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Dimensions of Variation Among Modals

Christopher Tancredi

Abstract: English modal auxiliaries come in many flavors. The goal of this paper is to spell out the dimensions along which they vary. The ultimate purpose of detailing this variation is for use in giving a formal analysis of modals. I do not provide such an analysis in this paper however. The dimensions of variation can be divided into two broad categories: contextual variation and grammatical variation. Contextual variation includes context-dependent differences in intuitive interpretations for a single modal expression, while grammatical variation typically shows up in differences among distinct modal expressions.

Introduction

English has a large number of modal expressions, including main predicates, auxiliary verbs and adverbs. I will focus in this paper on English modal auxiliary verbs, in particular the possibility modals *may*, *might*, *can* and *could*, the necessity modals *must*, *shall*, *should*, *will*, *would*, and the semi-auxiliaries *ought (to)*, *need (to)* and *have to*. These modals come in a wide range of different flavors, including *epistemic*, *deontic*, *alethic*, *teleological* and *bouletic* interpretations among others. Not all modals come in all flavors, however. They differ along other lines as well, such as how they interact with tense, how their prejacent is temporally located, whether they are appropriate in realis contexts, irrealis contexts or both, and whether they give rise to subjective interpretations, objective interpretations or both. These differences will be illustrated below, and a semantic framework for analyzing them without appeal to possible worlds will be developed.

Temporal location of evaluation:

The first dimension of variation that I look at is that of temporal location of evaluation. The sentence *John must leave*, on a deontic understanding, indicates the existence of a requirement. That requirement can be imposed by the speaker, by another individual, by law, by school regulations or in many other ways. I use “temporal location of evaluation” to indicate the time at which this requirement is required to hold. For the sentence in question, that time is at or after speech time. If the only requirements for John to leave are in the past, then the sentence is false. The standard use of this sentence is one where the requirement is at speech time. However, it is possible, if only marginally, to shift the requirement to the future, just as typical present tense sentences can have a future interpretation. For a future-shifted interpretation to be possible for a typical present-tense sentence, the event or state denoted by the sentence must be planned. This accounts for the perceived difference between (1a) and (1b) below, since travel can be planned but weather cannot:

- (1) a. John is (traveling) in Paris a week from Friday
b. #It [rains/is raining] a week from Friday

To illustrate a future-shifted requirement reading for *must*, consider a situation in which I want to spend the upcoming weekend with John in New York. I know, however, that other people have expectations of him, and unless they are convinced that they absolutely cannot be with him over the weekend they will insist that John be with them instead of me. His wife Mary, for example, will want to go to Paris with him, while his colleague Bill will want him to go to Tokyo together on a business trip. Mary will only give up on being with John if John has unavoidable business commitments. Bill, in contrast, will only give up on being with John if John has to be with his family. I’m planning to meet Mary on Monday and Bill on Tuesday, and have scheduled the following incompatible requirements for those days:

- (2) a. On Monday, John must be in Tokyo over the weekend on a business trip.
- b. On Tuesday, John must be with his family on vacation in Paris over the weekend.

Where the requirements are part of what is being planned, they can be forward shifted with *must* in this situation.

To illustrate the impossibility of using *must* to indicate a purely past requirement, imagine that in John's company travel schedules are determined by a committee. The committee meets every Monday at 3pm, and fixes travel schedules for employees. Last week the committee decided that John was to go to Paris this coming Christmas. This week, the committee decided that John is to go to Paris on Thanksgiving instead. Uttered at any time after last week's committee meeting but before this week's meeting, (3a) was true but (3b) false. After this week's meeting, however, (3a) becomes false and (3b) true.

- (3) a. John must go to Paris this Christmas
- b. John must go to Paris this Thanksgiving

The fact that there was a past requirement is not enough to render (3a) true once the decision was made to change that requirement. This illustrates the impossibility of using *must* to indicate existence of a past requirement.

In contrast to the behavior of *must*, parallel sentences with *have to* can readily be used to indicate past requirements in addition to present or future requirements, including unplanned future requirements, by varying the tense. In the same situation as above, the following sentences are all true and appropriate:

- (4) a. Last week, John had to go to Paris this Christmas.
- b. Now, he has to go to Paris this Thanksgiving instead.
- c. If the boss has her way, next week he will have to go on Halloween instead.

The time of the requirement in this case tracks the time picked out by the matrix tense and the first adverbial; last week, now, and next week.

Could differs both from *must* and *have to* in its deontic interpretation in two ways. First, rather than reporting on a requirement it reports on permission, something distinguishing all possibility modals from all necessity modals for those that can be given a deontic interpretation. Second, the permission it reports on can hold exclusively in the past. This can be seen by changing the committee's job above from one of deciding who has to travel to one of who is permitted to travel. Imagine that last week John got permission to go to Paris during Christmas, this week he got permission to go during Thanksgiving but his permission to go during Christmas was revoked, and next week he is expected to get permission to go on Halloween but to no longer be permitted to go on Thanksgiving. In this situation, *could* is most clearly acceptable when reporting the past permission, as seen in (5a) below. Whether present or future permissions can be so reported is less clear.

