

Disjunction in *Wh*-Questions*

Andreas Haida, Sophie Repp

Humboldt-Universität zu Berlin

1. Introduction: The Deviance of *Wh*-Question Disjunctions

Wh-question disjunctions have been observed to be deviant, e.g. Szabolcsi (1997), Krifka (2001): whereas a conjunction of two questions is fine, s. (1), a disjunction is unacceptable, s. (2).

- (1) Which dish did Al make and which dish did Bill make?
- (2) Which dish did Al make or which dish did Bill make?

The unacceptability of *wh*-question disjunctions can be given a semantic explanation if we take the partition theory of questions as a basis (Groenendijk and Stokhof 1982, 1984). According to this theory, a question defines a partition of the logical space. A disjunction of two questions is then a union of two partitions, which is not again a partition: there are overlapping cells. Thus the disjunction of two questions is not a question. According to Krifka (2001), the reason for the deviance of *wh*-question disjunctions is also pragmatic, the underlying assumption being that speech acts cannot be coordinated disjunctively. Speech acts are operations that, when applied to a commitment state, deliver the commitments that characterize the resulting state. Speech act disjunction would lead to disjunctive sets of commitments, which are difficult to keep track of. According to Krifka (2001), a question like (2) could only¹ be interpreted in the way

* Part of this work was presented earlier at the workshop *Clause linking and discourse structure* in July 2009 at ZAS Berlin. We would like to thank the audience there for useful comments. Special thanks go to Manfred Krifka for discussion. This work was supported by the German Research Foundation DFG as part of the Collaborative Research Centre (SFB) 632 'Information Structure' at the Humboldt-Universität zu Berlin and the University of Potsdam, Projects A2 & B2.

¹ For some speakers, the question disjunction in (2) seems to be felicitous under a reading where it is understood as a directive to choose one of the questions and answer it (thanks to Stefan Kaufmann for pointing this out to us). This reading corresponds to the so-called *choice reading* of questions like *What did someone read?* discussed in Groenendijk & Stokhof (1984). This question can be understood as a directive to the answerer to choose a person and say for that person what s/he read, e.g. *John read 'War and Peace'*.

indicated in (3), where the speaker retracts the first question and replaces it by the second. As a result there is only one question to be answered.

- (3) Which dish did Al make? Or, which dish did Bill make?

In this paper we propose that *wh*-question disjunctions do denote proper semantic questions but are pragmatically deviant outside specific contexts. We identify these specific contexts as contexts that license polarity-sensitive items (PSIs). In PSI-licensing contexts, the pragmatic inadequacy disappears due to a pragmatically induced recalibration of the implicature triggered by *or* (cf. Chierchia 2004). The account developed here does not carry over to alternative questions that have the form of *yes/no*-question disjunctions such as e.g.:

- (4) Are you coming or are you going?

See Haida (to appear) for an analysis of such questions.

2. The Semantics of *Wh*-Questions and *Wh*-Question Disjunctions

For the semantics of *wh*-questions we follow Karttunen (1977) and assume that a question denotes the set of its true answers. For instance, the question *How did Paul get home* denotes the set in (5) (where **a** is the index of the actual world). Assuming that in the actual world Paul got home by bus and by train, this is the set given in (6). The weakly exhaustive answer to (5) is the conjunction of all the propositions in the set of true answers, see (7).

- (5) $[[\text{How did Paul get home?}]]^g =$
 $= \{p \mid \exists m (p(\mathbf{a}) \wedge p = \lambda w (\text{Paul got home in manner } m \text{ in } w))\}$

- (6) $\{\lambda w(\text{Paul got home by bus in } w), \lambda w(\text{Paul got home by train in } w)\}$

- (7) $\lambda w(\text{Paul got home by bus in } w \wedge \text{Paul got home by train in } w)$

For the disjunction of *wh*-questions we propose that such a disjunction denotes the set of propositions that results from the pairwise disjunction of any two propositions from the respective disjuncts, s. (8).² Thus every proposition in the answer set of the first question

We show in section 3 that there is a true question-disjunction reading that is different from the choice reading.

