Nuclear Intervention

Deriving Beck-effects via cyclic scope and local exhaustification

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Weak islands

- Fox & Hackl (2007), Abrusán (2014).

  (1) *How far didn't Kazuko run?

  (2) Who didn't Kazuko invite?

- Have received a principled semantic explanation in terms of, e.g., maximal informativity.

- *German* scope-marking constructions (no intervention with overt *wh*-movement):

(3) a. *Was^{x} glaubt Hans nicht wer$_{x}$ da war?
What believes Hans not who there was?

b. Wer^{x} glaubt Hans nicht dass t_{x} da war?
Who believes Hans not that t there was?
'Who doesn't Hans believe was there?'

- *Japanese wh-in-situ* (Takahashi (1990)).
- No intervention when the *wh*-expression *scrambles* over the offending intervener.

(4) a. *John-sika nani-o tabe-na-katta-no?
J.-only.NPI what-ACC eat-not-past-Q

b. Nani-o John-sika tabe-na-katta-no?
What-ACC J.-only.NPI eat-not-past-Q
'What does only JOHN not eat?'

Intervention effects III

- Beck (2006), Kotek (2017) a.o.: explanation in terms of focus-sensitive operators.
- Issues:
  - Performs well for intervention by, e.g., *only*. Doesn't seem principled for negation; ultimately syntactic (see Mayr 2014 for discussion).
  - Alternative semantics runs into independent problems with abstraction (Shan 2004).

Our idea

- Focusing on negation, we'll attempt to generalize a maximal informativity account of weak islands to intervention effects, by drawing an analogy between the following two cases:

  (5) * *Was* doesn't Hans believe *wer* was there?

  (6) *What doesn't Hans believe?

- Ultimately, we'll argue that there's a stage of composition of (5) that corresponds to something like (6), and *this* is what's responsible for the global infelicity of the sentence.
- We'll attempt to derive this from independently proposed mechanisms for *in-situ* scope-taking …
- We requires exhaustification and maximal informativity to apply in the question nucleus, blind to the restriction from the lower question.

Cyclic scope

Cyclic scope

- The *cyclic scope* mechanism we assume here has its roots in Dayal's (1996) account of the *wh*-triangle, and scope-marking constructions.
- More recently, Charlow (2014, 2018) developed an influential account of the scopal properties of indefinites using a generalisation of Dayal (1996).
- Elliott (2015, 2019) uses Charlow's cyclic-scope mechanism to develop a compositional theory of *wh*-questions (see also Demirok, in prep). In the next section, we briefly motivate cyclic-scope, before presenting Elliott's system.

- In-situ *wh*-expressions can scope out of islands for syntactic movement.

  (7) Which linguist will be upset [if we invite which philosopher].

- The idea that such data involve *LF pied-piping* goes back to Nishigauchi (1990) work on *wh-in-situ* in Japanese, i.e.:

  (8) Which linguist^{x} [If we invite which philosopher]^{p} x will be upset p

- von Stechow (1996) pointed out that LF pied-piping doesn't resolve the issue. Assuming a standard Hamblin-Karttunen semantics for question, in order to get the meaning right, the LF should be:

  (9) Which linguist^{x} Which philosopher^{y} [If we invite y] x will be upset p.

- von Stechow's point is that, just because we pied-pipe the island at LF, this doesn't absolve us of the need to scope out the *wh*-expression, since the question is ultimately asking about *linguist-philosopher* pairs.