- (5) a. Last week, John could go to Paris this Christmas.
b. (?)Now, he could go to Paris this Thanksgiving but not Christmas.
c. ?If the boss has her way, next week he could go on Halloween but not Thanksgiving.

Parallel judgments for a deontic interpretation of the full range of English modal auxiliaries are given in the table below:

- (6) Possible time of requirement/ permission for a deontic interpretation of modal auxiliaries in the sentence *John ____ go to Paris.*

	past	present	future plan	future
<i>may</i>	–	ok	ok	–
<i>might</i>	–	–	–	–
<i>can</i>	–	ok	ok	–
<i>could</i>	ok	(?)	?	–
<i>must</i>	–	ok	ok	–
<i>shall</i>	–	?	?	–
<i>should</i>	–	ok	ok	–
<i>will</i>	–	?	?	–
<i>would</i>	?	?	?	–
<i>ought to</i>	–	ok	ok	–
<i>need *(to)</i>	ok (needed)	ok (need)	ok (need)	ok (will need)
<i>have to</i>	ok (had)	ok (have)	ok (have)	ok (will have)

(? indicates doubt about whether the sentence truly has a deontic interpretation.)

Teleological interpretations differ from deontic interpretations in at least two ways. First, a teleological interpretation necessarily involves a goal that is independent of the denotation of the prejacent. Second, while a teleological interpretation can be analyzed as involving what is permitted or required, it is not what is permitted or required by an agent as it is under a deontic interpretation but rather what is permitted or required by circumstances.

For teleological interpretations I use the sentence “[In 1964/ Today/ Next year/ In 2037], to get from Tokyo to Osaka by train in [4 hours/2.5 hours/67 minutes] or less you _____ take the [Hikari/Nozomi/Chuo] shinkansen.” The relevant facts regarding shinkansen service are as follows: In 1964, the fastest service was called the Hikari, which made the trip in 4 hours. The Kodama train stopped at every station, and so took longer. Today, the fastest service is the Nozomi, which can make the trip in as little as 2 hours and 22 minutes; the Hikari service makes extra stops and takes at least 2 hours and 57 minutes; and the Kodama still stops at every station and takes the longest: at least 3 hours and 57 minutes. In 2037 the Chuo-shinkansen service is scheduled to begin, using a new maglev train, and is expected to make the trip in 67 minutes for the fastest service. Given these facts, the following sentences are all true:

- (7) a. To get from Tokyo to Osaka by train in 4 hours or less in 1964 you [had to/ would] take the Hikari service.
- b. To get from Tokyo to Osaka by train in 5 hours or less in 1964, you [could/ might] take the Hikari or Kodama services.
- c. Today, you [must/ should/ would/ ought to/ need to/ have to] take the Nozomi service to make the trip in less than 2.5 hours.
- d. Today, you [might/ can/ could] take the Nozomi service to make the trip in less than 3 hours.
- e. In 2037, you [will/ would/ will need to/ will have to] take the Chuo shinkansen to make the trip in 67 minutes.
- f. In 2037, you [might/ could] take the Chuo shinkansen to make the trip in less than 2.5 hours.

While a future planning interpretation is possible for a teleological modal sentence, for sentences involving planned travel what is planned is not typically the possibility/ necessity indicated by the modal but rather the time of the preajcent, at least for passengers working out train schedules. A planned necessity/ possibility interpretation is pragmatically available, however, if we focus on the decisions of the company regarding scheduling, e.g. when deciding to have no Nozomi services late at night and hence to make it impossible to make the Tokyo-Osaka trip in 2.5 hours after 9:23pm. The availability of teleological interpretations for the various modals referring to past (1964-Hikari), present (Today-Nozomi), future planned (Next year-Nozomi) or future (2037-Chuo) achievement of goals is summarized in the following table:

- (8) Possible time of the circumstances that make possible a teleological interpretation of [*In 1964/ Today/ Next year/ In 2037*], to get from Tokyo to Osaka by train in [*5 hours/ 4 hours/ 2.5 hours/ 2.3 hours/ 67 minutes*] or less you _____ take the

	past 1964	present Today	future plan Next year	future 2037
<i>may</i>	–	?	?	–
<i>might</i>	ok	ok	ok	ok
<i>can</i>	–	ok	ok	–
<i>could</i>	ok	ok	ok	ok
<i>must</i>	–	ok	ok	–
<i>shall</i>	–	?	?	–
<i>should</i>	–	ok	ok	–
<i>will</i>	–	?	?	ok (?)
<i>would</i>	ok	ok	ok	ok
<i>ought to</i>	–	ok	ok	–
<i>need *(to)</i>	ok (needed)	ok (need)	ok (need)	ok (will need)
<i>have to</i>	ok (had)	ok (have)	ok (have)	ok (will have)

(? indicates doubt about whether the sentence truly has a teleological interpretation.)

