Temporal reasoning and modality

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1 Introduction

Empirical range two interpretations of possibility modal in the present perfect in French and Italian : *a pu* fr./ *ha potuto* it [1].

Claim The interpretations (epistemic and abilitative) depend on a temporal reasoning which involves actions, their consequences and their worlds. The temporal reasoning easily applies with the present perfect which grammaticalizes events and their consequent states.

1.1 Facts to be explained

French *a pu* + eventive predicates : epistemic (2-a) and abilitative (2-b) interpretation (e.g. Hacquard, 2006 ; Mari and Martin, 2007 ; Homer, 2009).

(1)   Jean **a pu** déplacer la voiture (epistemic and abilitative)
        John could$_{pres.perf}$ move the car
        'John might have moved / could move the car'

(2)   a.   D'après ce que je sais, Jean **a pu** déplacer la voiture (epistemic)
              'As far as I know, John might have moved the car'
        b.   Après tant d'efforts, Jean **a** finalement **pu** déplacer la voiture (abilitative)
              'After so many efforts, John could move the car'

Italian *ha potuto* + eventive predicates : the abilitative only.

(3)   Gianni **ha potuto** spostare la macchina (abilitative only)
        John could$_{pres.perf}$ move the car
        'John could move the car'

The abilitative reading in Italian is obligatorily associated with an 'actuality entailment' (Bhatt, 1999) : denying that the event denoted by the infinitival occurred results in a contradiction.

(4)   Gianni **ha potuto** spostare la macchina, #ma non lo ha fatto
        'Gianni could move the car, #but he didn't do it'

In French, the actuality 'entailment' is not obligatory :

(5)   a.   Jean **a pu** déplacer à la voiture, #mais il ne l'a pas fait
              'Gianni could move the car, #but he didn't do it'

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     b.   Le robot **a** même **pu** repasser les chemises à un stade précis de son développement, mais il ne l'a pas fait (Mari and Martin, 2007)
'The robot could even iron shirts at a precise stage of his development, but it didn't do it'

French and Italian, *a pu* and *ha potuto* + statives : epistemic interpretation.
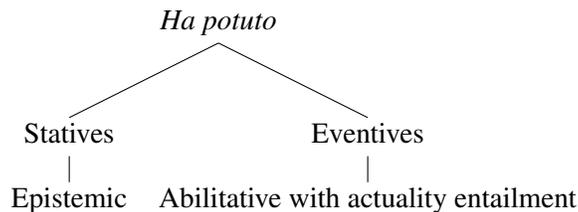
(6)   Jean **a pu** être malade et c'est pour cette raison qu'il n'est pas venu à la fête
'John might have been sick and for this reason he did not come to the party'

(7)   Gianni **ha potuto** essere malato ed è per questo che non è venuto alla festa
'John might have been sick and for this reason he did not come to the party'

Summary of the facts

(8)   French :
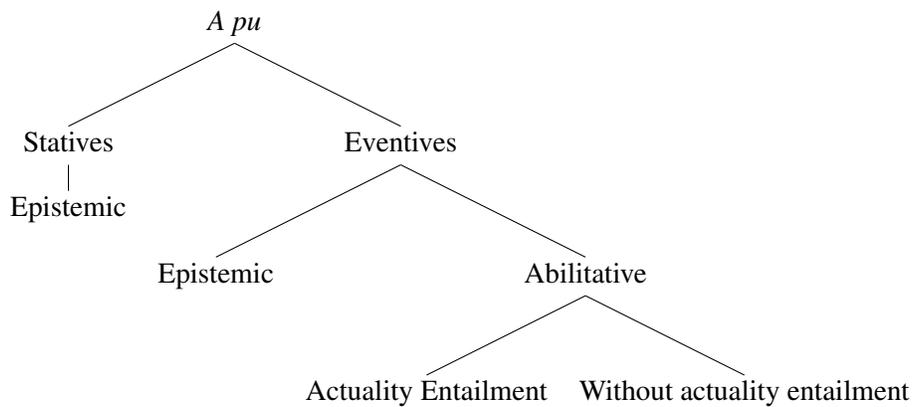
(9)   Italian

Immediate Questions

1. How to obtain two different interpretations for (1) ?
2. Why French and Italian differ (and what does the contrast teach us) ?
3. What is the role played by the present perfect ?

More general questions

1. What do these data tell us about the interpretation of epistemic modality ?
2. Where does the epistemic interpretation come from ?

1.2   The puzzle of epistemic modality in the present perfect : overview of the solutions

Epistemic modality requires indirect evidence (e.g. Kartunnen, 1972 ; Dendale and Tasmowski, 2001 ; von Fintel and Gillies, 2008).

The temporal location of the modal evaluation and the temporal location of the evidence generally coincide.

(10)   D'après ce que je sais (maintenant), Jean **peut** (maintenant) avoir pris le train (dans le passé)
       *'As far as I know (**now**), John may (**now**) have taken the train (**in the past**)'*

When (on the epistemic reading) *pouvoir* is in the present perfect the temporal location of the evidence and the temporal location of the modal do not coincide Hacquard (2006 :25).

(11)   D'après ce que je sais (maintenant), Jean **a pu** (dans le passé) prendre le train (dans le passé)
       *'From what I know (**now**), John might (**in the past**) have taken the train (**in the past**)'*

- Syntactic solution based on movement (Stowell, 2004 ; Hacquard, 2006 ; Laca, 2008) :
  - In order to make the time of the evidence and the time of the modal coincide, the modal is interpreted above tense
  - The modal interpretation takes place at the utterance time
- 'Lexicalist solution'
  - The epistemic modal is interpreted below aspect/tense (Boogaar, 2005 ; Homer, 2009), i.e. in the past.
  - The *imperfective* is a point of view aspect (epistemic interpretation takes place in the past) [2].
- 'Pragmatic solution'
  - There is no epistemic meaning coded by the modal. There is an epistemic inference.
  - The epistemic effect is obtained by reasoning on events and their consequences and the worlds in which they are located.

Here we focus on the present perfect ; for the imperfective, see Mari and Schweitzer (2010).

2   The syntactic explanation based on movement

Hacquard (2006).

