

## 1. Introduction: Epistemic modals and Tense

possibilities are the sort of thing that comes into and goes out of existence, that can be 'dated' (Mondadori (1978), p. 246)

**Question:** what are the semantic differences between the three French translations (2)-(4) of the example (1):<sup>1</sup>

(1) There might have been ice cream in the freezer. (von Fintel and Gillies (2008), (21))

(2) *Il pouvait y avoir de la glace au frigo.*  
It-IMPERS. can-PAST.IMP. PRN have of the ice-cream in-the freezer.  
'There might have been ice cream in the freezer.'

(3) *Il a pu y avoir de la glace au frigo.*  
It-IMPERS. can-PRST.PERF. PRN have of the ice-cream in-the freezer.  
'There might have been ice cream in the freezer.'

(4) *Il peut y avoir eu de la glace au frigo.*  
It-IMPERS. can-PRES. PRN have had of the ice-cream in-the freezer.  
'There might have been ice cream in the freezer.'

**Doxa:**

- No relevant difference between the three on the epistemic reading
- epistemic modals cannot be in the scope of Tense/Aspect: the evaluation time of the modal (**MOD-T**) is the utterance time (**U-T**) (Cinque (1999), Stowell (2004)).
- In languages like French, where, contrary to English, modals can be fully inflected and bear tense/aspect morphology, it is assumed that the past or perfect(ive) morphology on the epistemic modal originates between the modal and the verbal projection, raises to combine with the modal, but is **interpreted in its original position** (see (5)), cf. Tasmowski (1980), Cinque (1999), Stowell (2004), Hacquard (2006), Boronovo and Cummins (2007), Laca (2008)).

(5) PAST/PERF > EPIST-MOD > P is interpreted as EPIST-MOD > PAST/PERF > P

**Hypotheses:**

- Aspect/tense on the modal is interpreted on the modal (cf. also Eide (2002, 2003, 2010), Boogaart (2007), von Fintel and Gillies (2008) and Homer (2009)), (1)-(2)-(3) differ from each other;
- Infinitives are largely underspecified wrt. Tense and Aspect (Wurmbrand (2007))

**Plan of the talk:**

- Arguments against the Cinque/Stowell generalisation, incl. arguments against the Perfect raising (section 2)
- Differences between the *imparfait*, the *passé composé* and the *passé simple* on MOD (section 3)
- Problems of the analysis (section 4)

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<sup>1</sup>This work is in progress, please do not cite without permission.

- Notational conventions:

- P = 'the adjacent', i.e. the proposition embedded under the modal, cf. von Stechow (2005))
- EPIST-MOD.= epistemic modal
- EPIST-MOD.-S= epistemic modal sentences
- IMP.= imperfective
- PERF.= perfect
- PFTIVE= perfective
- PC= *passé composé*
- PS= *passé simple*
- PEUT AVOIR EU-Ss = sentences of the type *peut avoir+pp* (with PERF on the infinitive)
- A PU AVOIR-Ss = sentences of the type *a pu +inf.* (with PERF on MOD)

## 2. Arguments against the Cinque/Stowell hierarchy (EPIST-MOD > PERF. > ROOT-MOD)

### 2.1. Arguments from French

- French provides several pieces of data challenging the classical claim that PERF-MOD-Ss are synonymous with the corresponding PERF-MOD-Ss.

#### 2.1.1. First argument: generic sentences

While PEUT AVOIR EU-Ss can have a generic reading, A PU AVOIR ones cannot, cf. (6)-(7):

- (6) *On peut (/pouvait) très bien avoir été membre d'un parti communiste sans*  
 One can-PRES (can-PAST.IMP.) very well have been member of a party communist without  
*avoir été véritablement communiste.* (Internet)  
 having been really communist.  
 'One might very well have been a member of the communist party without having really been a communist.'
- (7) *#On a très bien pu être membre d'un parti communiste sans être véritablement*  
 One has very well could be member of a party communist without be really  
*communiste.* (generic reading)  
 communist.  
 'One might very well have been a member of the communist party without having really been a communist.'

- Assuming that tense/aspect morphology is interpreted *in situ*, this contrast can be accounted for: perfect(ive) sentences normally do not have a generic interpretation (cf. Carlson (1977), Dahl (1985)).<sup>2</sup>

#### 2.1.2. Second argument: future adverbials

While A PU AVOIR-Ss are systematically incompatible with an adverbial denoting a future temporal point, it is not the case with PEUT AVOIR ÉTÉ ones, cf. (9)-(10). Again, this contrast remains unexplained if the perfect is interpreted below the modal in (9) and (10).

<sup>2</sup>To be sure, sentences with *passé composé* used as a *present perfect* (2d reading of the PC) are compatible with generic sentences, but only with a particular element like a temporal adverbial explicitly limiting the interval of the generic property, cf. (8), which is absent of (7). On present perfect generic sentences, see also Comrie (1985) and Giorgi and Pianesi (1997), cited by Eide (2010).

- (8) Dans les années 70, un jeune homme dans le vent a été-PRES.PERF communiste # (dans son adolescence). (generic reading)  
*In the seventies, a cool boy was communist (in his teens)*

(9) *Votre voiture peut très bien avoir été détruite demain.*  
 Your car can-PRST very well have been destroyed tomorrow.  
 'Your car might very well have been destroyed tomorrow'.

