In: Ágnes Bende-Farkas and Arndt Riester (eds.), *Workshop on Information Structure in Context*, pp. 98–107. IMS, University of Stuttgart, 2002.

A focus semantics for echo questions*

Ron Artstein
Technion—Israel Institute of Technology
artstein@cs.technion.ec.il

Abstract

Echo questions are interpreted through focus semantics. Echo questions must be entailed by previous discourse; focus is therefore not needed to mark givenness, and instead it is used to compute the question denotation: the questioned element, marked with a pitch accent, is a focus constituent, and the alternative set of the echo question is its question denotation, i.e. the set of possible answers. The focus strategy exempts echo questions from locality restrictions ("islands"), allows echo questions on parts of words, and allows second-order echo questions which denote sets of questions.

1 Introduction

This paper develops a semantics for echo questions. My proposal is that the pitch accent in echo questions is an instance of focus, and echo questions are interpreted through focus semantics (cf. Hockey 1994). The alternative set $[\![\cdot]\!]^f$ of an echo question is the set of possible answers, which constitutes the meaning of the question. Focus is not sensitive to locality restrictions ("islands") and can be marked below the word level, two properties that are found in echo questions; focus semantics can also result in an alternative set that is a set of questions, allowing second-order echo questions which are responses to question utterances. A focus strategy is available for echo questions precisely because they "echo" a preceding statement—the entire echo question is given, so none of its parts needs to be marked with focus; therefore focus can serve the purpose of indicating disputed (rather than new) material.

The particular syntax of echo questions has made them resistant to linguistic treatment, since echo questions often constitute exceptions to otherwise valid generalizations about the syntax of questions. One of the difficulties in giving an analysis of echo questions has been the fact that echo questions can appear on arbitrary word parts.

(1) She believes in WHAT-jacency? (Janda 1985)

(2) John witnessed a great reve-WHAT-tion? (Janda 1985)

(3) Cha-WHAT-as? (Janda 1985)

(4) He's un-WHAT-able? (Hockey 1994)

Without an adequate theory of syntactic and semantic representations for word parts, the examples above give the impression that echo questions are fundamentally different from other grammatical constructions (see Janda 1985, who proposes that echo questions are derived by substituting question words for arbitrary syllable strings in the surface structure of a sentence). If however the semantics of echo questions is that of focus then echo questions on parts of words are expected, since focus can generally be marked below the word level (see Artstein 2002, chapter 2, for an account couched within the familiar system of syntax and semantics).

Echo questions have the following typical characteristics: they relate to a previous utterance, and are similar to it in form and meaning (hence the term "echo"); they inform the interlocutor that the speaker has misperceived part of the previous utterance or refuses to accept it; and they have a particular intonation, consisting of a rising pitch accent (L+H* in the terms of Pierrehumbert 1980) and a high-rising boundary (HH%). We can classify echo utterances according to two parameters—whether they contain a *wh*-phrase, and whether they have the syntax typical of direct questions (Parker and Pickeral 1985 attempt a more refined classification, but the above two parameters are sufficient for our purposes). The echo questions that are the most prominent in the linguistic literature are those that have a *wh*-phrase but do not display the familiar syntax of questions.

*Thanks to Veneeta Dayal, Alan Prince, Roger Schwarzschild, Hubert Truckenbrodt, and Ede Zimmermann for discussion and comments on an earlier draft.

(5) A: I gave flowers to George.

L+H* HH%

B: You gave WHAT to George?

Along with these, we also find utterances that display the same intonation pattern but with a fronted *wh*-phrase—the typical syntax of direct questions.

(6) A: I gave flowers to George.

L+H* HH%

B: WHAT did you give to George?

Both types of questions serve the same function, that is questioning or objecting to part of the interlocutor's utterance, and as far as I can tell they are pretty much interchangeable: they are pragmatically appropriate in the same contexts.

(A note on the transcription of pitch in the above examples: Hockey (1994) transcribes the pitch accent on echo *wh*-phrases as high (H*) rather than rising (L+H*); however I believe it is in fact rising, based on the description in Pope (1976) and the pitch tracks reproduced in Hockey (1994). Additional evidence that the pitch accent is indeed rising comes from questions with multiple echo *wh*-phrases.

(7) A: Bill gave flowers to George.