Motivating cyclic scope: island pied-piping III

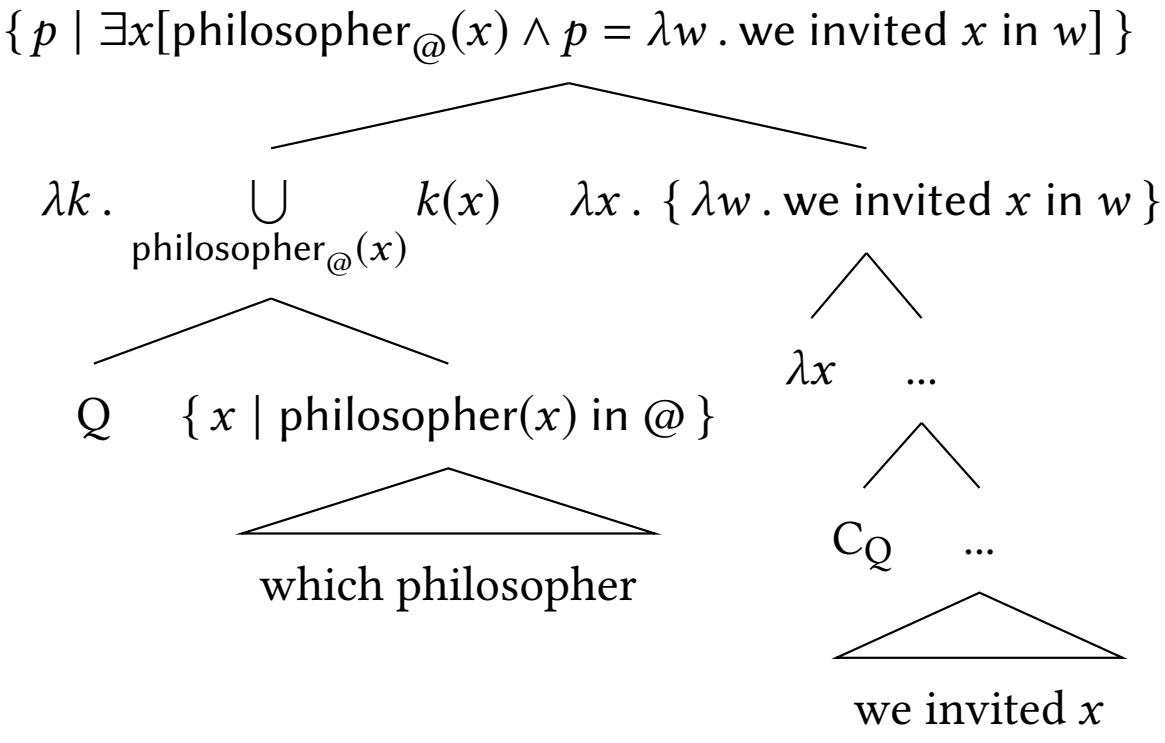
- Elliott's semantics for *wh*-questions, based on Charlow's semantics for indefinites, gives an account of LF pied-piping which isn't subject to von Stechow's critique.
- In this system, composition is mediated by two functional heads that work in tandem to extend the scope of *wh*: Cable's (2010) Q-particle, and the interrogative complementiser $\mathrm{C_Q}$

(10) $\llbracket \mathrm{C_Q} \rrbracket := \lambda a \,.\, \{\, a \,\}$ $:: \langle \sigma, \{\, \sigma \,\} \rangle$

(11) $\llbracket \mathrm{Q} \rrbracket := \lambda P \,.\, \lambda k \,.\, \bigcup_{P(x)} k(x)$ $\langle \{\, \sigma \,\}, \langle \langle \sigma, \{\, \tau \,\} \rangle, \{\, \tau \,\} \rangle \rangle$

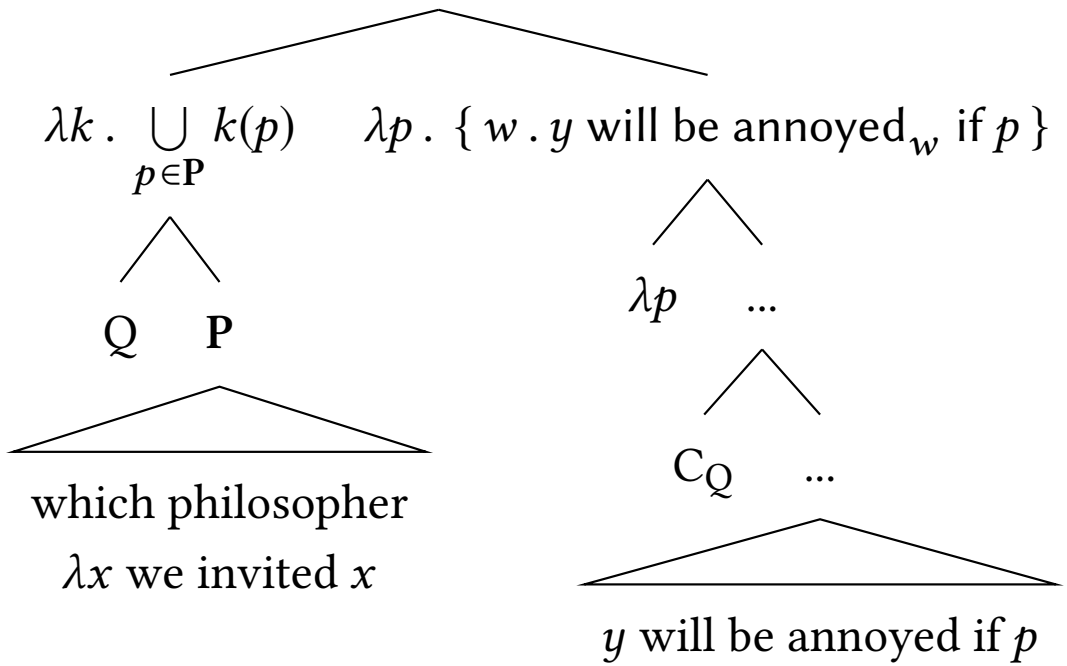
- Note the polymorphic types!

