MODALITY FOR THE 21st CENTURY

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PREVIEW

This isn't the text of my keynote address for the 19th International Congress of Linguists in Geneva. It is background material that puts some theoretical questions on the table that help define a contemporary agenda in the area of modality. The talk itself will largely consist of case studies, organized so as to break up that endless stretch of 75 minutes. Traditionally, modality has been almost exclusively investigated with modal auxiliaries. I will illustrate the role of modality in producing microvariation in all areas of semantics. Modality with its many different flavors is everywhere in the verbal projection spine – sublexically, with voice, aspect, tense, mood, and complementizers. It's at the core of the typology of sentential complementation, and it provides crucial parameters of variation for indefinites. I ask : why is that ?

QUANTIFIERS, DEGREE EXPRESSIONS,
OR BOTH?

We do not need language to dwell in possibilities: babies do it, baboons do it, they say that even birds do it.[1] We also do not need special words or moods to talk about possibilities. Plain indicative sentences can do it:

> "A certain computer scientist designed a remarkable series of machines that gave correct answers to any *yes*/*no* question put to them. The machines would answer by flashing either a green light or a red light – one of the colors meant *yes*, the other *no*. The machines were manufactured in China and Japan, but were unfortunately not manufactured uniformly, in that the machines made in one of these two countries meant *yes* by green and *no* by red, but the machines of the other country meant *no* by green and *yes* by red."[2]

The story, which is by Raymond Smullyan, picks out possibilities – possible worlds that have a computer scientist and machines with flashing lights in them. Nothing signals the departure from reality: no modal words, no irrealis moods. The story provides the setting for a series of puzzles that invite us to play with the possibilities it introduced. In one of them we are asked to imagine we acquired one of those machines, but didn't know whether it was made in Japan or China. Suppose we wanted to find out, but could only ask the machine a single *yes*/*no* question. What question would we ask? Overt markers of modal displacement[3] have now started to appear in my writing: *imagine*, *suppose*, *could*, and *would*. The trend continues as I begin to reason my way towards a solution of the puzzle. Suppose we asked the machine: Do the Japanese machines mean *yes* by green? The machine can react in two ways: it can flash a green light or a red one. Suppose it flashes a red light. The red light might mean *yes* or *no*. Suppose it means *yes*. Then the machine must be Chinese, the Japanese machine would use green for *yes*. What if it meant *no*? Then the machine

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[1]   Apologies to Emily Dickinson and Cole Porter. For babies, see e.g. Téglás *et al*. (2007). For baboons, see Cheney & Seyfarth (2007). Neo-Caledonian crows can select and manufacture task-appropriate tools (Bluff *et al*. 2007).

[2]   Smullyan (1997, p. 114).

[3]   The term 'displacement' comes from Hocket (1960). Talk about modal displacement originated in von Fintel and Heim's lecture notes on intensional semantics. URL mit. edu/fintel/fintel-heim-intensional.pdf

would also have to be Chinese. The Japanese machines would have to flash red for *yes*, not *no*. More markers of modal displacement came up in that most recent passage, including *can*, *might*, *must*, *would have to*. What do those markers do if they are not needed to initiate talk about possibilities, if even the simplest sentences can do that on their own?

Natural languages do not care all that much about the distinction between the actual and the merely possible. Cross-linguistically, indicative or 'realis' moods cover more than actuality (Portner 2011b). There do not seem to be such things as 'fictional' moods in the languages of the world. In my rendition of Smullyan's puzzle, markers of modal displacement appeared when possibilities were embedded under other possibilities. Hypothetical assumptions were made against the background of Smullyan's story: that we bought one of those machines, that we didn't know whether it was manufactured in China or Japan, that we wanted to find out. Possible questions were considered for eliciting the information we were after. Possible reactions of the machine were discussed, possible meanings of those reactions were pondered, and, finally, inevitable conclusions were drawn. New possibilities were projected from given possibilities, were constrained, ranked, and quantified over. We use markers of modal displacement to cleverly manipulate and keep track of possibilities – sometimes for serious, sometimes just for fun.