L+H* L+H* HH%

B: WHO gave WHAT to George?

There is a discernible drop in pitch before the second echo *wh*-phrase *what* in B's response; this is expected if the word is marked with a rising pitch accent (L+H*), but would be surprising if it were marked with a high accent (H*), in which case we would expect the pitch to remain high between the two accents. In the remainder of the paper I will suppress the actual pitch notations, and simply set accent-bearing words in SMALL CAPS; all echo questions are to be read with a L+H*HH% intonation.)

Echo utterances are also possible without a *wh*-phrase; the echo intonation is imposed on a declarative sentence, and the rising (L+H*) pitch accent is placed on the word or phrase that is being questioned.

(8) A: I gave flowers to George.

B: You gave FLOWERS to George?

The function of such an utterance is similar to that of questions of the type in (5) and (6)—it too questions part of the interlocutor's utterance or objects to it (this similarity is noted by Hockey 1994, who calls such utterances "echo declaratives"). The difference between echo questions with *wh*-phrases and utterances like (8) is that the former may indicate that the speaker hasn't heard or perceived part of the interlocutor's utterance, while the latter obviously cannot.

What's missing from the paradigm are echo questions with the characteristic syntax of questions but without a *wh*-phrase. Fronting of a non-*wh* constituent is ungrammatical in English (except in certain Yiddish-influenced dialects).

(9) A: I gave flowers to George.

B:*FLOWERS you gave to George?

It is also impossible to have echo utterances with the syntax of direct yes/no question as a response to declarative sentences (such echoes are acceptable as responses to yes/no questions (11), in which case they are interpreted as second order questions; see section 5).

(10) A: I gave flowers to George.

B:*Did you give FLOWERS to George?

(11) A: Did Mary give flowers to George?

B: Did Mary give FLOWERS to George? That's not important. The question is whether she gave him candy.

Based on a survey that checked the suitability of various sentence types as echo-responses to a number of different constructions, Parker and Pickeral (1985) report that structures like (10) are marginal at best (that is, they report that such structures are completely unacceptable in some contexts, and marginally acceptable in others). In a response to this article, Moulton (1987) attempts a different classification of interrogative utterances, and he too notes the absence of echo yes/no questions (for reasons that are obscure to me he proposes that the missing slot in the paradigm is filled by questions such as the last one in the following sequence, pronounced with a falling pitch: *Is it a vegetable? Is it an animal? Is it a mineral?*).

In this paper I will consider questions like (5) and (8), that is utterances with echo intonation but without the syntactic properties of direct questions, whether they have a *wh*-phrase or not. Bolinger (1987, p. 263) considers utterances like (5) to be echo *wh*-questions, as opposed to ones like (8), which are echo yes/no questions; he bases this distinction on the observation that the latter can be answered with *yes* or *no*, while the former need an answer that replaces the *wh*-phrase, e.g. *flowers*. I disagree with this characterization: while *yes* is an appropriate response to a non-*wh* echo, just plain *no* is rather odd—the speaker is expected to clarify what she had originally intended to say. This is in contrast to a direct question like *did you give flowers to George?*, to which a *no* response is perfectly acceptable. I believe this shows that a non-*wh* echo is more than an inquiry about a particular proposition—it is an inquiry about alternatives to it. Consequently I propose that both *wh* and non-*wh* echo questions have the same kind of denotation, a set of alternatives arrived at by focus semantics. *Yes* is a possible response to a non-*wh* echo because the echo offers a proposition that can be responded to. *Wh*-echo questions do not offer such a proposition so they can not be answered with *yes*, but still, if the speaker assumes that her original utterance had been fully perceived and the echo expresses surprise or objection, she can respond to the echo with something like *you heard me right*.

Questions with echo intonation and fronted *wh*-phrases (6) are excluded from the discussion in this chapter. Such questions can be interpreted either with the familiar semantics of questions or through the focus semantics for echo questions, and since at the moment I do not have a reason to decide one way or the other, I prefer to put these constructions aside. The focus semantics for echo questions is developed in the next two sections: section 2 argues for identifying the pitch accent in non-*wh* echoes as focus, and section 3 shows how the same assumption for *wh*-echo questions explains their insensitivity to locality restrictions. The following sections show how the theory applies to echo questions below the word level (section 4), second-order echo questions which denote sets of questions (section 5), and echo questions on prepositions, quantifiers and question words (section 6).

