

## Actuality Entailments\*

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The term ‘actuality entailment’ was coined by Rajesh Bhatt in his 1999 dissertation to describe the **implicative** inference that arises when **ability modals** combine with **perfective aspect**. This article investigates the nature of this inference and the contributions of aspect and modality, by surveying the environments in which it is found. Prior to Bhatt’s dissertation, the literatures on aspect and modality were largely independent of each other. While some investigated whether certain aspects involve a modal component, very little work examined the *interaction* of distinct aspectual and modal operators. As actuality entailments question core assumptions about aspect and modality, their investigation has led to a fruitful reassessment and better understanding of both.

### 1. The basic problem: when possibilities become reality

Consider the following sentence:

- (1) John is able to lift a fridge.

One might infer from hearing (1) that John actually lifted a fridge. Indeed, the most natural way for the speaker to be in a position to attribute this ability to John is to have seen him lift a fridge. However, (1) could be uttered truthfully if John never did lift a fridge. By knowing something about his strength, the speaker may confidently attribute to John such an ability, even if it was never instantiated.

Now consider (2):

- (2) At the World’s Strongest Man contest last year, John was able to lift a fridge.

The implication that John lifted a fridge seems even stronger: surely, a World Strongest Man contest involves some actual lifting. Yet, (3) shows that the implication can still be canceled:

- (3) At the World’s Strongest Man contest last year, John was able to lift a fridge, but he didn’t, because he was afraid to hurt his back.

This seems to suggest that the actuality implication is not an *entailment* of (2), but a mere pragmatic implication, which might arise when an ability attribution is tied to a short time interval (such as the duration of a contest): we infer from the speaker ascribing such a specific ability to such a short time period that it must have been instantiated during that time.

Bhatt (1999) shows, however, that the picture is more complicated and muddled by English morphology. The sentence ‘*John was able to lift a fridge*’ is in fact ambiguous, as English does not overtly distinguish *viewpoint aspect*. In languages like French or Hindi which do, however, aspect correlates with whether the modal’s complement has to be actualized. With *imperfective* aspect on the modal, the ability need not have been actualized. But it does with

*perfective* aspect: the continuation that Jean did not lift the fridge comes out as a **contradiction** in (4b) but not (4a):<sup>2</sup>

- (4) a. Jean **pouvait** soulever un frigo, mais il ne l'a pas soulevé. (French)  
 Jean could-**IMPF** lift a fridge, but he NE it-has not lifted  
*Jean could lift a fridge, but he didn't lift it.*
- b. Jean **a pu** soulever un frigo, #mais il ne l'a pas soulevé.  
 Jean has could(**PFV**) lift a fridge, but he NE it-has not lifted  
*Jean could lift a fridge, #but he didn't lift it.*

A morphological note before we proceed: past perfective in French is expressed by the *passé composé*, which consists of an auxiliary and past participle. This form is also used to express present perfect, which will become important in section 2.3.

The same English sentence in (2) is used for both the past perfective and past imperfective French sentences in (4). The adverbial *at the World's Strongest Man contest* favors the former interpretation, which yields an actuality entailment. However, the latter interpretation is also possible, and is responsible for the non contradictory reading of (3).

The contradiction in (4b) indicates that the sentence somehow entails the actualization of the complement. Further support comes from Homer's (2009) presupposition test: sentences with ability modals and *perfective* can satisfy presuppositions triggered by *aussi* ('too') that require the existence of an actual event, as in (5a). With *imperfective*, the presupposition is not supported (5b):

- (5) a. Olga a pu soulever un frigo, et Marie<sub>F</sub> **aussi** en a soulevé un.  
 Olga has could(**PFV**) lift a fridge and Marie **too** of-it has lifted one  
*Olga could lift a fridge, and Marie<sub>F</sub> **lifted one too**.*
- b. Olga pouvait soulever un frigo, #et Marie<sub>F</sub> **aussi** en a soulevé un.  
 Olga could(**IMPF**) lift a fridge and Marie **too** of-it has lifted one  
*Olga could lift a fridge, #and Marie<sub>F</sub> **lifted one too**.*

Thus, perfective on an ability modal yields what Bhatt calls an '**actuality entailment**': an uncancelable inference that the complement was actualized. To appreciate the theoretical importance of actuality entailments, we need to understand why they are unexpected, under standard assumptions about aspect and modality (SEE ALSO: MODAL-TEMPORAL INTERACTIONS).

*Modality* is the category of meaning that deals in possibilities beyond the here and now: modals allow us to talk about possible states of affairs that may never be realized. Actuality entailments are puzzling in that they seem to eradicate the 'modality' of a modal expression, to wit, its *raison d'être*.

Bhatt (1999) first discovered actuality entailments with ability modals. Hacquard (2006) and Borgonovo & Cummins (2007) further showed that they occur with all 'root' (i.e., non epistemic) modals, including deontics (i.e., obligations and permissions) and teleologicals (i.e., possibilities and necessities given certain goals). The examples in (6) and (7), which feature teleological interpretations of *pouvoir* and *devoir*, illustrate this:

- (6) a. Jean **pouvait** prendre le train pour aller à Paris, mais il ne l'a pas pris.  
 Jean could-**IMPF** take the train to go to Paris, but he NE it-has not take  
*Jean could take the train to go to Paris, but he didn't take it.*
- b. Jean **a pu** prendre le train pour aller à Paris, #mais il ne l'a pas pris.  
 Jean has could(**PFV**) take the train to go to Paris but he NE it-has not take  
*Jean could take the train to go to Paris, #but he didn't take it.*
- (7) a. Jean **devait** prendre le train pour aller à Paris, mais il ne l'a pas pris.  
 Jean must-**IMPF** take the train to go to Paris but he NE it-has not take  
*Jean had to take the train to go to Paris, but he didn't take it.*
- b. Jean **a dû** prendre le train pour aller à Paris, #mais il ne l'a pas pris.  
 Jean has must(**PFV**) take the train to go to Paris but he NE it-has not take  
*Jean had to take the train to go to Paris, #but he didn't take it.*

However, not all modal flavors trigger actuality entailments: *epistemic* modals (SEE ALSO: EPISTEMIC MODALITY), which describe possibilities and necessities given a body of evidence, do not. No actuality entailment arises with perfective on French *pouvoir* when it expresses epistemic possibility:

- (8) Jean a (bien) **pu** partir, mais il est aussi possible qu'il soit resté.  
 Jean has (well) could(**PFV**) leave but it is also possible that-he is-SUBJ stayed  
*Jean may well have left, but it's also possible that he stayed.*

To sum up, actuality entailments are unexpected from a modality standpoint, given that a modal's very function is to express possibilities that go beyond the actual. To add to the mystery, they arise only with some, but not all modals.

There are also unexpected from an *aspect* standpoint. The main role of aspect is to locate events in time. *Perfective* locates the running time of an event *within* a reference time; *imperfective* locates it as *surrounding* the reference time. The following lexical entries are based on Kratzer (1998). As we will see, the semantics of the imperfective may be more complicated (SEE ALSO: IMPERFECTIVITY):

- (9) a.  $[[\textit{Perfective}]]^{\text{w,g,c}} = \lambda P_{<\text{vt}>}\lambda t_i. \exists e[\tau(e) \subseteq t \ \& \ P(e)]$   
 b.  $[[\textit{Imperfective}]]^{\text{w,g,c}} = \lambda P_{<\text{vt}>}\lambda t_i. \exists e[\tau(e) \supseteq t \ \& \ P(e)]$

In the sentences below, Jean's reading of the book surrounds the reference time (yesterday afternoon) with imperfective (10a), but it is contained within that reference time with perfective (10b). Hence (10b), unlike (10a), entails that Jean finished the book yesterday afternoon.

