

Nesting habits of flightless wh-phrases

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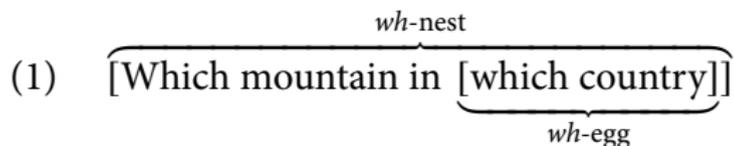
COMPLEX MULTIPLE WH-CONSTRUCTIONS, NANTES

A FLIGHTLESS EM-WHO



*Nested which-phrases:
properties and puzzles*

- The empirical focus of this talk is constructions involving *nested which-phrases*; a term coined by Heim (1994) to describe the configuration schematised in (1).



- I'll refer to the *container* as the *wh-nest*.
- I'll refer to *contained wh-expressions* as *wh-eggs*.

- Consider example (2), adapted from von Stechow (1996); I'll refer to questions involving nested *which*-phrases as **nested *which*-questions**:

(2) Which mountain in which country did you climb?

a. #The Dom.

b. The Dom, (which is) in Switzerland.

- As von Stechow (1996), observes a complete answer to (2) must name both a *mountain* and a *country*. This is a desideratum for any compositional account of (2).

- (2) appears to be an instance of the broader phenomenon of *multiple questions*, as illustrated in (3).
- (3) Which climber sent which route?
- a. # Adam.
 - b. Adam sent *Silence*.
- In English, only a single *wh*-expression undergoes overt movement to specCP; a complete answer to (3) must still name both a *climber* and a *route*.
 - Ideally, our account of (3) should extend to nested *which*-questions.

- There are, however, a two puzzles associated with nested *which*-questions which distinguish them from *wh-in-situ*.
- Accounting for the first puzzle will be the focus of this talk; there will also be speculative remarks on the second.
- **Elliott's puzzle:** Nested *which*-questions lack a pair-list reading.
- **Sudo's puzzle** Nested *which*-questions lack a complete *de re* reading.

- Unlike other multiple questions, nested *which*-questions lack a Pair List (PL) interpretation (to my knowledge first observed in Elliott 2015).
- In order to see this, let's first look at a multiple question that *does* have a PL interpretation.
- A complete answer to (4), under the pair-list interpretation, provides a mapping from *climbers* to *the route that they sent*.

(4) Which climber sent which route?

- a. Adam sent *Silence*, Sasha sent *Thunder Muscle*, and Chris sent *Joe Mama*.

- Helpfully, there are certain question embedding predicates which impose a PL interpretation, such as *rattle off* and *list*.
- (5)
- a. Duncan listed which climber sent which route.
 - b. Duncan rattled off which climber sent which route.

- Now, consider (6). This is felicitous, on the assumption that exactly one climber has sent *Silence*.
- (6) Which climber from which country sent *Silence*.
- a. Adam from the Czech Republic.
- (7), on the other hand, is infelicitous, on the assumption that more than one climber is competing in the olympics.
- (7) #Which climber from which country is competing in the olympics?
- expected answer:* Adam from the Czech Republic, Shauna from Britain, and Alex from Germany

- Furthermore, nested *which*-questions are incompatible with question embedding predicates which impose the PL interpretation:

(8) #Duncan { rattled off | listed } which climber from which country is competing in the olympics.

- In summary: multiple questions involving independent *wh*-expressions are compatible with both Single Pair (SP) and PL readings; nested *which*-questions tolerate only PL readings. We can conclude:
 - The SP reading is not a special case of the PL reading; the two readings should have distinct compositional sources.¹
 - A compositional account of nested *which*-phases should block the PL reading.

¹This is also argued for by Dayal (2002), on the basis of distinct data.

- Prevailing theories of *wh-in-situ* make use of island-insensitive *pseudo-scope* mechanisms, such as *pointwise function application* (see, e.g., Kotek 2014).
 - Such theories are tailored to account for the availability of PL across islands:
- (9) Which linguist will be upset
if which philosopher comes to the party?
- Pseudo-scope theories are difficult to constrain; no reason in principle why PL should be available across islands but not in nested *which*-questions.

