COORDINATED WHICH-PHRASES

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1. **The puzzle**:
   Conjoined singular 'which'-phrases have list readings with collective predicates but not with distributive predicates.
2. **Theoretical Background**:
   - Intersective semantics for conjunction, Distributivity and Collectivity (Winter 2001, Champollion 2015)
   - ANS-operator and uniqueness presupposition (Dayal 1996)
3. **Our analysis**
4. **Conclusions**

THE PUZZLE

Conjoined singular 'which'-phrases = 'which NP and which NP'.
(See appendix for 'which NP and NP')

They typically invite single-tuple answers.

(1) Which boy and which girl sneezed?
  a. #John and Mary sneezed, Fred and Sue sneezed, and Ed and Laura sneezed.
  b. John and Mary sneezed.

Observation

Conjoined singular 'which'-phrases can receive a list answer with collective predicates like 'live together'.

(2) Which boy and which girl live together?
   a. % John and Mary live together, Fred and Sue live together, and Ed and Laura live together.
   b. John and Mary live together.

Since we have found the judgements at issue to be fairly delicate, we ran an experiment (see Appendix).

- (2a) is acceptable but its felicity seems to be subject to **inter-speaker variation**.
- (2b) is a felicitous answer to (2) for everyone.

We will develop an account of why distributive and collective predicates differ (and how speakers differ).

We propose that the list readings of conjoined singular ‘which’-phrases with collective predicates are due to **plurality**, similarly to (3).

(3) Which boys left the party?
— John, Bill and Fred left the party.

(See Appendix for why they are different from ‘pair-list answers’).

- Winter’s (2001) theory of intersective conjunction, distributivity and collectivity (see also Champollion 2015).
- Dayal’s (1996) ANS-operator to explain single-tuple vs. list answers.
- Contraints on the distributivity operator D (cf. De Vries 2015)

THEORETICAL BACKGROUND

Conjoined nominals give rise to distributive and collective readings.

$$\text{(4)}\quad \left.\begin{array}{l}\text{John and Mary}\\ \text{A boy and a girl}\end{array}\right\}\left\{\begin{array}{ll}\text{live together.} & \qquad\text{(Collective)}\\ \text{sneezed.} & \qquad\text{(Distributive)}\end{array}\right.$$

Winter (2001) derives both readings with a single meaning for ‘and’ (also Champollion 2015).

(5) Intersective semantics for ‘and’
$[\![\text{and}]\!]^{w} = \lambda P_{\tau t}.\lambda Q_{\tau t}.\lambda x_{\tau}.\ x \in P \wedge x \in Q$

Collective readings are derived with two operators, MIN and ER.

(We won’t distinguish sets and their characteristic functions)

Let's first see how the distributive and collective readings of 'John and Mary' are derived.

Proper names denote Montagovian individuals of type $\langle et, t \rangle$.

(6) $[\![\text{John}]\!]^w = \lambda P_{et}.\ j \in P \qquad [\![\text{Mary}]\!]^w = \lambda P_{et}.\ m \in P$

(7) $$\begin{aligned}[\![\text{John and Mary}]\!]^w &= [\![\text{and}]\!]^w ([\![\text{John}]\!]^w)([\![\text{Mary}]\!]^w) \\ &= \lambda P_{et}.\ j \in P \wedge m \in P \\ &= \{\, P_{et} \mid j \in P \wedge m \in P \,\}\end{aligned}$$

The distributive reading of 'John and Mary' is straightforwardly derived.

(8) $[\![\text{John and Mary sneezed}]\!]^w = j \in \text{SNEEZED}_w \wedge m \in \text{SNEEZED}_w$

In order to derive the collective interpretation an operator **MIN** ('Minimization') is necessary.

(9) $[\![\mathrm{MIN}]\!]^{w} = \lambda Q_{\langle et,t\rangle}.\lambda P_{et}.P \in Q \wedge \forall P'[P' \subset P \rightarrow P' \notin Q]$

MIN applies to a quantifier (a set of sets) Q and gives back the smallest predicates in Q (minimal subsets of Q).

(10) $[\![\mathrm{MIN}]\!]^{w}([\![\text{John and Mary}]\!]^{w})$
$= [\![\mathrm{MIN}]\!]^{w}(\{\, P_{et} \mid j \in P \wedge m \in P \,\})$
$= [\![\mathrm{MIN}]\!]^{w}(\{\, \{\, j, m \,\}, \{\, j, m, a \,\}, \{\, j, m, b \,\}, \{\, j, m, a, b \,\} \ldots \})$
$= \{\, \{\, j, m \,\} \,\}$

$\{\, j, m \,\}$ **represents the plurality consisting of John and Mary.**

Collective predicates are true of pluralities like $\{\, j, m \,\}$.

