WHO AND WHAT DO 'WHO' AND 'WHAT' RANGE OVER?

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This presentation is based on work in progress with Andreea Nicolae (ZAS) and Uli Sauerland (ZAS).

Overview

"Which" vs. "who"

- Singular *which*-questions carry a *Uniqueness Presupposition* (UP). (1) seems to presuppose that no more than one employee left early. Therefore, the question can be felicitously answered if, e.g., only Moss left early (1a), but not if both Roy and Moss left early (1b).

(1) Which employee left early?

  a. Moss left early.

  b. # Roy and Moss left early.

- Plural *which*-questions carry an anti-singleton inference. If a speaker asks the question in (2), we can infer (that the speaker believes) that more than one employee left early.

(2) Which employee<u>s</u> left early?

  a. ? Roy left early.

  b. Roy and Moss left early.

- Simplex *wh*-questions carry neither a UP nor an anti-singleton inference.

(3) Who left early?

  a. Roy left early.

  b. Roy and Moss left early.

- The semantics that Nathan outlined for questions last week obviously fails to account for the contrast between (1) and (2), since we haven't said anything about the semantics of number. Perhaps more interestingly, it says nothing about the contrast between (1) and (3).[1,2]

(4) a. $[\![(1)]\!] = \lambda p.\exists x[\text{employee}_{@}(x) \wedge p = \lambda w.x \text{ left early in } w]$

  b. $[\![(3)]\!] = \lambda p.\exists x[\text{person}_{@}(x) \wedge p = \lambda w.x \text{ left early in } w]$

- Dayal 1996 provides a concrete analysis of the contrasts outlined above, based on one key assumptions: questions carry a *Maximal Informativity Presupposition* (MIP).

[1] To simplify, I assume that NP restrictors are always interpreted *de re*.

[2] Here I provide denotatons based on Hamblin, 1973, but the same reasoning goes through for denotations based on Karttunen, 1977, or Groenendijk and Stokhof, 1984.

- Dayal's central idea is that, when a speaker asks a question, they presuppose that there exists a unique, maximally informative, true answer to that question.[3]
- Dayal cashes this out by positing an answerhood operator (called $\text{ANS}_{\text{Dayal}}$ here) that composes with a question and is defined as below.[4]

(5) $$[\![\text{ANS}_{\text{Dayal}}]\!] = \lambda w.\lambda Q.\iota p[p(w) \wedge Q(p) \wedge \forall p'[[p'(w) \wedge Q(p)] \rightarrow p \subseteq p']]$$

[3] This idea has been argued to be crucial in understanding weak island phenomena (Abrusán 2014), and the semantics of degree questions (Rullmann 1995; Fox and Hackl 2007).

[4] $\text{ans}_{\text{Dayal}}$ is a function from a world w and a question Q, to the unique proposition p, that is true in w, that is an answer to Q, and entails every other true answer to Q.

- Furthermore, Dayal assumes that singular *which*-phrases range over atomic individuals only.
- This immediately derives the UP for singular *which* questions.

$$[\![(1)]\!] = \left\{\begin{array}{l} ① \lambda w.\text{Roy left early in } w, \\ ② \lambda w.\text{Moss left early in } w, \\ \lambda w.\text{Jen left early in } w \end{array}\right\}$$

- If ① and ② are both true in @, then $[\![\text{ANS}_{\text{Dayal}}]\!](@)([\![1]\!])$ is undefined, since ① does not entail ②, and ② does not entail ①. This captures the fact that (1b) is infelicitous as an answer to (1). $[\![(1)]\!]$
- Dayal assumes that semantically plural *which*-phrases may also range over groups.

