

## You Do What You Gotta Do, Or Why *must* Implies *will*

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In this paper I present a theory to highlight similarities and differences in meaning for various modals in English, in order to account for three sets of facts: modal cooccurrence facts, sequencing preferences between modals, and finally, a difference in strength between the modals *must* and *should*. Modal cooccurrence facts have to do with which modals can be used together in conjoined sentences, and which can never be used together. Sequencing preferences have to do with the order in which modals in conjoined sentences appear. As for the difference between *must* and *should*, the puzzle here is why these modals are not synonymous, given that they are both strong modals with either deontic or circumstantial readings. My aim will be to give an account that stays as much as possible within a standard theory of modals, using only mechanisms provided in that theory – quantificational force, a modal base, and an ordering source – and proposing at most minimal changes to how these work.

My thesis is that the meanings of certain modals are interrelated. Not only do these modals, under particular readings, share the same modal base, but the ordering sources by which modal base worlds are ordered work in a hierarchical fashion with respect to each other. The point of the hierarchy is that an ordering can only order worlds left as ties by any higher ranked orderings. A lower ordering can never reorder the worlds ordered by a higher one.

This hierarchical arrangement helps explain the sets of facts just mentioned. Modal sentences can be conjoined only when the meanings do not clash, as dictated by the ordering source hierarchy. Sequencing preferences respect a requirement that a less informative statement precede a more informative one, if we allow that the degree of informativity is established not only by quantificational force but by the ordering source hierarchy. Finally, the difference in meaning between *must* and *should* is to be found in the participation of *must* in the hierarchy, and the exclusion of *should*. In section 1 of this paper, I will be making these hypotheses more explicit.

An outcome of my theory is the claim that *must* implies *will*, and this has proven to be controversial. By the way I have set things up, the claim is deduced from the theory and therefore is a way of testing it. But as the original facts I set out to explain are quite robust, and the theory to explain them is quite simple, why should an implication of the theory seem false?

The reason, I will argue, is that my claim only extends to circumstantial or deontic *must*, and not a reading of *must* which is teleological. The teleological reading occurs in a variety of sentence types and has tended to be overlooked, but it is salient enough to complicate judgements of modal entailment. In section 2 of this paper, I will examine some of the contexts in which *must* has a teleological reading. I will offer a suggestion of how this modal is to be interpreted, and I will show how teleological *must* cannot be expected to imply *will* because that modal has no teleological reading.

## 1. A Ranking of Orderings

### 1.1. *The Facts to Explain*

Some modal combinations are common, such as those seen in examples in (1-5) which are found frequently.

- (1) I can and I will.
- (2) We must and we will.
- (3) We can and we must.
- (4) We cannot and we will not.
- (5) (He said) I may and (in fact) I will.

Other combinations are never found. Examples such as those in (6-9) are completely ruled out.

- (6) #I can't but I will.
- (7) #I must but I might not.
- (8) #We cannot but we must.
- (9) #We must but we won't.

For those combinations that are permissible, there is a sequencing preference, as shown in examples (10-13).

- (10) ?We will and we can.
- (11) ?We will and we must.
- (12) ?We must and we can.
- (13) ?We will not and we cannot.
- (14) ?I will and (in fact) I may.

These examples contrast with (1-5) which exhibit the preferred sequencing. The contrast between the two sets of sentences seems fairly robust, even if the dispreferred options are more odd than completely unacceptable.

At this point we may ask, why should some modals be incompatible, or certain orders of presentation dispreferred, unless the meanings of the modals is related in some way?

I am also interested in a difference in the urgency between deontic or circumstantial *must* versus the modal *should* under related deontic or circumstantial readings. The intuition to capture is that *must* (colloquially *have to*) is binding in the way that *should* is not, as seen in (15) versus (16).

- (15) I have to fix the tail light.
- (16) I should fix the tail light.

In (15), the implication is that the speaker has no choice but to fix the tail light. (16) suggests there is a moral or practical advantage to fixing the tail light, but it is left

open whether or not the speaker is going to do it.

The contrast between (17) and (18) reinforces the point.