- Sudo (2017) observes that nested *which*-questions lack a *complete de re* reading.
- To see why, let's first illustrate the *de re* reading of *which-phrases*.

- As discussed by Groenendijk & Stokhof (1984), Beck & Rullmann (1999) among others, *which*-phrases give rise to a *de re/de dicto* ambiguity.
- Consider the following context, from Sudo: p. 29:
- *I reserve part of my bookshelf for Russian novels, and my son doesn't know what kind of books they are or who wrote them, but knows which ones I haven't opened (e.g., because they're clean).*
- In this context, the *de re* construal of (10) is true.

(10) My son knows which Russian novels I haven't opened.

- Crucially, PP modifiers contained within *which*-phrases may be interpreted *de re*; (11) allows a complete *de re* construal of the *which*-phrase:

(11) My son knows which novels by Russian authors I haven't opened.

- Sudo (2017) notices that the *complete de re construal* is unavailable for nested *which*-phrases; (12) has no true reading in the context given.
- *I reserve part of my bookshelf for Russian novels, and my son doesn't know what kind of books they are or who wrote them, but knows which ones I haven't opened (e.g., because they're clean).*

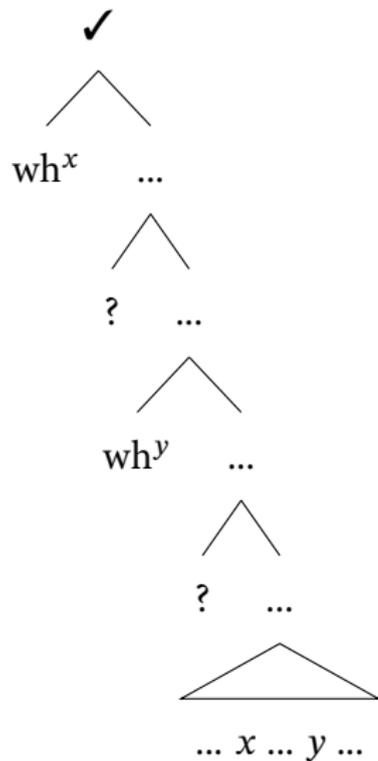
(12) # My son knows which Russian novels by which authors I haven't opened.

- There is no general ban on a complete *de re* construal of a *which*-phrase with a PP modifier; this must be a *wh*-specific constraint.
- According to a theory of *de re* construals with object-language world pronouns (see, e.g., PERCUS), it's not clear how to block the following representation:

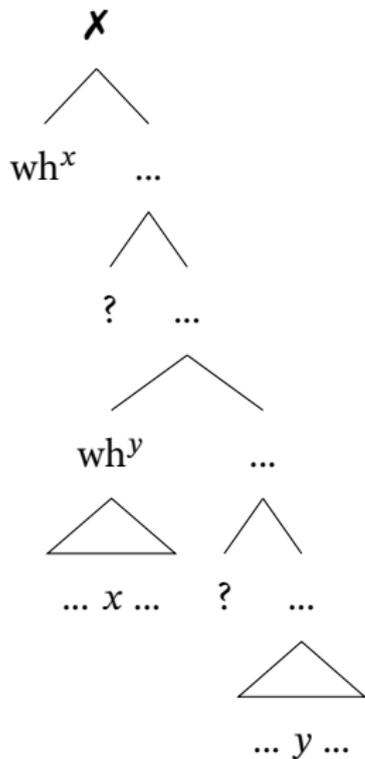
(13) which Russian novels_@ by which authors_@ haven't I opened?

- In the following, I'll suggest that an account of both Elliott's puzzle falls out from independently motivated restrictions on *scope*.
- According to the picture I'll sketch, *wh*-expressions are scope-takers; the PL reading requires two *wh*-expressions to independently scope over two question operators.
- PL can obtain across islands, due to the availability of *covert island pied-piping* (Nishigauchi 1990)
- The PL reading for nested *which*-questions is blocked because the *wh*-nest is a scope island for the *wh*-egg. Pied-piping does nothing for us here.