Markers of modal displacement provide a unique window into the interplay between grammar and other modules of cognition since they share properties with both quantifiers and degree expressions:

(1) a. Das muss eine japanische Maschine sein.
        This must a   Japanese machine be
        This must be a Japanese machine.

     b. Das kann eine   japanische Maschine sein.
        This might a   Japanese machine be
        This might be a Japanese machine.

     c. Das kann eher eine   japanische als eine chinesische Maschine sein.
        This might more a   Japanese than a   Chinese machine be.
        This is more likely a Japanese than a   Chinese machine.

     d. Das kann am ehesten eine japanische Maschine sein.
        This might most   a   Japanese machine be.
        This is more likely a Japanese machine than anything else.
        This is more likely a Japanese machine than a machine from any other country.

> This machine is more likely a Japanese machine than any other machine.

1(a) and (b) quantify over a restricted set of possible worlds. Modal auxiliaries often come in duals: *must* is a universal, *can* an existential quantifier. 1(c) is a comparative, 1(d) a superlative construction. The German comparative adverb *eher* and the superlative adverbial *am ehesten* are used for temporal and modal comparisons.[4] I used *more* and *most* in the English glosses of 1(c) and (d) for lack of better translations. 1(a) to (d) invite comparison with other quantifier and degree constructions. Is modal quantification like determiner or adverbial quantification? Are comparatives and superlatives with modal auxiliaries like comparatives and superlatives with adjectives? If there are differences, can we derive them from differences in syntactic category and the nature of the quantification domains?

There are substantial differences between determiner and adverbial quantification on the one hand, and modal quantification on the other. There are no modal counterparts of *most*, *usually*, *few*, *rarely*, *two*, *twice*, *three*, *three times*, and so on. There is likely to be a straightforward conceptual explanation for this gap. It's hard to see what claims about truth in most, few, or two possible worlds could even amount to. More mysterious is the fact that there are languages that have no dual pairs of modal quantifiers at all: St'át'imcets (Salish), Gitksan (Tsimshianic), and Nez Perce (Sahaptian) are documented examples (Matthewson i. *et al.* 2007, Rullmann *et al*. 2008, Peterson 2008, Deal 2011). The English modal system has modals without duals, too: *ought* and *should*, on both their epistemic and deontic interpretations. Modals without duals have received a range of interpretations in the literature. English *ought* and *should* have been analyzed as weak necessity modals (von Fintel & Iatridou 2005, 2008; Rubinstein 2012). Rullmann *et al*. (2008) present a variation of a weak necessity analysis for Salish modals. Those analyses do not explain the lack of duals, however. Why aren't there any strong possibility modals? Peterson (2008) and Deal (2011) analyze modals without duals in Gitksan and Nez Perce as existentials. On that account, too, the absence of duals remains unexplained. Kratzer (2012) conjectures that modals without duals may not be quantificational at all, but may be 'upper end degree'

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4   . *Eher* and <u>am</u> *ehesten* are also used for 'metalinguistic comparisons' (Morzycki 2011). Those comparisons are arguably special cases of modal comparisons.

modals indicating a certain degree of probability, feasibility, potential, or desirability. Such an analysis would not only explain the absence of duals, but would also link that absence to the fact that modal domains can be ordered in a way that makes a degree semantics possible. There is now a new question, however : how come only upper end degree modals are ever lexicalized, why aren't there any 'lower end degree modals' ? Shouldn't there be pairs of antonyms like *light* and *heavy* ? If we want to maintain that *ought* and *should* are upper end degree modals, then, we need to find a principled explanation for the lack of antonyms.

Differences between comparative constructions with modal auxiliaries and those with adjectives are subtle and harder to detect, but no less substantial. 3(a) to (c) feature test cases for adjectival comparative constructions. I picked modal adjectives to highlight potential differences with modal auxiliaries.

(3)   a. Her moving to Paris is more likely than his leaving Rome (is).

       b. Her moving to Paris is more likely than you think (it is).

       c. His leaving Rome is more desirable than (it is) feasible.