² In (8) and below, we write $p_1 \vee p_2$ as a shorthand for $\lambda w(p_1(w) \vee p_2(w))$. Corresponding conventions hold for other truth functions when applied to propositional objects.

Local and Global Implicatures in Wh-Question Disjunctions

is conjoined disjunctively with every proposition in the answer set of the second question. For (9) this delivers (11) if in fact Paul got home by bus at 3 a.m. and in no other way and at no other time. The weakly exhaustive answer defined by (11) is then the proposition in (11).

$$(8) \quad \llbracket Q_1 \text{ or } Q_2 \rrbracket^g = \{p_1 \vee p_2 \mid p_1 \in \llbracket Q_1 \rrbracket^g \wedge p_2 \in \llbracket Q_2 \rrbracket^g\}$$

$$(9) \quad [Q_1 \text{ How did Paul get home?}] \text{ or } [Q_2 \text{ When did Paul get home?}]$$

$$(10) \quad \{\lambda w(\text{Paul got home by bus in } w \vee \text{Paul got home at 3 a.m. in } w)\}$$

$$(11) \quad \lambda w(\text{Paul got home by bus in } w \vee \text{Paul got home at 3 a.m. in } w)$$

Above and in the following we only consider singleton sets for easier exposition. This simplification is without loss of generality because of the distributivity of ' \vee ' over ' \wedge ': the (weakly) exhaustive answer to a question disjunction is identical to the disjunction of the exhaustive answers to the individual questions (See (31) for a definition of the answer operator 'ans'):³

$$(12) \quad \text{ans}(\llbracket Q_1 \text{ or } Q_2 \rrbracket^g) = \lambda w(\text{ans}(\llbracket Q_1 \rrbracket^g)(w) \vee \text{ans}(\llbracket Q_2 \rrbracket^g)(w))$$

The deviance of the question disjunction in (9) can be explained if we consider its pragmatics, more specifically, if we look at it from the point of view of Gricean reasoning (Grice 1989). When trying to give the true exhaustive answer to (9) (= the proposition in (11), since we consider the weakly exhaustive answer) the answerer cannot avoid violating Grice's Maxim of Quantity. Both disjuncts are true in the actual world since they are *true* answers to the disjoined questions. The use of *and* would be more informative and would not violate the Maxim of Quality. We suggest that this is the reason for the unacceptability of *wh*-question disjunctions. *Wh*-question disjunctions are unanswerable and therefore deviant.

Before closing this section, we would like to point out that our proposal might be rejected on the assumption that the over-informative *and*-answer should pose no problems because it is generally possible to give over-informative answers to questions, cf. (13). So this should be possible for disjoined *wh*-questions as well.

$$(13) \quad \text{Q: Were there any calls for me? A: Yes, Paul called.}$$

³ That is:

$$(i) \quad \lambda w((p_{1,1}(w) \vee p_{2,1}(w)) \wedge (p_{1,1}(w) \vee p_{2,2}(w)) \wedge \dots \wedge (p_{1,2}(w) \vee p_{2,1}(w)) \wedge (p_{1,2}(w) \vee p_{2,2}(w)) \wedge \dots) = \\ = \lambda w((p_{1,1}(w) \wedge p_{1,2}(w) \wedge \dots) \vee (p_{2,1}(w) \wedge p_{2,2}(w) \wedge \dots))$$

We argue below (section 4) that *wh*-question disjunctions do not have a true maximally informative answer. In this sense there is no such thing as an over-informative answer in these cases.

3. Non-Deviant *Wh*-Question Disjunctions

In the previous section we discussed the observation that *wh*-question disjunctions are deviant and gave an account for why this should be. Note that we only considered matrix questions in that section. Moving on to embedded questions at first sight does not change the picture: speakers judge the sentence in (14) to be unacceptable.

(14) *The police found out how or when Paul got home that night.

