What to Do If You Want to Go to Harlem: Anankastic Conditionals and Related Matters[*]

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1   Anankastic Conditionals

This paper revolves around what we call the Harlem Sentence:[1]

(1)   If you want to go to Harlem, you have to take the A train.

At first glance, this is an entirely unremarkable kind of sentence. It is easy to find naturally occuring exponents. Its meaning is also clear: taking the A train is a necessary condition for going to Harlem. Hence the term "anankastic conditional", Ananke being the Greek protogonos of inevitability, compulsion and necessity.

   What turns out to be quite a puzzle, however, is how the meaning of the Harlem Sentence arises compositionally from its ingredients, in particular *if*, *want*, and *have to*. We will see that moving towards a solution to this problem will open up some fundamental issues in the compositional semantics of modals and conditionals.

   In the recent semantic literature, it was Sæbø [11], who brought this puzzle to our attention, but otherwise this kind of sentence has been neglected. Sæbø found a relevant passage by von Wright [15]:

> [The sentence "If the house is to be made habitable, it ought to be heated"] ... says that heating the house is a *necessary condition* of making the house habitable. [...] An equivalent formulation ... would be "Unless the house is heated, it will not be habitable".

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1 One presumably has to either suspend some disbelief or to make the tacit assumption that walking or taking a car or ... have already been ruled out as possible modes of transportation. This could arguably happen via accommodation, of course.

A pair discussed by Hare [2] shows that not all sentences of the same form have the anankastic meaning:

(2)   If you want sugar in your soup, you should ask the waiter.

(3)   If you want sugar in your soup, you should get tested for diabetes.

The difference . . . can be brought out, first, by noticing the entirely different grounds that would be given to justify them. The first would be justified by pointing out that the waiter has the only access to sugar. The second would be justified by arguing that an inordinate desire for sugar is a symptom of diabetes, and that those with diabetes should have it treated. Alternatively, we might bring out the difference in the following way: the first suggests that asking the waiter would be a means to having sugar in one's soup; the second does not suggest that getting tested for diabetes is a means to having sugar in one's soup. (Hare [2:45])

The basic make-up of the construction is:

- A TELEOLOGICAL modal that specifies what can or must be done to achieve a given goal.

- An *if*-clause that contains an expression picking out a goal or intention.

Sæbø points out that the construction has a (near?) equivalence in the combination of a teleological modal with a purpose *to*-clause:[2]

(4)   To go to Harlem, you have to take the A train.

We will see that the purpose variant plays an important role in what we think is the right way to approach anankastic conditionals.

Independently of us, Arnim von Stechow and some of his students have also been working on the Harlem sentence [13, 14]. After our first draft and von Stechow et.al.'s first notes were made available over the web, other researchers joined the fray, in particular Janneke Huitink [3, 4] and Jon Nissenbaum [10]. At various points in this paper, we will comment on these "competing" efforts.

The paper is organized as follows. We first put in place some background on modals and conditionals. We then show that the compositional semantics of the Harlem Sentence does not quite work out. We present Sæbø's proposed

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2 There is also the possibility of finding a contraposed paraphrase:

(i)   If you do not take the A train, you cannot go to Harlem.

Note that the contraposed form is not:

(ii)   If you do not take the A train, you do not want to go to Harlem.

solution to the puzzle and show that it is not correct. We then suggest a nested modal structure for the sentence but quickly see that this cannot be the entire story. We then explore the difference between *have to* and *ought to*, which will help us complete our analysis. Finally, we address a remaining worry.

2 Kratzer's Theory of Modals and Conditionals

We start with a deontic modal sentence:

(5)   John has to pay a $25 fine.

The relevant circumstances are that John has obstructed his neighbor's driveway and that the Cambridge traffic regulations require that driveways not be obstructed and that first time offenders pay a $25 fine. The fundamental idea of the possible worlds semantics for modal expressions is that they effect quantification over a set of accessible worlds. In (5), this would be the set of worlds compatible with what the Cambridge traffic regulations require. A necessity modal like *have to* would then say that *all* of the worlds have a certain property, in (5) that would be the property that John pays a $25 fine.

But there is an immediate problem: in worlds compatible with the Cambridge traffic regulations, there are no driveway obstructions! So, (5) would incorrectly be predicted to be false in our scenario.

Kratzer's solution to this problem (building on previous work by logicians and philosophers) is to say that modals are in general *doubly relative*, being sensitive to a set of accessible worlds *and* to an ordering imposed on those worlds [5, 6, 7, 8]. There is an interplay of facts on the ground and a preference ordering, which results in the claim made by the modal sentence. Formally, Kratzer treats both elements as what she calls "conversational backgrounds", functions from worlds to sets of propositions. The "modal base" determines for a given world w a set of accessible worlds (those worlds in which all the propositions assigned to w are true). The "ordering source" induces an ordering on the worlds in the modal base. In the end, the modal quantifies over those worlds in the modal base that are assessed to be "as good as possible" by the ordering source.