- (10) a. Hier après-midi, Jean **lisait** un livre.  
 Yesterday afternoon Jean read-**IMPF** a book  
*Yesterday afternoon, Jean was reading a book.*
- b. Hier après-midi, Jean **a lu** un livre.  
 Yesterday afternoon Jean has read(**PFV**) a book  
*Yesterday afternoon, Jean read a book.*

*Read a book* is telic: it describes an event as having an end point. Given that perfective requires that the running time of the entire event (including its culmination) be located within the reference time, we obtain that the entire book was read yesterday afternoon. No such implication occurs with imperfective, since it only requires overlap with the reference time.

What happens when the eventuality that aspect combines with is an ability? If abilities are states (as argued by Hackl 1998 and Homer 2009), they shouldn't have natural boundaries. Combining perfective with a state may thus require coercion to transform the state into a 'bounded eventuality' (cf. section 2.2). Whether states require coercion or combine directly with perfective, the result should be that the ability is contained within, and thus does not extend beyond, the reference time. This is what happens when perfective combines with other states, such as a state of being beautiful:

- (11) Marie a été belle.  
 Marie has been(PFV) beautiful  
*Marie was beautiful*

(11) implicates that Mary is no longer beautiful. If abilities are states, we thus expect that the ability doesn't extend beyond the reference time. But this alone doesn't guarantee an *actualization* of the ability. It should merely require that the ability doesn't continue in time.

Interestingly, this is what happens when perfective appears in sentences containing *nouns* that express abilities, such as *capacité* ('capacity') or *possibilité* ('possibility'). (12) suggests that Jean no longer has the possibility to lift a fridge. However, it doesn't require that Jean *actually* lifted it. Why, then, does perfective on a root modal *auxiliary* trigger an actuality entailment, and not a mere cessation implication?

- (12) Jean a eu la possibilité de soulever un frigo mais il ne l'a pas soulevé  
 Jean has had(PFV) the possibility to lift a fridge but he NE it-has not lifted  
*Jean had the {capacity/possibility} to lift a fridge, but he didn't lift it*

The contrast between (4b) and (12) suggests that actuality entailments are not only contingent on the type of modality and aspect, but that they are somehow linked to the **lexical status** of the modal expression: they occur with modal auxiliaries, but not necessarily with nominals that express similar meanings.

To sum up, actuality entailments require a few crucial ingredients. They arise with certain **types of modals** (ability and other roots) but not others (epistemics). They require a particular **aspect** (perfective). Finally, the **lexical status** of the modal expression also seems to matter. Various accounts of actuality entailments have been put forward, with different emphasis on each of these ingredients: *type of modality* (is there something special about ability and root modality more generally?); *aspect* (what are the semantics of perfective and imperfective aspects, and how do various aspects combine with various types of predicates?); *lexical status* (what does the grammatical status of various modal expressions contribute?). Section 2 goes over these various proposals. We devote more time to those accounts that are more fully developed, as representatives of different approaches (Bhatt 1999 ties actuality entailments primarily to the semantics of ability modals; Hacquard 2006, to modals' grammatical status; Homer 2009 to the

semantics of perfective aspect). We however mention a few interesting alternatives along the way. Section 3 briefly turns to actuality-entailment-like behavior beyond modal auxiliaries.

## 2. Accounting for actuality entailments

If the actuality implication is uncancelable, it should be part of the truth-conditional content of a sentence like (4b). But how? Is the actualization encoded directly in the semantics of the modal (and if so, what remains of its modality), or is it a side product of combining the modal with perfective? And is the implication truly uncancelable?

### 2.1. Bhatt (1999): Ability modals are implicative predicates

Consider the following scenario from Thalberg (1969), where a character named Brown fires hundreds of rounds at a shooting gallery, and somehow manages to hit three bulls-eyes in a row. In such a scenario, we would be reluctant to attribute to Brown the ‘ability’ to hit three bulls-eyes in row. Yet, we can report his feat with an ability modal:

(13) Brown was able to hit three bulls-eyes in a row.

What meaning does *able* contribute in such a scenario, if not ability? It doesn’t seem to be completely vacuous, when we compare (13) to its unmodalized counterpart below:

(14) Brown hit three bulls-eyes in a row.

With (13), we get a sense that hitting three bulls-eyes was somehow effortful. This meaning component can be seen more vividly when the complement describes a trivial task: Bhatt (1999) points out that the sentence ‘*Tim is able to breathe*’ seems odd, unless breathing requires effort, as if, for instance, Tim was involved in an accident.

Now, imagine a variant of Thalberg’s scenario, where Brown is a robot designed to hit bulls-eyes with perfect accuracy. Brown hasn’t left the factory yet, and has never fired a single round. Yet we know that it would undoubtedly hit three bulls-eyes in a row, were it put to use. We can report this ability with (15):

(15) Brown is able to hit three bulls-eyes in a row.

With (13) and (15), we see that ability modals can be used in two very different ways. In the first scenario, the meaning of *able* seems equivalent to the implicative predicate *manage*: the action did happen, and it wasn’t trivial, but we’re reluctant to talk about a genuine ‘ability’. The second scenario, on the other hand, seems to report a genuine ability, even if it was never instantiated: Brown should successfully hit bulls-eyes whenever the right conditions are met. How are these two senses of ability related, if at all?

One possibility is that they are ontologically distinct, and reported by two semantically distinct *ables*, which happen to overlap in form: a general ability *able*, and an implicative *able*. Just as in Karttunen & Peters’ (1979) analysis of the implicative predicate *manage*, implicative *able* would entail the realization of its complement, and further presuppose (or conventionally implicate) that it was effortful. Implicative *able* would straightforwardly yield actuality entailments, as the realization of the complement would be directly asserted:

(16)  $[[able_{imp}]]^w = \lambda P_{\langle et \rangle} \lambda x_e$ . defined iff x doing P in w takes effort. x does P in w

General ability *able* would have a modal semantics, as in (17), and only require that the complement clause hold in ideal worlds in which the subject gets to exercise their abilities:

(17)  $[[able_{abil}]]^w = \lambda P_{\langle et \rangle} \lambda x_e$ . In all ideal  $w'$  where x uses x's abilities in w, x does P in  $w'$

Such an ambiguity account easily derives all of the right readings. But it is unsatisfying in several ways. First, why should the two types of 'ability' be realized by the same predicate in English, French, or Hindi, if they are unrelated?<sup>1</sup> Second, why should aspect matter? Why should perfective only combine with implicative *able*?

Bhatt (1999) proposes an account that derives the two types of abilities from a single predicate *able*. Looking at the lexical entries in (16) and (17), we see that (17) contains (16) (modulo the presupposition). Bhatt's proposal avoids an ambiguity analysis by assuming that *able* is never modal, but implicative, and that the modal meaning involved with general ability is contributed by a separate modal operator, which is independently associated with the imperfective and scopes over *able*.

In Bhatt's analysis, *able* is at-base implicative, with a lexical entry like that in (16). This meaning shines through with perfective. Under this view, (13) has the LF in (18a); it asserts that the complement occurred in the actual world, and presupposes that the deed was effortful. No 'general' ability is required: the truth conditions in (18b) do not require any kind of repeatability.