2 Focus

Focus in ordinary, direct questions serves the same function it does in declarative sentences. Schwarzschild (1999, p. 162) demonstrates how focus marking on questions satisfies the requirement that all constituents must be given.

(12) A: I bought a watch for my younger sister.
B: What did you buy for your OLDER$_F$ sister?

According to Schwarzschild, a constituent is given if after replacing its focused subconstituents by variables and existentially binding all the unsaturated arguments, the resulting proposition is entailed by previous discourse. Schwarzschild takes the denotation of a question to be the set of true answers (Karttunen 1977); the proposition derived from B's utterance in (12) for the purpose of determining givenness turns out to be the one in (13), and indeed it is entailed by A's utterance.

(13) $\exists X\, \exists y$ [speaker A bought y for her X sister]

Focus is necessary on the adjective *older* in (12) in order to get an existentially bound variable in (13). The *wh*-phrase *what* is not focused—this follows if it is an existentially quantified indefinite to begin with. *Wh*-phrases are generally not focused in direct questions.

In some instances, a *wh*-phrase may be marked with a pitch accent because a larger constituent needs to satisfy the givenness requirement. This can be seen in embedded questions where focus marking on a *wh*-phrase is possible (14), though not obligatory (15).

(14) Mary knows that George ate breakfast, and Jane knows WHAT he ate.

(15) Mary knows that George ate breakfast, and Jane knows what he ATE.

The embedded question *what he ate* is given even without focus marking—the proposition that John ate something is entailed by the first part of the sentence; each part of the embedded question is also given. However, the constituent *knows what he ate* is not given, since nothing in the first part of the sentence entails the proposition that someone knows what John ate. The entire constituent must be marked with focus, though none of its parts has to be. What determines where accent is placed within the constituent is something other than the givenness requirement, and as we see, there is more than one possibility (the factors that determine pitch assignment in the above examples remain to be determined; pitch on *ate* in (15) may be the result of the Nuclear Stress Rule, see Halle and Vergnaud 1987).

Turning over to echo questions, we notice that an echo question in its entirety is always given, and so is each part of the echo. This leads us to expect that no part of an echo question should be focused. But echo questions characteristically do have a pitch accent. We start by looking at echo questions without a *wh*-phrase: the echo in (8), repeated below, is identical to the preceding utterance except for its intonational contour (rising pitch and high-rising boundary).

(8) A: I gave flowers to George.
B: You gave FLOWERS to George?

The echo intonation indicates that the speaker believes she has misperceived part of the interlocutor's utterance or wishes to dispute it, and the disputed constituent is marked with a pitch accent.

Of course, the disputed part of the echo question in (8) is in fact given. Furthermore, givenness is a requirement on echo questions—the disputed part of an echo question must be entailed by the preceding utterance: the echo in (16) is felicitous because giving Jill a chihuahua entails giving her a dog; the echo in (17) sounds odd because the entailment doesn't go through in the other direction.

(16) A: I gave Jill a chihuahua for her birthday.
B: You gave her a DOG for her birthday?

(17) A: I gave Jill a dog for her birthday.

B:#You gave her a CHIHUAHUA for her birthday?

The sensitivity to entailment relations shows that the givenness requirement on echo questions is semantic—what is disputed in the echo question is not some part of a linguistic expression, but rather some aspect of its meaning. Furthermore, the entailment relations that determine givenness are sensitive to context: the echo question in (17) is felicitous if the speakers assume that if speaker A gave Jill a dog, it was a chihuahua. This shows that the relation between the echo and the preceding utterance has to be one of "pragmatic" or contextual entailment (see Karttunen 1973).

Non-*wh* echo questions are therefore distinct from direct yes/no questions. The difference in intonation is subtle but clear: the pitch accent in an echo question (18) is rising (L+H*), while a direct yes/no question (19) carries a high (H*) pitch accent.

L+H* HH%
(18) You gave Jill a CHIHUAHUA?

H* HH%
(19) You gave Jill a CHIHUAHUA?

The difference in the requirement on context is that the echo question (18) takes it for granted that the interlocutor has implied she had given Jill a chihuahua, whereas no such implication is present in the direct question (19). The echo question expresses surprise (and a bias as to what the expected answer is), while the direct question is a genuine question.