- (17) #I have to fix the tail light but I'm not going to.  
 (18) I should fix the tail light but I'm not going to.

Nothing is strange about (18), but (17) is ruled out. The clash in (17) is apparently between *have to* (*must*) and *not going to*, or equivalently, *won't*. (In this paper I assume that *will* and *be going to* have the same meaning.) Saying that one has to or must do something seems to entail that they will do it.

A similar kind of fact is observed with past tense modals. Consider the contrast between (19) and (20) or (21).

- (19) #I had to cook dinner last night, but I didn't.  
 (20) I should have cooked dinner last night, but I didn't.  
 (21) I was suppose to cook dinner last night, but I didn't.

Saying that I had to cook dinner apparently entails that I did so. The modal in the past tense still carries the meaning of inevitability. (20) or (21), on the other hand, are acceptable. Here, I am supposing that *should have* is a past tense form of *should*, but the same thing holds for the modal expression *was supposed to*. That is, these expressions do not carry the meaning of inevitability.

Again we may raise a question. Given the standard theory of modals in which *must* and *should* have virtually the same semantic content, where does the additional meaning of inevitability for *must* come from?

### 1.2. Modal Theory

We need a theory for modals, and the theory I start with is the one developed in Kratzer (1981) and Kratzer (1991), and elsewhere in Kratzer's work. The theory attributes to each modal a quantificational force that is unchanging across different occasions of use, and two conversational backgrounds – a modal base and an ordering source – that are contextually variant. A conversational background is a function from a world to a set of propositions, where a proposition is identified with a set of worlds. For a modal base  $f$ ,  $f(w^*)$  is a set of propositions and  $\bigcap f(w^*)$  is a set of worlds. I'll be calling these worlds  $MB_{w^*}$  with the subscript  $w^*$  for the world of utterance suppressed.  $MB$  can be epistemic or circumstantial. For an ordering source  $g$ ,  $g(w^*)$  is a set of propositions. The basic idea of ordering is that for two worlds in  $w$  and  $w' \in MB$ , and ordering source  $g(w^*)$ ,  $w <_{g(w^*)} w'$  just in case the set of  $g(w^*)$ -propositions to which  $w'$  belongs is a proper subset of the set of  $g(w^*)$ -propositions to which  $w$  belongs.

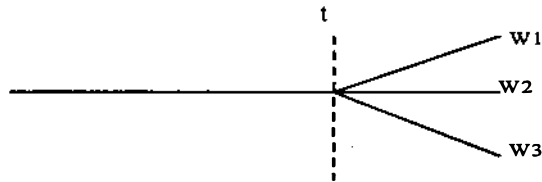
As explained in Kratzer (1981) and (1991), modal readings depend on the interaction of the modal base and the ordering source. For Kratzer, the modal base can be epistemic or circumstantial, and ordering sources can be stereotypical, deontic, or empty. Kratzer (1991) discusses a stereotypical ordering source

associated with an epistemic modal base. A stereotypical ordering source orders things according to how well they conform to ‘the normal course of events’. Circumstantial readings in Kratzer’s theory are derived from a circumstantial modal base combined with a null ordering source. A circumstantial base is a set of facts that makes things possible or necessary, in that theory, and the null ordering source imposes no ordering on these worlds.

I will introduce certain adaptations to the theory, in part to capture certain intuitions about indeterminism and in part to allow for a greater integration of the meanings of modals. To begin with, let conversational backgrounds take worlds and times as arguments. We will still have epistemic modal bases, but instead of a circumstantial modal base, we have a totally realistic modal base up to a time:  $f_{TR}$ .  $f_{TR}(w^*, t)$  is a set of propositions that exhaustively characterize  $w^*$  up to time  $t$ .  $\cap f_{TR}(w^*, t)$  is the set of worlds containing  $w^*$  that branch at  $t$ , since the exhaustive description of  $w^*$  up to  $t$  pertains to all the worlds that overlap  $w^*$  up to  $t$ . This is the modal base for all the readings I consider in this paper, and I do not consider modals with epistemic readings.

The totally realistic modal base up to the time of speech is represented in the figure 1.

