Which-questions, uniqueness, and answerhood: evidence from disjunction*

Michaela Socolof,[1] Aron Hirsch[1,2] & Bernhard Schwarz[1]

[1]McGill University, [2]The Hebrew University of Jerusalem

1. Introduction

Singular *wh*-questions typically carry a presupposition of (existence and) uniqueness. For example, (1a) presupposes (1b), that exactly one letter is missing.[1]

(1) a. Which letter is missing?
b. $\exists!x$ [letter(x) $\wedge$ miss(x)]

How is the presupposition triggered? Dayal (1996) proposed that it is triggered *globally*, as a condition on how the question is answered. The source is an answer operator ANS_D, which, as in (2a), merges with the interrogative CP, and operates on the question's Hamblin set (see also, e.g., Xiang 2016, Fox 2018). Alternatively, the presupposition may be triggered *locally*, within the question nucleus. It is then carried by each Hamblin answer (as in Uegaki 2018, 2020). One possibility, sketched in (2b), is that the *wh*-item itself is the trigger, building on Rullmann and Beck's (1998) suggestion that *which*-phrases reconstruct into the question nucleus (cf., Champollion et al. 2017, Uegaki 2020).

(2) a. $\boxed{ANS_D}$ [$_{CP}$ which letter is missing]
b. [$_{CP}$ $\boxed{\text{which}}$ letter is missing]

Our aim is to build an argument for local triggering. We consider cases whose logical form (LF) we take to instantiate the configuration in (3), where the presupposition is triggered within the scope of an operator, OP, inside CP. This configuration is incompatible

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[1]We take the metalanguage constant *letter* to be of type <e,st> corresponding to: $\lambda x . \lambda w . [\![\text{letter}]\!]^w(x)$. We write statements like (1b) to abbreviate: $\lambda w. \exists!x$ [letter(x)(w) $\wedge$ miss(x)(w)].

with ANS_D being the trigger. ANS_D, merging with the CP, will outscope any CP-internal operator. The configuration in (3) is, however, compatible with local triggering. In particular, assuming *wh*-reconstruction, it is compatible with the trigger being *which*.

(3) $[_{\text{CP}} \ldots \text{OP} [\ldots \boxed{\text{TRIG}} \ldots] \ldots]$

Hirsch and Schwarz (2019) build a case for local triggering based on cases where OP in (3) is instantiated by a modal auxiliary. Extending this line of argumentation, we will present data where we argue OP is instantiated by the disjunction particle *or*.

Our case for local triggering has consequences for the theory of answerhood. Local triggering paves the way for a weakening of the ANS operator's meaning, which Fox (2013) considered as a way of accommodating *mention-some* questions. The *wh*-questions with *or* to be explored here will, in fact, be analyzed as mention-some questions.

2. Global triggering

To begin, we introduce Dayal's (1996) global triggering account in more detail. We return to (1a) above, which Dayal's analysis associates with the LF in (4).

(4) ANS_D $[_{\text{CP}}$ which letter is missing]

The CP is taken to determine a Hamblin set, a set of propositions. Those propositions, the Hamblin answers, ascribe the property expressed by the *wh*-phrase's scope (here: the property of being missing) to elements of the extension of the *wh*-phrase's restrictor (here: atomic letters). The Hamblin set determined by the CP in (4) is accordingly (5).

(5) $\{\text{miss}(a), \text{miss}(b), \ldots\}$

Dayal's semantics for ANS_D in (6) references the notion of a *strongest* element of a set of propositions, an element that is *maximal* with respect to entailment. Notably, there can be at most one such element. Dayal proposes that ANS_D maps a Hamblin set to its unique maximal true element, presupposing that such an element exists.

(6) $[\![\text{ANS}_\text{D}]\!]^w = \lambda Q : \exists p{\in}Q\,[\, p(w) \wedge \forall q{\in}Q\,[\, q(w) \rightarrow p{\subseteq}q\,]\,]$
$\qquad\qquad\qquad\qquad . \; \iota p{\in}Q\,[\, p(w) \wedge \forall q{\in}Q\,[\, q(w) \rightarrow p{\subseteq}q\,]\,]$

In (4), then, ANS_D introduces the maximality presupposition that one of the true members of the set in (5) is strongest. Crucially, the members of (5) are all logically independent of one another. For any Hamblin set with this logical profile, the maximality presupposition amounts to the presupposition that exactly one of its members is true. For (5), this, in turn, amounts to the intended presupposition that exactly one letter is missing.

We note that Dayal intends the proposition that ANS_D outputs for a question's Hamblin set, its maximal true member, to characterize this question's complete true answer. The

uniqueness presupposition of singular *which*-questions is accordingly a side-effect of a theory of answerhood. We will return to the topic of answerhood in Section 6, after having presented our case against global triggering, to which we now turn.

3. A problem from disjunction

Extending related data in Haida and Repp 2013, Ciardelli et al. 2019, and Hirsch 2018, we now present a case that we argue to be incompatible with global triggering. Consider (7), say, in a context where the questioner is doing a crossword and needs to answer one of two clues next. Example (7) is felicitous in such a context, and could be answered with either *Shakespeare was born in Stratford* or *Bach died in Leipzig*.

(7) In which town was Shakespeare born or did Bach die?