The differences between available teleological interpretations and available deontic interpretations show up here in bold-face. *May* is seen to have a readily available deontic interpretation but it is doubtful whether it allows a teleological interpretation. *Will* can be used to indicate future circumstances, though it is unclear whether the relevant sentence is being interpreted as a modal or whether *will* is merely acting as a future tense morpheme in this case. The remaining differences show up with *might*, *could* and *would*, all of which give rise to hypothetical interpretations when interpreted teleologically that are not available when interpreted deontically. Unlike all other interpretations for modals that can't combine with multiple tenses, these three hypothetical modals can be used to indicate potential future circumstances. I take these differences to relate to the realis/ irrealis distinction: *might*, *could* and *would* are the only three modals here that give rise to an irrealis interpretation. I take irrealis

1 For some speakers it is pragmatically infelicitous to use a possibility modal in cases where the prejaent is the only option for achieving the intended goal. The intended interpretations can still be brought out for those speakers by lengthening the time within which the goal is to be achieved so that 2 services or more can succeed in achieving the goal in that time.

interpretation to be compatible with any temporal location, but irrealis interpretation I assume is incompatible with deontic interpretation: permission and requirement are inherently realis in nature.

Epistemic interpretation is relative to the knowledge/ belief state of one or more individuals. The question thus arises of when this state must hold for an epistemic modal statement to be true. We find that with two classes of exceptions, the state has to hold uniformly in the present.

- (9) Possible time of knowledge/ belief state for epistemic interpretation of modal auxiliaries in the sentence *John ____ [be/ have been] in Paris.*

	past	present	future plan	future
<i>may</i>	–	ok	–	–
<i>might</i>	ok(?) (have been)	ok	–	–
<i>can</i>	–	? (ok: can't)	–	–
<i>could</i>	ok (?) (have been)	ok	–	–
<i>must</i>	–	ok	–	–
<i>shall</i>	–	?	–	–
<i>should</i>	–	ok	–	–
<i>will</i>	–	ok	–	–
<i>would</i>	ok (?) (have been)	ok	–	–
<i>ought to</i>	–	ok	–	–
<i>need (*to)</i>	–	ok (need)	–	–
<i>have to</i>	ok (had)	ok (have)	–	ok (will have)

(? indicates doubt about whether the sentence truly has an epistemic interpretation.)

The uniform absence of a planned future interpretation I take to derive from the impossibility of controlling one's future epistemic state. The exceptions arise first for *have to*, and second for *might*, *could* and *would*. For *have to*, the time of knowledge/ belief is controlled straightforwardly by the tense. For *might*, *could* and *would*, in addition to being able to indicate that the knowledge/ belief is in the present, they can also indicate it to be in the past provided that the prejacent is in the perfect. This latter behavior is illustrated below by contrasting *might* with *may*.

- (10) a. Last week, John might have been in Paris, though now I know he wasn't.
b. Last week, John may have been in Paris, #though now I know he wasn't.
c. #Last week, John may/might be in Paris(, though now I know he wasn't).

(10a) can be interpreted as saying that last week the speaker was in an epistemic state that allowed for John's being in Paris at that time, though now she is in an epistemic state that no longer allows him to have been there then. Neither (10b) nor (10c) can be interpreted in this same way. Both use of *might* instead of *may* and of the perfect *have been* instead of *be* are necessary for obtaining this interpretation. It should be noted that *might* can be combined with *have been* to indicate a present knowledge/belief state about a past time as well, like all other modals that have an epistemic interpretation.

- (11) Last week, John couldn't have been in Paris, though given what you just told me, now he might have been.

The behavior of *need (to)* is special enough to warrant scrutiny. This expression comes in two forms: and non-agreeing, present-tense form *need* that (typically combined with *not*) can be interpreted epistemically in addition to deontically or teleologically and that does not occur with *to*; and an agreeing form *need to* which requires *to*, can come in past, present or future forms, and lacks an epistemic interpretation.

As we saw, where deontic modals trade in permission and requirement, teleological modals trade in circumstances and epistemic modals trade in knowledge and belief. Despite these clear differences in interpretation, however, we see two clear patterns of temporal location in matrix utterances that cut across these interpretations. On the one hand are interpretations that are anchored clearly to the speech time. These include the interpretations of *may*, *can*, *must*, *should*, *ought to* and non-agreeing *need*.

For these, the permission, requirement, circumstances, knowledge or belief that license use of the modal, or what I will refer to as the modal foundation, has to obtain at speech time, or where planning is possible at a planned future time. On the other hand are interpretations that can be manipulated by tense, including those of *have to* and *need to*. This leaves us with a final group consisting of *might*, *could* and *would*, the only three modals that allow for an irrealis interpretation. These show a less systematic range of behavior across the three types of interpretation. They are the only modals other than the past tensed *had to* and *needed to* that can indicate a past-shifted modal foundation. They are also the only modals not involving *will* that can indicate an unplanned future-shifted modal foundation.

To account for the differences in temporal behavior, I posit the following lexical properties for the modals under consideration:

- (12) Present tense: may, can, must, shall?, should, will_m, ought to, need (to), have to
 Past tense: could_p, needed to, had to
 Future tense: will_f
 Tenseless:² might, could_{ir}, would

The subscripts on *will* distinguish a modal version (_m) from a pure tense version (_f), while those on *could* distinguish a past-tensed, realis version (_p) from a tenseless, irrealis version (_{ir}). For tensed modals, tense determines the time at which the modal foundation holds. For non-tensed modals, the time at which the modal foundation holds is determined purely pragmatically.