- The analysis of a simple constituent question is completely parallel to Heim's (1994) Karttunen semantics (see also Cresti 1995), although we assume that *which* is semantically vacuous.



- Since Q and C_Q are *polymorphic*, we can re-apply Q, to the question meaning we just arrived, and scope it out.

$$\{\, p \mid \exists p \in \mathbf{P}[p = \lambda w\,.\, y \text{ will be annoyed in } w \text{ if } p] \,\}$$
$$= \{\, p \mid \exists x[\text{philosopher}_{@}(x) \wedge p = \lambda w\,.\, y \text{ will be annoyed}_w \text{ if } x \text{ gets invited}] \,\}$$



- The computed meaning is the same *as if* the *wh* had exceptionally scoped out of the island – this is the fundamental insight of Charlow (2014, 2018).
- By scoping in-situ *wh*-expressions *cyclically*, via Q and C_Q, we can account for the scope of *wh-in-situ* via LF pied-piping, ala Nishigauchi (1990), while addressing von Stechow's objection.
- *Wh-in-situ* scopes via familiar mechanisms, but need not violate scope islands. No focus semantics necessary.

- Heck (2008) has argued extensively that *overt* pied-piping obeys the *Edge Generalization* – if α pied-pipes β, movement of α to the edge of β is obligatory (if overt movement is possible).
- Pied-piping triggered by movement of the scopal expression to the edge of the local domain mirrors our proposed LF.

(12) [[How smart]^{x} a t_x semanticist]^{y} is Paul t_y?

(13) *[A [how smart]^{x} semanticist]^{y} is Paul t_y?

Cyclic scope is syntactically realistic II

- Huhmarniemi (2012) argues that the kind of recursive pied-piping we're positing at LF is attested overtly in *Finnish*.
- PP pied-piping:

(14) [$_{PP}$ [$_{DP}$ Mitä taloa]^{x} kohti x]^{y} Pekka käveli y?
which.PAR house.PAR towards t Pekka walked t
"Which house did Pekka walk towards?"

