

THERE IS NO *WH*-MOVEMENT IN SPROUTING

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Sluicing & Sprouting

SLUICING

A(ntecedent)-Clause

That frog will go extinct very soon,

CORRELATE

though it's not clear [*how soon* **< E >**].

E(llipsis)-site

REMNANT

Reduced *wh*-question

[*how soon* ~~that frog will go extinct~~ —]

SPROUTING

That frog will go extinct _____,

IMPLICIT CORRELATE

though it's not clear [*how soon* **< E >**].

Sluicing & Sprouting

Reduced *wh*-question

[*how soon* ~~that frog will go extinct~~ _____]

? *Wh*-Movement

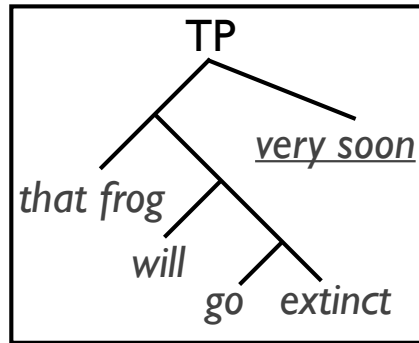
SPROUTING

That frog will go extinct _____, though it's not clear [*how soon* < E >].
IMPLICIT CORRELATE

Q. Is the REMNANT of sprouting derived by *wh*-movement?

Sluicing & Wh-Movement

That frog will go extinct very soon, though it's not clear

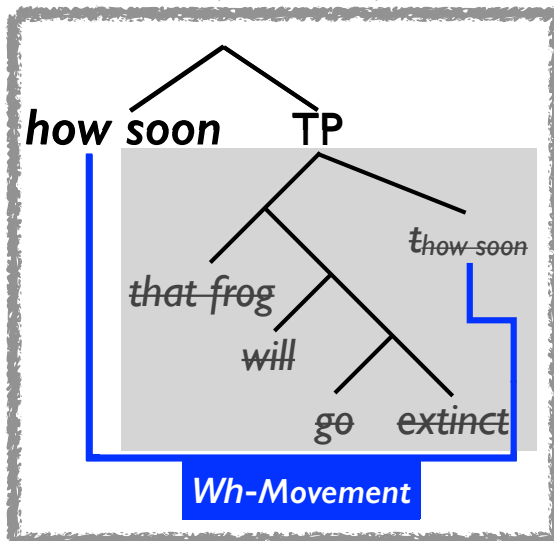


YES, Full but invisible syntax

[*how soon* ~~that frog will go extinct~~]

? Wh-Movement

(Ross 1969)



Wh-Movement

Sluicing & Wh-Movement

- In **sluicing**, the traits of the purported *wh*-movement is **not detected**.

COMPLEX NP ISLAND

Jack believes [*the rumor that* that frog will go extinct very soon], though it's not clear...

* ...*how soon* Jack believes [*the rumor that* that frog will go extinct ____].

UNELIDED

ISLAND-SENSITIVE

✓ ...*how soon* Jack believes [*the rumor that* that frog will go extinct ____].

SLUICING

ISLAND-IMMUNE

- FULL-SOURCE + REPAIR BY PF-DELETION (e.g., Ross 1969, Kim 1997, Merchant 2001)

✓ *how soon* Jack believes [*the rumor that* that frog will go extinct ____].

ISLAND REPAIR

- SHORT-SOURCE (Merchant 2001, Barros et al. 2014)

✓ *how soon* that frog will go extinct ____.

- LF-COPY + MERGER (Chung et al. 1995)

✓ *how soon* Jack believes [*the rumor that* that frog will go extinct very soon]

“Merger”: BINDING-like dependency

Sluicing & Wh-Movement

That frog will go extinct very soon, though it's not clear

[how soon ~~that frog will go extinct~~ —]

? Wh-Movement

(e.g., AnderBois 2014)

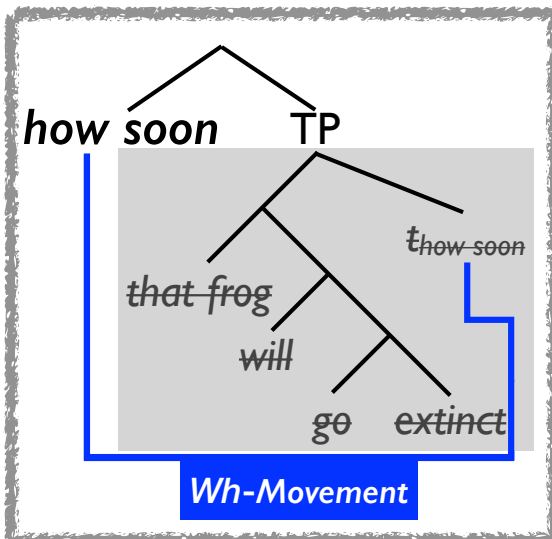
Question under Discussion (QuD)

Why will it go extinct?

How soon will it go extinct?

YES, Full but invisible syntax

FULL-SOURCE + REPAIR BY PF-DELETION
SHORT-SOURCE cf. LF-COPY + MERGER



NO, No syntax

Nothing (e.g., Culicover & Jackendoff 2005)

or Referential element (*pro*TP)

(e.g., Jäger 2005, Barker 2013, Poppels 2020)



Referential inference
(Anaphora)

Sprouting & Wh-Movement

- In **sprouting**, the purported *wh*-movement **preserves its properties**.

Jack believes COMPLEX NP ISLAND *[the rumor that that frog will go extinct]*

though it's not clear...

*...*how soon* Jack believes *[the rumor that that frog will go extinct]* ____].

