subj
sperimentando su di lui gli effetti di un nuovo sciroppo purgativo.
experimenting on of him the effects of a new syrup purgative

The subjunctive is used to indicate certain facts, traditionally described as a lack of certainty, concerning what its clause asserts. I will begin to incorporate this intuition with the proposal that the Italian subjunctive is present in a clause when the modal context for that clause is *NONFACTIVE* in a particular sense: For example, a set of α 's doxastic alternatives to a situation s is nonfactive because w_s , the world of s , is not necessarily in $\text{Dox}_\alpha(s)$; in contrast, the modal context provided by *sapere* ('to know') is factive in the relevant sense. Even *dire* ('to say'), which usually takes the indicative, can be treated within this system, though showing how will require some work. Incorporating the mood switch under negation represented by (49d) will also require discussion. In the end, the lack of a factive modal context will be one factor, one type of uncertainty, that can rule out the indicative.

4. FORMALIZATION: SEMANTIC FEATURES

In this section we will see how all the data in section 3 can be covered in a single formal system. I begin in section 4.1 with discussion of the English indicative and *for*-infinitive. Then in section 4.2, the theory presented thus far is extended to cover the Italian data. Following this, in section 4.3 I examine the English mandative subjunctive and the mood-indicating modal *may*. These last forms are not as consistently characterizable as the others; their core semantics seems to be much interfered with by syntactic and lexical differences. Nevertheless, they may be fruitfully studied within the paradigm of sections 4.1 and 4.2. Finally, in section 4.4 I briefly examine the relation of these ideas to the proposals of Pesetsky (1992) and Farkas (1992). Throughout section 4 I focus on occurrences of the various moods and related forms in embedded contexts. In section 5 it is discussed how the proposed meanings are related to the conversational force of unembedded uses.

4.1. *English Indicatives and For-Infinitives*

Let us begin by once again looking at a simple embedded indicative. The components of the present analysis can be seen in the representation of (50)'s meaning given in (51). Sentences are interpreted with respect to a reference situation, a modal force, and a modal context.

(50) Maggie believes that Charlotte is untrustworthy.

(51) $\|\text{believe}_M(\text{that}(\text{C}(\text{indic}(\text{Charlotte is untrustworthy}))))\|^{\text{r,FR}} = \{s: \text{Dox}_M(s) \subseteq \|\text{indic}(\text{Charlotte is untrustworthy})\|^{\text{r,NEC,Dox}_M}\}$

In (52) I show precisely how the meaning in (51) is obtained. The operator C simply creates the modal assertion with appropriate modal force and modal context – in (51) force NEC (necessity) and context Dox_M . It represents the only way mood-related parameters enter the determination of truth conditions. The complementizer *that* (and *for* as well) relativizes the subordinate clause to those parameters, causing it to be a function from modal parameters to propositions; it is thus like the ‘ \wedge ’ operator. The attitude verb then applies this function to the pair $\langle NEC, Dox_M \rangle$. This results in the expected semantics for (50): the set of situations in which it is believed by Mary that Charlotte is untrustworthy.

- (52) a. *that* ψ translates as: $that(C(\psi'))$, where ψ' is the translation of ψ .
- b. For any ψ of type $\langle s,t \rangle$,¹⁶ reference situation r , modal force F , and modal context R ,
 $\|believe_M(\psi)\|^{r,FR} = \|\psi\|^{r,FR}(\langle NEC, Dox_M \rangle)$
- c. For any ϕ of type t , reference situation r , modal force F , and modal context R , $\|that(\phi)\|^{r,FR} =$ that function $f \in D_{\langle s,t \rangle}$ such that for any pair of a modal force F' and a modal context R' ,
 $f(\langle F', R' \rangle) = \|\phi\|^{r,F',R'}$.
- d. For any ϕ of type t , reference situation r , and modal context R ,
 $\|C(\phi)\|^{r,NEC,R} = NEC_R(\|\phi\|^{s,NEC,R}) =$
 $\{s: R(s) \subseteq \|\phi\|^{s,NEC,R}\}$

NEC_R is the necessity operator with accessibility relation R . In place of NEC , there could be other modal forces: possibility, weak necessity (Kratzer 1991), non-necessity (we’ll have call for this below), and so forth. Now we can state the restrictions on the indicative:

- (53) For any indicative ϕ , reference situation r , modal force F , and modal context R , $\|\phi\|^{r,FR}$ is only defined if R is prototypically expandable.
- (54) The modal context R associated with a verb V is prototypically expandable if it has the following property: for typical situations s in the domain of R , $R(s)$ contains only normal worlds.
- (55) For any reference situation r , modal force F , and modal context R ,
 when defined, $\|indic(\phi)\|^{r,FR} = \{s: \text{for some } s' \leq s, s' \in \|\phi\|^{r,FR}\}$.