(11) $[\![\text{live togeher}]\!]^{w} = \lambda X_{et}.\ X \in \text{LIVE.TOGETHER}_{w}$

Since $[\![\text{MIN}]\!]^{w}([\![\text{John and Mary}]\!]^{w}) = \{\, \{\, j, m \,\}\, \}$ is a type-$\langle et, t\rangle$ quantifier, it cannot combine directly with a collective predicate.

To solve the type-mismatch, ER ('Existential Raising') is used.

(12) $[\![\text{ER}]\!]^{w} = \lambda P_{\tau t}.\lambda Q_{\tau t}.\ \exists x[x \in P \wedge x \in Q]$

(13)
$$\begin{aligned} & [\![\text{ER}]\!]^{w}([\![\text{MIN}]\!]^{w}([\![\text{John and Mary}]\!]^{w})) \\ & = [\![\text{ER}]\!]^{w}(\{\, \{\, j, m \,\}\, \}) \\ & = \lambda P_{\langle et,t\rangle}.\ \exists X[X \in \{\, \{\, j, m \,\}\, \} \wedge X \in P] \\ & = \lambda P_{\langle et,t\rangle}.\ \{\, j, m \,\} \in P \end{aligned}$$

(14)
$$\begin{aligned} & [\![\text{ER MIN John and Mary live together}]\!]^{w} \\ & = \{\, j, m \,\} \in \text{LIVE.TOGETHER}_{w} \end{aligned}$$

The same mechanism accounts for the distributive and collective readings of conjoined quantifiers like 'a boy and a girl'.

(15) a. $[\![\text{a boy}]\!]^{w} = \lambda Q_{et}.\ \exists x[x \in \text{BOY}_{w} \wedge x \in Q]$

b. $[\![\text{a girl}]\!]^{w} = \lambda Q_{et}.\ \exists y[y \in \text{GIRL}_{w} \wedge y \in Q]$

By intersecting these with 'and', we get:

(16) $[\![\text{a boy and a girl}]\!]^{w}$
$= \lambda Q_{et}.\ \exists x \exists y[x \in \text{BOY}_{w} \wedge y \in \text{GIRL}_{w} \wedge x, y \in Q]$

This accounts for a distributive interpretation.

(17) $[\![\text{A boy and a girl sneezed}]\!]^{w}$
$= \exists x \exists y[x \in \text{BOY}_{w} \wedge y \in \text{GIRL}_{w} \wedge x, y \in \text{SNEEZED}_{w}]$

Using MIN and ER, we can derive the collective interpretation.

(18) $[\![\text{MIN}]\!]^w([\![\text{a boy and a girl}]\!]^w)$
$= \text{MIN}(\{\, Q_{et} \mid \exists x \exists y[x \in \text{BOY}_w \wedge y \in \text{GIRL}_w \wedge x, y \in Q] \,\})$
$= \{\, \{\, x, y \,\} \mid x \in \text{BOY}_w \wedge y \in \text{GIRL}_w \,\}$

This is a set of sets containing a boy and a girl and nothing else. Unlike for 'John and Mary', there are multiple such sets.

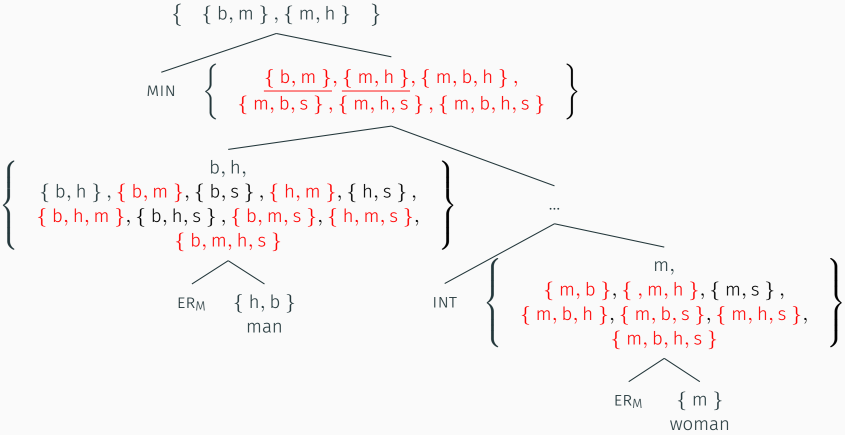
Using ER, we derive the correct interpretation.