UNELIDED

ISLAND-SENSITIVE

*...*how soon* Jack believes *[the rumor that that frog will go extinct]* ____].

SPROUTING

ISLAND-SENSITIVE

- FULL-SOURCE + REPAIR-BY PF-DELETION (e.g., Kim 1997, Merchant 2001)

**how soon* Jack believes *[the rumor that that frog will go extinct]* ____].

NO ISLAND REPAIR

- SHORT-SOURCE (Merchant 2001, Barros et al. 2014)

✓*how soon* that frog will go extinct ____].

(cf. Barros et al. 2014: fn. 7)

- LF-COPY + SPROUT + FORM-CHAIN (Chung et al. 1995)

**how soon* Jack believes *[the rumor that that frog will go extinct]* ____].

SPROUTED

"Form-Chain": movement-like dependency

Sprouting & Wh-Movement

That frog will go extinct _____, though it's not clear [how soon ~~that frog will go extinct~~ _____]

? Wh-Movement

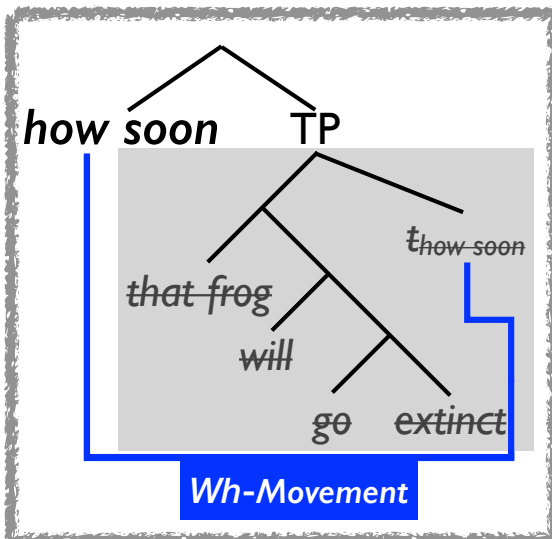
QuDs

Why will it go extinct?

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(e.g., Chung et al. 1995, Kim 1997, Merchant 2001)
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Referential inference
(Anaphora)

Sprouting & Wh-Movement

Approaches	Assumptions		Predictions	
	< E >	Wh-Movement	Island-sensitivity?	
Full Source	Full syntax (= A-clause)	✓	✓	
Anaphora (No Source)	No syntax (\emptyset_{ProTP})	X	X	

↑
according to
CLASSIC OBSERVATIONS

Sprouting & Wh-Movement

- Classic observations: Sprouting is island-sensitive

(e.g., Chung et al. 1995, Merchant 2001; Yoshida et al. 2013)

(1) * Tony sent Mo [*a picture that* he painted ____], but it's not clear *with what*.

cf. (Tony believes that) Mo painted a picture ____, but it's not clear *with what*.

- Data dispute: Sprouting is island-immune

Counter-examples (Culicover & Jackendoff 2005: 258; Kim & Kuno 2012: 317)

(2) Bob found [*a plumber who* fixed the sink ____], but I'm not sure *with what*.

(3) Mary met [*a man who* claimed he could turn copper into gold ____],
but she couldn't find out from him *with what kind of technique*.

Sprouting & Wh-Movement

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according to
COUNTER-EXAMPLES

Sprouting & Wh-Movement

- Another major property of wh-movement: **Distance-sensitivity**

Distance-related degradation (e.g., Phillips et al. 2005, Sprouse et al. 2012)

- (1) It's not clear *to what extent* Jack believes __ [that Jill bought a Ferrari].
- (2) ? It's not clear *with what money* Jack believes [that Jill bought a Ferrari __].

- FULL-SOURCE: Sprouting** will **also** exhibit distance-sensitivity

- (3) Jack believes __ [that Jill bought a Ferrari],
though it's not clear *to what extent* Jack believes __ [that Jill bought a Ferrari].

- (4) ? Jack believes [that Jill bought a Ferrari __],
though it's not clear *with what money* Jack believes [that Jill bought a Ferrari __].

(FORWARD)
SPROUTING

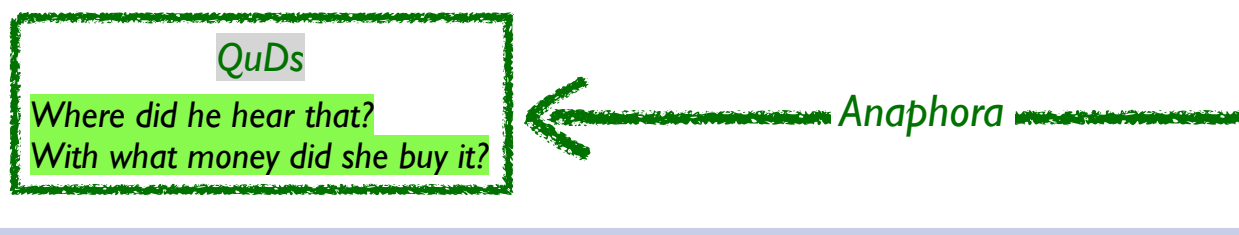
- (5) Though it's not clear *to what extent* Jack believes __ [that Jill bought a Ferrari],
Jack believes __ [that Jill bought a Ferrari].

- (6) ? Though it's not clear *with what money* Jack believes [that Jill bought a Ferrari __],
Jack believes [that Jill bought a Ferrari __].

BACKWARD
SPROUTING

Sprouting & Wh-Movement

- ANAPHORA** (No-Source): Only **backward** sprouting will be sensitive to distance



(7) Jack believes __ [that Jill bought a Ferrari], though it's not clear **[to what extent \emptyset_{proTP}]**.