¹⁶ Here t is the type of expressions which denote propositions. $\langle s,t \rangle$ is the type of expressions which denote functions from modal parameters (modal force and context) to propositions.

According to (53), an indicative clause presupposes that its modal context belongs to a class that typically has the property of expandability. If this condition is not met, the indicative's meaning is not defined. In (54), the verbs which provide such a modal context are identified; for example, as discussed above, doxastic modal contexts are prototypically expandable because typical states of belief render accessible only normal worlds. It should be noted that the modal context is here a function from situations to sets of situations, and not simply a set of situations as it was assumed to be, for purposes of exposition, in the last section. Thus it is simply an ordinary modal accessibility relation.

Now we can see why (56) is impossible.

(56) *Maggie wishes that Charlotte is untrustworthy.

(57) For any ψ of type $\langle s,t \rangle$, reference situation r , modal force F , and modal context R ,

$$\|\text{Wish}_\alpha(\psi)\|^{r,FR} = \|\psi\|^{r,FR}(\langle \text{NEC}, \text{want}_{\alpha,b} \rangle)$$

(58) $\|\text{Wish}_M(\text{that}(\text{C}(\text{indic}(\text{Charlotte is untrustworthy}))))\|^{r,FR} =$
 $\{s: \text{want}_{M,b}(s) \subseteq \|\text{indic}(\text{Charlotte is untrustworthy})\|^{s, \text{NEC}, \text{want}_{M,b}}\}$

It is not the case that $\text{want}_{M,b}(s)$ contains only normal worlds, for typical wanting situation s . Indeed, the elements in $\text{want}_{M,b}(s)$ are all plans beginning temporally with s . Thus according to (53) the meaning of the indicative complement clause is not defined.

Now we may move on to discuss the pattern with *for*-infinitives. The meaning given previously, expressed in (59), is still appropriate:

(59) For any clause ϕ , reference situation r , modal force F , and modal context R ,

$$\|\text{F}(\phi)\|^{r,FR} = \{s: s \text{ has as its initial segment a dispositional counterpart of } r \text{ and for some } s' \leq s, s' \in \|\phi\|^{r,FR}\}$$

The interpretation of (60) will then be (61), where *for* has the same meaning as *that*.

(60) Maggie wishes for Charlotte to be untrustworthy.

(61) $\|\text{Wish}_M(\text{for}(\text{C}(\text{F}(\text{Charlotte be untrustworthy}))))\|^{r,FR} =$
 $\{s: \text{want}_{M,b}(s) \subseteq \|\text{F}(\text{Charlotte be untrustworthy})\|^{s, \text{NEC}, \text{want}_{M,b}}\}$

There is no problem with (60)–(61); the case is different with (62):

(62) *Maggie believes for Charlotte to be untrustworthy.

$$\|\text{believes}_M(\text{for}(\text{C}(\text{F}(\text{Charlotte be untrustworthy}))))\|^{r,FR} =$$

$$\{s: \text{Dox}_M(s) \subseteq \|\text{F}(\text{Charlotte be untrustworthy})\|^{s, \text{NEC}, \text{Dox}_M}\}$$

In typical belief situations s , $\text{Dox}_M(s)$ is expandable. As we saw in the last section, Dox_M is therefore an inappropriate modal context for the *for*-infinitive. This reasoning can be made explicit in a grammatical restriction:

- (63) For any *for*-infinitive ϕ , reference situation r , modal force F , and modal context R , $\|\phi\|^{r,FR}$ is only defined if R is prototypically future-oriented.
- (64) The modal context R associated with a verb V is prototypically future-oriented if it has the following property: for typical situations s in the domain of R , $R(s)$ is a set of future-extensions of s .

For example, *wish* selects the *for*-infinitive because of the fact in (65).

- (65) For any situations s , b , and r , modal force F , and modal context R ,
- $$\|\text{want}_{\alpha,b}(s)\|^{r,FR} \subseteq \{s' : s' \text{ has as its initial segment a dispositional counterpart of } s\}$$

Wish makes accessible a set of plans, situations extending into the future from s .

In the above, I have treated the indicative and *for*-infinitive similarly, in that their restrictions are both expressed via presuppositions ((53) and (63)). Nevertheless, these cases are not completely parallel. Should an indicative find itself with a non-expandable modal context, due to an atypical belief's being reported, for instance, it will still be usable. An interpretation such as (51) will still make sense. In contrast, if a *for*-infinitive has an expandable modal context, the sentence in question will necessarily be false. For example, if $\text{Dox}_M(s)$ is expandable in (62), it will inevitably not be a subset of the infinitive's denotation. Thus, *for*-infinitives are semantically ruled out here, in addition to causing a presupposition violation.

