

# Tense and temporal questions in Inquisitive Semantics\*

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## 1 Empirical motivation

- Temporal questions can be formed with a variety of lexical items:

- (1) a. *English*  
when? at what time?  
until what time? since when?<sup>non-temporal</sup> ...  
during which meeting? (Nelken and Francez 1998)
- b. *Dutch*  
wanneer? hoe laat?  
tot wanneer? vanaf hoe laat? ...

These have all somewhat different properties, but today I will focus on *WHEN*-questions.

- One of the main aims of inquisitive semantics (IS) is to provide a framework for the analysis of questions, but it has mainly focused on argument questions (*what/who/which*), and not on adverb questions (see Sæbø 2016 for some more (non-IS) work on adverb questions).
- Little work has been done on the (formal) semantics of temporal questions, but see Nelken and Francez (1998) for some work in a partition semantics framework.
- Two empirical areas: ① tense restrictions in *when*-questions (§1.1)  
② temporal sluices (§1.2)

### 1.1 Tense restrictions

#### 1. Current present tense

- In both English and Dutch, *WHEN*-questions are incompatible with the present tense that is interpreted as ‘currently ongoing’:
  - (2) a. When does John speak? [only OK as a futurate interpretation]
  - b. #When is Mary tired?
  - c. #Wanneer is Peter aan het zingen?

This is surprising, given that “Mary is tired right now”, “Peter is nu aan het zingen”, etc. are fine.

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## 2. Present perfect

- English *when*-questions are incompatible with the present perfect:

- (3) a. When did you read the book?  
 b. When will you read the book?  
 c. \*When have you read the book?

The restriction of the present perfect in *when*-question is often given in descriptive/teaching grammars of English. We also find support in corpus searches.

- In Dutch, however, present perfect *WHEN*-questions are completely natural:

- (4) Wanneer heb je dat gedaan?  
 when have you that done?  
 ‘When did you do that?’

- English *when*-questions can have the present perfect when they are non-temporal questions. This is the case for “rhetorical” questions with *since when* (5) and *ever* (6):

- (5) a. **Since when** has Turkey been part of Europe? [Europarl corpus]  
 b. **Since when** has cryptic turned down a way to make more money? [iWeb corpus]

These are known in the literature as *since when-attacks* or *meta-conversational since when-questions* (see [Kiss 2017](#), and references there).

- (6) a. When have we **ever** seen Hamas investigate its own actions? [Europarl]  
 b. When have we **ever** needed an excuse to grab a gin & tonic? [iWeb]

It seems difficult to interpret (5) or (6) as sincere information-seeking questions (cf. How long has Turkey been part of Europe?).

- There are reports that English present perfect *when*-questions improve under an existential reading, suggesting that the question asks about *multiple events*:

- (7) a. (?)When have you been in America?  
 ~> suggests multiple times  
 b. (?)When have The Beatles performed in New York City?  
 ~> suggests multiple events

The precise empirical status of these sentences is not entirely clear to me yet.

### 3. Dutch simple past

- English *when*-questions are typically formed with the simple past. However, in Dutch the general pattern is that *wanneer*-questions are incompatible with the simple past (there are some exceptions, though):

- (8) a. Wanneer heb je dat boek gelezen?  
 b. #Wanneer las je dat boek?

- A better understanding of the meaning of temporal questions (and their answers) will help elucidate the nature of these tense restrictions.

#### 1.2 Temporal sluices

- Sluices are of interest to inquisitive semantics, because they function as a type of diagnostic for inquisitive content (Anderbois (2014), more in §2.2 below).
- Temporal sluices are sluices with a temporal *wh*-word:

- (9) a. Fred baked a cake, but I don't know when. (Anderbois 2014: 889)  
 b. Ich weiß dass er so was gesagt hat, aber ich weiß nicht mehr wann. [www]

The tense restrictions in temporal sluices are similar to those in temporal questions.

- A quick corpus search reveals that most *when*-sluices are about the future (10a,b), but past ones are also attested (10c).

- (10) a. I'm going to get it, but I don't know when. [iWeb]  
 b. We will send someone out to have a look, but we don't know when. [iWeb]  
 c. We know that she was previously treated for bipolar disorder, but we don't know when. [iWeb]

- That temporal sluices have restrictions on which tenses can be used with them, may indicate that tenses differ in inquisitive strength.

