There is no *wh*-movement in sprouting
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Sprouting is often thought to obey islands (Chung et al. 1995) and though this has sometimes been questioned (Culicover & Jackendoff 2005, Kim & Kuno 2012), it has served as the major argument for the existence of *wh*-movement of the remnant from its gap within the ellipsis site. Here, via two formal acceptability experiments, we test if sprouting shows two signature properties of *wh*-movement that have been identified in earlier work in experimental syntax: sensitivity to islands and to distance (Cowart 1997, Sprouse et al. 2012). We demonstrate that sprouting shows mixed behavior: it does not obey islands and it is sensitive to distance only in *backward* sprouting, not *forward* sprouting.

BACKGROUND: *Sprouting* refers to the ellipsis of everything in a *wh*-question except for the *wh*-phrase remnant ('*how soon*'), as in (1b) (ellipsis indicated by '< $_E$ >'; cf. the non-reduced *wh*-question in (1a)). Unlike in sluicing, in sprouting there is no overt correlate to the *wh*-phrase remnant in the antecedent clause (e.g., there is no '*very soon*'). (1b) shows forward sprouting; in backward sprouting, as in (2), the ellipsis site precedes the antecedent clause ('__' shows the implicit correlate).

(1) a. That frog will go extinct __, though no one knows *how soon$_i$* that frog will go extinct t_i.
   b. That frog will go extinct __, though no one knows *how soon* < $_E$ >.
(2) Though no one knows *how soon* < $_E$ >, the frog will go extinct __.

The standard analyses of sprouting assume that the ellipsis site has the full syntax of the antecedent clause, though it is not phonetically realized (Chung et al. 1995, Merchant 2001). The remnant is thought to be moved from the gap in the ellipsis site, so (1a) and (1b) are derived in parallel ways. Evidence for this comes from the purported island-sensitivity of sprouting, as in (3).

(3) *Joe believes [the rumor that that frog will go extinct __], though no one knows
   how soon$_i$ < $_E$ ~~Joe believes [the rumor that that frog will go extinct t_i]~~ >.

This purported island-sensitivity should be detectable in a formal acceptability experiment, as should sensitivity to distance, the other well-known property of *wh*-dependencies in acceptability experiments. Long-distance *wh*-dependencies are typically significantly degraded relative to short dependencies (Sprouse et al. 2012).

EXPERIMENT1: We tested sensitivity to islands and to distance in *wh*-questions (our control conditions) and in backward sprouting. If standard analyses of sprouting are correct and sprouting involves covert *wh*-movement, then sprouting should show island and distance effects. We constructed a 2×2×2 acceptability experiment crossing GAP-POSITION (*matrix* vs. *embedded*), ISLANDHOOD (*non-island* vs. *island*), and CONSTRUCTION (*wh-question* vs. *backward sprouting*), lexicalized into 32 sets (examples in (4)-(7)). All *wh*-elements were adjuncts. 80 native-speakers rated four tokens of each condition on a 7-point scale, across eight counterbalanced lists (a Latin square design), pseudorandomized with 64 filler items of varying acceptability.

(4) [MATRIX |{NON-ISLAND/ISLAND}| *WH*-MOVEMENT]
   It is unclear **at what meeting** Jack heard __ {Ø/the rumor} that Jill bought a Ferrari.
(5) [EMBEDDED |{NON-ISLAND/ISLAND}| *WH*-MOVEMENT]
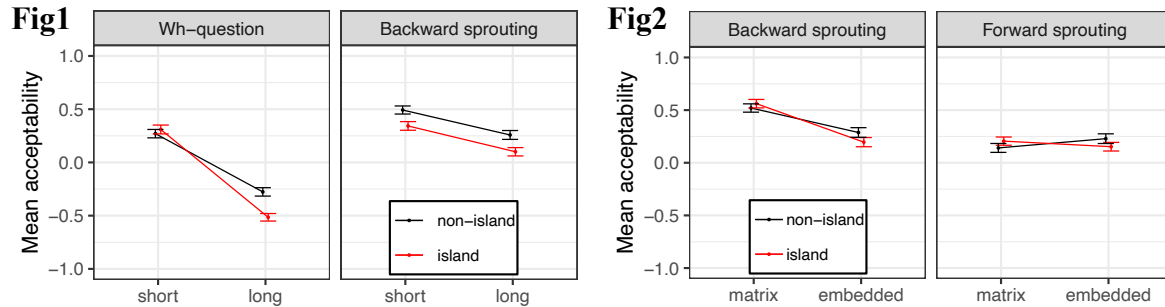   It is unclear **with what money** Jack heard {Ø/the rumor} that Jill bought a Ferrari __.
(6) [MATRIX |{NON-ISLAND/ISLAND}| BACKWARD SPROUTING]
   While it is unclear **at what meeting**, Jack heard __ {Ø/the rumor} that Jill bought a Ferrari.
(7) [EMBEDDED |{NON-ISLAND/ISLAND}| BACKWARD SPROUTING]
   While it is unclear **with what money**, Jack heard {Ø/the rumor} that Jill bought a Ferrari __.