In our example, the modal base is given by a "circumstantial" conversational background, a set of propositions that characterize the relevant circumstances on the ground, here most importantly the fact that John has obstructed the neighbor's driveway. The ordering source is induced by the Cambridge traffic regulations. While this ordering source would rank most highly worlds in which there is no driveway obstructions, there are no such worlds in the modal base. So, the most highly ranked worlds in the modal base are those where John pays the required fine. The prediction of this analysis is that (5) could be false if either the circumstances are different (e.g. if John didn't obstruct a driveway) or the traffic regulations are different (e.g. requiring incarceration for first time driveway obstructors).

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We can now add to the mix an *if*-clause:

(6)   If John obstructed his neighbor's driveway, he has to pay a $25 fine.

This sentence would naturally be used if it is not settled knowledge whether John obstructed his neighbor's driveway or not. Kratzer's proposal is that *if*-clauses are modifiers of the modal base. Whatever the initial modal base is, the *if*-clause in (6) adds to the set of propositions defining the set of accessible worlds the proposition that John obstructed his neighbor's driveway. The resulting set of accessible worlds now contains only worlds where John obstructed the driveway. From then on, the analysis proceeds as in the case of a simple modal sentence.

Different kinds of modals (and conditionals) now arise from different contextual resolutions of the two parameters, modal base and ordering source. One kind of modal Kratzer mentions are modals that give advice. Here, as in some deontic cases, we must countenance the possibility of an ordering source induced by an inconsistent set of propositions. Imagine for example, that Henk wants to go to the movies (there's a new James Bond movie out) and at the same time wants to stay at home (some quiet time with his family). In such a case, one wouldn't want to say that given Henk's preferences, he *should* go to the movies or that he *should* stay at home.

Formalities

For concreteness, we will assume a syntacticized version of Kratzer's theory, in which modals take two covert arguments, which are variables over conversational backgrounds:
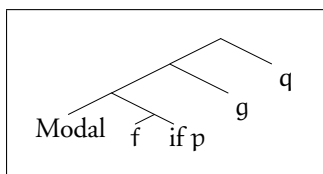
Here, q is the overt proposition that the modal combines with, while f and g are covert "pronouns" which take conversational backgrounds as their values. f is the modal base, g is the ordering source. Optionally, an *if*-clause can combine with the modal base pronoun to restrict it further.

(7)   For any set of propositions P, we define a strict partial order $<_P$:

$$\forall w', w'' : w' <_P w'' \text{ iff } \forall p \in P\,(w'' \in p \to w' \in p) \wedge \exists p \in P\,(w' \in p \wedge w'' \notin p)$$

w' is better than w'' according to P iff all propositions in P that hold in w'' also hold in w' but some hold in w' that do not also hold in w''.

(8)   For a given strict partial order $<_P$ on worlds, define the selection function $\max_P$ that selects the set of $<_P$-best worlds from any set X of

worlds:[3]

$$\forall X \subseteq W : \max_P(X) = \{w \in X : \neg \exists w' \in X : w' <_P w\}.$$

(9)   For any world w, conversational backgrounds f, g, and proposition q:

$$[\![\text{have to}]\!](w)(f)(g)(q) = 1 \text{ iff } \forall w' \in \max_{g(w)}(\cap f(w)) : q(w') = 1.$$

(10)   For any conversational background f:

$$[\![\text{if } \phi]\!](f) = \lambda w.f(w) \cup [\![\phi]\!].$$

3   The Obvious Analysis

We now let loose the standard Kratzer theory on the Harlem Sentence:

(1)   If you want to go to Harlem, you have to take the A train.

We expect that the *if*-clause modifies the modal base of the modal *must*. Without it, the modal base would presumably be a circumstantial one pairing the evaluation world with a set of propositions describing relevant circumstances (of geography, facts about transportation systems, facts about how much money you have to spend on transportation, your current location, etc.). To this, the *if*-clause now adds the proposition that you want to go to Harlem. A natural reading of the sentence would seem to be one where the salient ordering source is a teleological / practical necessity one, which pairs the evaluation world with the set of propositions describing your goals in that world.

The analysis makes wrong predictions. Assume that in the actual world $w_@$, you want to go to Hoboken.[4] I, however, do not know that. I am uncertain as to whether you want to go to Hoboken or to Harlem. The best way to Hoboken is the PATH train, the best way to Harlem is the A train. So, I utter the Harlem Sentence, correctly it seems. But the obvious analysis falsely predicts that what I said is false. Even in a world where you want to go to Harlem, the best way to achieve the goal that you actually have (namely, to go to Hoboken) is to take the PATH train.

(11) $\forall w' \in \max_{g(\mathbf{w}_@)}(\cap(f(w_@) \cup \lambda w. \text{ you want}_w \text{ to go to Harlem})) :$
                                                you take the A train in w'.