(19) $[\![\text{ER}]\!]^w([\![\text{MIN}]\!]^w([\![\text{a boy and a girl}]\!]^w))$
$= [\![\text{ER}]\!]^w(\{\, \{\, x, y \,\} \mid x \in \text{BOY}_w \wedge y \in \text{GIRL}_w \,\})$
$= \lambda P_{\langle et,t\rangle}.\, \exists X[X \in \{\, \{\, x, y \,\} \mid x \in \text{BOY}_w \wedge y \in \text{GIRL}_w \,\} \wedge X \in P]$

(20) $[\![\text{ER MIN a boy and a girl live together}]\!]^w$
$$= \exists X \left[\begin{array}{l} X \in \{\, \{\, x, y \,\} \mid x \in \text{BOY}_w \wedge y \in \text{GIRL}_w \,\} \wedge \\ X \in \text{LIVE.TOGETHER}_w \end{array} \right]$$

(21) a. $[\![\text{man}]\!]^{w} = \{\, h, b \,\}$
b. $[\![\text{woman}]\!]^{w} = \{\, m \,\}$
c. $[\![\text{dog}]\!]^{w} = \{\, s \,\}$

VISUALIZING MIN II



(22) a. #A man and woman who were all angry left quickly.

b. A man and woman who were both angry left quickly.

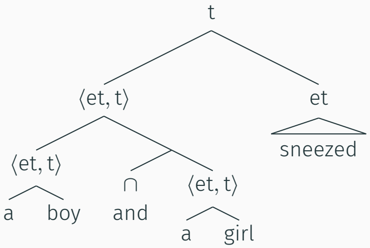
The anti-presupposition of the relative clause in ((22a)) (that $|X| > 2$) clashes with the restrictor of the quantifier 'man and woman', just in case 'man and woman' ranges 'only' over pairs, i.e., pluralities X s.t. $|X| = 2$.

- Can we get rid of MIN and replace it with something a bit more principled?
- In ongoing WiP, Aron Hirsch and I suggest that it's EXH which is responsible for winnowing out the groups consisting of a man, a woman, and other individuals, leaving only the man-woman pairs.
- $[\![\text{EXH}]\!]^{w}(w)(\varphi) = 1$ iff $[\![\varphi]\!]^{w}(w)\text{EXCL}(\varphi)[\,[\![\psi]\!]^{w}(w)]$
- INTUITION: for 'a man and a woman' the prejacent of EXH means the following: X has a man part and X has a woman part. We want to strengthen it to following: X has 'only' a man part and a woman part.

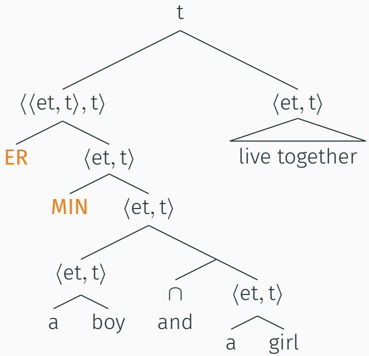
  (23) Alternatives to φ are of the form: $NP_{1,ER}$ and $NP_{2,ER}$
- See `https://keybase.pub/patrl/handouts/elliottHirsch2018-ZAS.pdf` for details.

EXAMPLES

Distributive



Collective



Both distributive and collective readings are derived from the intersective semantics of ‘and’.

(24) $[\![\text{and}]\!]^w = \lambda P_{\tau t}.\lambda Q_{\tau t}.\lambda x_\tau.\ x \in P \wedge x \in Q$

The collective interpretation requires extracting a minimal set (= plural individual) $\{x, y\}$ in the extension of the quantifier.

(25) $[\![\text{MIN}]\!]^w = \lambda Q_{\langle et,t\rangle}.\lambda P_{et}.P \in Q \wedge \forall P'[P' \subset P \rightarrow P' \notin Q]$

(26) $[\![\text{ER}]\!]^w = \lambda P_{\tau t}.\lambda Q_{\tau t}.\ \exists x[x \in P \wedge x \in Q]$

Both Winter and Champollion use choice-functions instead of ER; ultimately we need to do something similar for questions, given the general problem of ‘overlapping individuals’.

See Champollion (2015) for an extension of this account for ‘Q NPs and NPs’.

We follow Winter and assume that plural nouns denote sets of sets of individuals; they can be derived from the meaning of the singular noun via the application of D:

(27) $[\![\text{boys}]\!]^{w} = \mathrm{D}([\![\text{boy}]\!]^{w})$

The semantics of D is as in (28):

(28) $[\![\mathrm{D}]\!]^{w} = \lambda Q_{\tau t}.\lambda P_{\tau t}.\ P \neq \emptyset \wedge P \subseteq Q$

D applies to a set and returns the power set of that set, minus $\emptyset$ (D $= \wp^{+}$). Note that it raises the type from σt to $\langle \sigma t, t \rangle$.

