Towards a non-vacuous theory of intervention effects

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Roadmap

- Background
- Intervention effects: the empirical landscape.
- Deficiencies of Beck's account.
- Mayr's static account and outstanding issues.
- Back to basics: question composition.
- Analysis: higher-order quantification and a pragmatic condition on question meanings.

Background

Wh-in/ex-situ

- Languages can be grouped according to:
  - In simple *wh*-questions, whether movement of the *wh*-expression to its scope position is obligatory (*wh-ex-situi*), disallowed (*wh-in-situ*), or optional.
  - In multiple questions with two *wh*-expressions wh_{a} and wh_{b}, whether:
    - Both *wh*s are ex-situ
    - Both *wh*s are in-situ
    - wh_{a} is ex-situ; wh_{b} is in-situ.

Wh-in/ex-situ ii

- In this talk we're going to be paying special attention to configurations in which *at least one* wh is in-situ.

$Q\, wh^x \ldots t_x \ \ldots$

$Q \ldots wh^x \ldots$

$Q\, wh^x\, wh^y \ldots t_x \ \ldots \ t_y \ \ldots$

$Q\ wh^x \ldots t_x \ldots wh^y \ldots$

$Q \ldots wh^x \ldots wh^y \ldots$

- AN example of a multipe *in-situ wh*-question in Japanese:

Wh-in/ex-situ iii

Japanese:

(1) *John-wa* ***da're-ni*** ***na'ni-o*** *maka'seta -no?*
John-TOP who-DAT what-ACC entrusted -COMP$_{WH}$

"Who did John entrust with what?"

Bulgarian:

(2) ***Koj*** ***kogo*** *e* *pokanil na večerjata?*
Who whom AUX invited to dinner

"Who invited whom to the dinner?"

Wh-in-situ = wh-ex-situ?

A common view is that all these language-types share a common LF for multiple questions, i.e., the *covert* syntax of English, Japanese etc. lines up with the *overt* syntax of Bulgarian: all *wh*s move to reach their scope position.

- Who t talked to whom?
- LF: Who λx whom $\lambda y\ t_x$ talked to t_y.

The existence of *intervention effects* is going to call this assumption into question.

The phenomenon

- When a certain class of operators ("interveners") c-command and in-situ *wh*-expression, the result is ungrammaticality (as reported in the literature), which can be avoided by *scrambling* the in-situ *wh*-expression to a position above the intervener.
- We'll illustrate this with data from German, but it holds across a broad range of *wh-in-situ* languages, e.g., Korean and Japanese (although strikingly, not English – we'll come to that later).

German data

- Negative indefinites intervene:

(3) *Wen hat niemand wo gesehen?*
Who has nobody where seen?

"Who has nobody seen where?"

(4) *Wen hat der Hans wo gesehen?*
Who has Hans where seen?

"Who has Hans seen where?"

German data ii

- Scrambling the *in-situ wh*-expression over the intervener *obviates* the intervention effect.

(5) *Wen hat kein Junge wann angerufen?
who has no boy when called

(6) Wen hat wann kein Junge angerufen
who has when no boy called

"Who did no boy call when?"

- Note that the full range of negative indefinites in German, e.g.,*niemand* (nobody), *niemals* (never) are interveners.

German data iii

- Universal quantifiers are interveners. Beck (2006) observes that the effects aren't quite as easy to see here, since the question is in principle ambiguous.

(7) *When has jeder Junge wann beobachtet*
who hat every boy when observed

For every boy, who did he observe when (list reading)
*Who is such that every boy observed him when?

(8) *Wen hat wann jeder Junge beobachtet?*
who has when every boy observed

For every boy, who did he observe when (list reading)
Who is such that every boy observed him when?

German data iv

- The list reading isn't blocked by the intervener (where the universal takes wide scope), but the ordinary multiple question meaning *is*.
- The morale: intervention effects are about LF, not just surface c-command.