(12)   Perfective : $[\![\text{PERFECTIVE}]\!]^w = \lambda P \lambda t_i . \exists e [e \in w \ \& \ t(e) \subset t \ \& \ P(e)]$

2.1   Circumstantial (abilitative) interpretation

(13)
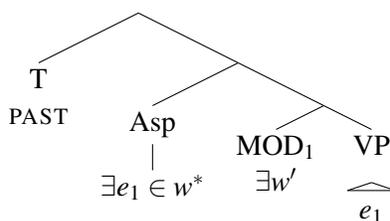
- The e_1 is closed at Asp.
- Asp comes with its own world argument (w^*)
- Circumstantial modal base is triggered by the event closed at Asp.

(14) $[\![(1)_{\text{circ}}]\!]^w = 1$ iff $\exists e [e \in w \& \tau(e) \subseteq t \{t \prec t^*\} \& \exists w'$ compatible with circumstances in w s.t. e is a moving-car event in $w']$
       Paraphrase : There is an actual event located at a past interval which, in some world w' compatible with the circumstances, is an event of moving the car by John

Principle of event identification : if an event e has property P in some world compatible with the circumstances, that it is an event P also in w.

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2. Martin (2009) has suggested along the lines of Boogaar (2005) that the present perfect is also a point of view aspect, but no analysis is provided for this label.

2.2 Epistemic interpretation

(15)
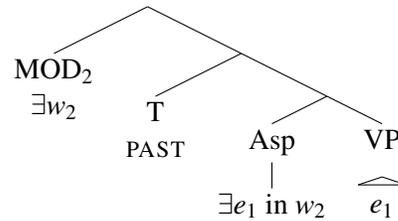
(16) $[[(1)_{\text{epist}}]]^{w,B,\leq,c}$ is 1 iff $\exists w'$ compatible with what is known in w such that $\exists e[e$ in w' &
$\tau(e) \subseteq t\{t \prec t^*\}$ & $move(e, j, w')]$
Paraphrase : There is a world w_2 compatible with what is known in w such that there is an event in w_2 that
occurred in the past and which was an event of moving the car.

Note : epistemic modal base is triggered by the speech event which is located in the present, where the modal is
evaluated.
A consequence According to syntactic movement based solutions, the epistemic interpretations of the modality
in the present (17) and the present perfect (18) are the same. The modal evaluation coincides with the temporal
localization of the evidence.

(17) Jean **peut**$_{pres}$ avoir pris$_{perfect}$ le train
'John may have taken the train'

(18) Jean **a pu**$_{pres.perfect}$ prendre$_{pres}$ le train
'John might take the train'

Other facts explained Past morphology determines the time of the event and not the time of the modal evaluation.
Laca (2008) :

(19) a. Marie a écrit$_{\text{PRES.PERF}}$ / *écrivait$_{\text{IMPERF}}$ ce roman en moins d'un an
'Mary has written / was writing this novel in less than a year'
b. Marie a dû$_{\text{PRES.PERF}}$ écrire ce roman en moins d'un an. OK EPISTEMIC
'Mary had to write this novel in less than a year'
c. Marie devait$_{\text{IMPERF}}$ écrire ce roman en moins d'un an. *EPISTEMIC
Mary had to write this novel in less than a year

3 On the relation between (17) and (18)

Question : Can we tease apart the epistemic interpretations of (17) and (18) (repeated here as (20) and (21)) ?

(20) Jean **peut**$_{pres}$ avoir pris$_{perfect}$ le train
'John may have taken the train'

(21) Jean **a pu**$_{pres.perfect}$ prendre$_{pres}$ le train
'John might take the train'

3.1 The argument from ILP : a good one ?

Zwarts (2007) had noted that with ILP (Carlson, 1977) the present perfect is strange because it implies that the state
of having blue eyes is verified during a part of John's life (22). Martin (2009) points the same fact for French.

(22) #Jean a eu$_{\text{PRES.PERF}}$ les yeux bleu
'John had blue eyes'

The author claims that the oddity disappears with an infinitival perfect ILP.

(23)   Il peut$_{\text{PRES}}$ avoir eu$_{\text{PERF}}$ les yeux bleus
         He may have had blue eyes

However, we note that the oddity disappears also with *a pu* :

(24)   Il a très bien pu avoir les yeux bleus *'He might have blue eyes'*

- Not a good argument for teasing apart (20) and (21).
- Is it a good argument for proving that the present perfect does not bound the embedded event (i.e. argument against e.g. Laca, 2008) ? The embedded event must be bounded no matter whether stative (25-b) or eventive (25-a).

(25)   a.   Il **a pu** prendre la voiture *'He could take the car'*
         b.   Il **a pu** être albinos (he must be dead) *'He might have been albinos'*

- If the embedded eventuality cannot be bounded the use of the modality in the present perfect is not allowed.

(26)   Scenario : the police speculates about the causes of an accident that has just taken place. One of policemen utters :
         '#La route **a pu** être droite'
         'The street might have been straight'

The sentence is odd since it is very unlikely that the street has changed its trajectory in a few hours.

Conclusion
 – The ILP argument shows that present perfect does not have the same effect with or without the modality (no matter whether above or below the modal).
 – The event must be bounded.
 – This effect is derived compositionally without assuming movement.

3.2   A contrast

• (20) and (21) cannot be treated on a par.

(27)   a.   Jean **a pu**$_{\text{PRES.PERF}}$ être récompensé$_{\text{PRES}}$ de la médaille Fields au moment où il est entré au CNRS
                'John migh have been awarded the Fields medal when he entered the CNRS
         b.   Jean **peut**$_{\text{PRES.PERF}}$ avoir été récompensé$_{\text{PERF}}$ de la médaille Fields au moment où il est entré au CNRS
                'John migh have been awarded the Fields medal when he entered the CNRS [3]

Only (27-b) is compatible with the interpretation according to which John has already received the medal before entering the CNRS.

4   On the structural differences between the epistemic and abilitative interpretation of (1)

Question : is there ground for assuming that the closure of the embedded event takes place outside the modal for the circumstantial reading of (1) ?

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3. I thank Benjamin Spector for discussing with me many versions of this contrast, which was first found in Mari (2009).

4.1 The traditional control-raising distinction

The tradition : there are two types of modals, raising and control modals (for French only : Sueur, 1979 ; Tasmowski, 1980 ; Guimier, 1984, Rooryck, 1989).

– Raising modals are epistemic
– Control modals are root modals (they require an agent and an action)

Impersonal constructions are only compatible with the epistemic reading (Tasmowski, 1980).