3(a) and (b) have a grammatical analogue with modal auxiliaries in German, but 3(c) does not. Before presenting the modal auxiliary data, I'd like to remind you, though, that German *eher* is used for both modal and temporal comparisons, and that sentences with *eher* are thus usually ambiguous between temporal and modal interpretations. In 4(a) to (c), I only added glosses, translations, and stars for the modal interpretations. 4(c) is fully grammatical on the temporal interpretation of *eher*. It then means that Jockl wanted to commit this murder earlier than he could. That 4(c) is grammatical on one interpretation is a precious piece of evidence, because we now know that there is nothing syntactically wrong with that sentence.

(4) a.   Jockl kann eher in Aufhausen gewesen sein, als   Jackl in Mindelheim.
          Jockl can more in Aufhausen been   be than   Jackl in Mindelheim.
          Jockl is more likely to have been in Aufhausen than Jackl in Mindelheim.

     b.   Jockl kann den Mord eher begangen haben als   der Richter denkt.
          Jockl can the murder more committed have than the judge thinks.
          Jockl is more likely to have committed the murder than the judge thinks.

c. * Jockl wollte diesen Mord   eher begehen als   er konnte.
   Jockl wanted this   murder more commit than he could.
   Jockl was more desirous than capable of committing this murder.

Degree constructions like those in 3(a) to (c) are standardly given an analysis where the adjective has a degree argument that can be saturated and bound. 5(a) to (c) illustrate a degree analysis for 3(a) to (c).

(5)   a. Max λd (her moving to Paris is d-likely) > Max λd (his leaving Rome is
           d-likely).
        b. Max λd (her moving to Paris is d-likely) > Max λd (the judge thinks his
           leaving Rome is d-likely).
        c. Max λd (his leaving Rome is d-desirable) > Max λd (his leaving Rome is
           d-feasible).

5(a) to (c) follow the format in Heim (2001). 5(a), for example, is to be understood as: the maximal degree d such that her moving to Paris is at least d-likely is greater than the maximal degree d such that his leaving Rome is at least d-likely. 5(c), which formalizes 3(c), is an indirect comparison in the terminology of Bale (2008). It asks us to compare positions on two different scales: the scale of probability and the scale of desirability. Somehow, we manage to make such multi-scale comparisons. Bale (2008) and van Rooij (2010) explore theoretical possibilities and connections with measurement theory. 4(c) was an attempt to express an analogous indirect comparison with two modal auxiliaries. The attempt failed. Since 3(c) shows that we can make that kind of comparison, there can't be any conceptual obstacle. Since 4(c) is grammatical on the temporal reading of *eher*, there can't be any syntactic obstacle either. And since the auxiliary *wollen* ('want') uses *eher* for modal comparison, just as *können* ('can', 'might') does, the comparative morphology can't be the culprit.

(6)   a. Jockl wollte diesen Mord   eher begehen als   Jackl.
           Jockl wanted this   murder more commit than   Jackl.
           Jockl was more desirous of committing this murder than Jackl.

        b. Jockl konnte diesen Mord   eher begehen als   Jackl.
           Jockl could   this   murder more commit than   Jackl.
           Jockl was more capable of committing this murder than Jackl.

We are left with the question why an indirect modal comparison inter-pretation is not available for 4(c). The plot thickens when we factor in van Rooij's (2010) observation that statements like (7), which are common in political economy talk, also compare positions on different scales. They should thus be considered indirect comparisons.

(7)   Knowing Chinese was more useful for Lucie than knowing Japanese was for Daniel.

(7) compares two properties on two distinct scales of usefulness, one for Lucie, and one for Daniel. Interestingly, analogous comparisons with modal auxiliaries are fully grammatical in German:

(8)   Lucie konnte ihr Chinesisch eher vermarkten, als Daniel sein Japanisch.
        Lucie could her Chinese   more market   than Daniel his Japanese.
        'Lucie was more in a position to market her Chinese than Daniel was in a position to market his Japanese.'