(14)



(15)



- Our account of Sudo's puzzle will be more speculative, but we'll ultimately suggest a similar explanation.
- Due to the way the system will be set up, a complete *de re* construal would require scoping out the *wh*-egg, in violation of the locality condition on scope-taking.

Wh-in-situ via scope

- The system I'll present, which goes back to Elliott (2015), is a straightforward adaptation of Charlow's (2014) semantics for indefinites to *wh*-questions, using Cable's (2010) Q-based syntax.
- An important predecessor is Dayal's (1996) account of the *wh*-triangle; it can also be thought of as a generalisation of Heim's (1994) question semantics.

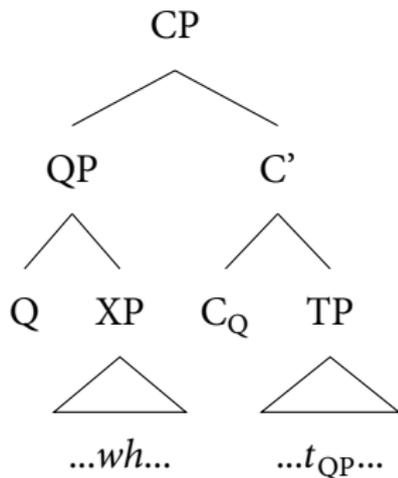
- The system makes good on the promise of island-violation scope via *covert island pied-piping* (Nishigauchi), which addresses von Stechow's objections.
- See Elliott & Sauerland (2019) for a theory of intervention by negation in terms of the theory outlined here.
- See also Demirok (2019) for a recent theory of question composition based on similar assumptions.

- Most theories of question composition assume that *wh*-expressions introduce *alternatives*; the scopal theory is no different.

(16) $\llbracket \text{which climber} \rrbracket := \{ x \mid \text{climber } x \}$

- Following Cable (2010), I assume a Q-based system for *wh*-movement and pied-piping.
- The idea here is that, what moves in a *wh*-question is always a QP – a null morpheme, Q, merges with a constituent containing a *wh*-phrase, projecting a QP layer.
- The interrogative complementizer C_Q bears an uninterpretable Q feature that attracts the lower QP.
- ‘Pied-piping’ can be captured by assuming some variability in the size of constituent that Q may attach to. In fact, in this system, *wh*-movement *always* involves pied-piping.

(17) *wh*-fronting as a secondary effect of QP-movement



- Question composition proceeds by two type-shifters/functional heads working in tandem: ? and Q.
- **Informal intuition:** ? is just a type-general formulation of Partee's IDENT; its a function from a value to the corresponding singleton set.

$$(18) \quad ? := \lambda p . \{p\} \qquad a \rightarrow \{a\}$$

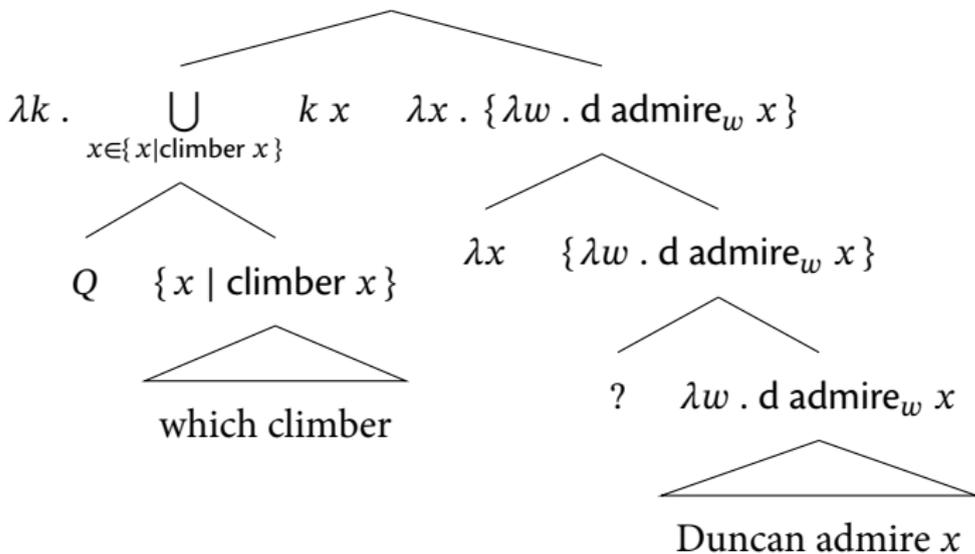
- **Informal intuition:** Q is a bit more complex. It takes an alternative set X , and gathers together the result of feeding each $x \in X$ into a scope k .