Let us be clear on the lesson to draw from the Hoboken Problem: *In the correct analysis of anankastic conditionals, we need the "hypothetical" goal expressed in the* if-*clause (that you want to go to Harlem) to override or take precedence over any conflicting goals that you actually have.*

3 This is only legitimate under what Lewis calls the LIMIT ASSUMPTION.

4 Sæbø uses Brooklyn, but there are too many ways to get to Brooklyn for the scenario to be realistic. For a very cool map of the New York subway system, see http://www.columbia.edu/~brennan/subway/.

We proceed to consider Sæbø's proposal [11] for how to achieve this task. We then show that his proposal does not achieve the task. And then, we we'll try to come up with a proposal that does work as required.

4   Sæbø's Analysis and Why It's Inadequate As Well

4.1   Sæbø's Analysis

The basic insight of Sæbø's discussion is that the antecedent of the anankastic conditional serves to change the ordering source of the teleological modal. In our syntacticized version of Kratzer's system, the initial idea can be implemented quite perspicuously. Instead of attaching to the modal base pronoun f, the *if*-clause attaches to the ordering source pronoun g:
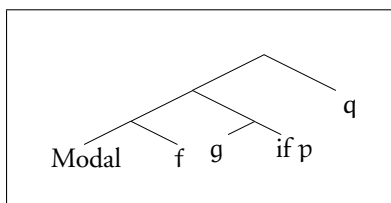
It is immediately clear that the simplest such analysis won't do. If we add the proposition that you want to go to Harlem to the ordering source, we would be making it a goal of yours that you want to go to Harlem, in other words: you want it to be the case that you want to go to Harlem.

What needs to happen is that the proposition that you go to Harlem is added to the ordering source. This is non-compositional. The interior modal *want* is zapped and instead interpreted as a signal as to what kind of ordering source is intended. This non-compositionality is one of two problems with this analysis.

4.2   Two Problems

Non-Compositionality

Sæbø mentions that there is a range of possible antecedents in anankastic conditionals, not just *want* as in the Harlem sentence or *be to* as in von Wright's sentence. He writes: "There are alternatives to *want*: Within certain limits, any intentional attitude can occur in the same function, e.g., *intend, hope, plan, aim*, even *fear*, with an implicit negation. I will let the verb *want* represent these other possibilities. One may question the term 'expression of intention' for the raising verb *be (to)*. In any case, this verb expresses something over and above futurity: plan, aim, norm, or the like. I subsume this under the term intention."[5]

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5 In their handout, von Stechow et.al. give an example where to their ears an anankastic reading is not available:

His proposal is that what these expressions are used for in anankastic conditionals is to determine what the ordering source for the advice modal is. That is, in a sentence like

(12)   If you hope to convince Paul, you have to use first order logic only.

the ordering source for *have to* would be your hopes. And we add the proposition that you convince Paul to your hopes before we evaluate the modal claim. So, the procedure needs to look inside the antecedent to identify the relevant ordering source and to identify the embedded propositions since that is the one that is "hypothetically" added to the ordering source. It is obvious that this procedure is non-compositional. One would hope that one could do better. But perhaps anankastic conditionals are another example of a construction that raises the possibility that not all natural language semantics is compositional. But even so, as we will now show, Sæbø's analysis has the added problem of being wrong.

Conflicting Goals

Sæbø's analysis in fact makes false predictions in a scenario similar to the one that killed the obvious analysis. Assume again, that in the actual world $w_@$, you want to go to Hoboken. I, however, do not know that. I am uncertain as to whether you want to go to Hoboken or to Harlem. The best way to Hoboken is the PATH train, the best way to Harlem is the A train. So, I say, correctly it seems:

(13)   If you want to go to Harlem, you should take the A train.

As before we assume that the modal base is the set of worlds compatible with the relevant circumstances (of geography, facts about transportation systems, facts about how much money you have to spend on transportation, your current location, etc.). What is the ordering source? A function g that assigns to a world the set of propositions that you want to be true. But now Sæbø's system modifies g by adding to it the proposition that you go to Harlem:

(14)   For any w: $g^+(w) = g(w) \cup \{$that you go to Harlem$\}$.

But now see what happens when we apply g^+ to $w_@$: we get at least the set of propositions that contains the two propositions that you go to Hoboken and that you go to Harlem. The former is in there because that is your actual goal in $w_@$ and the latter is in there because it was added by the anankastic conditional.

(i)   Wenn du die Absicht   hast, Maria zu heiraten, musst du viel   Geld   haben.
       If   you the intention have Maria to marry   must you much money have
       "If you have the intention to marry Mary you must have lots of money"

We can't replicate this judgment.

Assume now that that going to Hoboken and Harlem are inconsistent goals, which they may well be if we are talking about what to do this afternoon (there simply isn't enough time to go to both places). In the best worlds in the modal base, you either go to Hoboken or to Harlem. The best you can do is go to one of them. It is not true that in all of them you take the A train. So, (13) is predicted to be false, contrary to fact.

Recall the lesson we drew from the Hoboken Problem earlier: *In the correct analysis of anankastic conditionals, we need the "hypothetical" goal expressed in the* if-*clause (that you want to go to Harlem) to override or take precedence over any conflicting goals that you actually have.* The problem with Sæbø's analysis is that it doesn't do the trick. His analysis *adds* the goal of going to Harlem to whatever goals you actually have. What we need to do is to get rid of or at least demote your actual goal (of going to Hoboken) and to make your hypothetical goal (of going to Harlem) be the one that counts.