2 The analysis of *might*, *could* and *would* as tenseless is not forced by the data, though it is suggested by it. Since overt tense affects the time at which the modal foundation is indicated as holding, the lack of temporal restriction for these three modals in teleological and epistemic interpretations will require either that they be ambiguous among past, present and future tensed forms, or that they lack tense. I adopt the latter option.

Temporal event location

While evaluation time is restricted by tense, the time at which the prejacent, i.e. *p* in *modal p*, holds, or what I will call prejacent time or temporal event location, is restricted by aspect. I break aspect into two categories: inherent aspect, determined by the lexical items making up the main predicate, and grammatical aspect, determined by overt grammatical formatives like progressive and perfective markers, and by covert grammatical formatives denoting planning and recurrence. The inherent aspect of the prejacent can either be stative or eventive. In the former category belong stative predicates like *be in the room*, while in the latter category belong eventive predicates denoting a single occurrence of an event, including processes like *run*, achievements like *arrive*, and accomplishments like *make a cake*. The grammatical aspect of the prejacent can be modified by aspectual markers, all of which I analyze as deriving stative predicates. These stative predicates include predicates denoting recurring states or events like [*be in the room/ run/ arrive/ make cakes*] *regularly*, progressive predicates like *be [running/ arriving/ making a cake]*, and perfect predicates like *have [been in the room/ run/ arrived/ made a cake]*. It also includes the state of a plan holding, where what is planned is a future state or event. Predicates that are not overtly progressive or perfective are in many cases ambiguous between a recurring event interpretation and a single event interpretation.

While cast in terms of properties of the prejacent, the above properties can be most straightforwardly illustrated with non-modal sentences. The interpretation of the sentence can be manipulated contextually by using the sentence to answer a question, where the question makes it explicit whether what is at issue is a plan, a recurrent state/ event, or a single unplanned state/ event. Consider the sentence *John runs*, for example, as an answer to each of the following questions:

- (13) a. What are John's mornings like these days? (present recurring events)
b. What activity is John engaged in as we speak? (#present single event)
c. What is John's role in the upcoming track and field meet?

(planned single event)

d. What do John's mornings look like once he recovers from his injury?

(planned recurring events)

The sentence can be felicitously used to answer any of the questions in (13a,c,d), but not the question in (13b). I take this to indicate that the sentence can denote a present state of events recurring, a present state of a single future event being planned, or a present state of a future state of events recurring being planned, but that it cannot denote a single present event. This array of facts can be given a uniform explanation by taking present tense to obligatorily relate speech time to a state, not to an event.³ The inherent aspect of the verb phrase *run* is eventive. The interpretations needed to answer the questions in (13a-d), however, call for a state, requiring an aspectual marker to convert the event denoted by the VP into a state. For (13a,c,d), there are covert aspectual markers that can do what is needed, what I label PLAN and RECUR. PLAN takes a state or event predicate P and produces a state predicate true of all states in which a plan exists for a P-type state/ event to occur in the future, while RECUR takes a state or event predicate P and produces a state predicate true of all states in which P-type states/ events recur. The unacceptability of *John runs* as an answer to (13b) derives from the absence of any appropriate covert aspectual marker that can convert *run* into the state of running occurring throughout. There is an aspectual marker that can accomplish this task – the marker PROG. This marker, however, is overt, not covert, showing up as *be ...-ing*, and is what renders *John is running* an appropriate response to (13b).

This test allows us to give a full characterization of the possible interpretations of all sentences, including those with overt aspectual elements (*be ...-ing*, *have ...-en*) and those without. To do so, however, we first need to have a working hypothesis for how the overt aspectual elements are interpreted. I take the progressive morpheme *-ing*

3 Past tense shows different behavior – in particular a single, unplanned past event reading – that is best explained by assuming it can directly locate an event in addition to a state.

and the perfective morpheme *-en* to attach to a verb but to semantically modify a clausal projection of the verb. For *-ing*, the clausal projection is required to denote a property of (non-stative) events E, and *-ing* converts that into the property of being a state S such that the atelic event E' whose necessary completion is determined by the completion of E occurs throughout S.⁴ For *-en*, an overt instantiation of the aspectual marker PERF, the clausal projection can denote a property of states or of events, and following Higginbotham (2008) I take it to semantically convert that property into the property of the resultant state of P holding. The resultant state of a property is the state that begins the moment that property is instantiated. For a telic eventive property such as an accomplishment or an achievement, the resultant state begins the moment the telos has been reached. For an atelic property such as a process or a state, its resultant state holds as soon as the state or event gets under way.

