

# Future Orientation on an Event-Relative Semantics for Modals\*

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## 1. Introduction

Hacquard's event-relative modal semantics (Cf. Hacquard 2006, 2010) allows one to account for what she calls Cinque's Puzzle, the different positions of modal auxiliaries in the hierarchy of functional projections.<sup>1</sup> One of Hacquard's innovations in her 2006, 2010 was to reconfigure modal bases and ordering sources to take an event as opposed to a world argument, which in turn constrain the modal's flavor. Epistemic modals sit high in the clause (above Tense) and take the speech event as an argument, yielding an epistemic modal base as in (1a).<sup>2</sup> Root modals sit low (below Tense and Aspect), take the vP event as an argument, and yield circumstantial modal bases as in (1b). This permits modals' lexical entry to be uniform as in (1c), despite the difference in height.

- (1) a.  $\bigcap f_{ep}(e) = \{w' : w' \text{ is compatible with } \text{CON}(e)\}$   
b.  $\bigcap f_{circ}(e) = \{w' : w' \text{ is compatible with the circumstances of } e\}$   
c.  $[[ \text{ must} ]]^{w.f.g} = \lambda P.\lambda f.\lambda g.\lambda w[\forall w' \in \text{BEST}_{g(e)}(\bigcap f(e)) : P(e)(w')=1]$

The difficulty comes in balancing the event dependency of the modal with interpretive facts about the modal's temporal *perspective* and *orientation*. This terminology originates with Condoravdi 2002.<sup>3</sup> By way of review, the temporal perspective of a modal is the time at which the worlds in the modal base are calculated. The temporal orientation of a

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<sup>1</sup>According to (Cinque 1999), the relevant projections are ordered  $\text{Modals}_{epistemic} > \text{Tense} > \text{Aspect} > \text{Modals}_{root}$ .

<sup>2</sup>CON is a function from a content-bearing event, like an illocutionary act, speech event, or attitude event, to the set of possible worlds characterizing its content. Cf. Pietroski 2000 for discussion.

<sup>3</sup>Cf. also (Matthewson 2012), to which I owe my brief summary, for a concise formulation.

modal is the relation between the temporal perspective and the time of the described event. For root modals, since they have a circumstantial modal base, this would be the time at which the relevant facts hold which help determine the set of worlds against which the modal is evaluated. I'll focus on a single example that exemplifies the difficulty I have in mind: present tense root modals with eventive prejacent. In English, such sentences have a present perspective and a future orientation. But facts about the event-relative framework as put forward by Hacquard conspire to produce difficulties in yielding a representation which can capture this interpretation properly. This paper aims to lay out nature of the problem, diagnose its source, and propose a solution favorable to the event-relative framework.

## 2. Two problems for the event-relative account

In English, root modal sentences with eventive complements have a present perspective with a future orientation. Take (2a) as an example. I'll implement Kratzer 1998's semantics for **PRES** and **IMPF** as in (2b) and (2c). Ignoring the speech event, this gives one the truth conditions in (2d).<sup>4</sup> By way of context for our example, let's say that John's mother is due for a visit, and his refrigerator is empty. His goal is to have food in his fridge before his mother's visit.

- (2) a. John must stock his refrigerator.  
 b. **IMPF**:  $\lambda P.\lambda t.\lambda w. \exists e[t \subseteq \tau(e) \ \& \ P(e)(w)=1]$   
 c. **PRES**:  $\lambda P.\lambda w. \exists e[t = t_u \ \& \ P(e)(w) = 1]$   
 d.  $[_{TP} \text{PRES } [_{AspP} \text{IMPF } [_{Mod} \text{MUST } [_{vP} \text{John stock his refrigerator } ]]]]$   
 $= \exists e[t \subseteq \tau(e) \ \& \ t = t_u \ \& \ \forall w' \in \text{BEST}_{g(e)}(\bigcap f(e)):\text{John-stock-his-fridge}'(e)(w')$   
 $= 1]$

The analysis in (2) simplifies Hacquard 2010's semantics in two ways. First, it glosses over the aspect movement which guarantees modals' arguments are of a uniform type. Second, it adopts a standard semantics for **IMPF**; Hacquard 2010 adds an extra layer of modality to the imperfective. Neither simplification affects the verdict of the paper, but I'll return to the second point later. Notice, for now, that  $e$  in (2d) is both (i) the source of the modal parameters for *must*, and (ii) an event of John stocking his fridge in the teleologically ideal worlds picked out by BEST. These features conspire to yield two problems.