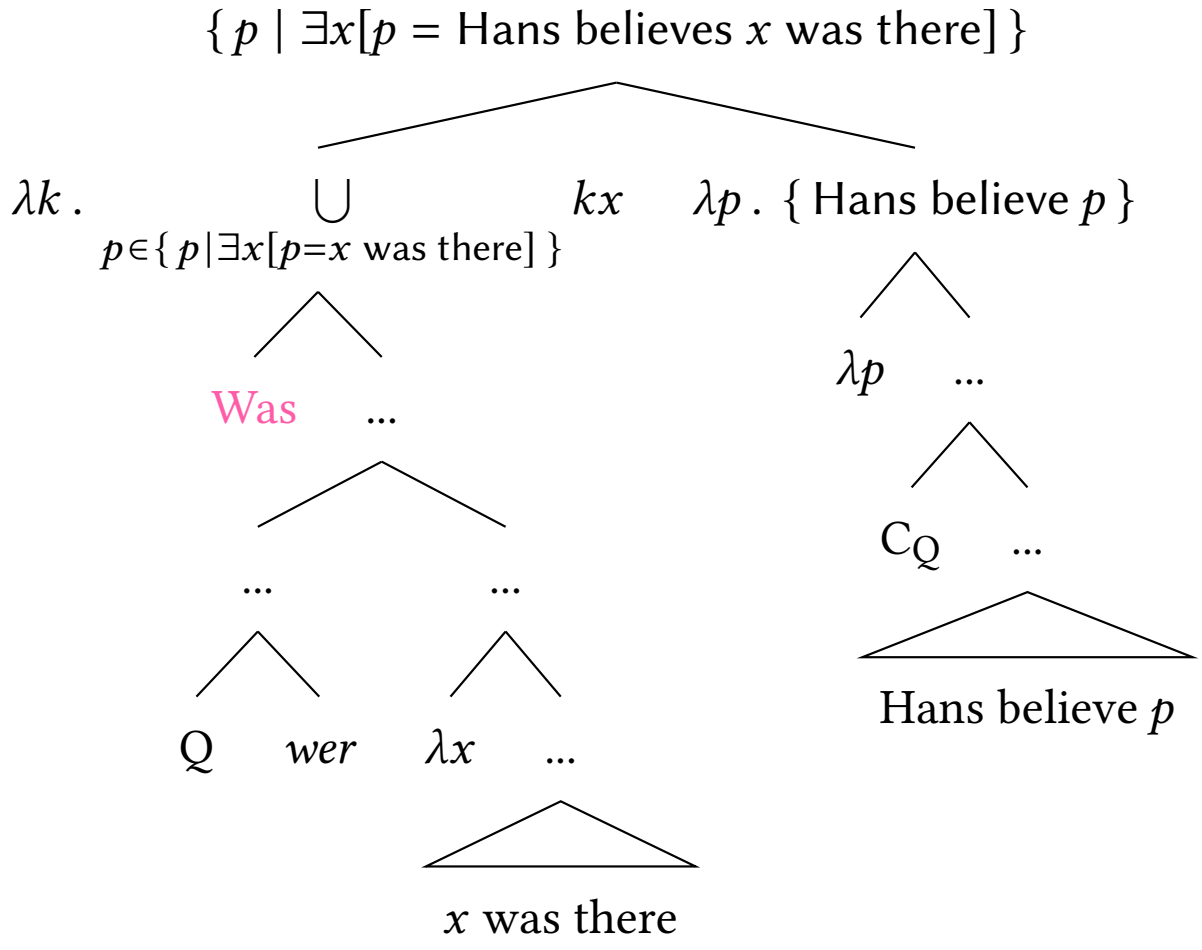
- Adjunct island pied-piping:

(15) [[Mitä pöytään]^{x} kantaessaan x]^{y} Pekka kompastui y?
what.PAR table.to carry.ESSA t Pekka fell t
"What was Pekka carrying to the table when he fell?"

Extension to scope marking I

- We assume that *wh-in-situ* scopes cyclically. Furthermore, we assume that each movement-step must be *local*. For the time being, let's assume that the local domain is the finite clause.
- We generalise this analysis to scope-marking by analysing the scope-marker *was* as a spell-out of the Q particle that pied-pipes the finite clause.

(16) *Was* believe Hans [that *wer* there was]?



Weak islands, homogeneity, and maximal informativity

Developing the analogy with weak islands

- Note that in the course of constructing the LF for our scope-marking construction, we've created a derived constituent (the movement remnant), of the form *Hans believes p*.
- As a prelude to our analysis, we observe that when *what* may range over propositions. $What_{prop}$ questions are infelicitous in the presence of negation.

(17) a. What does Hans believe?
b. #What does Hans not believe?

- We'll analyse this as a kind of weak island effect – a violation of a semantic requirement imposed on questions. Inspired by Nicolae (2013), we'll suggest that this check is performed *locally*, i.e., at the question nucleus.

Weak islands and maximal informativity I

- Dayal (1996) proposed that *a question presupposes the existence of a unique, maximally informative, true answer* – i.e., a unique true answer which entails each of the other true answers.
- This directly accounts for the uniqueness presupposition of singular *which*-questions:

(18) a. Which generative semanticist are you reading?
b. Ross (#and Lakoff).

- See Elliott, Nicolae & Sauerland (2016), and Aron and Bernard's talk yesterday for complications which we'll gloss over here.

