

# The categorial approach

## Core assumption

The meaning of questions is defined based on possible **short** answers.

- (1)  $\llbracket \text{which girl smiled} \rrbracket^{w_0} = \left\{ \begin{array}{cc} \langle a, w_0 \rangle, & \langle b, w_1 \rangle, \\ \langle c, w_1 \rangle, & \langle c, w_2 \rangle \end{array} \right\}$
- (2)  $\llbracket \text{which girl smiled} \rrbracket^{w_0} = \lambda x \lambda w : \text{girl}_{w_0}(x). \text{smiled}_w(x)$

## Answerhood

- (3) A: Which girl smiled?  
B: (i) Anna. (ii) Anna smiled.

Deriving true short answers:

$$\text{Ans}_{w_0}^S(P) = \lambda x. x \in \text{Dom}(P) \wedge P(x)(w_0)$$

i.e., THE entity that makes true the function  $P$  denoted by a question (see [Xiang 2021](#) for a sophisticated version)

Deriving true full answers:

- (4)  $\text{Ans}(w_0)(P) = P(\text{Ans}^S(w_0)(P))$

✓ Full answers are derived from short answers.

## Debate: Semantics vs. Syntax

Short answers are derived from full answers via ellipsis.

[Merchant \(2004\)](#)

- (5) A:  $[\text{Which book}]_1$  did Jill read  $t_1$ ?  
B:  $\text{Emma}_1$   $[\text{Jill read } t_1]$

[Jacobson \(2016\)](#): Short answers are not semantically equivalent to full answers.

- (6) Which math professor left the party at midnight?
- a. Jill.  $\leadsto$  Jill is a math professor  
b. Jill did.  $\nrightarrow$  Jill is a math professor  
c. Jill left the party at midnight.  $\nrightarrow$  Jill is a math professor

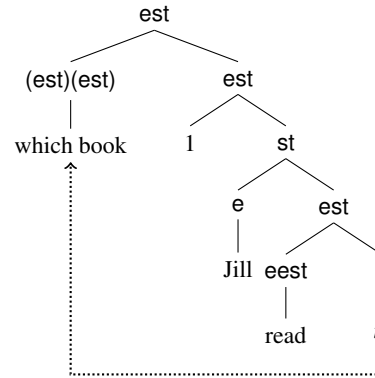
[Weir \(2014\)](#): clausal ellipsis must inherit a presuppositional restriction.

✓ The debate is still there.

## Composition

$Wh$ -expressions denote restrictions of functions.

- (7)  $\llbracket \text{which book} \rrbracket^{w_0} = \lambda P \lambda x \lambda w : \text{book}_{w_0}(x). P(x) \text{ (est)(est)}$



## Free relatives

Semantic similarities between  $wh$ -questions and free relatives ([Chierchia & Caponigro 2013](#))

Mention-all

- (8) What did Jill cook? — Pasta.  
 $\leadsto$  All food that Jill cooked is pasta.
- (9) Peter ate what Jill cooked.  
 $\leadsto$  Peter ate all food that Jill cooked.

Mention-some

- (10) Where can I buy coffee? — Starbucks.  
 $\leadsto$  Starbucks is just one coffee shop.
- (11) Jill went to where she could buy coffee.  
 $\leadsto$  Jill went to a place where she could buy coffee.

✓ Unification: The meaning of a free relative equals to the true short answer to the corresponding  $wh$ -question (see also [Jacobson 1995](#); [Caponigro 2003](#)).

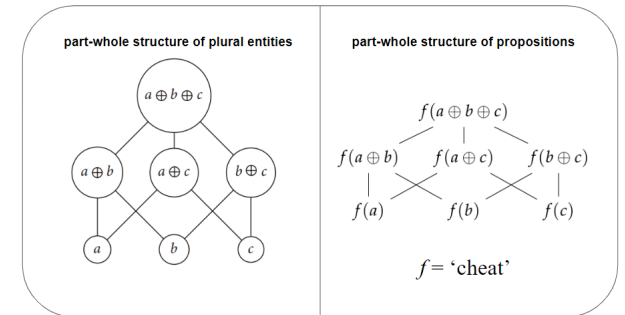
Question: why are some  $wh$ -expressions not used to form free relatives? ([Caponigro 2003](#))

- (12) \*Peter ate {what / which} food Jill cooked.  
(13) \*I did it why you did it.