The z-score results are given in **Fig1**. The super-additive interaction associated with islands (Sprouse et al. 2012) was observed in *wh*-questions ($p<.003$), but not in backward sprouting ($p=.844$). The degradation due to distance—the effect of GAP-POSITION with non-island conditions—was significant in both *wh*-questions ($p<.001$) and backward sprouting ($p=.014$). The results for backward sprouting are thus mixed: The surprising lack of an island effect suggests that no *wh*-movement occurs, but the presence of a distance effect suggests that it could.

Fig1

Fig2

EXPERIMENT2: We ran a follow-up experiment comparing forward sprouting and backward sprouting with 80 native-speaker participants. We used the same design and stimuli from EXPERIMENT1, but forward sprouting (as in (8)-(9)) was employed instead of *wh*-questions.

(8) Jack heard __ {Ø/the rumor} that Jill bought a Ferrari, while it is unclear ***at what meeting***.
(9) Jack heard {Ø/the rumor} that Jill bought a Ferrari __, while it is unclear ***with what money***.

Fig2 shows the z-score results. The result for backward sprouting replicated EXPERIMENT1: no island effect ($p=.252$), but a significant distance effect ($p=.028$). Forward sprouting, however, showed no island effect ($p=.240$) and no distance effect ($p=.339$). These results clearly contradict the predictions of the standard analyses of sprouting: Forward sprouting shows neither of the signatures of *wh*-movement, while backward sprouting only shows one.

DISCUSSION: As we know from much previous work (and EXPERIMENT1 here), *wh*-dependencies are sensitive both to islands and to distance. If sprouting is derived through covert *wh*-movement, as in standard analyses, we expect similar sensitivity, but our findings do not support this. Backward sprouting shows sensitivity to distance, but otherwise, we see no signs of a *wh*-dependency. The lack of an island effect could be handled through additional assumptions, such as *island repair* (Merchant 2001) or a short, mono-clausal structure in the ellipsis site that could evade an island violation (Barros et al. 2014), but still, these approaches wouldn't capture the fact that backward sprouting is sensitive to distance and forward sprouting is not, since the ellipsis site would involve the same movement in both cases.

The puzzling results seen here follow naturally from a Q-equivalence analysis, which claims that the reduced *wh*-question is anaphoric to a discourse-salient question under discussion (QuD, AnderBois 2014). The immunity to islands naturally follows given that there is no syntax in the ellipsis site, hence no island-violating *wh*-movement. The difference in distance effects between forward and backward sprouting follows from the distinction between *anaphora* vs. *cataphora*. In *forward* sprouting, the antecedent (the QuD) comes first, so the reduced *wh*-question can be *anaphoric* to any of the QuDs already raised by either predicate (matrix or embedded). In *backward* sprouting, in contrast, the reduced *wh*-question comes first, so it is *cataphoric* to a QuD later in the sentence. Unlike anaphora, cataphora shows a sensitivity to distance similar to that of *wh*-movement (Matchin et al. 2014), so it is not surprising that the cataphora in backward sprouting is also distance-sensitive. A cataphoric relation between the reduced *wh*-question and a QuD from the matrix predicate, as in (6), is thus less costly and more acceptable than a case where the QuD

is in the embedded predicate, as in (7). Cataphora is not sensitive to islands, however, so no island effect is expected here.

References

AnderBois, Scott. 2014. The semantics of sluicing: Beyond truth conditions. *Language* 90, 887–926.

Barros, Matthew, Patrick Elliott & Gary Thoms. 2014. There is no island repair. Ms., Rutgers University, University College London, and University of Edinburgh. https://ling.auf.net/lingbuzz/002100/current.pdf (accessed 23 May 2020)

Chung, Sandra, William A. Ladusaw & James McCloskey. 1995. Sluicing and logical form. *Natural Language Semantics* 3, 239–282.

Cowart, Wayne. 1997. *Experimental syntax: Applying objective methods to sentence judgments*. Thousand Oaks, CA: Sage Publications Inc.

Culicover, Peter & Ray Jackendoff. 2005. *Simpler syntax*. Oxford and New York: Oxford University Press.

Kim, Soo-Yeon & Susumu Kuno. A note on sluicing with implicit indefinite correlates. *Natural Language Semantics* 21, 315–332.

Matchin, William, Jon Sprouse & Gregory Hickok. 2014. A structural distance effect for backward anaphora in Broca's area: An fMRI study. *Brain and Language* 138, 1–11.

Merchant, Jason. 2001. *The syntax of silence: Sluicing, islands, and the theory of ellipsis*. Oxford: Oxford University Press.

Sprouse, Jon, Matt Wagers & Colin Phillips. 2012. A test of the relation between working memory capacity and island effects. *Language* 88, 82–123.