Diagnosing covert syntax: Lessons from *wh*-in-situ

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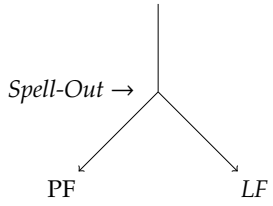
1 Introduction

► Consider Syntax and its interfaces:

(1) **The Y-model of grammar:**



Two big-picture questions:

❶ What causes LF/PF mismatches and how are they constrained?

❷ How does this vary cross-linguistically?

Two LF/PF mismatches:

(2) **A scope ambiguity:**

Some student read every book. ∃ > ∀, ∀ > ∃

a. some student every book read ____. ∃ > ∀

b. every book some student read ____. ∀ > ∃

► Resolved through (covert) **Quantifier Raising** (May 1977, 1985).

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In *wh*-questions, (phonologically) in-situ *wh*-phrases also appear to take wide scope, at the left edge of the clause:

(3) ***Wh*-in-situ in a Japanese question:**

Hanako-ga *nani*-o kai-mashi-ta-ka?
Hanako-NOM what-ACC buy-POLITE-PAST-Q
'What did Hanako buy?'
⇝ what x is such that Hanako bought x?

(4) ***Wh*-in-situ in an English multiple *wh*-question:**

Who did Mary introduce to whom?
⇝ what x, y are such that Mary introduced x to y?

► **How are in-situ *wh*-phrases interpreted?**

1.1 Two approaches to *wh*-in-situ

The covert movement approach:[2] *Wh*-phrases **must move to C** by LF for interpretability (Karttunen 1977, Huang 1982, among others).

(5) LF: *Who whom* C did Mary introduce ____ to ____?

The in-situ approach: *Wh*-phrases **are interpreted in their base positions**, without requiring movement (Hamblin 1973, Kratzer and Shimoyama 2002, among others).

(6) LF: *Who* C did Mary introduce ____ to *whom* ?

Spoiler alert!

I will argue that both approaches are sort of correct — we need both in-situ composition (focus alternatives) *and* movement to derive *wh*-questions.

► But the movement we get is **not** what you think it will be.

[2]Throughout, solid arrows indicate overt movement, dashed arrows indicate covert movement, and curly arrows indicate areas of focus-alternatives computation. These arrows are used here as a notational convenience only.

► **How can we tell if covert *wh*-movement happened?**

❶ Intervention effects (Kotek 2017b, in prep.)

❷ Island effects (Kotek 2016)

❸ Processing signature (Kotek 2014, 2019)

(Also: Antecedent Contained Deletion licensing (Pesetsky 2000), Parasitic Gap licensing (Nissenbaum 2000))

1.2 *Wh*-in-situ and intervention effects

► *Wh*-in-situ is sensitive to **intervention effects**.

(3) Hanako-ga *nani*-o kai-mashi-ta-ka?
Hanako-NOM what-ACC buy-POLITE-PAST-Q
'What did Hanako buy?'

(7) a. ?? **Da're-mo**-ga *nani*-o kai-mashi-ta-ka?
everyone-MO-NOM what-ACC buy-POLITE-PAST-Q

b. ✓ *Nani*-o **da're-mo**-ga ____ kai-mashi-ta-ka?
what-ACC everyone-MO-NOM buy-POLITE-PAST-Q
'What did everyone buy?'[3] (Hoji 1985:270)

Intervention effects affect *wh*-phrases that are truly in-situ at LF but not ones that have undergone (overt or covert) movement (Beck 2006, Beck and Kim 2006, Kotek 2014, Kotek and Erlewine 2016).

(8) **Beck (2006) intervention schema:**

a. ✓ [$_{CP}$ C ... *wh*]

b. * [$_{CP}$ C ... **intervener** ... *wh*]

c. ✓ [$_{CP}$ C ... *wh* **intervener** ... *t*]

[3] More accurately, the universal quantifier here is decomposable into a *wh* component (*da're*, 'who') and an *even/also* component (*mo*). See e.g. Kratzer and Shimoyama 2002 on the compositional semantics of *wh*-quantification. Note that *wh-mo* forms universal quantifiers and NPIs, which are distinguishable by their pitch accents and use of case markers; see e.g. Aoyagi and Ishii (1994). The forms here are universals.

► **Two related unresolved questions:**

❶ What counts as an intervener?

(9) ***Subete* 'all' is not an intervener (cf 7a):**
✓ [**Subete**-no hito]-ga *nani*-o kai-mashi-ta-ka?
all-GEN person-NOM what-ACC buy-POLITE-PAST-Q
'What did everyone buy?'

❷ What causes intervention?

* Focus (Kim 2002, Beck 2006, Beck and Kim 2006)
* Quantification (Beck 1996, Mayr 2014)
* Anti-topichood (Grohmann 2006)
* Prosodic mismatch (Tomioka 2007, Branan 2018)
* Type mismatch (Li and Law 2016)

Today:

❶ The problem is with **movement** into a position between *wh* and C at LF.