$$[\![(2)]\!] = \left\{\begin{array}{l} ① \lambda w.\text{Roy left early in } w, \\ ② \lambda w.\text{Moss left early in } w, \\ \lambda w.\text{Jen left early in } w, \\ \underline{③ \lambda w.\text{Roy and Moss left early in } w,} \\ \lambda w.\text{Roy and Jen left early in } w, \\ \lambda w.\text{Moss and Jen left early in } w, \\ \lambda w.\text{Roy, Moss and Jen left early in } w \end{array}\right\}$$

- If ①, ②, and ③ are all true in @, then $[\![\text{ANS}_{\text{Dayal}}]\!](@)([\![(2)]\!])$ is defined, returning the proposition in ③.
- In order to account for the absence of a UP with simplex *wh*-questions, Dayal claims that, although simplex *wh*-expressions such as "who" are morphosyntactically singular (in English). They are semantically plural.

(6) Who { is | *are } leaving early?

- Dayal's explanation, therefore, rests on an idiosyncratic property of English. It makes predictions for languages which distinguish between singular *who* and plural *who*, which we explore in the next section.
- Note that, without saying anything further, this account fails to account for the fact that plural *which*-questions carry an anti-singleton inference, whereas simplex *wh*-questions do not.[5]

[5] The story one wants to tell here probably seems rather obvious: singular *which*-questions count as alternatives to plural *which*-questions, but not to simplex *wh*-questions.

“Which” vs. “who” cross-linguistically

- In order to test the predictions of Dayal’s account, we need to look at languages which make a morphosyntactic distinction between who.SG and who.PL.
- Two such languages are Spanish and Hungarian. In both languages, the following trend emerges: (i) singular *which*-questions carry a UP, (ii) plural *which*-questions carry an anti-singleton inference, (iii) singular *who*-questions carry *no* UP, but (iv) plural *who*-questions carry an anti-singleton inference.
- Spanish[6]

[6] Thanks to Luisa Martí for judgements and help with these data.

(7) *Qué chico se fue pronto?*
Which boy.SG REFL left early?
   a. John left early.
   b. # John and Bill left early.

(8) *Qué chicos se fueron pronto?*
Which boy.PL REFL left early?
   a. # John left early.
   b. John and Bill left early.

(9) *Quién se fue pronto?*
Who.SG REFL left early?
   a. John left early.
   b. John and Bill left early.

(10) *Quiénes se fueron pronto?*
Who.PL REFL left early?
   a. # John left early.
   b. John and Bill left early.

- Hungarian[7]

[7] Thanks to Andás Bárány for judgements and help with these data.

(11) *Melyik fiú ment el?*
which boy.SG go.3SG away?
   a. John went away.
   b. # John and Bill went away.

(12) *Ki* *énekel?*
who.SG sing.3SG

a. John sings.

b. John and Mary sing.

(13) *Ki-k* *énekel-nek?*
who.PL sing.3PL

a. #John sings.

b. John and Mary sing.

- These data are straightforwardly problematic for Dayal's account, assuming that who.SG is semantically singular, and therefore ranges over atomic individuals.
- Perhaps Dayal could simply stipulate that who.SG is semantically plural. But then the fact that who.PL carries an anti-singleton inference becomes problematic, since the most prominent theory of this (Sauerland, Anderssen, and Yatsushiro's 2005 *Maximize Presupposition!* based account), relies on the availability of a semantically singular competitor.
- In the next section, I introduce some basics concerning the semantics of plurality, which will be necessary background for our account.

Plurality

Basics

- Semantically plural DPs such as "the employees", and "Roy and Moss" denote *i(-ndividual) sums* (Link 1983).[8]

(15) a. $[\![\text{Roy and Moss}]\!] = \text{Roy} \oplus \text{Moss}$

b. $[\![\text{the employees}]\!] = \text{Roy} \oplus \text{Moss} \oplus \text{Jen}$

- D_e is closed under the i-sum forming operator $\oplus$.[9]

(17) $\mathscr{D} = \{\text{Roy}, \text{Moss}, \text{Jen}\}$

(18) $$D_e = \left\{ \begin{array}{c} \text{Roy, Moss, Jen} \\ \text{Roy} \oplus \text{Moss, Roy} \oplus \text{Jen, Moss} \oplus \text{Jen} \\ \text{Roy} \oplus \text{Moss} \oplus \text{Jen} \end{array} \right\}$$

- Group-denoting expressions combine with distributive predicates via the *distributivity operator* DIST.