### 2.1 The Event Identification Problem (EIP)

To get a purchase on the first problem, recall that  $f$  and  $g$  project from the  $vP$ 's event argument. With Aspect sitting above the root modal, existential quantification of the  $vP$ 's event argument takes wide scope over the modal. This commits us to an eventuality which exists in the actual world (or in the *generic worlds*, on the semantics of **IMPF** advocated by Hacquard), but which is a fridge-stocking event in the ideal worlds. Intuitively, actual-world

<sup>4</sup>I'll largely ignore the role of the speech event, which is important the event-relative framework primarily for the interpretation of epistemics.

$e$  is a state consisting of John's circumstances ("CIRCUMSTANCE $_e$ "), which are held fixed in the worlds delivered by  $\bigcap f(e)$  and where the stocking-the-fridge event occurs ("MODAL $_e$ ").

We can make this idea vivid by drawing on the context to flesh out the circumstances of the scenario a bit. John's mother is due for a visit and his refrigerator is empty. The relevant circumstances picked out by  $f$  and  $g$  involve John's empty refrigerator and his goals. Let's say his relevant sole goal is to have food in the fridge when his mother arrives. So  $\bigcap f(e)$  yields a set of worlds where John's fridge is empty, and  $g(e)$  is the set of John's goals. [[ (2a) ]] is true, relative to this  $f$  and  $g$ , just in case every world in  $\bigcap f(e)$  in which John has food in his fridge by the time of his mother's visit is one in which he stocks his fridge. The problem is, we can't identify CIRCUMSTANCE $_e$  with MODAL $_e$ , because any fridge-stocking event is *eo ipso* not an empty-fridge state. At best, we can perhaps say CIRCUMSTANCE $_e$  is a state which partially overlaps MODAL $_e$ , but this is, properly speaking, a different event. Yet in (2d), both of these eventualities, an empty-fridge state and a fridge-stocking event, are implausibly picked out by  $e$ .

## **2.2 the Orientation Problem (OP)**

The second problem has to do with the temporal orientation of the complement clause in (2d). In (2d), **IMPF** introduces a reference time, and says that this reference time is included in the run-time of the event; the modal event of John-stocking-his-fridge (what I called MODAL $_e$  above). The reference time is identified with the utterance time via **PRES**. By the transitivity of identity,  $\tau(e)$  is included in the utterance time, albeit where this time occurs in another world. This is the wrong prediction. The fridge-stocking event should be future oriented with respect to the circumstances. We want MODAL $_e$  to follow CIRCUMSTANCE $_e$  in the ideal worlds, not be contemporaneous with it. (2d) fails capture the future orientation of the modal's complement.

An event-relative modal semantics is in need of some kind of response to the EIP and the OP. It might seem that the OP would be easy enough to deal with simply by adopting an off-the-shelf mechanism for securing future orientation. Part of the aim of this paper is to show that the matter is not so simple, because the EIP constrains the kinds of solutions one could hope to give to the OP. The next two sections describe some of these issues.

## **3. Perspectives on the source of future orientation in modals**

There tend to be three types of proposals about the source of future orientation in modals. One position, advanced by Enç 1996 and Werner 2006, suggests that circumstantial modals have a future orientation as part of their lexical meaning. This might be due to the modal's meaning including a mechanism that explicitly extends the evaluation time into the future (as in the case of Enç 1996), or to some more general mechanism. In the case of Werner 2006, the structure of branching worlds combined with modal reasoning will ensure a future orientation for circumstantial modals more generally. A second kind of proposal is similar in that it ties future orientation to the lexical meaning of the modals. But this account, the classic example of which is Condoravdi 2002, also provides a mechanism whereby the

Aktionsart of the embedded predicate can impact the orientation. This makes the orientation rely on the interaction of the lexical meaning of the modal and the Aktionsart of the complement with which it composes. On Condoravdi's account, the temporal perspective is either given by tense (where present tense gives a present orientation), or by the interaction with a perfect operator PERF (where MOD > PERF gives a past orientation). The lexical entries are given in (3).<sup>5</sup>

- (3) a. Possibility modal:  $\lambda P.\lambda w.\lambda t.\exists w'[w' \in \text{MB}(w, t) \ \& \ \text{AT}([t, \infty), w', P)]$   
 b. Necessity modal:  $\lambda P.\lambda w.\lambda t.\forall w'[w' \in \text{MB}(w, t) \rightarrow \text{AT}([t, \infty), w', P)]$
- (4)  $\text{AT}(t, w, P) = \begin{cases} \exists e [P(w, e) \ \& \ \tau(e, w) \subseteq t] & \text{if } P \text{ is eventive} \\ \exists e [P(w, e) \ \& \ \tau(e, w) \circ t] & \text{if } P \text{ is stative} \\ P(w)(t) & \text{if } P \text{ is temporal} \end{cases}$