Figure 1



$w_1$ ,  $w_2$ , and  $w_3$  are worlds that branch at  $t$  and that are identical up to  $t$ ; these are *proxies for the actual world at t*, assuming that we inhabit this broomstick.

To get the relevant modal readings, MB is the set of branching worlds, and the difference between circumstantial, deontic, and stereotypical readings will come down to a matter of ordering source. Deontic (D) is some set of normative statements, or rules. Circumstantial (C) is a set of things like physical and biological laws. This is different than Kratzer’s theory where circumstantial readings involve an empty ordering source.

The stereotypical ordering (S) also requires some comment. As in Kratzer’s theory, the stereotypical ordering source is concerned with the normal course of things, but what is crucial here is which MB worlds are S-best. According to the picture of branching worlds, there is no actual world until the end of time, if there is an end of time. At speech time  $t$ , we can’t refer to  $w_1$ ,  $w_2$ , or  $w_3$  as the actual world. But any of these worlds will serve just as well as the actual world, so I call the whole bundle of branching worlds the set of *proxies for the actual world at t*. This set, I assume, contains wildly implausible worlds that don’t represent real possibilities. The S-best worlds are just those worlds that are real possibilities, real candidates to eventually be the actual world. Any of the S-best worlds at  $t$  could finally be the actual world, but worlds that are not S-best at  $t$  haven’t got a chance.

### 1.3. Explaining Modal Cooccurrences

To account for the data I looked at earlier, I assume all the relevant modal readings involve the same modal base, and that there is a hierarchy of orderings which ranks the circumstantial, deontic, and stereotypical orderings with respect to each other.

In (22), I spell out my assumptions about which ordering sources are associated with which modals, and which modals are duals to each other.

(22)

	Stereotypical	Deontic	Circumstantial
Universal	will	must	must
Existential	may/might	may (can)	can

All the modals on the chart have the same MB – totally realistic up to the time of speech. Columns show ordering source, as labeled at the top, and rows show quantificational force, as labeled at the side. Modals in the same column but different rows are duals.

The hierarchy of ordering sources I assume is as in (23).

(23)  $S < D < C$

By this ranking, the circumstantial ordering is the highest, and trumps the deontic and the stereotypical. Likewise, the deontic trumps the stereotypical. The idea behind the hierarchy is this: a lower ranked ordering cannot rearrange worlds ordered by a higher ranked ordering – at best it can offer a refinement. Another way to put it is that a lower ranked ordering can only order worlds that are ties with respect to a higher ranked ordering. A consequence of the hierarchy is that rankings between worlds in the modal base are passed down from higher ranked orderings to lower ranked orderings. In other words, if  $A < B$ , then  $w <_B w' \rightarrow w <_A w'$ , or, if B is higher than A, w is B-better than w' only if w is A-better than w'.

The intuition behind this setup is mostly common sense. Some laws or regularities tolerate no exceptions, while others do. Scientific laws (physical, biological, and so on) are the strongest. They are stronger than moral laws – you can hardly have a moral law that requires you to do what is physically impossible. They are stronger than human will – we cannot choose not to obey the law of gravity, for example. Moral laws of the sort found in D are meant to overrule human tendencies. Of course, there is a question of whether there is ever a moral law can overrule human tendencies. This is a matter I return to.

Now to the cooccurrence and non-cooccurrence facts. These come about by entailments between modals, and we are now ready to see how the ranking in (23) gets the right entailments. (I am assuming a version of modal theory in which there are best worlds for a given ordering source.)

The ranking imposes subset relations between modal base worlds best with respect to the given orderings. Start with the ranking between S and D. Since  $S < D$ ,

S can only impose further ordering on worlds that are ties with respect to D. That means that all S-best worlds in MB are also D-best worlds, but any given D-best world in MB is not necessarily S-best. Next, the ranking between D and C. Since  $D < C$ , D can only impose further ordering on worlds that are ties with respect to C. That means that all D-best worlds in MB are also C-best worlds, but any given C-best world in MB is not necessarily D-best. Finally, since  $S < C$ , S can only impose further ordering on worlds that are ties with respect to C. All S-best worlds in MB are also C-best worlds, but any given C-best world in MB is not necessarily S-best.