For some speakers (14) improves if the question words are heavily accented and if there also is an intonational phrase break after the first question word, as indicated in (15). These phonological means, we suggest, indicate the readings in (15a) or (15b):

- (15) %The police found out HOW, or WHEN Paul got home that night.
- a. The police found out HOW, or rather WHEN Paul got home that night.
 - b. The police found out HOW, or ~~the police found out~~ WHEN Paul got home that night.

(15a) is a retraction reading, similar to the one in (3) discussed in section 1. (15b) involves ellipsis of matrix clause material, so that we are not dealing with a question disjunction here but with a disjunction of the matrix clause assertions. Under both readings, truth obtains if the police can answer one of the embedded questions. These readings are irrelevant for the present discussion. The relevant reading, which (14) does not have, is the proposition that the police have attained a belief state that is a subset of the set of possible worlds characterized by (11). Note that this belief state would not necessarily allow the police to answer either of the embedded questions (see section 4 for more discussion on this).

Now, digging a bit deeper we find that there are actually instances of embedded disjoined questions that are acceptable. As a matter of fact, there are quite a number of contexts that license embedded disjoined questions:

(16) The police did not find out how or when Paul got home that night. (*negation*)

(17) If the police find out how or when Paul got home that night they can solve the crime. (*antecedent of conditional*)

Local and Global Implicatures in Wh-Question Disjunctions

- (18) Few detectives found out how or when Paul got home that night. (*downward-entailing quantifier*)
- (19) The police hoped to find out how or when Paul got home that night. (*strong intensional predicate*)
- (20) The police might have found out how or when Paul got home that night. (*modalized context*)
- (21) The police refuse to find out how or when Paul got home that night. (*adversative predicate*)
- (22) Have the police found out how or when Paul got home that night? (*question*)
- (23) Find out how or when Paul got home that night! (*imperative*)

These contexts are all contexts that license PS items. Thus, *wh*-question disjunctions can be classified as polarity-sensitive:

- (24) **The PS Property of Wh-Question Disjunctions.** *Wh*-question disjunctions are licensed in downward-entailing contexts and in non-downward-entailing contexts that are non-veridical.

A context *C* is non-veridical if for any sentence ϕ , $C(\phi) \not\rightarrow \phi$ (= if ϕ occurs in a non-veridical context the truth of ϕ does not follow). Some non-veridical contexts, like negation, are also anti-veridical, which means that if ϕ occurs in such a context the falsity of ϕ follows (Giannakidou 1998).

Before we proceed we would like to argue that the question word disjunctions considered above indeed correspond to the disjunction of full questions. Note that it is possible to coordinate disjunctively the complementizer *if* with a *wh*-word, see (25). Such a disjunction must involve ellipsis as it cannot be derived semantically as a term disjunction.

- (25) The police did not find out if or when Paul got home that night.

Therefore we assume that embedded *wh*-question-word coordinations are also derived by ellipsis in the embedded clauses.

What about matrix clause ellipsis? For the unacceptable example in (14) above, which involved a matrix context that did not license PSIs, we considered the possibility that it might improve for some speakers if the intonational means signal matrix clause ellipsis. For the felicitous examples in (16) through (23) this option is not available. Let

Haida & Repp

us illustrate this for the negation context in (16). If this sentence were derived from matrix clause ellipsis its meaning would be different:

(26) The police did not find out how or when Paul got home that night.

↔

The police did not find out how ~~Paul got home that night~~ or ~~the police did not find out~~ when Paul got home that night.

We conclude from this that ellipsis of the entire matrix clause is not available as a general point of departure for a unified analysis of disjoined embedded questions.