The contribution to temporal orientation made by modals is due to the AT-predicate; this predicate specifies the interval at which the prejacent is evaluated. A possible future orientation is ensured by  $[t, \infty)$ , which describes an interval which extends infinitely into the future from  $t$ . The precise nature of the AT-predicate differs for eventive and stative predicates, as indicated in (4). The run-time of eventive predicates is required to be included in this interval. To be included in this interval, the latest such an eventuality could start would be the start of the interval,  $t$ . Since events take time to occur, this constraint effectively gives eventives an obligatory future orientation. For stative predicates, by contrast, the run-time of the eventuality denoted by the predicate need only overlap with the interval  $[t, \infty)$ . In a nutshell, this difference provides for the fact that modals with complements with stative predicates can sometimes have a present orientation, but that modals with eventive complements are always future oriented.

A third approach, exemplified by Matthewson 2012 and Kratzer 2010 (cited in Matthewson), separates the element responsible for the future orientation from the modal itself. On this approach, the modal itself does not provide the future orientation, but the modal will be interpreted as future oriented when it occurs with some other element that triggers a future orientation. Both Matthewson and Kratzer suggest viewpoint aspect as the element thus responsible. Matthewson supports this claim with evidence from Gitskan, where the aspectual morpheme *dim* is both necessary and sufficient for securing future orientation. Her lexical entry for *dim* is below.

- (5) a.  $[[ \text{ASP} ]] = \lambda P \lambda t \lambda w \exists e [P(e)(w) \ \& \ \tau(e) = t]$   
 b.  $[[ \text{dim} ]] = \lambda P \lambda t \lambda w \exists t' [t \prec t' \ \& \ P(t')(w) = 1]$

Matthewson separates the existential closure over events into an ASP head, which acts primarily as a type-shifter, so that various aspectual operators like *dim* may stack above it. ASP existentially binds the event variable and introduces a reference time, which *dim*

<sup>5</sup>To be clear, Condoravdi is explicitly concerned with non-root modals. But her "metaphysical" modals are similar to circumstantial modals, and nothing in principle prevents us from considering the efficacy of extending her proposal to future orientation in root modals.

shifts into the future. As Matthewson points out, *dim* occurs obligatorily with circumstantial modals, intervening between the modal and the verb, so we'd expect present circumstantial modals with eventive predicates to have precisely same kind of interpretation in Gitskan as our main example (2a) in English. I think this expectation is largely borne out, except for the fact that *dim* occurs obligatorily, while there are present oriented circumstantial modals in English.<sup>6</sup>

In Matthewson's account, *dim* amounts to a prospective aspect marker, which echoes Kratzer's contention about the source of future orientation. The difference is that while such a marker is unpronounced in English, it is pronounced in Gitskan. The example Kratzer uses to illustrate this is the ability modal *can*. I give Kratzer's lexical entries for both the modal *can* and the null prospective morpheme in (6).

- (6) a.  $[[ \textit{can} ] ] = \lambda R \lambda x \lambda t \exists x' \exists t' [ \langle x', t' \rangle \in f(\langle x, t \rangle) \ \& \ R(x')(t') ]$   
 b.  $[[ \textit{prospective} ] ] = \lambda P \lambda t \exists e [ P(e) \ \& \ e \preceq \textit{future}_t ]$

That Kratzer uses *can* as an example to illustrate the approach proves to be significant. Like Hacquard, Kratzer advocates conceiving of the arguments to the modal parameters as “anchors”, which figure in the determining the value of the modal base. (Cf. Kratzer 2013) In (6a), the modal is anchored to a time-slice of an individual. So *f* takes an ordered pair of an individual and a time,  $\langle x, t \rangle$ , and gives the set of modal alternatives to  $\langle x, t \rangle$ , which are the other-worldly counterparts of *x* at *t*. This is already a departure from the event-relative framework because the modal anchor is no longer the vP's event as in (1b).