(8) Jack believes [that Jill bought a Ferrari __], though it's not clear **[with what money \emptyset_{proTP}]**.

(FORWARD)
SPROUTING

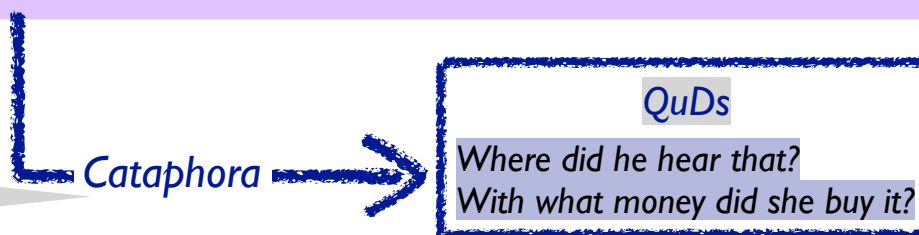
(9) Though it's not clear **[to what extent \emptyset_{proTP}]**, Jack believes __ [that Jill bought a Ferrari].

(10) Though it's not clear **[with what money \emptyset_{proTP}]**, Jack believes [that Jill bought a Ferrari __].

BACKWARD
SPROUTING

Unlike anaphora, CATAPHORA shows **SIMILARITIES** with wh-movement

- **ACTIVE SEARCH** for catecedent (Kazanina et al. 2007)
- parallel **BRAIN RESPONSE** (Matchin et al. 2014)



- **ACTIVE SEARCH** in BACKWARD SLUICING (Yoshida et al. 2012, 2014, Yoshida 2018)

Sprouting & Wh-Movement

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	< E >	Wh-Movement	Island-sensitivity?	Distance-sensitivity?
Full Source	Full syntax (= A-clause)	✓	✓	✓ (both fwd. & bwd.)
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Experiments

- Comparison: Wh-Movement vs. Backward Sprouting vs. Forward Sprouting

WH-MOVEMENT

It's not clear *with what money* Jack believes [*the rumor that* Jill bought a Ferrari ____].

BACKWARD SPROUTING

Though it's not clear *with what money*, Jack believes [*the rumor that* Jill bought a Ferrari ____].

(FORWARD) SPROUTING

Jack believes [*the rumor that* Jill bought a Ferrari ____], though it's not clear *with what money*.

Approaches	Assumptions		Predictions	
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Full Source	Full syntax (= A-clause)	✓	✓	✓ (both fwd. & bwd.)
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Design of Experiments

DISTANCE
(GAP-POSITION)

STRUCTURE

[MATRIX-GAP | NON-ISLAND] **A** It's not clear *to what extent* Jack believes ___ [that Jill bought a Ferrari].

[EMBEDDED-GAP | NON-ISLAND] **B** It's not clear *with what money* Jack believes [that Jill bought a Ferrari ___].

[MATRIX-GAP | ISLAND] **C** It's not clear *to what extent* Jack believes ___ [*the rumor that* Jill bought a Ferrari].

[EMBEDDED-GAP | ISLAND] **D** It's not clear *with what money* Jack believes [*the rumor that* Jill bought a Ferrari ___].

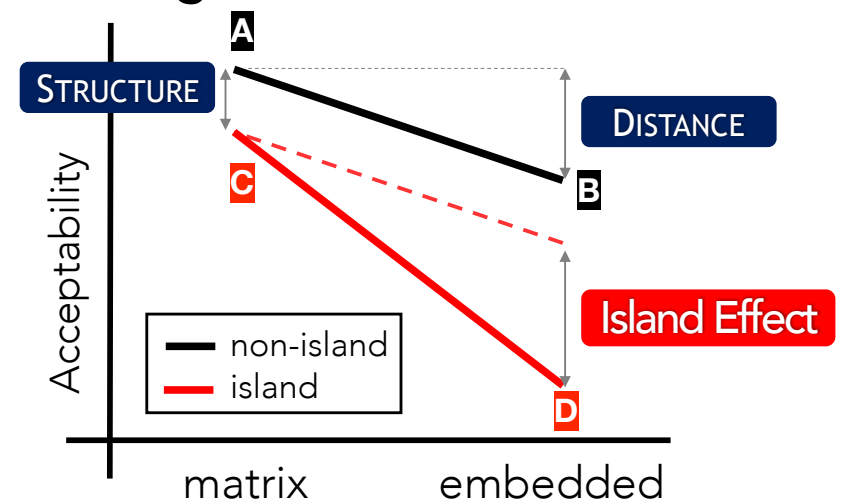
Island-sensitivity in *wh-movement* = **Super-additive Degradation** (e.g., Sprouse et al. 2012)

Higher processing costs = lower acceptability

- complex *structure* (*islands*)
- longer-*distance* dependency

Super-additive interaction Distance × Structure

= *greater degradation* than the sum of the two individual effects (*island effect*)



Method

EXPERIMENT [I]

Wh-movement vs. *Backward Sprouting*

		Structure	Gap.Position	Example
<i>Wh-movement</i>	1	Non-Island	matrix	It's not clear <i>to what extent</i> Jack believes __ [that Jill bought a Ferrari].
	2	Non-Island	embedded	It's not clear <i>with what money</i> Jack believes [that Jill bought a Ferrari __].
	3	Island	matrix	It's not clear <i>to what extent</i> Jack believes __ [<i>the rumor</i> that Jill bought a Ferrari].
	4	Island	embedded	It's not clear <i>with what money</i> Jack believes [<i>the rumor</i> that Jill bought a Ferrari __].
<i>Backward Sprouting</i>	5	Non-Island	matrix	Though it's not clear <i>to what extent</i> , Jack believes __ [that Jill bought a Ferrari].
	6	Non-Island	embedded	Though it's not clear <i>with what money</i> , Jack believes [that Jill bought a Ferrari __].
	7	Island	matrix	Though it's not clear <i>to what extent</i> , Jack believes __ [<i>the rumor</i> that Jill bought a Ferrari].
	8	Island	embedded	Though it's not clear <i>with what money</i> , Jack believes [<i>the rumor</i> that Jill bought a Ferrari __].