$$(19) \quad Q := \lambda X . \lambda k . \bigcup_{x \in X} k x \qquad \{b\} \rightarrow (b \rightarrow \{a\}) \rightarrow \{a\}$$

- A question involves Q composing with an *alternative-set* and scoping it over something lifted via $?$.
- At the interface, we can simply assume $\llbracket Q \rrbracket = Q$.
- We can assume that $\llbracket C_Q \rrbracket = ?$, but we'll need to assume that $?$ is also freely available as a type-shifting operation.
- As I'll demonstrate in the following, surprisingly, just Q and $?$ give us an account not just of simple questions, but also (i) exceptional *wh*-scope out of islands, and (ii) the PL/SP ambiguity.

Which climber does Duncan admire?

(20) $\{p \mid \exists x[\text{climber } x \wedge p = \lambda w . \text{d admire}_w x]\}$



Pair-list readings

- Following, e.g., Fox (2012), Nicolae (2013) and Kotek (2014), I assume that a sensible meaning for the PL reading of a question is a *family* (= set) of questions.

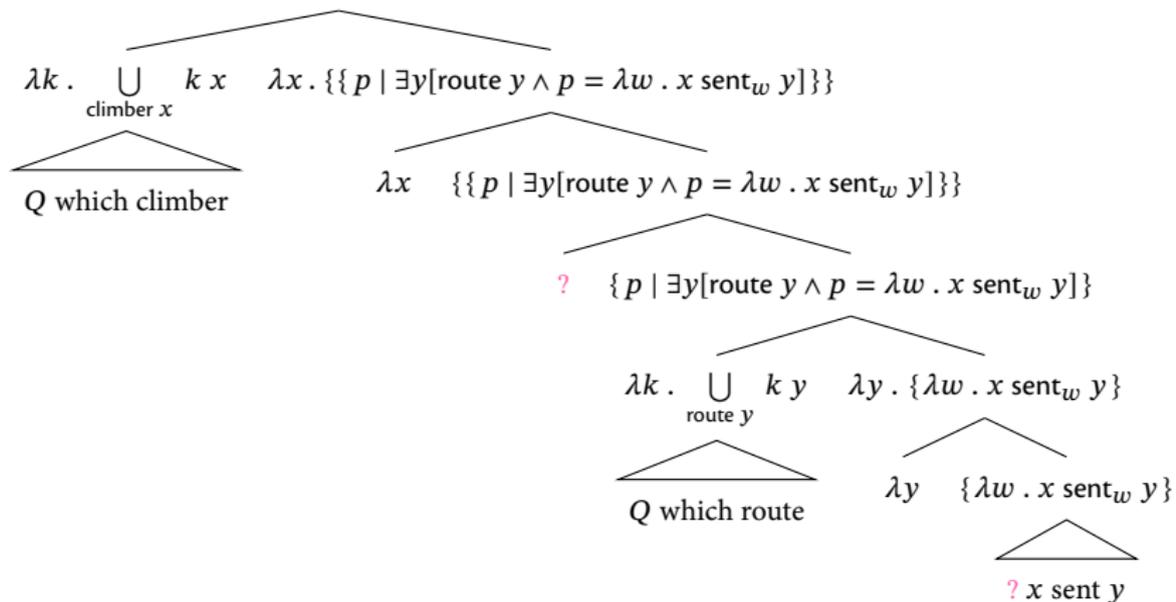
$$(21) \quad \llbracket \text{which climber sent which route?} \rrbracket = \left\{ \begin{array}{l} \text{which route did Adam send?} \\ \text{which route did Sash send?} \\ \text{which route did Alex send} \end{array} \right\}$$

- Following Kuno & Robinson (1972), we'll refer to the overtly-moved *wh*-expression as the *sort key*.