(10) *\*Votre voiture a très bien pu être détruite demain.*  
 Your car has very well could be destroyed tomorrow.  
 'Your car might very well have been destroyed tomorrow'.

• Note that (10) is acceptable if the present perfect on the modal is replaced by a past imperfective (the *imparfait* form 'pouvait'), cf. (11):

(11) *Votre voiture pouvait être détruite demain.*  
 Your car can-PAST.IMP. be destroyed tomorrow.  
 'Your car might very well have been destroyed tomorrow'.

### 2.1.3. Third argument: interpretation of the perfect infinitival

One of the strongest arguments in favour of assuming a tense/aspect raising in (3) is given by Tasmowski (1980) (cited on this point by Laca (2008)): the choice of the tense/aspect morphology on MOD in epistemic sentences always matches the choice that would be made of the adjacent *P* in the absence of the modal:

(12) *Marie a écrit un roman. → Marie a pu écrire un roman.*  
 Marie has written a novel Marie has could write a novel  
 'Marie wrote a novel.' 'Marie might have written a novel'

(13) *Marie écrivait un roman. → Marie pouvait écrire un roman.*  
 'Marie write-PAST.IMP. a novel.' Marie can-PAST.IMP. write a novel.'  
 'Marie was writing a novel.' 'Marie might have written a novel'

• However, this is not always true.

– **Counter-evidence 1:** the Norwegian present perfect (Eide (2005, 2010)) is always infelicitous with adverbials denoting the previous cycle (*yesterday, last week, last year*). However, this effect disappears with an infinitival perfect embedded under a modal:

(14) *\*Marit har spist grøten sin i går.* Eide 2005, 2010  
 Marit has eaten porridgeDef PossRefl yesterday.  
 'Marit has eaten her porridge yesterday'.

(15) *Marit må ha spist grøten sin i går.* Eide 2005, 2010  
 Marit must have eaten porridgeDef PossRefl yesterday.  
 'Marit must have eaten her porridge yesterday'.

→ the perfect infinitival is not (always) a perfect.

– **Counter-evidence 2:** Applied to ILPs which are normally instantiated the whole life of an individual, the the Dutch present perfect (Zwart (2007)) and the French *passé composé* (Martin (2008)) are strange because they imply that the state is verified a part of the individual's life only:

(16) *#Scriabin is een genie geweest.* Zwarts 2007, (11)  
 Scriabin is a genius been.  
 'Scriabin has been a genius'.

(17) *#Pierre a été albinos.* Martin 2008, (255)  
 Pierre has been albino

'Pierre has been an albino'.<sup>3</sup>

- However, as already noted by Zwart (2007), the oddity disappears with an infinitival perfect ILP:

(18) *Scriabin moet een genie geweest zijn.*

Scriabin must a genius been be

'Scriabin must have been a genius.'

(19) *Pierre peut très bien avoir été albinos.*

Pierre can-PRES. very well have been albino

'Pierre might very well have been an albino'.

- The following contrast confirms the same point:

(20) *#Quand Pierre l'a vue la semaine passée, elle a eu les cheveux roux.*

When Pierre her has seen the week last, she has had the hair red.

'When Pierre saw her last week, she had red hair.'

(21) *Quand Pierre l'a vue la semaine passée, elle peut avoir eu les cheveux roux.*

When Pierre her has seen the week last, she can-PRST have had the hair red.

'When Pierre saw her last week, she might have had red hair.'

- The example (20) is odd because the perfect on *avoir les cheveux roux* implies that the Theme of the state didn't have red hair before and after the event time (which is given by the *when*-clause), cf. Martin (2008), p. 146 ff. Again, the oddity disappears when the perfect is on the infinitival, cf. (21).

• **Ccl.: the 'infinitival perfect' is not always a perfect** (its aspectual value is partly underspecified, cf. also Hofmann (1976), Eide (2010)):

– *peut avoir P*: PRES(*pouvoir*(PERF + PAST ∨ ¬PERF + PAST ∨ PERF + FUT(*P*)))

– *a pu P*: PRES.PERFECT(*pouvoir*(IMP + PAST ∨ PERF + PAST(*P*))) (cf. examples (51) and (52) below)

- The underspecified aspectual value of the infinitival is not surprising, since, as Hofmann (1976) already observed, the **infinitival perfect** is the **only way of expressing a past** under a (present) modal.
- Note that as (9) showed, the infinitival perfect can also express a future under a present modal, which suggests that **infinitives are tenseless** (infinitival 'tense' is non-deictic/relative, cf. Wurmbrand (2007)).

#### 2.1.4. Fourth argument: double-perfect sentences

As noted in the traditional French literature (cf. Dubois and Dubois Charlier (1970), Sueur (1975), p. 200) but largely ignored later (but see Eide (2003) for Norwegian), it is possible to simultaneously have a perfect on the modal and another one on the infinitival, cf. (22) and (23). To explain this with the Perfect raising hypothesis, one should make additional assumption to explain why we sometimes have a "Perfect copy".

(22) *Les enfants ont très bien pu avoir mangé trop de fruits.*

The children have very well can-PAST PP. have eaten too many fruits.

'The children might very well have eaten too many fruits.'

(23) *Han har måtta arbeidd med det i heile natt.* Eide 2003

he has must-PERF work-PERF on it in all night

'He must have worked on it all night'.