## Quantificational Variability

- (14) Sarah knows, **for the most part**, who cheated.  
 $\leadsto$  For most people who cheated, Sarah knows they cheated.
- (15) The school paper recorded, **in part**, what made the dean's list.  
 $\leadsto$  For some people who made the dean's list, the school paper recorded they made the dean's list.

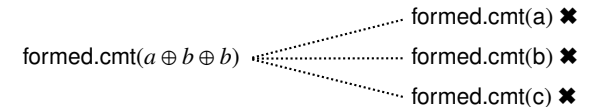
- **H1**: Quantification over short answers ([Berman 1991](#))  
**most**  $x. x \leq_{\text{atom}} \text{Ans}_{w_0}^S \llbracket \text{who cheated} \rrbracket : \text{know}(\text{cheat}(x))(s)$
- **H2**: Quantification over full answers ([Lahiri 2000](#))  
**most**  $p. p \leq_{\text{atom}} \text{Ans}_{w_0} \llbracket \text{who cheated} \rrbracket : \text{know}(p)(s)$



## Williams' (2000) puzzle

- (16) For the most part, Sarah knows who formed the committee.  
 $\leadsto$  For most committee members, Sarah knows they are **part of** the committee.

The full answer to the embedded  $wh$ -question does not have atomic parts. **H2** is challenged.



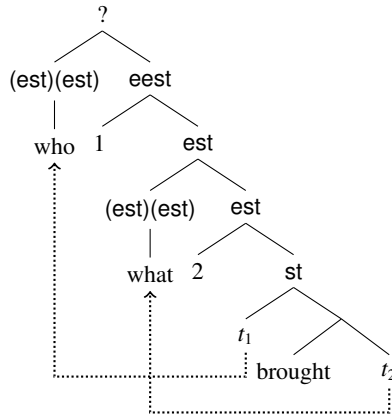
Under **H1**, the meaning of (16) can be formulated as:

- (17) **most**  $x. x \leq_{\text{atom}} \text{Ans}_{w_0}^S \llbracket \text{who cheated} \rrbracket : \text{know}(\text{in.cmt}(x))(s)$  [Xiang \(2021\)](#)

Question: How is (17) compositionally derived? Where does the underlined part come from? (see [Cremers \(2018\)](#) for a solution)

## Multiple-wh questions

(18) Who brought what?



### Xiang's (2021) solution

Karttunen (1977): *wh*-expressions are existential quantifiers

(19)  $\llbracket \text{who} \rrbracket^{w_0} = \lambda P \lambda w \exists x. \text{human}_{w_0}(x) \wedge P(x)(w)$  (est)st

Partee (1986): Shifting existential quantifiers to properties

(20)  $\text{Be}(\mathcal{P}) = \lambda x. \mathcal{P}(\lambda y. \lambda w. y = x)$

A new type shifter **BeDom**:

**BeDom**( $\mathcal{P}$ ) =  $\lambda f t g. g$  is a function such that:

1.  $\text{Dom}(g) = \text{Dom}(f) \cap \text{Be}(\mathcal{P})$  and
2.  $\forall x \in \text{Dom}(g). g(x) = f(x)$

i.e., for any function  $f$ , **BeDom** restricts the domain of  $f$  with **BeDom**( $\mathcal{P}$ ).

(21)  $\text{BeDom} \llbracket \text{what} \rrbracket^{w_0} = \lambda f_{ea} \lambda y : y \in \text{thing}_{w_0}. f(y)$

(22)  $\text{BeDom} \llbracket \text{who} \rrbracket^{w_0} = \lambda f_{ea} \lambda y : y \in \text{human}_{w_0}. f(y)$

✓ A shifted *wh*-expression can combine with a function of any type (Note:  $a$  is a variable of type).

Comparison: Chung & Ladusaw (2003) propose a new compositional mode **Predicate Restriction**.

(23) **Restrict** ( $\lambda x \lambda y. f(x)(y), \lambda x. g(x)$ ) =  $\lambda x \lambda y. f(x)(y) \wedge g(x)$

## Wh-coordination

(24) Jenny knows who came and who brought what.

- $\llbracket \text{who came} \rrbracket$ : est
- $\llbracket \text{who brought what} \rrbracket$ : eest

However, two elements of different types cannot be coordinated.

- (25) a. \*Peter brought and came a cake.  
b. \*Susan and student came.