German data v

- Focus-associating with both *only* and *even*, is an intevener:

(9) **When hat nur der Hans wann angerufen?*
who has only the Hans when called

(10) *When hat wann nur der Hans angerufen?*
who has when only the Hans called

(11) **When hat sogar der Hans wann angerufen?*
who has even the Hans when called

(12) *When hat wann sogar der Hans angerufen?*
who has when even the Hans called

Indefinites

- Just like R-expressions, indefinites *don't* intervene.

(13) *?Wo haben mehr als drei Maler wann vorgetragen?*
where have more than three painters when presented

"Where did more than three painters give a talk when?"

(14) *Wo haben sich mehr als drei Maler wann versammelt?*
where have self more than three painters when gathered

"Where did more than three painters gather when?"

Beck's account

- Beck (2006) attempts to account for intervention effects via focus-semantics.
- **Intervention schema with in-situ wh-expressions**
  * LF: [C .. intervener ... wh_F]
- The idea relies on the premise that *wh* introduces focus alternatives which must be "closed off" by the question operator C.
- Beck adopts a Roothian bi-dimensional framework, according to which *wh*s introduce alternatives in the focus-semantic dimension, but are undefined in the ordinary semantic dimensions.

Beck's account ii

- Intervention effects happen if some other focus-sensitive operator is encountered before C.

(15) a. *Only John$_F$ saw who?

b. [C [only *ALT* [∼*ALT* [John saw *who*]]]]

- In a Roothian alternative-semantics, ∼ *closes off* the focus-alternatives introduced by its prejacent, by resetting the focus-semantic value to its ordinary semantic value. Since *wh*s, by stipulation, don't have an ordinary semantic value, composition can't proceed.

Beck's account iii

- Issues:
  - On Beck's theory, negative indefinites and universals, but NOT upward-entailing indefinites must be focus-sensitive. There don't seem to be independent reasons to draw this distinction.
  - The intervener-status of certain expressions does not follow from independently motivated facts about their *meaning*.

Mayr’s Static account

Mayr

- Mayr (2014) argues that the class of inteveners can be isolated based on their logical properties – the logical property of *non-additivity* renders an expression an intervener.
- Intervention effects are epiphenomenal, and arise due to a condition relating the *presupposition* of a question to its *assertion* – namely, that the presupposition be equivalent to (the closure of) the assertion.
- Due to the different ways in which the presupposition and assertion of a question is computed, interveners guarantee that this equivalence will *not* hold, hence the deviance.
- N.b. Mayr does *not* say anything about where this condition on questions comes from.

Some auxiliary notions

- $\mathbb{B}$ is the set of *boolean types*; τ is a variable over boolean types.
- $\sqcup$ is *generalized boolean disjunction*.

$$\sqcup_{\langle \tau, \tau\tau \rangle} := \begin{cases} \vee & \tau = t \\ \lambda f_\tau \,.\, \lambda g_\tau \,.\, \lambda x_{\sigma_1} \,.\, f\ x \sqcup_{\langle \sigma_2, \sigma_2\sigma_2 \rangle} g\ x & \tau = \langle \sigma_1, \sigma_2 \rangle \end{cases} \tag{16}$$

The Intervention Effects Generalization (IEG)

(17) *Generalized additivity*

f of type $\langle \sigma, \mathtt{t} \rangle$, where $\sigma \in \mathbb{B}$, is *additive* if for any g, h of type $\sigma \in \mathbb{B}$, $f\ (g \sqcup h) = f\ g \sqcup f\ h$.

(18) *Intervention effects generalization*

An operator is a problematic intervener if it is *non*-additive.

Consequences

- Expressions of type **e** don't take scope and hence don't intervene.
- (Generalized) negation is an intervener:

(19) $\neg(g \sqcup h) \neq \neg g \sqcup \neg h$

(20) Elin doesn't smoke or drink ≠ Elin doesn't smoke or he doesn't drink

- Universally quantified DPs are interveners:

(21) $\mathsf{evBoy}\ (g \sqcup h) \neq \mathsf{evBoy}\ g \sqcup \mathsf{evBoy}\ h$

(22) Every woman smokes or drinks ≠
every woman smokes or every woman drinks.