With this as background, the next question is what combinations of aspectual morphemes are possible, and in what scopal order. If we assume that PLAN, PERF(ective), RECUR and PROG(ressive) are the only grammatical aspect markers in English; that each marker can occur at most once in a clause; and that their order of occurrence affects interpretation; then there are 60 logically possible orderings of two or more of these markers, and hence 60 potential interpretations to be checked for to determine how aspect is implemented in English. We can simplify our task by assuming that any restrictions that show up on isolated pairs of markers will also hold when additional markers are align. With this assumption, we only have to check the 12 ordered pairs of markers given below:

- | | | |
|------|------------|------------|
| (14) | PERF-PLAN | PLAN-PERF |
| | PERF-RECUR | RECUR-PERF |
-

4 This complicated description is needed to cover the three types of events that can be progressivized: processes like *run*, achievements like *arrive*, and accomplishments like *make a cake*. In the case of *run*, the event corresponding to E' is simply the running event E itself. In the case of *arrive*, however, it is an event leading up to the arrival event, while in the case of *make a cake* it is the making process leading up to the existence of a finished cake.

PLAN-PROG	PROG-PLAN
RECUR-PROG	PROG-RECUR
PERF-PROG	PROG-PERF
PLAN-RECUR	RECUR-PLAN

Since PLAN and RECUR are by hypothesis phonetically null, we can only test for their presence by their effect on interpretation. PERF and PROG, in contrast, can be assumed to only occur when phonetically overt.

The top four pairings can be tested with the sentence *John has run*, involving a covert PERF marker and optionally also PLAN and/or RECUR. If PERF is the scopally higher marker, it will require that the resultant state of a PLANned running or of a state of RECURrent running hold at speech time. That is, it will require that a state of PLANned running or of RECURrent running have gotten under way by speech time, possibly concluding by then and possibly not. If PERF is the scopally lower marker, it will require that a PLAN hold at speech time for a future resultant state of running, or that a RECURrent state of resultant states of running hold at speech time. The following examples test these possibilities and show that if PERF co-occurs with PLAN it has to be in the order PLAN-PERF, while if it co-occurs with RECUR it has to be in the order PERF-RECUR.

(15) a. What past and possibly still ongoing plans are there for John's role at the upcoming track meet?

#John has run (for the past 2 days) then. (#PERF-PLAN)

(Intended: there has been a plan (lasting the past 2 days) for John to run then.)

b. What are the current plans for John's events at the track meet tomorrow?

(The current plan is the following:) By 2:00, John has run (and by 5:00 he has done the long jump). (PLAN-PERF)

As the above examples show, it is possible to use *John has run* to indicate current

plans about what is to have occurred in the future, but it is not possible to use it to indicate plans about the future that have occurred in the past, be it a relative future w.r.t. the time of the plans or an absolute future w.r.t. speech time.

I turn now to the co-occurrence of PERF and RECUR.

(16) a. What kinds of things has John done as a regular morning routine in the past?

He has run. (PERF-RECUR)

(Intended: Regularly running in the morning is something he has done.)

b. What is John's current morning routine?

#He has run. (#RECUR-PERF)

(Intended: Having run is something that John does as part of his regular morning routine.)

Here we see that it is possible to use *John has run* to indicate the existence of a past routine. Formally this comes out as the resultant state of a past state of recurrent running events holding at speech time, i.e. a PERF-RECUR interpretation. It is not possible for the same sentence to indicate a recurrence of simple perfect *John has run* states. Such an interpretation would allow the sentence to be true if John were to run regularly at night but never in the morning, since running at night makes it true in the morning that he has run. Regular nighttime running, however, does not render (b) true.

The next four pairings to test involve again one overt and one covert aspectual marker, this time with the overt marker being PROG instead of PERF. The sentence under consideration this time is *John is running*. Under a PLAN-PROG interpretation it should mean that there is a current plan for John to be running in the future. Under a PROG-PLAN interpretation it should mean that there is a currently ongoing planning event that is planning for John to run in the future.⁵ As the following examples show,

5 If PROG can only apply to eventive predicates and not to stative ones, and if PLAN produces a stative predicate, then a PROG-PLAN should be unavailable in principle, and

only the PLAN-PROG interpretation is possible.

(17) a. What activity is planned for John for the weekend?

(At the moment,) John is running (on Saturday, though those plans might change before then). (PLAN-PROG)

b. What plans for John is his coach in the process of making?

#(At the moment and probably for another hour,) John is running (on Saturday). #PROG-PLAN

(Intended: The coach is at the moment planning for John to run on Saturday, and his [planning/ having that plan] is likely to continue for another hour.)

For the occurrence of PROG with RECUR, a RECUR-PROG interpretation of *John is running* would mean that events of John running recur over a period of time that includes speech time. A PROG-RECUR interpretation, in contrast, would mean that there is a currently ongoing recurrence of *John run* events. While these two interpretations feel intuitively different, in terms of their truth conditions they appear to be identical. We can still distinguish the two classes of readings, however, by changing our example to one involving a telic predicate rather than the atelic run. On the analysis of PROG given above, PROG applied to a telic eventive predicate does not entail reaching the telos: *John is building a house*, for instance, does not entail on its simple progressive interpretation that John ends up with a house. RECUR, in contrast, when applied to a telic eventive predicate, does entail reaching the telos: *These days, John builds a house in the morning* does entail that John regularly ends

similar considerations would make a PROG-RECUR interpretation impossible. With other stative predicates, however, we find that they can occur under PROG, as in *John is being altruistic*, or as in the McDonald's ad campaign slogan *I'm loving it*. I don't take a stand on whether these sentences involve eventive interpretations or whether they instead show that PROG can in fact apply to stative predicates as well as to eventive ones. Their existence at least renders PROG-PLAN and PROG-RECUR interpretations something that needs to be contended with.

up with a house in the morning. This means that a PROG-RECUR interpretation of *John is building a house* should entail that John regularly ends up with a house, while under a RECUR-PROG interpretation that need not be the case.