With global triggering, what is (7) predicted to presuppose? The answer, we will see, depends on the relative scope of ANS_D and *or*. Given the linear string in (7), a transparent syntax takes *or* to scope at the C' level. Each disjunct contains a C head, hosting a fronted auxiliary. The *wh*-phrase moves across-the-board to the spec of CP. Because ANS_D merges with the CP, *or* takes scope under ANS_D, the uniqueness trigger.

(8) $[ANS_D\ [_{CP}$ [in which town] $[[_{C'}$ was Shakespeare born t]] or $[_{C'}$ did Bach die t]]

To assess the expected presupposition, we first need to identify what Hamblin set the CP determines, hence to spell out CP-internal composition. We follow a classical view, based on Karttunen (1977), and adapted to fit with current models of syntax in Heim (1994) and Fox (2013). First, consider again the basic question (9a), now with the detailed LF in (9b).

(9) a. Which letter is missing?
b. $[_{CP}\ \lambda p\ [$ [which letter] $\lambda x\ [_{C'}\ [_{C}\ ?\ p]\ [_{TP}\ x$ missing]]]]

The C position houses the ? morpheme in (10), which equates two propositions. Its first argument is a proposition variable p, and that is equated with the proposition expressed by the TP containing the trace of *which letter*, as in (11). In informal terms, the contribution of the C' is to set the form of Hamblin answers, here as propositions *that x is missing*.

(10) $[\![?]\!] = \lambda p_{st} . \lambda q_{st} . p = q$

(11) $[\![C']\!] \approx p = miss(x)$

The *wh* item denotes the existential determiner in (12), and the *wh*-phrase scopes above C. The p variable is abstracted over at the the final step, to derive the overall denotation for the CP in (13a), characterizing the Hamblin set in (13b), repeated from (5).

(12) $[\![which]\!] = \lambda f_{et} . \lambda g_{et} . \exists x\ [\ f(x) \wedge g(x)\ ]$

(13) a. $\lambda p\ .\ \exists x\ [\ \text{letter}(x)(w) \wedge p = \text{miss}(x)\ ]$
b. $\{\text{miss}(a), \text{miss}(b), \ldots\}$

Equipped with a composition, we can determine the effect of C' disjunction. Undoing pied-piping of the preposition, and fleshing out the internal make-up of the CP, the LF in (8) elaborates as (14). *Or* has the classic semantics of the logical connective. C' disjunction sets the propositions in the Hamblin set as having either of two forms: *that Shakespeare was born in x* or *that Bach died in x*. The disjunction is interpreted as (15).

(14) $[\ \text{ANS}_D\ [_{CP}\ \lambda p\ [\ [\text{which town}]\ \lambda x\ [\ \ [_{C'}\ [_C\ ?\ p]\ [_{TP}\ \text{S was born in x}]\ ]$
$[\text{or}\ [_{C'}\ [_C\ ?\ p]\ [_{TP}\ \text{B did die in x}]\ ]\ ]\ ]\ ]\ ]$

(15) $[\![\text{C' or C'}]\!] \approx p = \text{born}_s(x) \vee p = \text{died}_b(x)$

In turn, the CP denotes (16a), which characterizes the Hamblin set in (16b). For each town in the *wh*-phrase's domain, the Hamblin set contains two propositions, one of each form. The two families of propositions determined by the two C' disjuncts coincide with the Hamblin sets for the *wh*-questions *In which town was Shakespeare born?* and *In which town did Bach die?*. The Hamblin set (16b) is the union of these.

(16) a. $\lambda p\ .\ \exists x\ [\ \text{town}(x)(w) \wedge [\ p = \text{born}_s(x) \vee p = \text{died}_b(x)]\ ]$
b. $\{\text{born}_s(\text{Stratford}), \text{died}_b(\text{Stratford}), \text{born}_s(\text{Leipzig}), \text{died}_b(\text{Leipzig}), \ldots\}$

What presupposition results from applying ANS_D above disjunction? ANS_D will trigger a maximality presupposition that (16b) has a strongest true member. The propositions in (16b) are all logically independent. As noted, for a Hamblin set with this logical profile, the maximality presupposition amounts to the requirement that exactly one of its members be true. For (16b), the requirement is met just in case either of two conditions holds: (i) Shakespeare was born in exactly one town and Bach did not die in a town; (ii) Shakespeare was not born in a town and Bach died in exactly one town. The condition amounts to:

(17) $[\ \exists!x\ [\ \text{town}(x) \wedge \text{born}_s(x)\ ] \wedge \neg\exists y\ [\ \text{town}(y) \wedge \text{died}_b(y)\ ]\ ]$
$\vee\ [\ \exists!x\ [\ \text{town}(x) \wedge \text{died}_b(x)\ ] \wedge \neg\exists y\ [\ \text{town}(y) \wedge \text{born}_s(y)\ ]\ ]$

The presupposition entails that either Shakespeare was not born in a town or Bach did not die in a town. Clearly, example (7) is not perceived to carry such a presupposition. It is not judged to challenge either the common knowledge that Shakespeare was born in a town or the common knowledge that Bach died in a town. We thus arrive at the problem for global triggering: the predicted maximality presupposition in (7) is incorrect.[2]

[2]In all derivations we will consider, *or* scopes above the ? morpheme in C. Another possibility might be that *or* takes scope beneath ?, as shown in (i). If ? is housed in a covert head above the landing site of the fronted auxiliaries, (i) would be consistent with the surface string. Matters would not, however, improve. With *or* inside the question nucleus, each Hamblin answer is disjunctive, as in (ii). ANS_D would introduce

3.1 A problem of scope

The problem is a matter of scope. An intuitive presupposition would derive in (7) if the uniqueness trigger took narrow scope under disjunction, rather than vice versa. We will refer to this idea as the *Scope Hypothesis*. According to the LF in (14) above, the trigger, ANS_D, outscopes the disjunction, instantiating the configuration in (18a). By the Scope Hypothesis, the configuration in (18b) must at least be available.