Consequences

- Focus-sensitive operators are interveners:

(23)

Only Hans smokes or drinks ≠ only Hans smoked or only Hans drinks.

- UE indefinites are NOT interveners (distributive predication is a complicating factor which I'll ignore):

(24)

More than three painters hugged or kissed more than three painters hugged or more than three painters kissed.

Novel predictions

- Non-monotonic expressions are interveners:

(25) Exactly three women smoke or drink ≠ Exactly three women smoke or exactly three women drink

- Prediction borne out:

(26) **When haben genau drei Studenten wann eingeladen?*
who have exactly three students when invited

Deriving the generalization

- The intuition that Mayr develops is that the semantics of questions is two-sided.
- Components of the analysis:
    - The meaning of a question in the assertive dimension is a Hamblin-set, computed by *scoping out* the *wh*-phrases.
    - Questions carry an *existential presupposition* – the proposition assigned by giving the *wh*-phrases *surface scope* as existential quantifiers.

Deriving the generalization ii

- Mayr's idea is that, in languages with intervention effects, such as German, the presupposition induced by a *wh*-expression is *divorced from its scope*.
- To cash this out, Mayr adopts a bidirectional alternative semantics.
- *Wh*-expressions are existential quantifiers which take *surface scope*.
- *Wh*-expressions introduce *singleton subdomain alternatives* (Chierchia 2013) in their restrictor. Scoping out the alternatives yields a Hamblin set. The ordinary semantic meaning is presupposed.

Mayr's analysis i

(27) $[\![\text{John called who}]\!] = \lambda w\,.\,\exists x \in D[\mathtt{J}\ \mathtt{called}_w\ x]$

(28) $\text{alts} = \left\{ \begin{array}{l} \lambda w\,.\,\exists x \in \{\,a\,\}[\mathtt{J}\ \mathtt{called}_w\ x] \\ \lambda w\,.\,\exists x \in \{\,b\,\}[\mathtt{J}\ \mathtt{called}_w\ x] \\ \lambda w\,.\,\exists x \in \{\,c\,\}[\mathtt{J}\ \mathtt{called}_w\ x] \\ \ldots \end{array} \right\}$

The question operator Q takes a question p, returns $\mathtt{alt}(p)$ and *presupposes* that p.

Summing up

- The crucial component in Mayr's account is that both the "presupposition" π (i.e., *Nobody talked to anyone*) and the Hamblin-set (i.e., propositions of the form *Nobody talked to* x) Q are made available over the course of semantic composition.
- Mayr then stipulates that π and Q must stand in a particular logical relation - namely, π must be equivalent to the existential closure of Q.
- Issues:
    - Not very explanatory.
    - Wedded to a bidimensional focus semantics for questions. Shown to be problematic by Shan (2004), Charlow (2014).
    - Complicates composition.
    - No *obvious* way to think about cross-linguistic variation.