(28)   a.   Il doit / peut venir / y avoir 36 personnes à cette réunion
              'There must / can be 36 people at this meeting'
        b.   Il doit/peut s'avérer que cela est vrai
              'It must / can turn out that this is true'

In formal terms - Brennan (2003). Modals have different types : if they are merged at the VP level, they take a complement of type <e,st> (and they get a root interpretation). Or, they can be merged at the IP-level, take a complement of type <st> and get an epistemic meaning.

4.2 More recent discussion : The deontic

From discussion in Wumbrandt, 1999 :

1. Impersonal constructions are compatible with the deontic interpretation

   (29)   a.   Il **peut** y avoir une fête pour autant qu'il n'y ait pas de bruit
                 'There can be a party, provided there is no noise'
           b.   Il **a pu** y avoir une fête grace à l'intervention de la mairie *'There could be a party thanks to the city hall intervention'*

2. Subject of control verbs with an infinitive in the passive cannot be inanimate. It can be inanimate with a deontic modal.

   (30)   a.   The biscuits seem to have been finished by Paul
           b.   *The biscuits tried/decided to be finished by Paul
           c.   The biscuits may be finished by Paul (Warner 1993)

   For *pouvoir* in the present perfect

   (31)   Les biscuits ont pu être finis par Jean facilement (OK ROOT INTERPRETATION)
           'The biscuits could be easily finished by John'

Conclusion : deontic interpretation can be raising.

A note : Impersonal constructions, deontics and eventives
- Impersonal constructions are not compatible with deontic readings if the predicate is eventive.

(32)   a.   Il **peut** arriver que cela se passe
              It might happen that this happens'
        b.   Il **a pu** arriver que cela se passe
              'It might have happened that this happens'

(33) a. *Il **peut avoir** lieu une fête, pour autant qu'il n'y ait pas de bruit
          Lit. *'There can take place a party, provided that there is no noise'*
      b. *Il **a pu** avoir lieu une fête, grâce à l'intervention de la mairie
          Lit. *'There could take place a party, thanks to the intervention of the city hall'*

- (34) can have a non-epistemic interpretation provided a certain degree of agentivity is allowed.

(34) Il **a pu** pleuvoir
      'It could rain'

Hence :
  – **deontic** ok with **statives** ;
  – if the predicate is **eventive**, then **epistemic** interpretation

For more on the thesis that statives provide propositions, see Copley, 2006.

4.3   What about abilitative ?

4.3.1   Thomason's observation for *can* (2005)

We extend the observation to French *a pu* : abilitative *a pu* does not scope over a proposition but assigns a thematic role.

(35) Jean **a pu** ouvrir la boîte
      'John could open / might have opened the box'

(36) a. Il **a été possible** que Jean ouvre la boîte (epistemic)
          Lit. *'It has been possible that John opened the box'*
      b. Il **a été possible pour** Jean d'ouvrir la boîte
          Lit. *'It has been possible for John to open the box'*

4.3.2   The argument from left-dislocation

Guimier (1984) has argued that (37) has uniquely an abilitative interpretation.

• *Pouvoir* in the present

(37) Aller à la pêche, Jean le **peut**$_{pres}$ (abilitative only)
      Lit. *'To go fishing, John this can'*

Hypothesis : (although not stated in these terms by Guimier) in the abilitative reading the modal takes a property of events and not a proposition.

• *Pouvoir* in the present perfect
  French speakers do not accept left dislocation with the present perfect [4].

(38) ? ?Aller à la pêche, Jean l' **as pu**$_{pres.perf}$
      Lit. *'To go fishing, that John could'*

• Comparison with Italian
In Italian left-dislocation is acceptable with *potere* in the present (39) *and* the present perfect (40) :

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4. This contrasts with my first erroneus description (Mari, 2009a), and I thank all the colleagues that have commented on my previous work, signaling that the data were to be revised. I thank in particular Danièle Godard, Olivier Bonami, Claire Beyssade, Benjamin Spector and David Nicolas.

(39)   Andare a pesca, lo **può**$_{pres}$
         Lit. *'To go fishing, that he can'*

(40)   Andare a pesca, lo **ha potuto**$_{pres.perf}$!
         Lit. *'To go fishing, that, he could'*

However, the dislocation is not allowed when only the epistemic reading is available, as with statives (the sentence is acceptable only if a coercion is operated from the stative to the eventive interpretation).

(41)   ? ?Essere bella, lo **può**$_{pres}$
         Lit. *'To be beautiful, that she can'*

(42)   ? ?Essere bella, lo **ha potuto**$_{pres.perf}$
         Lit. *'To be beautiful, that she could'*

4.3.3   What does this correlate with ?

• *Ha potuto* + *eventive*, with an abilitative reading (43-b), behaves like a 'control' verb (43-a) : they are ok with left dislocation.

(43)   a.   Essere malato, lo **vuole** (control)
            Lit. *'To be sick, (he) wants'*
        b.   Andare in bici, lo **ha potuto** (abilitative)
            Lit. *'To bike, he this could'*

(44)   a.   *Essere malato, lo **sembra** (raising)
            Lit. *'To be sick, (he) seems'*
        b.   *Essere bello, lo **ha potuto** (epistemic)
            Lit. *'To be beautiful, he this could'*

• *A pu* + *eventive* behaves like a raising verb (45-b).

(45)   a.   Etre malade, il le **veut** (control)
            Lit. *'To be sick, (he) wants'*
        b.   *****Aller à vélo, il l' **a pu** (abilitative)
            Lit. *'To bike, he this could'*

(46)   a.   *Etre malade, il le **semble** (raising)
            Lit. *'To be sick, (he) seems'*
        b.   *Etre beau, il l' **a pu** (epistemic)
            Lit. *'To be beautiful, he this could'*

4.3.4   What analysis for the Italian abilitative case ?

• We follow Chierchia (1989) in assuming that, in Italian with *de se* reading, in control constructions (47-a), the verb selects a property of events (<s,et>).

(47)   a.   Gianni vuole mangiare -   property of events
            'Gianni wants to eat'
        b.   Gianni vuole che Sofia mangi -   proposition
            'Gianni wants that Sophie eats'

(48)   a.   Gianni vuole$_{<x,<s,et>>}$ mangiare
            'Gianni wants to eat'
        b.   Gianni ha potuto$_{<x,<s,et>>}$ spostare il tavolo
            'Gianni could move the table'

4.3.5 Conclusion

- French *a pu*
  - on both the epistemic and abilitative interpretations scopes over a proposition (there is one LF for the epistemic and abilitative interpretation)
- Italian *ha potuto*
  - **Epistemic** reading
    - scopes over a *proposition*
    - requires *statives*
  - **Abilitative** reading
    - takes *properties of events*
    - requires *eventives*

- We do not extend to French abilitative *a pu* the analysis for abilitative Italian *ha potuto*.