What we can't do is simply add lower ranked ordering source propositions to a higher ranked ordering source. Because ordering depends on the sheer number of propositions true in a world, if we just added propositions together, we would risk having a lower ranked ordering change an ordering imposed by a higher ranked source. The facts I'm looking at wouldn't follow from such a setup.

Notice that for explaining differences between modals in the same column, duals, the hierarchy has no role to play. There is no difficulty in explaining (3).

(3) We can and we must.

Here, the modals both have the same modal base and same ordering source. It is no contradiction to say that one C-best world in MB is  $\phi$ , and all C-best worlds in MB are  $\phi$ , although it may be redundant to do so. I return to the issue of redundancy later. And of course, (8) is bad for the very reason that these modals are duals.

(8) #We cannot but we must.

The hierarchy does help explain cooccurrence examples and non-cooccurrences examples for modal pairs across different columns of the chart in (22). Start with (1), repeated here.

(1) I can and I will.

'Can  $\phi$ ' is true iff there is a C-best world in MB which is a  $\phi$  world, and 'will  $\phi$ ' is true iff all S-best worlds in MB are  $\phi$  worlds. (I ignore the issue of the temporal interpretation in this paper.) Since all S-best worlds are C-best worlds, if all S-best worlds are  $\phi$ , then at least one C-best world is  $\phi$ , and the cooccurrence in (1) is explained.

In the same way, we can explain the contrast between (6), repeated here, and (24).

(6) #I can't but I will.

(24) I can but I won't.

Starting with (6), if all S-best worlds are  $\phi$ -worlds, but no C-best world is a  $\phi$ -world, we have a contradiction. As for (24), it is perfectly possible that no S-best world is  $\phi$  while at least one C-best world is  $\phi$ . No contradiction is involved and the sentence is good.

Similarly, since all S-best worlds in MB are C-best worlds, if all C-best worlds are  $\varphi$ , then so are all S-best worlds, and (2) should be good, and (9) should be bad.

- (2) We must and we will.  
 (9) #We must but we won't.

That prediction is borne out.

#### 1.4. Explaining Sequencing Preferences

Modal cooccurrences appear in special environments, such as speeches, editorials, and so on. Their purpose appears to be rhetorical. They are used for a kind of emphasis, and by our theory, they should be redundant, as we see when we reconsider (1).

- (1) I can and I will.

The sentence in (1) says that at least one C-best world is  $\varphi$  and all S-best worlds are  $\varphi$ . But if all S-best worlds are  $\varphi$ , then at least one C-best world is  $\varphi$ . Why bother saying so, unless the intent is rhetorical?

In explaining sequencing preferences, it should be observed that duals behave differently than non-duals. If the modals are duals and the cooccurrence is allowed at all, it appears that quantificational force makes a difference in the sequencing. This can be seen by comparing (3) and (12).

- (3) We can and we must.  
 (12) ?We must and we can.

It appears that the existential modal has to come first. *can* comes before *must* and not the reverse.

However, if the pair are not duals, quantificational force is not the only factor in determining the sequence. Consider the following examples.

- (1) I can and I will.  
 (2) We must and we will.

Existential *can* is before universal *will*, but universal *must* is also before universal *will*. From these examples, it appears that the modal associated with the higher ranked ordering must come first.

An explanation for these facts can be given in terms of informativity. The rule seems to be that the less informative modal statement should come first. If the modals are duals, the difference is in quantificational force. An existential modal is less informative than a universal modal in the sense that saying something about some members of a set is less informative than saying something about all members

of the set. Therefore, the existential modal should come first.

Informativity also may be at work in the hierarchy. A lower ranked ordering cannot change the ordering imposed by a higher ranked ordering, but it can impose a further ordering on any worlds that have been left as ties. In that way, a lower ranked ordering is more informative than a higher ranked ordering. By the principle that the less informative modal statement should come first, when the quantificational force is the same, the modal associated with the higher ranked ordering should come first. That is what we see in (2).

We have not considered any cases which contain a lower ranked modal with existential force and a higher ranked modal with universal force. Here are two examples to consider, although both seem bad.