So the propositional content of a non-*wh* echo question has to be given, and the utterance expresses surprise or disbelief directed at that particular aspect of the proposition corresponding to the pitch-marked constituent. In what sense, then, does the echo utterance constitute a question? It is here that focus comes into play. The speaker who uses an echo question informs her interlocutor that she refuses to accept part of the interlocutor's utterance: the disputed part is marked as focus, as if it were not given in prior discourse, and the part that the speaker accepts is deaccented. The question meaning is then arrived at through a Gricean inference: the proposition expressed by the echo offers no new information and the echo itself signals that the speaker considers part of it not to be given, so the interlocutor infers that the speaker intends to question this information. An argument along this line is given in Hockey (1994).

The semantics of non-*wh* echoes can be formalized through the use of alternative semantics for focus (Rooth 1985, 1992): the question denotation of an echo utterance will be its alternative set $[\![\cdot]\!]^f$. Groenendijk and Stokhof (1984) show that the notion relevant to characterizing question-answer relations is the set of all possible answers (Hamblin 1973), rather than the set of true answers (Karttunen 1977) or the full semantic answer (Groenendijk and Stokhof 1982) which are important for embedded questions. The alternative set of a non-*wh* echo question is the set of all propositions derived by substituting alternatives to the denotation of the focused constituent—precisely the set of possible answers to the question; the echo is used to ask the interlocutor which of these propositions was asserted, or intended.

Wh-echo questions too have an obligatory pitch accent, which must be located on the *wh*-phrase. This is not due to a givenness requirement: as we have seen in the beginning of this section, *wh*-phrases are already given and need not be focused. Rather, I suggest that the reason the *wh*-phrase of an echo question is marked with focus is that this is a strategy to arrive at the meaning of the echo question itself, the same way as for non-*wh* echoes. This sounds superfluous—after all, shouldn't the meaning of the echo question follow from the semantics of questions? The familiar treatment of questions runs into problems because it is sensitive to locality restrictions, while echo questions are not; an additional strategy is necessary in order to escape these locality restrictions.

3 Locality

Echo questions appear to be exempt from any locality requirements. This is not to be confused with another property of echo questions in English, which has received much attention in the literature—the fact that echo *wh*-phrases need not be fronted, as in (5), repeated below.

(5) A: I gave flowers to George.

B: You gave WHAT to George?

Sentence (5) is an obvious exception to the generalization that *wh*-expressions in English necessarily appear in front of their clauses. In itself, this property does not seem to be of great significance to the semantics of echoes, since the option exists to use a question with echo intonation and the syntax of a direct question, as seen in (6).

(6) A: I gave flowers to George.

B: WHAT did you give to George?

Some speakers of English find the fronted versions more acceptable than the unfronted ones; in other languages, fronting of echo *wh*-phrases may be obligatory (Romanian, see Comorovski 1996) or highly preferred (Hebrew, my personal judgment). Furthermore, English itself has unfronted non-echo *wh*-phrases in multiple question constructions.

(20) Mary knows who ate what.

Finally, unfronted *wh*-expressions are the norm in languages other than English for all questions (e.g. Chinese). The existence of echo *wh*-phrases in unfronted positions in English is therefore not a very remarkable property.

A much more striking fact is that echo *wh*-phrases which do not appear in a fronted position are exempt from locality restrictions. This is not directly attributable to the fact that they are not fronted. Unfronted non-echo questions are still subject to locality requirements: sentence (21) is ungrammatical—it does not have a pair-list reading, because the *wh*-phrase *what* is inside a coordinate structure.

(21)*Mary knows who ate beans and what.

(cannot be used to report, for instance, that she knows that Mike ate beans and fish, and that Bill ate beans and squid; cf. (20).)

Echo questions are not subject to this locality requirement: echo *wh*-phrases can appear in a coordinate structure, both as the only echo *wh*-phrase in a sentence (22) and when there are multiple ones (23).

(22) A: John knows who ate beans and squid.

B: John knows who ate beans and WHAT?

(23) A: Jane knows Bill ate beans and squid.

B: Jane knows WHO ate beans and WHAT?