(29) $$[\![\mathrm{D}]\!]^{w}(\{b_1, b_2, b_3\}) = \left\{ \begin{array}{c} \{\, b_1, b_2, b_3 \,\}, \\ \{\, b_1, b_2 \,\}, \{\, b_2, b_3 \,\}, \{\, b_1, b_2 \,\}, \\ \{\, b_1 \,\}, \{\, b_2 \,\}, \{\, b_3 \,\} \end{array} \right\}$$

PLURALS EXAMPLE

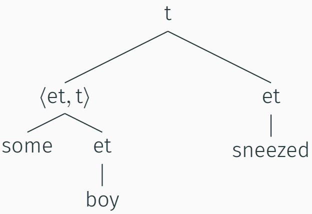
$[\![\text{D boy}]\!]^w$ is of type $\langle et, t\rangle$ (a set of sets).

‘Some’ is a cross-categorial existential quantifier (type $\langle \tau t, t\rangle$).

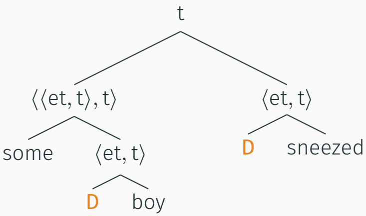
‘Some boys’ combines directly with a collective predicate (type $\langle et, t\rangle$).

To combine with a distributive predicate of type $\langle e, t\rangle$, another instance of D is necessary.

Singular: Some boy sneezed



Plural: Some boys sneezed



$\exists x[x \in [\![\text{boy}]\!]^w \wedge x \in [\![\text{sneezed}]\!]^w]$

$\exists X[X \in D([\![\text{boy}]\!]^w) \wedge X \in D([\![\text{sneezed}]\!]^w)]$

QUESTION SEMANTICS

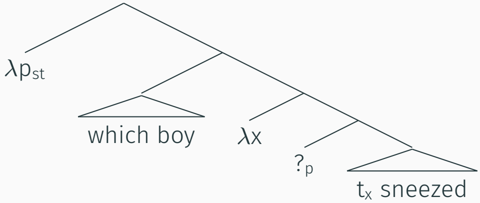
Questions denote sets of propositions.

‘Which’-phrases are existential quantifiers.

(30) $[\![\text{which boy}]\!]^w = \lambda Q_{et}.\exists x[x \in \mathrm{BOY}_w \wedge x \in Q]$ $\qquad$ $(= [\![\text{a boy}]\!]^w)$

‘Wh’-phrases obligatorily take scope over the question operator (for syntactic reasons). p gets bound at the top-most node.

(31) $[\![?_p]\!]^w = \lambda q_{st}.\ p = q$



$\{\, p \mid \exists x[x \in \mathrm{BOY}_w \wedge p = \lambda w'.\ x \in \mathrm{SNEEZED}_{w'}] \,\}$

We use Dayal's (1996) ANS-operator to derive the uniqueness presupposition of singular 'which'-phrases.

(32) $[\![\text{ANS}]\!]^w = \lambda Q_{\langle st,t\rangle} : \exists! p[p \in \text{maxinf}_w(Q)].\ \iota p[p \in \text{maxinf}_w(Q)]$

(33) $\text{maxinf}_w(Q) = \{\, p \in Q \mid w \in p \wedge \forall p' \in Q[w \in p' \rightarrow p \subseteq p'] \,\}$

ANS applies to a question denotation Q and denotes the maximally informative true answer to Q.

(ANS is essentially a definite determiner)

The uniqueness presupposition of singular 'which'-phrases comes from the presupposition that there is a unique maximally informative true answer.

(34) Which boy sneezed?

(35) w_1: John sneezed, and Bill and Martin didn't sneeze.

$$[\![\mathrm{ANS}]\!]^{w_1}\left(\left\{\begin{array}{l}\lambda w'.\, j \in \mathrm{SNEEZED}_{w'},\\ \lambda w'.\, b \in \mathrm{SNEEZED}_{w'},\\ \lambda w'.\, m \in \mathrm{SNEEZED}_{w'}\end{array}\right\}\right) = \lambda w'.\, j \in \mathrm{SNEEZED}_{w'}$$

(36) w_2: John and Bill sneezed, Martin didn't sneeze.

$$[\![\mathrm{ANS}]\!]^{w_2}\left(\left\{\begin{array}{l}\lambda w'.\, j \in \mathrm{SNEEZED}_{w'},\\ \lambda w'.\, b \in \mathrm{SNEEZED}_{w'},\\ \lambda w'.\, m \in \mathrm{SNEEZED}_{w'}\end{array}\right\}\right) = \text{undefined}$$

In (36) $\lambda w'.\, j \in \mathrm{SNEEZED}_{w'}$ and $\lambda w'.\, b \in \mathrm{SNEEZED}_{w'}$ are equally informative.

