

# Pair-list and functional readings

---

Haoze Li

UCSC Semantics Seminar

## Setting the stage

---

## Questions with universal quantifiers

- (1) Which professor did **every student** meet?
- a. Professor Johnson. (Individual answer)
  - b. Her advisor. (Functional answer)
  - c. Jenny met Prof. Johnson. Sue met Prof. Smith. (Pair-list answer)
- (2) Which student met **every professor**?
- a. Sue. (Individual answer)
  - b. #Her advisee. (Functional answer)
  - c. #Jenny met Prof. Johnson. Sue met Prof. Smith. (Pair-list answer)

Groenendijk & Stokhof (1984); Engdahl (1986); Chierchia (1993); Dayal (1996); Szabolcsi (1997); Krifka (2001); a.o.

## Multiple-*wh* questions

- (3) Which student met which professor?
- a. Jenny met Prof. Johnson. (Single-pair answer)
  - b. #Her advisor. (Functional answer)
  - c. Jenny met Prof. Johnson. Sue met Prof. Smith. (Pair-list answer)
- (4) (?)Which professor did which student meet? [Anti-superiority]
- a. Jenny met Prof. Johnson. (Single-pair answer)
  - b. #Her advisor. (Functional answer)
  - c. #Jenny met Prof. Johnson. Sue met Prof. Smith. (Pair-list answer)

Chierchia (1993); Dayal (1996); Kotek (2019); a.o.

# Scrambling

Japanese multiple-*wh* questions

- (5) **Dara-ga** kinoo **nani-o** katta no?  
who-NOM yesterday what-ACC bought SFP  
'Who bought what yesterday?'

(Pair-list, Single-pair)

- (6) **Nani-o** kinoo **dara-ga** katta no?  
what-ACC yesterday who-NOM bought SFP  
'Who bought what yesterday?'

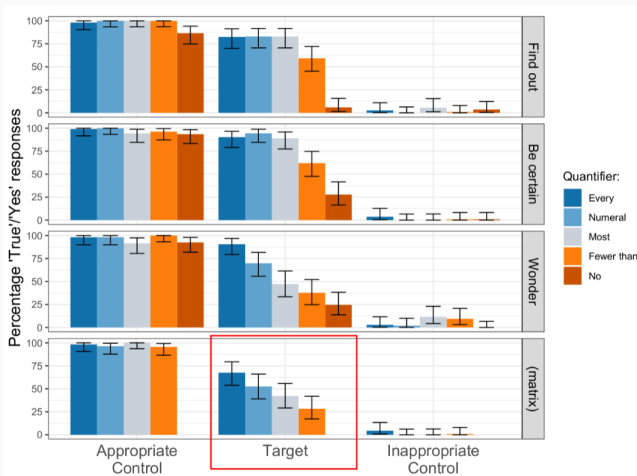
(\*Pair-list, Single-pair)

Hagstrom (1998)

## Other quantifiers

- (7) Which professor did **no student** meet?
- a. Prof. Johnson. (Individual answer)
  - b. Her advisor. (Functional answer)
  - c. #Jenny didn't meet Prof. C. Sue didn't meet Prof. S. (Pair-list answer)
- (8) Which professor did **most students** meet?
- a. Prof. Johnson. (Individual answer)
  - b. Her advisor. (Functional answer)
  - c. #Jenny met Prof. Johnson. Sue met Prof. Smith. (Pair-list answer)
- (9) Which professor did **two of the students** meet?
- a. Prof. Johnson. (Individual answer)
  - b. Her advisor. (Functional answer)
  - c. (?)Jenny met Prof. Johnson. Sue met Prof. Smith. OR Annie met Prof. Carl. Becky met Prof. Kim. (Choice answer)

## Other quantifiers



van Gessel & Cremers (2020)

## Domain cover

Suppose that 100 candidates are competing for 3 job openings.

(10) Guess **which candidate** will get which job.

(11) #Guess which job will **every candidate** get.