In separating out the element responsible for a modal's future orientation, the Matthewson/ Kratzer approach offers the most obvious way of augmenting the event-relative semantics envisioned in (2) so that it may deal with the OP. But there are a few complications. First of all, the ordering of the functional categories differs—at least between Hacquard's account and Matthewson. Hacquard (2010) relies on the hierarchy argued for by Cinque (1999), which has the following ordering: Modals<sub>epistemic</sub> > Tense > Aspect > Modals<sub>root</sub>. For Matthewson, both ASP and the additional aspectual operators she posits occur under (circumstantial) modals. With the event variable existentially closed before composing with the modal, the modal parameters wouldn't have access to the event variable to anchor the modal.<sup>7</sup> Kratzer's account assumes the same ordering as Hacquard's but, as pointed out above, Kratzer's proposal for *can* doesn't have an event anchor.

<sup>6</sup>Putting a finer point on the difference between Gitskan and English, in Gitskan, the Aktionsart of the verb has no effect on the temporal orientation, which is uniformly future oriented. In English, the Aktionsart makes a difference; stative predicates can have a present orientation for some modals. This fact is reflected in Condoravdi's analysis. Also, *dim* can occur *above* the circumstantial modal, allowing for a future temporal perspective in addition to a future orientation.

<sup>7</sup>Not necessarily perhaps. Champollion (2015)'s quantificational event semantics allows the event variable to take lowest scope with respect to the quantifier in quantified NPs. On this semantics, verbs denote existential quantifiers over events, so verbal meaning directly introduces an existentially closed event variable to the semantic composition. The closed event description contains a second order variable *f* which ranges over event predicates, allowing the event variable to be modified even when it is closed. This allows for the possibility that the event variable could be “available” for modification even when it is closed. So, perhaps it could be “available” to the modal parameter to anchor the modal. But I put aside this possibility for now.

Still, Kratzer’s proposal for [prospective] gives us a clue as to how we might apply prospective aspect to (2), which I do in (7).

- (7) a. John must stock his refrigerator.  
 b. [<sub>TP</sub> PRES [<sub>AspP</sub> [prospective] [<sub>Mod</sub> MUST [<sub>VP</sub> John stock his refrigerator ]]]]  
 c. [[ (7b) ]] =  $\exists e[e \preceq \text{future}_t \ \& \ t = t_u \ \& \ \forall w' \in \text{BEST}_{g(e)}(\cap f(e)):\text{John-stock-his-fridge}'(e)(w')=1]$

It might seem that adopting the Matthewson/ Kratzer account of future orientation, with Kratzer’s [prospective] more specifically, solves the OP. However, this isn’t so. In (7c), MODAL<sub>e</sub> is no longer erroneously predicted to be contemporaneous with the utterance time, and is now properly predicted to be future oriented. This is an improvement. However, closer inspection of (7c) shows that new problems now arise. The source of the new problem is that *e* is now included in a future *t*, and yet *e* is the argument to the modal’s parameters. In short, the modal is now anchored an event included in a future time. Putting this in terms of the terminology used in section 2, MODAL<sub>e</sub> is now in the future, but CIRCUMSTANCE<sub>e</sub> is thereby shifted to the future as well. (7c) gives us a future perspective when we wanted a present perspective. While adopting this proposal does allow us to secure future orientation, it does so at the expense of the modal’s present perspective.

Kratzer’s use of a different modal anchor for *can* is precisely what allows her semantics for *can* to avoid this perspective problem. It allows one to set the temporal perspective of the modal directly via the *t* input to the modal base. But, as indicated above, to follow Kratzer in adopting this modal anchor would amount to giving up the event-relative framework, and the aim of this paper is to see whether we could have an *event*-relative semantics which gets the perspective and orientation facts right.

#### 4. Revisiting Hacquard (2006)’s account

As I mentioned in section 2, the event-relative semantics for modals I presented in (2) was not entirely faithful to Hacquard’s account. There were two additional innovations that (2) left out. First, Hacquard’s semantics relativizes the events that aspect quantifies over to worlds. Second, she contends that imperfective meaning can involve an number of different aspectual operators which quantify over a verb’s event argument; GEN, the progressive, and the counterfactual modal CF, which is construed as a universal modal with a metaphysical modal base and a future operator, making it look like a metaphysical modal in the sense of Condoravdi (2002).<sup>8</sup> Since viewpoint aspect relativizes the event quantified over to a world, the added layer of modality above aspect can shift its world parameter. This is the source of Hacquard’s account of actuality entailments. When *no* additional layer of modality sits above aspect, then the existential quantification of the event variable takes wide scope over the modal, and we have a configuration where the event occurs in the world of evaluation. Above, I glossed this such an event as CIRCUMSTANCE<sub>e</sub> and distinguished

<sup>8</sup>In French, this is usually expressed by *conditionnel* morphology.

it from  $\text{MODAL}_e$ . But Hacquard 2009 proposes a much stronger principle for identifying events across different possible worlds, the PED.