If the noun is plural and the predicate has D, there is always a unique maximally true answer.

(37) Which boys D sneezed?

(38) w_2: John and Bill sneezed, Martin didn't sneeze.

$$[\![\text{ANS}]\!]^{w_2}\left(\left\{\begin{array}{l} \lambda w'.\ j \in \text{SNEEZED}_{w'}, \\ \lambda w'.\ b \in \text{SNEEZED}_{w'}, \\ \lambda w'.\ m \in \text{SNEEZED}_{w'}, \\ \lambda w'.\ j, b \in \text{SNEEZED}_{w'}, \\ \lambda w'.\ j, m \in \text{SNEEZED}_{w'}, \\ \ldots \end{array}\right\}\right)$$

$$= \lambda w'.\ j, b \in \text{SNEEZED}_{w'}$$

OUR ANALYSIS

Combining Winter's theory of conjunction and collectivity and Dayal's ANS-operator, we are now in a position to account for our observation.

Observation

Conjoined singular 'which'-phrases can receive a list answer with collective predicates like 'live together', but not with distributive predicates like 'sneezed'.

We will proceed as follows:

1. Single-tuple reading with 'live together'
2. List reading with 'live together'
3. Single-tuple reading with 'sneezed'
4. *List reading with 'sneezed'

SINGLE-TUPLE READING WITH A COLLECTIVE PREDICATE

The single-tuple reading with 'live together' is derived by the operators ER and MIN, just as in the case of 'a boy and a girl'.

Assume $\mathrm{BOY}_w = \{ b_1, b_2 \}$ and $\mathrm{GIRL}_w = \{ g_1, g_2 \}$.

(39) $[\![\text{ER MIN which boy and which girl live together?}]\!]^w$

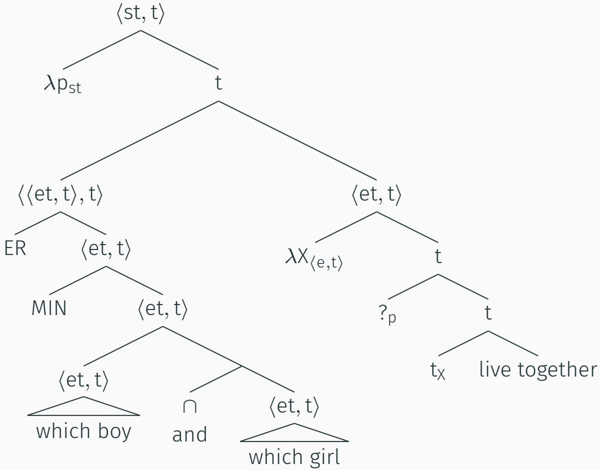
$$= \left\{ \begin{array}{l} \lambda w'.\ \{ b_1, g_1 \} \in \mathrm{LIVE.TOGETHER}_{w'}, \\ \lambda w'.\ \{ b_2, g_2 \} \in \mathrm{LIVE.TOGETHER}_{w'}, \\ \lambda w'.\ \{ b_1, g_2 \} \in \mathrm{LIVE.TOGETHER}_{w'}, \\ \lambda w'.\ \{ b_2, g_1 \} \in \mathrm{LIVE.TOGETHER}_{w'} \end{array} \right\}$$

Applying the ANS-operator to this set derives the uniqueness presupposition and delivers the single-tuple answer.

(40) w_1: b_1 and g_1 live together, and nobody else lives together.

$[\![\mathrm{ANS}]\!]^{w_1}((39)) = \lambda w'.\ \{ b_1, g_1 \} \in \mathrm{LIVE.TOGETHER}_{w'}$

(41) Which boy and which girl live together?



Proposal: The list reading with 'live together' can be derived via the insertion of D, one at the level of the 'which'-phrase and another at the level of the collective predicate.