## 2 Tense in inquisitive semantics

Route 1: move from (sets of) sets of worlds to (sets of) sets of world-time/world-event pairs

⇒ the tenseless proposition 'John dance' is now represented as  $\{\{\langle w, t \rangle \mid \text{John dances in } w \text{ at } t\}\}^\downarrow$

Route 2: start from the compositional typed version of inquisitive semantics, and add times and events to the ontology

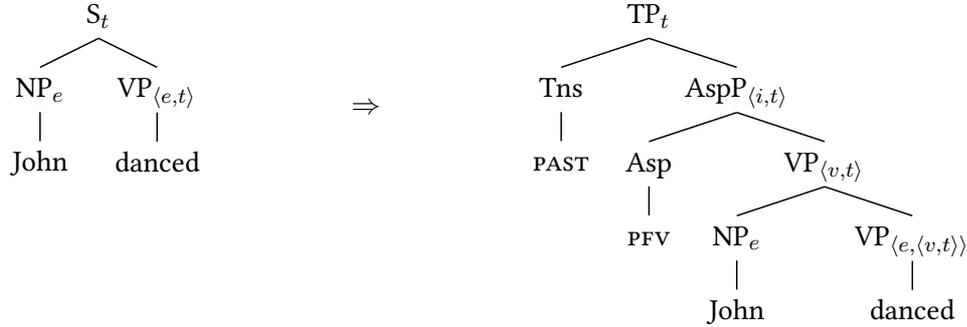
⇒  $\{\{w \mid e \text{ is a dancing event by John in } w\}\}^\downarrow$

- The choice between these is reminiscent of the choice in classical frameworks between having temporal parameters ( $\llbracket \ ]^t$ , and temporal quantification only in the metalanguage), and time variables in the syntax (see e.g. Kusumoto 2005).

- I will here follow Route 2.

## 2.1 Adding times/events to the ontology

- In a classical non-temporal framework, we can add tense and aspect operators by adding times (type  $i$ ) and events (type  $v$ ) to the ontology:



Aspectual operators introduce existential quantification over events:

- (11) a.  $\llbracket \text{PFV} \rrbracket = \lambda P \lambda t. \exists e (P(e) \ \& \ \tau(e) \subseteq t)$   
 b.  $\llbracket \text{IMP} \rrbracket = \lambda P \lambda t. \exists e (P(e) \ \& \ t \subseteq \tau(e))$

The tense operator anchors the time property of the event on the timeline:

- (12)  $\llbracket \text{PST} \rrbracket = \lambda P. \exists t (t \prec n \ \& \ P(t))$

- In IS, we can do something similar by adopting a typed version of the framework, as introduced in *Composing Alternatives* (Ciardelli, Roelofsen, and Theiler 2017) (henceforth CompAlt). Here a compositional, typed inquisitive semantics is provided for a fragment of English. Sentence meanings come out as inquisitive propositions (non-empty downward closed sets of sets of worlds). In CompAlt, sets of sets of worlds (type  $T$ ) are introduced at the level of predicates, as in (13a):

- (13) a.  $\llbracket \text{sing} \rrbracket = \lambda x. \{\{w \mid x \text{ sings in } w\}\}^\downarrow$  (type  $\langle e, T \rangle$ )

It is technically straightforward to add times (type  $i$ ) and events (type  $v$ ) to the ontology:

- b.  $\llbracket \text{sing} \rrbracket = \lambda x_e \lambda t_i. \{\{w \mid x \text{ sings at } t \text{ in } w\}\}^\downarrow$  (type  $\langle e, \langle i, T \rangle \rangle$ )  
 c.  $\llbracket \text{sing} \rrbracket = \lambda x_e \lambda e_v. \{\{w \mid e \text{ is a singing event by } x \text{ in } w\}\}^\downarrow$  (type  $\langle e, \langle v, T \rangle \rangle$ )

- In CompAlt, anything above the VP/NP level (such as GQ subjects, negation, conjunction) must be defined as an operator on sets of sets of worlds (a type- $T$  operator). For example:

- (14)  $\llbracket \text{every} \rrbracket = \lambda P_{\langle e, T \rangle}. \lambda Q_{\langle e, T \rangle}. \bigcap_{x \in D} (Px \rightarrow Qx)$  (CompAlt, p. 20)  
 $\llbracket \text{not} \rrbracket = \lambda P_T. \neg P$

- We have two options for defining tense and aspect operators in the compositional inquisitive framework:

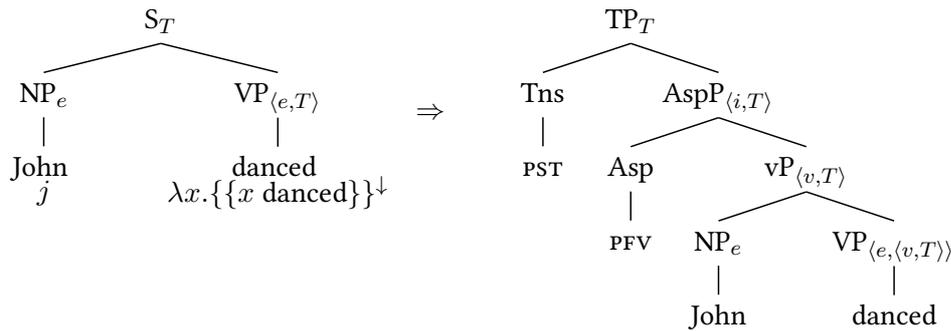
Option 1 keep the classical type  $\langle e, t \rangle$  entries for verbs, and have sets of sets of worlds be introduced higher than the verb level, namely by Aspect or Tense operators;

Option 2 have  $\langle e, T \rangle$  entries for verbs as in CompAlt, and define Tense and Aspect operators in terms of type- $T$  operations.

The two options are illustrated for perfective aspect below:

- (15) a.  $\llbracket \text{PFV} \rrbracket = \lambda P_{\langle v, t \rangle} \lambda t_i. \{ \{ w \mid \exists e (P(e, w) \ \& \ \tau(e) \subseteq t) \} \}^\downarrow$  (type  $\langle \langle v, t \rangle, \langle i, T \rangle \rangle$ )  
 b.  $\llbracket \text{PFV} \rrbracket = \lambda P_{\langle v, T \rangle} \lambda t_i. \bigcup_{e: \tau(e) \subseteq t} P(e)$  (type  $\langle \langle v, T \rangle, \langle i, T \rangle \rangle$ )  
 $= \lambda P_{\langle v, T \rangle} \lambda t_i. \{ s \mid s \in P(e) \text{ for some } e \text{ such that } \tau(e) \subseteq t \}$

[for the shorthand for (15b), compare  $\llbracket \text{who } P \rrbracket = \bigcup_{x \in D_e} Px := \{ s \mid s \in P(x) \text{ for some } x \in D_e \}$ ]



- (16)  $\llbracket \text{PST} \rrbracket = \lambda P_{\langle i, T \rangle} \cdot \bigcup_{t: t < n} P(t)$

- The difference between Option 1 and Option 2 amounts to the difference between classic and inquisitive event quantification. This leads to a central question:

**Question** Existential quantification over individuals is inquisitive. Is quantification over events/times also inquisitive?

## 2.2 Event quantification and sluices

- Anderbois (2014) proposes that sluicing requires an inquisitive antecedent:

- (17) a. John or Mary is coming, but I don't know who.  
 b. Someone is coming, but I don't know who.  
 c. \*John is coming, but I don't know who.  
 d. \*It is not the case that nobody is coming, but I don't know who.

- (18) Inner antecedent generalization: an expression  $\alpha$  can serve as an inner antecedent for sluicing only if  $\alpha$  makes an inquisitive contribution. (p. 900)

This makes sluicing a diagnostic for inquisitive content.

- In cases of so-called “sprouting”, sluicing is possible despite the absence of overt inquisitive content in the antecedent:

(19) *Indirect sprouting* (examples from [Anderbois 2014](#))

- a. [John baked a cake]<sub>A</sub>, but we are all wondering with whose help.
- b. [John won]<sub>A</sub>, but I don't know which contest.

Anderbois suggests that existential event quantification in the antecedent ( $\exists e(\text{bake-cake}(e) \ \& \ \text{Ag}(e, j)); \exists e(\text{win}(e) \ \& \ \text{Ag}(e, j)))$ ) provides the required inquisitive content, raising an issue of ‘Which event?’. He has not explored in detail the further technical consequences of introducing inquisitive event quantification.