Summing up ii

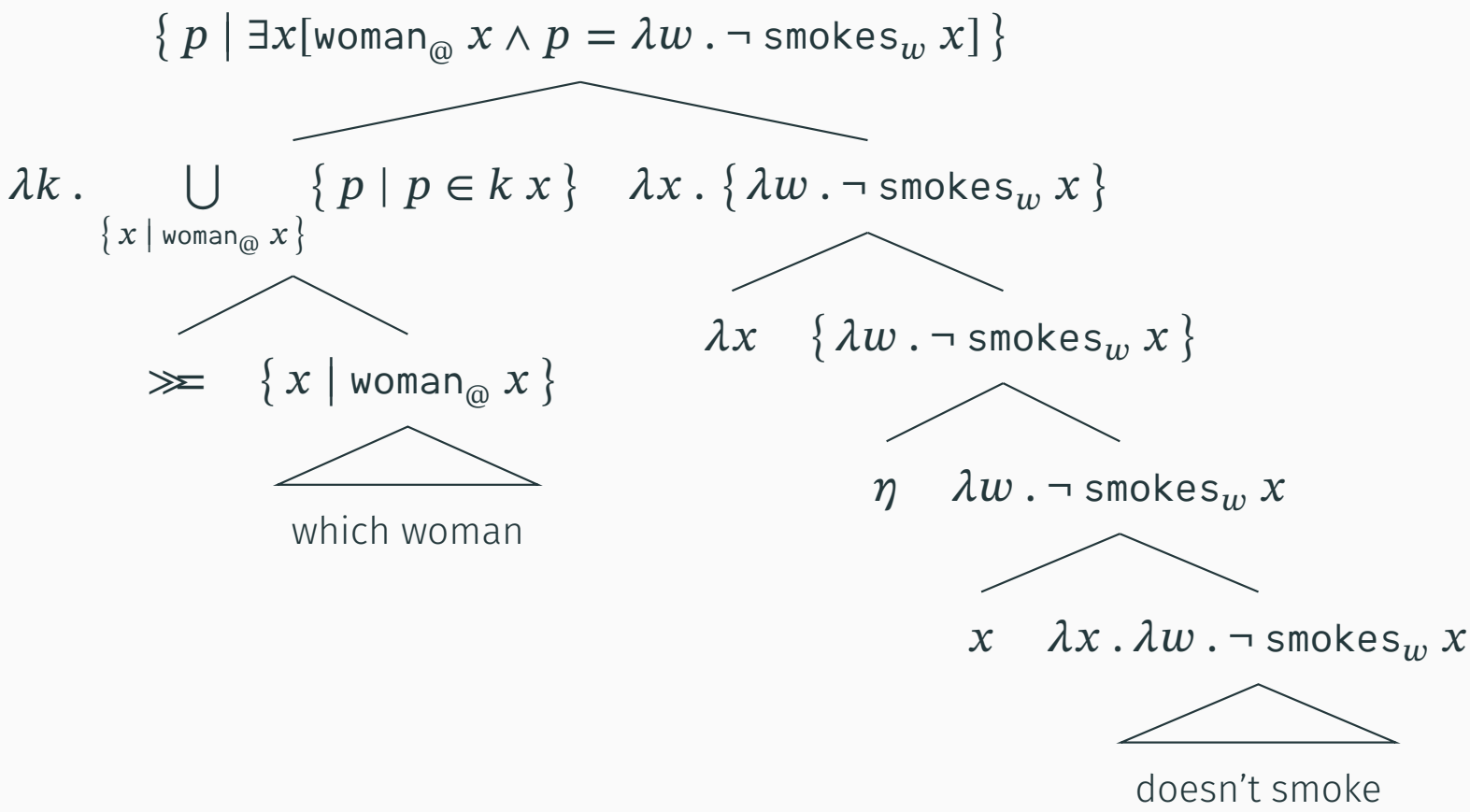
- In the next section I'll suggest that there's a different way to retrieve the information we need for a semantic account of intervention effects to fly, involving *higher-order quantification*.
- Intervention effects (or lack thereof) will *follow* from the interaction between problematic interveners, higher-order quantification, and an independently-motivated pragmatic principle on question meanings: *non-vacuity* (Fox n.d.).
- We'll end up suggesting a clear link between intervention effects and *scope rigidity*.
- Before we get round to addressing any of this, I'll lay out my assumptions concerning question composition. This is partially a matter of taste, but I'll also suggest some arguments for this particular world-view.

Question composition

- I assume that questions compose with the help of two operators: η and $\gg\!=$
- η is just Partee's IDENT operator.
  $\eta\ a \coloneqq \{\ a\ \}$
- $\gg\!=$ is a little more complex – it takes an alternative set p, and a scope k, and composes p with k pointwise.
  $\gg\!=\ X\ k \coloneqq \bigcup_{x \in X} \{\ p \mid p \in k\ x\ \}$
- An aside: η and $\gg\!=$ are the `return` and `bind` functions associated with the `Set` monad.