Care must be taken in constructing the examples to test the ordering possibilities. For the sentence *John is building a house these days*, it is possible in principle to give the indefinite *a house* wide scope, and under such an interpretation the predictions of the PROG-RECUR interpretation potentially become muddled. If combination of *build* with a variable entails completion of what binds the variable then the predictions remain unchanged, but not otherwise. Rather than face this issue directly, I sidestep it by supplementing the answer in such a way as to make a wide scope indefinite interpretation pragmatically unavailable. Suppose that John is working on 3 different houses these days, but that on any given day he only works on one, regularly alternating which house he works on. House building being what it is, John cannot complete a house in a day and so works on each house for many months. In such a context, we can distinguish a RECUR-PROG interpretation from a PROG-RECUR interpretation of *John is building a house these days* by their predicted truth values: the former is predicted to be true and the latter false. As seen below, observation shows the RECUR-PROG interpretation to be available.

(18) a. What activities are a part of John's regular morning routine these days?

John is building a house (in the morning, working alternately on a total of 3 different houses).

(RECUR-PROG: True; PROG-RECUR: False; Observation: True)

(Intended: His ongoing house building activity occurs regularly in the morning these days, sometimes on one of 3 houses, sometimes on another.)

The tendency of speakers to favor an interpretation that gives a true answer over one giving a false answer makes it difficult to conclude from the above example that a RECUR-PROG interpretation is unavailable. We can overcome this problem by

negating the answer. In the situation described, it is not the case that John completes a house regularly in the morning. If a RECUR-PROG interpretation is available for the sentence, its negation should thus be potentially true in the situation described.

(18) b. What activities are a part of John's regular morning routine these days?

John is not building a house (in the morning these days: he can't complete a house in a day. Rather, each morning he works a little bit at a time on one of 3 houses he is building, each of which will take several months to complete).

(RECUR-PROG: False; PROG-RECUR: True; Observation: False?)

(Intended: It's not the case that John's building of a complete house occurs regularly in the morning these days.)

While the judgment here is not crystal clear, I will take it to indicate that a PROG-RECUR interpretation is unavailable.

Next we turn to the combination of PERF and PROG. Since both of these aspect markers are overt in English, distinguishing the orderings is straightforward. The PERF-PROG order is readily available, while the PROG-PERF order is not.

(19) a. What extended (ongoing) activity has John engaged in today?

He has been running. (PERF-PROG)

b. What is John doing now?

*He is having run. (*PROG-PERF)

This leaves us with the combination of PLAN and RECUR, which I will probe with the sentence *they run*. With the PLAN-RECUR order, this sentence is predicted to mean that there is a present plan for future recurring running. Under the RECUR-PLAN order, it is predicted to mean that plans for them to run recur over a span of time that includes speech time. As the following examples show, of the two orderings only the PLAN-RECUR ordering is possible.

(20) a. What regular activity is planned for the basketball team next season?

(For starters, to get warmed up) they run. (PLAN-RECUR)

b. What plan for the basketball team does the coach regularly have for the team these days?

#They run (these days, though the players never follow the coach's plan and so don't actually run). (#RECUR-PLAN)

(Intended: He regularly has plans for them to run, which they ignore.)

We have seen above that only the following pairwise orderings are possible for the posited grammatical aspect markers: PLAN-PERF, PLAN-RECUR, PLAN-PROG, PERF-RECUR, PERF-PROG, and RECUR-PROG. From these results I posit that these aspect markers are rigidly ordered as follows, with each marker being optional:

(21) PLAN-PERF-RECUR-PROG

This analysis predicts that in addition to the combinations we have already looked at there will only be 5 more combinations possible:

(22) PLAN-PERF-RECUR

PLAN-PERF-PROG

PLAN-RECUR-PROG

PERF-RECUR-PROG

PLAN-PERF-RECUR-PROG

I leave it as an exercise for the reader to construct examples showing this prediction to be correct.

Aspect and Modals

Having illustrated the role of grammatical aspect in simple present tense sentences, we can now turn to the question of how grammatical aspect interacts with modals. We can divide this question into two parts: Can the grammatical aspects operate over modals? and Can modals operate over the grammatical aspects? I will show in this section that the answer to both questions is *yes*, though with restrictions.