5   Nested Modality?

We will develop our analysis in a number of steps. Our first goal is to get rid of the non-compositionality of Sæbø's proposal. Recall that he added the goal expressed in the *if*-clause to the ordering source but that to achieve this, he had to treat the *want to*-phrase as a mere grammatical marker without effect on the proposition that is added to the ordering source.

If we do not want to follow such a non-compositional analysis, what else can we do? We saw that treating the *if*-clause as restricting the modal base of *have to* in the Harlem Sentence does not give the right result. So, by the logic of Kratzer's theory, we would have to say that the *if*-clause is not restricting *have to*. But the doctrine is that *all* conditionals restrict the modal base of a modal. Therefore, the *if*-clause must be restricting a covert modal. So, the idea would be that the *if*-clause does not restrict the overt necessity modal but instead restricts an additional covert necessity modal, which is located above the overt modal.

(15)   [NEC if you want to go to Harlem] [have-to (you take the A train)]

In the relevant reading, the lower modal has the practical necessity / teleological interpretation, that is, its modal base will be circumstantial, its ordering source will be goal-based.

We derive truth-conditions as follows:

(16)   (15) is true in w iff

for all worlds w' such that w' is accessible from w and in w' you want to go to Harlem:

for all of the worlds w'' among the worlds which are circumstantially accessible from w' and which best satisfy your goals in w':

you take the A train in w''.

We first let the higher modal together with the *if*-clause take us to worlds where you want to go to Harlem. Now, the lower modal finds the best worlds relative to your goals in the worlds where you want to go to Harlem. The claim is that all of those are worlds where you take the A train.

Note that we can still assume with Sæbø that the mere mention of *wants* in the *if*-clause makes it contextually natural for the lower modal to be relative to the wants of the subject. But apart from that role as a contextual signal, the *if*-clause now does its accustomed job of restricting the modal base of some modal.

A precedent: Anette Frank argues in her dissertation [1] for a doubly-modalized analysis of *all* deontic conditionals,[6] although the best arguments come from counterfactual deontic conditionals. Here is a non-counterfactual example of ours that makes the point that at least some deontic conditionals need to be doubly modalized:

(17)   If jaywalking is illegal in this town, that guy over there has to be punished.

Imagine that we're saying this in a town where jaywalking is actually completely legal, but we are uncertain about the law. Further, that guy over there is blatantly crossing the street right in the middle of a block, ignoring two perfectly fine crosswalks, and making two lines of traffic come to a screeching halt. (17) appears true. But under a single modal analysis, it will come out false.

It may be instructive to compare the analysis sketched here to what happens in examples such as the following:

(18)   Everybody who wants to go to Harlem has to take the A train.

We suggest that the LF for this looks as follows:

(19)   every ($\lambda x.$ x wants$_w$ to go to Harlem)
                    ($\lambda x.$ has to ($f(w)$) ($g(x,w)$) $\lambda w'.$ x takes$_{w'}$ the A train).

The higher quantifier over individuals picks out just those individuals who want to go to Harlem. The modal embedded under that quantifier then claims that for each of those individuals his or her actual goals are best achieved by taking the A train. Similarly, the idea of the nested modal analysis of the anankastic construction is that the higher modal (together with the *if*-clause) moves us to worlds where your goals include going to Harlem.

What might be the nature of the higher modal, what kind of conditional do we have in the Harlem Sentence? Let's think about what we want the modal to do:

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6 Frank concludes: "These observations lead us to the conclusion that there are in fact no truly *deontically modalized if*-conditionals. Instead we assume conditionals with a deontic modal operator in the consequent clause to be analyzed throughout in terms of an implicit or explicit epistemically (or circumstantially) based modal operator. The deontic modal is then to be analyzed within the scope of the 'higher' epistemic modal operator."

- the worlds it takes us to should match the evaluation world as far as the relevant circumstances (of geography, facts about transportation systems, facts about how much money you have to spend on transportation, your current location, etc.) are concerned

- the worlds it takes us to should match the evaluation world as much as possible as far as your goals and preferences are concerned, modulo that they have to be worlds in which you want to go to Harlem

What kind of modal would have these effects? In early versions of this paper, we suggested that the higher modal is a covert epistemic necessity modal. But that would fail both of the conditions we just identified. (i) The worlds it would take us to would have circumstances consistent with *what we know* about the circumstances, which leaves it open that we have limited knowledge of the circumstances and thus giving us too many worlds that differ from the evaluation world in the facts on the ground. (ii) The worlds it would take us to would also merely be consistent with *what we know* about your goals and preferences.