- Is “raising an issue” connected with the inquisitive nature of the proposition? Disjunctive declaratives are non-inquisitive, even though, intuitively speaking, they can set up an issue for further discourse:

(20) Ann or Bill left.  $\rightsquigarrow ! (L(a) \vee L(b))$  ([Dotlačil and Roelofsen 2018](#))

Perspectives on inquisitiveness (from [Ciardelli, Groenendijk, and Roelofsen 2012: 42](#))

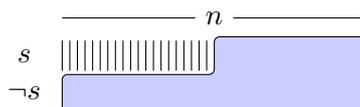
- **strong**: in uttering a sentence  $\phi$ , the speaker *requests* a response that establishes a state in  $[\phi]$
- **weak**: in uttering a sentence, the speaker *invites* a response that establishes a state in  $[\phi]$
- **mixed**: in uttering a sentence  $\phi$ , the speaker *requests* a response that establishes a state in  $[\phi]$  if  $\phi$  is purely inquisitive, and *invites* that response otherwise.

- Should alternatives introduced by disjunction or existential quantification over individuals be of the same sort as those introduced by other types of quantification? The current system does not allow for different sorts of alternatives.

### 3 Too many alternatives?

- If we adopt inquisitive event quantification as in (15b), every (tensed) sentence becomes inquisitive. A sentence like “Mary sang” then has indefinitely many alternatives corresponding to different events and past times of Mary singing. The idea that some sentences are inquisitive (like interrogatives or disjunctions), and others are not, is lost.

(21) Schematic picture of alternatives in ‘Did Mary sing?’:  
 {Mary did not sing, Mary sang at  $t_1$ , Mary sang at  $t_2$ , Mary sang at  $t_3$ , ... }



- [Nelken and Francez \(1998\)](#) seem to have similar worries, which is why they define ‘when’ as ranging over events rather than time intervals:

The alternative formulation using intervals instead of events means such extensions [of *when*-questions, JT] will include not only all those entities that may be referred to by calendrical items, but any interval included within the  $\text{toi}^1$  that includes an event of Mary’s kissing John. This would seem to make the extension much larger, including any closed bounded interval which contains the event-time of Mary’s kissing John. For this reason, we prefer to use the event formulation. (p. 18)

### 3.1 Closing off alternatives

- One response to the above concern is to observe that inquisitive semantics has a device to remove alternatives, namely issue-cancelling projection. For example, in certain disjunctive questions the  $!$  is used to “suppress” the alternatives that are generated by the  $\vee$  operation:

- (22) a. Will John-or-Bill<sup>†</sup> come?  
 b.  $!(\text{John come} \vee \text{Bill come})$  (Ciardelli, Groenendijk, and Roelofsen 2018)

The same thing could be done for Tense/Aspect operators:

- (23) a. Mary sang.  $!_{\text{PST PFV}}$  (Mary sing)  
 b. Did Mary sing?  $?!_{\text{PST PFV}}$  (Mary sing)

This effectively makes the time/event quantification in these sentences non-inquisitive. The translation in (23b) makes sure it is still a binary question, and not asking about the time of Mary’s singing.

- In  $\text{Inq}_B^D$  (Dotlačil and Roelofsen 2018), this is standardly done for questions: the Interrogative Type closes off the inquisitiveness of its complement:

- (24) Who left?  $\rightsquigarrow !(\exists x \wedge L(x)) \wedge ?x$  (Dotlačil and Roelofsen 2018)

- In general, when having multiple inquisitive sources in one sentence, typically only one “issue” is raised:

- (25) Someone met John or Mary.  
 a.  $\exists x(J(x) \vee M(x))$   
 b.  $\exists x!(J(x) \vee M(x))$   
 c.  $!\exists x(J(x)) \vee !\exists x(M(x))$

If (25) is represented as in (25a) (with no  $!$ -operators), the alternatives contributed by disjunction and those contributed by existential quantification are of “equal standing”, i.e. they cannot be distinguished from each other.

Suppressing the  $\vee$ -alternatives is straightforward: adding a  $!$  in (25b). To suppress only the  $\exists$ -alternatives, however, one needs to “scope out” the disjunction, as in (25c).

<sup>1</sup> $\text{toi}$  = ‘time of interest’. Nelken and Francez explicitly ignore the role of tense in their analysis of temporal questions. Instead they include a contextual parameter  $I$ , called the ‘time of interest’, which is supposed to be valued by tense operators in the question (see their p. 8).