5 Analysis

5.1 The present perfect

The *passé composé/passato prossimo* in French and Italian :

1. Perfective ;
2. Present perfect (see, among many others, Kamp and Reyle, 1993 ; Lusher, 1998 ; Mittwoch, 2008 ; Pancheva and von Stechow, 2004 ; Sthioul, 2000 ; de Swart, 2007 ; Schaden, 2009 ; Vet, 1992)[5].

We adopt Kamp and Reyle (1993) and de Swart (2007) classical positions for the *perfect* in French (see also Schaden, 2009).
  - The **perfect** operates on an eventuality e and introduces the state e' of that eventuality as immediately following e. It establishes a relation of strict anteriority between the two eventualities.
  - The perfect is tense neutral (and generalizes over the present, past and future[6]).
  - The **present** component of the present perfect locates the consequent state at the utterance time.

5.2 The temporo-aspectual structure and the lexical entries

$\Diamond$ symbolizes **subjunctive** modality (i.e. modality that is neither epistemic nor deontic).
In particular, we consider here worlds that are **nomologically** similar (i.e. obey the same laws).

(49) $PRES(PERF(\Diamond(PRES/PERF(P_{eventive/stative}))))$

(50) a. Il a pu$_{pres.perf}$ pleuvoir$_{pres}$
          It might have rained
      b. Il a pu$_{pres.perf}$ avoir plu$_{perf}$
          It could had rained [7]

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5. In the French literature, the distinction between 'passé composé de l'antériorité' (perfective) and 'passé composé de l'accompli' (present perfect) goes back to Benveniste 1966/1974.

6. For the future perfect in Italian, see Mari, 2009b.

7. See Mari (2009a) for examples and analysis.

5.3 The explanation informally

The reasoning relies on past events and their consequent states

The speaker utters [8] :

(51) a. Il **a pu** pleuvoir (abilitative and epistemic)
          'It could rain / It might have rained'
      b. **Ha potuto** piovere (abilitative)
          'It could rain'

For French :
Underspecified interpretation : there is a nomologically similar world in which it has rained and there is an **unspecified world in which the result of raining persists**.

Two possible specifications (in context) :

1. **Abilitative interpretation** The result of raining persists **in the actual world**. If the result of raining persists **in the actual world**, then it has rained in the actual world.

2. **Epistemic interpretation** It has rained in some accessible world and the result also holds **in some accessible world**. The speaker cannot conclude that this accessible world is the actual world, nor exclude it.

For Italian :
The lack of ambiguity is due to the fact that the auxiliary tells us in which world the consequent state persists.

5.4 The composition

Lexical entries

(52) Lexical entries [9]

$\llbracket VP \rrbracket : \lambda w \lambda e[P(e,w)]$
$\llbracket pouvoir/potere \rrbracket = \lambda p \lambda w \lambda t \exists t'[R(w',w) \wedge p(w',t)]$ [10]
$\llbracket present \rrbracket = \lambda p \lambda w \exists t[n \subseteq t \wedge p(w,t)]$
$\llbracket perfect \rrbracket = \lambda p \lambda w \lambda t \exists t', e'[t' \prec t \wedge Q(e') \wedge t \subseteq \tau(e',w) \wedge p(w,t')]$

5.4.1 Case 1 : embedded proposition

(53) a. Il **a pu** déplacer la voiture (abilitative - epistemic)
          'He could move/might have moved the car'
      b. **Ha potuto** essere malato (epistemic)
          'He might have been sick'

– MOD scopes over a proposition (the event is existentially closed at VP)

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8. Under the abilitative interpretation the 'agent' is 'the weather'. As an illustration of this use :

(i) Ora mi chiedo : come ha potuto nevicare a Pescara e, in generale sulla costa, a Roma, con tali termiche ?
     'I am wondering : how could it snow in Pescara and, in general, on the coast, in Rome, with such temperatures ?'
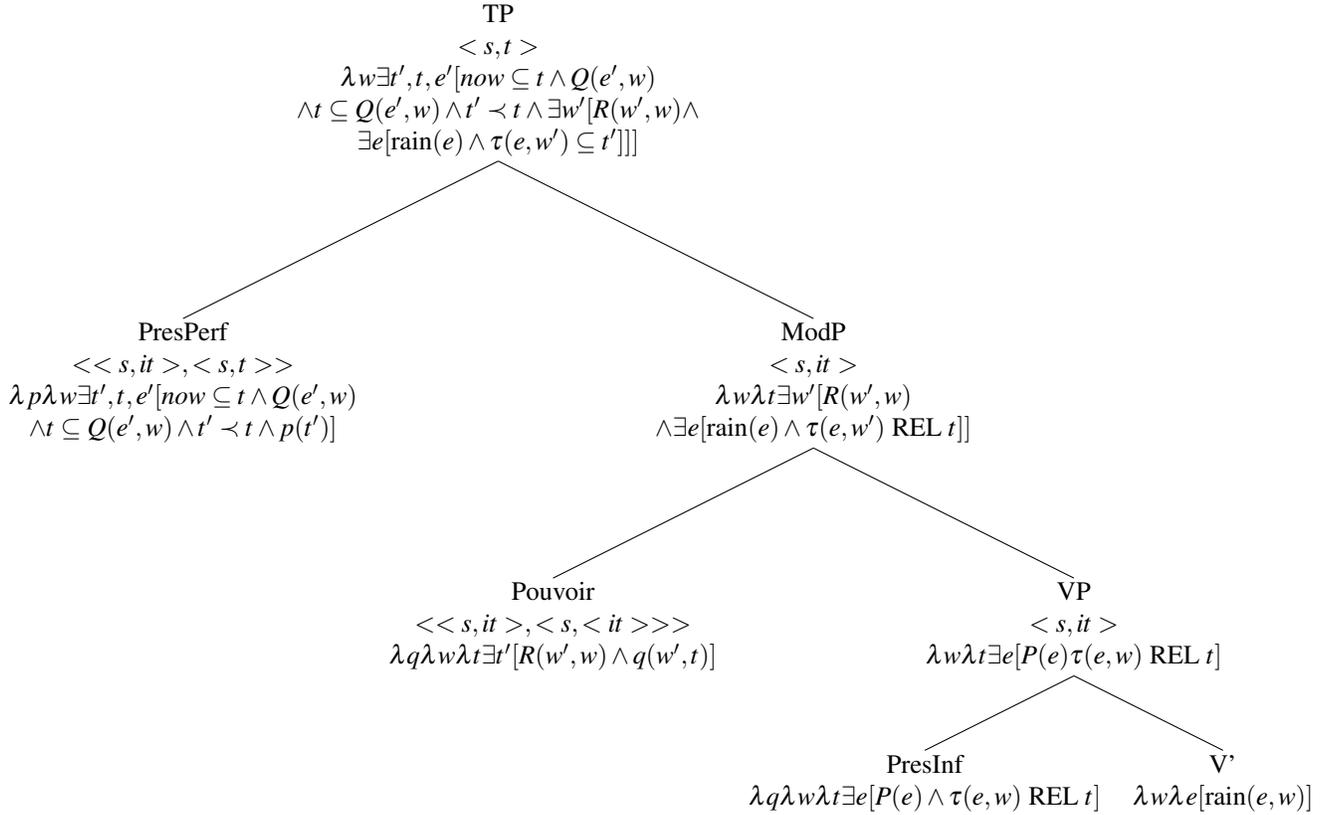
www.abruzzometeo.it/forum/showthread.php?p=182133