► Explained as a semantic problem with *predicate abstraction* over *focus alternatives* (see Appendix).

(10) **Intervention schema (Kotek 2017b, in prep.):**

* LF: [$_{CP}$ C ... **DP** λx ... *wh* ... x]

❷ Covert *wh*-movement is not 'regular' probe-driven movement, but rather **covert scrambling**.

❸ Many consequences for the grammar:

– Probing and movement
– Overt vs covert structure building
– Cross-linguistic variation and language acquisition

2 Intervention tracks scope-rigidity in Japanese

2.1 Data

- ▶ Recall: *Wh*-in-situ is sensitive to **intervention effects**. (cf (3), (7))
- ▶ What counts as an intervener? What causes intervention?

Quantifiers in Japanese vary in their ability to take scope below negation:

- Q > Neg only ⇝ scope rigid
- Q > Neg or Neg > Q ⇝ not scope rigid

- ▶ Shibata (2015a) notes that the scope of different disjunctors correlates with their status as interveners.

Two disjunctions: *ka* and *naishi*

(11) ***ka*-disjunction is scope-rigid; *naishi* is not:**

a. [Taro **ka** Jiro]-ga ko-**nak**-atta.
Taro or Jiro-NOM come-NEG-PAST (Shibata 2015a:23)
'Taro or Jiro didn't come.' ✓or > not, *not > or

b. [Taro **naishi** Jiro]-ga ko-**nak**-atta.
Taro or Jiro-NOM come-NEG-PAST (Shibata 2015a:96)
'Taro or Jiro didn't come.' ✓or > not, ✓not > or

(12) ***ka*-disjunction is an intervener; *naishi* is not:**

a. ??? [Taro **ka** Jiro]-ga *nani*-o yon-da-no?
Taro or Jiro-NOM *what*-ACC read-PAST-Q (Hoji 1985:264)

b. ✓ [Taro **naishi** Jiro]-ga *nani*-o yon-da-no?
Taro or Jiro-NOM what-ACC read-PAST-Q
'*What* did [Taro or Jiro] read?' (Shibata 2015a:98)

- ▶ Shibata's correlation extends to other quantificational DPs:

(13) **Generalization: Intervention correlates with scope-taking**
Scope-rigid DP quantifiers above an in-situ *wh*-phrase cause intervention. DP quantifiers that allow scope ambiguities—i.e., those that can reconstruct below the *wh*-phrase—do not.
(Erlewine and Kotek 2018)

- ▶ Explained by and supports Kotek's (2017b) theory of intervention, (10).

[3]Based on joint work with Michael Yoshitaka Erlewine (see Erlewine and Kotek 2018).

Two universal quantifiers: *wh-mo* and *subete*

(14) ***wh-mo* universal quantifier is scope-rigid; *subete* is not:**

a. [**Dono** mondai]-o-**mo** toka-**nak**-atta.
every problem-ACC-MO solve-NEG-PAST
'*pro* did not solve every problem.' ✓ every > not, *not > every

b. [**Subete**-no mondai]-o toka-**nak**-atta.
all-GEN problem-ACC solve-NEG-PAST (Mogi 2000:59)
'*pro* did not solve every problem.' ✓every > not, ✓not > every

(15) ***wh-mo* is an intervener; *subete* is not:** =(7a)

a. ?? **Da're-mo**-ga *nani*-o kai-mashi-ta-ka?
every-MO-NOM what-ACC buy-POLITE-PAST-Q
Intended: 'What did everyone buy?' (Hoji 1985:270)

b. ✓ [**Subete**-no hito]-ga *nani*-o kai-mashi-ta-ka?
all-GEN person-NOM what-ACC buy-POLITE-PAST-Q
'What did everyone buy?'

Focus particles: *-mo* 'also' and *-sae* 'even'

(16) **Focus particles are scope-rigid:** (Shibata 2015b:235)
Taro-**mo/sae** ko-**nak**-atta.
Taro-ALSO/EVEN come-NEG-PAST
'{Even} Taro {also} didn't come.' ✓EVEN/ALSO > not, *not > EVEN/ALSO

(17) ***-mo* 'also' is an intervener:** (Hasegawa 1995:119)
* Hanako-**mo** *nani*-o ka-tta-no?
Hanako-ALSO what-ACC buy-PAST-Q
Int.: 'What did Hanako$_F$ also buy?' (in addition to other people)

(18) ***-sae* 'even' is an intervener:** (Yanagida 1996:30)
?* John-wa Mary-ni-**sae** *nani*-o oku-tta-no?
John-TOP Mary-to-EVEN what-ACC send-PAST-Q
Intended: 'What did John send even to Mary?'