- (18) a. [Past [Able [Brown hits three bulls-eyes in a row ] ] ]  
 b.  $[[a)]^w =$  defined iff Brown put effort into hitting three bulls-eyes in a row. If defined, true iff Brown hit three bulls-eyes in a row in w.

To derive non implicative readings, Bhatt argues for an additional modal, a **generic operator (Gen)**, which quantifies over ideal test situations,<sup>2</sup> and does not require verifying instances (SEE ALSO: GENERICS). This operator is associated with imperfective aspect.<sup>3</sup> In English, genericity can be expressed by the simple present. (19) doesn't require that its complement be instantiated. It can be true if the machine has never been used:

(19) This machine crushes up oranges and removes the seeds. Carlson & Pelletier (1995)

This Gen allows us to derive the right meaning for a sentence like (15). As it is in the simple present, we assume that it involves Gen. We can further assume that the 'effort' presupposition gets accommodated into the restriction of Gen (Schubert & Pelletier 1989):

- (20) a. [ Present [ Gen [Able [Brown hits three bulls-eyes in a row ] ] ] ]  
 b.  $[[20a)]^w =$  true iff in all ideal test situations accessible from w where Brown puts effort into hitting bulls-eyes, Brown hits three bulls-eyes in a row.

This ability need not be *instantiated*: the situation in the actual world may not be an ideal test case. These truth conditions, however, do require some repeatability: the feat cannot be a fluke,

since it is supposed to occur every time the appropriate conditions are met. Gen is involved in the non-implicative reading of (13), but under a past tense, yielding a past ability.

Bhatt's account is appealing in two respects: first it derives the two meanings of *able* without having to postulate ambiguity. Second, it explains the connection between aspect and actuality entailments: In English, present tense is associated with genericity, and present tense ability attributions never require verifying instances. In languages like French or Hindi, which distinguish aspect morphologically in the past (unlike English, where the simple past is used for both), *imperfective* is the aspect associated with genericity. *Perfective* is not: hence, perfective on an ability modal is always implicative.

Bhatt's account however faces two short-comings. First, it leads us to expect that imperfective on a truly implicative predicate like *manage* should also allow non-implicative readings, contrary to fact: '*Brown manages to hit three bulls-eyes in a row*' seems to require that Brown habitually hits three bulls-eyes in a row. Lawler (1973) and Dahl (1975) argue for two types of generic operators: a *universal* one, which requires verifying instances, and a *dispositional* one, which doesn't. Bhatt speculates that ability modals combine with the latter, but implicative *manage* does not, for reasons that remain to be explored. Another limitation of Bhatt's account is that it stipulates a non-modal, implicative semantics for *able*. This proposal loses some of its appeal when we see the same pattern occurs with other modals.

## 2.2. Actuality entailments and root modality

As we saw in the introduction, actuality entailments are not limited to ability modals, but extend to teleologicals and deontics. They do not, however, occur with epistemics. What makes this particularly puzzling is that this pattern holds even when the same modal words are used to express these various flavors of modality. French *pouvoir* and *devoir* can express both root and epistemic possibilities and necessities. With root interpretations, they yield actuality entailments; with epistemic interpretations, they do not. This is illustrated in (21). The same string of words is ambiguous between an ability (a) and an epistemic possibility (b). The former describes a past, actualized ability; the latter a current epistemic possibility about a past state of affairs, which may or may not have been actualized.

- (21) Jean a pu retrouver Marie.  
Jean has could(PFV) find Marie  
a. Ability: *Jean was able to find Marie (#but it's possible he didn't).*  
b. Epistemic: *Jean may have found Marie (but it's possible he didn't).*

Before we turn to accounts aimed at deriving actuality entailments with roots, and preventing them with epistemics, we need to briefly consider our standard semantic analysis of modality. In her seminal work on modality (Kratzer 1981, 1991), Kratzer proposes that modals such as *pouvoir* and *devoir* come in single lexical entries: they are, respectively, existential and universal quantifiers over worlds. The set of worlds that the modals quantify over depends on the context: in contexts where John's abilities are discussed, they are worlds compatible with his abilities and circumstances; in contexts in which interlocutors discuss possibilities given a body of evidence, they are worlds compatible with the evidence.

Formally, in a Kratzerian framework, modals are lexically specified for *force* (existential or universal), but their *domain* of quantification is determined by context, via *modal bases* and *ordering sources*. Both modal bases and ordering sources are functions from worlds to sets of

propositions: propositions that denote relevant *facts* for the modal base, and *ideals* for the ordering source. The modal base  $f$  determines a set of worlds compatible with all of the relevant facts; the ordering source  $g$  imposes an ordering on these worlds. Modals quantify over the ‘best’ worlds of the modal base, given the ideal determined by the ordering source (SEE ALSO: GRADED MODALITY; WEAK NECESSITY):

- (22) a.  $[[can]]^{w,f,g} = \lambda p_{\langle st \rangle}. \exists w' \in \text{Best}_{g(w)}(\cap f(w)): p(w')=1$   
 b.  $[[must]]^{w,f,g} = \lambda p_{\langle st \rangle}. \forall w' \in \text{Best}_{g(w)}(\cap f(w)): p(w')=1$

The fundamental difference between roots and epistemics is in the modal base. An *epistemic* modal base determines a set of worlds compatible with a body of knowledge, and gives rise to an epistemic flavor. A *circumstantial* modal base determines a set of worlds compatible with certain circumstances: this is the modal base underlying all root modals. Differences in root modal flavors result from different ordering sources: deontic, bouletic, teleological, etc.

One advantage of a Kratzerian account is that it can explain why the same words are used to express various flavors of modality in unrelated languages. All else equal, we would like to preserve such a unified account. However, if we extend Bhatt’s account of actuality entailments to all root modals, we would have to treat all root meanings as implicative, and all epistemic meanings as modal, and we would have to stipulate the same lexical ambiguity across these languages. The next three proposals aim at keeping a unified treatment of modals, while still deriving actuality entailments for root, but not epistemic flavors.

### 2.2.1. Borgonovo & Cummins (2007): trivializing the modal

Borgonovo & Cummins (2007) assume that root and epistemic modals share a Kratzerian semantics, but scope in two different positions: epistemics scope above tense and aspect, roots scope below. The reason epistemics are immune to actuality entailments is that they outscope aspect (in such a configuration, tense and aspect are interpreted below the modal, despite appearing morphologically on the modal).

Borgonovo & Cummins assume that perfective “constraints the period in which the event under evaluation can be located”. The domain of quantification of the modal is narrowed down to the point where only one world remains: the world of evaluation. This results in a ‘totally realistic’ modal base (Kratzer 1991), i.e., a modal base which only picks out the world of evaluation, and essentially trivializes the modal, leading to an actuality entailment. In (23) and (24), the only world quantified over is the actual world,  $w_0$ , and hence (23) and (24) are equivalent. We obtain an *actual* bulls-eye for both, just as with unmodalized (25):

- (23) Brown a pu tirer dans le mille.  
 Brown has could(PFV) pull in the thousand  
*Brown was able hit a bulls-eye.*  
*In some world  $w$  compatible with all of the facts of  $w_0$  [ $=w_0$ ], Brown hit a bulls-eye in  $w$*

- (24) Brown a dû tirer dans le mille.  
 Brown has must(PFV) pull in the thousand  
*Brown had to hit a bulls-eye.*  
*In all worlds  $w$  compatible with all of the facts of  $w_0$  [ $=w_0$ ], Brown hit a bulls-eye in  $w$*

- (25) Brown a tiré dans le mille.  
 Brown has pulled(PFV) in the thousand  
*Brown hit a bulls-eye*  
*Brown hit a bulls-eye in  $w_0$*

While this derives actuality entailments, it is not obvious how perfective aspect results in the selection of a totally realistic modal base. Even if perfective narrows down the *time* in which the event happens, why should this temporal narrowing trigger a narrowing of worlds?