Weak islands and maximal informativity II

- *Maximal informativity* is easily satisfied with positive questions with *wh*-expressions ranging over pluralities, since part-whole relations map to entailment.

$$[\![\text{Which Italians sneezed?}]\!] = \left\{ \begin{array}{l} \text{d sneezed, n sneezed, p sneezed} \\ \text{d+n sneezed, d+p sneezed, n+p sneezed} \\ \textbf{d+n+p sneezed} \end{array} \right\}$$

- It's crucial here that the predicate is distributive.

- What about *negative* questions about pluralities? This is a little less straightforward:

$$[\![\text{Which Italians didn't sneeze?}]\!] = \left\{ \begin{array}{l} \neg\ \text{d sneezed}, \neg\ \text{n sneezed}, \neg\ \text{p sneezed} \\ \neg\ \text{d+n sneezed}, \neg\ \text{d+p sneezed}, \neg\ \text{n+p sneezed} \\ \neg\ \textbf{d+n+p sneezed} \end{array} \right\}$$

- In order for the highlighted answer to entail each of the other answers, we rely on *homogeneity*. Given the homogeneity presupposition, *Dani, Nino and Patrizio didn't sneeze* entails each of the other negative answers.

Weak islands and maximal informativity iv

- What about *wh-expressions* ranging over propositions?
- We assume that the domain of $what_{prop}$ is *closed under conjunction.* In a positive context, this means maximal informativity can easily be satisfied, since entailment between propositions typically maps to entailment between answers.

$$[\![\text{what does Hans believe?}]\!] = \left\{ \begin{array}{r} \text{h believes } p, \text{h believes } q, \text{h believes } r \\ \text{h believes } p \wedge q, \text{h believes } p \wedge r, \text{h believes } q \wedge r \\ \mathbf{h\ believes\ p \wedge q \wedge r} \end{array} \right\}$$

Weak islands and maximal informativity v

- There is nothing like homogeneity with propositional predication; *Hans doesn't believe* $(p \wedge q)$ doesn't entail *Hans doesn't believe* q or that *Hans doesn't believe* p.
- Due to the closure properties of the propositional domain, maximal informativity therefore predicts that negative questions about propositions should be presupposition failures.

$$[\![\text{what doesn't Hans believe?}]\!] = \left\{ \begin{array}{r} \text{h doesn't believe } p, \text{ h doesn't believe } q, \text{ h doesn't believe } r, \\ \text{h doesn't believe } p \wedge q, \text{ h doesn't believe } p \wedge r, \text{ h doesn't believe } r \wedge q, \\ \text{h doesn't believe } p \wedge q \wedge r \end{array} \right\}$$

Analysis

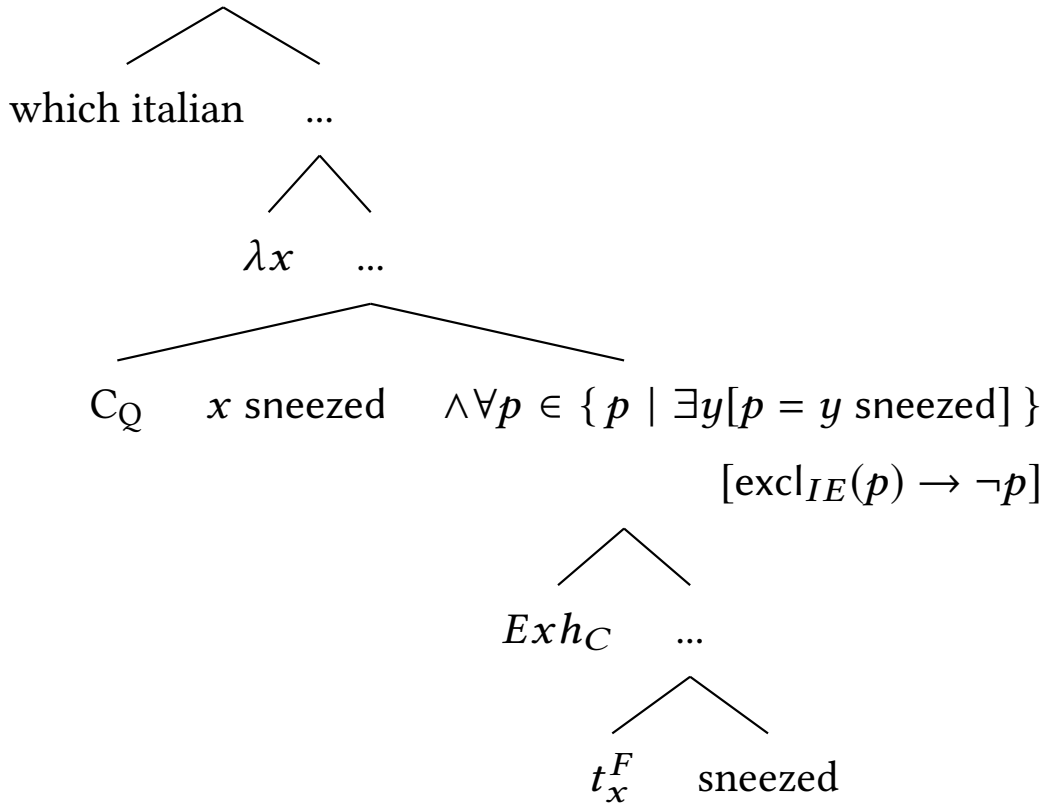
- Going back to our scope marking construction, if we check maximal informativity globally, we predict it to be felicitous, even with negation, since the global meaning is equivalent to scoping out a *wh*-expression ranging over individuals.
- What we want to achieve, is a system according to which maximal informativity is checked at the stage of composition parallel to *what doesn't Hans think?*
- In this section, we show how this can be achieved via exhaustification.