- Under the PL reading a multiple question involving an overtly moved *wh* with domain X and an in-situ *wh* with domain Y presupposes a unique function $f : X \mapsto Y$.
- Following Fox (2012), this follows if we assume that Dayal's 1996 answerhood operator applies *pointwise* to a set of questions keyed to the overtly moved *wh*, and we take the grand conjunction of the resulting propositions. See Dayal (1996) for a different approach.
- In the following then, for PL readings I'll assume we want to generate sets of questions keyed to the overtly moved *wh*.

PAIR LIST: A FAMILY OF QUESTIONS

$$\{Q \mid \exists x[\text{climber } x \wedge Q = \{p \mid \exists y[\text{route } y \wedge p = \lambda w . x \text{ sent}_w y]\}]\}$$



- In order to generate the SP reading, we scope two *whs* above a single *?*.
- In order to generate the PL reading, we scope two *whs* independently over distinct *?*s.
- Under the PL reading, the overtly moved *wh*-expression is the “sort key”.

Covert island pied-piping

- Kotek (2014) argues that the PL reading is available out of both scope islands and syntactic islands.

(22) Which linguist believes

that which philosopher will come to the party?

PL

Chomsky believes that Derrida will come, David believes that Habermas will come, etc...

(23) Which linguist will be upset

if which philosopher comes to the party

PL

Chomsky will be upset if Derrida comes, David will be upset if Habermas comes, etc...

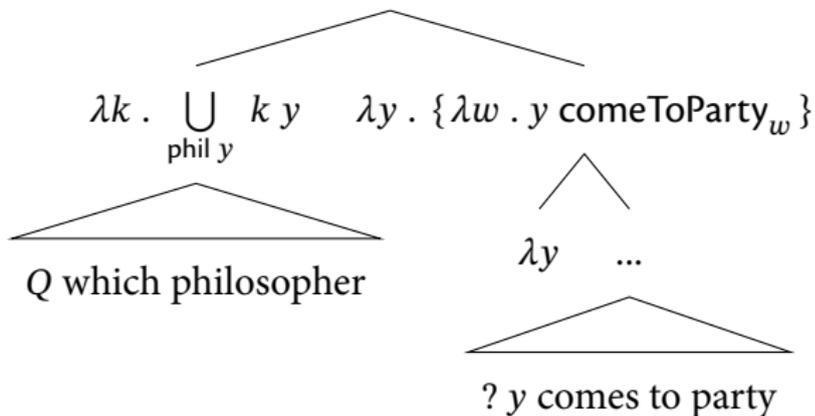
- The intuition behind our account of exceptionally scoping *wh* will be the following: the *in-situ wh*-expression moves to the edge of the island and *wh*-ifies it.
- *Q* scopes out the island as one big *wh*-phrase!
- The result will be equivalent to scoping out the *wh*-phrase by itself.

(24) Which linguist will be upset if which philosopher comes to the party? (Pair List)

(25) $(Q \text{ whLing})^x ? \boxed{Q ((Q \text{ whPhil})^y ? (y \text{ comesToParty}))}^p ? (x \text{ upset if } p)$

- The island comes to denote a *set of alternative islands* via movement of *wh* to its edge, i.e., a *wh-ified island*.

(26) $\{p \mid \exists y[\text{phil } y \wedge p = \lambda w . y \text{ comeToParty}_w]\}$



- Scope via island-internal scope, followed by covert island pied piping results in a meaning *equivalent* to as if the *in-situ wh*-expression had scoped out of the island. This addresses von Stechow's objection to island pied-piping.
- This cyclic scoping mechanism is *recursive*, and therefore PL readings are predicted to be possible from out of an island contained within an island.