Question composition ii

- Simple question LF (*which woman doesn't smoke*):



Flexible composition

- Note that the machinery we're using to do question composition is *extremely* flexible, since the operators involved in question composition are all type-flexible.
- $\mathsf{K}\ \mathsf{e} \coloneqq \langle \mathsf{et}, \mathsf{t} \rangle$
- who$^{\gg=}_{\langle \mathsf{K}\ \mathsf{e}, \mathsf{t} \rangle}$ $\lambda Q\ \eta$ nobody $\lambda y\ Q\ \lambda x\ t_y$ talked to t_x
- $\left\{ p \mid \exists Q[p = \lambda w\,.\,\neg\exists y[Q[\lambda x\,.\,y\ \mathtt{talkedTo}_w\ x]]] \right\}$
- The set of propositions of the form *Nobody talked to* Q, where *nobody* scopes over Q.

Composition iv

A_1 : $\texttt{Nobody}\ \lambda x\,(\{\, y \mid y\,.\,x\ \texttt{talkedTo}\ y \,\} \in \{\{\, a \,\}, \{\, a, b \,\}, \{\, a, b, c \,\}, \ldots\})$

(= Nobody talked to a)

A_2 $\texttt{Nobody}\ \lambda x\,(\{\, y \mid y\,.\,x\ \texttt{talkedTo}\ y \,\} \in \{\{\, b \,\}, \{\, b, a \,\}, \{\, b, a, c \,\}, \ldots\})$

(= Nobody talked to b)

A_3 $\texttt{Nobody}\ \lambda x\,(\{\, y \mid y\,.\,x\ \texttt{talkedTo}\ y \,\} \in \{\{\, c \,\}, \{\, c, a \,\}, \{\, c, a, b \,\}, \ldots\})$

(= Nobody talked to c)

A_4 $\texttt{Nobody}\ \lambda x\,(\{\, y \mid y\,.\,x\ \texttt{talkedTo}\ y \,\} \in \{\{\, a, b, c \,\}\})$

(= Nobody talked to everyone)

A_5 $\texttt{Nobody}\ \lambda x\,(\{\, y \mid y\,.\,x\ \texttt{talkedTo}\ y \,\} \in \{\, X \mid X \subseteq D \wedge X \neq \varnothing \,\})$

(= Nobody talked to anyone)

...

Background on partition semantics

- If we conceive of the context set as a *set of worlds*, a contextual partition is a way of carving up the logical space, corresponding to logically-independent propositions.
- Let's say we have a set of worlds: $\{ w_\varnothing, w_a, w_b, w_{ab} \}$, and we're interested in *who of* a *and* b *left*, the corresponding contextual partition is: $\{ \{ w_\varnothing \}, \{ w_a \}, \{ w_b \}, \{ w_{ab} \} \}$

Background on exhaustivity

- Observation about answers: a question with denotation Q, is typically answered by a proposition p, such that $p \in Q$, hence it is not, in itself a cell in the partition induced by Q. Still, p manages, by exhaustification, to identify a cell in the partition.
- Q: Who among Jane, Mary, and Sue is here?
- A: Jane is here.
- A': *Jane is here and Mary is not here and Sue is not here* (by exhaustification)

Exhaustivity in questions

- We'll define our exhaustification operator $\texttt{exh}$ in terms of Dayal's (1996) notion of *Maximal Informativity*:

(29) **Maximal Informativity**

$$\texttt{MaxInf}(Q, w) = p \;\; \texttt{iff} \;\; p\, w \wedge \forall q \in Q[q\, w \rightarrow p \subseteq q]$$

(30) $$\texttt{exh}(Q, p) = \lambda w\, .\, \texttt{MaxInf}(Q, w) = p$$

Note that, if there is a *unique* maximally-informative true answer to a question Q, we rewrite the partition induced by the question as pointwise exhaustification of the Hamblin-set.

(31) $$\texttt{Partition}_C(Q, A) = \{\, \texttt{exh}(Q, p) \mid p \in Q \,\}$$

Question-Partition matching

(32) *Question-Partition Matching (QPM)*

A question Q, and a context-set A, meet QPM if they meet *Cell Identification (CI)* and *Non-Vacuity (NV)*.

Cell Identification

- A question Q meets *cell-identification* for a context-set A iff:
  $\forall C \in \texttt{part}_C(Q, A), \exists p \in Q[[\texttt{exh}(Q, p)]_A = C]$
- In plain(er) English: every cell in the contextual partition of the context set is identifiable by an exhaustified member of Q.