(19) $\text{DIST}(P_{et}) = \lambda P_{et}.\lambda x_e.\forall x'[(\text{ATOM}(x') \wedge x' \sqsubseteq x) \rightarrow P(x')]$

[8] There is also a long tradition in the linguistic and philosophical literature, of treating plural DPs as denoting *sets* of atomic individuals.

(14) $[\![\text{Roy and Moss}]\!] = \{\text{Roy}, \text{Moss}\}$

The two approaches are largely equivalent, especially if one adopts Quine's set theory, according to which α and $\{\alpha\}$ are equivalent (see, e.g., Schwarzschild 1996 for discussion). There is some debate as to whether the additional structure provided by set theory is necessary in order to account for nested pluralities.

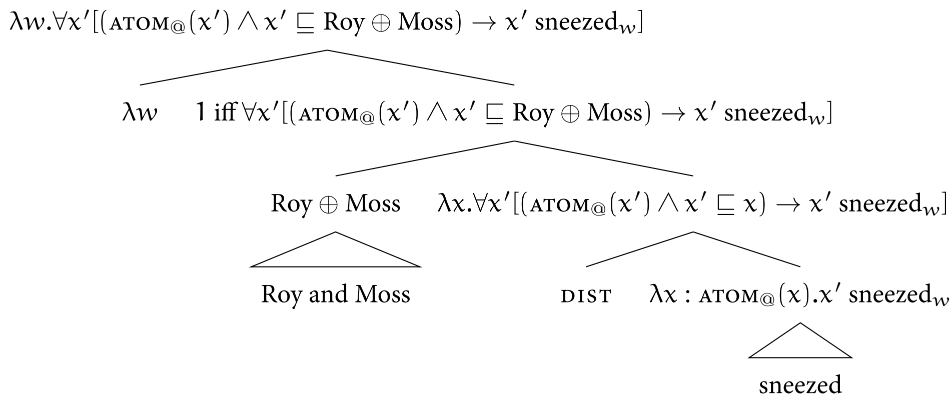
[9] $\oplus$ is *commutative* (16a), *associative* (16b), and *idempotent* (16c).

(16) a. $x \oplus y = y \oplus x$

b. $x \oplus (y \oplus z) = (x \oplus y) \oplus z$

c. $x \oplus x = x$

(20) Roy and Moss sneezed.



- Group-denoting expressions can compose directly with collective predicates.

(21) $[\![\text{gather}]\!] = \lambda w.\lambda x : \neg\textsc{atom}_{@}(x).x \text{ gather}_w$

The weak theory of plurality

- Conjecture: the plural is semantically vacuous; the singular is semantically meaningful.[10]

[10] To simplify here, I assume that number features are always interpreted *de re*.

(22) **Weak theory**

a. $[\![\textsc{sg}]\!](P_{et}) = \lambda x : \textsc{atom}_{@}(x).P(x)$

b. $[\![\textsc{pl}]\!](P_{et}) = P$

(23) a. $[\![\text{man.}\textsc{sg}]\!] = \lambda x : \textsc{atom}_{@}(x).\text{boy}_w(x)$

b. $[\![\text{man.}\textsc{pl}]\!] = \lambda x.\text{man}_w(x)$

(24) $[\![\text{the}]\!] = \lambda P.\sigma(P)$[11]

[11] σ is defined for P iff there is a unique maximal element in P.