The possibility of having grammatical aspect markers both above and below a modal can be shown with the modals *have to* and *need to*. Both of these allow for both preceding and following occurrences of PERF and PROG, as seen below:

- (23) a. John has been [having/need] to mow the lawn for weeks.
(PERF-PROG-MODAL)
- b. John [has/needs] to have been working in order to get paid.
(MODAL-PERF-PROG)
- c. For weeks now, John has been [having/need] to have been working in order to get paid.
(PERF-PROG-MODAL-PERF-PROG)

No other modal auxiliaries can occur in the perfect or progressive form, as seen partially⁶ below, suggesting that these modals have to scope over PERF and PROG, never under them:

- (24) a. *John has [mayen/ mighten/ cannen/ couldnen/ musten/ shallen/ shoulden/ willen/ woulden/ oughten to] mow the lawn.
- b. *John is [maying/ mighting/ canning/ coulding/ musting/ shalling/ shoulding/ willing/ woulding/ oughting to] mow the lawn.

6 All of the modal forms presented are unattested. Given the general variability in available past participial forms, however, the possibility arises in principle of there being distinct forms for the modals as well, such as forms parallel to the participles *walked*, *swum*, *frozen*, *gone*, *taught*, etc. I know of no such irregular participial forms for any of the modals listed here, but do not attempt to demonstrate their non-existence. Hence the partiality.

We saw above, however, that the time of a modal foundation can be future-shifted when planned, at least for deontic and teleological interpretations. This suggests that it is possible in principle for PLAN to scope over at least some of these modals. Further inspection shows that for deontic and teleological interpretations it is impossible for PLAN to scope below the modal. To say that John may leave is to say there permission is given for John's leaving, not merely for there to be a plan for his leaving. Were the latter possible, it should be possible to indicate that the plan is allowed but the actual action is not by saying the following:

(25) John may leave, but he must not.

Such an interpretation is impossible. Instead, this sentence can only be interpreted as indicating that John has permission to do something that he is required not to, i.e. that his permissions and his requirements conflict.

The scope relations between a modal and PLAN are reversed under an epistemic interpretation. We've already seen that a planned epistemic state interpretation is impossible for an epistemically interpreted modal. That a modal sentence can indicate that a plan is epistemically necessary or possible can be seen in the following examples:

(26) Q: Where's John this weekend?

A: He [?may/ might/ could/ must/ should/ will/ would/ ought to/ need (not)/ has to] be in Paris – I saw his plane reservations.

The speaker is indicating with an epistemic modal answer not that based on her knowledge or beliefs John's presence in Paris this weekend is a (likely or possible) fact, but rather only that it is (likely or possibly) what is planned.

Turning to RECUR, we see that it cannot scope over a modal no matter how it is

interpreted. To highlight the relevant reading, it is best to use a predicate in the preadjacent that doesn't typically recur in order to block an interpretation in which what recurs is only the preadjacent and not the modalized proposition. I use the predicate *die* for this purpose.

- (27) What is John regularly permitted/ required in the mornings to do these days?
- a. #These days, John [may/ can/ ?could/ must/ ?shall/ should/ ?will/ ?would/ ought to/ needs to/ has to] die in the mornings. (So far, though, the permission/ requirement has been nullified before John actually died.)
 - b. These days, John is regularly permitted/ required in the mornings to die.
- (28) In order to appease John's boss, what action is regularly possible/ necessary in the mornings on John's part?
- a. #These days, John [might/ can/ ?could/ must/ ?shall/ should/ ?will/ ?would/ ought to/ needs to/ has to] die in the mornings to appease his boss. (So far, though, John has chosen not to do so, leaving his boss unappeased.)
 - b. These days, it is regularly possible/ necessary for John to die to appease his boss.
- (29) What are your regular morning thoughts these days on John's whereabouts?
- a. #These days, John (regularly) [?may/ might/ could/ must/ should/ will/ would/ ought to/ need (not)/ has to] have died in the mornings.
 - b. These days, I (regularly) believe in the mornings that John has died.

(27a) illustrates the unavailability of a RECUR-MODAL interpretation for a modal interpreted deontically, (28a) for a modal interpreted teleologically, and (29a) for a modal interpreted epistemically. In all cases, the intended interpretation is one close in meaning to the (b) examples.

We can see below that a MODAL-RECUR interpretation is available under all three

interpretations of the modal.

- (30) a. What regular activities is John permitted/ required to do in the mornings?
John [may/ can/ ?could/ must/ ?shall/ should/ ?will/ ?would/ ought to/ needs to/ has to] eat breakfast in the mornings.
- b. John is permitted/ required to do the following: regularly eat breakfast in the mornings
- (31) To improve his health, what regular morning action is possible/ necessary on John's part?
- a. To improve his health, John [might/ can/ ?could/ must/ ?shall/ should/ ?will/ ?would/ ought to/ needs to/ has to] eat breakfast in the mornings.
- b. To improve his health, it is possible/ necessary for John to regularly eat breakfast.
- (32) What are your thoughts these days on John's regular morning routines?
- a. These days, John [?may/ might/ could/ must/ should/ will/ would/ ought to/ need (not)/ has to] eat breakfast in the mornings.
- b. These days, I believe that John regularly eats in the morning.