Another structural option we have to consider involves ellipsis of matrix clause material below the operator that creates the PSI-licensing context, e.g. the negation in (16), see (27):⁴

(27) The police did [not [_{orP} [_{VP} find out [_{Q1} how ~~Paul got home that night~~]]
[_{or'} or [_{VP} ~~find out~~ [_{Q2} when Paul got home that night]]]]]

The structure in (27) gives rise to a choice reading: the police did not find out the answer to either question but they may have found out that Paul got home by bus or at 3 a.m. without knowing which is the case. This, however, is not the only available reading (16) has. This is evidenced by the fact that it can be contradicted by (28):

(28) Not true! The police did find out that Paul got home by bus or at 3 a.m. (They just don't know which.)

This shows that (16) has a reading where the police did not find out anything at all, which, we suggest, is the reading that involves a disjunction of questions. It arises from a structure where the ellipsis is confined to the embedded clauses:

(29) The police did [not [find out [_{orP} [_{Q1} how Paul got home that night]
[_{or'} or [_{Q2} when Paul got home that night]]]]]

The unenriched meaning of (29) is given in (30).⁵ We follow a standard assumption in the Hamblin/Karttunen framework and assume that a predicate like *find out* embeds the true exhaustive answer to a question and not the question directly. The embedding is mediated

⁴ Thanks to Rajesh Bhatt and Danny Fox for pointing this out to us.

⁵ Here and below we give the extension of the considered sentence. We omit the index of the evaluation world.

Local and Global Implicatures in Wh-Question Disjunctions

by the operator 'ans', defined in (31): 'ans' delivers the intersection of the propositions in the set of true answers denoted by the embedded question, cf. Heim (1994).⁶

(30) $\neg\text{find_out}(\text{the_police}, \text{ans}(\{p_1 \vee p_2 \mid p_1 \in \llbracket Q_1 \rrbracket^g \wedge p_2 \in \llbracket Q_2 \rrbracket^g\}))$

(31) $\text{ans}(Q) = \lambda w. \forall p(p \in Q \rightarrow p(w))$

If we assume, as before, that Paul in fact got home only by bus and only at 3 a.m., (30) is the semantic object in (32), where ANS is the proposition in (33).

(32) $\neg\text{find_out}(\text{the_police}, \text{ANS})$

(33) $\text{ANS} = \lambda w(\text{Paul got home by bus in } w \vee \text{Paul got home at 3 a.m. in } w)$

(32) is the reading where the police have not attained any knowledge with respect to the actual time and manner of Paul's getting home. They do not even have the limited knowledge that the choice reading would allow.

Further evidence for the availability of the question disjunction reading in PSI-licensing contexts can be drawn from conditional sentences like (17) above, repeated below:

(17) If the police find out how or when Paul got home that night they can solve the crime.

In the familiar scenario where Paul got home by bus at 3 a.m., the unenriched meaning of (17) can be represented as given in (34), where ANS again is the proposition in (33) above. Thus, to solve the crime the police need to attain a belief state that is a subset of ANS, but need not necessarily be able to answer either of the embedded questions.

(34) $\text{find_out}(\text{the_police}, \text{ANS}) \rightarrow \text{the_police_can_solve_the_crime}$

To see that this is the correct result, assume that (17) and the sentence in (35) both are true:

⁶ In the Hamblin (1973) framework that Heim's (1994) analysis is based on, the answer set contains not only the true answers to the question as in Karttunen (1977) but all the possible answers. Therefore Heim's answer operator must single out the true propositions in this set, which is not required in the Karttunen approach we are using here. Since we always work with the answers to the questions in our proposal the Hamblin vs. Karttunen frameworks deliver the same results. They only differ in the place where the true propositions are singled out.

- (35) The police found out that Paul got home by bus or at 3 a.m. (but they don't know which).

In this case we can conclude that the police can solve the crime, see the entailment in (36), which shows that the question-disjunction reading is available for (17).

- (36) (17), (35) ⊢ The police can solve the crime.

Next consider imperatives as embedding contexts. Imperatives license free choice items and not negative polarity items like negation and conditionals.

- (37) *Suspicious wife to private investigator*: Find out how or when my husband returned to his hotel last night! I'll give you \$ 1000 if you succeed.

A week after, the private investigator tells the wife that her husband returned to his hotel by bus or at 3 a.m. Should he get the money?