(25) $[\![\text{the man left}]\!] = \lambda w : \textsc{atom}_{@}(\sigma(\text{man}_{@})).\text{left}_w(\sigma(\text{man}_{@}))$

(26) $[\![\text{the men left}]\!] = \lambda w.\text{left}_w(\sigma(\text{man}_{@}))$

- Without saying anything else, the weak theory predicts that a sentence with a plural, such as (26), is felicitous in a context where, e.g., Moss is the only man, and Moss left. This does not match up with speaker intuitions about the felicity conditions of sentences with plurals.
- This might seem like a major problem for the weak theory, but we account for this on the basis of the pragmatic principle in (27) (based on Heim 1991).

(27) **Maximize Presupposition! (MP)**
Do not use S in context set c if there is an S′ such that:

a. $S' \in \textsc{alt}(S)$

b. S′ is defined in c

c. you believe S′ to be true

d. The presuppositions of S′ entail those of S

- Assuming that (25) ∈ ALT((26)), an utterance of (26) gives rise to an *implicated presupposition* (Sauerland 2008): namely, that (25) is not defined in the utterance context c, and therefore that $\textsc{atom}_{@}(\sigma(\text{man}_{@}))$ is not believed to be true.

Empirical arguments for weak theory

Unless otherwise noted, all examples are taken from Sauerland, Anderssen, and Yatsushiro, 2005.

- Mixed reference:

(28) Context: The coach knows exactly how many sisters each boy has. Every boy has at least one sister; Bill has exactly one, whereas Tom has three. The coach thinks that all the sisters should be invited.

a. Every boy should invite his sisters to the party.

b. #Every boy should invite his sister to the party.

Crucially, Sauerland, Anderssen, and Yatsushiro (2005) assume that presuppositions project universally through universally quantified environments.

- Indefinites in Downward Entailing (DE) contexts:

(29) a. Josie hasn’t found any eggs.

b. Josie has found no eggs.

(30) a. Some eggs are still hidden.

b. Some egg is still hidden.

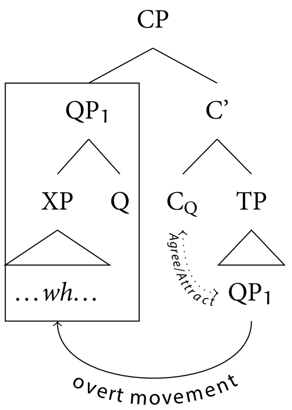
Analysis

Implementation 1

This is my preferred way of doing things! A lot of this boils down to aesthetic preferences. Andreea and Uli would probably disagree.

- We adopt Cable’s (2010) syntax for constituent questions (schematised in (31)), reflecting an emerging consensus in the syntactic literature (see, e.g., Horvath 2007; Safir 2015; Urk 2015)

(31)



- Generalised system for question composition inspired by Cresti, 1995; Heim, 1994; Sternefeld, 2001 and Charlow, 2015a; Charlow, 2015b. See Elliott, 2017 for details of the full system.

(32) a. $[\![C_Q]\!] = \lambda q_{st}.\lambda p_{st}.p = q$

b. $[\![Q]\!] = \lambda X_{\sigma t}.\lambda f_{\langle \sigma,\langle st,t\rangle\rangle}.\lambda p_{st}.\exists x_\sigma[X(x) \wedge f(x)(p)]$