- $2 \times 2 \times 2$ design

Structure \times Gap.Position/DISTANCE

\times Construction (*wh-movement* vs. *backward sprouting*)

- 4 tokens per condition (32 lexical sets)
- 2:1 filler:target ratio (64 fillers + 32 targets)
- 8 counterbalanced (Latin square) lists
- Pseudo-randomization for each participant
- 80 native speakers
- 7-point Likert scale ('very bad' 1— 7 'very good')

Method

EXPERIMENT [II]

Backward Sprouting vs. Forward Sprouting

		Structure	Gap.Position	Example
Backward Sprouting	5	Non-Island	matrix	Though it's not clear <i>to what extent</i> , Jack believes __ [that Jill bought a Ferrari].
	6	Non-Island	embedded	Though it's not clear <i>with what money</i> , Jack believes [that Jill bought a Ferrari __].
	7	Island	matrix	Though it's not clear <i>to what extent</i> , Jack believes __ [<i>the rumor</i> that Jill bought a Ferrari].
	8	Island	embedded	Though it's not clear <i>with what money</i> , Jack believes [<i>the rumor</i> that Jill bought a Ferrari __].
Forward Sprouting	9	Non-Island	matrix	Jack believes __ [that Jill bought a Ferrari], though it's not clear <i>to what extent</i> .
	10	Non-Island	embedded	Jack believes [that Jill bought a Ferrari __], though it's not clear <i>with what money</i> .
	11	Island	matrix	Jack believes __ [<i>the rumor</i> that Jill bought a Ferrari], though it's not clear <i>to what extent</i> .
	12	Island	embedded	Jack believes [<i>the rumor</i> that Jill bought a Ferrari __], though it's not clear <i>with what money</i> .

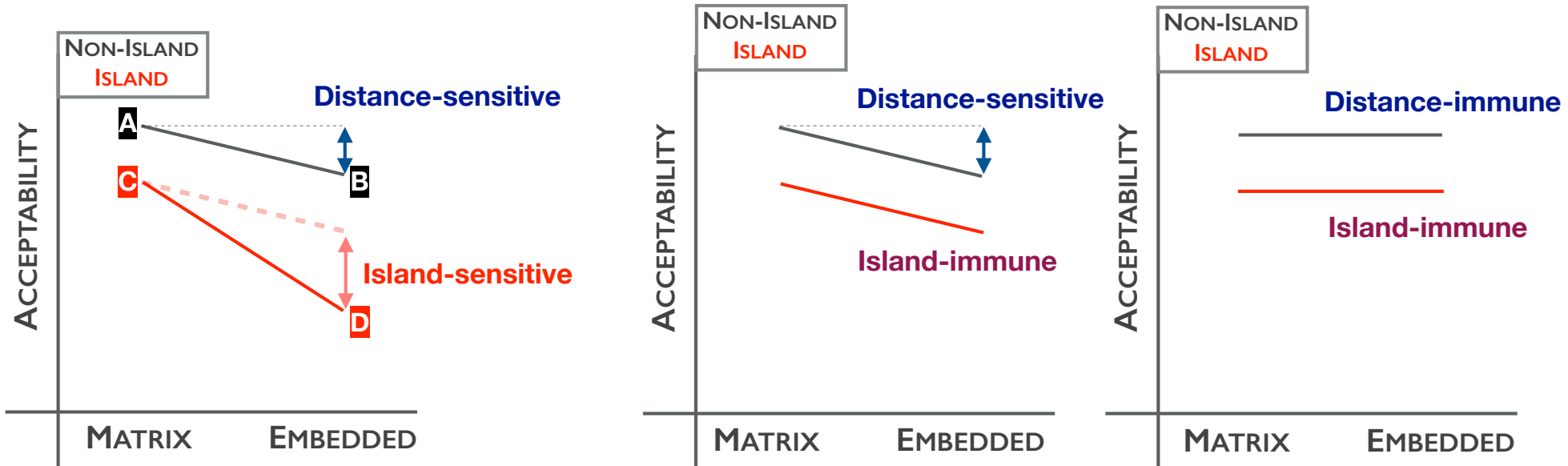
- $2 \times 2 \times 2$ design

Structure \times Gap.Position/DISTANCE

\times Construction (*backward* vs. *forward sprouting*)

- Same lexical sets from Experiment [I]
- Same task & procedure with Experiment [I]
- 80 native speakers