- (8) **Preservation of Event Description (PED):** for all worlds  $w_1, w_2$ , if  $e_1$  occurs in  $w_1$  and in  $w_2$ , and  $e_1$  is a  $P$ -event in  $w_1$ , then *ceteris paribus*,  $e_1$  is a  $P$ -event in  $w_2$  as well.

Perfective aspect involves no such added layer of modality. An application of the PED would then entail that the event also occurs in the actual world. (In fact, an application of the PED to the analysis in (2d) would entail that the fridge-stocking event occurs in the actual world as well.) Due to the additional layer of modality in the imperfective, the world the event is located in doesn't have to be the actual one. When, for example, the imperfective involves a GEN operator, the event is said to populate all "generic" worlds, which need not include the actual world.

The account of actuality entailments doesn't need to concern us farther, but the added layer of modality provides the opportunity for an additional element to secure the future orientation and address the OP. Though the kinds of examples offered by (2a)–present tense root modals with eventive complements– is not discussed in Hacquard (2010), Hacquard does discuss root modal sentences with eventive complements under PRES in her 2006 (cf. pp. 109 - 111). Upon surveying the inventory of aspectual operators that might be part of imperfective meaning in this case, she settles on the CF operator by process of elimination. The progressive is out because it cannot scope over the modal, and GEN is dispreferred because because it doesn't accurately capture the natural reading of (2a), leaving only CF. So a more accurate representation of Hacquard's account would render the analysis of (2a) more like (9). For perspicuity, I will not complete the derivation past the CF modal  $\Box_{meta}$ . We just need to keep in mind that the time introduced by *fut* will be identified with  $t_u$ , as per PRES.

- (9) a. John must stock his fridge.  
 b. [<sub>TP</sub> PRES [  $\Box_{meta}$  [ *fut* [<sub>AspP</sub> IMPF [<sub>Mod</sub> MUST [ John stock his fridge ]]]]]  
 c. [[ (9b) ]] =  $\lambda w_3. \lambda t_2. \forall w_2 \in \text{META}(w_3): \exists t_1 [t_1 \subseteq [t_2, \infty)] \& \exists e_1 [e_1 \text{ in } w_2 \& t_1 \subseteq \tau(e_1)] \& \forall w_1 \in \text{BEST}_{g(e_1)} \cap f(e_1): \text{John-stock-his-fridge}'(e_1)(w_1) = 1]$

This seems to deal with the OP effectively, but not the EIP. To see why, let's take a systematic look at a few features of (9c); to start with, the underlined portion of (10).

- (10)  $\lambda w_3. \lambda t_2. \forall w_2 \in \text{META}(w_3): \exists t_1 [t_1 \subseteq [t_2, \infty)] \& \exists e_1 [e_1 \text{ in } w_2 \& \underline{t_1 \subseteq \tau(e_1)}] \& \forall w_1 \in \text{BEST}_{g(e_1)} \cap f(e_1): \text{John-stock-his-fridge}'(e_1)(w_1) = 1]$

The run-time of the  $e_1$  now includes a time  $t_1$ , which itself is included in an interval that extends into the future (remember,  $t_2$  will be bound by PRES and identified with  $t_u$ ). We still have the event quantification scoping over the modal (which we have of necessity, since  $\text{Asp} > \text{Modal}_{root}$ ), but now the event aspect quantifies over is relativized to a world,

$w_2$ , which is quantified over by the added layer of modality contributed by CF. Cf. the underlined portion in (11).

$$(11) \quad \lambda w_3. \lambda t_2. \underline{\forall w_2 \in \text{META}(w_3): \exists t_1 [t_1 \subseteq [t_2, \infty) \ \& \ \exists e_1 [e_1 \text{ in } w_2 \ \& \ t_1 \subseteq \tau(e_1) \ \& \ \forall w_1 \in \text{BEST}_{g(e_1)} \cap f(e_1): \text{John-stock-his-fridge}'(e_1)(w_1) = 1]]]}$$