There are other problems.[7] Here is a problem raised for us by Matt Weiner (pc):

> Consider the following case: You and I know that Joe has been considering buying a used car in Harlem, but we do not know whether he has bought the car yet. If Joe has already bought the car, then he can get to Harlem either in the car or on the A train; if he does not have the car, then the A train is the only way for him to get to Harlem. The only reason why Joe would want to go to Harlem is to buy the car. If Joe wants to go to Harlem, he has not yet bought the car.
>
> I say:
>
> (20)   If Joe wants to go to Harlem, he must take the A train.

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7 One objection to the idea that the higher modal is epistemic is that it is not easy to make the putative higher modal explicit, as pointed out to us by Tamina Stephenson (pc):

(i)   If you want to go to Harlem, you must have to take the A train.

This has a distinctly different flavor from the sentence without *must*. Furthermore, its possibility counterpart,

(ii)   If you want to go to Harlem, you may have to take the A train,

shares the same flavor. It appears that these sentence are most easily read as signalling a deduction (from some unstated pieces of evidence) that someone who wants to go to Harlem has to take the A train. That is, (i) and (ii) feel like they have an epistemic modal *on top of* the entire anankastic construction, rather than making explicit the putative epistemic modal *inside* the anankastic construction.

But who is to say that the covert epistemic modal has the same "deductive flavor" that overt epistemic modals of English have? The objection to the epistemic analysis based on Matt Weiner's scenario discussed in the text is more damaging.

It seems that (20) is true only if Joe has not yet bought the car. If he has bought the car, then (if he wanted to go to Harlem, which he wouldn't) he can either drive or take the A train.

But on your reading of anankastic conditionals, I think, (20) comes out true in all circumstances. By adding "Joe wants to go to Harlem" to the modal base, we exclude those epistemic possibilities in which Joe has not yet bought the car. Then, in all the remaining epistemic possibilities, the worlds in which Joe goes to Harlem are all worlds in which he takes the A train. So the best worlds, ordered by the designated ordering base, are all worlds in which he takes the A train.

In short, once we've restricted the epistemic possibilities to those in which Joe wants to go to Harlem, "Joe must take the A train in order to go to Harlem" comes out true.

We can sometimes hear Weiner's sentence as true, which suggests that maybe the epistemic reading is not completely unavailable. But we're uncertain at this time.

Since the requirements we layed out make the higher modal seem like it cares about being as close as possible to the evaluation world, modulo the possible addition of a desire to go to Harlem, the obvious idea might be to say that the higher modal is a Lewis-style closeness modal. In Kratzer's framework, that is modelled by giving the modal as its modal base an empty set of propositions, making all worlds available. The ordering source for such modals is given by some set of propositions, all of which are true in the evaluation world (a "realistic" ordering source). Worlds are then measured as to how similar they are to the evaluation world by "counting" how many of the propositions in the ordering source are true in them.

We can now avoid Weiner's problem by saying that it doesn't matter for similarity measurements whether a world agrees with the evaluation world in that Joe only wants to go to Harlem if he doesn't yet have a car. This is achieved by assuming an ordering source that does not include a proposition that would bring in this consideration. Whether or not this can be spun into a convincing story remains to be seen.

Having stared that problem resolutely in the face for a few seconds, we will now move on and explore the other problem that Sæbø's analysis had, which is actually shared by the nested modal analysis.

Other Goals Again

The nested modality analysis may or may not solve the non-compositionality problem that Sæbø had. Can we at least declare that the Hoboken Problem is taken care of when we assume nested modality?

The answer unfortunately is "no". Imagine again that you actually want to go to Hoboken. But it is not impossible for you to want to go to Hoboken

and to want to go to Harlem. So, the closest worlds where you want to go to Harlem, and which are otherwise as similar as possible to the actual world, may well be worlds where you want both. And then, the Harlem Sentence is incorrectly predicted to be false. The nested modal analysis thus shares with Sæbø's analysis the flaw that it fails to knock out (or at least demote) the Hoboken goal.

Similarly, von Stechow et.al. point out that the nested modality analysis fails to account for a scenario discussed by Kratzer:

(21)   You want to become mayor.
        You want to not go to the pub regularly.
        You will become mayor only if you go to the pub regularly.

(22)   If you want to become mayor, you have to go to the pub regularly.

Again, having the *if*-clause modify a higher modal doesn't help here. The two goals – while incompatible – can coexist in one person. So, even in the worlds where you want to become mayor, you can still want to not go to the pub regularly. Again, it is clear that we need the goal in the *if*-clause to override *any other* goal.

Huitink's Ruud van Nistelrooy scenario is another case in point. Imagine that one can take either the A train or the C train to Harlem. One thing about you is that you are an incorrigible fan of van Nistelrooy's – in fact, one of your strongest desires is to meet (and kiss) him. It so happens that Ruud regularly rides the A train. So, if we add to your actual goals the goal of going to Harlem, the advice to give is obvious: you have to take the A train (since you might get to meet Ruud). But as Huitink observes, we are reluctant to judge the Harlem Sentence as true in this scenario. Somehow, your goal to meet Ruud should be irrelevant.