(18) a. [TRIG [... or ...]]
b. [[TRIG ...] or [TRIG ...]]

With *or* taking wide scope, separate uniqueness presuppositions will be triggered internal to each disjunct. Within the left disjunct in (7), the presupposition that Shakesepeare was born in exactly one town will be triggered. Within the right disjunct, the presupposition that Bach died in exactly one town will be triggered. If both triggered presuppositions project, the question as a whole will presuppose their conjunction, as stated in (19).

(19) $\exists!x\,[\,\text{town}(x) \wedge \text{born}_\text{s}(x)\,] \wedge \exists!y\,[\,\text{town}(y) \wedge \text{died}_\text{b}(y)\,]$

This conjunction is the strongest presupposition that (7) could be expected to carry under the Scope Hypothesis. But even that strongest conceivable presupposition is consistent with intuitions. In fact, it is likely to be entailed by common knowledge.

The question is how the Scope Hypothesis derives in (7). We will consider two options. One targets disjunction, positing that its scope can actually extend beyond C' and may be broad enough to include ANS_D. The other targets the trigger, positing that it can take scope within the question nucleus, and in particular within a TP included in a C' disjunction. That approach is incompatible with the trigger being an ANS operator. Operating on the Hamblin set, determined by the CP, ANS must scope above CP. In the remainder of the paper, we argue for the second option, requiring a move to local triggering.

4. Extended scope of disjunction?

We turn to the first way of elaborating the Scope Hypothesis, where *or* takes wider scope than it appears to, scoping over ANS_D. Under such an analysis, a central issue is what exactly the scope of disjunction might be. A scope site must be identified that both yields the target presupposition and predicts a viable meaning for the question overall.

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the presupposition that exactly one is true. That excludes that Shakespeare's place of birth and Bach's place of death are different and, as such, is again incompatible with world knowledge.

(i) [ANS_D [$_\text{CP}$ λp [[which town] λx [[? p] [[was S born in x] or [did Bach die in x]]]]]

(ii) a. $\lambda p\,.\,\exists x\,[p = \text{born}_\text{s}(x) \vee \text{died}_\text{b}(x)]$
b. $\{\text{born}_\text{s}(\text{Stratford}) \vee \text{died}_\text{b}(\text{Stratford}), \text{born}_\text{s}(\text{Leipzig}) \vee \text{died}_\text{b}(\text{Leipzig}), \ldots\}$

The most promising route we see emerges from a proposal in Sauerland and Yatsushiro (2017) that questions contain a covert performative layer, which decomposes into multiple embedding predicates. Consider again (20a) to start. The two silent predicates in (20b) have essentially the meanings suggested by the names we have shown. (20b) thus expresses that the listener ought to make known the maximal true Hamblin answer to the question *Which letter is missing?*—arguably capturing the act that (20a) can be used to perform. Assuming the presupposition of ANS_D projects through the performative layer unaltered, the uniqueness presupposition associated with (20a) is accounted for as before.

(20) a. Which letter is missing?
b. [OUGHT-MAKE [KNOWN [ANS_D [$_\text{CP}$ which letter is missing]]]]

Returning to our central example with disjunction, a potential parse for (7), repeated in (21), could be one where *or* scopes between the two layers of the performative. One way to make this concrete is shown in (22). Here, *or* disjoins constituents larger than the C', as *or* attaches above covert KNOWN. On this parse, (21) contains two occurrences of the *wh*-phrase, one in each disjunct. To reconcile this structure with the pronunciation of (21), the *wh*-phrase in the second disjunct must undergo ellipsis.

(21) In which town was Shakespeare born or did Bach die?

(22) [OUGHT-MAKE [[KNOWN [ANS_D [$_\text{CP}$ in which town was S born]]]
[or [KNOWN [ANS_D [$_\text{CP}$ ~~in which town~~ did B die]]]]]]

Since *or* scopes within the performative layer, which itself is above the ANS operator, each disjunct contains a separate ANS_D, achieving the target scope order, with *or* above the uniqueness trigger. Each ANS_D merges with its own interrogative CP, and triggers a separate maximality presupposition. The CP in the left disjunct determines the Hamblin set in (23a), and the one in the right disjunct (23b), and these are not unioned.

(23) a. $\{\text{born}_\text{s}(\text{Stratford}), \text{born}_\text{s}(\text{Lepzig}), ...\}$
b. $\{\text{died}_\text{b}(\text{Stratford}), \text{died}_\text{b}(\text{Lepzig}), ...\}$

Since the answers within each Hamblin set are logically independent, the presupposition of ANS_D will amount to uniqueness in each case. There is exactly one true answer in (23a) just in case Shakespeare was born in exactly one town, and exactly one true in (23b) just in case Bach died in exactly one town. The ANS operators introduce these presuppositions, and projecting both delivers the target presupposition (24), repeated from (19).