(25) ?John might go, and he must.

(26) ?John must go, and he might.

(25) involves an existential modal with an S ordering, followed by a universal modal with a D or C ordering, and (26) the reverse. In lieu of a more careful examination of the facts, it appears that the two constraints are working at cross purposes in these examples. (25) correctly involves the existential modal coming first, but the higher ranked modal comes second. (26) correctly involves the higher ranked modal coming first, but the existential modal comes second. That both sequences are odd can be seen as preliminary support for the informativity account I have given here.

### 1.5. *Explaining the Difference Between should And must*

We come to our last topic in this initial discussion – the difference in urgency between *must* and *should*. That difference is illustrated in (17) versus (18), repeated here, in which *have to* is considered a colloquial variant of *must*.

(17) #I have to fix the tail light but I'm not going to.

(18) I should fix the tail light but I'm not going to.

That *have to* is more urgent than *should* is shown by its incompatibility with *not going to*. If you accept that you have to change the tail light, you accept the urgency or inevitability of the task, and it makes no sense to say that you won't do it. If you merely accept that you should change the light, you still give yourself the option of not carrying out that action.

To capture this difference, let us say that for *must* or *have to*, the ordering source is D or C, depending on whether the reading is deontic or circumstantial. D and C are part of the hierarchy in (23), and the entailments to *will* (or *be going to*) follow. Furthermore, we posit that *should* is associated with different orderings, that although may be deontic or circumstantial are not part of the hierarchy. What matters in particular is that the orderings associated with *should* are unrelated to the orderings associated with *will* or *might*. As a consequence, *should* is less binding, and you don't get the same behavior with this modal as with *must*.

It follows from the non-participation of *should* in the ordering source hierarchy that this modal is used only to chose between live options, to mark one of these as more advantageous in a moral or practical sense. For example, in (18), both the option of changing the tail light and not changing it are in play, and we are only marking one of these as better. The normative force of *should*, whatever it is, does not overrule human choice, and this is captured theoretically by excluding it from the hierarchy.

We can also mention the contrast between (19) and (20) or (21), with the examples repeated here.

- (19) #I had to cook dinner last night, but I didn't.  
 (20) I should have cooked dinner last night, but I didn't.  
 (21) I was suppose to cook dinner last night, but I didn't.

In (19), the modal base under consideration is a set of worlds that branch at a time prior to last night. In all the D-best or C-best of these, depending on whether *had to* in this case is deontic or circumstantial, I cook dinner. But that means, by the hierarchy, that all the S-best worlds are worlds where I cook dinner. Since we have assumed that the actual world comes from this set of S-best worlds, the worlds that remain as of the speech time in (19) must be worlds in which I did cook dinner last night. That is why the sentence is ruled out.

Since we assume that *should*, and it appears *is supposed to*, involves ordering sources outside this hierarchy, there is no entailment that I did cook dinner, and (20) and (21) are not ruled out.

## 2. Speaker Nominated Telos and Teleological *must*

A consequence of the theory is that *must*, circumstantial or deontic, implies stereotypical *will*, the ordinary future modal. This consequence was revealed in the explanation of why examples like (9) are not good.

- (9) #We must but we won't.

All S-best worlds in MB are C-best worlds, so it can't simultaneously be the case that all C-best worlds are  $\varnothing$  but no S-best worlds are  $\varnothing$ . But if all S-best worlds in MB are C-best worlds, *must* entails *will*.

However, as mentioned, this result is controversial and the opinion has been expressed to me that *must* could not possible entail *will*. I think there are two reasons that judgements on this issue are less than clear. The first is that saying there is an entailment to a *will* sentence doesn't mean that the *will* sentence is true. The *must* sentence itself may be false. This is shown in the following dialogue.

- (27) A: You must clean out the sink.  
 B: I won't do it.

In this dialogue, B denies the entailment of A's remark that B will clean out the sink. This denial amounts to the claim that what A has said is false. This is a common sort of exchange and it doesn't render the claim that *must* entails *will* false.