We actually think that this is a little too fast. To move forward, what we propose to do is to pay attention to the difference between two kinds of "necessity" modals: *have to* and *must* on the one hand and *ought to* and *should* on the other hand. This will inspire a modification of Kratzer's analysis, which will then give us a handle on the Hoboken Problem and similar issues.

6   Designated Goals

6.1   Sloman's Insight

Many people, including Sæbø, feel there to be a difference in "strength" between *have to* and *must* on the one hand and *ought to* and *should* on the other hand.[8] Some initial evidence for this:

(23)   You ought to take the train, but you don't have to.

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8 Sæbø writes: "Some [modals], like *ought* and *should*, express a necessity that may seem weaker than *must*" (p. 433).

It is easy to multiply such conjunctions.[9]

But how precisely can the difference in strength be captured? Sloman [12] proposes that *ought* says what is *best*, or *better* than all alternatives, while *must* picks out the *only* candidate.[10]

> For instance *If you want to get to London by noon, then you ought to go by train* picks out the best means without excluding the possibility of others, whereas *If you want to get to London by noon then you have to (must, will be obliged to etc.) go by train* implies that no other means exists. [12: 391]

6.2 How to Implement Sloman

To implement Sloman's insight, we propose some modifications to the standard semantics of teleological modals.

- We will assume that in one of their syntactic frames, teleological modals take a purpose *to*-clause as their argument.

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9 A deontic example:

(i)   You really should take out the garbage, but of course you don't have to.

Or the sign in the bathroom of a Boys Scout Camp on Cape Cod:

(ii)   Everyone ought to wash their hands, employees have to.

10 Sloman's paper is quite remarkably prescient. He advocates a highly context-dependent, "elliptical" analysis of *ought*-statements, according to which *it ought to be the case that p* means that p is the best of the possibilities in the comparison class Z relative to the basis of comparison B – roughly parallel to Kratzer's later modal base / ordering source system. He writes that "Where others claim to see differences in meaning of *ought*, we can now see differences in basis of comparison, as well as differences in comparison class." He further writes:

> We have noted that without a basis of comparison, a sentence using *ought, must*, etc. cannot express a complete true or false proposition. As previous illustrations show, there are various ways in which a basis may be explicit, including the use of such phrases as *From the point of view of . . .* , *In order to achieve . . .* , *If you want . . .* , *If you're the mayor . . .* , or *If there's to be . . .* . Where an *if*-clause specifies a basis of comparison, as in *If you want to travel safely you ought to buy seat belts*, then the statement thus made is not really a conditional statement, since the apparent consequent does not express a complete proposition on its own.

Sloman also makes the rather interesting remark that what we would call epistemic uses of *it ought to be the case that p* could be analyzed as "Among the possible alternatives, p is the one which best fits the available evidence or known facts". (The difference between epistemic *ought* and *must* may be parallel to what he suggests for their teleological readings.) He ends with the following delightful suggestion: "However, it may be that in addition this use can be construed as having overtones to the effect that nature, or the world (or God?) is some sort of agent which ought to produce this particular state of affairs in order to keep its promises to us!"

- In the semantics, we will distinguish between a designated goal and considerations that measure how good a particular way of achieving the goal is. That is, in *To go to Harlem, you ought to take the A train*, going to Harlem is the designated goal and all other "goals" or considerations (you want to spend as little money as possible, you want to get there in time for the movie, you want to avoid exercise, etc.) are subordinate and serve to rank the worlds in which you achieve the designated goal. This is one particular instance of a general issue for modal ordering semantics: whether and how to rank the propositions in the ordering source.[11] Here, we will just employ a binary distinction between designated goal and ancillary considerations.

- We follow Sloman in making a distinction between *ought*-type expressions and *must*-type expressions as to their strength. Here is how we could do this:[12]

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11 Here is what Kratzer [7] says about this topic:

> Actually, it is simplification to assume that there is never more than one ordering source involved in modal reasoning. Suppose I draw conclusions which involve established facts, the Encyclopedia Britannica, the local newspaper and the gossip I picked up at the corner. And suppose further that the established facts have priority over the Encyclopedia Britannica, the Encyclopedia Britannica has priority over the local newspaper and the local newspaper has priority over the gossip I picked up at the corner. How do we reason in such a case?

> I think that the semantics of modals which I have presented so far can be extended in a straightforward way to handle these cases. The interpretation of a modal expression would have to depend on a modal base f and a finite sequence of ordering sources $g_1, \ldots, g_n$ For any world w, $g_1(w)$ would induce an ordering on $\cap f(w)$ in the usual way. $g_2(w)$ would – if necessary – refine this ordering in undoing the "ties" left by its predecessor and so on for every successive member in the sequence.

> Probably, we can't assume that the different ordering sources form a natural sequence with respect to having priority over each other. There may be ordering sources which have equal priority. This all sounds as if it were the beginning of my next paper.

Unfortunately, it wasn't. It is certainly time to revisit this topic.