The exemption from locality constraints is also valid crosslinguistically. Fronting of echo *wh*-phrases is obligatory in Romanian, except when fronting would result in an island violation, in which case echo *wh*-phrases remain unfronted (Comorovski 1996; unfronted *wh*-phrases also occur in second order questions, see section 5). In Hebrew too I feel that the fronting of echo *wh*-phrases is preferred, but when fronting is ungrammatical, unfronted echo *wh*-phrases are perfectly acceptable. And in Chinese, where *wh*-phrases are not normally fronted, some dependencies between *wh*-phrases are still excluded—for instance, there is no grammatical counterpart to (21) with *wh*-dependencies across a coordinate structure (thanks to Lian-Hee Wee and Liping Chen for their judgments; see also Nishigauchi 1990, p. 32, fn. 13 for the possibility that *wh*-dependencies are also impossible across a *wh*-clause). Nevertheless, Dayal (1996, p. 228) reports that echo questions are possible in Chinese in certain configurations where direct questions are not allowed. The fact that all the above languages allow echo *wh*-phrases in positions that other *wh*-phrases are excluded (due to locality violations) suggests that this property is not accidental.

Before developing an explicit semantics for *wh*-echo questions we will look at the contextual requirements on their use. Recall that the propositional content of a non-*wh* echo has to be entailed by preceding discourse. A similar requirement on *wh*-echo questions is what makes the following discourse odd.

(24) A: I saw a kangaroo in the cafeteria today.

B:#You saw WHO?

The echo in (24) is appropriate only in contexts that entail that speaker A saw a person; the echo therefore implies that speaker B thinks that this is what speaker A had said, presumably because she has misperceived A's utterance. What the context must entail in order for a *wh*-echo to be appropriate is the proposition derived by treating the *wh*-phrase as an indefinite with its normal content (e.g. *who* must refer to a person) but without *wh* properties (for the separation of *wh* properties from the content of a *wh*-phrase in echo questions see Reis 1992). The contextual requirements are the same for non-*wh* and *wh*-echo questions—the *wh* properties of an echo *wh*-phrase are simply ignored for this purpose.

The denotation of a *wh*-echo question cannot be computed through the familiar semantics for direct and indirect questions because the *wh*-phrase in an echo question is in the wrong position—it is not at the front of a clause, nor is it bound by another *wh*-operator at the front of a clause. In formalizing the semantics for echo *wh*-questions we must make sure it is insensitive to locality restrictions: whatever is responsible for locality in direct and indirect questions must be turned off for echoes. Such a solution is offered by Dayal (1996, p. 125): questions are interpreted through LF-movement, which enforces locality restrictions; echo *wh*-phrases are bound by a special operator outside the CP that does not require LF-movement, thus exempting echo questions from any requirements imposed by movement. This proposal captures the insensitivity of echo questions to locality and also links it to the availability of second order questions (see section 5), but not to the obligatory pitch accent on echo questions.

My proposal is that *wh*-echo questions are interpreted through the same focus strategy as non-*wh* echoes. Focus is insensitive to locality restrictions.

(25) Bill $\left\{\begin{matrix}\text{even}\\ \text{only}\end{matrix}\right\}$ knows who ate beans and SQUID.

Indeed, observations about the absence of locality restrictions on association with focus were a major motivation in developing a semantics of focus that does not rely on syntactic movement (Anderson 1972; Rooth 1985; see also von Stechow 1989). Tying the focus on echo *wh*-phrases to the interpretation of echo questions explains why echo questions are not subject to locality restrictions.

The question denotation of a *wh*-echo is its alternative set $[\![\cdot]\!]^f$, just like that of a non-*wh* echo; alternatives to a *wh*-phrase are denotations matching in type. Note that this semantics gives the echo questions *you saw* WHO*?* and *you saw* WHAT*?* the same denotation; the difference between the two is in their contextual appropriateness—the former is only felicitous in response to the an utterance that entails that the interlocutor saw a person. Alternative sets also turn out to be identical for *wh* and non-*wh* echoes: the alternative set, i.e. the question denotation, of (5), (8) and (26) is the set of propositions (27).

(5) A: I gave flowers to George.
B: You gave WHAT to George?

(8) B: You gave FLOWERS to George?

(26) B: You gave SOMETHING to George?