4.2. Italian Mood

Italian mood choice is governed by the following two principles:

- (66) The subjunctive is used whenever the indicative is inappropriate.
- (67) The indicative is used with a modal force of necessity and a prototypically factive modal context:
- a. For any clause ϕ , reference situation r , modal force F , and modal context R , $\|\text{indic}(\phi)\|^{r,FR}$ is only defined if $F = \text{NEC}$.

- b. For any clause ϕ , reference situation r , modal force F , and modal context R , $\|\text{indic}(\phi)\|^{r,FR}$ is only defined if R is prototypically factive.
- c. The modal context R associated with a verb V is prototypically factive if it has the following property: for typical situations s in the domain of R , $w_s \in R(s)$.
- d. For any reference situation r , modal force F , and modal context R , when defined, $\|\text{indic}(\phi)\|^{r,FR} = \{s: \text{for some } s' \leq s, s' \in \|\phi\|^{r,FR}\}$.

Clauses (b)–(c) will account for (47b) (repeated below) and clause (a) for (47c).

(47) *The Italian Subjunctive*

- b. May be present under operators expressing attitudes other than certainty, such as opinion ((49a, b)) and desire ((49c)).
- c. Occurs with verbs and adjectives of certainty or assertion in negative sentences ((49d)).

First I illustrate the relevance of (67b,c). The semantics of (68a), similar to (49a) but with an indicative complement, would be as in (68b).

- (68) *Riteneva che in quella zona era facile ritrovare qualche rivoltella.
'He thought that in this area it was easy to find a revolver.'

- b. $\{s: \text{Ritenere}_{He}(s) \subseteq \|\text{indic}(\text{in quella zona essere facile ritrovare qualche rivoltella})\|_{s, \text{NEC}, \text{Ritenere}_{He}}\}$

The indicative is impossible here, because *ritenere* is not prototypically factive; that is, it is not the case that, for each situation s , w_s (the world of s) is normally in $\text{Ritenere}_\alpha(s)$. People frequently think things that are false. If the embedding verb were *sapere*, however, matters would be different. What one knows in a situation s must hold in w_s itself, and so an indicative complement would be allowed. Also note that (67c) requires that R make accessible whole worlds. This is a characteristic similar to expandability, and might be used to correctly rule out the use of certain factives like *piacere* ('to like') with an indicative complement, as these are intuitively like verbs of desiring in denoting attitudes only toward small situations. However, it is not obvious whether such verbs denote propositional attitudes, as opposed to attitudes toward events. I leave the matter for future research.

The next question is how the present approach accounts for the fact that *dire* ('to say') and *sicuro* ('certain') also take the indicative. Just because someone says something, for example, one can't be certain that it is true.

However, these cases will work out too if we consider that the modal contexts in question need not be rigorously factive, but merely prototypically factive. Consider for instance a report that α says ψ . In many situations it is expected that reported claims are true. I would like to suggest that such situations are the ones considered typical for the purposes of (67c). As a result, the indicative has been grammaticalized as the default mood for complements of verbs of assertion.¹⁷ (The reasoning is even clearer in the case of *sicuro*.) Furthermore, as we saw above in (49e), it is possible to override the default and use a subjunctive with *dire* to indicate that the reported assertion is not true. The present theory is able to take account of this in a precise way: the selection of an indicative complement by *dire* is optional, and given the default status of the subjunctive, its failure to do so implicates that the modal context is not factive.

Before going on to present an account as to why a verb like *sapere*, which typically takes an indicative complement, requires a subjunctive in the presence of the negative *non*, I need to note some facts concerning the interaction of modality and negation. Schmerling (1983), Palmer (1990), and Roberts (1993) discuss the fact that, once ambiguities between epistemic and circumstantial readings are controlled for, modals in English display a fixed scope with respect to negation. For instance in (69a), on an epistemic reading for *may*, the negation has narrow scope; in contrast, in the deontic (69b) the negation has wide scope.

- (69) a. Jane may not be leaving.
 b. Jane may not leave.¹⁸

These scope relations are not simply due to the difference between a deontic and an epistemic modal; consider epistemic *can't*, where the scope of negation is wide, and deontic *mustn't*, where it is narrow. Of interest to us is the idea that these facts tell us something more general about the relation between modality and negatives. I will claim that, within the semantics at least, negation and modal force often form a single unit, with the scope relation between the two idiosyncratically fixed.¹⁹ This could be

¹⁷ It is an open question whether reported assertions are more often true than reported beliefs. It may be that the language makes a somewhat arbitrary decision in having *ritenere* select the subjunctive but *dire* select the indicative. On the other hand, a factive belief can be reported with *sapere*, while there is no verb corresponding to 'factive *say*'. Thus, there may be no functional pressure within the language to be able to report factive thoughts with *ritenere* plus the indicative.