A second reason is that there is a separate kind of *must* which is not merely circumstantial but circumstantial/teleological. My claim does not extend to this interpretation of *must* because for one thing, there does not appear to be a teleological *will*. The teleological *must*, appearing as it does in special contexts, has been insufficiently appreciated and I propose looking at some of those contexts here.

Consider the sentences in (28-30), all apparent counterexamples to the claim that *must* implies *will*.

- (28) John must call the plumber or the pipes will burst.
- (29) Mr. Bush must...overcome approval ratings stuck near 50 percent, a united Democratic opposition, and Congressional Republicans for whom the President's proposals have little upside.  
(NYTimes, 2/6/05 Wk 3)
- (30) The Syrians must remove their troops as well as their intelligence services.(3/9/05)

The disjunction in (28) leaves open the possibility that John won't call the plumber and that the pipes will burst, so it does not imply that John will call the plumber. The sentence in (29) appears within a discussion of whether the President will be able to put into place his Social Security plan. The remark is not meant to suggest that he actually will unstick his approval ratings, beat the Democrats, or persuade the Republicans, but only that those things must be done to realize the plan. And (30), a comment by the President, doesn't sound like a guarantee that the Syrian government will remove their troops from Lebanon.

### 2.1. *Disjunction*

Consider again (28), repeated here.

(28) John must call the plumber or the pipes will burst.  
In this sentence, we have disjunction between two modal sentences, but the modals are different. (28) does not entail that John will call the plumber since the possibility of his not calling the plumber and letting the pipes burst is explicitly mentioned. But the meaning of this sentence is a puzzle for our semantic theory. The question is how modals interact semantically with disjunction. How are the worlds in the modal base to be divided up for both modals to quantify over?

A related sentence is found in (31).

- (31) John will call the plumber or the pipes will burst.

Simons (2005) suggests an ATB strategy which puts the modal under the scope of

the disjunction. By such an approach, (31) would mean that the S-best worlds in MB are either worlds where John calls the plumber or worlds where the pipes burst. (31) doesn't entail that John will call the plumber. It doesn't even involve a guarantee that the pipes won't burst if he calls the plumber. What it does say is that in all worlds in which the pipes don't burst, John calls the plumber. That means John had better call the plumber.

An ATB strategy is ruled out for (28), as the modals in the disjuncts are different, but we may take a hint from this analysis. (28) is also about two future possibilities – that John calls the plumber or that the pipes burst. Once again, maybe the pipes will burst even if he calls the plumber. What is crucial, however, is that in all the worlds in which the pipes don't burst, John calls the plumber. That again means he'd better call the plumber, but this time, this is not merely an implicit suggestion. (28) is more of an urgent recommendation. The urgency is part of the meaning of the sentence.

Here is what I want to say about (28). The second disjunct in (28) establishes that the S-best worlds in MB are divided into worlds in which the pipes burst and worlds in which the pipes don't burst. The first disjunct in (28) then is to be interpreted with respect to those worlds in MB in which the pipes don't burst. What is the ordering source to be? It is circumstantial in that by the laws of physics, etc., the pipes don't burst only when they are fixed by a plumber. It is teleological in that the relevant laws are specific to a particular outcome. What (28) means therefore is that in the best worlds in MB in which the pipes don't burst – best by the laws determining this outcome – John calls the plumber.

I believe that this accords with our intuitions about the sentence. The sentence does not mean that John is simply forced to call the plumber, as it would with simply a circumstantial reading of *must*. The sentence allows that John is free to not call the plumber and let the pipes burst. But given the goal of preventing the pipes from bursting, the sentence says that John does not have a choice but to call the plumber. Notice that nothing is said about John's goals. Even if he wants the pipes to burst, the sentence can be true.

This particular interpretation is invoked by the modal/disjunction structure we see in (28) where *must* is found in the first disjunct and *will* is found in the second. By the interpretative strategy required, worlds with certain, often aversive, consequences are removed from the modal base. Next the remaining worlds are ordered by the circumstantial-teleological ordering. This meaning is reminiscent of Kratzer's approach to conditionals. In Kratzer (1991), a conditional is analyzed as a modal statement with the denotation of the *if* clause added to the modal base. (32) is adapted from that paper.

$$(32) \quad [\text{if } \alpha, \text{ must } \beta]^{f,g} = [\text{must } \beta]^{f,g}, \text{ where for all } w \in W, f'(w) = f(w) \cup \{[\alpha]^{f,g}\}.$$

The crucial thing is that the antecedent fact is added to the modal base, not as a lasting update, but just long enough to work out its consequences.