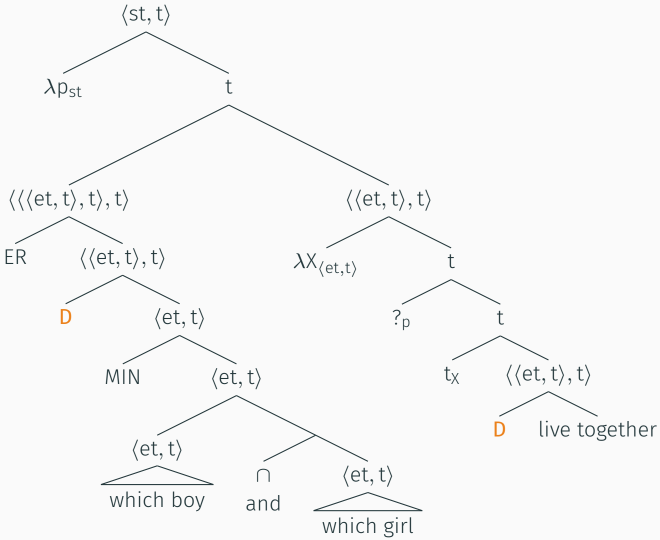
(42) $[\![$[ER D MIN which boy and which girl] [D live together]?$]\!]^{w}$

This is no different from what we assumed for a plural 'which'-question like 'which boys sneezed?'

(43) $[\![$[which D boy] [D sneezed]?$]\!]^{w}$

LIST READING WITH A COLLECTIVE PREDICATE

(44) Which boy and which girl live together?



Recall that $[\![\text{MIN}]\!]^{w}([\![\text{which boy and which girl}]\!]^{w})$ delivers a set of all possible boy-girl pairs.

(45) $\{\{b_1, g_1\}, \{b_2, g_1\}, \{b_1, g_2\}, \{b_2, g_2\}\}$

Applying D to this set delivers the set consisting of all possible subsets of $[\![\text{MIN}]\!]^{w}([\![\text{which boy and which girl}]\!]^{w})$

$$\left\{ \begin{array}{l} \{\{b_1,g_1\},\{b_2,g_1\},\{b_1,g_2\},\{b_2,g_2\}\}, \\ \{\{b_1,g_1\},\{b_2,g_1\},\{b_1,g_2\}\}, \quad \{\{b_1,g_1\},\{b_2,g_1\},\{b_2,g_2\}\}, \ldots \\ \{\{b_1,g_1\},\{b_1,g_2\}\}, \quad \{\{b_1,g_1\},\{b_2,g_1\}\}, \ldots \\ \{\{b_1,g_1\}\}, \quad \{\{b_2,g_1\}\}, \quad \{\{b_1,g_2\}\}, \quad \{\{b_2,g_2\}\} \end{array} \right\}$$

Similarly, applying D to the collective predicate 'live together' delivers the power set of all possible cohabitants.

The question denotation contains propositions that make reference to plural individuals.

(46) $[\![\text{ER D MIN which boy and which girl D live together?}]\!]^{w}$

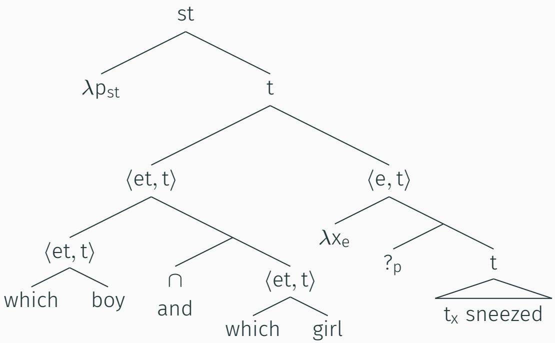
$$= \left\{ \begin{array}{l} \lambda w'.\ \{ b_1, g_1 \} \in \text{LIVE.TOGETHER}_{w'}, \\ \lambda w'.\ \{ b_2, g_2 \} \in \text{LIVE.TOGETHER}_{w'}, \\ \lambda w'.\ \{ b_1, g_2 \} \in \text{LIVE.TOGETHER}_{w'}, \\ \lambda w'.\ \{ b_2, g_1 \} \in \text{LIVE.TOGETHER}_{w'}, \\ \lambda w'.\ \{ b_1, g_1 \}, \{ b_2, g_2 \} \in \text{LIVE.TOGETHER}_{w'}, \\ \lambda w'.\ \{ b_1, g_2 \}, \{ b_2, g_1 \} \in \text{LIVE.TOGETHER}_{w'} \end{array} \right\}$$

An answer that names a plurality, namely a list answer, is acceptable.