¹⁸ Palmer describes this case as one in which the modal is negative, not the embedded proposition. The analysis to be given below can be seen as formalizing just this intuition.

¹⁹ All that's really crucial for the analysis is that this hold when the negative has wide scope.

accomplished by extending to attitude verbs Schmerling's (1983) proposal that *not* plus a modal form a basic expression. The idea can be illustrated in the analysis of (69b), as given in (70), where D represents the appropriate deontic accessibility relation.

$$(70) \quad \begin{aligned} & \|\text{C}(\text{Jane leaves})\|^{\text{r,Neg-POSS,D}} = \\ & \text{Neg-POSS}_D(\|\text{Jane leaves}\|^{\text{s,Neg-POSS,D}}) = \\ & \{s: D(s) \cap \|\text{Jane leaves}\|^{\text{s,Neg-POSS,D}} = \emptyset\} \end{aligned}$$

Additional evidence for treating Neg-POSS as a unit comes from examples such as (71), in which it is not possible for the quantifier *someone* to have scope between the negative and *may*.

$$(71) \quad \text{Someone may not leave.}$$

It should be obvious how Neg-POSS can be treated via function composition.

I wish to use these facts about the fixed scope of modals and negation in English as evidence for the broader view that modals and negation have a propensity to form a semantic unit. In particular, I propose that the Italian (72) should be analyzed as in (73), where the clause's modal force has been combined with negation.

$$(72) \quad \begin{array}{ccccccc} \text{Non} & \text{sapevo} & & \text{nemmeno} & \text{che} & \text{si} & \text{fosse} & & \text{sposata.} \\ \text{not} & \text{knew-1sg} & & \text{not even} & \text{that} & \text{refl} & \text{was-subj-2sg} & & \text{married} \\ & & & & & & & & \text{'I didn't even know that she was married.'} \end{array}$$

$$(73) \quad \begin{aligned} & \text{Neg-NEC}_{\text{Know}_1}(\|\text{subj}(\text{si essere sposata})\|^{\text{s,Neg-NEC,Know}_1}) = \\ & \{s: \text{Know}_1(s) \not\subseteq \|\text{subj}(\text{si essere sposata})\|^{\text{s,Neg-NEC,Know}_1}\} \end{aligned}$$

At this point clause (a) of (67) comes into play; if instead of *fosse* there were an indicative form, the sentence would be ungrammatical. An indicative requires a modal force of NEC, which is not the same thing as Neg-NEC.

Given (67), then, it is possible to predict a good deal of the distribution of Italian subjunctives. The intuition that (67) expresses is quite simple. Within the present framework, the traditional, informal notion of 'certainty', which calls for the indicative, breaks down into two components: a prototypically factive modal context and a modal force of necessity. The conjunction of these two ideas is not accidental: as we will see in section 5, both of them are shared by the core use of indicatives, the unembedded assertion. The first characteristic is contributed by the semantics of an embedding verb or adjective, while the second depends both on this lexical item and on other factors. We have noted how *non* can affect the modal

force in such a way as to destroy this certainty; other things, such as a sentence's having an impersonal subject, can have the same effect. Further work will be necessary to determine how all of these cases can be analyzed.

4.3. *Other Moods and Related Forms in English*

In this section I briefly discuss the notional mood-indicating *may* and the mandative subjunctive in English. Neither of these have a completely predictable distribution, in that neither occurs in every context in which a purely semantic account would predict that it could. Nevertheless, their distribution is not semantically random, and the present theory is able to describe the kinds of circumstances in which they are semantically possible. It seems that beyond this, it must be admitted that lexical and syntactic idiosyncrasies come into play.

First let us consider *may*. Recall that as a dependent modal, *may* can occur under certain verbs expressing desire, such as *hope*, *wish*, or *pray*, and with epistemic operators like *possible* or *likely*. To repeat some data given earlier:

- (42) b. Jack wishes that you may be happy.
 c. I pray that God may bless you.
 d. It is possible that Sue may win the race.

I believe that there are actually two related lexical items here. There is a core requirement which pertains to all the examples, and an additional restriction on those that we see in (42b, c). The core requirement is simply a presupposition: the complement clause is presupposed to be possible. In general, as discussed by Karttunen (1974), the presuppositions of a complement clause become presupposed beliefs of the agent of the matrix clause. For example, (74) presupposes that Jane believes that it has been raining.

- (74) Jane hopes that it stops raining.

Likewise, the presupposed possibility of the complement clause in (42b) becomes a presupposed belief of Jack's: Jack must believe that it is possible you are happy. I do not intend to propose any explanation for the presupposition projection facts with attitude verbs, but simply note the presupposition in (75).