We need something similar here. The following shows in part how we want to analyze (28).

- (33)  $[\text{must } \alpha \text{ or will } \beta]^{f,g} = [\text{must } \alpha]^{f,g}$ , where for all  $w \in W$ ,  $f'(w) = f(w) \cup \{W - [\beta]^{f,g}\}$  and  $g$  is circumstantial/teleological.

This says that we add the complement of the proposition embedded under *will* to the modal base and interpret the first disjunct against a background of worlds in which the pipes do not burst. Something should also be said about the temporal interpretation of the sentence, since we are interested only in worlds in which the pipes don't burst in the future. I ignore that problem here.

I call the relevant reading in this sentence a Speaker Nominated Telos (SNT) reading. An SNT reading involves a proposal by the speaker of some result for consideration, though not a result that is necessarily an aim of the designated agent of the sentence. SNT always require a modal with a circumstantial/teleological reading. A disjunction of the sort in (28) brings about as SNT reading by mentioning in the second disjunct the consequence which is being avoided. But it appears that disjunction is only one of several devices in natural language to bring about SNT readings. We turn directly to another.

## 2.2. In order to *Clauses*

We return to (29).

- (29) Mr. Bush must...overcome approval ratings stuck near 50 percent, a united Democratic opposition, and Congressional Republicans for whom the President's proposals have little upside.  
(NYTimes, 2/6/05 Wk 3)

This sentence appears within a discussion of the likelihood of the President passing his plan for private Social Security accounts for retiring Americans. Given that context, the sentence does not imply that Mr. Bush will actually overcome the obstacles mentioned, but only says that in order to win approval for them, he needs to do those things. This meaning can be made explicit by adding an *in order to* clause, as in (34).

- (34) In order to pass his private accounts plan, Mr. Bush must overcome approval ratings stuck near 50 percent, a united Democratic opposition, and Congressional Republicans for whom the President's proposals have little upside.

Clauses beginning with *in order to* are sometimes called rationale clauses, but in (34) that label doesn't seem right. By the meaning of the sentence, the obstacles really must be overcome to pass the private accounts plan and it is not a question of Mr. Bush merely believing they do.

That there is a reading for *in order to* clauses besides the agent's rationale is made clear in (35).

- (35) In order for me to sell those stocks, their price must double.

The *in order to* clause in (35) cannot be a rationale clause. My selling the stocks can in no way be a rationale for the price of the stocks doubling. That is something which happens independently of anybody's intent.

The interpretation of both sentences seems to involve a particular outcome proposed by the speaker for consideration. In (34), the outcome is the passing of the private accounts plan. In (35), the outcome is my selling the stocks. Both sentences are talking about what is needed to achieve this proposed result – overcoming a set of obstacles in the one case, and the price of the stocks doubling in the other. It looks like we have more Speaker Nominated Telos readings again. Therefore, I propose that an *in order to* clause is another possible device used to nominate a particular telos for consideration.

One way to make the SNT reading of the *in order to* clause more salient is to add the word *first* to the matrix. Consider, for example, (36), in which the meaning is unchanged from (35).

(36) In order for me to sell those stocks, their price must first double.

The same test shows that the *in order to* clause in (34) has an SNT reading.

(37) In order to pass his private accounts plan, Mr. Bush must first overcome approval ratings stuck near 50 percent, a united Democratic opposition, and Congressional Republicans for whom the President's proposals have little upside.

In (37), we have added the word *first* to the matrix clause without a change of meaning from (34).

Given this reading, the meaning for the sentence will be as follows.

(38)  $[\text{must } \alpha \text{ [in order to } \beta]]^{f,g} = [\text{must } \alpha]^{f',g}$ , where for all  $w \in W$ ,  $f'(w) = f(w) \cup \{\beta\}^{f,g}$  and  $g$  is circumstantial/teleological.