(27) $\left\{\begin{array}{l}\text{“A gave flowers to George”}\\ \text{“A gave chocolate to George”}\\ \text{“A gave flowers and chocolate to George”}\\ \ldots\end{array}\right\}$

The set in (27) is a set of propositions—it is the same as the denotation of the question *what did you give to George?* according to the proposal in Hamblin (1973), or the partition of possible worlds induced by the intension of the same question according to Groenendijk and Stokhof (1984). The difference lies in the pragmatics: a direct question asks for a true proposition, while an echo question asks for the proposition that was asserted or intended. Furthermore, a non-*wh* echo also offers a proposition (so it can be answered with *yes*, see section 1), and indicates that it is that proposition which the speaker finds hard to accept, rather than the interlocutor's original utterance. Thus, sentence (8) indicates surprise at giving flowers to George, while (26) expresses surprise at giving him anything at all. If a *wh*-echo is understood as expressing surprise or disbelief, this can only be directed at the echoed utterance, since the echo does not offer a proposition by itself (the meaning of its content is not computable, though the alternative set is).

To summarize the proposal so far: focus semantics constitutes an alternative strategy for arriving at a question denotation, one that allows interpreting unfronted *wh*-phrases without locality restrictions. In English this strategy is available for any sentence with a focused *wh*-phrase; in Romanian and Hebrew the strategy is only available when a corresponding sentence with a fronted *wh*-phrase is ungrammatical. The focus strategy is available for echo questions (but not other questions) precisely because they “echo” previous statements, so focus can fall on the question word and there is no need for anything else to be focused. By using focus semantics we capture the similarity between echo *wh*-questions and echo questions that do not contain a *wh*-phrase. Focus semantics also extends to echoes below the word level and to second order questions, which are discussed in the following two sections.

4 Echo questions below the word level

The focus semantics for echo questions immediately accounts for echo questions on parts of words, since focus is generally allowed below the word level (see Artstein 2002, chapter 2). Focus below the word level is interpreted through *phonological decomposition*, a process that assigns denotations to the focused and unfocused word parts: a focused word part denotes its own sound (so in ORTHO*dontist*, with focus on *ortho*, the word part *ortho* denotes its own sound), and the rest of the word denotes a function from sounds to word meanings (so *dontist* denotes a function that for each sound β yields the meaning of the word β*dontist*). Given these denotations, alternative semantics (Rooth 1985, 1992) correctly predicts that the alternative set for ORTHO*dontist* is a set of meanings related through the form of the words that denote them, namely the set of all the meanings of words that end in *dontist*.

We can see how the semantics of focus below the word level interacts with the interpretation of echo questions by looking at an example of an echo question on a word part.

(28) Bill is a WHAT-dontist?

Since an echo *wh*-phrase is focused, the alternatives to the constituent WHAT-*dontist* in (28) are predicted to be meanings of words ending in *dontist*.

(29) $[\![\text{what}]\!]^f = \mathrm{D}_e$
(The focus semantic value of a focused constituent is the entire domain of meanings matching in type.)

(30) $[\![\text{dontist}]\!]^o =$ the function $h : \mathrm{D}_e \to \mathrm{D}_{et}$ such that for all $\beta \in \mathrm{D}_e$, $h(\beta) = [\![\beta\text{dontist}]\!]^o$ if β*dontist* is a word and $[\![\beta\text{dontist}]\!]^o \in \mathrm{D}_{et}$, undefined otherwise.

(31) $[\![\text{dontist}]\!]^f = \{[\![\text{dontist}]\!]^o\}$
(The focus semantic value of an unfocused basic constituent is the unit set containing the constituent's ordinary semantic value as a sole member.)

(32) $[\![\text{what-dontist}]\!]^f$
$= \{\alpha(\beta)|\alpha \in [\![\text{dontist}]\!]^f \wedge \beta \in [\![\text{what}]\!]^f\}$
$= \{[\![\text{dontist}]\!]^o([\![\text{ortho}]\!]^o), [\![\text{dontist}]\!]^o([\![\text{perio}]\!]^o), \ldots\}$
$= \{[\![\text{orthodontist}]\!]^o, [\![\text{periodontist}]\!]^o, \ldots\}$

So the alternative set for the question (28) is the set of propositions that include "Bill is an orthodontist", "Bill is a periodontist" and so on; the echo question asks which of these propositions was asserted, or intended. The fact that these possible answers have a similar form is a consequence of the meaning of focus below the word level, where the meaning of a word part depends on its form; it does not have to do with the semantics of echo questions.