Predictions



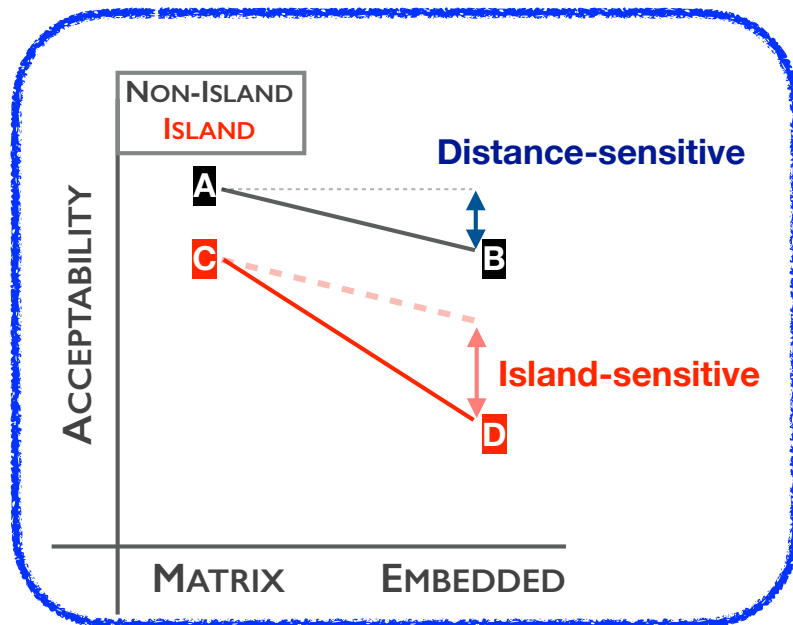
[MATRIX | NON-ISLAND] **A** It's not clear *to what extent* Jack believes [that Jill bought a Ferrari].

[EMBEDDED | NON-ISLAND] **B** It's not clear *with what money* Jack believes [that Jill bought a Ferrari].

[MATRIX | ISLAND] **C** It's not clear *to what extent* Jack believes [the rumor that Jill bought a Ferrari].

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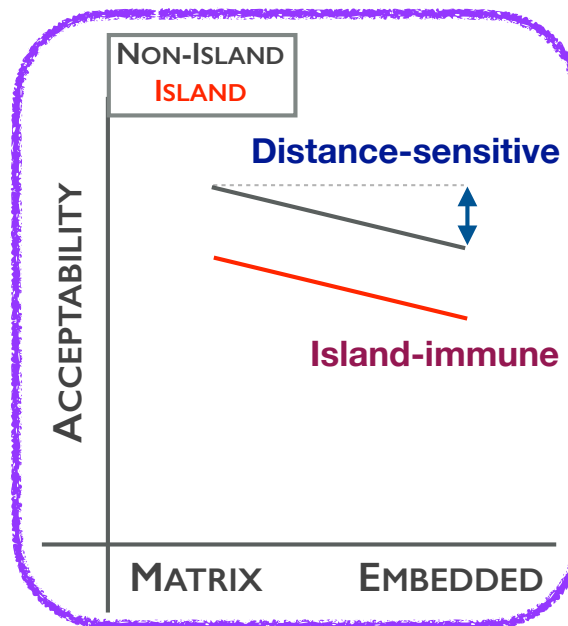
Predictions