The proposition embedded inside the *in order to* clause is added to the modal base. The relevant ordering source is circumstantial-teleological. The sentence indicates what is necessary for reaching this outcome. (Once again, I am ignoring the crucial issue of how the temporal interpretation gets fixed.)

Given the meaning for circumstantial-teleological *must*, we shouldn't expect any entailment to *will*. These sentences say what is required for a particular goal to be met and it is hard to imagine what a corresponding sentence containing *will* would mean. As it turns out, *in order to* clauses in *will* sentences do not appear to have SNT readings. The closest I have been able to get are sentences like (39).

(39) In order not to burn it, the bread will be taken out of the oven after forty minutes.

But this sentence is in the passive voice and an agent is implied. Even here, the *in*

*order to* clause functions as a rationale clause and the rationale is that of the implied agent. After all, the sentence does not guarantee that taking the bread out of the oven after forty minutes will keep it from burning.

### 2.3. *Deontics*

Lastly, I consider the case of deontics. Let's return to (30).

(30) The Syrians must remove their troops as well as their intelligence services.

The intuition about (30) is that it could be a simple moral assertion, but it equally could be an implied threat. In other words, the sentence is ambiguous.

As a simple moral assertion, (30) would imply (40).

(40) The Syrians will remove their troops as well as their intelligence services.

(40) is either true or false. If it is false, (30) would also be false. This accords with what we have said about deontic *must* sentences.

However, (30) could also be read as an implied threat. If we make the threat explicit, we end up with a sentence like (41).

(41) The Syrians must remove their troops as well as their intelligence services, or we will drive them out.

But now we have a sentence with a familiar pattern. We decided that this combination of modals in a disjunctive sentence gives us a Speaker Nominated Telos reading and invokes a circumstantial-teleological ordering source.

Suppose we apply this interpretive strategy to (41). The second disjunct sets up a division over the modal base. It says that there are S-best worlds in MB in which the US military drives out the Syrian army as well as ones in which they don't. The first disjunct is now interpreted against a background of worlds in which the US military does not drive the Syrian army out of Lebanon. The best of these, by the circumstantial-teleological ordering, are worlds in which Syria voluntarily removes its troops and its intelligence forces from Lebanon. The hand of the Syrians is here not being forced absolutely, but if they want to avoid a certain consequence, it is being forced.

Sentences like these, ambiguous between a purely deontic reading and a circumstantial-teleological reading, are not at all uncommon. A parent may say something like (42) to a child.

(42) You must behave.

Does this mean the child is under a moral obligation to behave, or does it mean that if they don't, they will be punished? I think it carries both meanings. In fact, the ambiguity of these sentences makes them quite handy for moralists with real-world

power to exact punishment.

### 3. Conclusion

In this paper, I have proposed a hierarchy for modal orderings which accounts for some modal cooccurrence facts and helps explain certain sequencing preferences. The hierarchy also explains a semantic difference between *must* and *should*, two modals which, under the relevant readings, appear to have the same quantificational force, the same modal base, and either a deontic or a circumstantial ordering source. I proposed that the semantic difference between these modals is that *must* participates in the modal hierarchy and therefore carries a sense of inevitability that *should* lacks.

One consequence of the theory – that *must* entails *will* – seemed at first counterintuitive. I defended the claim by arguing that it only extends to circumstantial *must*. In syntactic environments whose interpretation involves a Speaker Nominated Telos, *must* has a circumstantial/teleological reading. In such cases we don't expect any entailments to *will* because *will* does not appear to have a teleological reading.

We have seen that Speaker Nominated Telos readings are associated with a certain kind of disjunct and with some *in order to* clauses, which can therefore be viewed as telic clauses. A parallel between the interpretation of telic clauses and conditionals was drawn. Conditionals, in Kratzer's theory, are interpreted by adding a proposition to the modal base, and I've suggested that this is what happens in the interpretation of a telic clause. A crucial difference between an *if* clause and a telic clause, however, has to do with the directionality of time. This is the difference in whether you are going from a fact forward to its consequences or from a fact back to its necessary antecedents, and that is a matter for further research.

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