(47) w_2: b_1 and g_1 live together and b_2 and g_2 live together.
$[\![\text{ANS}]\!]^{w_2}((46)) = \lambda w'.\ \{ b_1, g_1 \}, \{ b_2, g_2 \} \in \text{LIVE.TOGETHER}_{w'}$

SINGLE-TUPLE READING WITH A DISTRIBUTIVE PREDICATE

Turning now to the distributive predicate ‘sneezed’, the single-tuple reading is generated with the following LF without covert operators.

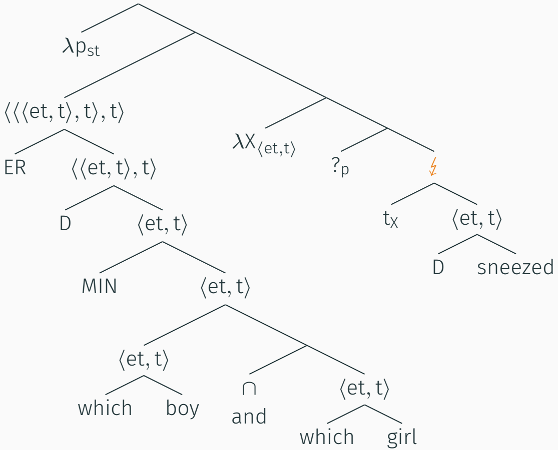


$$\{\, p_{st} \mid \exists x, y[x \in \text{BOY}_w \wedge y \in \text{GIRL}_w \wedge p = [\lambda w'.\ x, y \in \text{SNEEZED}_{w'}]] \,\}$$

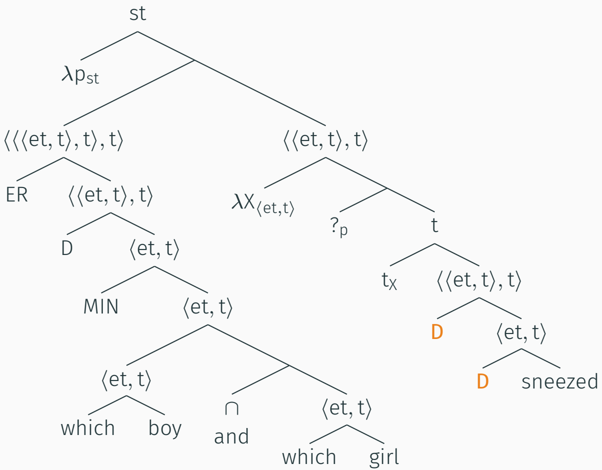
LIST READING WITH A DISTRIBUTIVE PREDICATE

We generated the list reading with a collective predicate with D above MIN and below ER and on the predicate.

But this will result in a type-mismatch with a distributive predicate.



The type mismatch would be resolved if another D could be used.



This would derive the list reading with distributive predicates.

We need to assume that D cannot be stacked like this.

More generally, the distribution of D needs to be constrained (Winter 2001, De Vries 2015).

If covert D were freely available, it would make a singular NP plural!

(48) a. *Which boy live together?
     b. Which boy sneezed?
        —# John, Bill and Fred sneezed.
     c. *A boy live(s) together.

We assume that each occurrence of D needs to be licensed by [plural]-feature (cf. Winter 2001, De Vries 2015).

- Nominal conjunction ‘and’ introduces [plural] within the DP (Sauerland 2003, 2008) and licenses D.
- [plural] on the auxiliary/verb licenses D, but can only license one D ($\therefore$ *Double D).

NB: [plural] does not imply D. The LFs of (49) do not involve D.

(49) a. John and Mary live together.
b. A man and a woman live together.
c. Which man and which woman live together?
— John and Mary live together.

The list reading of (50) is judged less good than the single tuple reading.

(50) Which boy and which girl live together?

The single tuple reading requires only ER and MIN, while the list reading additionally requires two instances of Ds.

(51) a. $[\![$[ER MIN which boy and which girl] [live together]?$]\!]^{w}$
b. $[\![$[ER D MIN which boy and which girl] [D live together]?$]\!]^{w}$

We assume that in such a situation, the simpler LF is preferred. Speakers might differ in how willing they are to complicate the LF, hence inter-speaker variation.

For (52), there is only one coherent LF, so no degradation.

(52) Which boys sneezed?
$[\![$[which D boy] [D sneezed]?$]\!]^{w}$

ISSUES AND FURTHER DIRECTIONS

- In the examples of wh coordination we considered, the sets denoted by the wh were (crucially) taken to be disjoint. What happens if the sets are not disjoint?
- Assume that, contingently, all of the doctors happen to also be lawyers, and vice versa.

  (53) Which doctor and which lawyer live together.