(27) Which linguist will be upset if we invite someone who knows which philosopher.

(28) ① = $(Q \text{ whPhil})^y ? (\text{someone who knows } y)$

(29) ② = $(Q \text{ ①})^z ? (\text{we invite } z)$

(30) ③ = $(Q \text{ whLinguist})^x ? ((Q \text{ ②})^p ? (x \text{ upset if } p))$

which ling^x

 which phil^y someone who knows y^z we invite z^p
 x will be upset if p

- 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.

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

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

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

(33) PP pied-piping

$[_{PP} [_{DP} \text{Mitä} \quad \text{taloa}]^x \quad \text{kohti} \quad x]^y \text{ Pekka käveli } y?$
 which.PAR house.PAR towards t Pekka walked t

“Which house did Pekka walk towards?”

(34) Adjunct pied-piping:

$[[\text{Mitä} \quad \text{pöytään}]^x \quad \text{kantaessaan } x]^y \text{ Pekka kompastui } y?$
 what.PAR table.to carry.ESSA t Pekka fell t

“What was Pekka carrying to the table when he fell?”

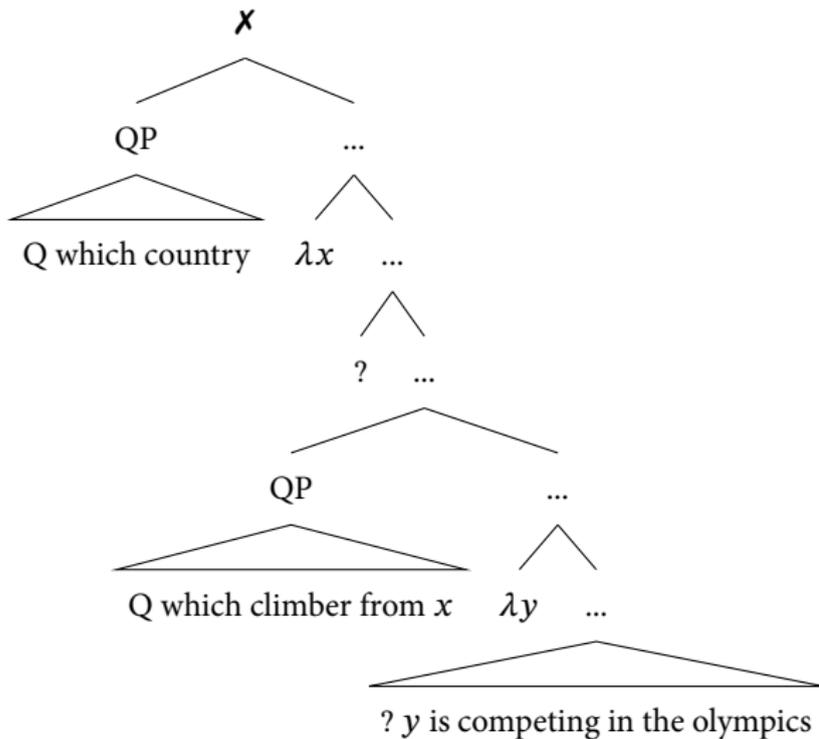
Back to nested *which*-phrases

- Recall Elliott's puzzle – the following lacks as PL reading:

(35) # Which climber from which country is competing in the olympics?

- In order to derive a PL reading, both the *wh*-nest and the *wh*-egg would have to take scope independently.
- This would necessitate extracting the *wh*-egg from the *wh*-nest. I argue that this is disallowed, since the *wh*-nest is a scope island. Note that covert island pied-piping won't help.

ON THE ABSENCE OF THE PL READING FOR NESTED WHICH-QUESTIONS II



- Supporting evidence comes from the fact that a universal embedded inside of a *wh*-expression fails to give rise to a PL reading.