Nicolaeic/Nucleic exhaustification I

- Following Nicolae (2013), we assume strengthening at the question nucleus.
- *Exh* obligatorily associates with the trace of the moved *wh*-expression.
- Nicolae (2013) develops independent arguments for this assumption based on NPI licensing.

Nicolaeic/Nucleic exhaustification II

(19) $\left\{ \begin{array}{c} \text{Dani and no other Italian sneezed} \\ \text{Nino and no other Italian sneezed} \\ \text{Patrizio and no other Italian sneezed} \end{array} \right\}$



Question-Partition Matching

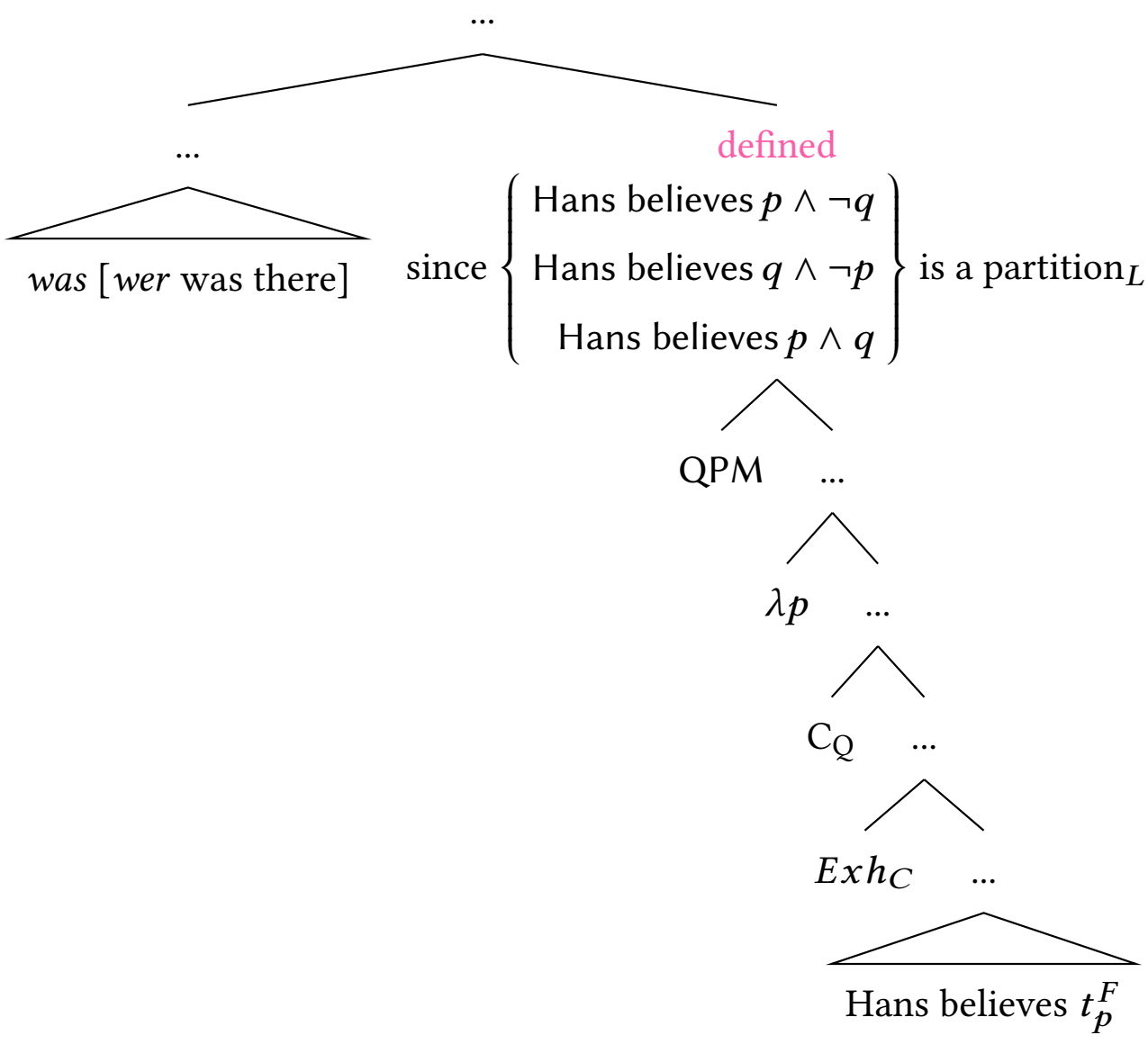
- In order to test for *Maximal Informativity* locally, we exploit Fox's (2018) insight that Maximal Informativity can be derived from pointwise exhaustification.
- Question-Partition Matching (loosely based on Fox 2018):