Questions with universal quantifiers presuppose domain cover, but multiple-*wh* questions don't (Xiang 2020; cf. Dayal 1996).



## **Family of questions**

---

## A set of sub-questions

A multiple-*wh* question can be interpreted as a set of sub-questions. Answering these sub-questions leads to a pair-list answer.

(12) Which student met which professor?

↪ Which prof did Jenny meet? Which prof did Sue meet?

↪ Jenny met Prof Johnson. Sue met Prof. Smith.

## Scope of alternatives

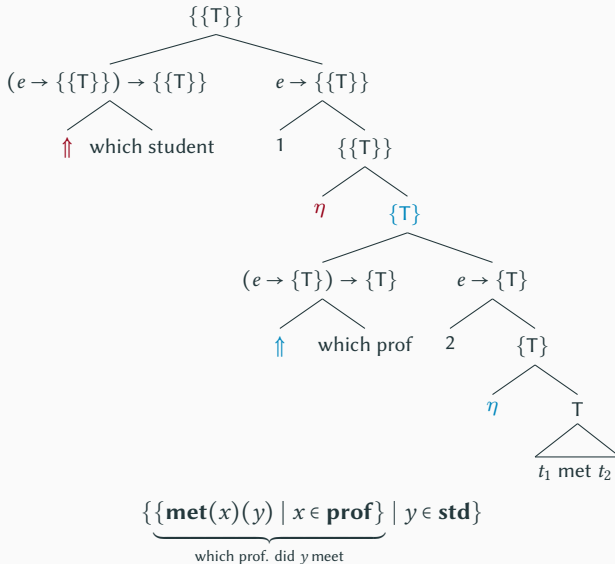
Recall the type shifters:

- $\uparrow (A) = \lambda f \bigcup \{f(x) \mid x \in A\}$
- $\uparrow\uparrow: \{a\} \rightarrow (a \rightarrow \{b\}) \rightarrow \{b\}$
- $\eta(x) = \{x\}$
- $\eta: a \rightarrow \{a\}$

Charlow (2019)

The combination of  $\uparrow$  and  $\eta$  allows alternatives to scope over any semantic objects.

## Higher order alternatives



# Answerhood

Answerhood of multiple-*wh* questions: (based on Hagstrom 1998)

- For each sub-question, **if it has answers**, then pick up the complete answer;
- Conjoin those answers.

Presupposition of multiple-*wh* questions

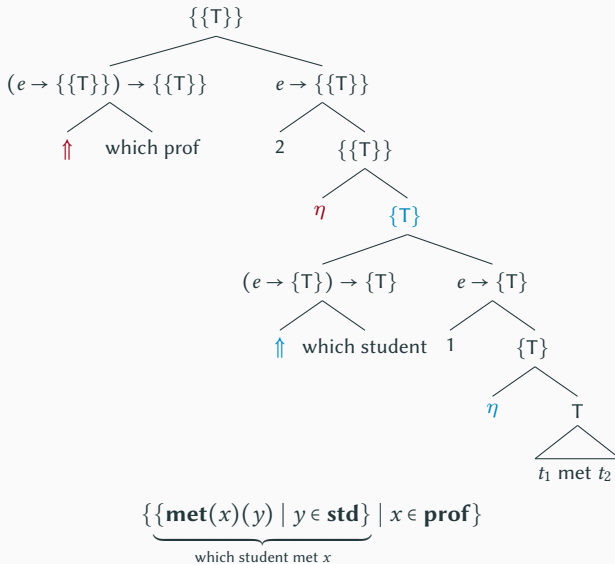
(13) Which student met which professor?

Presuppose:  $\exists y \in \mathbf{std} \exists x \in \mathbf{prof} : \mathbf{met}(x)(y)$

Consequence:

- Multiple-*wh* questions do not have the domain cover effect.
- A single-pair answer is a special case of a pair-list answer.

## Inverse scope (?)



## Superiority

(14) Which student met which professor?

↷ Which prof did Jenny meet? Which prof did Sue meet?

↷ Jenny and Sue both met Prof Smith.