(8) could be true in a situation where, generally, knowledge of Chinese and Japanese are equally marketable, but where the particular circumstances of Lucie and Dan differed, with the result that knowledge of Chinese ended up being more useful for Lucie than knowledge of Japanese was for Daniel. The comparison in (8), then, is also based on two distinct utility scales. Any theory of modality will have to come to terms with the different judgments for 4(c) versus (8). The contrast between 4(c) and (8) would be unexplained if we simply analyzed 4(a) to (c) as degree comparisons following the model of 5(a) to (c). There would be no good reason for the deviance of 4(c) on the intended interpretation. The facts are clear, but subtle and remote from daily experience. They might thus be hidden pointers to the hard-wired mechanics of modal scale construction for adjectives versus auxiliaries.

In the best of all possible worlds, the properties of modal displacement would be derivable from general, category-blind, theories of quantifica-tion and comparison in interaction with general properties of adjectives and auxiliaries and the specific properties of modal domains. In the best of all possible worlds, then, all that is special about modal words would come from the distinctive properties of modal domains: how they are set up, constrained and ordered, and how they are represented in the syntax.

MODALITY AND SYNTAX

A linguistic theory of modal displacement needs to bring together our ability to project, restrict, and order modal domains with suitable syntactic representations. We want to find out if, and if so, how, modal domains, their restrictions, and their orderings are represented by hierarchically organized syntactic structures. Syntactic structures are cleverly designed tools that are used as scaffolding to weld together information pulled from different cognitive domains. The heart of any syntactic representation is the hierarchy of verbal inflectional heads, the verbal projection spine. Here is a snap shot of what it might look like. At the bottom (or innermost, depending on how you look) are verb roots and morphology dedicated to argument structure building (voice alternations, causatives, applicatives), and aktionsarten (stative versus eventive, telic versus atelic). This portion of a syntactic representation describes events and states. Moving up (or outwards), we encounter viewpoint aspect (perfective, imperfective, prospective, perfect). We can think of viewpoint aspect as relating the events described by the lower regions of the verbal projection spine to salient topic situations. Above (outside of) viewpoint aspect, we find tense, which temporally relates topic situations to utterance situations (past, present, future).

(9) $[\ldots [_{\text{Tense}} \ldots [\text{past}] [_{\text{Aspect}} \ldots [\text{perfective}] [_{\text{Voice}} \ldots [\text{active}] [_{\text{V}} \sqrt{\text{verb}} \ldots {}_{\text{V}}] {}_{\text{Voice}}] {}_{\text{Aspect}}] {}_{\text{Tense}}] \ldots]$

Where is the home of modality in all of this ? That is, where do markers of modal displacement live ? Modal auxiliaries in English or German have long been known to show up in distinct syntactic positions (Jackendoff 1972, Brennan 1993, Cinque 1999). Modal auxiliaries below aspect (traditionally called 'root modals') are future oriented and are used to talk about propensities and potentials of people, things, and spatiotemporal locations, given their current circumstances.

(10)   a. The glass *can* break easily.
        b. When you *must* sneeze, cover your mouth.
        c. Hydrangeas *can* grow there.

Modal auxiliaries above aspect (traditionally called 'epistemic modals') represent assessments of the truth of propositions against a range of possibilities determined by a body of evidence.

(11)   a. They *must* have forgotten.
        b. He *might* be around.
        c. Hydrangeas *might* be growing there.

But markers of modal displacement do not have to be modal auxiliaries. Modal displacement can be found with just about any syntactic category in just about any syntactic position. Viewpoint aspect has long been known to be tied to the introduction of certain types of possibilities: the English progressive invokes 'inertia worlds', or events that get completed in merely possible worlds (Portner 2011a). Many markers of modal displacement straddle the border between the functional and the lexical vocabulary of a language. Bittner (2005) documents that the Greenlandic language Kalaallisut has about thirty morphemes that translate English future auxiliaries. They include verb-extending suffixes, verbal roots, a noun-extending suffix, a denominal verb-forming suffix, and mood inflections. Bittner points out that this is not a morphologically natural class, yet the meanings expressed fall into natural categories. Most prominent are prospective statives describing future-oriented mental states related to expectations, desires, hopes, fears, intents, plans, and assessments of prospects as likely, unlikely, liable to happen, and so on (Bittner 2005, 13). Determiners in the free-choice family are also known to be intimately tied to modal displacement. Consider (12) from von Fintel (2000, his example (19)):

(12)   I had no time to play around, so I grudgingly used whatever email program was installed on the computer.