12 We should also consider a slightly different proposal, according to which *ought* triggers a presupposition that there is more than one way to achieve the goal, while *must* has no such presupposition and is thus typically chosen when there is no such choice. Here are the entries we would have:

(i) PRESUPPOSITIONAL VERSION

    a.   *to p, ought to q* is true in w relative to modal base $f(w)$ and ordering source $g(w)$ iff all the $g(w)$-best worlds in $f(w)$ where p is achieved are q-worlds *plus* a presupposition that there are worlds in $f(w)$ where p is achieved that are not q-worlds.

    b.   *to p, must q* is true in w relative to modal base $f(w)$ and ordering source $g(w)$ iff all the $g(w)$-best worlds in $f(w)$ where p is achieved are q-worlds. *No presupposition.*

At the moment, we will not pursue this option.

(24)   a.   *to p, ought to q* is true in w relative to modal base $f(w)$
            and ordering source $g(w)$ iff all the $g(w)$-best worlds in $f(w)$
            where p is achieved are q-worlds.

       b.   *to p, must q* is true in w relative to modal base $f(w)$ iff all
            the worlds in $f(w)$ where p is achieved are q-worlds.

As you can see, this analysis would treat the *to*-infinitive as an argument of the teleological modal. Other variants that maintain an adjunct-analysis could be explored.

6.3   Problems Solved

The designated goal semantics solves some of the crucial problems we encountered, at least for the infinitival variant. The Hoboken Problem doesn't arise:

(25)   To go to Harlem, you have to/ought to take the A train.

The fact that you want to go to Hoboken can at best be a secondary considerations, but in all of the relevant worlds the designated goal of going to Harlem has to be achieved.

The mayor problem is also dissolves:

(26)   To be become mayor, you have to go to the pub regularly.

Your goal of not going to the pub regularly is overridden by the designated goal of becoming mayor (and the relevant fact that you can only become mayor if you go to the pub regularly).

Lastly, let's look at the Ruud van Nistelrooy Problem:

(27)   To go to Harlem, you have to/ought to take the A train (because then you might meet Ruud van Nistelrooy).

In Huitink's scenario, we now predict the *have to*-variant to be false, since you could also take the C train. The fact that the A train is the optimal choice, given your preferences, does not play a role in the semantics of *have to*. But we also predict that the *ought to*-variant should be true, since your other preferences single out the A train as the best way of achieving the designated goal. To our ears, this prediction is right: given that you want to meet Ruud, you ought to take the A train to go to Harlem.

6.4   Contextual Designation

Our modals, even in their advice reading, do not require a purpose clause argument. We easily find cases like this one:

(28)   A: I'm going to Harvard Square tomorrow.
       B: You have to/ought to have some hot chocolate at Burdick's.

We would want to say that while there is no syntactically explicit designated goal in these cases, the semantics of advice modals still requires there to be a designated goal. So, what we have to say is that context can supply not just an ordering source as in the standard Kratzer analysis, but that context can also supply a designated goal. Note that we have a choice of saying that the designated goal, whatever it is, leaves only one choice: having Burdick's hot chocolate, hence the *have to*-variant or saying that having Burdick's hot chocolate is the best among all alternative ways of achieving the designated goal, hence the *ought to*. We leave it to the reader to imagine what a plausible contextual resolution of the designated goal and the remainder of the ordering source would be in the two cases.

We suspect that there is possibly some variation as to whether there is any contextual modification of the designated goal when it is explicitly given by a purpose clause. So, we would not be surprised if there were speakers who find the *have to*-variant in the Ruud van Nistelrooy scenario to be true. What they would be doing is making meeting Ruud van Nistelrooy be part of the designated goal, even though the overt *to*-clause only designates going to Harlem as the goal. There is some support for our suspicion in an experiment presented by von Stechow et.al.. They present a scenario suggested to them by Wolfgang Klein. Imagine that to cross Siberia to go to Vladivostok you can take one of two trains: the Russian train or the Chinese train. The Chinese train is significantly more comfortable. Now consider the following two variants:

(29) To go to Vladivostok, you have to take the Chinese train.

(30) To go to Vladivostok, you ought to take the Chinese train.

They report that Wolfgang Klein accepts the *have to*-variant, while Orin Percus only accepts the *ought to*-variant. What Klein-type speakers can do, in our analysis, is to make being comfortable be part of the designated goal even though it is not explicitly given. Percus-type speakers do not accept this contextual restriction but would have to do it explicitly:

(31) To go to Vladivostok comfortably you have to take the Chinese train.

6.5 Anankastic Conditionals

Now that we (think we) understand the purpose clause variant of the Harlem Sentence, we need to return to the conditional version:

(32) If you want to go to Harlem, you have to take the A train.

We might treat (32) as "elliptical" (in an informal sense) for

(33) If you want to go to Harlem, you have to take the A train (to go to Harlem).

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The idea is that we fill in the designated goal argument with the proposition that you go to Harlem, because that is precisely the goal made contextually salient by the *if*-clause.