Polarity items: *-shika* and *wh-mo*

Wh-mo and *-shika* 'only' are often called NPIs, but Shimoyama (2011) and Kataoka (2006) show they are (types of) universals which scope over local negation.

(19) ***wh-mo* "NPI" is an intervener:** (Aoyagi and Ishii 1994:306)

* **Dare-mo** *nani-o* tabe-nak-atta-no?
who-MO what-ACC eat-NEG-PAST-Q
Intended: 'What did no one eat?'

(20) ***-shika* 'only' "NPI" is an intervener:** (Takahashi 1990:134)

?* John-**shika** *nani*-o tabe-**nak**-atta-no?
John-ONLY$_{NPI}$ what-ACC eat-NEG-PAST-Q
Intended: 'What did only John eat?'

Indefinites and numerals:

(21) **Indefinite *wh-ka* is scope-rigid:** (Mogi 2000:59)

[**Ikutsu-ka**-no mondai]-o toka-**nak**-atta
how.many-KA-GEN problem-ACC solve-NEG-PAST
'*pro* did not solve some problems.' ✓some > not, *not > some

(22) **Indefinite *wh-ka* is an intervener:** (Hoji 1985:269)

* **Dare-ka**-ga *nani*-o nomi-masi-ta-ka
who-KA-NOM what-ACC drink-POLITE-PAST-Q
'What did someone drink?'

(23) **Indefinite *suu-* is not scope-rigid:**

[**Suu**-nin-no gakusei]-ga ko-**nak**-atta.
some-CL-GEN student-NOM come-NEG-PAST
'Some number of students didn't come.' ✓some > not, ✓not > some

(24) **Indefinite *suu-* is not an intervener:**

✓ [**Suu**-nin-no gakusei]-ga *dono-hon*-o yon-da-no?
some-CL-GEN student-NOM which-book-ACC read-PAST-Q
'Which book(s) did some number of students read?'

(25) **Modified numerals are not scope-rigid:** (Shibata 2015b:66)

[**Go-nin-ijyoo**-no gakusei]-ga ko-**nak**-atta
5-CL-or.more-GEN student-NOM come-NEG-PAST
'Five or more students didn't come.' ✓(≥ 5) > not, ✓not > (≥ 5)

(26) **Modified numerals are not interveners:**

✓ [**Go-nin-ijyoo**-no gakusei]-ga *dono-hon*-o yon-da-no?
five-CL-or.more-GEN student-NOM which-book-ACC read-PAST-Q
'Which book(s) did five or more students read?'

Two positions for *-dake* 'only' with postpositions:

Novel supporting data comes from the position of 'only' *-dake*. *-dake* can occur outside or inside a postposition: DP-P-*dake* or DP-*dake*-P.

(27) **-P-*dake* is scope-rigid; *-dake*-P is not:**[4]

a. Taro-wa Hanako-to-**dake** hanashi-tei-**nai**.
Taro-TOP Hanako-with-only talk-PERF-NEG
lit. 'T. hasn't talked only with H.' ✓only > not, *not > only

b. Taro-wa Hanako-**dake**-to hanashi-tei-**nai**.
Taro-TOP Hanako-only-with talk-PERF-NEG
lit. 'T. hasn't talked with only H.' ✓only > not, ✓not > only

(28) **-P-*dake* is an intervener; *-dake*-P is not:**

a. ??? Taro-wa Hanako-to-**dake** *nani*-o tabe-ta-no?
Taro-TOP Hanako-with-only what-ACC eat-PAST-Q

b. ✓ Taro-wa Hanako-**dake**-to *nani*-o tabe-ta-no?
Taro-TOP Hanako-only-with what-ACC eat-PAST-Q
'*What* did Taro eat (only) with (only) Hanako?'

Summary:

	disjunction		universal		also	even	NPI
	ka	*naishi*	*wh-mo*	*subete*	*-mo*	*-sae*	*wh-mo*
scope-rigid?	○ (11a)	× (11b)	○ (14a)	× (14b)	○ (16)	○ (16)	○*
intervener?	○ (12a)	× (12b)	○ (15a)	× (15b)	○ (17)	○ (18)	○ (19)

	NPI only	indefinite		modified	only	
	-shika	*wh-ka*	*suu*-CL	numerals	-P-*dake*	*-dake*-P
scope-rigid?	○*	○ (21)	× (23)	× (25)	○ (27a)	× (27b)
intervener?	○ (20)	○ (22)	× (24)	× (26)	○ (28a)	× (28b)

* See Kataoka 2006; Shimoyama 2011 on the rigid wide scope of so-called "NPIs."

(13) **Generalization: Intervention correlates with scope-taking**
Scope-rigid DP quantifiers above an in-situ *wh*-phrase cause intervention. DP quantifiers that allow scope ambiguities—i.e., those that can reconstruct below the *wh*-phrase—do not.
(Erlewine and Kotek 2018)

[4] Futagi (2004) shows this difference with respect to modals.