(24) $\exists!x\,[\,\text{town}(x) \wedge \text{born}_\text{s}(x)\,] \wedge \exists!y\,[\,\text{town}(y) \wedge \text{died}_\text{b}(y)\,]$

Moreover, (22) delivers the right overall meaning. It conveys that the listener ought to either make known the answer to one question or the other. This captures the intuition that (21) can be answered with *Shakespeare was born in Stratford* or *Bach died in Leipzig*. In the

crossword scenario we presented, either by itself is intuited to convey sufficient information to comply with the questioner's request for information.

A problem arises, however. In many environments, *or* can indeed take wider scope than it appears to in the surface string. In (25), for instance, *or* can scope above or below the overt embedding predicate *wonder*, as brought out by the continuations in (25a) and (25b). On the first reading, Al's curiosity can be satisfied in either of two ways, by learning the town where Shakespeare was born or the town where Bach died. On the second reading, Al's curiosity can be satisfied in one way, and the speaker is not sure whether that's by learning where Shakespeare was born or by learning where Bach died. The former reading involves narrow scope for *or*, the latter wide scope.

(25) Al is wondering in which town Shakespeare was born or in which town Bach died.

a. ... either fact will do. (*wonder* > *or*)
b. ... but I'm not sure which. (*or* > *wonder*)

Yet, in cases where *or* appears to coordinate C' constituents, baseline data involving overt embedding show that *or* can and must take narrow scope. Whereas the surface string in (25) has *or* appear between CPs, the string in (26) is compatible with *or* surfacing between C's. We judge (26) to be unambiguous, with *or* scoping low.

(26) Al is wondering in which town Shakespeare was born or Bach died.

a. ... either fact will do. (*wonder* > *or*)
b. #... but I'm not sure which. (*or* > *wonder*)

The observed scope freezing effect in (26) is most easily understood if inter-C' *or* simply must scope at the C' itself—and that would rule out the analysis of (7) in (22). An account based on (22) would have to motivate some weakened generalization that reconciles the assumed well-formedness of (22) with the unavailability of inverse scope for disjunction in (26), and we are not aware of independent considerations that might support such a generalization.[3] On this basis, we move to a different perspective on our Scope Hypothesis, one that attributes scope reversal between the trigger and disjunction to the trigger's scopal mobility, rather than to the disjunction's.

5. Local triggering

In this section, we spell out our proposal where the uniqueness presupposition observed in singular *wh*-questions is triggered locally, within the question nucleus. As noted earlier,

[3]Note that *wonder* might itself be decomposed into two embedding predicates (*want to know*). If so, the continuation in (26b) would test whether *or* can take widest scope above both layers of *wonder*, and the judgment shows that it cannot. The data are in principle compatible with *or* taking scope just above the *know* layer, parallel to (22). In this way, (22) could perhaps be maintained in light of (26) if apparent C' disjunction could scope over one embedding predicate, but not two. We are not aware of independent constraints (for example, on ellipsis) which would derive such a restriction, however.

local triggering is incompatible with the trigger being ANS_D. Under the assumption that the *wh*-phrase can reconstruct into the question nucleus, we explore the option of encoding the presupposition in the *wh*-item (as in Hirsch and Schwarz 2019, Uegaki 2020).

5.1 Re-sourcing uniqueness

We take *which* to encode a sort of maximality presupposition, with maximality now based on mereology rather than entailment (cf., Sharvy 1980, Link 1983 on *the*). In (27), *which* composes with an entity and two predicates. It triggers the presupposition that there is a maximal entity, in terms of the part-of relation $\sqsubseteq$, satisfying both predicates. When defined, *which* maps its inputs to true just in case the individual satisfies both predicates.

(27) $[\![\text{which}]\!] = \lambda x_e \,.\, \lambda f_{et} \,.\, \lambda g_{et} : \exists y \,[\, [f(y) \wedge g(y)] \wedge \forall z \,[\, [f(z) \wedge g(z)] \rightarrow z \sqsubseteq y \,] \,] \,.\, f(x) \wedge g(x)$

The *wh*-phrase reconstructs into the question nucleus (as in Rullmann and Beck 1998). For the basic case repeated in (28a), the updated LF is (28b). Focusing on the TP, *which* composes with *letter* and *is missing*, triggering the maximality presupposition in (29a). Since the predicate given by singular *letter* is satisfied only by atomic letters, elements of $\{y \mid \text{letter}(y)(w) \wedge \text{miss}(y)(w)\}$ are not ordered by $\sqsubseteq$ for any w. The mereology-based maximality presupposition thus amounts to the intended presupposition (of existence and) uniqueness, repeated in (29b).