In a similar vein, Piñón (2003) proposes a scopal account of actuality entailments with English *able*, where the implicative and non implicative readings arise from scopal differences between a possibility modal and a past tense. When the modal scopes below tense, it receives a general ability meaning. The implicative meaning arises when a past tense scopes *under* the modal. This scopal configuration yields a ‘historical’ possibility, where the modality is trivialized, given the determinacy of the past. Since the past is fully determined, there is only one historically possible world. Thus, if it is *historically possible* that *past p*, then it has to be the case that *past p*. One shortcoming of this proposal is that it is unclear what role aspect plays in triggering actuality entailments: why should perfective trigger wide scope of the modal with respect to tense, and imperfective narrow scope?

### 2.2.2. Hacquard (2006, 2009): Outscoping the modal

In Hacquard (2006, 2009), the imperviousness of epistemics to actuality entailments is also linked to scope, with epistemics scoping above tense and aspect, and roots below. (23), with root *pouvoir*, has the LF in (26):

- (26) [TP Past [AspectP Perfective [ModP can [VP Brown hit a bulls-eye] ] ] ]

The modal base for root modals remains circumstantial (as in the Kratzerian view, and *contra* Borgonovo and Cummins 2007, where the modal base is totally realistic). Actuality entailments result from having aspect quantify over the VP event across the modal. Hacquard argues that aspect not only locates the event in time, but in a world as well. By having aspect outscope the modal, aspect locates the VP event in the actual world.

More formally, Hacquard (2009) proposes that root modals, such as *can* in (27a), combine with predicates of events, rather than propositions (and hence appear right above VP). The lexical entry for perfective in (27b) is modified from Kratzer (1998), so as to encode world anchoring. Perfective aspect has a world argument,  $w$ , that needs to be satisfied. When there is no modal in a position available to bind that world argument, the actual world,  $w_0$ , binds it, locating the event in the actual world. Tenses are treated as indexical pronouns, as in (27c). We derive the truth conditions in (27d) for (26):

- (27) a.  $[[can]]^{w,f,g,c} = \lambda P_{\langle s,vt \rangle} . \lambda e_v . \exists w' \in \text{Best}_{g(w)}(\cap f(w)) : P(e)(w')$   
 b.  $[[Perf]]^{w,f,g,c} = \lambda P_{\langle vt \rangle} \lambda t_i . \exists e[e \text{ in } w \ \& \ \tau(e) \subseteq t \ \& \ P(e)]$   
 c.  $[[past]]^{w,f,g,c} = \text{defined iff } c \text{ provides time } t < t_c . \text{ if defined } = t$   
 d.  $[[ (26) ] ]^{w,f,g,c} = \text{defined iff } c \text{ provides time } t < t_c . \text{ if defined, true iff}$   
 $\exists e[e \text{ in } w \ \& \ \tau(e) \subseteq t \ \& \ \exists w' \in \text{Best}_{g(w)}(\cap f(w)) : B\_hit\_bulls\text{-}eye(e)(w')]$   
*There is a past event  $e$  in  $w_0$ , s.t. in some world  $w$  compatible with the circumstances in  $w_0$ ,  $e$  is an event of Brown hitting a bulls-eye.*

We obtain an actual event, which in some world compatible with the circumstances is an event of Brown hitting a bulls-eye. This, by itself, doesn't guarantee an *actual* bulls-eye, but only an actual event which in some circumstantially accessible world is a bulls-eye. To ensure that the event is a bulls-eye in the actual world, Hacquard proposes a default principle (*Preservation of Event Description across worlds, PED*), according to which speakers assume that the same event has the same description in all the worlds in which it occurs. To describe a failed attempt (e.g., an event which is a bulls-eye in worlds in which the attempt succeeds, but not in the actual world), speakers must signal the mismatch in event descriptions with some morphological marking of counterfactuality (e.g., *conditionnel* mood in French):

- (28) Brown aurait pu tirer dans le mille, mais il a raté.  
 Brown has-COND could pull in the thousand but he has missed.  
*Brown could have hit a bulls-eye, but he missed*

To avoid actuality entailments with imperfective, Hacquard follows Bhatt in assuming that imperfective involves an additional layer of modality, e.g., a generic operator. The VP event need not occur in the actual world, but only in 'generic' worlds (the generic operator is borrowed from Lenci & Bertinetto 2000 and provides both world and event quantification).

- (29) a. Brown pouvait tirer dans le mille.  
 Brown could-IMPF pull in the thousand  
*Brown could hit a bulls-eye.*  
 b. [TP Past [AspectP Imperfective [ModP can [VP Brown hit a bulls-eye] ] ] ]  
 c. [[(29b)]]<sup>w,f,g,c</sup> = defined if c provides time  $t < t_c$ . If defined, true iff  
 $\forall w' \in \text{GEN}(w): \forall e[\mathbf{e \text{ in } w'} \ \& \ \tau(e) \approx t \ \& \ \exists w'' \in \text{Best}_{g(w)}(\cap f(w)): \text{B\_hit\_bulls-eye}(e)(w'')]$   
*In all ideal test  $w'$  accessible from  $w_0$ , all past events  $e$  of Brown shooting in  $w'$  are such that in some  $w''$  compatible with the circumstances in  $w'$ ,  $e$  are events of Brown hitting bulls-eyes*

These truth conditions guarantee bulls-eyes, but only in ideal test worlds, which the actual world may not be.

This account thus derives actuality entailments with perfective on a root modal, and prevents them with imperfective. What about with epistemics? Hacquard assumes (following Cinque 1999, Stowell 2004, a.o.), that epistemics, unlike roots, scope above tense (and hence above aspect). This means that with an epistemic, the VP event is bound by the epistemic, and the VP event only need to occur in the epistemic worlds, not necessarily the actual world:

- (30) a. Brown a pu tirer dans le mille.  
 Brown has could(PFV) pull in the thousand  
*Brown may have hit a bulls-eye.*  
 b. [ModP can [TP Past [AspectP Perfective [VP Brown hit a bulls-eye] ] ] ]  
 c. [[(30b)]]<sup>w,f,g,c</sup> = true iff  $\exists w' \in \text{Best}_{g(w)}(\cap f(w)): \exists e[\mathbf{e \text{ in } w'} \ \& \ \tau(e) \approx t \ \& \ \text{B\_hit\_bulls-eye}(e)(w')]$

*In some world  $w'$  compatible with the evidence in  $w_0$ , there is a past event  $e$  of Brown hitting a bulls-eye.*

Under Hacquard's account, unlike for Bhatt's, ability and root modals are at base modal, not implicative. Recall that actuality entailments with ability modals not only force an actual instantiation, but further require that the ability was not trivial. In Bhatt's account, this meaning component was taken to be a conventional implicature associated with *able*. Under Hacquard's account, non-triviality arises from a scalar implicature: (23) describes an *actualized* possibility, but a mere *possibility* nonetheless: by contrasting (23) to the stronger alternative in (24), the hearer infers that the outcome could have been different, i.e., that not in all worlds compatible with Brown's circumstances does he hit bulls-eyes.