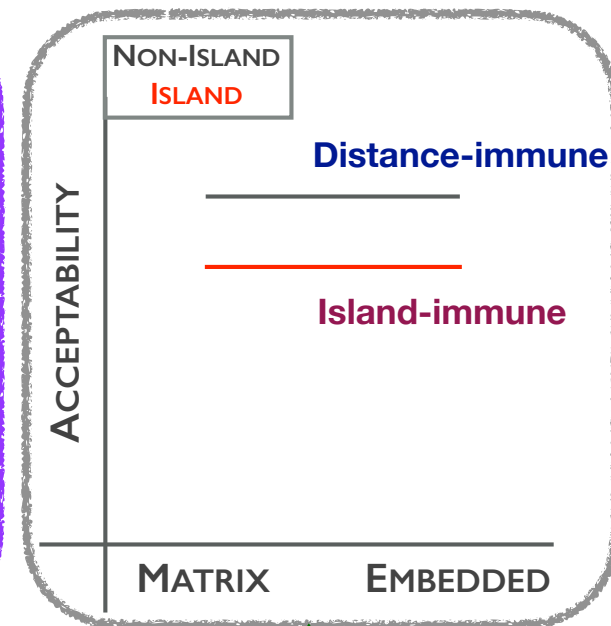
wh-movement

FULL SOURCE

backward sprouting
forward sprouting



backward sprouting

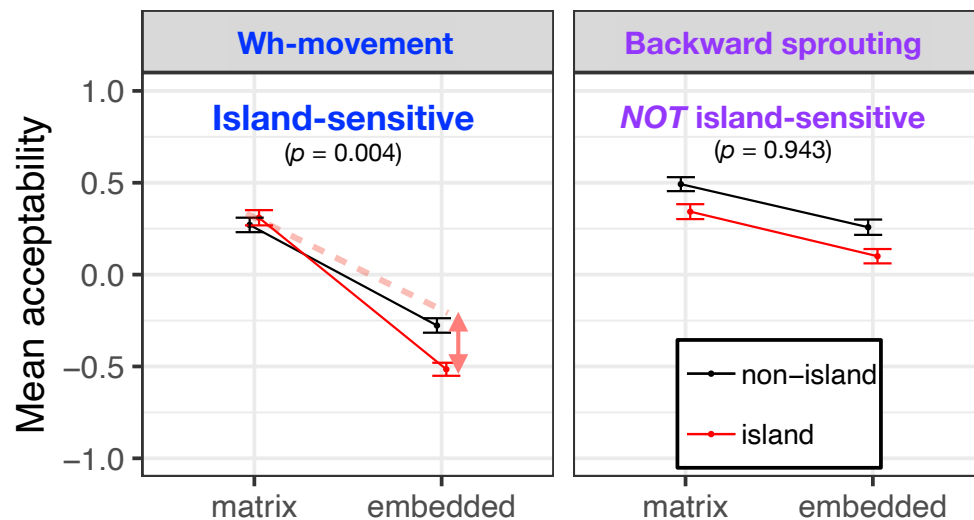


forward sprouting

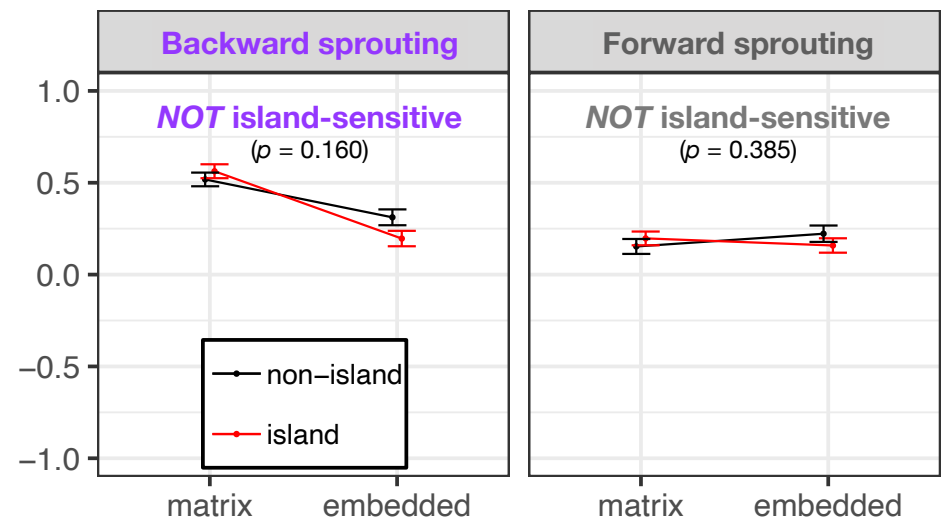
ANAPHORA

Results: ISLAND

EXPERIMENT [I]



EXPERIMENT [II]

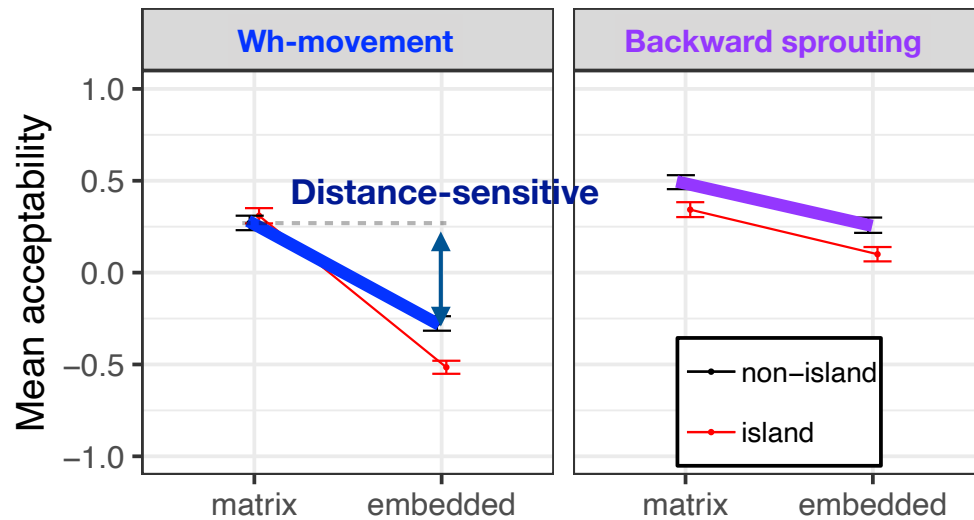


- *Wh-movement* showed island-sensitivity, as expected
- Neither *backward* nor *forward sprouting* showed island-sensitivity

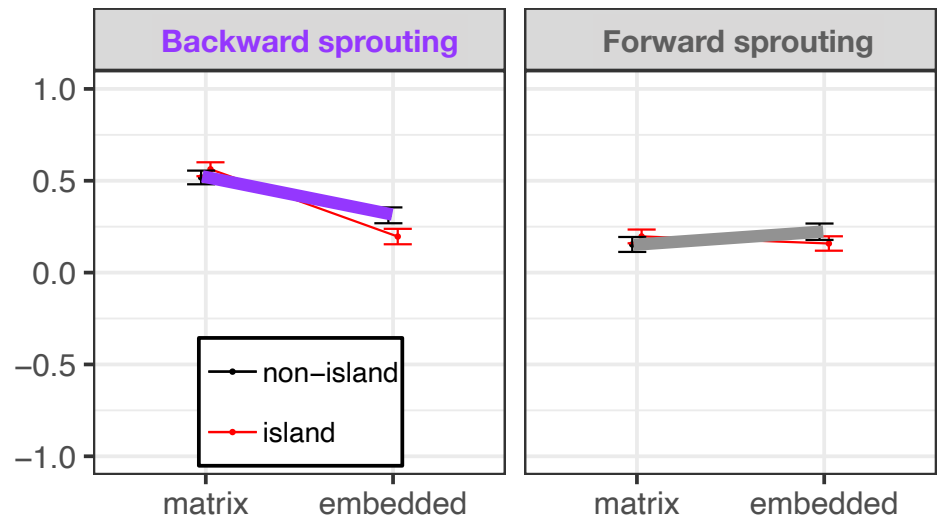
Both forward and backward sprouting were not sensitive to islands.