- (75) For any reference situation r , modal force F , and modal context R ,
- $\|\text{may}_{\text{dep}}(\phi)\|^{r,FR}$ is only defined if ϕ is possible with respect to $\text{Dox}_{\alpha}(r)$, where α is the denotation of the matrix subject.
 - When defined, $\|\text{may}_{\text{dep}}(\phi)\|^{r,FR} = \|\phi\|^{r,FR}$.

Principle (75) predicts that (42c) presupposes that I believe it possible that God will bless you. It is interesting to note that dependent *may* presupposes precisely what ordinary modal *may* asserts. It is in this case that we see most clearly the connection between notional mood and modality: mood can be seen as dependent modality, a form which signals that a higher modal operator has certain semantic characteristics.

The additional requirement pertaining to the *may* in (42b, c) is presented in (76).

- (76) For any reference situation r , modal force F , and modal context R ,
 $\|may_{dep2}(\phi)\|^{r,FR}$ is only defined if R is a buletic accessibility relation.

The reason for distinguishing two versions of mood-indicating *may* is to better account for the conversational force of matrix examples like (42a), repeated below. These only seem to involve the ‘wish’ interpretation of (42b, c), and not the pure epistemic reading of (42d).

- (42) a. May you have a pleasant journey!

Unembedded uses of non-indicative clauses will be brought up again in section 5, so I will put off until then further discussion of may_{dep2} . Neither version of mood-indicating *may* is completely productive, in that they cannot occur in all circumstances appropriate to their semantics. Nevertheless, their distribution is semantically coherent, describable within the proposed framework, and interestingly related to the true modal *may*.

The mandative subjunctive of (44b) has a straightforward treatment, seen in (77).

- (44) b. Mary demands that you join us downstairs at 3 p.m.
- (77) For any reference situation r , modal force F , and modal context R ,
- a. $\|m-subj(\phi)\|^{r,FR}$ is only defined if R is a deontic accessibility relation.
 - b. When defined, $\|m-subj(\phi)\|^{r,FR} = \|\phi\|^{r,FR}$.

As pointed out by B. Partee (p.c.), the relation R will qualify as ‘deontic’ if it is of the general type of either ‘ought to do’ (as in (78a)) or ‘ought to be’ (as in (78b)).

- (78) a. Karen gave the order to Jack that he climb the rock.
 b. It is necessary that it rain.

The fact that the mandative subjunctive is compatible with them both argues that the two kinds of deontic necessity form a coherent class.

4.4. *Alternative Proposals*

Before moving on to examine the role mood plays in determining conversational force, I would like to discuss briefly the relation of the above views to the proposals of Pesetsky (1992) and Farkas (1992). While their approaches are quite different from my own, there are underlying similarities of intuition which are worth remarking on. Nevertheless, I think the present proposal has the advantages of making explicit what semantic factors are relevant to mood selection and showing how those factors compositionally come into play.

Pesetsky argues that *for*-infinitives have the same semantics as *if*-clauses and that this allows an account of the interpretation of (60), repeated below. His proposal also requires that verbs which embed *for*-infinitives decompose into a combination of a modal plus a factive. For example, (60) has a post-LF syntactic representation along the lines of (79).

- (60) Maggie wishes for Charlotte to be untrustworthy.
- (79) If Charlotte were untrustworthy, Maggie would like it that Charlotte is untrustworthy.

Part of the intent of (79) is to unify the treatment of *for* in nonfactive contexts with the one which it has in factive ones. Recall the final set of data concerning *for*-infinitives given in (27d, e): they can occur with factives only in the presence of a modal, generic, or other quantificational operator.

- (27) d. James would like to arrive in Richmond soon.
e. James liked to arrive in Richmond early in the day.

Pesetsky's idea is that *for*-infinitives occur only in the presence of such an operator, and that when one isn't present in the surface structure it must be introduced at a later level of representation. In order to better evaluate Pesetsky's approach to (60), then, I will first consider a treatment of examples (27d, e) more in line with the ones I've been pursuing so far. Doing this will show that some of Pesetsky's ideas about them can be formalized within the present framework; additionally, a semantic account of the necessity of a modal or quantifier with factives will be suggested. Finally, it will be argued that it is both unnecessary and undesirable to follow Pesetsky in treating (60) on analogy to (27d, e).

Note first that it is possible to have *for*-infinitives as the antecedent of

a conditional, as seems to be the case with (80), nearly synonymous with (81).

(80) Sarah would like to visit us next weekend.

(81) If Sarah were to visit us next weekend, she would like it.

The sort of analysis I would like to suggest for these examples is the following: factive verbs which allow *for*-infinitives in this way actually denote attitudes toward situations (Portner 1992; Pesetsky 1992). Since the infinitive denotes a propositional function, it cannot be interpreted *in situ*.