9. These are standard lexical entries, see e.g. Condoravdi, 2001 and recently Schaden, 2009.

10. Modals are temporally inert in French/Italian (vs. Condoravdi, 2001) : they do not forwardshift the event description and the temporal location of the event is left unspecified until the present perfect combines.

– The temporal specification of the temporal trace of e in w' is unspecified until the present perfect is combined :
REL is specified as $\subseteq$

(54)

TP
$<s,t>$
$\lambda w \exists t',t,e'[now \subseteq t \wedge Q(e',w)$
$\wedge t \subseteq Q(e',w) \wedge t' \prec t \wedge \exists w'[R(w',w) \wedge$
$\exists e[\text{rain}(e) \wedge \tau(e,w') \subseteq t']]]$

PresPerf
$<<s,it>,<s,t>>$
$\lambda p \lambda w \exists t',t,e'[now \subseteq t \wedge Q(e',w)$
$\wedge t \subseteq Q(e',w) \wedge t' \prec t \wedge p(t')]$

ModP
$<s,it>$
$\lambda w \lambda t \exists w'[R(w',w)$
$\wedge \exists e[\text{rain}(e) \wedge \tau(e,w') \text{ REL } t]]$

Pouvoir
$<<s,it>,<s,<it>>>$
$\lambda q \lambda w \lambda t \exists t'[R(w',w) \wedge q(w',t)]$

VP
$<s,it>$
$\lambda w \lambda t \exists e[P(e) \tau(e,w) \text{ REL } t]$

PresInf
$\lambda q \lambda w \lambda t \exists e[P(e) \wedge \tau(e,w) \text{ REL } t]$

V'
$\lambda w \lambda e[\text{rain}(e,w)]$

The present perfect set an event in the past w.r.t. the speech time and provides the consequent state at the speech time ; the imperfect spreads the event in its scope on an interval whose left boundary is in the past w.r.t. the speech time

• Rule of temporal specification :

(55) $\lambda w \lambda t \lambda t'[t' \prec t \wedge \exists e(\tau(e,w) \text{ REL } t)]$

(56)   a. $REL = \subseteq$ if the event is in the scope of the present/past/future perfect ;
        b. $REL = \supseteq$ if the event is in the scope of the imperfect (for the analysis of the imperfect see Mari and Schweitzer, 2010)

5.4.2 Case 2 : Embedded properties of events

(57)   **Ha potuto** spostare la macchina (abilitative with actuality entailment)
        'He could move the car'

    – MOD takes properties of events, i.e. the event is not closed at VP ;
    – The temporal specification of the temporal trace of e in w' is unspecified until the present perfect applies :
      REL is specified as $\subseteq$

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(58)

TP
$< s, t >$
$\lambda w \exists t', t, e', e[now \subseteq t \wedge Q(e', w)$
$\wedge t \subseteq Q(e', w) \wedge t' \prec t \wedge in(e, w, t) \wedge \exists w'[(R(w', w) \wedge rain(e, w') \wedge \tau(e, w') \subseteq t')]]$

PresPerf
$<< s, < it >>, < s, t >>$
$\lambda p \lambda w \exists t', t, e', e[now \subseteq t$
$\wedge Q(e', w)$
$\wedge t \subseteq Q(e', w) \wedge t' \prec t \wedge in(e, w, t) \wedge p(t')]$

ModP
$< s, < it >>$
$\lambda w \lambda t \lambda e \exists w'[R(w', w) \wedge rain(e) \wedge \tau(e, w') \text{ REL } t]$

Pouvoir
$<< s, et >, < s, it >>$
$\lambda q \lambda w \lambda t \exists t'[R(w', w) \wedge q(w', t)]$