Hacquard's account ultimately ties actuality entailments to the grammatical status of the modal expression. Recall that while perfective on a root modal yields actuality entailments, perfective with nouns that express similar notions doesn't, as in (12) and (31a) below. What forces an actual event with modal auxiliaries is the fact that the aspect that quantifies over the VP event outscopes the modal. This is possible because the modal auxiliary and the VP are in the same clause: there is just one layer of tense and aspect. With lexical predicates like *possibility*, on the other hand, the clausal complement to the noun forms a separate clause, with its own aspectual quantification. This configuration does not force actuality entailments:

- (31) a. Brown a eu la possibilité de tirer dans le mille, mais il ne l'a pas fait.  
 Brown has had(PFV) the possibility to pull in the thousand but he NE it-has not do  
*Brown had the possibility to hit a bulls-eye, but he didn't do it.*
- b. [<sub>CP</sub> Past Asp<sub>1</sub> Brown has-possibility [<sub>CP</sub> Asp<sub>2</sub> Brown -hit-bulls-eye ] ]
- c. [[(29b)]]<sup>w,f,g,c</sup> = defined if  $c$  provides time  $t < t_c$ . If defined, true iff  
 $\exists e_1$  in  $w$  &  $\tau(e_1) \subseteq t$  & possibility'(e<sub>1</sub>,w) &  $\exists w' \in \text{Best}_{g(w)}(\cap f(w))$ :  
 $\exists e_2$  in  $w'$  &  $\tau(e_2) \subseteq t$  & B-hit-bulls-eye (e<sub>2</sub>,w')  
*There was a past possibility for Brown in  $w_0$  such that in some world  $w'$  compatible with the circumstances in  $w_0$  there was an event  $e$  of Brown hitting a bulls-eye.*

Hacquard's account however faces various shortcomings. First, as in Bhatt's, it leaves unexplained why imperfective on an implicative predicate like *manage* doesn't prevent actuality entailments. This difference may be tied to the lexical status of *manage* vs. modals, but in ways that need to be worked out. The second shortcoming concerns the somewhat stipulative nature of PED, the principle required to guarantee that the actual event have the right description. Finally, this account, just like Bhatt's and Borgonovo & Cummins', forces an actual event with perfective. However, we will see in section 2.3 that such accounts may be too powerful.

### 2.2.3. Kratzer (2011): Root modality and counterparts

A key aspect of actuality entailments is that we need the same event to occur in different worlds: the actual world and the modal worlds. An important debate in the philosophy literature concerns the nature of such cross-world identity. Can the *same* individual or event occur in different worlds, or do they only occur in a single world, but have '*counterparts*' in other worlds, as argued by Lewis (e.g., Lewis 1968)? Take the counterfactual '*Mary could have been taller*': is there a counterfactual world in which the individual Mary is still Mary herself, but with a

different height? Or does Mary have a *counterpart* that lives in this counterfactual world, which is just like Mary, except for her height? Hacquard assumes the former, but Kratzer follows Lewis in assuming the latter, and exploits counterparts to derive actuality entailments.

For Kratzer (2011), actuality entailments arise whenever an individual and her circumstances match exactly that of her counterpart's, and the actualized event is already part of these circumstances (to match exactly, they must share all of their "intrinsic" properties). This proposal relies on the determinacy of the past, and in that sense is reminiscent of Piñón (2003).

Building on Arregui (2005), Kratzer (2011) provides an account of circumstantial modality, in which the domain of circumstantial modals is partially determined via counterpart relations of the individuals involved in the VP event. Root modals still involve a circumstantial modal base, but unsuitable worlds are pruned out through the counterpart relation. Kratzer further proposes that circumstantial modals need to be anchored to an individual (often the subject), via a semantic EPP feature. The modal ends up quantifying over worlds that have a counterpart of that argument, at the time provided by tense (strictly speaking, modal alternatives are no longer just worlds, but pairs of individuals and time slides of worlds; ' $f(\langle x, t \rangle)$ ' is the set of individual-time-slide pairs that are counterparts of  $\langle x, t \rangle$ ):

$$(32) \quad [[\text{can}]] = \lambda R. \lambda x. \lambda t. \exists x' \exists t' [\langle x', t' \rangle \in f(\langle x, t \rangle) \ \& \ R(x')(t')]$$

A crucial difference between Kratzer's LFs (as in (33b)) and those of previous accounts is that root modals scope *between* tense and aspect. There are two kinds of aspects that can appear in the infinitival complement: *prospective* (which locates the event in some future time interval, and is responsible for the future-orientation often associated with root modals; Matthewson 2011); and *perfective*, which locates the event within the reference time, and gives rise to actuality entailments, by forcing the event to already be part of the circumstances which match exactly those of the world of evaluation:

- (33) a. Brown a pu turer dans le mille.  
 Brown has could(PFV) pull in the thousand  
*Brown was able to hit a bulls-eye*
- b. [ Past [ Brown can [ Perfective [ hit a bulls-eye ] ] ] ]
- c. *There is a counterpart of Brown, who lives in a world very much like ours, whose circumstances at t match exactly those of Brown at t, and who hit a bulls-eye at t.*

In (33), the modal describes a counterpart of Brown and his circumstances at the relevant past time interval. Given that these circumstances have to match exactly those of the actual world up to that past time interval, and that these circumstances already include a bulls-eye (thanks to perfective), we infer an actual bulls-eye. If *prospective* were to replace *perfective*, however, the event of hitting a bulls-eye would not have to be included in the matched time stretch. This prevents actuality entailments.

The *type* of modality here plays a crucial role, since actuality entailments are a consequence of a counterpart-based modality, which is tied to root, but not epistemic meanings. There are two advantages to this account. First, the appeal to counterparts better motivates why the event in the actual world and the circumstantial world share the same event description than Hacquard's PED. Second, unlike in Borgonovo & Cummins' and Hacquard's accounts, there is no need to appeal to structural differences between root vs. epistemic modality to explain why

actuality entailments only occur with the former. It is, however, not entirely clear how to capture the role that the *lexical status* of the modal element plays in triggering or avoiding actuality entailments, if we assume that root modality always involves counterparts of a modal's argument. It might be possible to appeal to more structure in the case of modal nouns like *possibility*, or to assume that the selection of the modal's anchoring argument works differently for auxiliaries than for nouns.

#### 2.2.4. Portner (2009): Root modality and performativity

Portner (2009) proposes that in addition to their ordinary truth conditional contributions as quantifiers over possible worlds, modals are conventionally associated with a performative dimension. For instance, deontic modal claims (e.g., *John must bathe*) pair an assertion describing an obligation (*John has an obligation to bathe*) with an additional command (*Make sure John bathes!*). For root modals, Portner proposes that the additional speech act is an assertion of the proposition expressed by the complement itself, resulting in an actuality entailment. Thus the sentence *Brown was able to hit a bulls-eye* asserts both that Brown had the ability to hit a bulls-eye and that Brown hit a bulls-eye. Such an approach faces a few shortcomings: first, why should aspect matter, such that perfective is associated with this additional assertion, but not imperfective? Second, why should ability modals (vs. epistemics) be associated with this additional assertion? Third, as Portner himself points out, embedded instances of 'was able to' are no less implicative than matrix ones, which is unexpected if actuality entailments are a performative phenomenon.