It is instructive to compare this approach with proposals to the effect that echo questions differ radically from familiar syntactic and semantic structures. Janda (1985) claims that echo questions are "metalinguistic", derived by substituting question words for syllable strings in the surface structure of a sentence. This is supposed to explain why echo questions allow violations of locality requirements (33)–(34), as well as cases where the question word appears in the place of what looks like a string that is not a syntactic constituent (35)–(36).

(33) They're having a WHAT-party?

(cf. *What are they having a party?; *A what-party are they having?; *Jill knows who's having a what-party.)

(34) He WHAT?

(cf. *What he?; *What did he?; *Jack knows who what.)

(35) A: He swam across the Monongahela River.

B: He swam across the Monongа-WHAT River?

(36) A: The man tore his laissez-passer into pieces.

B: The man tore WHAT (about) pieces?

Insensitivity to locality requirements (33)–(34) is expected under the focus semantics for echo questions. Echo questions on word parts (35) are also handled by the focus semantics, coupled with phonological decomposition. Finally, it appears that echo *wh*-phrases cannot substitute for non-constituents: the most striking alleged case of this (36) is outright weird in my opinion; McCawley (1987, p. 251) also judges it to be unacceptable, and continues to show that echo questions do have to respect constituent structure.

(37) a. Smith is the WHAT of the zoology department?

b.*Smith is WHAT of the zoology department?

Focus semantics thus deals with all the data that motivated a separate "metalinguistic" analysis for echo questions.

The reason echo questions on parts of words do appear to be "metalinguistic" is that focus below the word level is interpreted through the semantics of phonological decomposition, which makes reference to phonological form. The observation that echo questions can be "metalinguistic" is indeed limited to echo questions on parts of words. The proposal that echo questions as a rule are based on the form of the previous utterance runs into serious problems, which Janda fully acknowledges. The following examples show that echo questions do not copy the form of the statements they echo.

(38) A: I'm not acrocephalosyndactylic.

B: You're not WHAT? (Janda 1985, p. 182)

(39) A: It really throve.

B: It really did WHAT? (Janda 1985, p. 183)

(Note that the question word *what* is of the property type *et* in (38) and (39).)

(40) A: Jim gave me a present.

B: You got a present from WHOM?

In (38) speaker B must use the pronoun *you* where speaker A used *I*, and the verb must also match the subject. In (39) speaker B may use a dummy verb *did* that is not present in speaker A's utterance. And (40) shows that an active sentence can be echoed in the passive. In each of the three cases, the surface forms of the echoed and echo utterances are related in a non-trivial way.

In order to sustain the idea that echo questions are formed by syntactic operations on the interlocutor's utterance, Janda proposes that in (38) "the pronouns and verbs must also be altered appropriately when a former listener becomes a speaker"; as for (39), he suggests that *did what* as a unit can substitute for a verb or VP. The derivation of an echo question from a previous string seems complicated and arbitrary. Under the current analysis, the patterns in (38) and (39) are expected. The pronouns switch between speaker and hearer because they have actual denotations: the denotation of *you* in B's utterance is the same as the denotation of *I* in A's utterance, so the proposition expressed by speaker B is entailed by previous discourse; discourse also entails the echoes in (39) and (40). Echo questions generally allow substitution of coreferential expressions.

(41) A: Rusty chewed the antique chair you lent us.

B: Your dog chewed WHAT?

The only place where form plays a part in deriving the meaning of echo questions is when the question is on part of a word, and this is because the semantics of phonological decomposition is sensitive to the form of the word. Everywhere else, echo questions have meanings that are indifferent to the actual form of the utterance, just like other questions.

Echo questions are allowed on parts of words because their semantics is the semantics of focus. But phonological decomposition is a more general phenomenon; shouldn't it be possible to apply phonological decomposition in a way that would allow ordinary (non-echo) questions on word parts? If an ordinary question had a constituent like *what-dontist* which received a meaning through phonological decomposition, then we should be able to form a question. But such a question would violate locality constraints. These are not necessarily constraints on fronted *wh*-phrases: questions on parts of words are also ungrammatical with unfronted *wh*-phrases.

(42)*Sue knows who has an appointment with a what-dontist.

(cf. Sue knows who has an appointment with which specialist.)