<sup>3</sup>As Anne le Draoulec (p.c.) observes, the French translation of (16) (*Scriabine a été un génie*) is much better than (17), and in fact acceptable. Moreover, it does not invite to admit that the composer was a genius only during a subinterval of his whole life. She suggests that the relevant difference between *être albinos* and *être un génie* is related to the fact that contrary to what happens with *être albinos*, the fact that Scriabin was a genius has still some relevance at the time of utterance. I leave this point for further research, and simply note here that Martin 2008 cannot account for the difference between the two.

### 2.1.5. Fifth argument: double compound past

French has a double compound past, the *passé surcomposé*, which is used to mark an anteriority wrt. a sentence with a PC (cf. Schaden (2007) and references therein), cf. (24a). French also has a double compound infinitival, cf. (24b).

- (24) a. *Pierre est sorti quand il a eu fini.*  
Pierre is gone when he has had finished.  
'Pierre is gone when he had had finished'.  
b. *Avoir eu fini*  
*To have had finished*

• Observation: the modal *pouvoir* cannot be used with a double compound past<sup>4</sup>, cf. (25a), while an double compound infinitival can be embedded under a modal, cf. (25b).

- (25) a. *\*Pierre a eu pu finir son repas avant que Marie ne soit arrivée.*  
Pierre has had could finish his meal before Marie has arrived.  
'Pierre might have finished his meal before Marie arrived.'  
b. *Pierre peut avoir eu fini son repas avant que Marie ne soit arrivée.*  
Pierre may have had finished his meal before Marie arrived  
'Pierre may have had finished his meal before Marie arrived.'

If one resorts to Perfect raising, one should make additional assumptions to explain why Raising is not allowed with the double compound infinitive.

Ccl: The Perfect raising hypothesis is not unproblematic.

## 2.2. Previous arguments from other languages

### 2.2.1. The novel writer argument (Eide 2003)

• Iatridou (1990) investigate "metaphysical predicates" like *be possible/ probable/ evident*, which are very similar to (at least some) epistemic modals. She notes that they are incompatible with past and future tenses:

- (26) \*It was/will be possible that John stole the tapes.<sup>5</sup>

• Iatridou concludes that these predicates 'lack a time variable' and 'are incompatible with real tenses'.  
• Fagan (2001) exploits this hypothesis to explain the often made observation that epistemic modals do normally not appear in the perfect(ive).

• Eide's counter-argument: the problem is not semantic, but rather pragmatic. There *are* contexts where this kind of examples are acceptable:

- (27) It will be possible that John is the killer. (Eide 2003)

- (28) Yesterday, it was probable that Mary was the killer.

- (29) Tomorrow, Marit must be the murderer. (Eide 2010)

<sup>4</sup>No occurrences of it in the Frantext literary database containing 175 millions of words, and all the native speakers I consulted reject it categorically. However, one can find quite a few occurrences of *a eu pu* on Internet. Andrée Borillo and Anne Dagnac (p.c.) made me observe that this form is acceptable in some varieties of French in the South of France, where the *passé surcomposé* is much more used (but with different values than the ones characterizing the 'standard' *passé surcomposé*). However, this does not impede that there is still a difference between (25a), which pertains to Standard French, and (24b), which does not (besides, according to Borillo and Dagnac, the epistemic reading is not to be available in (25a) in this variety).

<sup>5</sup>French translations of (26) are not easy to compare since *être possible que* demands the subjunctive in the *que*-clause, and past subjunctive forms are not used in French anymore. The temporal logic of sentences like (26) is then very different in French and English.

(30) Yesterday, the butler had to be the murderer.

- These examples are odd in a normal context because EPIST-MOD signals what is possible/necessary according to the speaker's knowledge. What is construed as 'possible' or 'necessary' is not likely to switch value from one moment to another. Thus, to utter (26)-(30) truthfully, the speaker has to admit that his own present model of the world is an unreliable one, a contradiction resembling Moore's Paradox." (Eide (2003), p.127). Temporal alternation on this modality imply that the speaker does not trust his own epistemic model of the world, "which might be an indication of insanity" (Eide (2010)).<sup>6</sup>

- "On the other hand, if we could construct new models of the universe from one day to the next, like an author constructing a fictional universe, temporal alterations of metaphysical modalities and epistemic modals would be possible."

### 2.2.2. Embedded tense in SOT is a 'real' tense

- There are contexts where epistemic modals accept the perfect(ive), namely the 'Sequence of Tenses' (SOT) context, cf. (31b):

- (31) a. Colombo said it is possible that John had stolen the tapes.  
b. Colombo said it **was** possible that John had stolen the tapes

- Iatridou argues that the embedded tense in SOT is not a 'real' tense, but only a morphological copy of the matrix past tense.

- However, Eide (2003), following Comrie (1985) and Enç (1987) on this point, argues that there is no synonymy between (31a) and (31b), which is unexplained if the past tense in (31b) is fake.

- 'with the past tense, the speaker signals that the proposition expressed by this sentence belongs to *some individual's belief system at some previous point in time*, without asserting anything about this individual's belief system at the present point in time.' (the past signals a previous model of the world)
- 'present tense in a clause embedded under a matrix past signals that the speaker has some reason to believe that *the proposition belongs to some individual's current model of the actual world*'.

See the Norwegian data of Eide (2003), p.126, and (32)-(33):

- (32) *J'ai entendu qu'il peut très bien être le meurtrier, mais #personne ne le croit.*  
I have heard that he can-PRST very well be the murderer, but nobody Neg it believes.  
'I heard he might very well be the murderer, but nobody believes it'.