$e_1$  may not occur in the actual world, but this difference is insufficient to solve the EIP. In fact, the combination of the analysis in (9c) and the PED presents us with a kind of dilemma. In order for  $\cap f(e_1)$  to pick out the relevant circumstances against which the modal is evaluated,  $e_1$  needs to be a circumstance characterized by John's empty fridge. In fact, the CF modal may give us this, since it will hold fast the circumstances of the world of evaluation up through  $t_2$ . But, since  $e_1$  is an empty-fridge state in all metaphysical alternatives  $w_2$ , it is also an empty fridge state in all ideal worlds  $w_1$ . Then  $e_1$  is *both* an empty fridge state and a fridge-stocking event. Alternately,  $e_1$  is a fridge-stocking event in all ideal worlds  $w_1$ , so by the PED,  $e_1$  is also a fridge-stocking world in all metaphysical alternatives  $w_2$ . But then  $e_1$  in  $w_2$  cannot characterize John's circumstances in  $w_3$  where he has an empty fridge. Neither option is satisfactory.

## 5. An event-relative solution to both problems

The EIP seems to stymie otherwise plausible solutions to the OP. Part of the issue is that if we want the modal to have a present perspective but a future orientation, then it simply couldn't be that  $\text{CIRCUMSTANCE}_e = \text{MODAL}_e$ . Moreover, as long as the argument for the modal parameters is the same  $e$  as that which is introduced by the verb, we risk running into the EIP. But taking a vP event as modal anchor was a central claim of the event-relative semantics for modals, and allowed the account to deal with Cinque's Puzzle. Can we maintain the event-relative framework, given these difficulties? I think so, provided we reify what I've been calling  $\text{CIRCUMSTANCE}_e$ . Upon doing that, we can take a leaf from the Matthewson/Kratzer account of future orientation to secure the proper temporal orientation. Before detailing my proposed solution to both the OP and the EIP along these lines, I will first present some independent evidence which suggests that  $\text{CIRCUMSTANCE}_e$  can indeed have its own event variable.<sup>9</sup>

### 5.1 Reifying the circumstance state

The claim that root modals introduce a second event variable echoes a claim made by Homer (2011) that root modals are stative predicates of eventualities. Root modals then anchor to these stative eventualities ("the evaluation points of their accessibility relations"),

<sup>9</sup>Ramchand (2014, 2018)'s recent modal semantics also proposes a model along Homeric lines, with a kind of double situational semantics. Ramchand's account is similar to the present proposal in that it is not the vP event that anchors circumstantial modals, but a situation introduced above the vP. It is also similar in that it effects a future orientation without positing a prospective aspect head. But it also represents a more radical departure from the event-relative framework I aim to discuss here. Still, a comparison of the present proposal and Ramchand's semantics is worth undertaking, and I leave it to future work.



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which in turn are quantified over by viewpoint aspect. If the circumstance state had its own event variable, then we would expect this eventuality to have its own time and space coordinates independent of the eventuality that denotes the modal's complement. Homer provides examples from French indicating that this expectation is in fact met. In (12a), the temporal adverbial *hier* applies to the time of Pierre's obligation (the CIRCUMSTANCE<sub>e</sub>), while *la semaine prochaine* applies to the run-time of an event of Pierre turning in his homework. In (12b), the spatial coordinate of the legal situation fixed by the adverbial *dans ce pays* contrasts with the adverbial which modifies the event of Jean getting his surgeon's degree, *a l'étranger*.

- (12) a. Context: The rules have just changed: Pierre now has to turn in his homework tomorrow.

Hier encore, il devait<sub>deon</sub> rendre son devoir la semaine  
yesterday still he must-PST turn in his homework the  
prochaine.  
next week

'Yesterday, he still had to turn in his homework next week.'

- b. Context: Where he lives now, is Jean allowed to practice as a surgeon with his French degree?

Non, dans ce pays Jean ne peut<sub>deon</sub> pas avoir obtenu son diplôme de  
no in this country Jean NEG can-PRS NEG have gotten his degree of  
chirurgien l'étranger.  
surgeon abroad

'No, in this country, Jean is not allowed to have gotten his surgeon degree abroad.'

Similar evidence can be found in English. They are a bit harder to get because English modals tend not to inflect for tense, making the contrast harder to draw out. But we can use the periphrastic modal *have to* to make the contrast vivid.

- (13) Context: On June 1st, John's fridge is empty. He knows his mother is coming on the 16th, so he marks on his calendar to go to the store on the 15th. In the meantime, he subsists on takeout. On the 14th, John's roommates decide to do him a favor and do his shopping for him to stock up his fridge for his mother's visit. After running John's errands, one of his roommates utters:  
For two weeks, John had to go to the store tomorrow (but we wound up going for him).