2.2 Proposal

❶ All arguments evacuate *v*P in Japanese (Shibata 2015a,b), moving out of NegP (if present).

❷ Some (but not all) quantifiers can reconstruct into base positions.

❸ Intervention reflects the uninterpretability of (10) at LF:

(10) **Kotek (2017b) intervention schema** (repeated)
* LF: [$_{CP}$ C … **DP** λx … *wh* … x]

A quantifier moved above *wh* could lead to (10), but quantifiers that can reconstruct into *v*P can avoid (10) at LF.

(29) a. All arguments move out of *v*P:
[$_{CP}$ … DP … [$_{vP}$ … *t* … V]]

b. Interpretation in surface position ⇒ wide scope over Neg:
LF: [$_{CP}$ … DP λx … [$_{NegP}$ [$_{vP}$ … x … V] Neg]] DP > Neg

c. Some (not all) quants. reconstruct into *v*P ⇒ narrow scope:
LF: [$_{CP}$ … [$_{NegP}$ [$_{vP}$ … DP … V] Neg]] Neg > DP

2.3 Two predictions

(30) a. Potential intervener (DP) above *wh*:
[$_{CP}$ C … DP … *wh* … [$_{vP}$ … *t* … V]]

b. *LF interpretation in surface position leads to intervention!*
* LF: [$_{CP}$ C … DP λx … *wh* … [$_{vP}$ … x … V]]

c. Reconstruction avoids the intervention configuration:
✓ LF: [$_{CP}$ C … *wh* … [$_{vP}$ … DP … V]]

d. Scrambling *wh* above also avoids intervention:
✓ LF: [$_{CP}$ C … *wh* λy … DP λx … *y* … [$_{vP}$ … x … V]]

This proposal makes a number of predictions, which we can test. . .

2.3.1 Non-intervention through reconstruction

► A "non-intervening" quantifier must be reconstructed in *v*P.

(31) Taro-wa Hanako-**dake**-to *nani*-o tabe-**nai**-no?
Taro-TOP Hanako-only-with what-ACC eat-NEG-Q

a. * 'What does Taro only not eat with Hanako$_F$?' only > not
Answer: Squid ink pasta (because he gets embarrassed)

b. ? 'What does Taro not eat with only Hanako$_F$?' not > only
Answer: Dimsum (because it's better with more people)

2.3.2 Base-generated quantifiers are not interveners

► Quantifiers that are base-generated high and can be interpreted in their base positions are not interveners.

(32) ✓ Taro-wa kayoubi-ni-**dake** *nani*-o tabe-ru-no?
Taro-TOP Tuesday-on-ONLY what-ACC eat-NONPAST-Q
'What does Taro eat only on Tuesdays?'

Recall that -P-*dake* was an intervener in (28). *-dake* in (32) associates with a temporal modifier that is base-generated high and can be interpreted in-situ.

2.4 Interim summary

► **Recall our two questions:**

❶ What counts as an intervener?
A: **Anything that takes scope in a derived position at LF.**

❷ What causes intervention?
A: An incompatibility between predicate abstraction and focus-alternatives computation (see Appendix).

(10) **Kotek (2017b) intervention schema** (repeated)
* LF: [$_{CP}$ C … **DP** λx … *wh* … x]

► **Two ways of evading the intervention configuration:**

- Reconstruct quantifier below *wh* *covert*
- Scramble *wh* above quantifier *overt*

3 Intervention tracks movement in English

Intervention also affects *wh*-movement languages like English and German. Here, we must consider **multiple *wh*-questions**.

(33) **German: intervention above *wh*-in-situ, rescued by scrambling**

a. *Wer* hat Luise *wo* angetroffen?
who has Luise where met
'Who met Luise where'?

b. * *Wer* hat **niemanden** *wo* angetroffen?
who has no one where met

c. *Wer* hat *wo* **niemanden** _____ angetroffen?
who has where no one met
'Who didn't meet anybody where'? (Beck 1996)

In English, intervention appears to track **superiority** (Pesetsky 2000):

► Superiority-violating questions are susceptible to intervention effects; superiority-obeying ones are immune to these effects.

(34) a. *Which* book did **no one** give _____ to *which* student?
b. * *Which* student did **no one** give *which* book to _____?

(35) a. *Which* girl did **only Mary** introduce _____ to *which* boy?
b. * *Which* boy did **only Mary** introduce *which* girl to _____?

Note: for many (perhaps all) speakers, intervention is diagnosed by the loss of the **pair-list** reading of the question. A single-pair reading may survive.[5]

(36) *Who* ate *what*?
a. Fred ate the beans. *single-pair*
b. Fred ate the beans, Mary ate the eggplant, and Sue ate the broccoli. *pair-list*

► Superiority-obeying and violating questions differ in their available LFs. This follows from mechanisms of probing (Pesetsky 2000):

[5]This has been reported for superiority-violating questions in English and for German questions in footnotes in previous work Beck 2006, Pesetsky 2000, cf also Beck 1996). See discussion in Kotek 2014, 2019.