VP
$< s, et >$
$\lambda w \lambda e[rain(e, w) \wedge \tau(e, w) \text{REL} t]$
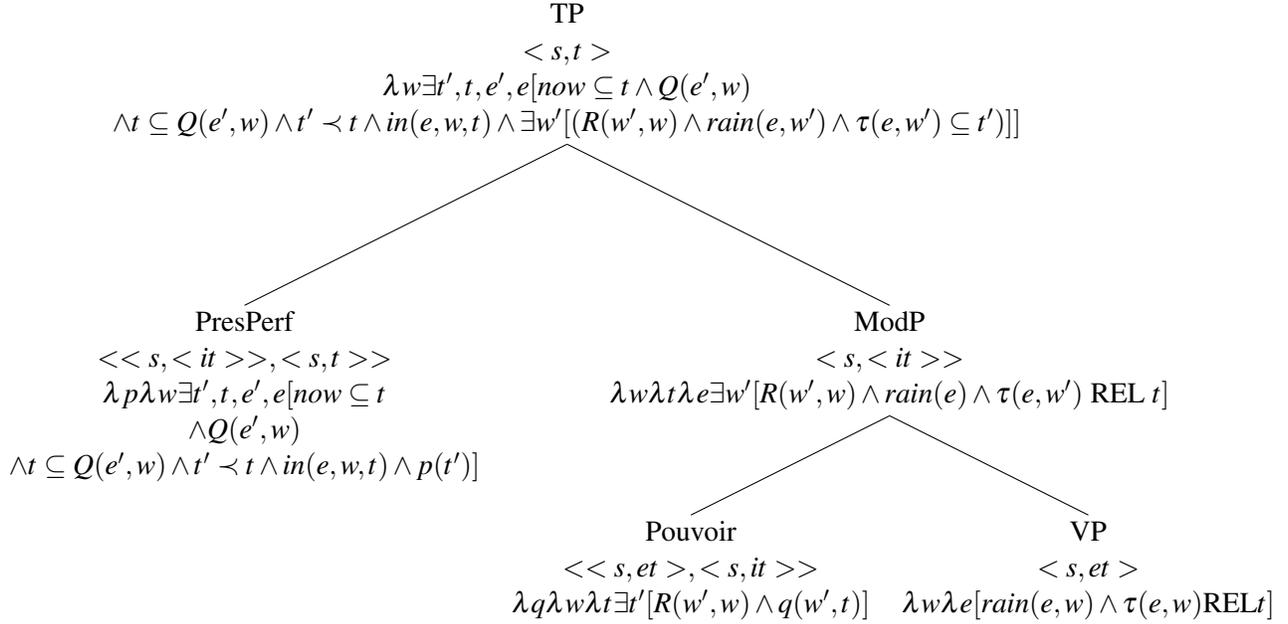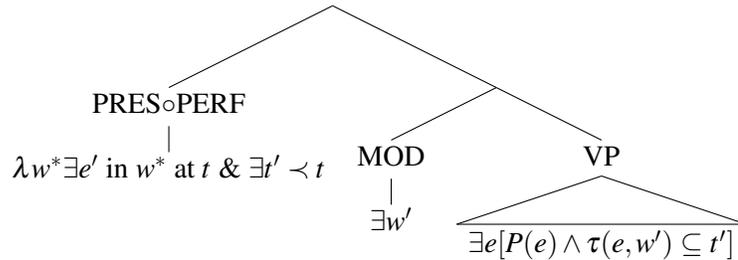
6 Explaining the facts

Simplified representations.

6.1 *A pu* + eventive/stative - *ha potuto* + stative

(59) a. Il **a pu** déplacer la voiture (abilitative - epistemic)
            'He could move/might have moved the car'
       b. **Ha potuto** essere malato (epistemic)
            'He might have been sick'

The modal in the present perfect scopes over a *proposition*.

(60)

PRES∘PERF
$\lambda w^* \exists e'$ in w^* at t & $\exists t' \prec t$

MOD
$\exists w'$

VP
$\exists e[P(e) \wedge \tau(e, w') \subseteq t']$

Paraphrase There is an event *e* that took place at t' in world w' and there is a consequent state e' that holds at the utterance time *t* in w^*.

Abilitative reading Instantiation : $w^* = w_0$ There is an event *e* that took place in the past at t' in world w' and there is a consequent state e' that holds at the utterance time *t* in *w*.

Temporal Inference : if the consequent state holds in the actual world, the event (of which it is a consequent state of) must also hold in the actual world.

- Question [11] : *why is the modal used ?*
  - *First hypothesis* : the modal signals indirect access to the event. The speaker knows that the consequent state holds in the actual world and calculate that the causing event must also hold in the actual world.
  - *Objection* : one can utter *Jean a pu déplacer la table/Gianni ha potuto spostare il tavolo* ('John *could move* the table') even though she has seen John moving the table.
  - *Answer* I cannot state that John has moved the table until the action was completed and once completed, I have no longer access to the action itself [12]. Hence, the access to the action is always indirect.
  - *Objection 2* : What is the difference between *Gianni ha spostato il tavolo* ('John *has moved* the table') and *Gianni ha potuto spostare il tavolo ?* ('John *could move* the table') ?
  - *Answer 2* : By using the modal the speaker signals that the moving of the table requires a particular world in which some circumstances where met, e.g. a world in which John tried, made an effort ... (see also Thomason, 2005).

Epistemic reading Instantiation : $w^* = w''$. The speaker states that there is a nomologically accessible world w'', such that the consequent state Q holds there [13].

Epistemic Inference By not binding the consequent state Q of P to the actual world w_0, the speaker cannot state that the actual world is the one in which the consequent state Q holds.
- However, since it is not excluded that $w'' = w_0$ epistemic uncertainty follows.

Comparison with classical view of epistemic modality Kratzer (1991,2009) / Hacquard (2006) view :
  - Modals introduce a quantification over possible worlds. The set of possible worlds is determined relatively to a world of evaluation, which is the actual world.
  - Sets of possible worlds are distinguished w.r.t. different bases : circumstances (circumstantial modality), knowledge (epistemic modality), laws (deontic modals), etc ...
  - Epistemic modals : the world of evaluation is the actual world. The proposition is true in the actual world iff it is true in some/all worlds which are compatible with what the speaker knows ...
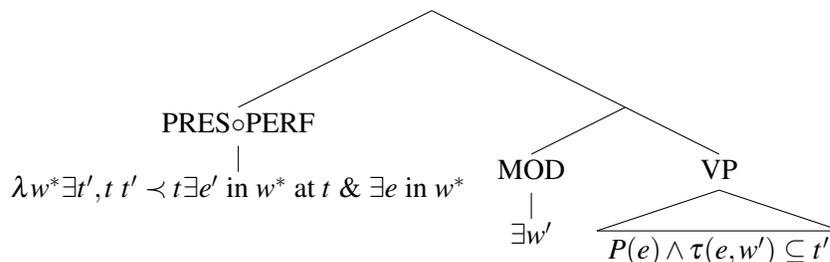
Present theory
  - We keep a classical modal framework : sets of worlds and accessibility relations.
  - The proposition is true **in an accessible world** (and not necessarily in the actual world) (see Cappellen and Lepore, 2005).
  - The speaker has no ground for excluding that $w'' = w_0$
  - Epistemic interpretation hinges on the availability of nomological alternatives.
  - **The speaker does not know in which world he/she is (one in which the consequent state persists or not)**.