- (33) *J'ai entendu qu'il pouvait très bien être le meurtrier, mais OK personne ne le croit plus.*  
I have heard that he can-PAST.IMP very well be the murderer, but nobody Neg it believes anymore.  
'I heard he might very well have been the murderer, but nobody believes it anymore'.

### 2.2.3. FUTURE on EPIST-MOD

Dyvik (1999) (cited by Eide (2010)) provides evidence that epistemic modals can be under the scope of future tense, cf. (34).

- (34) *Han vil kunne ha reist i morgen.*  
he will can-INF. have left tomorrow.  
'Tomorrow, he will possibly have left'.

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<sup>6</sup>As root modals do not refer to a mental model, but to what is required/allowed...in the real world, they may undergo temporal alternation.

### 3. Proposal

#### 3.1. Two words about the definition of EPIST-MOD

• **Classical view** about EPIST-MOD: the truth conditions of an epistemic modal sentence depend on the epistemic state of the speaker (cf. e.g. Palmer (1986)) or of a larger community determined by the context (cf. e.g. Stalnaker (1984), DeRose (1991)). Thus EPIST-MOD-Ss describe epistemic states:

(• Related view: EPIST-MOD do not have a (fixed) truth value. They can only be true-for-Jane-at-t (if Jane-at-t is not sure that  $P$  is false) – this is the relativist view –, or only 'express' the fact that the speaker is not sure that  $P$  is false – this is the expressivist view.)

- (35) a. It is possible<sub>epis</sub> that it will rain.  
b.  $\approx$  Based on the evidence I/we have, it is possible that it will rain.

• **Alternative view** (built from 'modal realists' like Cantwell (2009) and from Boogaart (2007)):

- (36) a. It is possible<sub>epis</sub> that it will rain.  
b.  $\approx$  It is possible that it will rain.
- i. **contribution of the modal**: alethic<sup>7</sup>/metaphysical modality (Cantwell 2009)  
ii. **contribution of the aspectual subjective point of view**: I/we (=the Evaluator)<sup>8</sup> evaluate the truth of  $P/\Diamond P$  at the 'epistemic evaluation time' EVAL-T (the 'epistemic component', Boogaart 2007)  
iii. conditions of assertability of an EPIST-MOD: the Evaluator cannot be sure that  $P/\Diamond P$  are false (Cantwell 2009)

**Arguments for (i)** (Cantwell (2009)):

- (37) (Context: nobody knows that the coin<sub>a</sub> is fake and can only land tails).  
The coin<sub>a</sub> might land heads.

(37) is *false* in this context, but true according to the classical view.

**Ccl.:** It is not clear that epistemic modals are made true in virtue of human knowledge.

• **Arguments for (ii)**: the epistemic reading of modals is unacceptable with Tenses which do not introduce a subjective aspectual point of view, cf. below.

• **Summary**:

- a. 'EPIST'-MOD = 'alethic' or 'metaphysical' modality (and as such EPIST-MOD contribute to propositional content) + a modification of the assertive force of  $P$  and  $\Diamond P$  (see [b.]):  
b. an EPIST-MOD sentence expresses a weaker commitment to  $P$  and to  $\Diamond P$  than the belief it is true. Thus, the Evaluator (typically the speaker) can properly assert it iff she is not sure that  $P/\Diamond P$  are false.  
b. An EPIST-MOD sentence puts in scene the speaker in her commitment to  $P/\Diamond P$  (cf. [b.]), i.e. as 'evaluating the probability of the state of affairs'  $P$  at the 'epistemic evaluation time' EVAL-T.  
d. (from [a.]-[c.]): an **epistemic modal sentence** describes an **alethic/metaphysical possibility** in MOD-T, which is **evaluated** by the speaker/Evaluator in EVAL-T (who shouldn't be sure in EVAL-T that  $P/\Diamond P$  is false).

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<sup>7</sup>Here defined as the most basic type of modality, in terms of which the other varieties can be defined, rather than a subtype of modalities, cf. Portner (2009), p. 10 fn 1. As Portner suggests (p.123), alethic modality is very close to Palmer's 'objective epistemic modality'. He proposes (p.135) to use the term "factual modalities" to cover the epistemic, alethic and metaphysical subtypes.

<sup>8</sup>Term taken from Nuyts (2001).

## 3.2. Proposal (I): scope, four temporal intervals

### 3.2.1. Scope

- In line with Eide (2002, 2003, 2010), Boogaart (2007), von Fintel and Gillies (2008) and Homer (2009), I question Stowell's hypothesis that MOD-T systematically equals U-T with epistemic modals, and admit that ASP/TENSE can scope above EPIST-MOD.
- In line with Eide (2002, 2003) for Norwegian, I assume that in sentences like (2) and (4), tense and aspect morphology on the modal is interpreted *in situ*, and in line with Wurmbrand (2007), I assume that Tense/Aspect on the infinitival is largely underspecified.