Superiority-obeying questions: *Wh*-in-situ covertly moves to C at LF.

(37) LF: [$_{CP}$ *Which student which book* C [$_{TP}$ _____ read _____]]?

⇝ **Predict: no intervention**

Superiority-violating questions: *Wh* is truly LF-in-situ.[6]

(38) LF: [$_{CP}$ *Which book* C did [$_{TP}$ *which student* read _____]]?

⇝ **Predict: intervention!**

Building on Pesetsky's syntactic proposal, Beck's (2006) influential semantic theory of intervention:

❶ *Wh*-in-situ is computed using focus alternatives (⇜)

❷ Interveners are focus-sensitive operators. They disrupt the relation between *wh*-in-situ and C.

Kotek (2017b, in prep.) adopts ❶, but characterizes intervention as stemming from an incompatibility of movement and focus alternatives:

(10) **Kotek (2017b) intervention schema** (repeated)
* LF: [$_{CP}$ C … **DP** λx … *wh* … x]

Virtues of the Kotek proposal:

► As we have seen already, there is no fixed set of interveners.
– Interveners don't have to be focus-sensitive

• **Languages differ in how they 'rescue' intervention configurations:**
– Move the *wh*-phrase out of the way
– Move the intervener out of the way

Next, I show this for English, as well — intervention correlates with **possible LF positions** for the *wh*-in-situ and for the intervener, not with superiority.

[6]Pesetsky doesn't provide a semantics for *wh*-in-situ. He describes the problem with intervention as affecting 'feature movement,' which differs from phrasal movement — but gives no theory of why this should be the case. Beck (2006) and later work retain the idea that superiority-obeying and -violating questions in English differ in the LF movement options available to them, and provide theories of intervention relating it to a semantic problem.

3.1 A-movement and reconstruction

English subjects normally undergo A-movement from a *v*P-internal position to Spec,TP.

Q: Under the proposal given here, why don't subjects always intervene?

A: Subjects are normally able to **reconstruct**, avoiding intervention.

But reconstruction can also be blocked by **binding from the subject** into a pronoun or reflexive, leading to intervention.

(39) Context: The lawyers seem to be likely to appeal different decisions to different courts.

a. ✓ *Which court* did **the lawyers** seem *to the reporters* to be likely to appeal *which decision* to ____?

a'. LF: *Which court* did ____ seem *to the reporters* to be likely to **the lawyers** appeal *which decision* to ____?

b. * *Which court* did **the lawyers** (λ) seem *to each other* to be likely to appeal *which decision* to ____?

3.2 No intervention if intervener reconstructs below wh

► Intervention rescued via reconstruction of a potential intervener:

(40) Context: The first-year students took several classes this past semester, taught by different professors. Each professor thought that the students particularly enjoyed one topic that she taught. Tell me,

a. ✓ *Which topic* did it seem to *which professor* that **all** of the students enjoyed ____? *baseline*

b. ✓ *Which topic* did **all** of the students seem to *which professor* to have enjoyed ____? *reconstructed reading possible*

c. * *Which topic* did the students **all** seem to *which professor* to have enjoyed ____? *reconstructed reading blocked*

d. ✓ *Which topic* did the students seem to *which professor* to have **all** enjoyed ____? *reconstructed reading possible*

(Floating a quantifier fixes its scope, preventing it from moving out of the way of *wh*-in-situ, leading to intervention (see Pesetsky 2000).[7])

3.3 No intervention if wh scopes above intervener

► Intervention rescued via exceptional (non-interrogative) movement of an otherwise in-situ *wh*-phrase:

Right-Node Raising can feed exceptional wide scope of a *wh* that is otherwise unavailable in questions (Bachrach and Katzir 2009, a.o):

(41) a. * *Which book* did John meet the man who wrote ____ ?

b. ✓ *Which book* did [John meet the man who wrote], and [Mary meet the man who published] ____?

This exceptional wide scope in RNR is also able to rescue intervention effects in superiority-violating questions:

(42) a. * *Which book* did **only Mary** allow *which student* to read ____?

b. ✓ *Which book* did [**only Mary** allow], and [**only Sue** require], *which student* to read ____?

3.4 Intervention in superiority-obeying question if covert wh-movement is blocked

► Conversely, intervention is predicted if covert *wh*-movement is unavailable in a superiority-obeying question.

Using **binding** to restrict covert movement: bindee cannot move out of the scope of a binder.

(43) **Baselines, with binders underlined:**

a. *Which daughter* showed Obama *which picture of herself*?

b. *Which daughter* showed Obama *which picture of himself*?