If confronted with this context and asked the final question speakers quite readily decide that the investigator should get the money even though the information he provides might not be what the wife had in mind – she might have wanted to hear the answer to either of her questions, e.g. that her husband indeed returned to his hotel by bus. We conclude that the imperative in (37) in addition to the choice reading also has a true question disjunction reading. To bring the point home consider the following minimal variant, where the disjunction is on the level of the imperative:

- (38) *Suspicious wife to private investigator*: Find out how my husband returned to his hotel last night or find out when my husband returned to his hotel last night! I'll give you \$ 1000 if you succeed.

A week after, the private investigator tells the wife that her husband returned to his hotel by bus or at 3 a.m. Should he get the money?

Here speakers judge that the investigator should not get the money.

Our discussion has shown that there are genuine *wh*-question disjunctions and that the semantic analysis we propose for them is on the right track.

4. Computing Local and Global Implicatures: Explaining the PS Property of *Wh*-Disjunctions

In section 2 we explained the deviance of matrix *wh*-question disjunctions by appealing to Gricean reasoning: the disjunctive operator *or* gives rise to a scalar alternative – the conjunctive operator *and* –, which would have been the better choice by the Maxims of

Local and Global Implicatures in Wh-Question Disjunctions

Quantity and Quality (when trying to give an answer to the question disjunction). In the previous section we proposed that *wh*-question disjunctions are polarity-sensitive. Now, scalar implicatures have also been argued to play an important role in the licensing of PS items like *any*. Kadmon and Landmann (1993) suggest that *any*-NPs are indefinites which come with an instruction to the hearer to consider domains of individuals that are broader than what one would usually consider, i.e. *any*-NPs are domain wideners. In downward-entailing contexts like negation, domain widening strengthens a statement because excluding a larger domain of individuals leads to a more informative statement than excluding a smaller domain of individuals. Krifka (1995) links these considerations directly to quantity implicatures and suggests that a NPI like *any* activates alternatives with smaller domains, which triggers the implicature that the alternative selected is the strongest one the speaker has evidence for. The fact that *wh*-question disjunctions are licensed in exactly those contexts that license PS items is thus very suggestive of a close link along these lines of reasoning.

What will be important for the data we consider here is the observation that implicatures can also arise in embedded contexts. This is somewhat unexpected if pragmatic reasoning is assumed to follow all syntactic and semantic computations, and it has led Chierchia (2004) to argue for a "more grammatical" view of implicatures, which we take our findings to be supporting evidence for. To start with, consider the following embedded disjunction of declaratives:

(39) The police found out that Paul got home by bus or that he got home at 3 a.m.

The preferred reading of *or* in (39) is the exclusive one: (39) could describe the findings of the police if the busses stop at 12 p.m. – Paul would have been home by 12 if he took the bus, or later (such as at 3 a.m.) if he did not take the bus. The implicature in (39) is a local scalar implicature, which leads to the interpretation in (40). Here and below, p_{bus} and p_{3am} are the propositions given in (41).

(40) $\text{find_out}(\text{the_police}, (p_{\text{bus}} \vee p_{\text{3am}}) \wedge \neg(p_{\text{bus}} \wedge p_{\text{3am}}))$

(41) $p_{\text{bus}} = \lambda w(\text{Paul got home by bus in } w)$
 $p_{\text{3am}} = \lambda w(\text{Paul got home at 3 a.m. in } w)$

The global implicature would be the one captured by (42), and it leads to a weaker interpretation than the local implicature: it is compatible with the police attaining the knowledge that it is possible that $(p_{\text{bus}} \wedge p_{\text{3am}})$. That is, the second conjunct in (42) expresses that the police did not find out anything with respect to $(p_{\text{bus}} \wedge p_{\text{3am}})$.