(28) a. Which letter is missing?
b. $[_{CP}\ \lambda p\ [\exists_{wh}\ \lambda x\ [_{C'}\ [_{C}\ ?\ p]\ [_{TP}\ [_{DP}\ [\text{which}\ x]\ \text{letter}]\ [_{VP}\ \text{is missing}]\ ]\ ]\ ]\ ]$

(29) a. $\exists y \,[\, [\text{letter}(y) \wedge \text{miss}(y)] \wedge \forall z \,[\, [\text{letter}(z) \wedge \text{miss}(z)] \rightarrow z \sqsubseteq y \,] \,]$
b. $\Leftrightarrow \exists! y \,[\, \text{letter}(y) \wedge \text{miss}(y) \,]$

To determine how this presupposition projects, we need to attend to the structure above the TP and calculate the new Hamblin set. Under the composition based on Karttunen (1977), the Hamblin set for (28a) was obtained by scoping *which letter*, which contributed an existential quantifier, above *?* in C. Now that *which letter* has reconstructed low, we localize existential quantification in a covert *wh*-operator $\exists_{wh}$, with the denotation in (30). As shown in (28b), the existential originates as the first argument of *which*, from where it moves to the specifier of C above *?* and remains there.

(30) $[\![\exists_{wh}]\!] = \lambda f_{et} \,.\, \exists x \,[\, f(x) \,]$

In addition to triggering the presupposition in (29), *which* at the TP level contributes as asserted content that the *wh*-operator's trace denotes a missing letter. The effect is that (28b) denotes the function in (31), determining the Hamblin set in (32). The Hamblin answers all carry the same presupposition, while differing from one another in their asserted content, which varies in the semantic value of the *wh*-operator's trace.

(31) $\lambda p\,.\,\exists x\,[\,p = \lambda w : \exists!y\,[\text{letter}(y)(w) \wedge \text{miss}(y)(w)]\,.\,\text{letter}(x)(w) \wedge \text{miss}(x)(w)\,]$

(32) $\left\{ \begin{array}{l} \lambda w : \exists!y\,[\,\text{letter}(y)(w) \wedge \text{miss}(y)(w)\,]\,.\,\text{letter}(a)(w) \wedge \text{miss}(a)(w), \\ \lambda w : \exists!y\,[\,\text{letter}(y)(w) \wedge \text{miss}(y)(w)\,]\,.\,\text{letter}(b)(w) \wedge \text{miss}(b)(w), \ldots \end{array} \right\}$

Because the presupposition is now carried by each one of the Hamblin answers, either universal or existential projection from the Hamblin set can account for the observation that the uniqueness presupposition in (29) is associated with the question in (28a) as a whole. Note that such projection is independently supported by cases like *Who invited the king of France?*, which is naturally analyzed as presupposing the existence of a king of France in virtue of each of its Hamblin answers carrying that presupposition.

For basic cases, then, our localist analysis yields the same presupposition as Dayal's globalist analysis would, but through a different compositional route. Reconstructed *which* triggers the presupposition internal to the question nucleus, so it is carried by each Hamblin answer, and projects as a result. We will now apply this analysis to our disjunctive question, showing that it solves the problem for the globalist analysis in Section 3.

5.2 Solving the disjunction problem

The disjunctive question is repeated in (33a). We maintain from Section 3 that in the overt syntax, the fronted *wh*-phrase undergoes across-the-board movement from a C' disjunction. Now, however, the *wh*-phrase reconstructs. Reconstruction applies in an across-the-board fashion, returning the *wh*-phrase into each of the disjuncts. The LF in (33b) results.

(33) a. In which town was Shakespeare born or did Bach die?

b. $[_{CP}\ \lambda p\ [\exists_{wh}\ \lambda x\ [\quad [_{C'}\ [_{C}\ ?\ p]\ [_{TP}\ [[\text{which } x]\ tn]\ \lambda y\ [_{TP}\ S \text{ was born in } y]\ ]\ ]$
$[\text{or}\ [_{C'}\ [_{C}\ ?\ p]\ [_{TP}\ [[\text{which } x]\ tn]\ \lambda z\ [_{TP}\ B \text{ died in } z]\ ]\ ]\ ]\ ]\ ]\ ]$

Since triggering is re-sourced to *which*, the revised LF bears out the Scope Hypothesis. Across-the-board reconstruction results in the trigger taking narrow scope under *or*. *Which* triggers a maximality presupposition at each TP, as shown in (34a) and (35a) for the left and right disjunct, respectively. In each case, the maximality presupposition amounts to a presupposition of uniqueness, given that *town*, the singular restrictor of *which*, holds of atomic towns only. The uniqueness presuppositions are given in (34b) and (35b).

(34) a. $\exists y\,[\,[\text{town}(y) \wedge \text{born}_s(y)] \wedge \forall z\,[\,[\text{town}(z) \wedge \text{born}_s(z)] \rightarrow z \sqsubseteq y\,]\,]$
b. $\Leftrightarrow \exists!y\,[\,\text{town}(y) \wedge \text{died}_b(y)\,]$

(35) a. $\exists y\,[\,[\text{town}(y) \wedge \text{died}_b(y)] \wedge \forall z\,[\,[\text{town}(z) \wedge \text{died}_b(z)] \rightarrow z \sqsubseteq y\,]\,]$
b. $\Leftrightarrow \exists!y\,[\,\text{town}(y) \wedge \text{born}_s(y)\,]$

With *or* scoping at the C' level, each C' constituent determines a family of propositions in the Hamblin set. The families now coincide with the Hamblin sets that the localist anal-

ysis would derive for *In which town was Shakespeare born?* and *In which town did Bach die?*, and their union yields the Hamblin set for (33a). Given the presuppositions triggered at the TP in each disjunct, all the members of one family presuppose that Shakespeare was born in a unique town, while all the members of the other presuppose that Bach died in a unique town. The denotation of (33b) is (36), and the Hamblin set is (37).