(44) **Target sentences, with intervener and binder underlined:**[8]

a. ?*Which daughter* showed **only** Obama *which picture of herself*?

b. **Which daughter* showed **only** Obama *which picture of himself*?

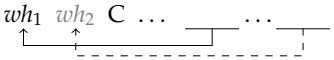
[7] Notice that (40b) may additionally have a wide-scope reading for 'all', such that the requested information is a list of triples. Wide scope is derived by scoping the universal quantifier out of the question; see e.g. Karttunen and Peters 1980, Comorovski 1989, 1996. This kind of rescue strategy for intervention configurations is also available in German and Japanese; ask me about this at the Q&A.

[8] We can understand why adverb *only* is an intervener if we adopt the movement theory of *only*, and assume that focus-particle phrases can't reconstruct (see discussion in Shibata 2015a). The resulting LF may then interfere with the schema in (10), leading to intervention effects.

4 Covert wh-movement as covert scrambling

Recall: Two strategies for interpreting *wh*-in-situ at LF

(45) **Covert movement:**



(46) ***Wh*-in-situ:**

Kotek (2014, 2016, 2019): covert movement in English superiority-obeying questions is a form of **covert scrambling**.

(47) [CP *wh*1 C ... *wh*2 [VP ... *t*]]

- Sentence processing evidence
- Judgement data evidence

This covert movement operation is the parallel of an observable **overt scrambling** step in German questions — *covert* scrambling.

(48) **Obligatory overt short *wh*-scrambling in German:**

a. *Wer* hat denn (das Buch) gestern (das Buch) gelesen?
who has *denn* (the book) yesterday (the book) read
'Who read the book yesterday?'

b. *Wer* hat denn (*was*) gestern (**was*) gelesen?
who has *denn* (what) yesterday (what) read
'Who read what yesterday?' (Hallman 1997)

Additional evidence for covert scrambling comes from the interaction of *wh*-in-situ with islands and interveners.

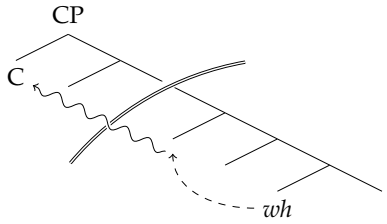
Baseline: Multiple *wh*-questions with islands are grammatical.[9]

(49) Context: The linguists at the conference are very picky about attending the conference dinner. However, each of them adores one philosopher and will certainly attend the dinner if that philosopher is invited. What I want to know is:
Q: *Which* linguist will come [if we invite *which* philosopher]?
A: ✓ Pair-list answer:
Chomsky will come if we invite Quine,
Bresnan will come if we invite Lewis,
Kratzer will come if we invite Russell, ...

[9] Based on Cheng and Demirdache 2010, citing Tancredi (p.c.).

Prediction: No intervention *inside* an island, as the *wh* can scramble above the intervener; **intervention *above* the island**, where movement is blocked.

(50)



Add interveners: here, ***only***.

(51) Context: The linguists at the conference are looking forward to the conference dinner. However, each of them dislikes all but one philosopher and will attend the dinner just in case that philosopher alone is invited. What I want to know is:
Q: *Which* linguist will come [if we **only** invite *which* philosopher]?
A: ✓ Pair-list answer:
Chomsky will come if we only invite Quine,
Bresnan will come if we only invite Lewis,
Kratzer will come if we only invite Russell, ...

► Intervener **inside** the island is **grammatical**.

(52) Context: The linguists at the conference don't really want to attend the conference dinner. However, each of them adores one philosopher and has said that they will come just in case that philosopher is invited. What I want to know is:
Q: *Which* linguist will **only** come [if we invite *which* philosopher]?
A: * Pair-list answer:
Chomsky will only come if we invite Quine,
Bresnan will only come if we invite Lewis,
Kratzer will only come if we invite Russell, ...

► Intervener **above** the island causes an **intervention effect**.

5 Conclusion: some implications

- Today: a close investigation of *wh*-in-situ and intervention effects.

- *Wh*-in-situ is susceptible to intervention effects
- . . . when something takes scope above it via movement
- Reconstruction and covert *wh*-scrambling are two ways to avoid an intervention configuration

Many implications for grammar!

5.1 Probing and movement

- Covert *wh*-movement (scrambling) cannot be probe-driven.

We require **some movement**, but **not to interrogative Spec,CP**.

Covert movement is driven not by the needs of a probe, but by the need to achieve a convergent derivation (cf free Merge, Chomsky 2004).

5.2 Overt vs covert movement

- Therefore, covert *wh*-movement is formally distinct from overt *wh*-movement, not just in its pronunciation.

Covert movement doesn't (have to) target interrogative C.

Is covert *wh*-movement successive-cyclic? Maybe not.