(42) $\text{find_out}(\text{the_police}, p_{\text{bus}} \vee p_{\text{3am}}) \wedge \neg \text{find_out}(\text{the_police}, p_{\text{bus}} \wedge p_{\text{3am}})$
 \cong The police found out that $(p_{\text{bus}} \vee p_{\text{3am}})$ and the police did not find out anything
with respect to $(p_{\text{bus}} \wedge p_{\text{3am}})$

Chierchia (2004, 2006) suggest that the difference between local and global implicatures can be put down to an operator O_{ALT} for scalar enrichment that can attach at various scope sites:⁷

(43) $O_{\text{ALT}}(p) = \lambda w(p(w) \wedge \forall q \in \text{ALT}(q(w) \rightarrow \forall w'(p(w') \rightarrow q(w'))))$

For a disjunctive proposition $p_{\text{dis}} = p_1 \vee p_2$, ALT contains p_{dis} and its conjunctive alternative as elements: $\text{ALT} = \{p_1 \vee p_2, p_1 \wedge p_2\}$. $O_{\text{ALT}}(p_{\text{dis}})$ is then $(p_1 \vee p_2) \wedge \neg(p_1 \wedge p_2)$. This means that the local scalar implicature captured by (40) results from enriching the meaning of (39) by inserting O_{ALT} at the level of the embedded proposition, see (44).

(44) $\text{find_out}(\text{the_police}, O_{\text{ALT}}(p_{\text{bus}} \vee p_{\text{3am}}))$

Turning to embedded *wh*-question disjunctions like (14) from section 3 above, repeated below for convenience, the insertion of O_{ALT} at the level of the embedded proposition yields the enriched meaning in (45).

(14) *The police found out how or when Paul got home that night.

(45) $\text{find_out}(\text{the_police}, O_{\text{ALT}}(\text{ans}(\{p_1 \vee p_2 \mid p_1 \in \llbracket Q_1 \rrbracket^{\text{g}} \wedge p_2 \in \llbracket Q_2 \rrbracket^{\text{g}}\})))$

In our standard scenario, (45) can be rendered in the same way as the locally enriched meaning of (39), i.e. as in (40) above. However, in the question disjunction case p_{bus} and p_{3am} are true in the actual world: they are elements of $\llbracket Q_1 \rrbracket^{\text{g}}$ and $\llbracket Q_2 \rrbracket^{\text{g}}$, respectively, which are sets of true answers. This means that the enriched embedded proposition, i.e. $(p_{\text{bus}} \vee p_{\text{3am}}) \wedge \neg(p_{\text{bus}} \wedge p_{\text{3am}})$, is false in the actual world. This produces a presupposition failure under the factive verb *find out*, and more generally, a failure of the existence presupposition of the embedded *wh*-question. That is we assume that a *wh*-question Q presupposes that there is a true answer, which is not satisfied by the pragmatically enriched answer to Q . This also explains why *wh*-disjunctions neither can be embedded under non-factive verbs like *tell* (not illustrated).

If the local insertion of O_{ALT} produces an unacceptable sentence we might wonder, of course, why it is not global insertion that is applied. The resulting enriched meaning would be the following (cf. (42) above).

⁷ O is a mnemonic for *only*: p and its entailments are the only members of ALT that hold.

Local and Global Implicatures in Wh-Question Disjunctions

- (46) $\text{find_out}(\text{the_police}, p_{\text{bus}} \vee p_{\text{3am}}) \wedge \neg \text{find_out}(\text{the_police}, p_{\text{bus}} \wedge p_{\text{3am}})$
where p_{bus} and p_{3am} are true in the actual world

Inserting O_{ALT} at the root level leads to rather weak strengthening – the police did not acquire knowledge about $(p_{\text{bus}} \wedge p_{\text{3am}})$ – but it does not lead to deviance. Still, this reading does not seem to be available. This is surprising given that O_{ALT} generally can be inserted at any scope site (cf. Chierchia, Fox and Spector to appear). Note, however, that under specific contextual conditions the preference for the local implicature can arguably be overridden. Here are two examples that illustrate this for disjoined declaratives, s. (47), and disjoined interrogatives, s. (48). (47) is perfectly acceptable in this context, (48) is less readily so but still seems much better than (14) above, which had no context. This suggests that these sentences can have an interpretation where O_{ALT} is inserted at the root level. Why there is a difference in acceptability between (47) and (48) we leave for future research.