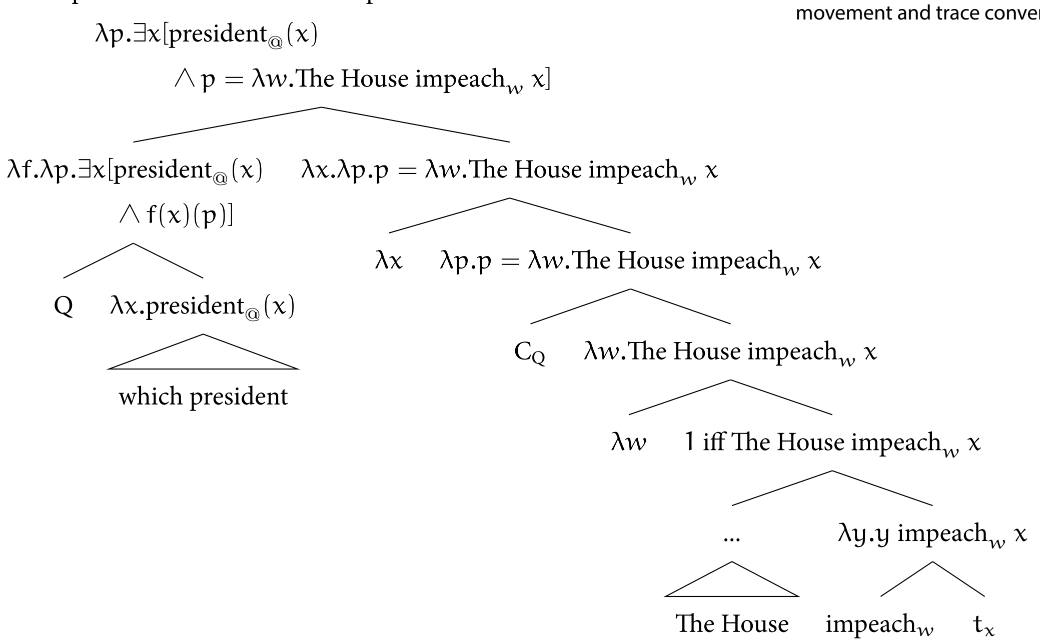
for any type σ

- *wh*-expressions denote sets of alternatives.

(33) $[\![\text{which president}]\!] = \lambda x.\text{president}_{@}(x)$

To simplify, I assume here that NP restrictors are interpreted *de re*. *De dicto* readings of questions can easily be accounted for in this system by incorporating the independently motivated copy-theory of movement and trace conversion.

(34) Which president did The House impeach?



- We treat ϕ-features as identity functions in the semantics; SG is presuppositional, whereas PL is semantically vacuous, in-line with Sauerland, Anderssen, and Yatsushiro, 2005.

(35) a. $[\![\text{SG}]\!](P_{et}) = \lambda x : \text{ATOM}_@(x).P(x)$

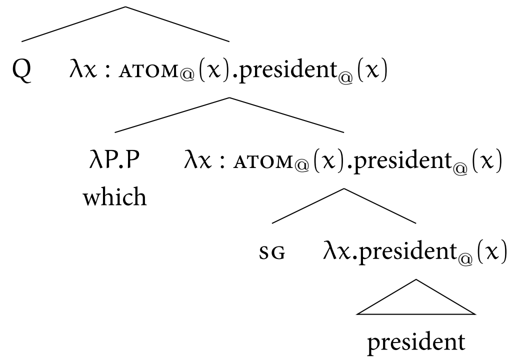
b. $[\![\text{PL}]\!](P_{et}) = P$

To simplify, we assume that presuppositions introduced by ϕ-features are construed *de re*.

- We can decompose a singular *which*-phrase as follows:[12]

[12] I assume that *which* is semantically vacuous (i.e., an identity function).

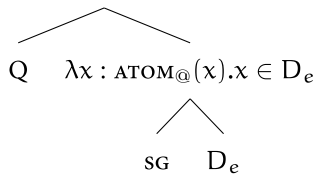
(36) $\lambda f.\lambda p.\exists x'[[\lambda x : \text{ATOM}_@(x).\text{president}_@(x)](x') \wedge f(x)(p)]$



- We decompose a simplex *wh*-expression such as *who* as follows:[13]

[13] To simplify, we ignore the animacy requirement of *who* here.