Cell Identification ii

- CI every cell in the contextual partition of the context set is identifiable by an exhaustified member of Q.
- The denotation of *which of* a *and* b *came?* is the set of propositions of the form x *came*:
  $\{ \texttt{came}\ a, \texttt{came}\ b \}$.
- CI predicts (correctly) that *which of* a *and* b *came?* should only be admissable in a context set where the *Just* a *came* and *Just* b *came* are the two (mutually exclusive) logical possibilties.
- This is just Dayal's Uniqueness + existential presupposition, and in fact Fox shows that CI is equivalent to Dayal's *Maximal Informativity* based account.

Non-vacuity

- A question Q meets *non-vacuity* for a context set A iff:
  $\forall p \in Q, \exists C \in \texttt{part}_C(Q, A)[[\texttt{exh}(Q, p)]_A = C]$
- In plain(er) English: for every answer p in the question, there is some cell of the contextual partition of the context set which is identifiable by exhaustified p.
- Let's say we have a question *who left*. Answers are going to be propositions of the form x *left*, i.e. $\{ \texttt{left}\ a, \texttt{left}\ b, \texttt{left}\ c \}$.
- $\texttt{exh}(\texttt{left}\ a) = \texttt{left}\ a \wedge \neg\, \texttt{left}\ b \wedge \neg\, \texttt{left}\ c$, etc.
- If we're in a situation where we're wondering which of a, b, and c left, the partition carves the logical space into cells where just a left, just b left and just c left. Exhaustified answers in the question denotation identify each cell.

The claim

- Putative generalization: an intervening operator gives rise to a question denotation that satisfies *cell-identification* but FAILS to satisfy *non-vacuity*.
- First let's see how the answer set corresponding to *nobody talked to which of a, b, c* can satisfy CI.
- Remember that CI says every cell in the contextual partition of the context set is identifiable by an exhaustified member of Q.

Higher-order questions and CI

A_1 : $\texttt{Nobody}\ \lambda x\,(\{\, y \mid y\,.\,x\ \texttt{talkedTo}\ y \,\} \in \{\{\, a \,\}, \{\, a, b \,\}, \{\, a, b, c \,\}, \ldots\})$

$(=$ Nobody talked to $a)$

A_2 $\texttt{Nobody}\ \lambda x\,(\{\, y \mid y\,.\,x\ \texttt{talkedTo}\ y \,\} \in \{\{\, b \,\}, \{\, b, a \,\}, \{\, b, a, c \,\}, \ldots\})$

$(=$ Nobody talked to $b)$

A_3 $\texttt{Nobody}\ \lambda x\,(\{\, y \mid y\,.\,x\ \texttt{talkedTo}\ y \,\} \in \{\{\, c \,\}, \{\, c, a \,\}, \{\, c, a, b \,\}, \ldots\})$

$(=$ Nobody talked to $c)$

A_4 $\texttt{Nobody}\ \lambda x\,(\{\, y \mid y\,.\,x\ \texttt{talkedTo}\ y \,\} \in \{\{\, a, b, c \,\}\})$

$(=$ Nobody talked to everyone$)$

A_5 $\texttt{Nobody}\ \lambda x\,(\{\, y \mid y\,.\,x\ \texttt{talkedTo}\ y \,\} \in \{\, X \mid X \subseteq D \wedge X \neq \varnothing \,\})$

$(=$ Nobody talked to anyone$)$

...

High-order Qs and CI ii

- We predict that *nobody talked to which of a, b, c* should be admissible in a context set where the logical possibilities under consideration are *Just a is s.t. nobody talked to them*, *just b is s.t. nobody talked to them*, and *just c is s.t. nobody talked to them*.
- This is because we can retrieve these partitions by exhaustifying the answers where Q corresponds to the Montague-lift of some individual.