- *peut avoir P*: PRES(*pouvoir*(PERF + PAST  $\vee$   $\neg$  PERF + PAST  $\vee$  PERF + FUT(*P*))
- *a pu P*: PRES.PERFECT(*pouvoir*(IMP + PAST  $\vee$  PERF + PAST(*P*)))

### 3.2.2. Temporal intervals

To propose the facts described, building on Boogaart (2007)'s analysis, I will differentiate four temporal intervals (all having been resorted to in different theories, although maybe not together in the same analysis):

- MOD-T: the interval during which the possibility that *P* takes place;
  - ADJ-T: the interval during which *P* takes place in the worlds where  $\Diamond P$  is true;
  - EVAL-T: the time of the modal evaluation by the Evaluator (Boogaart (2007));
  - UNCERT-T: the interval during which the Evaluator is uncertain about the truth of  $P/\Diamond P$ .<sup>9</sup>
- In sum, epistemic modals describe a possibility in MOD-T, evaluated in EVAL-T, that *P* is verified in ADJ-T.
  - Besides, given that the Evaluator-speaker of EPIST-MOD cannot be sure that  $\Diamond P$  is false in EVAL-T, UNCERT-T  $\supseteq$  EVAL-T.

**Which element determines which temporal interval** in an EPIST-MOD-S?

- MOD-T is naturally given by aspect/tense on the modal:
  - When MOD is under the scope of IMPERF., given that **imperfect(ive)** sentences are **unbounded** (in the sense e.g. of Depraetere (1995)), EPIST-MOD-S then describe what Mondadori (1978) (p.244) calls ***persisting possibilities*** (i.e. possibilities that have not reached their right boundary yet).
  - When MOD is under the scope of PERF., given that **perfect** sentences are **bounded**, EPIST-MOD-S then describe ***non-persisting possibilities*** (Mondadori *ibid.*, i.e. possibilities that have gone out of existence)<sup>10</sup>
- ADJ-T is determined, in the easy case, by the adverbial or the temporal clause in the adjacent if there is one. In the complex case, it is determined by an interaction between tense/aspect on the infinitive and the modal (see partly below).
- EVAL-T (the epistemic evaluation time) corresponds to the perspective point given by view point aspect (Boogaart (2007)), cf. next section.

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<sup>9</sup>Useful also for the study of *might* is NODAL-T: the interval at which 'things have not yet been decided' (Mondadori and Morton (1976); Mondadori (1978)).

<sup>10</sup>Mari and Martin (2009) already suggested that sentences with the *passé composé* on *pouvoir* on its epistemic reading denote what is there called 'bounded epistemic possibilities'. However, this paper focusing on the problem of the actuality entailment, it does not address the differences between sentences like (1)-(2)-(3). The term 'epistemic possibility' (that is left there undefined) conflates the two components that I propose to separate here (the possibility is introduced by *pouvoir*, and the epistemic evaluation is introduced by the aspectual point of view).



### 3.3. Proposal (II): the distribution of past tenses on the epistemic modal

• It has been largely ignored (see e.g. Hacquard (2006), Laca (2008), Mari and Martin (2007, 2009)) that replacing the *passé composé* by a *passé simple* (a perfective tense) in (3) blocks the epistemic reading of *pouvoir*:<sup>11</sup>

- (39) *Pierre put prendre le train.* (OK abilitative, circumst, #epistemic)  
Pierre can-PVTIVE take the train.  
Pierre could take the train.

→ The fact that the *passé composé* has a **present perfect** reading (besides its derived perfective reading, cf. e.g. Squartini and Bertinetto (2000), Vet (2001), de Swart (2007)) is **crucial to generate the epistemic reading** of the modal.

→ The **claim** (cf. e.g. Hacquard 2006, Laca 2008) that the aspect on the modal in sentences with *passé composé* like (3) is a **perfective** is an **oversimplification**.

#### • Hypothesis:

- **Imperfective** forms (present, *imparfait*) are **compatible** with EPIST-MOD-S because they introduce a subjective **point of view** in the discourse which may function as the EVAL-P required by the modal (Boogaart (2007)), and so do certain perfect forms like the *passé composé* in French (cf. below);
- **Perfective** forms (like the *passé simple*) are **incompatible** with EPIST-MOD-S because they cannot introduce the subjective point of view required by the modal (Boogaart (2007))

#### 3.3.1. The imperfective

• Boogaart (2007) convincingly argued that the (past) point of view introduced by the imperfective, which conveys simultaneity with a past act of perceiving or thinking, may function as the EVAL-P required by epistemic modal.

• (2) describes a past possibility taking place in MOD-T, and evaluated from the 'present of the past' EVAL-T:

- (2) *Il pouvait y avoir de la glace au frigo.*  
It-IMPERS. can-PAST.IMP. PRN have of the ice-cream in-the freezer.  
'There might have been ice cream in the freezer'

**Remark: No FIS needed.** Boogaart assumes however that for an imperfective tense to be acceptable in an EPIST-MOD-S, it has to be an instance of (free) indirect speech of reported thought (p.52).

• But Homer (2009) showed that the *imparfait* in EPIST-MOD-Ss is not always an instance of Free Indirect Speech:

- (40) #*Tu pouvais très bien avoir eu une crise cardiaque, alors qu'hier encore tu étais en bonne santé.*  
(Homer (2009))  
You can-IMP very well have had a stroke cardiac, whereas yesterday still you were in good health.  
'It was very possible that you had had a heart attack, while you perfectly well the day before.'

• The same way, Homer (2009) shows in (41) that Hacquard's idea that imperfective sentences of this kind always involve a hidden attitude verb (the *imparfait* being a fake past) is not correct:

- (41) #*Tu pouvais très bien avoir eu une crise cardiaque, et l'ambulance n'arriverait pas à temps.*  
You can-IMP very well have had a stroke cardiac, and the ambulance NEG arrive-FUT-PAST not on time.  
'It was very possible that you had had a heart attack and the ambulance would not arrive on time.'