- (47) *Context: Last night two paintings got stolen from the local museum. The police investigated all the windows and the two doors, and found out that the museum could only have been entered through the doors because the windows have solid bars. The doors have a voice-code lock and are undamaged. So they must have been opened with the voice code. Furthermore, the police learned that the front door is coded only for the director's voice and the back door only for the janitor's voice. So the findings of the police can be summarized as follows:*

The police found out that the thieves entered the museum with the director through the front door or that the thieves entered the museum with the janitor through the back door. What the police did not find out is that the museum was entered through both doors.

- (48) *Context: Last night two paintings got stolen from the local museum. The police investigated all the windows and the two doors and found out that the museum could only have been entered through the doors because the windows have solid bars. The doors have a voice-code lock and are undamaged. So they must have been opened with the voice code. Furthermore, the police learned for which employee's voice the front door is coded and for which employee's voice the back door is coded. So the findings of the police can be summarized as follows:*

?The police found out with which employee the thieves entered the museum through the front door or with which employee they thieves entered the museum through the back door. What the police did not find out is that the museum was entered through both doors.

Let us turn next to felicitous embedded *wh*-question disjunctions starting with downward-entailing contexts, e.g. (16) with negation. Chierchia (2004) observes that the

downward-entailing property of an operator like negation in the matrix clause typically induces a recalibration of the implicature because local enrichment would lead to weakening in these contexts. Thus, O_{ALT} applies to the matrix clause, s. (49).

(16) The police did not find out how or when Paul got home that night.

(49) $O_{ALT}(\neg \text{find_out}(\text{the_police}, \text{ans}(\{p_1 \vee p_2 \mid p_1 \in [[Q_1]]^g \wedge p_2 \in [[Q_2]]^g\})))$

In our scenario, (49) is equivalent to (50) because of the following entailment:
 $\neg \text{find_out}(x, p_1 \vee p_2) \rightarrow \neg \text{find_out}(x, p_1 \wedge p_2)$.

(50) $\neg \text{find_out}(\text{the_police}, p_{\text{bus}} \vee p_{\text{3am}})$, where p_{bus} and p_{3am} are true in the actual world

In the present case, application of O_{ALT} to the matrix clause does not produce an implicature and hence no deviance. This result carries over to all other downward-entailing contexts.

Turning to contexts that are not downward-entailing but nevertheless license embedded *wh*-question disjunctions, let us consider questions. That questions are not downward entailing can be seen from the fact that the positive answer to an *or*-question like the one in (51), is entailed by the positive answer to an (52). In other words, the *or*-question is actually weaker than its alternative.

(51) A: Have the police found out how or when Paul got home that night?
 B: Yes.

(52) A: Have the police found out how and when Paul got home that night?
 B: Yes.

Why would *or* be licensed if the semantics of the disjoined questions licenses the use of *and*? Asking weaker questions often is pragmatically advantageous (Krifka 1995). First observe that positive *yes-no* questions come with no particular bias as to the expected answer (*yes* or *no*). In order to optimize the information gain from both possible answers, the speaker will try to maintain an equilibrium between the informational value of the positive and the negative answer (Krifka 1995, also cf. van Rooy's 2003 notion of *entropy*). Importantly, the weaker a question is the more balanced the answers are, and the better the information gain is in proportion to the likelihood of the answer. This can be seen quite easily when considering guessing games where participants must guess e.g. the occupation of an invited person. In such a game, asking the rather weak question in (53) maximizes the information gain because the likelihood of receiving the *yes*- vs. the *no*-answer is roughly the same. This is different in a strong question like (54), where the *no*-answer would yield hardly any information gain.

Local and Global Implicatures in Wh-Question Disjunctions

(53) Are you involved in the distribution of a product?