(15) Which student met which professor?

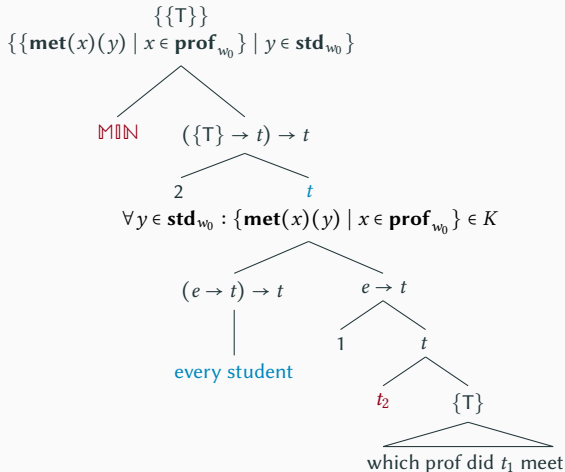
??↷ Which student met Prof Johnson? Which student met Prof Smith?

??↷ Jenny met both Prof John and Prof Smith.

Question: Why is the inverse scope reading banned?

# Quantifying into questions

Fox (2012); see also Pafel (1999)



$$\llbracket \text{MIN} \rrbracket = \lambda \mathcal{A}. \iota K \in \mathcal{A} \wedge \forall K' \in \mathcal{A} : K \subseteq K'$$



# Answerhood

Answerhood: (based on Hagstrom 1998)

- For each sub-question, **if it has answers**, then pick up the complete answer;
- Conjoin those answers.

Presupposition of questions with universal quantifiers

(16) Which professor did every student meet?

Presuppose:  $\forall y \in \mathbf{std} : \exists x \in \mathbf{prof} : \mathbf{met}(x)(y)$

Consequence:

- Questions with universal quantifiers have the domain cover effect.
- A single-pair answer is not possible.

## Types of quantifiers and availability of pair-list readings

- (17) Which professor did **no student** meet? (\*Pair-list)
- (18) Which professor did **most students** meet? (\*Pair-list)
- (19) Which professor did **two of the students** meet? (choice)

$\text{MIN}$  requires a unique minimal set  $K$ . This requirement is not satisfied whenever the involved quantifier is not universal.

- $\{K \mid \text{most students are } y \text{ such that } \llbracket \text{which prof did } y \text{ meet} \rrbracket \in K\}$
- $\{K \mid \text{no student is } y \text{ such that } \llbracket \text{which prof did } y \text{ meet} \rrbracket \in K\}$
- $\{K \mid \text{two of the students are } y \text{ such that } \llbracket \text{which prof did } y \text{ meet} \rrbracket \in K\}$

**Problem:** The choice reading of (19) is not captured.

- $\llbracket \text{MIN} \rrbracket = \lambda \mathcal{A}. f_{\text{CH}} \{K \in \mathcal{A} \mid \forall K' \in \mathcal{A} : K' \not\subseteq K\}$  (Xiang 2020; see also Winter 2001)

## What are not captured

### Functional answers

- (20) Which professor did every student meet? — Her advisor.
- (21) Which professor did no student meet? — Her advisor.

### Subject-object asymmetry

- (22) Which student met every professor?
- |   |                     |
|---|---------------------|
| a. Sue.   | (Individual answer) |
| b. #Her advisee.                                  | (Functional answer) |
| c. #Jenny met Prof. Johnson. Sue met Prof. Smith. | (Pair-list answer)  |