### 2.3. The role of aspect: Bounded possibilities

We have been assuming so far that perfective on a root modal always yields actuality entailments. However, Mari & Martin (2007) and Homer (2009) provide counterexamples, ((34a) and (34b) respectively) involving various temporal adverbials:

- (34) a. Notre nouveau robot a même pu repasser les chemises à un stade bien précis de son développement. Mais on a supprimé cette fonction (qui n'a jamais été testée) pour des raisons de rentabilité.  
 Our new robot has even could(PFV) iron the shirts at a stage very precise of its development. But one has eliminated this function which NE-has never been tested for of-the reasons of cost-effectiveness  
*Our new robot was able to iron shirts at a particular stage of its development. But we suppressed this function (which was never tested) for cost-effectiveness reasons.*
- b. A plusieurs reprises, Olga a pu soulever un frigo, mais ne l'a pas fait.  
 On several occasions Olga has could(PFV) lift a fridge but NE it-has not done  
*On several occasions, Olga was able to lift a fridge, but she didn't do it.*

Mari & Martin and Homer take these examples to show that accounts that force an actual event every time perfective appears on a root modal are too strong. They propose instead that the crucial trigger for actuality entailments is the 'boundedness' requirement of perfective aspect. Perfective needs to combine with a bounded eventuality (de Swart 1998, Bary 2009), which possibilities or abilities typically are not (but see Louie 2015 for arguments that in Blackfoot, the ability modal is in fact eventive). Mari & Martin and Homer argue that an actual bounded

eventuality (such as a fridge-lifting) is one way to satisfy the boundedness requirement, but crucially, not the only way.

### 2.3.1. Mari & Martin (2007): bounded abilities

Mari & Martin (2007) assume that *pouvoir* is monosemous, but can be used to describe two types of abilities: general ability, which doesn't require instantiation, and 'action-dependent ability' (ADA), which does. ADAs are associated with a bounded eventuality, namely, the 'action' associated with that ability. When perfective combines with an ability modal, speakers naturally assume that the reported ability is an ADA, as it satisfies the boundedness requirement of the perfective. This triggers actuality entailments. However, there are ways to satisfy the boundedness requirement even with a general ability, through the use of temporal adverbials, which allow us to understand the modal as describing a bounded *general* ability, as in example (34a). In this case, there is no actuality entailment.

### 2.3.2. Homer (2009): Actualistic aspectual coercion

Homer (2009) similarly proposes that actuality entailments result from a requirement that perfective combines with 'bounded' eventualities. He argues that modals are unbounded, stative predicates. This leads to a clash with perfective's boundedness requirement. This clash can be resolved by certain *aspectual coercion* operators, which intervene by taking a state and returning a bounded eventuality, which can then combine with perfective.

Different types of aspectual coercion operators are independently used with non-modal statives. One such operator is Bary's (2009) ingressive INGR operator, which returns the starting point of a state. The state *be angry* is infelicitous with perfective alone, as shown in (35a). However, the sentence becomes felicitous with the adverb *suddenly*, which triggers the presence of INGR. Another operator is Bary's (2009) MAX, which provides a bounded 'maximal state' that doesn't go on in time, and is triggered by adverbials like *on several occasions* or *at some point*, as in (35b):

- (35) a. Jean a #(soudain) été en colère cet après-midi.  
 Jean has suddenly been(PFV) in anger this afternoon  
*Jean was #(suddenly) mad this afternoon.*
- b. #(Il y a un moment de l'après-midi où) Jean a été assis.  
 There Y has a moment of the-afternoon where Jean has been(PFV) seated  
*#(There was a time in the afternoon when) Jean sat.*

Homer argues that the same operators can rescue sentences with perfective on a root modal. In such cases, no actuality entailment arises:

- (36) a. Olga a soudain pu soulever un frigo, mais elle ne l'a pas fait.  
 Olga has suddenly could(PFV) lift a fridge but she NE it-has not done  
*Olga suddenly could lift a fridge, but she didn't do it.*
- b. Il y a un moment où Olga a pu soulever un frigo,  
 There Y has a moment where Olga has could(PFV) lift a fridge,  
 mais elle ne l'a pas fait.  
 but she NE it-has not done  
*There was a time when Olga could lift a fridge, but she didn't do it.*

Homer proposes a third type of aspectual coercion, responsible for “actualistic” interpretations, which he argues is also at work with non-modal statives, such as ‘cost 100,000 euros’. This stative shouldn’t be able to combine with perfective. But it can, and when it does, it evokes an *actual* event (in (37) a *buying* event):

- (37) La maison a coûté 100.000 euros.  
 The house has cost(PFV) 100,000 euros.  
*The house cost 100,000 euros.*

In such cases, Homer argues that an aspectual coercion operator ACT intervenes between aspect and the state, and introduces a bounded eventuality, which perfective can then combine with (P is the value of the state perfective combines with; Q is the value of the bounded eventuality introduced by ACT):

- (38)  $[[ACT]]^{w,c} = \lambda P \lambda Q \lambda e. \mathbf{Q}(e) \wedge e \text{ in } w \wedge \forall e' [e' \sqsubset e \rightarrow \neg Q(e')] \wedge \exists e'' [P(e'') \wedge \tau(e) = \tau(e'')]$

This bounded eventuality overlaps in time with the state, and its value is contextually determined (with the help of world knowledge and the lexical meaning of the stative): a buying event in (37)).

Homer argues that ACT is responsible for actuality entailments with root modals in sentences like (26), repeated below. The clash between the modals’ stativity and perfective triggers the presence of ACT, which introduces an actual bounded eventuality which overlaps with the ability. The event’s description gets determined by context, the idea being that it will most naturally be an event of the same type as the one described in the complement of the modal (an event of hitting a bulls-eye in (39)).

- (39) a. Brown a pu tirer dans le mille.  
 Brown has could(PFV) pull in the thousand  
*Brown could hit a bulls-eye.*  
 b. *There is bounded e in w<sub>0</sub> contained in a past interval, whose value is determined by context, which is simultaneous with a state of Brown being able to hit a bulls-eye.*

A definite advantage of Homer’s proposal is that it does not need to invoke anything special about modals: actuality entailments fall out from assumptions about aspectual coercion that are independently needed. Furthermore, it does not force actuality entailments when perfective appears on a root modal: other kinds of aspectual coercion can occur, which do not force an actual event, and are associated with certain adverbials, as in the examples in (34).

There are, however, a few shortcomings with such an account. First, it is not entirely clear how the actual event gets its description: why couldn’t the context make salient a failed attempt at a bulls-eye in (39)? Second, it is also unclear why epistemics should differ from roots, in not ever yielding actuality entailments, unless we assume that epistemics scope higher than tense. This, however, would imply that the same word *pouvoir* is a stative predicate when it expresses root modality, but an auxiliary when it expresses epistemic modality. Finally, why should the *lexical status* of modals matter? If *pouvoir* is stative and so is *have the possibility*, why does the former force an actuality entailment (in the absence of adverbial modification), but

not the latter? Homer proposes that with the latter, *have* can have eventive usages (*get*). We briefly return to this issue in section 2.4.

### 2.3.3. Revisiting the cancelability of actuality entailments

In this section we take a closer look at the cancelability of actuality entailments with perfective. Strictly speaking, what Homer and Mari & Martin show is not that perfective on a root modal doesn't force actuality entailments, but rather that the *passé composé* (which is used to express past perfective in French) doesn't.