(37) $\lambda f.\lambda p.\exists x'[[\lambda x : \text{ATOM}_@(x).x \in D_e](x') \wedge f(x)(p)]$



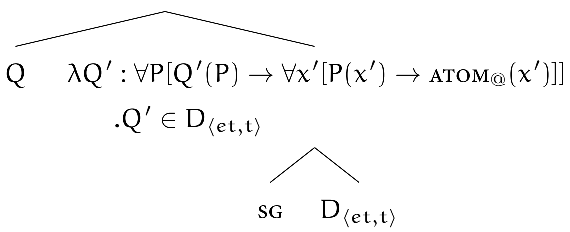
- Our innovation is that, rather than just ranging over elements of D_e, *who* can also range over members of $D_{\langle et,t\rangle}$. Furthermore, we give a new, recursive denotation for ϕ-features such as SG.

(38) **Recursive definition for SG:** for any type σ

a. $[\![\text{SG}]\!](P_{et}) = \lambda x : \text{ATOM}(x).P(x)$

b. $[\![\text{SG}]\!](Q_{\sigma t}) = \lambda a_\sigma : \forall b_\sigma[Q(b) \rightarrow [\![\text{SG}]\!](b)].Q(a)$

(39) $\lambda f.\lambda p.\exists Q_{\langle et,t\rangle}[[\lambda Q' : \forall P[Q'(P) \rightarrow \forall x'[P(x') \rightarrow \text{ATOM}_@(x')]].Q' \in D_{\langle et,t\rangle}](Q)$
$\wedge f(Q)(p)]$



- It follows that *who*.SG *left* has two different possible extensions, depending on the domain argument of SG. We end up with ① if it is D_e and ② if it is $D_{\langle et,t\rangle}$.

(40) $[\![\text{who.SG left?}]\!] = \begin{cases} ① \ \lambda p.\exists x[p = \lambda w : \text{ATOM}_@(x).\text{left}_w(x)] \\ ② \ \lambda p.\exists Q[p = \lambda w : \forall P[Q(P) \to \forall x'[P(x') \to [\text{ATOM}_@(x')]]].Q(\text{left}_w)] \end{cases}$

- If ② is a possible extension, then we do not necessarily expect a singular *who* question to carry a uniqueness presupposition. To see why, imagine that Roy and Moss left, but Jen didn't.[14]

(43) $[\![\text{who}_Q\text{.SG left?}]\!] = \left\{ \begin{array}{c} \lambda w.\text{leave}_w \in \{\emptyset\}, \\ \lambda w.\text{leave}_w \in \{\{\text{Roy}\}\}, \lambda w.\text{leave}_w \in \{\{\text{Moss}\}\}, \lambda w.\text{leave}_w \in \{\{\text{Jen}\}\}, \\ \lambda w.\text{leave}_w \in \{\{\text{Roy}\}, \{\text{Moss}\}\}, ① \ \lambda w.\text{leave}_w \in \{\{\text{Roy, Moss}\}, \{\text{Roy}\}\}, \ldots \\ ② \ \underline{\lambda w.\text{leave}_w \in \{\{\text{Roy, Moss}\}\}} \end{array} \right\}$

- ① and ② are both true, but ② asymmetrically entails ①, and therefore the MIP is satisfied; $\text{ANS}_{\text{Dayal}}$ picks out ②.
- We can therefore maintain, even for English, that *who* is both morphosyntactically and semantically singular.
- In order to account for the anti-singleton inference with *who*.PL, we assume that both who_Q.SG and who_x.SG count as alternatives for the purposes of MP!. *who*.PL competes with the presuppositionally strongest alternative.

[14] Note that since $\{\emptyset\}$ is a possible value for Q, we predict that a negative answer should be compatible with *who* question but not a singular *which* question.

(41) Who left?
  a. Nobody.

(42) Which employee left?
  a. #Nobody.