I will discuss these forms in terms of a Quantifier Raising analysis. The *for*-infinitive moves from its base position, leaving behind a type *e* trace. The LF of (80) would be (82), under the assumption that the modal also raises to form a tripartite structure.

(82) [_s would [_{s_i} PRO to visit us next weekend] [_s Sarah like t_i]]

Here the meaning of *would* must be rather complex; the idea is that, in addition to its ordinary counterfactual modal semantics, it also acts as a binder in the manner of an adverb of quantification, binding the variable *x_i*, corresponding to the trace *t_i*, which refers to a hypothetical visiting situation. Heim (1982) and Brennan (1996) argue that modals may have this variable binding function; for instance, in (83) *must* provides universal quantification over farmers.

(83) A farmer must be kind to his donkeys.

Oversimplifying the counterfactual semantics for the sake of clarity, and leaving out the matrix tense as well, the sort of meaning we should get for (82) is (84).

(84) In all the most similar worlds in which Sarah visits us next weekend, she likes her visit.

There are many complications involved in integrating the treatment of *for*-infinitives argued for above into the semantics of modals, generics, and other quantificational operators. What's crucial for our purposes is to compare (82) with what would occur if there were no modal or other operator present.

(85) [_s[_{s_i} PRO to visit us next weekend] [_s Sarah like t_i]]

In (82) the modal provides the infinitive with an appropriate semantic context, but it is not clear how the structure in (85) is to be interpreted. One obvious possibility, suggested by Heim's (1982) treatment of adjoined definite and indefinite NP's, is to treat the two clauses as if conjoined. As

was noted in the last section, an unembedded infinitive – as this one effectively is – typically receives the utterance situation as its reference situation and ends up expressing a proposition with non-assertive conversational force. If this is what would happen here, we do not expect the two clauses to be conjoinable. Indeed, conjunction would require intersecting the propositions denoted by the two clauses and then intersecting the result with the conversational context; because none of the situations in the infinitive's proposition extend into the past, etc., the empty set will result. According to this line of reasoning, an infinitive is as inappropriate for this structure as it is for serving as a matrix-level assertion or as the complement of *believe* or *claim*. Thus, a *for*-infinitive will only be usable as the complement of a factive if there is a modal or other operator present. In a sense, the operator shields the infinitive from having to be intersected with the conversational context. I believe the points made so far in this section are quite compatible with Pesetsky's views.

Now we can evaluate Pesetsky's hypothesis that *for*-infinitives are always in the configuration seen in (79) and (82), through lexical decomposition if necessary. A first point, recognized by Pesetsky, is that many words which take *for*-infinitive complements have no clear way of being decomposed and no obvious paraphrase with *if*: *possible*, *ask*, *choose*, *offer*, *petition*, *refuse*, etc. For instance, he suggests that (86) be decomposed as in (87).

(86) John refused to leave.

(87) John acted on his desire not to leave.

There should be significant evidence for such a radical departure from surface constituency, such as the presence of scope or attachment ambiguities, but I know of none. Furthermore, there is not always complete parallelism between a sentence with a desire verb and one with the postulated post-decomposition form *would like*.

(88) a. *If the fish were trout, John wants to eat it.

b. If the fish were trout, John would like to eat it.

None of these difficulties arise on the present approach, since it is explicable why *for*-infinitives are compatible with such words as *wish*, *refuse*, or *like* (if accompanied by *would*) in semantic terms. Furthermore, it can be stated what is common to the contexts in which *for* is possible: There is always some sort of operator present which allows the infinitive to avoid being interpreted with respect to an expandable modal context. I would like to note, however, that I believe Pesetsky's (1992) syntactic analyses of the distribution of PRO, embedded subject NP trace, and ECM to be inde-

pendent of which approach to the semantics of *for* is chosen. Thus the proposals of this paper can be seen as making a contribution to the study of these topics as well.

Farkas (1992) makes interesting proposals about which verbs embed subjunctives or infinitives in Romanian and French. According to her approach, indicative-taking verbs describe a single world, whereas subjunctive-complement verbs describe a set of worlds or futures. For example, *dream* describes a dream world, while *wish* describes a set of futures compatible with the wish's being true. The analysis above can be seen as capturing Farkas's intuition, I believe. Although someone's dreams or beliefs can never describe a single world – they are never specific enough for that²⁰ – the set of alternatives associated with a verb which embeds the indicative must in normal circumstances entail the truth of some counterfactuals, that there was a past, that there are things far away, and other commonsense propositions. It is this property, which was labeled 'expandability', that allows Farkas to say these verbs describe a world. The context entails properties throughout whole worlds. Verbs which embed *for*-infinitives and subjunctives, in contrast, do not have this expandability property. Their modal contexts are only sets of smaller situations, and in this sense they describe mere parts of worlds.²¹ Perhaps these sets may be said to give rise to a description of a set of worlds or futures in Farkas's sense.