The determiner *whatever* introduces a counterfactual presupposition, which von Fintel paraphrases as in (12').

(12')   I used the email program that was installed on the computer, and if a different email program had been installed, I would have used that one.

While modal displacement is not confined to particular syntactic positions, there is a dependency between the type of modal domains and syntactic positions. The 'low' modals in (10) have different kinds of domains than the 'high' modals in (11). This difference is traditionally associated with root versus epistemic 'flavors' of modality. The differences in flavor and their dependence on syntactic positions are systematic and uniform across languages (Cinque 1999). We therefore need to understand the theoretical connection between syntactic positions and modal domains. That there should be such a connection is surprising. How come a syntactic position can determine a modal domain ? The following section introduces some background for this question.

3. MODES OF PROJECTING, RESTRICTING, AND ORDERING MODAL DOMAINS

We begin with two sentences that almost mean the same. Trying to nail down the difference gives a first impression of how modal domains are selected and projected from anchors in the world of evaluation.

(13)   This glass is fragile.

While a fragile glass seems to be one that can easily break, (13) is not equivalent to (14):

(14)   This glass can break easily.

David Lewis' story of the Sorcerer and the Glass brings out the difference (Lewis 1997, 147).

"A sorcerer takes a liking to a fragile glass, one that is a perfect intrinsic duplicate of all the other fragile glasses off the same production line. He does nothing at all to change the dispositional character of his glass. He only watches and waits, resolved that if ever his glass is struck, then, quick as a flash, he will cast a spell that changes the glass, renders it no longer fragile, and thereby aborts the process of breaking. So his finkishly fragile glass would not break if struck – but no thanks to any protective disposition of the glass itself. Thanks, instead, to a disposition of the sorcerer."

On Lewis' scenario, (13) is true: the sorcerer's chosen glass is fragile. But (14) has an interpretation where it is false, given Lewis' story: the glass cannot break, let alone break easily: it is protected by the sorcerer at all times. (13) and (14) select different modal domains, they construct their modal alternatives differently. For (13), the modal alternatives are worlds that all have close matches of the glass, but may otherwise vary in countless ways. There may be no sorcerer to protect the glass, and it may then get struck and break. For the relevant interpretation of (14), the modal alternatives are worlds that have close matches of the glass and other relevant actual circumstances. What those circumstances are is not fixed by the meaning of *can*, but there is a temptation to include the sorcerer and his power and urge to protect the glass. On that interpretation, there is no modal alternative where the glass can break. Since there is nothing in the meaning of *can* that requires inclusion of the sorcerer, a person who denies the truth of (14) is treading on shaky grounds. Modal claims with *can* are defeasible.

(15)   You think the glass can't break? What if the sorcerer dropped dead?

The construction of modal domains follows fixed recipes. They are systematically projected from parts of the evaluation world, the modal 'anchors' in the terminology of Hacquard (2006). For (13), the anchor is the actual glass, and the modal alternatives all have matches of that glass. For (14), the anchor is the actual glass plus relevant circumstances, and the modal alternatives all have matches of the glass and those circumstances. That modal talk depends on a mechanism of projecting modal domains from anchors in the evaluation world was argued for counterfactuals in Arregui (2005, 2007, 2009), and for root and epistemic modality in Hacquard (2006, 2010). The innovative idea introduced by those proposals is that modals choose their anchors from entities that are independently made available during the construction of the verbal projection spine. Different kinds of potential modal anchors become available at different stages of a syntactic derivation, and this explains why there can be a connection between modal flavor and syntactic positions.