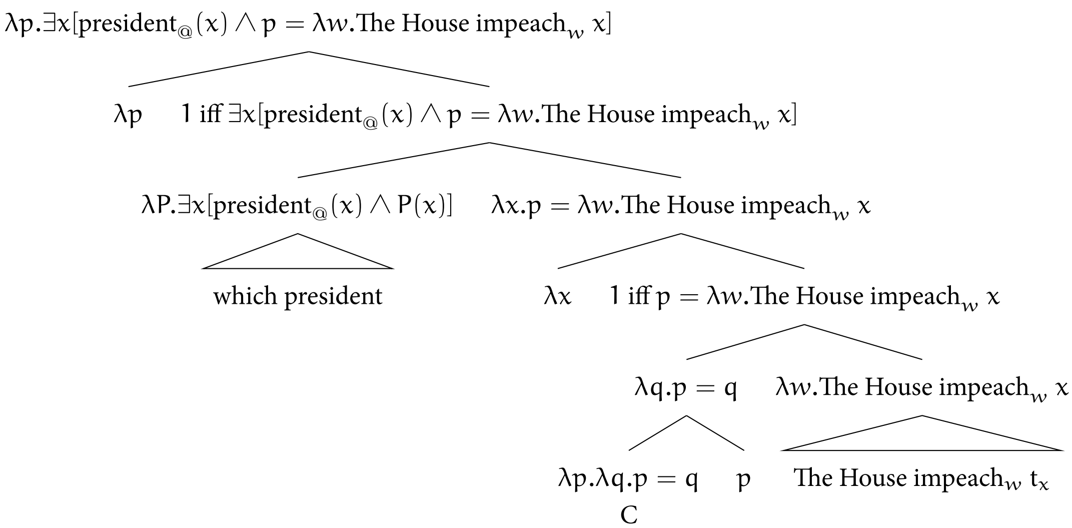
Implementation 2

- We assume Fox's (2012) take on Karttunen's (1977) system.

(44) $[\![C]\!] = \lambda q.\lambda p.p = q$

(45) $[\![\text{which president}]\!] = \lambda P.\exists x[\text{president}_@(x) \wedge P(x)]$

(46)



- Core idea: ϕ-features apply to the trace. We need a slightly different recursive definition.

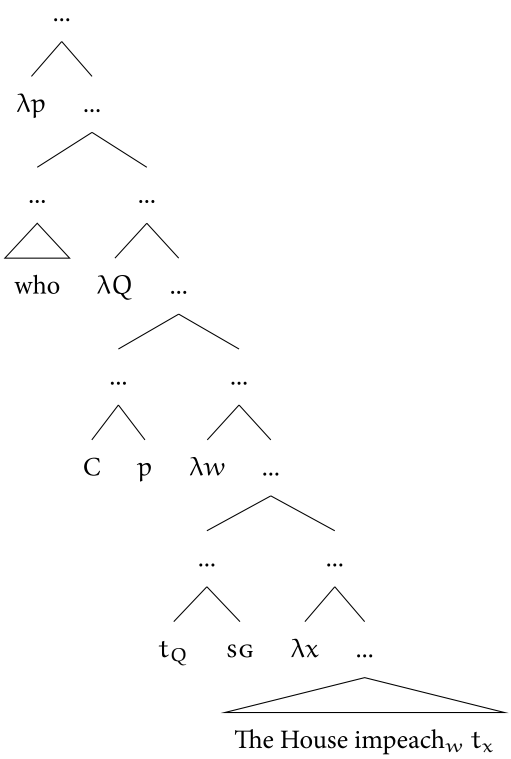
(47) **Recursive definition for SG v2:** for any type σ

a. $[\![\text{SG}]\!](x_e) = x$ defined if $\text{ATOM}_@(x) = 1$

b. $[\![\text{SG}]\!](X_{\sigma t}) = x$ defined if $\forall b_\sigma[X(b) \rightarrow [\![\text{SG}]\!](b)]$

- Homework: compute the meaning of the LF below and convince yourself that it derives the same result as before.

(48)



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