5.3 Successive-cyclic movement and reconstruction

- Intermediate landing sites of successive-cyclic movement behave differently than the final landing site of movement.

They cannot "count" for intervention!

(53) *Which book* λ C did Jill think that [$_{CP}$ *t* λ *which kid* read *t*]?

(54) LF: ✓ *Which book* **λ** C did Jill think that [$_{CP}$ *which kid* read **t**]?

- Reconstruction likewise must be "total," leaving no trace anywhere other than the interpretable base position.

5.4 Scope-taking and the shape of grammar

- Two scope-taking mechanisms: movement, focus alternatives[10]

They fail to compose in one particular way, leading to intervention:

(10) **Kotek (2017b) intervention schema** (repeated)
* LF: [$_{CP}$ C . . . **DP** **λx** . . . *wh* . . . **x**]

Grammar is very resilient, able to avoid this in a variety of ways (overt/covert scrambling, reconstruction, RNR, QR, extraposition).

5.5 Language variation and language acquisition

- Intervention is a logical property of UG.

There is no independent theory of intervention.

Advantageous from the viewpoint of acquisition and variation:

- A universal description for intervention.
- Learners discover scope-taking properties of individual quantifiers.
- One covert scope-taking operation, scrambling. QR is perhaps the same (e.g. Johnson and Tomioka 1997).

5.6 Additional predictions

- Many other consequences for syntax/semantics:

  Phases, modals, types, subjects, negation, focus association, $\mathcal{E}xh$, QR, top-down vs bottom-up structure building, . . .

. . . which you can ask me about in the Q&A.

[10] Also, the simple and familiar view of the semantic type system (e.g. Heim and Kratzer 1998).

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Appendix: The problem with abstraction over alternatives

Adding Roothian alternatives (Rooth 1985, 1992) to a Heim and Kratzer (1998) system:

(55) **A recursive definition for computing focus-semantic values:**

Terminal nodes (TN):

$$[\![\alpha_\tau]\!]^f = \begin{cases} \{[\![\alpha_\tau]\!]^o\} & \text{if } \alpha \text{ not F-marked} \\ \text{a subset of } D_\tau & \text{if } \alpha \text{ F-marked} \end{cases}$$

Pronouns and traces rule:

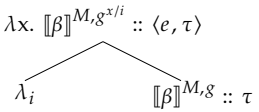
$$[\![\alpha_i]\!]^f = \begin{cases} g(i) & \text{if } \alpha \text{ not F-marked} \\ \{[\![\alpha_i]\!]^o\} & \text{if } \alpha \text{ F-marked} \end{cases}$$

Functional application (FA):

$$\left[\!\!\left[\begin{array}{c} \alpha_\tau \\ \beta_{\langle\sigma,\tau\rangle} \quad \gamma_\sigma \end{array} \right]\!\!\right]^f = \begin{cases} \{b(g) \mid b \in [\![\beta]\!]^f, g \in [\![\gamma]\!]^f\} & \text{if } \alpha \text{ not F-marked} \\ \text{a contextual subset of } D_\tau & \text{if } \alpha \text{ F-marked} \end{cases}$$

How should we define Predicate Abstraction? Let's start with simple PA:
(The discussion below based on Novel and Romero (2009).)

(56) a. Alice saw nobody
b. Nobody λ_i Alice saw t_i

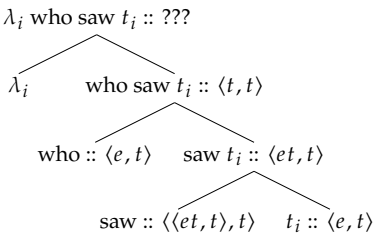


(57) a. $[\![t_i]\!]^{M,g}$ = g(i)
b. $[\![\text{saw}]\!]^{M,g} = \lambda x.\ \lambda y.$ y saw x
c. $[\![\text{Alice}]\!]^{M,g}$ = Alice
d. $[\![\text{Alice saw } t_i]\!]^{M,g} = 1$ iff A saw g(i)
e. $[\![\lambda_i \text{ Alice saw } t_i]\!]^{M,g} = \lambda x.$ A saw $g^{x/i}$(i)
$= \lambda x.$ A saw x
f. $[\![\text{A saw nobody}]\!]^{M,g} = 1$ iff $\neg\exists x$ [A saw x]

Now, in a *wh*-in-situ language, imagine the following:

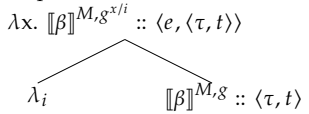
(58) a. Who saw nobody
b. Nobody λ_i who saw t_i

We want to create an abstraction rule over *sets of alternatives*.