In this example, the lower adverbial modifies the run-time of the event described by the verb. The frame adverbial modifies the time of the obligation. Intuitively, (13) means that John had an obligation to go to the store at a certain time (where *tomorrow* = June 15th),

and that this obligation lasted (at least) two weeks.<sup>10</sup> On the basis of the French data, Homer provides the following analysis of the root interpretation of *pouvoir*.

- (14) a.  $[[pouvoir_{root}]^{c,s}] = \lambda\Phi.\lambda w.\lambda e. e \text{ in } w \ \& \ \exists w' \in \text{Acc}(e)[\Phi(w')]$   
 b. Jean peut<sub>deon</sub> travailler.  
 c.  $[[ (14b) ]^{c,s}] = 1$  iff at  $t_c$  there is an eventuality  $e$  in  $w_c$  such that for some world  $w'$  compatible with  $e$ , Jean works in  $w'$ .

Note that the eventuality quantified over by aspect is the argument of the modal's parameters (the function *Acc*), but is not the eventuality introduced by complement's verb. Put in the terms introduced above, the *CIRCUMSTANCE<sub>e</sub>* is no longer the *MODAL<sub>e</sub>*.

## 5.2 Introducing the coercion operator $\Omega$

In the informal gloss Homer gives on his analysis in (14c), *CIRCUMSTANCE<sub>e</sub>* is not temporally ordered with respect to *MODAL<sub>e</sub>*, so we don't yet get the sense that the modal has a future orientation.<sup>11</sup> But we can combine Homer's reification of the circumstance state with the Matthewson/ Kratzer account of future orientation. To accomplish this, I propose a coercion operator,  $\Omega$ , which introduces an eventuality, and relates this eventuality to the complement's eventuality. As a first pass, consider (15a), and the resulting derivation in (15c).

- (15) a.  $[[ [_{vP2}\Omega ] ] ] = \lambda e_2.\lambda P.\exists e_1[P(e_1) \ \& \ R(e_2,e_1)]$   
 b.  $[_{TP} \text{PRES } [_{AspP} \text{IMPF } [_{Mod} \text{MUST } [_{vP2} \Omega [_{vP1} \text{John go to the store } ] ] ] ] ]$   
 c.  $[[ (15b) ] ] = \exists(e_1) [t \subseteq \tau(e_2) \ \& \ t = t_u \ \& \ \forall w' \in \text{BEST}_g(e_2)(\cap f(e_2)): [\exists(e_1)[\text{John-stock-his-fridge}'(e_1) \ \& \ R(e_2,e_1)](w') = 1]$

A few words on the proposal. The new eventuality introduced by  $\Omega$ ,  $e_2$ , is a stative eventuality, understood the way Homer suggests. Intuitively, it's the state characterizing the circumstances according to which the modal is evaluated.  $\Omega$  existentially closes the event variable of the embedded verb, but it does not relate this event directly to a time, so it does not perform the function normally associated with viewpoint aspect. Moreover, it is not a function from a property of events to a property of times, which is why I've suggested that it is introduced in a vP-shell projection as opposed to an aspectual operator in *AspP*. The eventuality  $\Omega$  introduces is in turn quantified over by aspect. However, we can use the predicate  $R$  to temporally order the eventualities  $e_1$  and  $e_2$  to get the orientation right.

So far, the proposal in (15a) doesn't give us future orientation—we just have a dummy predicate  $R$  relating  $e_2$  to  $e_1$ . A simple precedence relation like  $\prec$  would be sufficient to give us future orientation, and identifying  $R$  with  $\prec$  would be the most straight-forward

<sup>10</sup>This is the same kind of adverbial evidence given for the syntactic reality of a dedicated projection for futurates. Copley (2009) offers this as evidence for the syntactic reality of a *plan* which is referred to by futurate statements. In Copley (2014), she amends the proposal slightly, such that futurates introduce a stative eventuality of their own.