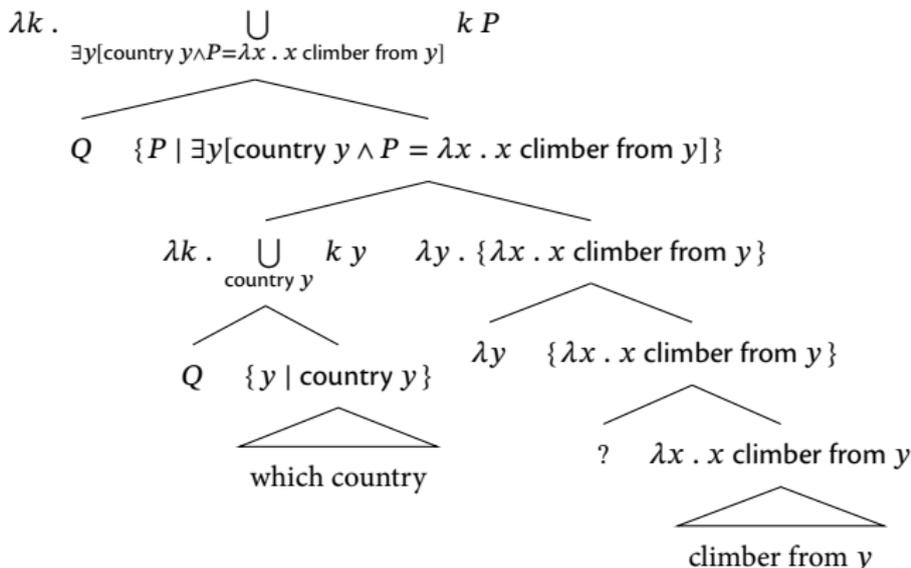
(36) # Which climber from each country is competing in the olympics?

- If a PL reading requires scope of the universal over the question, as has been argued for by e.g., Fox (2012), this supports the view that a *wh*-phrase is a scope island.
- This can be seen as a special case of the general claim that DPs are scope islands (see Charlow 2010 for discussion).

WHAT ABOUT THE SP READING?

- The most straightforward LF for nested *which*-questions which doesn't violate locality is the following (we assume that *which* can scope out):

(37) Nested *which*-phrase composition:



- **The problem:** the following meaning is equivalent to *which climber from a country is competing?*, since everyone is from some country.

$$(38) \quad \left\{ p \mid \begin{array}{l} \exists P \in \{P \mid \exists y[\text{country } y \wedge P = \lambda x . x \text{ climber from } y]\} \\ \wedge \exists x \in P[p = \lambda w . x \text{ isCompeting}_w] \end{array} \right\}$$

- I assume that this LF is ruled out by economy, due to competition with:

(39) Which climber from a country is competing?

- **The solution:** the restrictor of a *wh*-expression may optionally be interpreted downstairs, as part of a bound definite description (Beck & Rullmann 1999):

(40) Which climber from which country is competing?

$$(41) \left\{ p \mid \exists x, y [p = \lambda w . \iota x \left[\begin{array}{l} \text{climber}_w x \text{ from}_w \\ \iota y [\text{country}_w y] \end{array} \right] \text{isCompeting}_w] \right\}$$

- A similar solution was independently proposed by Sauerland & Heck (2003)

- This gives back a set of partial propositions:

$$(42) \quad \left\{ \begin{array}{l} \lambda w : \text{climber}_w \text{ Adam} \wedge \text{country}_w \text{ CzechRep} \wedge \text{Adam from}_w \text{ CzechRep} . \dots \\ \lambda w : \text{climber}_w \text{ Adam} \wedge \text{country}_w \text{ Germany} \wedge \text{Adam from}_w \text{ Germany} . \dots \\ \dots \end{array} \right\}$$

- As pointed out by Sauerland & Heck, the SP reading now follows from the following requirement:

(43) Any answer to a question must uniquely identify one element of the question.

- The answer *Adam is competing* doesn't uniquely identify one element of the above set.

- If nested *which*-phrases obligatorily reconstruct, and the *de re* reading requires scope over some extensionalising operator at the edge of the clause (Keshet 2010), the ban on the complete *de re* reading directly follows.