(36) $\lambda p\ .\ \exists x\ [\quad [p = \lambda w : \exists!y\ [tn(y)(w) \wedge born_s(y)(w)]\ .\ tn(x)(w) \wedge born_s(x)(w)]$
$\vee\ [p = \lambda w : \exists!y[tn(y)(w) \wedge died_b(y)(w)]\ .\ tn(x)(w) \wedge died_b(x)(w)]\ ]$

(37) $\left\{\begin{array}{l} \lambda w : \exists!y\ [\ tn(y)(w) \wedge born_s(y)(w)\ ]\ .\ tn(Stratford)(w) \wedge born_s(Stratford)(w), \\ \lambda w : \exists!y\ [\ tn(y)(w) \wedge born_s(y)(w)\ ]\ .\ tn(Leipzig)(w) \wedge born_s(Leipzig)(w), \\ \lambda w : \exists!y\ [\ tn(y)(w) \wedge died_b(y)(w)\ ]\ .\ tn(Stratford)(w) \wedge died_b(Stratford)(w), \\ \lambda w : \exists!y\ [\ tn(y)(w) \wedge died_b(y)(w)\ ]\ .\ tn(Leipzig)(w) \wedge died_b(Leipzig)(w), \ldots \end{array}\right\}$

Suppose that presupposition projection from Hamblin sets is universal, an assumption that maximizes the strength of the global presupposition derivable under our analysis. Then, the question in (33a) inherits the presupposition carried by the members of both families of Hamblin answers. The target presupposition repeated again in (38) results: it is presupposed that Shakespeare was born in a unique town and that Bach died in a unique town.

(38) $\exists!y\ [\ town(y) \wedge born_s(y)\ ] \wedge \exists!y\ [\ town(y) \wedge died_b(y)\ ]$

The problem for global triggering is solved. As noted earlier, the presupposition in (38), the strongest we might expect, is weak enough to be compatible with intuitions about (33a), and is likely entailed by common knowledge.[4]

5.3 Taking stock

So far, we have proposed that the *wh*-item introduces a uniqueness presupposition, and in disjunction data can reconstruct across-the-board to take low scope under *or*. In presenting our localist analysis, we have thus far not included any ANS operator in the LFs. Yet, an ANS operator may still be present to map the Hamblin set which contains the *possible* answers to the question to an actual *appropriate* answer in a given circumstance. We now re-assess the contribution of ANS so that a uniqueness presupposition is not triggered from that source, and answerhood conditions are captured, including in disjunctive data.

[4] Universal projection has been argued in some prior work (e.g., Abrusán 2011), but is controversial (e.g., Schwarz and Simonenko 2018). Regardless, existential projection, yielding (i), is also compatible with our key data point. The disjunction in (i) is weaker than the conjunction in (38), hence also likely to be entailed by common knowledge. All that matters here is that Dayal's system yields an inadequate presupposition, while our approach, one way or the other, yields a suitable one, consistent with common knowledge.

(i) $\exists!y\ [\ town(y) \wedge born_s(y)\ ] \vee \exists!y\ [\ town(y) \wedge died_b(y)\ ]$

6. Capturing answerhood

As discussed in Section 2, Dayal's globalist account links the uniqueness presupposition of singular *wh*-questions to the analysis of what counts as a complete answer to a question. A question's complete true answer is equated with the proposition that ANS_D outputs when applied to the Hamblin set at a given world. According to the semantics assigned to ANS_D, repeated in (39), this output is the maximal, that is, strongest, true answer in the set. The existence of a maximal true answer is presupposed.

(39) $[\![\text{ANS}_\text{D}]\!]^w = \lambda Q : \exists p{\in}Q\,[\,p(w) \wedge \forall q{\in}Q[\,q(w) \rightarrow p{\subseteq}q\,]\,]$
$\qquad\qquad\qquad\qquad\qquad\qquad . \iota p{\in}Q\,[\,p(w) \wedge \forall q{\in}Q[\,q(w) \rightarrow p{\subseteq}q\,]\,]$

As noted, any set can contain at most one such maximal proposition. If every interrogative clause must combine with ANS_D, the prediction is thus that every question should be judged to have exactly one complete true answer in any circumstance where the presupposition is met. This prediction is, however, known to be problematic, since certain questions—*mention-some* questions—permit multiple intuitively complete true answers. Canonical instances of mention-some questions are modalized, with a possibility modal like *can* in the question nucleus, as in (40). Intuitions indicate that there are circumstances where (40) can be taken to solicit just one place where we can get coffee. In such circumstances, either answer in (41) qualifies as a complete true answer to the question on its own. The responder can felicitously provide one answer or the other.

(40) Where can we get coffee?

(41) a. We can get coffee at Tim Horton's.
b. We can get coffee at Aroma.

As reported in Section 3, our central disjunction example, repeated in (42), can likewise allow for multiple answers in the same circumstance. In the crossword scenario we presented, the question intuitively calls for an answer addressing either of the two disjuncts. The responder can provide either (43a) or (43b), and both equally well resolve the question. In permitting multiple intuitively complete true answers, disjunctive questions pattern in a similar way to canonical mention-some questions with possibility modals.

(42) In which town was Shakespeare born or did Bach die?

(43) a. Shakespeare was born in Stratford.
b. Bach died in Leipzig.