## Functional approach

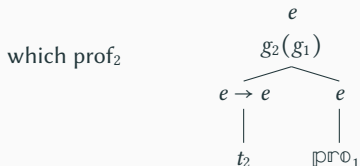
---

## Basic idea

*Wh*-expressions denote sets of functions of type  $e \rightarrow e$

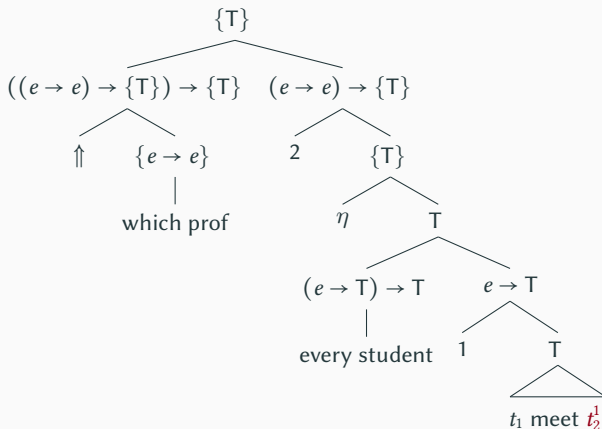
$$(23) \quad \llbracket \text{which prof} \rrbracket^\dagger = \{f \mid \mathbf{Range}(f) \subseteq \llbracket \text{which prof} \rrbracket \wedge \mathbf{Dom}(f) \subseteq D_e\}$$

The LF movement of a *wh*-expression leaves a functional trace.



## Functional answers

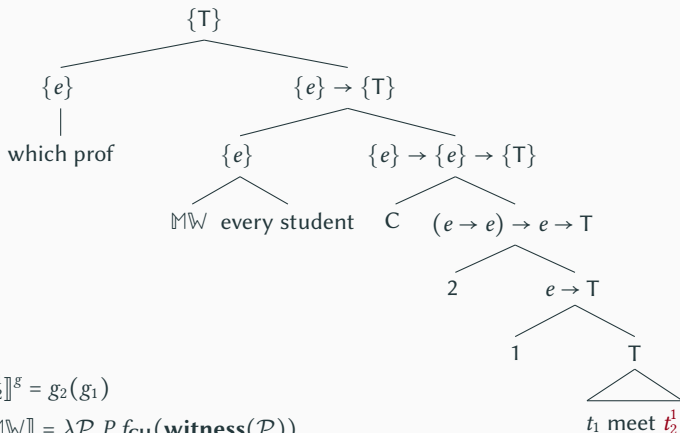
Engdahl (1986); Chierchia (1993);



$$\{\forall y \in \mathbf{std} : \mathbf{met}(f(y))(y) \mid f \in \llbracket \text{wh-prof} \rrbracket^\dagger\}$$

## Pair-list answers

Chierchia (1993); Dayal (1996)



- $\llbracket t_2^1 \rrbracket^g = g_2(g_1)$
- $\llbracket MW \rrbracket = \lambda P.P.f_{CH}(\mathbf{witness}(P))$
- $\llbracket C \rrbracket = \lambda R \lambda P \lambda P'. \{ \cap \{ R(f)(x) \mid x \in P \} \mid f \in [P \rightarrow P'] \}$

## Minimal Witness Set

As for a generalized quantifier  $\mathcal{P}$

- it lives on a set  $B$  iff for any set  $C$ ,  $C \in \mathcal{P} \leftrightarrow C \cap B \in \mathcal{P}$ ;
- it contains a minimal witness set  $A$  such that  $A \subseteq B$  and  $\neg \exists A' \in \mathcal{P} : A' \subset A$ .

Suppose our model contains three individuals  $a$ ,  $b$ , and  $c$ :

Quantifiers	Minimal Witness Set	Prediction on answerhood
everyone	$\{a, b, c\}$	Pair-list
one people	$\{a\}, \{b\}, \{c\}$	Choice
no people	$\emptyset$	No pair-list, No choice



## Weak crossover

The subject-object asymmetry results from weak crossover.

every prof [1 [which student [2 [ $t_2^1$  met  $t_1$  ]]]]

---

- (24) \*Which<sub>1</sub> professor did her<sub>1</sub> advisee meet  $t_1$ ? Weak crossover
- (25) Which student met every professor?
- a. Sue. (Individual answer)
  - b. #Her advisee. (Functional answer)
  - c. #Jenny met Prof. Johnson. Sue met Prof. Smith. (Pair-list answer)