- Principle: QPs leave behind copies. The type mismatch is resolved via a polymorphic indexed definite determiner:

(44) $\text{THE}_n P = g_n$ defined iff $P g_n$

Evidence for scope from Hindi

- In this final section, I'll present some evidence from Hindi supporting the idea that the unavailability of the PL reading for nested *wh*-questions in English is due to the opacity of the DP.
- Note: all Hindi judgements here are due to Rajesh Bhatt.

- (45) illustrates a nested *wh*-question in Hindi:

(45) *[kis lekhak-kii] Ram-ne [ko kitaab] khariid-ii*
WH writer-GEN.F RAM- ERG WH book.F buy-PFV.F

“which book by which writer did Ram buy?”

- The *wh*-egg is realized as a genitive possessor, rather than a PP; unlike in English, this has a PL reading, and can receive an answer as in the following:

(46) Ram bought WAR AND PEACE by TOLSTOY, and THE IDIOT by DOSTOEVSKY.

- This is *prima facie* unexpected! But, note that the *wh*-egg appeared discontinuous from the *wh*-nest, in a sentence initial position.
- It is independently known that possessors can scramble out of their containing DPs in Hindi, and that scrambling in Hindi *feeds scope-taking* (see Dayal 1996 for discussion).
- Thus, we at least have an explanation for why nested *wh*-questions in Hindi can have a PL reading – scrambling allows the *wh*-containee to move out of the *wh*-container and take scope.

- The prediction is that if we somehow prevent the *wh*-containee from scrambling out of the *wh*-container in Hindi, the PL reading should be unavailable; only the SP reading (if it is indeed insensitive to locality).
- We can accomplish this by introducing an *additional layer of nesting* – the *wh*-containee will be nested inside of an additional possessor, and complex possessors are islands for scrambling in Hindi.
- The kinds of examples we're interested in are as follows:

(47) [Which book [_{PP} by [_{DP} [which linguist]'s brother]]] are you reading?

- The PL reading is, unsurprisingly, unavailable in English.

- In (48), the *wh*-containe *kis linguist-ke* remains within the *container*. The PL reading is unavailable.

(48) *tum-ne parh-ii [kis linguist-ke bhaai-kii ko*
 you-ERG read WH linguist-GEN.OBL brother-GEN.F WH
kitaab]
 book

“Which book by which linguist’s brother did you read?”

- (49) shows that the entire *wh*-container can be scrambled to a sentence-initial position. The PL reading remains unavailable, which is exactly what we predict.

(49) *[kis linguist-ke bhaai-kii ko kitaab] tum-ne*
 WH linguist-GEN.OBL brother-GEN.F WH book you-ERG
parh-ii
 read-?

“Which book by which linguist’s brother did you read?”

- (50) shows that scrambling out of the *wh*-containee is indeed disallowed:

(50) * [*kis linguist-ke*]_i *tum-ne* *t_i* *bhaai-kii* *ko kitaab*
 WH linguist-GEN.OBL you-ERG *t_i* brother-GEN.F WH book
parh-ii
 read-?

- It is of course possible to extrapose the PP in nested *wh*-questions in English.

(51) [Which book t_i] $_j$ did you read t_j [$_{PP}$ by which author] $_i$?

- Several of my informants find a PL reading more readily available in examples such as (59), where the PP containing the *wh*-containee has been extraposed. Several however still find the PL reading to be unavailable.
- This would suggest that (for some speakers) PP extraposition feeds scope, much like scrambling in Hindi. I leave this question to future research.

Conclusion

- By positing two type-neutral type-shifters: Q and ?, we can give a fully compositional account of a large swathe of *wh*-questions via covert movement and functional application, including pair-list readings of multiple questions.
- The absence of the pair-list reading in nested *wh*-questions suggest that an independent mechanism must be available for the single-pair reading – we speculated that this follows from the independently motivated possibility of interpreting a *wh* in-situ as a bound definite description.
- Hindi provides the exception that proves the rule. Scrambling from DP feeds scope, and thus feeds the PL reading for nested *wh*-questions.

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