(20) QPM (def.)
QPM is a partial identity function from a *scope* $k_{\langle \sigma, \{ \tau \} \rangle}$ which is defined iff k maps its domain to logically independent propositions (cells in a partition).

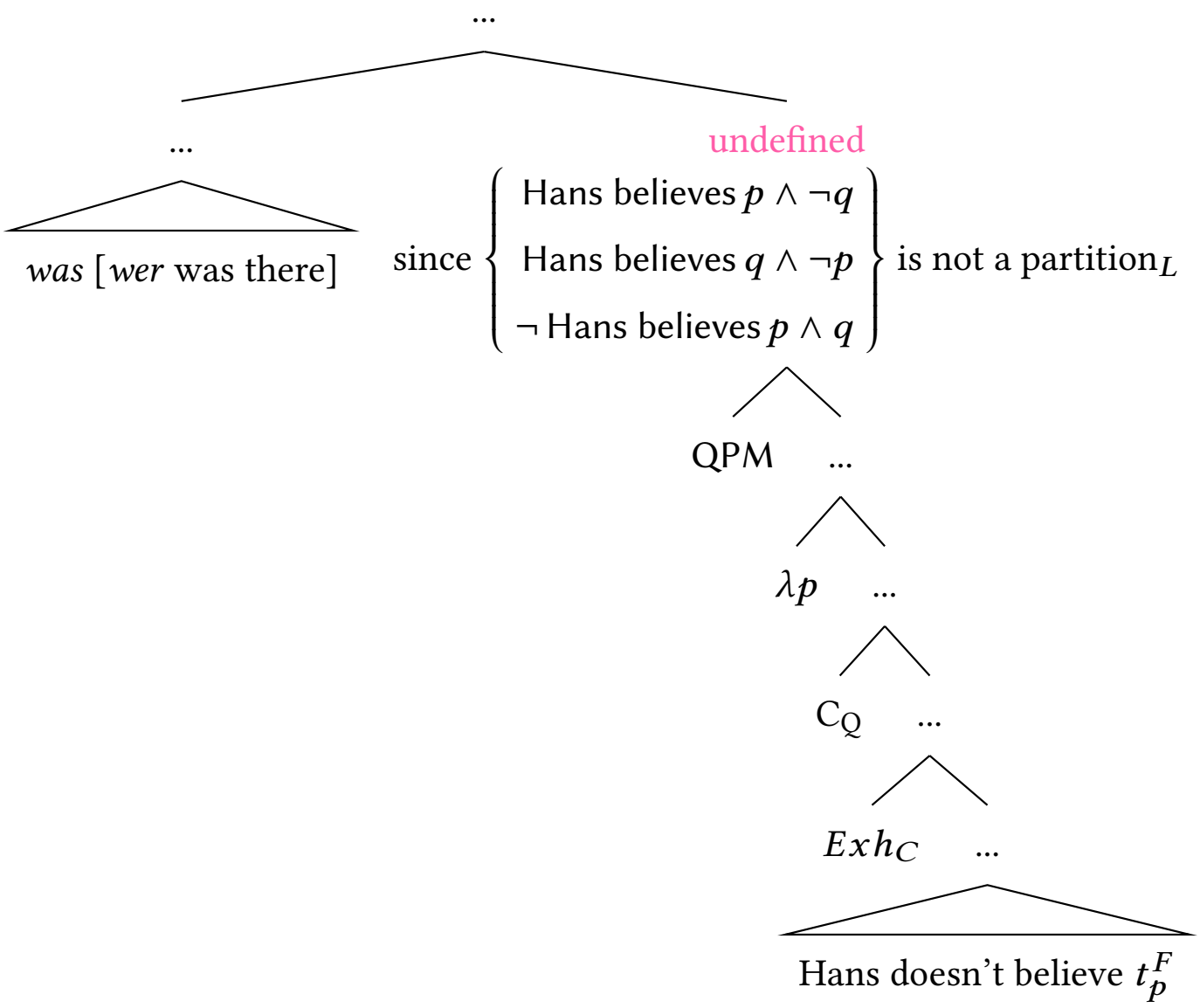
$$\text{QPM} := \lambda k : \forall q, q' \in \bigcup_{x \in \text{dom}(k)} k(x)[q \neq q' \rightarrow (q \not\equiv q' \wedge q' \not\equiv q)] \,.\, k$$