- With inquisitive Tense and Aspect operators, the above situation of having multiple inquisitive operators will become very common. In contrast to (23a) (“Mary sang”), a GQ subject will have to be scoped out (using the abstraction system from CompAlt):

- (26) a. Someone laughed.  
 b.  $!_{\text{PST PFV}}$  **someone laugh**  $\Leftarrow$  wrong, suppresses *all* alternatives  
 c. **someone**  $\lambda x$   $!_{\text{PST PFV}}$   $x$  **laugh**

- A potential alternative to suppressing alternatives by means of  $!$ -operators, is to adopt the dynamic system  $\text{Inq}_B^D$ , in which alternatives can be accessed beyond their syntactic scope:

- (27) a. Who left?  $\rightsquigarrow !(\exists x \wedge L(x)) \wedge ?x$   
 b.  $\text{Someone}^x$  left.  $\text{He}_x$  was furious.  $\rightsquigarrow !(\exists x \wedge L(x)) \wedge !(F(x))$  (D&R 2018)

## 4 Some empirical phenomena explained

### Current present restrictions

- There is a pragmatic constraint against asking questions for which the answer is already partially established in the context. In such a case, this must be marked in the question, for example with the additive *else* (Theiler 2018).

(28) [Linda invited three people to go for dinner]

- a. A: Linda invited Peter.  
 b. #B: Who did Linda invite?  
 c. B: Who **else** did Linda invite?

(29) [Peter cooked a three-course dinner. We’ve just had the starter, which was soup.]

- a. #What did you cook?  
 b. What **else** did you cook?

- Temporal questions ask for a time interval, and when one boundary of that interval has been established in the context, it counts as partially resolved:

(30) [John was sick for some time, but is better now.]

- a. A: John became sick on November 10th.  
 b. #B: When was John sick?  
 c. B: **Until** when was John sick?

- Present tense, when it has a “currently ongoing” interpretation, anchors the event time to the speech time. Thus, the same pragmatic constraint explains the current present tense restriction on *WHEN*-questions.

### Perfect restrictions

- The present perfect introduces a Perfect Time Span (PTS), which in English must reach up to the speech time, whereas in Dutch/German it need not (Rothstein 2006):

- (31) a. \*I **have** always **lived** in London, but recently I moved to Amsterdam.  
 b. ✓ Ich **habe** immer in Berlin **gewohnt**, aber vor kurzem bin ich nach Tübingen gezogen.  
 c. ✓ Ik **heb** altijd in Londen **gewoond**, maar ik ben onlangs naar Amsterdam verhuisd.

- Present perfect WHEN-questions ask for the PTS, not the resultant state time:

- (32) Wanneer heb je dat boek gelezen?  
 a. In de zomervakantie.  
 b. #Gisteren om 5 uur (intended: answer with the time of the resultant state)

The incompatibility of English *when*-questions with the Present Perfect can be related to the pragmatic constraint discussed above: the right edge of the PTS interval is asserted to be the speech time, hence an (unmarked) present perfect *when*-question is unacceptable. In German and Dutch, the PTS can be fully in the past, so the present perfect is compatible with *when*-questions in those languages.

- If the Dutch present perfect behaves like a simple past, why is there a contrast with the (true) simple past?

- (33) a. Wanneer heb je dat boek gelezen?  
 b. \*Wanneer las je dat boek?

I propose the simple past and the present perfect differ in inquisitiveness.

### Dutch simple past restrictions

- Recall Kratzer's (1998: 106) example, illustrating the anaphoric nature of the Dutch/German simple past:

- (34) [standing in front of a church]  
 a. Who built this church? / \*Who **has built** this church?  
 b. Wie **heeft** deze kerk **gebouwd**? / \*Wie bouwde deze kerk?  
 c. Wer **hat** diese Kirche **gebaut**? / \*Wer baute diese Kirche?

- The anaphoric nature of the Dutch/German simple past tense makes it non-inquisitive, and therefore incompatible with *when*-questions. The Dutch/German present perfect is inquisitive. For English the pattern is reversed.

## 5 Future work

- More work is needed on anaphoric tenses. What is the relation between anaphoricity of a tense and its inquisitive strength? To model tense anaphora, can we use a system similar to that in  $\text{Inq}_B^D$ ?

(35) John<sup>x</sup> left<sup>t</sup>. He<sub>x</sub> was<sub>t</sub> furious.

- Temporal adverbials value or restrict the domain of tenses and temporal questions:

(36) a. Linda left, but I don't know when.

b. #Linda left at 5pm, but I don't know when.  
 ⇒ "at 5pm" specifies the past time asked for by *when*

c. Linda left this morning, but I don't know when.  
 ⇒ OK when asked about a more specific time within the morning

How can temporal adverbials be implemented in the compositional framework of IS?

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