(59) a. $[\![t_i]\!]^{M,g} = \{$ g(i) $\}$
b. $[\![\text{saw}]\!]^{M,g} = \{\ \lambda x.\ \lambda y.$ y saw x $\}$
c. $[\![\text{saw } t_i]\!]^{M,g} = \{\ \lambda y.$ y saw g(i) $\}$
d. $[\![\text{who}]\!]^{M,g} =$
$\{$ Alice, Barbara, Carol $\}$
e. $[\![\text{who saw } t_i]\!]^{M,g} =$
$\{$ A saw g(i), B saw g(i), C saw g(i) $\}$
f. $[\![\lambda_i \text{ Alice saw } t_i]\!]^{M,g}$ = ???

The simplest solution won't work: adding a λ-operator outside the abstracted-over expression.



(60) **What we get isn't what we want:**
$\lambda x.\ \{$ A saw $g^{x/i}$(i), B saw $g^{x/i}$(i), C saw $g^{x/i}$(i) $\}$

(61) $[\![\text{Nobody}]\!]^{M,g} = \{\ \lambda Q_{\langle e,t\rangle}.\ \neg\exists x_e[Q(x)]\ \}$

This gives us something of the wrong type to be the argument of *nobody*. *Nobody* (61) wants to take as sister a set of $\langle e, t\rangle$ expressions — type $\langle\langle e, t\rangle, t\rangle$. But the above expression (60) is not of that type. Specifically, we want something like (62):

(62) **What we want to get:**
$\{\ \lambda x.$ Alice saw $g^{x/i}$(i), $\lambda x.$ Barbara saw $g^{x/i}$(i), $\lambda x.$ Carol saw $g^{x/i}$(i) $\}$

We want a type-shifting rule from type $\langle e, \langle\tau, t\rangle\rangle$ into type $\langle\langle e, \tau\rangle, t\rangle$:

(63) **A procedure for converting [a function into a set of τ-alternatives] to [a set of functions into τ-alternatives]:**
$\lambda Q_{\langle e,\langle\tau,t\rangle\rangle}.\ \{\ f_{\langle e,\tau\rangle} : \forall x_e . f(x) \in Q(x)\ \}$

But as Shan (2004) shows, a function into sets carries less information than a set of functions. If we transpose using (63), we end up with a set that contains both *constant* $\langle e, t\rangle$-functions (64) and non-constant $\langle e, t\rangle$-functions (65). The former describe properties like "to be seen by Alice/Barbara/Carol," which we want. The latter have no meaning in our system and should be excluded.

(64) **Constant $\langle e, t\rangle$-functions (desired):**

$$\left\{ \begin{bmatrix} x_1 \mapsto \text{Alice saw } x_1 \\ x_2 \mapsto \text{Alice saw } x_2 \\ x_3 \mapsto \text{Alice saw } x_3 \end{bmatrix}, \begin{bmatrix} x_1 \mapsto \text{Barbara saw } x_1 \\ x_2 \mapsto \text{Barbara saw } x_2 \\ x_3 \mapsto \text{Barbara saw } x_3 \end{bmatrix}, \begin{bmatrix} x_1 \mapsto \text{Carol saw } x_1 \\ x_2 \mapsto \text{Carol saw } x_2 \\ x_3 \mapsto \text{Carol saw } x_3 \end{bmatrix} \right\}$$

(65) **Non-constant $\langle e, t\rangle$-functions (undesireable):**

$$\left\{ \begin{bmatrix} x_1 \mapsto \text{Alice saw } x_1 \\ x_2 \mapsto \text{Carol saw } x_2 \\ x_3 \mapsto \text{Barbara saw } x_3 \end{bmatrix}, \begin{bmatrix} x_1 \mapsto \text{Alice saw } x_1 \\ x_2 \mapsto \text{Barbara saw } x_2 \\ x_3 \mapsto \text{Carol saw } x_3 \end{bmatrix}, \begin{bmatrix} x_1 \mapsto \text{Carol saw } x_1 \\ x_2 \mapsto \text{Barbara saw } x_2 \\ x_3 \mapsto \text{Alice saw } x_3 \end{bmatrix} \right\}$$

Hagstrom (1998), Kratzer and Shimoyama (2002) and Yatsushiro (2009) define rules along the lines of (63) above, and thus over-generate.[11] Poesio (1996) and later Novel and Romero (2009) type-lift the entire system, such that each expression is now a function from an assignment function to its original denotation.[12] This last solution *does* indeed fix the problem. See Novel and Romero (2009) for details. Shan (2004) uses this problem to motivate a move to a movement-free, variable-free semantics. Another solution, in Ciardelli et al. (2017), based on Inquisitive Semantics, takes propositions to have the basic type of sets. Through redefining the meanings of the basic elements composing up to propositions, the PA problem is avoided. (See also Charlow 2017.)

[11] Rooth (1985) proposes this too, but doesn't spell out the details.

[12] More specifically, Novel and Romero (2009) find a problem with Poesio's (1996) implementation, and fix it by assuming that *wh*-phrases are definite descriptions.