On Hacquard's account, modals have event arguments, and ordered modal domains are projected from events via the modal base and ordering source functions of Kratzer (1981, 2012). To explain the connection between syntactic position and modal flavor, Hacquard assumes that the

event arguments of modals are connected via local binding relations to other instantiations of event arguments in higher or lower regions of the verbal projection spine. It is ultimately those other event arguments that are responsible for a modal's flavor. For example, epistemic modals are speaker oriented, Hacquard says, because their anchor comes from their event argument, which in turn is locally bound by a higher event variable representing the speech event. Arregui argued for a conceptually simpler, counterpart-based, method of modal domain projection for counterfactual *would*. This method doesn't have to stipulate binding relations and seems to be used over and over in many other cases of modal displacement. We already saw two instantiations in (13) and (14). Arregui proposed that the anchor from which the modal domain for counterfactual *would* is projected is provided by the past tense morphology that surfaces in the *if*-clause of counterfactuals in English. Take (16).

(16)   If the glass broke, the sorcerer would be upset.

The initial modal domain for (16), according to Arregui, is the set of worlds that have close matches – counterparts – of the actual past. The initial domain is then restricted further by the antecedent of the counter-factual. I will refer to the method of domain projection illustrated in (13), (14), and (16) as 'factual domain projection'. Factual domain projection creates domains where every modal alternative has a counterpart of the anchor. Additional factual or non-factual restrictions can narrow down initially projected domains further. Factual domain projection is no newcomer to semantics. Lewis (1988) used it to link propositions and their subject matter. Kratzer (2002, 2012) used it to construct propositional facts from 'worldly' facts. Lewis (1996) used it for knowledge ascriptions. Rullmann *et al.* (2008) used it for reportative evidential modals in St'át'imcets (Salish). That factual domain projection can be found in so many subareas of semantics suggests that it is a mechanism that relates to a very basic cognitive ability : a creature's ability to map a part of its own world to a range of worlds representing possible ways that part could be 'extended' to or 'grow into' a complete world.

Modal domain projection relies on functions that project modal domains from anchors. Those functions are special cases of the quantifier domain fixing functions of Schwarzschild (2009). Modal domain fixing functions map individuals, events, or situations to a set of modal alter-

natives. I will construe modal alternatives as possible worlds for simplicity in what follows, but, ultimately, modal alternatives need to be partial worlds or situations (Kratzer 2007).

(17) **Modal domain fixing functions**
A modal domain fixing function is a function that maps a part of a world to a set of possible worlds.

(18) **Factual modality**
Domains for factual modality are projected via a domain fixing function f_{fact} so that
for any a in its domain, $f_{\text{fact}}(a) = \{w : \text{there is a counterpart a' of a and a'} \leq_{\text{part}} w\}$.

(18) presupposes that we can talk about worlds and their parts and relate them via $\leq_{\text{part}}$, a world-bound part relation (Kratzer 1989, 2012). I am assuming a Lewisean ontology (Lewis 1986), where worlds can't literally share parts. Counterparts relate parts of different worlds via similarity relations that, in the limiting case, might come close to perfect duplication.
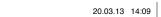
Different types of modals select different types of anchors. The anchor for *fragile* is the individual denoted by its subject. In contrast, *can* seems to be anchored to individuals plus their circumstances. How do modals find their anchors, then ? In an ideal world, modal anchors should be provided by the arguments of their modals. The argument relation is the device grammars would be expected to exploit to enforce the connection between modals and their anchors :

(19) **The Modal Anchor Hypothesis**
A modal expression's anchor is one of its arguments.

(19) is clearly true for *fragile*, but what about *can*, for example ? Argument structure is built in the lower regions of the verbal projection spine, and in those regions individuals and events are available as potential modal anchors. As we move up into the higher regions, we encounter functional operators that are interpreted as propositional operators. Propositional operators map propositions to propositions, hence are of type <<st><st>>. Within the situation semantics of Kratzer (1989), propositions are sets of situations, and situations are partial worlds. A propositional operator has two arguments, then : a proposition and a situation. Propositions aren't particulars, hence can't be anchors. If (19) is correct, we can conclude

that the anchors of propositional operators must be their situation argument. This has interesting consequences. We predict, for example, that the anchors for epistemic modals, which are raising predicates, must be their situation argument. Hackl (1998), Bhatt (1999), and Wurmbrand (1999) have argued that the modal *can* is a raising predicate, too.

(20) a. A lot of people might have been jumping in this pool.

     b. A lot of people can jump in this pool.
       Hackl (1998).