This concludes my discussion of how semantic properties can help explain the distribution of different clause types in subordinate positions. In the next section I will show that this theory of mood can make a contribution to understanding the conversational force of unembedded sentences.

5. THE ROLE OF PRAGMATICS

In the last section it was argued that notional mood can be better understood by considering it to be sensitive to the contextual factors of modal context, modal force, and reference situation. In this section I will try to show that the meanings for moods proposed there can be integrated naturally into an account of how sentences receive various types of non-assertive conversational force. Within the confines of this work, it will only be possible

²⁰ This problem also tells against Giannakidou's (1994) similar proposal.

²¹ This point may also be related to Rochette's (1988) proposal that Romance infinitives and subjunctives denote events. While an act of wishing, for example, clearly cannot be an attitude toward any particular possible event, according to the present theory a wish is toward a set of small 'event-like' situations.

to discuss the particular issue of conversational force. Other aspects of how the theory of mood relates to discourse semantics and pragmatics must await another paper.

Non-assertive uses of sentences are discussed in section 5.1. Section 5.2 contains a few final remarks.

5.1. *Conversational Force*

Let us begin by considering the mandative subjunctive in English, a form which seems to occur in unembedded contexts as the imperative. The proposed principle was given in (77a):

- (77) a. $\|m\text{-subj}(\phi)\|^{\text{R,R}}$ is only defined if R is a deontic accessibility relation.

In the cases we have examined so far, the modal force and context were always provided by an embedding predicate, but when a subjunctive of this type occurs as a matrix sentence, these things must be filled in from context. Let us consider as an example (89).

- (89) Leave the room immediately!

All that the mood requires with an imperative is that this R be deontic. As will be seen throughout this section, the contextually provided modal force typically is necessity. For this reason I propose (90) as a principle of determining conversational force.

- (90) The default modal force is necessity.²²

In (91) I express the result if (89) is interpreted with respect to a deontic modal context and a modal force of necessity. I also assume that imperatives contain a null version of *you* as subject.

- (91) $\|C(m\text{-subj}(you\text{ leave the room immediately}))\|^{\text{NEC,D}} = \{s: D(s) \subseteq \{s': you\text{ leave the room immediately in } s'\}\}^{23}$

²² The occurrence of permissives like (i) perhaps indicates that the modal force chosen can sometimes be possibility.

- (i) Have some fruit!

²³ As pointed out by an anonymous reviewer, assigning truth conditions to an imperative might lead one to expect that it could be judged true or false. I believe that the solution to why it cannot be requires a better understanding of the relation between semantics and pragmatics, in particular speech act theory, than we currently have. The same issue arises for indicatives used as performatives, sentences which I would assume to have their normal truth conditions.

Up until now, the operator C has always been introduced along with a complementizer. Here we see that it has to be provided for at the matrix level as well; this could be ensured in a number of ways, but most easily if we assume that matrix clauses are always CPs. Intuitively, C's introduction in the semantics can be seen as an operation corresponding to the function of making an assertion out of the imperative with respect to the modal parameters. This modeling of assertion will be used throughout the discussion of conversational force. Given this, the example must come out as a deontic necessity statement because of the requirements imposed by the clause's mood and principle (90). Thus we have been able to largely unify the semantics of the mandative subjunctive and the imperative.

Let us see now what this approach can do with ordinary indicatives. I propose that the default modal context for unembedded indicatives is the one defined in (92) and labelled 'ASSERT'.

- (92) ASSERT is the function such that for any situation s in the conversational context, $\text{ASSERT}(s) = \{s' : s \leq s'\}$

ASSERT is closely related to Kratzer's (1991) 'totally realistic modal base'. In (94) I work through example (93).

- (93) Mary is playing the piano.
- (94) $\|C(\text{indic}(\text{Mary is playing the piano}))\|^{\text{e,NEC,ASSERT}} =$
 $\text{NEC}_{\text{ASSERT}}(\{s' : \text{for some } s'' \leq s', s'' \in$
 $\| \text{Mary is playing the piano} \|^{\text{s,NEC,ASSERT}} \}) =$
 $\{s : \text{ASSERT}(s) \subseteq \{s' : \text{for some } s'' \leq s', s'' \text{ is a situation of}$
 $\text{Mary playing the piano}\}\} =$
 $\{s : \text{for some } s' \leq s, s' \text{ is a situation of Mary playing the piano}\}.$

In normal conversational contexts, ASSERT is plainly expandable. Thus, it can license the indicative. The proposition in (94) may be straightforwardly added to the conversational common ground.

Indicatives may also fail to be assertive.