These data suggest the following ordering possibilities for aspect markers and modals:

- (33) MODAL_{epistemic}-PLAN-MODAL_{deon.,tel.}-PERF-RECUR-PROG

Flavors

In addition to differences in temporal behavior, the above data also illustrate the need for lexical modals that can have the following combinations of flavors:

- (34) Deontic, Teleological, Epistemic: could?, can't, must, should, ought to, need (*to), have to
- Deontic, *Teleological, Epistemic: may
- *Deontic, Teleological, Epistemic: might
- Deontic, Teleological, *Epistemic: can(*'t), need to

(Ir)realis

A third distinction hinted at in the above data separates realis interpretation from irrealis interpretation. This distinction shows up most clearly for modal clauses embedded under *wish*, and for those occurring as the consequence clause of counterfactual *if*. Both of these environments only allow irrealis expressions. These contrast with the complement clause of *hope* and with the consequence clause of non-counterfactual *if*, both of which readily allow realis expressions.

- (35) a. I wish Mary [would/ could/ had to/ needed to/ ?might/ *should/ *must/ *ought to/ *need(s) (to/not)/ *will/ *can/ *may/ *has to] go skiing.
- b. I hope Mary [??would/ could/ might/ should/ must/ ought to/ needed to/ need(s) (to/not)/ will/ can/ may/ has to/ had to] go skiing
- (36) a. Counterfactual:
If Mary [went/ were] there (now/ tomorrow), she [would/ could/ might/ ?should/ *must/ *ought to/ *needed to/ *need(s) (to/ not)/ *will/ *can/ *may/ *had to/ *has to] go skiing.
- b. Non-counterfactual:
If Mary [goes/ is] there (now/ tomorrow), she [??would/ could/ might/ should/ must/ ought to/ needed to / need(s) (to/not)/ will/ can/ may/ has to/ had to] go skiing

The acceptability patterns for the modals in these two sets of contrasts are identical

except for the behavior of the past tensed *had to* and *needed to*, both of which are acceptable in the complement clauses of both *wish* and *hope* and in the consequence clause of non-counterfactual *if*, but both of which are unacceptable in the consequence clause of counterfactual *if*. In the (b) examples above, these two expressions are interpreted as simple past tensed expressions, indicating some past requirement. Under *wish* in (a), in contrast, they indicate a counterfactual situation that can either be in the past or in the future. None of these interpretations is available in the consequence clause of the counterfactual in (a), suggesting that the realis/ irrealis distinction is not the only thing that determines acceptability in that environment. Taking the data with *wish* to indicate the possibility of an irrealis interpretation, the above contrasts suggest the following classification of clauses bases on the modals that head them:

- (37) Realis: may, might, can, could, must, shall, should, will, ought to, need (to),
 have to (all forms)
 Irrealis: might, could, would, needed to (past only), had to (past only)

It is important to distinguish between a realis/ irrealis distinction in the modal clause and a similar distinction in the prejacent. Modal statements differ in whether the truth of the modal statement as a whole requires truth of the prejacent. *Must*, for example, differs from *will* in this respect. Upon hearing a knock at the door, an utterance of *That must be John* is judged true based solely on the epistemic state of the speaker. Whether it is actually John at the door or not is irrelevant. In contrast, to say in the same situation *That will be John* is to say something that is only true if John is the one at the door. This distinction does not apply to possibility modals, but separates necessity modals into two groups, which I label *internally realis* and *internally irrealis*. The distinction appears under all interpretations, and can be highlighted by whether it is appropriate to follow-up a modal statement with a negation of the prejacent.

(38) What is John required to do?

- a. He [must/ should/ought to/ needs to/ has to] die, but he isn't going to.
- b. He [shall/ will] die, #but he isn't going to.

(39) In order to appease John's boss, what action is necessary John's part?

- a. John [must/ should/ ought to/ needs to/ has to] die to appease his boss, but he isn't going to.
- b. John [shall/ will] die to appease his boss, #but he isn't going to.

(40) Who do you think is at the door?

- a. A: That [must/ should/ ought to/ ?need/ has to] be John at the door.
B: #That's wrong since it isn't John. / That may be, but it isn't actually John.
- b. A: That [shall/ will/ would] be John at the door.
B: That's wrong since it isn't John. / #That may be, but it isn't actually John.

The word *would* requires special mention. In simple matrix contexts, *would* is externally irrealis. This means that in order to understand a simple matrix *would* statement, it is necessary to accommodate what is needed to make an irrealis interpretation acceptable. In practice this generally involves accommodation of an implicit counterfactual *if* clause. *John would die (to appease his boss)* thus comes across as saying what John would do under some presumably understood counterfactual circumstances. This does not produce a deontic or teleological interpretation, but more importantly for our purposes here it makes it possible for the continuation *but he isn't going to* to be appropriate by contrasting the actual realis situation with the implicit irrealis one induced by the accommodated counterfactual *if* clause. That is, the continuation can be used in this case to relate to an external realis/ irrealis contrast rather than the internal contrast aimed for. Under an epistemic interpretation, *would* does not appear to require such accommodation, and the continuation can properly be

used to test for an internal realis/ irrealis distinction as desired. In this case, the test indicates that *would* patterns with *shall* and *will* in being internally realis. These results can be summarized by the following classification of necessity modals:

- (41) Internally realis: shall, will, would
Internally irrealis: must, should, ought to, need (to), have to

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