<sup>11</sup>Andrée Borillo (p.c) makes me observe that what I suggest about the *passé simple* can probably not be extended to other simple past forms like the past subjunctive. For instance, she observes that the example below is acceptable under the epistemic reading:

- (38) *Pierre douta qu'il pût pleuvoir à Essaouira.*  
Pierre doubted-PAST.PFCTIVE that it can-SUBJ.PAST.PFTIVE rain in Essaouira.  
Pierre doubted that it might be possible that it rained in Essaouira.

Indeed, Hacquard's prediction is that we should observe other kinds of SOT like the future in the past, which is not the case.

- In fact, the *imparfait* introduces a point of view simultaneous to the event referred by the sentence in any of its (imperfective) uses (cf. Jayez (1999)<sup>12</sup> and references therein), which leaves intact Boogaart's explanation of its compatibility with EPIST-MOD-Ss even without assuming FIS in the relevant examples.

### 3.3.2. The present perfect vs the perfective

- **Reminder:** epistemic modal sentences accept the PC (a present perfect) on MOD, but not the PS (an aorist/perfective). Why?

- According to its classical analysis, the PC differs from the PS in that it presents the past fact as **viewed from the present**.<sup>13</sup>

→ The U-T can thus function as the evaluation point required by the epistemic modal.

→ (3) describes a past possibility in MOD-T ("pu"), contemplated from the U-T ("a"), that P is verified in ADJ-T:

- (3) *Il a pu y avoir de la glace au frigo.*  
 It-IMPERS. can-PRST.PERF. PRN have of the ice-cream in-the freezer.  
 'There might have been ice cream in the freezer.'

- On the other hand, the *passé simple* is an 'objective past tense' (Imbs (1960), Wagner and Pinchon (1962)), i.e. does not relate the past eventuality to a past or present point of view.

→ The PS is thus unable to provide the evaluation point required by the epistemic modal. • Additional indication that it is the aspectual point of view which introduces the evaluation point required by the epistemic modality: the epistemic reading of *pouvoir* is not available with the infinitive (which does not relate the denoted eventuality to a point of view either):

- (42) *#Pierre a dû pouvoir avoir un accident.*  
 Pierre has must-PST.PART. can have an accident.  
 Necessarily, Pierre might have had an accident.

- (43) *OK Nécessairement, Pierre a pu avoir un accident.*  
 Necessarily, Pierre has could-PST.PART. have an accident.  
 Necessarily, Pierre might have had an accident.

## 3.4. Proposal (III): the interpretation of past tenses on the epistemic modal

### 3.4.1. A brief comparison with von Fintel and Gillies

- von Fintel and Gillies (2007), von Fintel and Gillies (2008) already admitted that PAST can scope over EPIST-MOD. However, they admit that the epistemic evaluation is provided by MOD itself and thus also under the scope of PAST:

- (1) There might have been ice cream in the freezer. (von Fintel and Gillies (2008), (21))  
 'Based on the evidence **I had in the past**, **it was possible** that there was some ice cream in the freezer.'  
 PAST > EPIST. EVAL. + POSS von Fintel & Gillies

- I consider with Boogaart that the epistemic evaluation point is provided by the aspectual point of view, and thus not under the scope of Tense/Aspect. We have thus the following situation:

<sup>12</sup>Jayez 1999 defines the aspectual point of view adopted in T as the set of propositions known in T, so it is clear that it can provide the epistemic component of the epistemic reading of *pouvoir*.

<sup>13</sup>And contrary to the English present perfect, the *passé composé* does not block temporal relations with the event time, cf. de Swart (2007), which might be responsible for the fact that in English, epistemic modal sentences are not acceptable with the present perfect on the modal.

- (3) Il a pu-PRST.PERF y avoir de la glace au frigo.  
 'Based on the evidence I **have now** [cf. **present** perspective], **it was possible** that there was some ice cream in the freezer.'  
 PAST>POSS  
 EPIST. EVAL.= PRST VIEW POINT ASPECT
- (2) Il pouvait-IMP. y avoir de la glace au frigo.  
 'Based on the evidence I **had in the past** [cf. **past** perspective] , **it was possible** that there was some ice cream in the freezer.'  
 PAST>POSS  
 EPIST. EVAL.= PAST VIEW POINT ASPECT

### 3.4.2. Present perfect vs imperfective on MOD

- The analysis predicts that MOD is not interpreted the same way with a *passé composé* or an *imparfait* on it.

**The ice cream example.** Remember the context of the ice-cream example from von Fintel and Gillies (2008) (Context 1): Sophie is looking for some ice cream, and checks the freezer in  $t$ . There is none in there. She is then asked why she opened the freezer in  $t$ . Note that at U-T, Sophie knows that  $\neg P$ .

- **Observation:** in this context, Sophie's reply (1) translates in French with an imperfect on the modal, cf. (2); a present perfect would be infelicitous in the same context; cf. (3).

- (2) *Il pouvait y avoir de la glace au frigo.*  
 It-IMPERS. can-PAST.IMP. LOCAT-PRN have of the ice-cream in-the freezer.  
 'There might have been ice cream in the freezer'.
- (3) *#Il a pu y avoir<sub>IMP</sub> de la glace au frigo.*  
 It-IMPERS. can-PRES.PERF. LOCAT-PRN have of the ice-cream in-the freezer.  
 'There might have been ice cream in the freezer'.