In order to accommodate canonical mention-some data, Fox (2013) entertained a weakened ANS operator. We pursue his formulation here. Fox's operator meets our desideratum of not deriving a uniqueness presupposition for singular questions from ANS, and can account

for the answering pattern observed with disjunction. Extending a proposal in Hirsch (2018), (42) is analyzed as a kind of mention-some question.

6.1 Weakening ANS

The formulation Fox put forward is stated in (44) as ANS_F, which references a weaker entailment-based notion of maximality than ANS_D.

(44) $[\![ANS_F]\!]^w = \lambda Q \, . \, \exists p \in Q \, [\, p(w) \wedge \neg \exists q \in Q \, [\, q(w) \rightarrow q \subset p \,] \,] \, . \, \{ p \in Q \mid p(w) \wedge \neg \exists q \in Q \, [\, q(w) \rightarrow q \subset p \,] \}$

Instead of presupposing that the Hamblin set contain a true proposition entailing any other true Hamblin answer, ANS_F merely triggers the presupposition that the Hamblin set contain a true proposition that *is not entailed by* any other true Hamblin answer. Importantly, it is logically possible for there to be more than one true Hamblin answer that is maximal in this weaker sense. ANS_F is accordingly taken to output not a proposition, but a *set* of propositions, containing all the weakly maximal true Hamblin answers.

This weakened answerhood operator supports a revised theory of answerhood, on which the set of intuitively complete true answers in a world is given by the set of propositions that ANS_F outputs in that world. Since this set may have multiple members, mention-some questions can now be accommodated. In this light, we examine the effect of ANS_F for singular *wh*-questions first without and then with disjunction.

6.2 Applying to disjunction

As Fox observed, ANS_F does not lead to any uniqueness presupposition in singular *wh*-questions. Consider again the basic case in (45a), with its classical Hamblin set, repeated in (45b) from (5). Suppose two letters are missing, *a* and *b*. Then, two propositions in (46) are true, miss(*a*) and miss(*b*). Since neither is entailed by the other, both are maximal in the weak sense relevant for ANS_F, and ANS_F returns the set {miss(*a*), miss(*b*)}, its presupposition being met. Either answer should be intuitively complete, leading to a core prediction that singular *wh*-questions should be mention-some questions.

(45) a. Which letter is missing?
b. {miss(*a*), miss(*b*), ...}

While Fox rejected ANS_F due to its inability to derive uniqueness in data like (45a), local triggering avoids the problem by re-sourcing the trigger to *which*. The revised Hamblin set is repeated in (46) from Section 4, with each answer presuppositional. The projected presupposition ensures that there is just a single missing letter, and that renders the Hamblin answers mutually exclusive. In turn, ANS_F must return a singleton set at any world where the presupposition from *which* is met.

(46) $\left\{ \begin{array}{l} \lambda w : \exists!y\ [\ \text{letter}(y)(w) \wedge \text{miss}(y)(w)\ ]\ .\ \text{letter}(a)(w) \wedge \text{miss}(a)(w), \\ \lambda w : \exists!y\ [\ \text{letter}(y)(w) \wedge \text{miss}(y)(w)\ ]\ .\ \text{letter}(b)(w) \wedge \text{miss}(b)(w), \ldots \end{array} \right\}$

In the disjunction data, by contrast, the core prediction of mention-some can emerge. With *which* taking low scope beneath disjunction, the global presupposition we derived for (42) is repeated in (47). The presupposition is not only compatible with there being multiple true propositions in the Hamblin set in (48), it entails that exactly two Hamblin answers must be true. One true answer names the town where Shakespeare was born; the other names the town where Bach died. As such, in the actual world, where Shakespeare was born in Stratford and Bach died in Leipzig, ANS_F will output the doubleton set in (49), designating either proposition as a felicitous complete answer.

(47) $\exists!y\ [\ \text{town}(y) \wedge \text{born}_\text{s}(y)\ ] \wedge \exists!y\ [\ \text{town}(y) \wedge \text{died}_\text{b}(y)\ ]$

(48) $\left\{ \begin{array}{l} \lambda w : \exists!y\ [\ \text{tn}(y)(w) \wedge \text{born}_\text{s}(y)(w)\ ]\ .\ \text{tn}(\text{Stratford})(w) \wedge \text{born}_\text{s}(\text{Stratford})(w), \\ \lambda w : \exists!y\ [\ \text{tn}(y)(w) \wedge \text{born}_\text{s}(y)(w)\ ]\ .\ \text{tn}(\text{Leipzig})(w) \wedge \text{born}_\text{s}(\text{Leipzig})(w), \\ \lambda w : \exists!y\ [\ \text{tn}(y)(w) \wedge \text{died}_\text{b}(y)(w)\ ]\ .\ \text{tn}(\text{Stratford})(w) \wedge \text{died}_\text{b}(\text{Stratford})(w), \\ \lambda w : \exists!y\ [\ \text{tn}(y)(w) \wedge \text{died}_\text{b}(y)(w)\ ]\ .\ \text{tn}(\text{Leipzig})(w) \wedge \text{died}_\text{b}(\text{Leipzig})(w), \ldots \end{array} \right\}$

(49) $\left\{ \begin{array}{l} \lambda w : \exists!y\ [\ \text{tn}(y)(w) \wedge \text{born}_\text{s}(y)(w)\ ]\ .\ \text{tn}(\text{Stratford})(w) \wedge \text{born}_\text{s}(\text{Stratford})(w), \\ \lambda w : \exists!y\ [\ \text{tn}(y)(w) \wedge \text{died}_\text{b}(y)(w)\ ]\ .\ \text{tn}(\text{Leipzig})(w) \wedge \text{died}_\text{b}(\text{Leipzig})(w) \end{array} \right\}$

By combining local triggering with ANS_F, we make correct predictions about how singular questions are answered. The core prediction of ANS_F is that singular questions should be mention-some. Mention-some is masked by uniqueness from *which* in basic data, but allowed to emerge when *which* takes low scope in our disjunction data.