The aspectual morphology of French, while richer than English, is still somewhat impoverished. While French has a dedicated form for past imperfective (*imparfait*), it expresses past perfective with the *passé composé*, which consists of an auxiliary and a past participle.<sup>4</sup> The *passé composé* is thus ambiguous between past perfective and present perfect. We thus cannot tell whether the examples in (34) actually involve *perfective*. The fact that such adverbials are needed to avoid actuality entailments, and the kinds of temporal adverbials involved in fact suggest that it is rather a *perfect* (SEE ALSO: THE PERFECT).

The relation between the perfect, perfective, and imperfective is a matter of debate: some treat the perfect on a par with the other two aspects, and have it locate the event prior to the reference time (as opposed to *within* the reference time, as with perfective; Kratzer 1998). Others argue that the perfect heads its own projection between tense and aspect. Its semantic role is to introduce a time interval, whose right boundary is set by tense, and left boundary by time adverbials (McCoard 1978, Iatridou *et al.* 2001). Under this approach, a perfect can co-occur with perfective, imperfective, or neutral aspect, a view supported by languages with a more articulated aspectual system like Bulgarian.

Given French's impoverished aspectual morphology, we can't be sure whether the sentences in (34) involve the perfective, or a mere perfect. We thus need to turn to languages like Hindi or Bulgarian, which have separate forms for perfective, perfect, and imperfective.

As the following Bulgarian sentences show, *perfective* always forces an actuality entailment, even in the presence of adverbials like *suddenly* or *on several occasions*. This is true whether perfective appears alone (40a), or co-occurs with the perfect (40c).<sup>5</sup> No actuality entailment arises with the imperfective, regardless of the additional presence of a perfect (40b) and (40d) (R. Pancheva, p.c.):<sup>6</sup>

- (40) a. #Olga vnezapno mozha da vdigne hladilnika, no ne go napravi.  
           Olga suddenly can-PFV subjunctive lift-PFV the-fridge, but not it did
- b. #Olga vnezapno e mogla da vdigne hladilnika, no ne go e napravila.  
                                   **is can- PFV.PERF**
- c. Olga vnezapno mozheshe da vdigne hladilnika, no ne go napravi.  
                                   can-IMPF
- d. Olga vnezapno e mozhela da vdigne hladilnika, no ne go e napravila.  
                                   **is can- IMPF.PERF**

*Suddenly, Olga could lift the fridge, but she didn't.*

Similarly in Hindi, perfective on a root modal always yields actuality entailments, even in the presence of temporal adverbials (A simple perfect is ungrammatical; R. Bhatt, p.c.):

- (41) Acaanak Mina fridge uThaa sakii, #lekin us-ne nahiiN uThaayaa  
 Suddenly Mina fridge lift can.PFV.F but she-ERG not lift.PFV  
*Suddenly, Olga could lift the fridge, #but she didn't.*

This data suggests that *perfective* on a root modal always triggers actuality entailments, and that the absence of actuality entailments in the French sentences should be pinned to the presence of a perfect, rather than perfective, which may mask the presence of an additional modal element (e.g., the one associated with imperfective).

#### 2.4. Taking stock

We have seen that various ingredients are involved in creating an actuality entailment: flavor of modality, aspect, and lexical status of the modal expression. Accounts differ in the emphasis they place on each of these ingredients.

The *type of modality* plays a crucial role for Bhatt, who argues that what was thought to be an ability modal is really an implicative predicate. It also matters for Mari & Martin, who invoke an ontological distinction between different types of abilities, with actuality entailments being tied to action dependent ability. For Kratzer, *root* modality is prone to actuality entailments because it is partially based on counterparts. For Portner, it is associated with a particular, assertive, performative dimension. For Hacquard, on the other hand, the type of modality is incidental: actuality entailments arise with modals that scope below aspect, which happen to be root modals for independent reasons. For Homer, the type of modality doesn't matter: actuality entailments arise with modals because of their aspectual properties: any stative is in principle susceptible to actuality entailments.

*Aspect* also plays a prominent role in various accounts, but in different ways. For Mari & Martin and Homer, perfective is the main culprit, or, more precisely, its need to combine with a bounded eventuality. For Bhatt and Hacquard, *imperfective* plays a major role, not in triggering, but in *preventing* actuality entailments, because it introduces an additional layer of modality (genericity) on top of the root modal. For Kratzer, *prospective* aspect prevents actuality entailments by allowing the event to not be included in the shared history of the actual and the modal worlds.

Finally, *lexical status* plays a crucial role for Hacquard: the reason that modal auxiliaries trigger actuality entailments, but that nouns like *possibility* or *capacity* which express similar meanings do not, is because with the former, the modal forms a single clause with the VP: the single aspect outscopes the modal and thus anchors the VP event in the actual world.

Further support for this view comes from differences in implicativity between French and Italian 'want'. Hacquard (2006, 2008) shows that Italian 'want' triggers actuality entailments with perfective (42a), but that its French counterpart (42b) doesn't.

- (42) a. Gianni ha voluto parlare a Maria, #ma non lo ha fatto.  
 Gianni has wanted(PFV) talk to Maria, but not it has done(PFV)  
*John wanted to talk to Mary, but he didn't.*
- b. Jean a voulu parler à Marie, mais il ne lui a pas parlé.  
 Jean has wanted(PFV) talk to Marie, but he NE to-her has not talked(PFV)  
*John wanted to talk to Mary, but he didn't.*

While *volere* and *vouloir* share similar meanings and both take infinitival complements, they differ crucially in structure: unlike *vouloir*, *volere* is a restructuring predicate, that is, it forms a *single* clause with its complement, with a single layer of tense and aspect (Cinque 2004, Wurmbrand 2001, Grano 2012). Hacquard argues that this difference leads Italian *volere* to trigger actuality entailments the same way root modals do, i.e., by having aspect scope over *volere* and quantify over the event described by the complement clause, as schematized below:

- (43) Italian:  $\exists e_1 \text{ in } w \ \& \ \forall w' \in \text{DESIRE}(J, w): J\text{-talk-to-M.}(e_1, w')$   
 French:  $\exists e_1 \text{ in } w \ \& \ \text{want}'(e_1, w) \ \& \ \forall w' \in \text{DESIRE}(J, w): \exists e_2 \text{ in } w' \ \& \ J\text{-talk-to-M.}(e_2, w')$

Accounts thus differ in the emphasis they place on the various components involved in an actuality entailment. Despite these differences, there definitely are similarities. First, in all accounts, the existence of an *actual* event is entailed (and not merely suggested). It is either directly asserted via the semantics (or update potential) of the modal in Bhatt's and Portner's accounts, or it results from the combination of aspect and modality. In the latter case, the description of the event is not directly part of the asserted content, but has to be inferred from context: for Homer, the ACT operator relies on the context and world knowledge to provide a description for the actual event; for Hacquard, the description is transferred from the modal event via PED; for Kratzer, it arises from inferences about counterparts; for Mari & Martin, from a particular ontology of abilities. Finally, in all accounts besides Bhatt's, modals remain modals, and their implicative behavior arises as a consequence of combining with perfective.

### 3. Beyond modal auxiliaries

#### 3.1. Actuality entailments with modals other than auxiliaries?

Actuality entailments arise when perfective appears on root modals. In this section, we survey other modal constructions which exhibit a similar implicative behavior. We have already seen that Italian *volere* ('want') behaves like root modals in yielding actuality entailments with perfective, but not imperfective. This pattern can be explained by assimilating *volere* to root modals, given its restructuring properties.