- **Explanation** of the oddity of (3) in Context 1 (2 problems):

1. With PERF on MOD, EVAL-T= U-T. This is problematic, since Sophie knows in U-T that  $P/\Diamond P$  are false (given the conditions of assertability of epistemic modals, she should not).
2. Given that MOD is in the scope of *passé composé* (a **bounded** tense), (3) denotes a **past non-persistent possibility**, i.e. which has already reached its right frontier before U-T. As such, it is odd in this context because the **state of the freezer hasn't changed**. Why stating that the possibility of ice-cream-in-the-freezer existed in  $t$ , and is over afterwards?

- Let us now compare Context 1 with **Context 2**:

2. Sophie wants to check the freezer in  $t$ , but Paul stands in her way, takes something from the freezer (**the state of the freezer might have changed**, problem 2 solved)
1. Besides, Sophie cannot see what Paul took (she doesn't know in U-T whether  $P/\Diamond P$  are true, problem 1 solved)

Paul then asks why she wanted to open it. In this context, (3) is fine. In this situation indeed, it is rational from Sophie to justify her attempt by invoking a bounded (past) possibility to find ice-cream in the freezer, and she as an Evaluator is not sure that  $P/\Diamond P$  is false.

- **The imparfait in Context 1** is fine because with an imperfective on MOD

2. we take Sophie's perspective when she opened the freezer (EVAL-T is in the 'ignorant' past, problem 1 solved)
1. a modal sentence with the *imparfait* denotes a **past persistent possibility**, i.e. which can still hold in U-T. This answer thus **does not require** to be acceptable that the state of the **freezer changes** between  $t$  and U-T (problem 2 solved).

**Future adverbial in the adjacent.** We can explain the same way the contrast between (10) and (11):

(10) \**Votre voiture a très bien pu être détruite demain.*  
 Your car has very well can-PST.PP be destroyed tomorrow.  
 'Your car might very well have been destroyed tomorrow'.

(11) *Votre voiture pouvait être détruite demain.*  
 Your car can-IMPERF. be destroyed tomorrow.  
 'Your car might very well have been destroyed tomorrow'.

- Sentence (10) containing a *passé composé* on the modal, it describes a bounded (past) possibility that *P* takes place in ADJ-T: it is presented as over at U-T (i.e. MOD-T totally precedes U-T).

→ It is thus contradictory to locate ADJ-T after U-T by the adverbial *demain*: locating the possibility that *P* in the past, but *P* in the future generates a contradiction (if *P* is the case in *t*, then necessarily,  $\Diamond P$  is the case in *t*).<sup>14</sup>

- Sentence (11) containing an *imparfait* on the modal, it describes a unbounded (past) possibility. This *persistent* possibility can thus perpetuate until and after U-T.

→ The previous contradiction vanishes.

### 3.5. Proposal (IV): *Passé composé* vs infinitival perfect

The differences between sentences like (44) and (45) can also be identified and explained:

(44) *Pierre peut avoir pris le train.* (epistemic)  
 Pierre can-PRST have taken the train  
 'He might have taken the train'.

(45) *Pierre a pu prendre le train.* (epistemic)  
 Pierre can-PRST.PERF take the train.  
 'He might have taken the train'

- While the *passé composé* is always used as a **past**<sup>15</sup>, the **infinitival perfect** is much more **underspecified** wrt. Tense and Aspect:

- It can be used as a perfect wrt. a past **or** a future point (**no intrinsic past value**)
- It can **lose its perfect value** and translates in the infinitival domain all kinds of tensed pasts (cf. the Hofmann insight illustrated through the examples (14)-(19)).

→ Sentences like (45) systematically describe a **past bounded** possibility in MOD-T ('pu'), contemplated from the U-T ('a'), that *P* is verified in ADJ-T. ADJ-T **cannot** be situated in the future without generating a contradiction (since the possibility that *P* is presented as over at U-T).

→ Sentences like (44) systematically describes a **present unbounded** possibility in MOD-T=U-T, contemplated from the U-T, that *P* is verified in ADJ-T. ADJ-T **can** be situated in the future without generating a contradiction (the possibility that *P* being unbounded, it can continue after U-T).

- This reflects in several differences in the distribution of MOD-HAVE-Ss (cf.(44)) and HAVE-MOD-ones (cf. (45)).

<sup>14</sup>Cf. the reflexivity axiom  $\Box P \rightarrow P$  and the B axiom  $p \rightarrow \Box \Diamond P$  of modal logic.

<sup>15</sup>But see Section (4) for counter-examples to this general rule.

**Future adverbial in the adjacent.** Contrary to (44)-sentences, (45) ones accept a future adverbial in the adjacent:

- (9) *Votre voiture peut très bien avoir été détruite demain.*  
 Your car can-PRST very well have been destroyed tomorrow.  
 'Your car might very well have been destroyed tomorrow'.
- (10) *\*Votre voiture a très bien pu être détruite demain.*  
 Your car has very well can-PST.PP be destroyed tomorrow.  
 'Your car might very well have been destroyed tomorrow'.