6.2 *Ha potuto* + eventive

(61)   **Ha potuto** spostare la macchina (abilitative with actuality entailment)
         'He could move the car'

(62)

PRES∘PERF

$\lambda w^* \exists t', t\ t' \prec t \exists e'$ in w^* at t & $\exists e$ in w^*

MOD   VP

$\exists w'$

$P(e) \wedge \tau(e, w') \subseteq t'$

---

11. This question can also be addressed to Hacquard's style accounts.
12. This would explain why eventives are difficult with the present, whereas the present is fine with statives ...
13. Since w' cannot be existentially bound twice, we introduce a world w'' (which is accessible from/to or is equal to w')

Paraphrase In the present, in world w^*, there is consequent state and there is its causing event. There is a world in which this event is a P event and has occured in the past.

Prediction of non ambiguity in Italian (between epistemic and abilitative) :
Ha potuto is restructuring in Italian (the auxiliary of *potere* is the auxiliary of the verb in the embedded infinitival)

(63)   Gianni **è potuto** venire
       'John could come'

The auxiliary tells us that the result is the one of the *non modalized event*. Hence the world of the result w^* can **only** be w_0. This is expected by the fact that the event e takes place at w_0.

Since the world of evaluation cannot be a nomologically accessible world w'', the epistemic reading is not allowed.

Remarks   - The event e' (not only its result) is located in the actual world.
- The description of the event is provided in a world accessible from the actual one, and, since the existential quantifier binds both occurrences of the event, we know that this is the same event (as for Hacquard, 2006).
However, there are no extra assumptions, in particular :
   – there is no need to assume that aspect comes with its own event ;
   – there is no movement of the event, but existential closure above the modal follows from rules of composition.

6.3   Conclusion

Temporal reasoning : localization of the consequent state e' - as either in w_0 or w'' - provides information about the localization of the event e.

   – all heads are interpreted *in situ*
   – no semantic ambiguity of the modality which is nomological modality
   – the world of evaluation is not necessarily the actual world
   – epistemic inference

7   Other predictions of the analysis

   1. Differences regarding the inferences associated with the abilitative interpretation in Italian and French

   2. Explain the ILP argument

   3. Explain the abductive reasoning (Mari and Martin, 2007 ; Piñón, 2009) -see Mari, 2009a.

7.1   Cancellation of the actuality inference

A pu / Ha potuto + eventives.

French   - Fact : in French, the 'actuality entailment' can be cancelled.

(64)   a.   Jean **a pu** déplacer à la voiture, #mais il ne l'a pas fait
            'Gianni could move the car, #but he didn't do it'
       b.   Le robot **a** même **pu** repasser les chemises à un stade précis de son développement, mais il ne l'a pas
            fait (Mari and Martin, 2007)
            'The robot could even iron shirts at a precise stage of his development, but he didn't do it'

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- Explanation : Under the abilitative interpretation $w^* = w_0$. However, one is allowed to know that the consequent state does not obtain in w_0 (i.e. there were no shirts ironed). It is still possible that in an accessible world the robot ironed shirts. What is known is that the result state does not hold in the actual world. (NB : under the epistemic reading the speaker does not know whether the result state holds in w_0).

- Summarizing . . .

1. e' is in w_0 : the event e took place in w_0 (abilitative reading with actuality entailment)

2. e' is in w" which can either be equal or different from w_0 : the speaker does not know whether w" $= w_0$. (epistemic reading)

3. The result state does not hold in w_0, nonetheless the event was possible in an accessible world (abilitative reading without actuality entailment)

Italian   - Fact : the actuality entailment is obligatory.

- Explanation : the state *and* the causing event hold in the actual world. Should one know that the consequent state and the event have not taken place, the use of the modal would no longer be felicitous.
- Summarizing . . .

1. e' and e are in w^*. e' is a non modalized consequent state (i.e. e' is in w^*)

+ statives   Statives provides propositions (see Asher, 1993 ; Copley, 2006).

7.2   ILP

The observation : in absence of modality, the ILP is not compatible with lifetime effects.

(65)   #Il a eu$_{\text{PRES.PERF}}$ les yeux bleus
         'He had blue eyes'

(66)   Il peut$_{\text{PRES}}$ avoir eu$_{\text{PERF}}$ les yeux bleus
         He might have had blue eyes

(67)   Il a très bien pu avoir les yeux bleus *'He might have blue eyes'*

Explanation : this depends on the domain of quantification of the existential quantifier. In (65) the maximal set of times is the lifetime of the individual. Considering that worlds are maximal sets of times, the domain of quantification of the present perfect is an entire history.
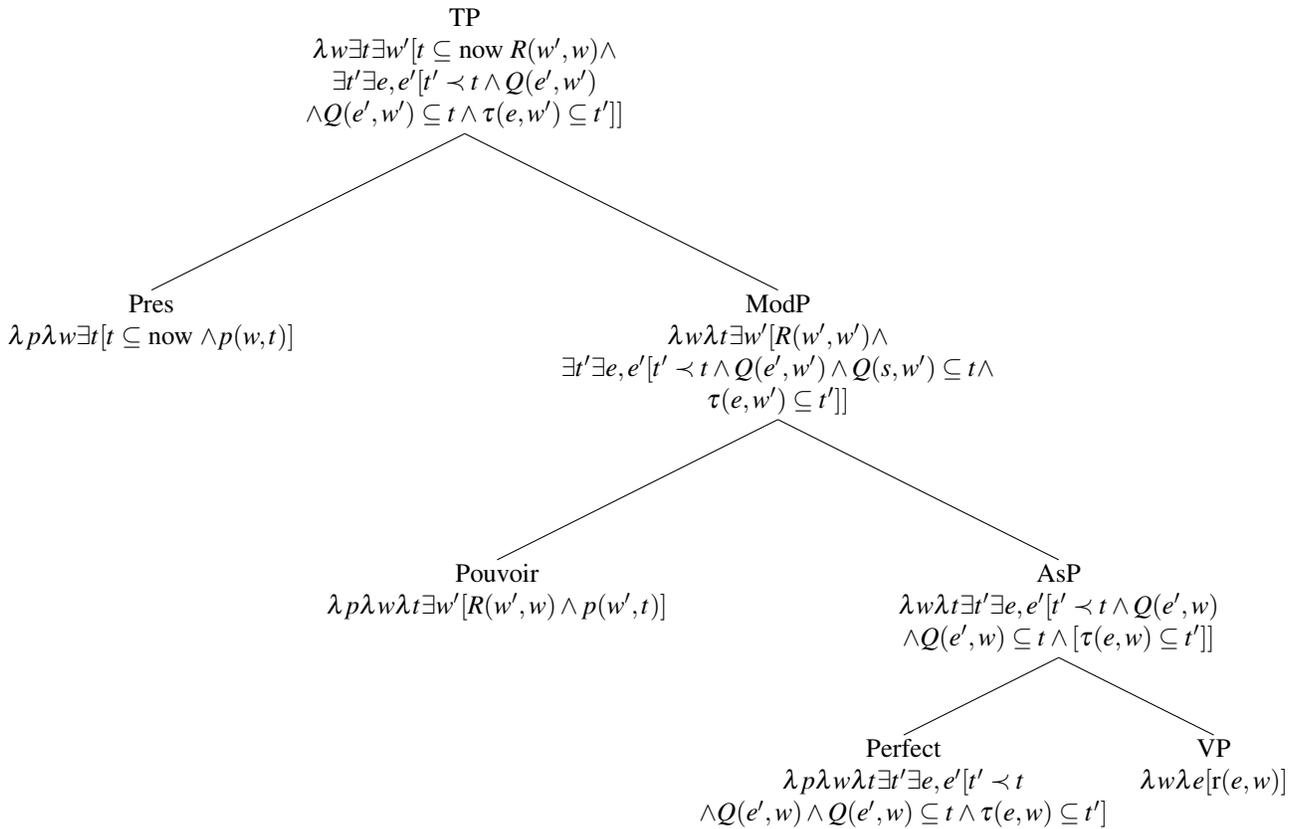
7.3   The modal in the present