- When the k is a function from atomic/plural individuals, this is easy to satisfy. Also for propositions in positive contexts...

Intervention effects are violations of QPM 1



Intervention effects are violations of QPM II



Intervention effects are violations of QPM III

- In the latter case, QPM is undefined, since $\mathbf{k}$ maps $a \wedge b$ to $\{ Exh_C$ Hans doesn't believe $a \wedge b \}$.
- This doesn't correspond to a cell in the partition induced by *What doesn't Hans believe?* – it's weaker than both:
  - $\{ Exh_C$ Hans doesn't believe $a \}$
  - $\{ Exh_C$ Hans doesn't believe $b \}$
- It can't be strengthened by *Exh* since the individual propositional alternatives aren't excludable.

Modal obviation I

- Weak island violations are subject to *modal obviation effects* (see, e.g., Fox & Hackl 2007).

(21) *What doesn't Hans believe?

(22) What isn't Hans allowed to believe?

- On our view, this is because QPM is checked above the modal, and it's defined, since the following is a partition:

$$\left\{ \begin{array}{l} Exh_C \neg \diamond \text{ Hans believe } p, \\ Exh_C \neg \diamond \text{ Hans believe } q, \\ Exh_C \neg \diamond \text{ Hans believe } p \wedge q, \end{array} \right\}$$

Modal obviation II

- BUT, we don't get modal obviation with intervention effects:

(23) *Was darf Hans nicht glauben wer da war?
What may Hans not believe who there was?
'Who isn't Hans allowed to believe was there?'

- In order to account for this, we posit that cyclic scope is extremely *local* – minimally, it must recursively pied-pipe the prejacent of negation:

(24) [Q [[[[*wer* was there] believe] Hans] may]]
QPM $\lambda p\ Exh_C$ not t_p^F

Modal obviation III

- Prediction: Modal obviation with modalized idioms.

(25) Was kann Hans nicht glauben wer da war?
What can Hans not believe who there was
'Who is John surprised that was there?'

Conclusion

- Using independently motivated machinery – *cyclic scope* ala Dayal and Charlow, and *nucleus level strengthening* ala Nicolae, we've generalised a *Maximal Informativity*-based account of weak islands to a class of intervention effects.
- The trick was to posit a stage in the composition at which we essentially derive unrestricted question ranging over non-individual/non-scalar domains.
- In the presence of negation, such domains give rise to violations of *Maximal Informativity*, which we check locally using mechanisms based on Fox (2018).
- In this talk, we only cover negation, since it seemed to us this is a major weakness of current accounts of intervention. We'll explore the implications of this system for other interveners in future work.

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