Results: DISTANCE

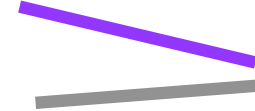
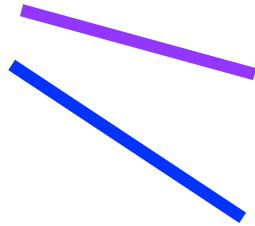
EXPERIMENT [I]



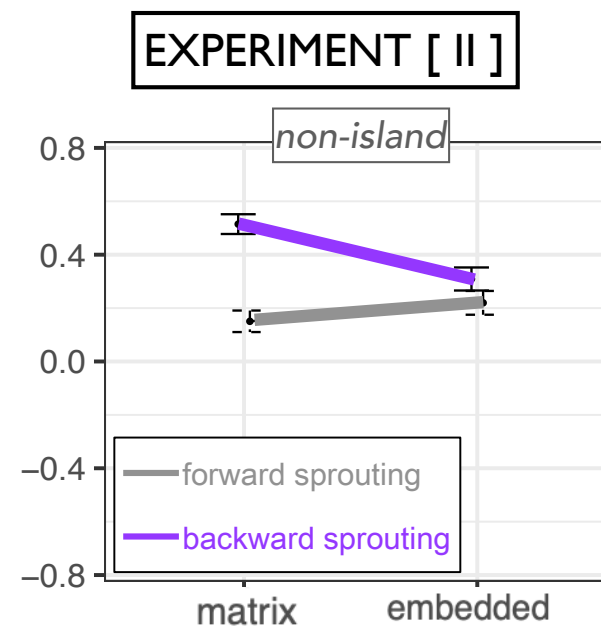
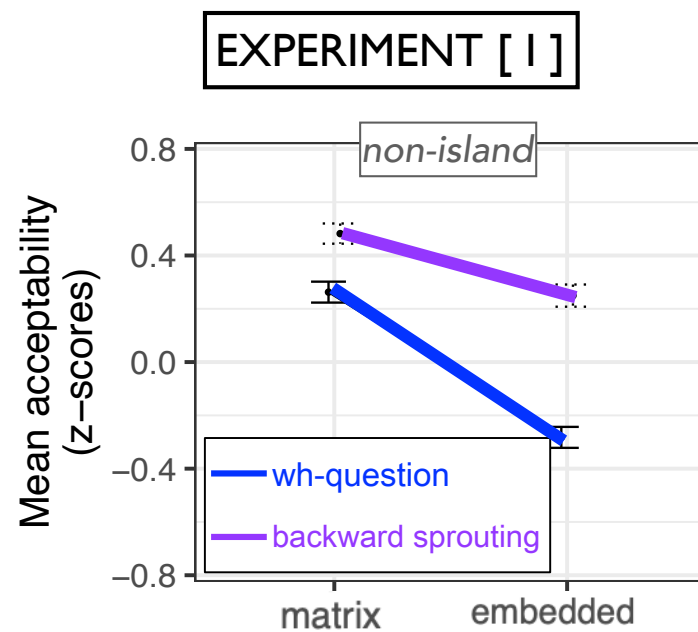
EXPERIMENT [II]



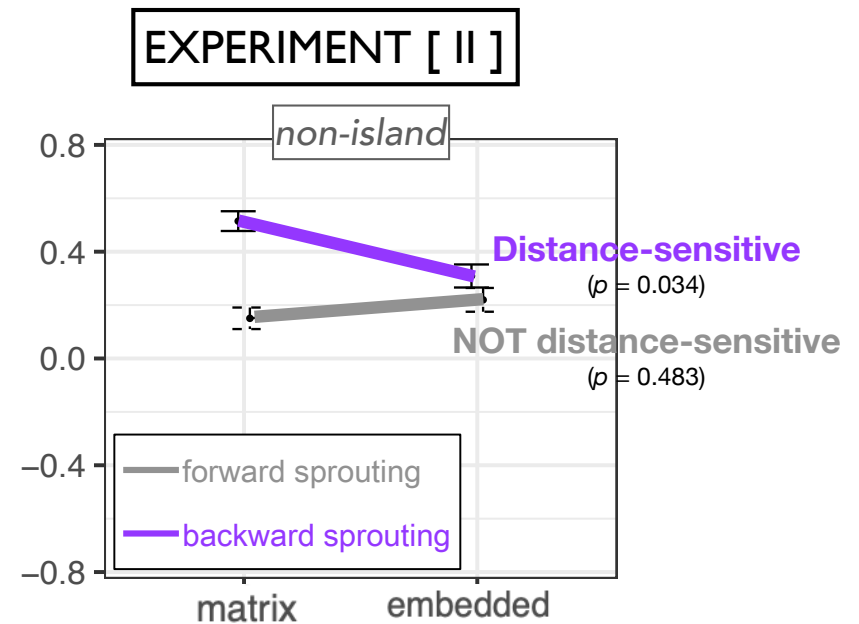
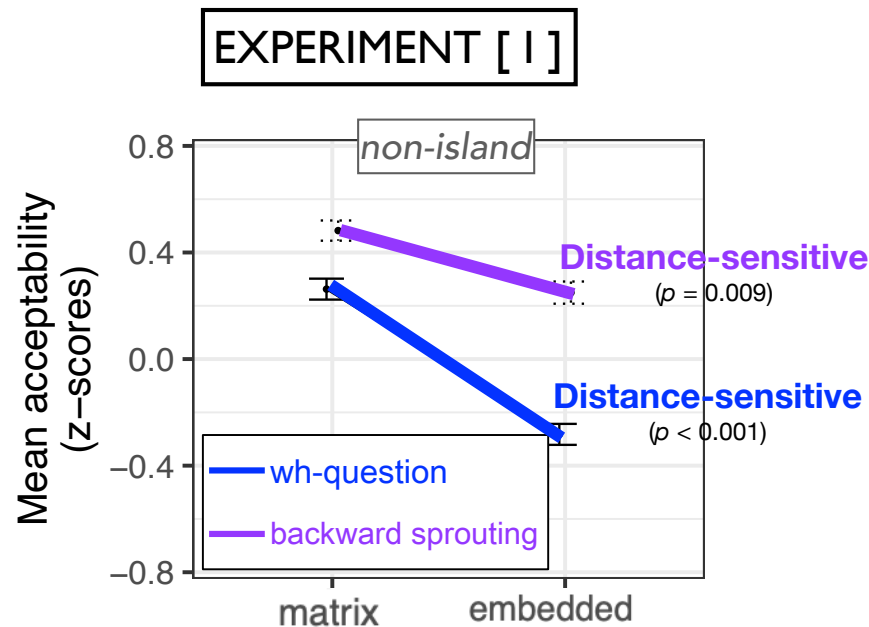
Results: DISTANCE