Both sentences have a reading where the subject scopes under the modal, showing that the subject is not an argument of the modal. Both *can* and *might* are raising predicates, then, and (19) thus dictates that the modal anchor for (14) be a situation. That situation would be one that has the mentioned glass in it, plus relevant circumstances. The theoretical interest of the Modal Anchor Hypothesis is that no special devices have to be posited for the syntactic representation of initially projected modal domains, and that modal domains can be projected in just about any syntactic position. They come into existence via domain projection functions that are uniquely determined by a modal expression's regular arguments, hence can be syntactically represented by those arguments. Denotations of run of the mill modal auxiliaries could look as in (21).

(21) a. $[[\text{must}]] = \lambda p \lambda s \forall w (w \in f_{\text{fact}}(s) \rightarrow p(w))$.

     b. $[[\text{can}]] = \lambda p \lambda s \exists w (w \in f_{\text{fact}}(s) \, \& \, p(w))$.

The representations in (21) do not only determine the modals' argument structure and their truth-conditional contribution. They are also explicit hypotheses about the way grammar collaborates with other cognitive modules in the interpretation of modals. Grammar provides expressions of a λ-calculus constructed from variables and logical and non-logical constants. The non-logical constants establish a connection with cognitive modules outside of grammar. In (21), the non-logical constant f_{fact} is a link to a factual domain projection function recruited from extra-linguistic resources.

There usually are general factual constraints that narrow down initially projected modal domains further, without necessarily having to be signaled

by specialized modal vocabulary. Major departures from actuality tend to be barred. Laws of nature tend to be preserved. Initial modal domains may be further constrained by goals and preferences, ethical principles, and some such. To illustrate, against the background of the scenario below (from Phillips and Knobe 2009), sentence (22) (from Knobe and Szabó (forthcoming)) is judged true:

> While sailing on the sea, a large storm came upon a captain and his ship. As the waves began to grow larger, the captain realized that his small vessel was too heavy and the ship would flood if he didn't make it lighter. The only way that the captain could keep the ship from capsizing was to throw his wife's expensive cargo overboard. Thinking quickly, the captain took her cargo and tossed it into the sea. While the expensive cargo sank to the bottom of the sea, the captain was able to survive the storm and returned home safely."

(22)   Given the circumstances, the captain *had to* throw his wife's cargo overboard.

We judge (22) true on the scenario above because, in addition to anchoring the modal *have to* to the facts of the case as described, we also eliminate all modal alternatives where the goal of saving the ship is not reached. Potentially non-factual constraints like those coming from goals or ethical principles impact modal domains by ordering them. Depending on the nature of the ordering, ordered modal alternatives determine a set of 'best' worlds. For (22), the best worlds are those where the ship is saved. Ordered modal alternatives become crucial when non-factual constraints are in conflict with each other. The scenario below, also from Phillips and Knobe (2009), is a case where priorities clash.

«While sailing on the sea, a large storm came upon a captain and his ship. As the waves began to grow larger, the captain realized that his small vessel was too heavy, and the ship would flood if he didn't make it lighter. The only way that the captain could keep the ship from capsizing was to throw his wife overboard. Thinking quickly, the captain took his wife and tossed her into the sea. While the captain's wife sank to the bottom of the sea, the captain was able to survive the storm and returned home safely.»

As Knobe and Szabó report, subjects judge (23) false in such a situation:

(23)   Given the circumstances, the captain *had to* throw his wife overboard.

For (23) to come out false, the best worlds can no longer be those where the goal of saving the ship has been reached. Ethical standards now come into play that rank modal alternatives where no murder is committed higher than those where the ship is saved. (22) and (23) show that English *must* and *have to* tolerate domains that are constrained by laws of nature, by priorities of various kinds (relating to goals, ethical standards, etc.) or a mix of both. Interestingly, Aynat Rubinstein (2012) found that this tolerance doesn't extend to just any type of priority. It is restricted to priorities that are presupposed to be collectively committed to. The presence of other priorities has to be signaled by weak necessity modals like *ought to* or *should*. Rubinstein (her example (40), p. 52) imagines a young woman, Rachel, who is a student coming to the United States, where it is illegal not to have health insurance. We understand 24(a) as relating to the legal requirement to get health insurance. 24(b), in contrast, suggests that we are in a context where breaking the law is an option. There is no longer a presupposition of collective commitment to the law requiring health insurance. Getting health insurance may still be advisable for Rachel to avoid run-ins with the law.