(33) $\texttt{exh}\,(\textsf{nobody}\ \lambda x\,(a^{\uparrow})\,\lambda y\,.\,x\ \texttt{talkedTo}\ y) =$
Nobody talked to a *and somebody talked to* b *and somebody talked to* c*,...*

Higher-order Qs and NV

- Recall that NV says that for every answer p in the question, there is some cell of the contextual partition of the context set which is identifiable by exhaustified p.
- We predict that *Nobody talked to which of a, b, c* should fail to satisfy NV, and hence *inadmissable* relative to this context set and this partition.
- This is easy to see: The propositions *Nobody talked to* x (for all x) are in the answerset, i.e. the answers corresponding to the Montague lift of the individuals in the domain.
- *Nobody talked to everyone* is also in the answer set. Whenever it is true, there will always be a more informative true answer, such as *Nobody talked to* a in the question denotation. Therefore it is impossible for NV to be satisfied.

Univeral quantifiers

- We make the same prediction for universals.

(34) $[\![$everyone talked to which of a and b$]\!]$

$=$

$\{\ p \mid \exists Q \in (\mathcal{P}(\{\ a, b\ \}) - \varnothing) \wedge p = \lambda w\ .\ \forall x[Q[\lambda y\ .\ x\ \texttt{talkedTo}\ y]]\ \}$

- ✓Everyone talked to a.
- ✓Everyone talked to b.
- ✗Everyone talked to $a \vee b$
- ✓Everyone talked to $a \wedge b$

Non-monotonic quantifiers

- We make the same prediction for non-monotonic quantifiers too!

(35) $[\![$exactly two people talked to which of a and b$]\!]$

$$= \left\{ p \;\middle|\; \begin{array}{l} \exists Q \in (\mathcal{P}(\{\, a, b \,\}) - \varnothing) \\ \wedge\, p = \lambda w \,.\, \exists! X[|X| = 2 \wedge \forall x \in X[Q[\lambda y \,.\, x \;\texttt{talkedTo}\; y]]] \end{array} \right\}$$

- ✓Exactly two people talked to a.
- ✓Exactly two people talked to b.
- ✗Exactly two people talked to $a \vee b$
- ✓Exactly two people talked to $a \wedge b$

Additive expressions

- Ok, but what about additive expressions:

(36) ⟦Hans talked to which of a and b⟧

$$= \left\{ p \;\middle|\; \begin{array}{l} \exists Q \in (\mathcal{P}(\{\, a, b \,\}) - \varnothing) \\ \\ \wedge\, p = \lambda w \,.\, Q[\lambda y \,.\, \texttt{Hans talkedTo}\ y] \end{array} \right\}$$

- ✓Hans talked to a.
- ✓Hans talked to b.
- ✗Hans talked to $a \vee b$
- ✓Hans talked to $a \wedge b$
- Oh no, if scope-taking *always* involves higher-order quantification, we predict that even questions without interveners should fail to meet NV!

Scope and type economy

- The basic idea: if the closure of a question with higher-order quantification is equivalent to the closure of a question involving ordinary quantification, prefer ordinary quantification.

(37) $[\![\text{Hans talked to [which of a and b}]_{Q}]\!]$
$= \{\ p \mid \exists Q \in (\mathcal{P}(\{\ a, b\ \}) - \varnothing) \wedge p = \lambda w\ .\ Q[\lambda y\ .\ \text{H}\ \texttt{talkedTo}\ y]\ \}$

(38) $[\![\text{Hans talked to [which of a and b}]_{\mathsf{e}}]\!]$
$= \{\ p \mid \exists x \in (a, b) \wedge p = \lambda w\ .\ \text{H}\ \texttt{talkedTo}\ x\ \}$

(39) $\texttt{clo}\,(37) = \texttt{clo}\,(38) =$ Hans talked to someone

Scope and type economy ii

- Q-type economy:

  Given two logical forms differing only in the functions Q and f:

  $\phi[Q_{\langle \mathsf{K\,e,t}\rangle}]$ and $\phi[f_{\langle \mathsf{e,t}\rangle}]$,

  where $Q = \mathcal{P}(f) - \varnothing$,

  prefer $\phi[f_{\langle \mathsf{e,t}\rangle}]$ if $\phi[f_{\langle \mathsf{e,t}\rangle}] = \phi[Q_{\langle \mathsf{K\,e,t}\rangle}]$.