### Xiang's (2021) solution

Questions take scope (see also Krifka 2001).

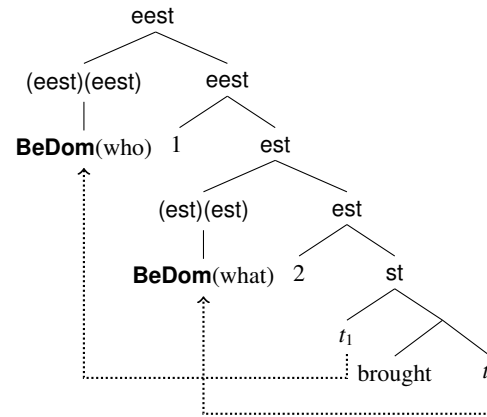
(26)  $\llbracket \text{who came and who brought what} \rrbracket \lambda Q \text{ Jenny knows } Q$   
 $\lambda f. f(Q_1) \wedge f(Q_2)$

☺ Both  $f(Q_1)$  and  $f(Q_2)$  are of type  $t$ , so they are conjoinable.

However, ...

☹  $f$  doesn't have a fixed type!  
(see Xiang's response on pg 640, ft 34)

Note: No matter which technique is used to resolve the problem, it shouldn't be applicable to the examples in (25).



(27) The denotation of (18):  
 $\lambda x \lambda y \lambda w : x \in \text{thing}_{w_0} \wedge y \in \text{human}_{w_0}. \text{brought}_w(x)(y)$

The type of (18) is eest.

✓ A single-*wh* question and a multiple-*wh* question don't have different types.

## Other types of questions

(28)  $\llbracket \text{Did Mary meet Jane or Peter} \rrbracket$   
 $= \lambda x \lambda w : x \in \{j, p\}. \text{met}_w(x)(m)$

(29)  $\llbracket \text{Did Mary leave} \rrbracket$   
 $= \lambda f : f \in \{\lambda p. p, \lambda p. \bar{p}\}. f(\lambda w. \text{left}_w(m))$

### Other variants

#### Structured meaning approach

von Stechow (1991); Krifka (2001)

Questions denote ordered pairs  $\langle D, f \rangle$

(30)  $\llbracket \text{who left} \rrbracket^{w_0} = \langle \text{human}_{w_0}, \lambda x \lambda w. \text{left}_w(x) \rangle$

(31)  $\llbracket \text{John}_F \text{ left} \rrbracket = \langle j, \lambda x \lambda w. \text{left}_w(x) \rangle$

**Question-answer congruence:** A question-answer pair is congruent only if the focus component of the answer is in  $D$  and the background component of the answer is equal to  $f$ .

- (32) A: Who left?  
B: (i) John<sub>F</sub> left.  
(ii) #John [left]<sub>F</sub>.

### Variable-free semantics

Jacobson (1999); Xiang (2019)

Variable-free Semantics can 'pass up' the information about an unfilled syntactic argument.

Geach Rule:  $\mathbf{g}(f) = \lambda g \lambda x. f(g(x))$

i.e.,  $\mathbf{g}$  shifts a function of type  $ab$  to a function of type  $(ca)(cb)$ .

1.  $\llbracket \text{and} \rrbracket : \text{ttt} \xrightarrow{\mathbf{g}} (\text{et})(\text{ett}) \xrightarrow{\mathbf{g}} (\text{eet})(\text{eett})$
2.  $\mathbf{gg}(\llbracket \text{and} \rrbracket) \circ \llbracket \text{who brought what} \rrbracket : \text{eett}$
3.  $\lambda x \lambda y. \mathbf{g}(\mathbf{gg}(\llbracket \text{and} \rrbracket) \circ \llbracket \text{who brought what} \rrbracket)(x)(y) : \text{ee}(\text{et})(\text{et})$
4.  $\llbracket \text{who left} \rrbracket : \text{et} \xrightarrow{\text{lift}} ((\text{et})(\text{et}))(\text{et}) \xrightarrow{\mathbf{g}} (\text{e}(\text{et})(\text{et}))(\text{eet}) \xrightarrow{\mathbf{g}} (\text{ee}(\text{et})(\text{et}))(\text{eett})$

A potential problem: It is predicted that a *wh*-expression can be bound as a pronoun.

- (33) Who knows who is a genius?  
 $\nearrow$  Who knows he is a genius?