<sup>11</sup>To be fair, temporal orientation is not the phenomenon Homer's paper is concerned with.

way of implementing the Matthewson/ Kratzer insight about future orientation. However, I won't be advocating identifying  $R$  with  $\prec$ . Though I won't defend the claim at length here, I think  $\prec$  is too weak a relation to relate  $e_2$  to  $e_1$ . It doesn't capture the intuition that in sentences like (2a),  $\text{CIRCUMSTANCE}_e$  calls for  $\text{MODAL}_e$ . The reason John must go to the store is because of his empty fridge and his mother's impending visit. It would be preferable, if possible, for the relation to encode the intuition that in order to comply with demand on him (2a) expresses, John's stocking his fridge must be the means by which he responds to his circumstances.<sup>12</sup>

Luckily, another idea is ready to hand which allows us to capture this intuition. In Copley 2014's causal chain analysis of futurates, she employs a coercion operator very similar to  $\Omega$ , but for futurates. In Copley's semantics for futurates,  $R$  is simply the predicate  $\text{CAUSE}$ . Insofar as  $e_2$ 's causing  $e_1$  implies that  $e_2$  precedes  $e_1$ , it gets the facts about temporal orientation right, and it also encodes the intuition that  $e_1$  is brought about by the relevant circumstances. Adopting this proposal, we can update the first pass at  $\Omega$  with (16b).

- (16) a.  $[[[_{VP2}\Omega]]] = \lambda e_2. \lambda P. \exists e_1 [P(e_1) \ \& \ \text{CAUSE}(e_2, e_1)]]$   
 b.  $[[[(15b)]]] = \exists(e_2) [t \subseteq \tau(e_2) \ \& \ t = t_u \ \& \ \forall w' \in \text{BEST}_g(e_2)(\cap f(e_2)): [\exists(e_1) [\text{John-stock-his-fridge}'(e_1) \ \& \ \text{CAUSE}(e_2, e_1)](w') = 1]]]$

The way this addresses both the OP and EIP should now be fairly obvious. According to the analysis in (16b), (2a) is predicted to be future oriented, due to the fact that  $\text{MODAL}_e$  is subsequent to  $\text{CIRCUMSTANCE}_e$  because  $\text{CAUSE}(e_1, e_2)$ . Yet,  $\text{CIRCUMSTANCE}_e$  is quantified over by aspect, and the temporal trace of the newly introduced event variable is bound by tense. So we have future orientation without sacrificing present perspective, and thereby a genuine solution to the OP. As for the EIP, there is no expectation that  $e_1$  is the same event as  $e_2$ , whether identified across possible worlds or not. However, the relation between  $e_1$  and  $e_2$  makes it appropriate to see one as the circumstances relative to which the necessity of the other is evaluated.

Finally, I will address a loose end for this proposal. Upon introducing  $\Omega$ , I said that it was a coercion operator, but I neglected to say what triggers the operator, or what grammatical circumstances call for the coercion. Homer's account, it is worth noting, does not involve coercion; he claims that root modals always introduce their own event variable. In construing  $\Omega$  as an operator introduced by coercion, I don't assume that root modals *always* introduce a new event argument. Part of the reason for this is that not all English root modals are future oriented; their perspective does not always differ from their orientation. Complements with stative predicates, like those in (17), can have present perspective and present orientation, and do not give rise to OP or EIP.

- (17) a. There should to be world peace.  
 b. Milton, you should be alive at this hour! (paraphrased from Wordsworth)

<sup>12</sup>Though I lack the space to pursue the parallel here, the intuition recalls a debate pursued by a number of philosophers and deontic logicians who describe the difference between so-called "deliberative" and "evaluative" *oughts*. Cf. Harman 1973, Geach 1982 and more recently, Schroeder 2011, Chrisman 2015.

Instead, what seems to trigger the future orientation, and the ensuing need for  $\Omega$ , is a complement with an eventive predicate, echoing the kind of Aktionsart effect pointed out in (Condoravdi 2002). The coercion proposal then integrates the kind of aspectual sensitivity that Condoravdi builds directly into the lexical meaning of modals. My idea, instead, is that root modals themselves do not affect the underlying aktionsart of the eventuality they anchor to. So, *were* the modal to project from the complement's event variable, as in (2d), the eventuality thus described would still be eventive (since it is a fridge-stocking event). However, as pointed out by Bohnemeyer and Swift 2004, eventive predicates trigger default perfective readings in English. Eventive prejacent without  $\Omega$  would therefore trigger **PFV**, instead of **IMPF**. Of course, the **PFV + PRES** configuration is ruled out, since an event cannot be included in the utterance time.  $\Omega$  therefore introduces a stative eventuality, and being stative, allows the expression to compose with **IMPF**. In a nutshell,  $\Omega$  is triggered by the eventive predicate in the complement, so that the expression may compose with **IMPF** as opposed to **PFV**.

In conclusion, maintaining an event-relative semantics for modals would require root modals with eventive predicates to introduce a new eventuality. I've proposed just such an account by means of the coercion operator  $\Omega$ , which maintains the essential ingredients of Hacquard's event-relative semantics.

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