- (95) I had a dream last night. My friend came to visit me.

A natural interpretation of (95) is that I dreamed that my friend came to visit me. This fact can be easily accommodated in the present system: the contextually supplied modal context for the second sentence, named DR below, is that which represents the content of my dream.

- (96) $\|C(\text{indic}(\text{My friend came to visit me}))\|^{\text{e,NEC,DR}} =$
 $\text{NEC}_{\text{DR}}(\{s' : \text{for some } s'' \leq s',$

$$s'' \in \llbracket \text{My friend came to visit me} \rrbracket^{s, \text{NEC}, \text{DR}} = \\ \{s: \text{DR}(s) \subseteq \{s': \text{for some } s'' \leq s', s'' \text{ is a situation of my friend} \\ \text{coming to visit me}\}\}.$$

What we have in (96) is simply the assertion that I dreamed that my friend came to visit me. This information may be directly added to the conversational context.

The modal context for the second sentence in (95) is one made salient by the semantics of the first. It is introduced via *dream*, a word which typically is associated with an expandable modal context. By virtue of this fact, the use of the indicative is allowed. Similarly to (96), a matrix indicative may be used to represent the content of more than just a dream; also possible would be stories, beliefs, claims, imaginings, or anything which would be expected to make contextually available an expandable modal context. Formally, we could represent these ideas about the nature of discourse by enriching the notion of a conversational context, making it a pair as in (97). Let us call this entity a DISCOURSE CONTEXT.²⁴

$$(97) \quad D = \langle C, \{\text{ASSERT}, M_1, M_2, \dots\} \rangle$$

Here, *C* is the conversational context, a set of possible situations, and the members of the second component of *D* are modal contexts, functions from elements of *C* to sets of situations. The modal contexts may be thought of as ways of accessing *C*. When a sentence is interpreted, its modal context must be selected from those available in *D*. Choosing *ASSERT* will make the sentence an ordinary assertion, while a modal context which represents the content of a dream will get a result like that for (95). This approach therefore lets us understand how as part of a conversation or discourse it is possible to maintain numerous subsidiary conversations or discourses, not all of which are taken as relating to reality in a direct way. Furthermore, sentences which relate to a subordinate context are treated in a way identical to that used with ordinary assertions. Nothing more is required to deal with a sentence which describes the content of a dream, for instance, than is needed for a simple assertion. Clearly there is a lot more that could be said here. However, it will require a work devoted to the connection between mood and discourse to fully evaluate these ideas; such a project is beyond the scope of the present paper.

By now it should be clear how all the other notional moods are going to work out; in each case, the mood in a matrix clause places restrictions

²⁴ Another possibility would be to introduce modal contexts as ordinary discourse referents. This approach is pursued in Portner (1994).

on the contextually supplied modal context. This means that the sentence will be interpreted with a conversational force corresponding to one of the attitude verbs which could embed it. A clause with our *may*_{dep2} has a meaning that could be obtained by embedding it under *wish*, *pray*, or something similar. (I do not know why the more general *may*_{dep} cannot occur unembedded.) Italian subjunctives can act as if they are the complements of a wide range of predicates which fail to express certainty. In this way they can express such things as orders or wishes. Unembedded *for*-infinitives may express wishes or regrets, just as they may be embedded by such verbs. It supports this conclusion that the infinitive can only occur with *regret* if it has perfective aspect, and can only express regret unembedded when it is in this same form.

- (98) a. I regret for you have to come all this way.
 b. *I regret for you to go to Paris.

- (99) a. For you to have come all this way!
 b. *For you to go to Paris! (regret interpretation)

Presumably this restriction on the ‘regret’ interpretation has to do with the fact that regret is a past-oriented attitude, incompatible with the future-orientation of a *for*-infinitive unless a perfective operator is present. With *have*, the infinitive will denote future-extensions of the reference situation which eventually include a situation of the hearer having come all this way. The time at which the hearer actually came would then precede this ‘having come’ situation, and may therefore precede even the reference situation.

5.2. Summary Remarks

Notional mood constrains the conversational force a clause may have, and determines the sorts of embedding contexts it may occur in. This can be analyzed in general by theorizing that mood places conditions on the modal parameters of interpretation for a clause. While in some cases, as with the mandative subjunctive, these preconditions are unable to be related to anything else, in many instances they are intimately linked to other components of the semantics of the mood: The *for*-infinitive is future oriented yet tenseless, and one natural way of encoding this aspect of its meaning goes far toward explaining its mood-like restrictions. Likewise, the indicative creates persistent propositions as part of its function of yielding sentences which describe facts to be incorporated into the expandable conversational context; these clauses then occur embedded with predicates

that are associated with this property of expandability. With a theory of this type, one can then go on to investigate more complex aspects of discourse structure within a uniform framework.

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