Back to the contrast in (27-a)-(27-b) (repeated here as (68-a)-(68-b)) :

(68)   a.   Jean **a pu**$_{\text{PRES.PERF}}$ être récompensé$_{\text{PRES}}$ de la médaille Fields quand il est entré au CNRS
                'John migh have been awarded the Fields medal when he entered the CNRS
         b.   Jean **peut**$_{\text{PRES.PERF}}$ avoir été récompensé$_{\text{PERF}}$ de la médaille Fields quand il est entré au CNRS
                'John migh have been awarded the Fields medal when he entered the CNRS

Only (68-b) is compatible with the interpretation according to which John has already received the medal before entering the CNRS.
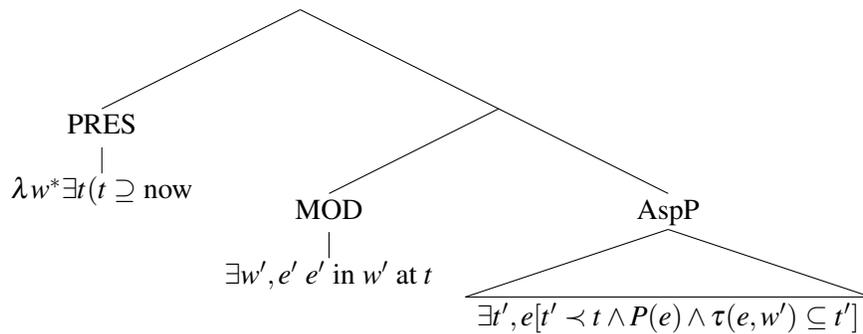
(69)

TP
$\lambda w \exists t \exists w'[t \subseteq \text{now } R(w',w) \wedge$
$\exists t' \exists e, e'[t' \prec t \wedge Q(e',w')$
$\wedge Q(e',w') \subseteq t \wedge \tau(e,w') \subseteq t']]$

Pres
$\lambda p \lambda w \exists t[t \subseteq \text{now} \wedge p(w,t)]$

ModP
$\lambda w \lambda t \exists w'[R(w',w') \wedge$
$\exists t' \exists e, e'[t' \prec t \wedge Q(e',w') \wedge Q(s,w') \subseteq t \wedge$
$\tau(e,w') \subseteq t']]$

Pouvoir
$\lambda p \lambda w \lambda t \exists w'[R(w',w) \wedge p(w',t)]$

AsP
$\lambda w \lambda t \exists t' \exists e, e'[t' \prec t \wedge Q(e',w)$
$\wedge Q(e',w) \subseteq t \wedge [\tau(e,w) \subseteq t']]$

Perfect
$\lambda p \lambda w \lambda t \exists t' \exists e, e'[t' \prec t$
$\wedge Q(e',w) \wedge Q(e',w) \subseteq t \wedge \tau(e,w) \subseteq t']$

VP
$\lambda w \lambda e[\text{r}(e,w)]$

$r = $ 'être recompensé de la médaille Fields' (*to be awarded the Fields medal*)

Simplified representation :

(70)

PRES
$\lambda w^* \exists t (t \supseteq \text{now}$

MOD
$\exists w', e' \ e'$ in w' at t

AspP
$\exists t', e[t' \prec t \wedge P(e) \wedge \tau(e,w') \subseteq t']$

Paraphrase p = In the present, in a possible world w' there is a consequent state e' of an event e that took place in the past in w'. p is true in w.

- 'Quand' (when) signals coincidence between the event in the main clause and the subordinate clause (Le Draoulec, 2003).
- At t, one can either consider the event of being rewarded the Fields medal, or the consequent state of it. In the first case, the reading unavailable for (68-a) arises.

• Epistemic interpretation : The proposition 'there is an event P in the past with a consequent state Q of P holding in the present in a world w'' is true now in a world w. The speaker can consistently hold that $(w = w_0) = w'$ or $(w = w_0) \neq w'$. She/he does not know in which world she/he is (whether she is in w' or not) -i.e. **she/he cannot exclude that** $w_0 = w_1$.

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- epistemic uncertainty hinges on availability of nomological alternatives.

7.4 The simple past

The simple past in French cannot have an epistemic interpretation (Martin, 2009).

(71)   (? ?)Anne **put** être princesse (? ?epistemic)
        'Anne could be a princess'

Across Romance languages, the *simple past* can have an epistemic interpretation :

(72)   a.   Pedro **pudo**$_{simple.past}$ tomar el tren de las 3 :50 (épistémic) (Laca, 2009)
              'Pedro could take the train of 3 :50'
        b.   **Poté**$_{simple.past}$ benissimo essere stato donato dallo stesso curatore (Internet) (Mari, 2009a) *'It could have been donated by the curator himself'*

The present perfect *facilitates* the epistemic reading, although this does not depend on the meaning of the tense, but on the type of computation that is allowed in the temporal setting. The computation can also be achieved without a grammaticalized consequent state. As given in Stowell (2007) [14] it is essential to past tenses to have two arguments. However, if the grammaticalized consequent state is available, it is preferred over the non grammaticalized one.

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14. See also Sthioul, 1998.

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