Results: DISTANCE



Results: DISTANCE



- *Wh-movement* showed *DISTANCE*-related degradation, as expected
- *Backward sprouting* showed *DISTANCE*-related degradation, although it was milder than *wh-movement* ($p = 0.009$)
- *Forward sprouting* showed no such degradation

Unlike forward sprouting, *backward sprouting* was sensitive to distance

Discussion: ISLAND

Both *forward* and *backward* sprouting are not sensitive to islands.

Approaches	Assumptions		Predictions	
	< E >	Wh-Movement	Island-sensitivity?	Distance-sensitivity?
Full Source	Full syntax (= A-clause)	✓	✓	✓ (both fwd. & bwd.)
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Discussion: DISTANCE

Unlike forward sprouting, *backward* sprouting is sensitive to distance

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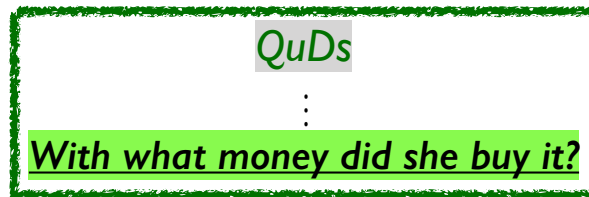
A Sketch

ANAPHORA ACCOUNT TO SPROUTING

- Why is sprouting **not sensitive to islands**?
because there is no syntactic *wh*-movement

(FORWARD)
SPROUTING

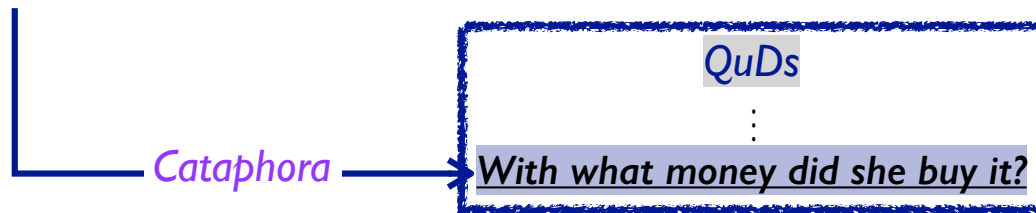
Jack believes [*the rumor that* Jill bought a Ferrari ____] while it's not clear *with what money* \emptyset_{proTP} .



Anaphora

BACKWARD
SPROUTING

While it's not clear *with what money* \emptyset_{proTP} , Jack believes [*the rumor that* Jill bought a Ferrari ____].



Cataphora

A Sketch

ANAPHORA ACCOUNT TO SPROUTING

- Why does only backward sprouting show **sensitivity to DISTANCE**?
because it forms **CATAPHORA** with the upcoming QuD

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(FORWARD)
SPROUTING

Jack believes [*the rumor* that Jill bought a Ferrari ____]

QuDs [matrix] + [embedded]

Why does he believe that?

How much does he believe that?

⋮

With what money did she buy it?

A Sketch

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= EQUALLY ACCESSIBLE

= NO DISTANCE-SENSITIVITY

← Anaphora

A Sketch

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Anaphora

BACKWARD
SPROUTING

While it's not clear [*with what money* \emptyset_{TP}], Jack believes [*the rumor*

QuDs [matrix]

Why does he believe that?

How much does he believe that?

⋮

Cataphora

A Sketch

ANAPHORA ACCOUNT TO SPROUTING

- Why does only backward sprouting show **sensitivity to DISTANCE?**
because it forms CATAPHORA with the upcoming QuD

(FORWARD)
SPROUTING

Jack believes [*the rumor* that Jill bought a Ferrari ____] while it's not clear [*with what money* \emptyset_{TP}].

QuDs [matrix] + [embedded]

Why does he believe that?

How much does he believe that?

⋮

With what money did she buy it?

= EQUALLY ACCESSIBLE

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Anaphora

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QuDs [embedded]

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With what money did she buy it?

Cataphora

X

Stepwise, Active Search

= DISTANCE-SENSITIVE

Summary

I. Sprouting is not island-sensitive.

- Naturally follows *Anaphora (no-source)* account — there is no wh-movement or islands in E-site
- Also accountable by FULL-SOURCE + REPAIR BY PF-DELETION — island-repair occurs in sprouting, too
SHORT-SOURCE — short-source is available for sprouting, too

II. Only backward sprouting is Distance-sensitive.

- Naturally follows *Anaphora (no-source)* account — unlike anaphora, Cataphora is distance-sensitive
- Challenging to FULL-SOURCE + REPAIR BY PF-DELETION — PF-deleted wh-movement loses distance-sensitivity.

The distance-sensitivity in backward sprouting is due to extra factors.

SHORT-SOURCE — short source is available for forward sprouting,
but not for backward sprouting

what factors & why?

why?

III. At this moment, *Anaphora account* may best capture the experimental findings.

i.e., there is no wh-movement in sprouting

Thank you!

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