7. Conclusion

Our goal in this paper has been to build an argument from disjunction that the uniqueness presupposition associated with singular *wh*-questions is triggered locally, not globally by an answer operator. We argued that in C' disjunction, the presupposition trigger can take scope below *or* and, on that basis, proposed that the trigger must be a scopally mobile element within the question nucleus. Concretely, we re-localized the presupposition from the answer operator to the *wh*-item, which we took to be able to reconstruct beneath *or*. Re-localizing the presupposition paved the way for a weakening of ANS, which captured the relevant disjunction cases as mention-some questions.

References

Abrusán, Márta. 2011. Presuppositional and negative islands: a semantic account. *Natural Language Semantics* 19:257–321.

Champollion, Lucas, Ivano Ciardelli, and Floris Roelofsen. 2017. On questions and presuppositions in typed inquisitive semantics. Handout for talk at 2nd Workshop on Inquisitiveness Below and Beyond the Sentence Boundary (InqBnB), Amsterdam.

Ciardelli, Ivano, Jeroen Groenendijk, and Floris Roelofsen. 2019. *Inquisitive semantics*. Oxford: Oxford University Press.

Dayal, Veneeta. 1996. *Locality in Wh Quantification*. Dordrecht: Kluwer.

Fox, Danny. 2013. Mention some readings. URL `http://lingphil.mit.edu/papers/fox/class1-3.pdf`, MIT lecture notes, February 2013.

Fox, Danny. 2018. Partition by exhaustification: Comments on Dayal 1996. In *Proceedings of Sinn und Bedeutung 22*, ed. Uli Sauerland and Stephanie Solt, volume 2 of *ZASPiL 61*, 403–434. Berlin: Leibniz-Centre General Linguistics.

Haida, Andreas, and Sophie Repp. 2013. Disjunction in wh-questions. In *Proceedings of NELS 40*, ed. Seda Kan, Claire Moore-Cantwell, and Robert Staubs, 259–272. Amherst: GLSA.

Heim, Irene. 1994. Questions. Class handout, MIT, Cambridge, MA.

Hirsch, Aron. 2018. Disjoining questions. Ms, McGill University, Montreal, QC.

Hirsch, Aron, and Bernhard Schwarz. 2019. Singular *which*, mention-some, and variable scope uniqueness. In *Proceedings of Semantics and Linguistic Theory (SALT) 29*, ed. Katherine Blake, Forrest Davis, Kaelyn Lamp, and Joseph Rhyne. LSA.

Karttunen, Lauri. 1977. Syntax and semantics of questions. *Linguistics and Philosophy* 1:3–44.

Link, Godehard. 1983. The logical analysis of plurals and mass terms: A lattice-theoretical approach. In *Meaning, Use, and the Interpretation of Language*, ed. Reiner Bäuerle, Christoph Schwarze, and Arnim von Stechow, 302—323. Berlin: de Gruyter.

Rullmann, Hotze, and Sigrid Beck. 1998. Presupposition projection and the interpretation of 'which'-questions. In *Proceedings of Semantics and Linguistic Theory (SALT) 8*, ed. Devon Strolovitch and Aaron Lawson, 215–232. Ithaca, NY: Cornell University.

Sauerland, Uli, and Kazuko Yatsushiro. 2017. Remind-me presuppositions and speech-act decomposition: Evidence from particles in questions. *Linguistic Inquiry* 48:651–678.

Schwarz, Bernhard, and Alexandra Simonenko. 2018. Decomposing universal projection in questions. In *Proceedings of Sinn und Bedeutung 22*, ed. Uli Sauerland and Stephanie Solt, volume 2 of *ZASPiL 61*, 361–374. Berlin: Leibniz-Centre General Linguistics.

Sharvy, Richard. 1980. A more general theory of definite descriptions. *The Philosophical Review* 89:607–624.

Uegaki, Wataru. 2018. On the projection of the presupposition of embedded questions. In *Proceedings of Semantics and Linguistic Theory (SALT) 28*, ed. Katherine Blake, Forrest Davis, Sireemas Maspong, and Brynhildur Stefánsdóttir, 789–808. LSA.

Uegaki, Wataru. 2020. The existential/uniqueness presupposition of *wh*-complements projects from the answers. Ms, University of Edinburgh, Edinburgh, UK.

Xiang, Yimei. 2016. Interpreting questions with non-exhaustive answers. Doctoral dissertation, Harvard University, Cambridge, MA.

Michaela Socolof, Aron Hirsch, Bernhard Schwarz
michaela.solocof@mail.mcgill.ca, aronh@alum.mit.edu, bernhard.schwarz@mcgill.ca