(54) Are you a hearing aid audiologist?

For questions as licensing contexts, inserting O_{ALT} at the root level rather than at the embedded level yields the weaker question. This supports the view put forward in Chierchia (2006) that different pragmatic effects – weakening and strengthening – can be associated with the insertion of O_{ALT} .

5. Conclusion

Our analysis lends strong support to the central claim of Chierchia (2004) that the syntactic distribution of PS items is determined by grammatically conditioned pragmatic principles. The PS property of *wh*-disjunctions is semantically composed of two independent properties: the semantic/pragmatic property of *or* to induce (scalar) alternatives, and the semantics of the disjoined questions. This means that the licensing of the PS property cannot be reduced to the licensing of a lexical property of a single item (as has been suggested e.g. for *any* as having the property of denoting a ‘dependent variable’, cf. Giannakidou (to appear)). If there is a syntactic feature involved in the licensing of the PS property it must be the syntactic correlate of the alternative-inducing property of an element like *or*, cf. the feature [+ σ] in Chierchia (2004). This is what we assume here: *or* always comes with [+ σ], which forces the insertion of O_{ALT} as discussed above.

6. References

- Chierchia, Gennaro. 2004. Scalar implicatures, polarity phenomena, and the syntax/pragmatics interface. In The Cartography of Syntactic Structures, ed. Adriana Belletti, 39-103. Oxford: Oxford University Press.
- Chierchia, Gennaro. 2006. Broaden your views. Implicatures of domain widening and the “Logicity” of language. Linguistic Inquiry 37: 535-590.
- Chierchia, Gennaro, Danny Fox, and Benjamin Spector. To appear. The grammatical view of scalar implicatures and the relationship between semantics and pragmatics. In Semantics: an international handbook of natural language meaning, ed. Claudia Maienborn, Klaus von Stechow, and Paul Portner. Berlin: De Gruyter.
- Giannakidou, Anastasia. 1998. Polarity sensitivity as (non)veridical dependency. Amsterdam: Benjamins.
- Giannakidou, Anastasia. To appear. Negative and positive polarity items: variation, licensing, and compositionality. In Semantics: an international handbook of

Haida & Repp

- natural language meaning, ed. Claudia Maienborn, Klaus von Heusinger, and Paul Portner. Berlin: De Gruyter.
- Grice, Paul. 1989. Studies in the way of words. Cambridge, Mass.: Harvard University Press.
- Groenendijk, Jeroen, and Martin Stokhof. 1982. Semantic analysis of *wh*-complements. Linguistics and Philosophy 5: 175-233.
- Groenendijk, Jeroen, and Martin Stokhof. 1984. Studies on the semantics of questions and pragmatics of answers. Doctoral dissertation, University of Amsterdam.
- Haida, Andreas. To appear. On the semantics and pragmatics of *yes/no*-question disjunctions: evidence from Chadic. In Proceedings of Sinn und Bedeutung 14. Vienna
- Kadmon, Nirit, and Fred Landmann. 1993. Any. Linguistics and Philosophy 15: 353-422.
- Karttunen, Lauri. 1977. Syntax and semantics of questions. Linguistics and Philosophy 1: 3-44.
- Krifka, Manfred. 1995. The semantics and pragmatics of polarity items. Linguistic Analysis 25: 209-257.
- Krifka, Manfred. 2001. Quantifying into question acts. Natural Language Semantics 9: 1-40.
- Szabolcsi, Anna. 1997. Quantifiers in pair-list readings. In Ways of scope taking, ed. Anna Szabolcsi, 311-347. Dordrecht: Kluwer.
- van Rooy, Robert. 2003. Negative polarity items in questions: strength as relevance. Journal of Semantics 20: 239-273.

Humboldt Universität zu Berlin
Department of German Language and Linguistics,
Unter den Linden 6, 10099 Berlin, Germany

andreas.haida@rz.hu-berlin.de
sophie.repp@rz.hu-berlin.de