- In this instance, applying MIN will return a set of atomic doctor-lawyer individuals, and the sentence is incorrectly predicted to be deviant in this context, since collective predicates such as ‘meet’ are undefined for atomic individuals.

- Winter uses a variety of diagnostics to draw a distinction between ‘set’ collective predicates like ‘meet’ and ‘gather’, and ‘atom’ collective predicates like ‘are a happy couple’, ‘are numerous’.

(54) Exactly three students met/gathered/*are a good team/*are numerous.

- Winter argues crucially that ‘atom’ predicates aren’t set-denoting. This leads to the expectation (not borne out?) that atom predicates don’t give rise to list readings.

(55) Which boy and which girl are a good team.
   a. John and Mary are a good team.
      (i) ?John and Mary, Bill and Sue, and Eric and Lisa are a good team.

- We make completely the wrong prediction ”the boy and girl live together” if existential raising is freely available.
- The following Logical Form should be possible:

  (56) THE D MIN ER boy and ER girl λX X D live together.
- Predicted truth conditions if there are multiple pairs of boys and girls living together: there exists a unique plurality of pairs of boys and girls, such that each pair lives together.
- The system as it stands is too powerful. We need to restrict it somehow.

CONCLUSIONS

Observation

Conjoined singular ‘which’-phrases can receive a list answer with collective predicates but not with distributive predicates.

We combined Winter’s (2001) theory of conjunction and plurality and Dayal’s (1996) ANS-operator to derive list readings for conjoined singular ‘which’-phrases with collective predicates.

But the resulting theory overgenerates. We postulated constraints on the distribution of D.

- D needs to be licensed by [plural] (De Vries 2015).
- Simpler LFs are preferred.

REFERENCES

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- Dayal (1996) Locality in WH Quantification.
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- Winter (2001) Flexibility Principles in Boolean Semantics.

APPENDIX

List readings are not the same as pair-list readings

Multiple singular 'which'-questions can receive pair-list answers (Dayal 1996, Fox 2012, Kotek 2014, a.o.).

(57) Which girl hugged which boy?
  a. Sue hugged Frank, Mary hugged Bill, and Jill hugged John.
  b. Sue hugged Frank.

It might be tempting to try to provide a common explanation for list readings of (i) multiple singular 'which' questions like (57), and (ii) conjoined singular 'which' questions.

But there are reasons to doubt that such a uniform analysis is desirable due to the following:

- Inter-speaker variation
- Predicate sensitivity
- Non-Exhaustivity

WHICH NP AND NP

Our analysis predicts that 'which NP and which NP' and 'which NP and NP' should behave similarly.

- $[\![\text{man and woman}]\!]^w = \emptyset$
- $[\![\text{ER(man) and ER(woman)}]\!]^w$
  $= \lambda P_{et}.\ \exists x, y[x \in \text{MAN}_w \wedge y \in \text{WOMAN}_w \wedge x, y \in P]$
  $= \{\, P_{et} \mid \exists x, y[x \in \text{MAN}_w \wedge y \in \text{WOMAN}_w \wedge x, y \in P] \,\}$
- $[\![\text{MIN(ER(man) and ER(woman))}]\!]^w$
  $= \{\, \{\, x, y \,\} \mid x \in \text{MAN}_w \wedge y \in \text{WOMAN}_w \,\}$

Applying 'which' to this, we derive the single-tuple reading. If D applies before 'which' (and on the predicate), we derive the list reading.

(See Champollion 2015 for how to deal with plural nouns)

The following two parses derive the same distributive reading.

(58) a. A man and a woman sneezed.
b. ER MIN (a man and a woman) D sneezed.

The second strategy is necessary for cases like (59).

(59) A man and a woman went to a bar and had many beers.

According to our logic, (58b) should be dispreferred, because it involves more optional operations.

Inferential task: Does sincerely uttering S1 necessarily commit you to assume S2 is true?

S1: Ann knows which girl and which boy hugged each other.

S2: Only one girl and one boy hugged each other.

Conditions:

- Conjoined-Collective (CC): Ann knows which girl and which boy hugged each other.
- Conjoined-Distributive (CD): Tami knows which laywer and which judge studied.
- Non-Conjoined: Rhonda knows which kid received which present.
- Pragmatically fored SP (PS): Pam knows which spy killed the present with which weapon.

6 items per condition. Each subject saw 2 items from each condition, and 16 filler items.

EXPERIMENT: RESULTS

23 native speakers of English on Amazon Mechanical Turk

- CC vs. CD (p=0.03)
- CC vs. PS (p=0.02)