(24)   a. Rachel has to get health insurance.

        b. Rachel should get health insurance.

Rubinstein's work confirms and fleshes out von Fintel and Iatridou's earlier claim that weak necessity modals point to a two-way split in the way modals treat priorities (von Fintel & Iatridou 2005, 2007). It is still an open question, though, how exactly grammars implement that split. One possibility, which is suggested by the discussion in von Fintel and Iatridou (2005), might be that priorities that are presupposed to be collectively committed to directly impact the set of contextually relevant worlds, along with presuppositions about the laws of nature and the general workings of the world. Those priorities would then not be organized into an ordering source that is visible to the compositional interpretation process. In contrast, priorities that are not presupposed to be collectively committed to could be represented via ordering sources that are targeted by modals like *should* or *ought to* in the process of semantic interpretation.

Hacquard (2006) and Kratzer (2006) consider a second method of modal domain projection, the 'content mode', which produces content-related modality. The content mode of modal domain projection

requires anchors that can be associated with intentional content: books, rumors, mental states like those related to belief and desire, but also, as Hacquard points out, speech events. Domain fixing functions that project modal domains in the content mode map anchors that can be naturally associated with intentional content to the set of possible worlds that are compatible with that content.

(25) **Content modality**
      Domains for content modality are projected via a domain fixing function $f_{content}$ so that:
      $f_{content}$ is only defined for entities that determine intentional content.
      For any a in the domain of $f_{content}$:
      $f_{content}(a) = \{w: w$ is compatible with the intentional content determined by a$\}$.

Many of the Kalaallisut prospective statives identified in Bittner (2005) seem to depend on modal domains projected in the content mode. According to Bittner, they relate to mental states of designated individuals. The German reportative modal *sollen* is another example of a content-related modal.

(26)   Der Hampshire Gazette nach   soll   Clyde geheiratet haben.
       The Hampshire Gazette according SOLL Clyde married   have
       'According to the Hampshire Gazette, Clyde supposedly got married.'

(26) is true just in case Clyde got married in all possible worlds that are compatible with the content of some particular issue of the Hampshire Gazette. We may ask for better representations of content. More dimensions of meaning may have to be considered, maybe locally folded in at suitable junctures: presuppositions, conversational and conventional implicatures, pragmatic enrichment (Recanati 2004, 2010). Better formats of content representation may be called for: sets of propositions, structured propositions, discourse representations, semi-quotations, full quotations. Better representations of content can always be pushed for. That's the Achilles heel of any content-related modal claim. Semantic theories need to recognize this vulnerability as an inherent property of content ascriptions, rather than a flaw that can be used to discredit particular theories. Many contributions to content do not come from knowledge of language. This is why we are often at a loss about what a text means.

We turn to experts to help us figure it out – legal commentators, literary critics, philologists, bible scholars, historians.

I have developed a hypothesis about the projection, restriction, and syntactic representation of modal domains. Initial modal domains are projected from anchors that are syntactically represented arguments of modal expressions. Modal domain projection itself is located outside of grammar. Grammar cannot directly affect modal domains. It can only manipulate and constrain their anchors. There are two major methods of modal domain projection : factual and content-related. There are also two distinct processes overseeing how priorities impact modal domains : one is visible to compositional semantic interpretation, the other is not. If the Modal Anchor Hypothesis is true, and if modal domains can be projected from any part of a world (individuals, events, situations), any type of expression that has an individual, event, or situation argument can introduce modal displacement. Since any non-referential expression has at least a situation argument in a situation semantics, modality should indeed be everywhere. Since modality comes in different flavors depending on where it originates, it should be a major source for semantic microvariation. My talk will document that this is indeed so, with case studies tracking modal displacement sublexically, with voice, aspect, tense, and evidential systems, in attitude ascriptions, and with indefinites.

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