So far so good, but what is the compositional role of the anankastic *if*-clause? Well, we are tempted to maintain a nested modal analysis and say that first we are taken to the closest accessible worlds where you want to go to Harlem, and then we evaluate in those worlds the claim that to go to Harlem, you have to take the A train. We could explore other options for the *if*-clause. It may be a "biscuit conditional" or a "factual conditional". In fact, von Stechow et.al. say that our *if*-clauses share some of the properties of both of these species, but that neither is a perfect match.

On the other hand, as pointed out to us by Marketa Ceplova, we might in fact be able to let the *if*-clause restrict the modal base of the teleological modal itself. The crucial step of demoting your actual goals is achieved by the designated goal and does not need to be effected by the *if*-clause directly. We won't pursue this issue at this point.

7 Last Obstacles

We're not quite done yet. There are some remaining obstacles to address.

7.1 Breathe!

First, von Stechow et.al. raise the issue that the semantics we have (theirs is relevant similar to ours in this respect) predicts many sentences to be unremarkably true:

(34)   a.   In order to go to Harlem, you have to take the A train.
        b.   In order to go to Harlem, you have to take a train.
        c.   In order to go to Harlem, you have to wait.
        d.   In order to go to Harlem, you have to breathe.
        e.   In order to go to Harlem, you have to be a person.

We do not think this is a problem, because these sentences do seem to be true. They are less than helpful of course, because for example, *just* breathing won't get you to Harlem. But that doesn't make them false to our ears. An *ought to*-variant does sound quite perplexing:

(35)   To go to Harlem, you ought to breathe.

But this is quite expected under our analysis. Given that the *have to*-variant asymmetrically entails the *ought to*-variant in our semantics, choosing *ought to* signals that the stronger *have to* is false. In other words, choosing *ought*

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to signals that there are other options. But that is just not so in the case of (35).[13]

7.2   Kissing Pedro Martinez

Jon Nissenbaum [10] presents a devastating version of Huitink's problem: both the A train and the C train go to Harlem, the C train will have Pedro Martinez on it, you want to kiss Pedro Martinez.

(36)   #To go to Harlem, you ought to kiss Pedro Martinez.

This absurd sentence is one we currently predict to be true, quite contrary to fact.

Nissenbaum proposes that in these cases the *to*-clause does not in fact combine with the modal, supplying a designated goal. Instead, the teleological modal takes scope over a sentence where the *to*-clause is a "non-modal" modifier. Consider that we can in fact say:

(37)   He took the A train to go to Harlem. (= with the goal of going to Harlem)

So, the LF of one of our prime examples would be:

(38)   ought [you take the A train to go to Harlem]

Nissenbaum's Pedro Martinez sentence is claimed to be absurd for the same reason that the following is absurd:

(39)   #He kissed Pedro Martinez to go to Harlem.

Unfortunately, we do not think that we can adopt Nissenbaum's proposal.

An empirical problem: Nissenbaum conflates two different kinds of rationale clauses: the ones that are in construction with a teleological modal and the ones that modify a (non-modal) VP. The distinction was clearly identified by Gunnar Bech, as reported by von Stechow et.al. Here is a data point to illustrate the difference:

(40)   To get this job, you have to be fluent in Spanish.

(41)   #I am fluent in Spanish to get this job.

Rationale clauses at the VP-level seem to need to attach to agentive VPs, but the complement of "have to" can be non-agentive.

The main complaint we have: the LF in (38) doesn't represent the meaning of the example correctly. To go to Harlem, you do *not* have to take the A train with the goal of going to Harlem. What you need to do is take the A

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13 If we had chosen the presuppositional variant in Footnote 12, (35) would turn out to be a presupposition failure, since it would presuppose – rather than implicate, as in the text version – that there are other options.

train. It doesn't matter whether you take it with the goal of going to Harlem (as long as you get off at the right stop).

But what about the awful Pedro Martinez example? We conjecture that the teleological modal construction (*to p, ought to q*) signals that q is an *essential part of a way of achieving p*.[14] Kissing Pedro Martinez is not an essential part of a way of achieving p. You can still get to Harlem by just getting on the A train and refraining from kissing Pedro.

(42) q is an essential part of a way of achieving p
        iff there is a set P of propositions such that $q + P \Rightarrow p$ but $P \not\Rightarrow p$.
        more precisely: $\exists P : f(w) + P + q \Rightarrow p$ but $f(w) + P \not\Rightarrow p$.

What we don't know at this point is what status this condition has. Is it a presupposition of advice modals? Or is it a natural pragmatic assumption that rules out Nissenbaum's sentence as possibly true but absurd?

The End

This is still a preliminary draft of work in progress. We still have to compare our results to the proposals by von Stechow et.al. and Huitink. In many ways, it appears that the accounts are converging on the truth, but there are still points of possible contention. We also have to work more on situating this investigation in the broader perspective of work on modals and conditionals. Stay tuned.

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14 Josh Dever pointed out to us that our notion of an "essential part of a way of achieving" is similar to Mackie's notion of an INUS condition, a necessary but not sufficient component of a sufficient but not necessary condition [9]. Mackie also introduces the notion of a "causal field", which corresponds quite closely to the notion of "circumstantially accessible" in Kratzer's theory.

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