Scope-rigidity

- Scope rigidity:
  Scope-taking can't lead to scopal ambiguities.
- If covert movement must leave behind a higher-type trace, scope-ridigity is forced.
- Every girl λQ some boy λx [t_Q λy [x talked to y]]
- some boy λx [Every girl λy [x talked to y]]

Scope-rigidity ii

- Suggestion: in scope rigid languages, covert movement must leave behind a higher-type trace, modula *Q*-type economy.
- We predict that intervention effects should correlate with *scope-rigidity* in a given language.
- This may explains why we don't observe intervention effects in English. Since English is *not* scope-rigid, the *wh* can simply QR to a position above the intervener.
- Q: Which person here bought nothing for which of their relatives?

Independent evidence for higher-order quantification

- The suggestion here relies on the idea that *wh*-expressions can quantify over *quantifiers*.
- In joint work with Uli Sauerland, Andreea Nicolae and I argue that exactly this obtains with simplex *wh*-expressions in Spanish.
- The basic observation is that singular simplex *wh*-expressions, unlike singular *which*-phrases, lack a uniqueness presupposition.
- This is difficult to reconcile with Dayal's Maximal Informativity presupposition, according to which a uniqueness presupposition should emerge forany *wh* ranging over atoms.

Spanish i

(40) **Spanish singular *which*-Q: ✓UP**

Qué chico se fue pronto?

Which boy.SG REFL left early?

a. John left early.

b. #John and Bill left early.

(41) **Spanish plural *which*-Q: ✓ASI**

Qué chicos se fueron pronto?

Which boy.PL REFL left early?

a. #John left early.

b. John and Bill left early.

Spanish ii

(42) **Spanish singular simplex *wh*-Q: ✗UP**

Quién se fue pronto?

Who.SG REFL left early?

a. John left early.

b. John and Bill left early.

(43) **Spanish plural simplex *wh*-Q: ✓ASI**

Quiénes se fueron pronto?

Who.PL REFL left early?

a. #John left early.

b. John and Bill left early.

Spanish iii

- In order to reconcile the Spanish data with Dayal's presupposition, we claim that *simplex wh*-expressions in this language may range over *quantifiers* over atomic individuals.
- $[\![\text{who}]\!] = \{ Q \mid \forall P \in Q[\forall x \in P[\texttt{atom}\, x]] \}$
- Once we make this shift, Dayal's presupposition no longer predicts a uniqueness presupposition.
- This conjecture is supported by the fact that *who*-questions, unlike *which*-questions can be answered with a negative quantifier.

- Q: Who left
- A: No-one.

- Q: Which boy left?
- A: # No boy.

Conclusion and summing up

- We saw that certain expressions count as *interveners* for *wh-in-situ*.
- Syntactico-semantic accounts such as Beck's stipulate that *interveners* have certain properties that lead to intervention, such as focus-sensitivity. Such an account risks circularity.
- Mayr showed that the interveners form a (logically) natural class, suggesting that intervention effects should receive a genuinely *semantic* explanation.
- I attempted to derive Mayr's generalization by claiming that:
  - *wh-in-situ* involves higher-order quantification.
  - question denotations are subject to a pragmatic condition: *non-vacuity*.
- Non-vacuity is violated in cases where an intervener is present.

Issues and further directions

- Right now this account is just a sketch – it remains to be seen whether it extends to the full range of data.
- How does the theory outlined here stack up against the *dynamic* theory of intervention effects (see, e.g., Haida 2007)?
- More general questions for this workshop:
    - There are several phenomena which seem to motivated treating at least some *wh*-expressions as involving higher-order quantification.
    - Can we find evidence for higher-order quantification in related constructions, such as correlatives?
    - Higher-order quantification is made available by the grammar just in case we have higher-type variables in our logical representation. It can't always be available, otherwise we predict that, e.g., *which*-questions should never presuppose uniqueness. How do we limit the expressive power of this system?

Bibliography i

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