'Too and enough' constructions (Hacquard 2005) are also implicative with perfective, but not imperfective:

- (44) a. Jean a été assez rapide pour s'enfuir, #mais il ne s'est pas enfui.  
 Jean has been(PFV) quick enough to escape but he NE is not escaped  
*Jean was quick enough to escape, #but he didn't escape.*  
 b. Jean était assez rapide pour s'enfuir, mais il ne s'est pas enfui.  
 Jean was-IMPF quick enough to escape, but he NE is not escaped  
*Jean was quick enough to escape, #but he didn't escape.*

Perhaps relatedly, definite descriptions with nouns like *courage* (or *strength*) that express gradable notions trigger actuality entailments, unlike nouns like *permission* (or *possibility*), which express absolute notions (cf. enough courage/strength vs. #enough permission/possibility):

- (46) a. Jean a eu le courage de soulever un frigo, #mais il ne l'a pas fait.  
 Jean has had(PFV) the courage to lift a fridge but he NE it-has not done

- b. Jean a eu la permission de soulever un frigo, mais il ne l'a pas fait.  
 Jean has had(PFV) the permission to lift a fridge but he NE it-has not done

Martin & Schaefer (2012) show that what they call 'defeasible' causatives also have implicative readings. However, aspect does not seem decisive for implicativity, while the type of subject is. These verbs are implicative with *causer* subjects, but not *agentive* subjects:

- (47) a. L'organisateur de la course lui a offert la première place,  
 The-organizer of the race her has offered(PFV) the first place  
 mais elle a refusé ce marché.  
 but she has refused(PFV) this deal  
*The organizer of the race offered her the first position, but she refused this deal.*
- b. Son excellent résultat lui a offert la première place,  
 Her excellent result her has offered(PFV) the first place  
 #mais elle ne l'a pas prise.  
 but she NE it-has not taken  
*Her excellent performance offered her the first position, #but she didn't take it.*

Finally, Giannakidou & Staraki (2013) show that ability modals in Greek are always implicative when they appear in a causative coordinate structure, irrespective of the aspect that appears on the modal:

- (48) I Maria borese ke eftiakse to aftokinito.  
 The Maria could.PFV.PAST.3sg and fixed.PFV.PAST.3sg the car  
*Mary could, and did, fix the car.*

Given that this structure also yields implicative readings with verbs like *try*, we can assume that the causative component is responsible for the actuality entailment, above and beyond the contribution of modality and aspect.

Should our actuality entailment accounts be extended to these various constructions? For the two causative cases, aspect seems irrelevant, and other components can be blamed for the implicative readings. The route to implicativity may thus be different. *Too* and *enough*, and *have the courage*, however, seem to behave very similarly to root modals. It remains to be determined, however, how exactly to relate their actuality entailments to those of root modals. Interestingly, structural factors here again seem to contribute to implicativity. Indeed, actuality entailments only occur with *too* and *enough* in predicative, but not in attributive position, when they modify the noun, rather than serve as the main predicate (Hacquard 2006). Arguably, the former involve a single aspectual quantification, the latter does not.

- (49) Bingley a acheté assez de bois pour chauffer sa maison, mais il y a  
 Bingley has bought(PFV) enough of wood to heat his house but it there has  
 fait froid tout l'hiver, vu qu'il était trop occupé pour faire un feu.  
 made(PFV) cold all the-winter see that-he was-IMPF too busy to make a fire  
*Bingley bought enough wood to heat his house, but it was cold there all winter long, as he was too busy to make a fire.*

### 3.2. Aspect and implicativity?

In his seminal paper on implicatives, Karttunen (1971) identifies a group of verbs that “must sometimes be understood in an implicative, sometimes in a non-implicative sense”, for reasons that he leaves open. These include *able, can, be \_\_ enough to...*, which are exactly the ones that trigger actuality entailments. While we have made significant progress, following Bhatt’s insight, in identifying what exactly matters for the implicativity of these verbs, namely aspect, it remains to be determined why truly implicative predicates differ from modals in their insensitivity to aspect. As suggested in section 2.2.2, lexical status may play a role. However, the relation between implicatives and actuality entailments with modals needs to be further investigated (see White 2014 for an actuality entailment-based analysis of implicative *remember*).

Interestingly, there seems to be some connection between meaning, structure and implicativity. First, both implicatives and actuality entailment-prone modals seem to express some kind of root modality: possibilities and necessities given certain circumstances and desires. But there also seems to be a correlation with syntactic position: all have been claimed to be part of the functional projection of the clause between verb and aspect: this has been argued extensively for root modals (Cinque 1999), for Italian ‘want’ as a restructuring predicate (Cinque 2004), and even for implicative predicates (Grano 2012). Interestingly, other elements in this part of the functional hierarchy also seem to involve some implicativity: aspectual verbs (*continue, begin, finish...*) require that part of the event described by their complement occur in the actual world; progressive aspect also requires that the ‘beginning stages’ of the event occur in the actual world (Landman 1992), as might the verb *try* (Sharvit 2003). But what exactly to make of these connections between implicativity, aspect, and syntactic position remains to be explored.

### 3.3. Non actuality entailments?

So far, we have looked at implications of actualization. However, certain aspect and modal combinations sometimes yield implications of *non* actualization. In Spanish, perfective on a root modal is in fact ambiguous between an implicative reading and a **counterfactual** reading (Borgonovo & Cummins 2007). The sentence in (50) can either mean that Pedro managed to win the race or that he could have won the race:

- (50) Pedro pudo                    ganar la        carrera.  
      Pedro can-PAST-PFV win    the        race  
      *Pedro could win the race.*

This additional counterfactual reading is available in Spanish, Albanian and Basque, but not in French, Hindi, or Greek (Bhatt 1999). It remains to be determined why only certain languages have this additional reading. More generally and cross-linguistically, aspect seems to play an important role in expressions of counterfactuality (Condoravdi 2002, Iatridou 2000, Arregui 2005, Ippolito 2004, a.o.). This again suggests a tight connection between aspect and implicativity.

## 4. Conclusion

Actuality entailments arise when perfective aspect appears on a root modal. As our survey has shown, these entailments can be blamed on a combination of properties of both aspect and

modality. While many questions still remain, and there still is no general agreement on how exactly they come about, actuality entailments have provided a fertile ground to explore and further our understanding of both aspect and modality.

## Cross-References

EPISTEMIC MODALITY  
GENERICIS  
GRADED MODALITY  
IMPERFECTIVITY  
MODAL-TEMPORAL INTERACTIONS  
THE PERFECT  
WEAK NECESSITY

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## Biographical Note

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<sup>1</sup> An anonymous reviewer points out that an ambiguity account may find support in historical data. See Aijmer (2004).

<sup>2</sup> It is notoriously difficult to define the domain of quantification for the generic operator: should it quantify over 'normal', 'stereotypical', or 'ideal' worlds (or situations or events)? (see Carlson & Pelletier 1995 for overview of issues). Here, I use the term 'ideal test situations' to remain neutral.

<sup>3</sup> Whether this association is mere co-occurrence, or whether the semantics of the imperfective should be enriched to incorporate this modal meaning (and others) is a matter of debate.

<sup>4</sup> Historically, the *passé simple* was used to express past perfective, but it is disappearing from spoken language.

<sup>5</sup> Roumi Pancheva (p.c.) reports that additional evidential meanings arise with a perfect+perfective combination, and the actuality entailment seems somewhat weaker than with a simple perfective.

<sup>6</sup> Mari & Martin (2007) argue that actuality entailments are also not obligatory when ability modals take stative complements. Perfective on root modals with stative complements in Bulgarian forces actuality entailments, and is ungrammatical in Hindi.