Note that it is possible to state that the bounded possibility described by the *passé composé* is followed by another unbounded possibility of the same nature, and thus to cancel the implicature that one deals with a non-persistent possibility, cf. (46). In this case, the future adverbial becomes acceptable again:

- (46) *Votre voiture a très bien pu et peut très bien être détruite demain.*  
 Your car has very well can-PST.PP and can-PRST very well be destroyed tomorrow.  
 'It was and it is possible that your car is destroyed tomorrow'.

**The ice-cream example again.** As the infinitival perfect can lose its perfect value, (4) is OK in another variant of the von Fintel & Gillies' context (**context 3**): Sophie wants to check the freezer in *t*, but Paul stands in her way, this time without taking something from the freezer (**the state of the freezer does not changed**) and asks why Sophie wanted to open it. Note that in context 3, (2) is still not felicitous (cf. problem 2 above: why a bounded possibility if the state of the freezer hasn't changed?).

- (4) *Il peut y avoir eu de la glace au frigo. (context 3)*  
 It-IMPERS. can-PRES. LOCAT-PRN have had of the ice-cream in-the freezer.  
 'There might have been ice cream in the freezer'.
- (2) *#Il a pu y avoir de la glace au frigo. (context 3)*  
 It-IMPERS. can-PRES.PERF. LOCAT-PRN have of the ice-cream in-the freezer.  
 'There might have been ice cream in the freezer'.

## 4. Remaining Problems

### 4.1. Interpretation of tense/aspect on the infinitives

**Odd past adverbials in the adjacent.** Old observation (cf. e.g. Tasmowski 1980, p. 51): one cannot use a past adverbial in the adjacent with a present on the modal and a simple infinitive, cf. (47). The problem vanishes with a past on the modal, cf. (48).

- (47) *\*Pierre peut très bien être malade hier.*  
 Pierre can-PRST very well be ill yesterday.  
 'Pierre might very well be ill yesterday'.
- (48) *Pierre pouvait très bien être malade hier.*  
 Pierre can-PAST.IMP. very well be ill yesterday.  
 'Pierre might very well be ill yesterday'.

- One can explain the unacceptability of (47) in the following way<sup>16</sup>: by choosing a present on the modal (which then describes a present possibility), the speaker of (47) implicates that he wasn't in a position to use a stronger form, stating that the possibility already begun to occur in the past. One deduces that  $\Diamond P$  wasn't true in the past. But this generates a contradiction, because **MOD-T** should include the (past) interval of **ADJ-T** (when *P* is true, automatically,  $\Diamond P$  is true). This can also explain why (49) is much better than (47):

<sup>16</sup>The argument is of the same nature as the one used by Condoravdi (2002) to explain the use of the perfect in the counterfactual reading of *might have*.

(49) *Pierre peut très bien être malade hier et aujourd'hui.*  
 Pierre can-PRST very well be ill yesterday and today.  
 'Pierre might very well be ill yesterday and today'.

• The problem of this explanation is that it predicts that (50) should also be unacceptable, since according to the same argument, MOD-T is supposed not to take place in the past, while ADJ-T takes place in the past:

(50) *Pierre peut très bien avoir été malade hier.*  
 Pierre can-PRST very well have been ill yesterday.  
 'Pierre might very well have been ill yesterday'.

**Simple infinitive embedded under a Perfect modal.** An imperfect(ive) interpretation of the simple infinitive seems possible when the modal is under the scope of PERF. (the progressive *être en train de* is traditionally conceived as incompatible with the perfect):

(51) *Il a pu être en train de travailler.*  
 He has could be working  
 It is possible that he was working.

(52) ??*Il a été en train de travailler.*  
 He has had be working  
 He has been working.

## 4.2. Other Romances languages

The analysis cannot be extended to other Romance languages like Spanish at least. Two important differences:

- The epistemic reading is compatible with the Spanish perfective (Laca 2008, (45)), cf. (53)
- Spanish prefers the present on the modal to the 'perfect raising' linearisation (Laca *id.*, (49), cf. (54)): "the tendency to (overt) perfect raising is much more pronounced in French" (Laca *id.*)

(53) *Pedro pudo tomar el tren de las 3.50.*  
 Pedro can-PFTIVE take the train of the 3.50  
 'Pedro might have taken the 3.50 train'

(54) *Ha podido producirse un accidente.* (dispreferred)  
 can-PRES.PERF produce-REFL an accident  
 'There may have been an accident'

## 4.3. Is the *passé composé* always a past?

(uttered at 9.00):

(55) *Je pense que cet après-midi, on a mangé à deux heures.*  
 I think that this afternoon, we have eaten at two o'clock.  
 'I think that this afternoon, we will have eaten at two o'clock.'

## 4.4. Differences between *pouvoir* and *être possible que*

(56) \*Ta voiture a très bien pu être détruite demain.

(57) ?Il a été possible que ta voiture soit détruite demain.

(58) \*Pierre put très bien être malade.

(59) Il fut possible que Pierre soit malade.

## 5. Conclusions

- It is useful to distinguish MOD-T from EVAL-T to understand better the interaction between Tense and Modality
- the subtle distribution of tense/aspect morphology on French modals suggests that the reason that past modals resist an epistemic reading is not so much that epistemic modality cannot be in the scope of the past, but rather that epistemic modality is incompatible with perfective aspect (Boogaart 2007)
- present perfect forms are in principle compatible with this modality because they have non perfective readings.
- 'It is obvious that we don't have a good understanding of what happens when a modal is combined with temporal operators.' (Portner (2009), p.230)<sup>17</sup>

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