The example above is similar to (21), where a *wh*-phrase could not be interpreted inside a coordinate structure. Any semantics for questions has to incorporate a locality mechanism, be it in the syntax or the semantics, that blocks dependencies like (21) and (42). It appears that words are simply islands for interpreting *wh*-dependencies; for this reason phonological decomposition does not apply in non-echo questions.

5 Second order questions

Echo questions can be uttered as a response to questions. In such instances they seek to ascertain what question had just been asked or intended, or express surprise at such a question. Echoes that inquire about questions are often referred to as "second order questions", following Karttunen (1977, fn. 7, p. 12).

(43) A: Who did Mary see?

B: Who did WHO see?

The expected answer to the echo in (43) is a clarification of the question that speaker A had originally intended. Question denotations are sets of possible answers (Hamblin 1973; Groenendijk and Stokhof 1984); the denotation of speaker B's utterance is therefore the set of question denotations which can serve as answers to the echo.

(44) {"who did Mary see?", "who did Bill see?", "who did Jane see?", ...}

The two occurrences of the question word *who* in the echo in (43) serve different functions: the first, unaccented *who* is part of the original question that speaker B accepts; the second *who*, with a rising (L+H*) pitch accent, marks the constituent that speaker B wishes to question or dispute. It is the latter *who* which gives rise to alternatives in the denotation of the echo.

The familiar semantics for questions (e.g. Hamblin 1973; Karttunen 1977; Groenendijk and Stokhof 1982) does not yield second order denotations for questions with multiple *wh*-phrases, regardless of the order in which the *wh*-phrases are processed. For this reason Dayal (1996, p. 125) introduces a layer above the CP for computing the meanings of echo questions: the CP level gives an ordinary denotation of a statement (for first-order echoes) or a question (for second-order echoes), with a free variable for each echo *wh*-phrase; an echo operator above the CP binds the free variables and returns a set of statement or question denotations, whichever the case may be, as the denotation of the echo.

Focus semantics for echo questions has the same effect. The alternative set of an expression is a set of ordinary denotations of the same type, so the alternative set of a question is a set of denotations of the same type as the question. Since the only focused constituent in a second-order question is the echo *wh*-phrase (or phrases), the alternative set of the second-order question will be the set of question denotations formed with alternatives to the echo *wh*-phrase(s).

Focus semantics also predicts that second order questions are possible when the echo pitch accent occurs on a non-*wh* constituent in a question. This is correct.

(45) A: Who gave flowers to George?

B: Who gave FLOWERS to George? I don't care. What bothers me is who gave him candy.

(11) A: Did Mary give flowers to George?

B: Did Mary give FLOWERS to George? That's not important. The question is whether she gave him candy.

The alternative sets for the echoes above are indeed sets of questions. Like other non-*wh* echo questions, the fact that the echo constituent is given explicitly means that second-order non-*wh* questions cannot be used to signify that the speaker has not perceived the original utterance correctly, but they can show an objection to the original utterance.

Fronted second order questions are ungrammatical, because the ordinary semantics for questions cannot compute second-order question denotations.

(46) A: Who gave flowers to George?

B:*WHAT did who give to George?

(cf. Who gave WHAT to George?)

Not only is sentence (46) ungrammatical, but to the extent that we can give it an interpretation, it would be a multiple question. Since focus rather than fronting is the only strategy that semantically results in sets of questions, we predict that second order questions will have unfronted echo *wh*-phrases even in languages that require fronting whenever possible; this is correct for Romanian (see Comorovski 1996) and Hebrew.

By using alternative sets as the denotation of echo questions, focus semantics captures the insight of Dayal (1996), that echo denotations are sets of ordinary denotations of statements and questions. Rather than arriving at these sets through a special operator located in a distinct syntactic position, the current proposal uses the already available semantics of focus. In doing so we not only correctly predict the absence of locality restrictions on echoes and the existence of second-order questions, but also tie together the semantics of *wh* and non-*wh* echoes, and link that to the obligatory pitch accent of echo questions.

6 Prepositions, quantifiers and question words

The data so far show a full parallelism between *wh* and non-*wh* echo questions: every non-*wh* echo question corresponds to a *wh*-echo in which the focused constituent is replaced with a *wh*-phrase, and conversely, every *wh*-echo corresponds to a non-*wh* variant. This parallelism does not hold of all echo questions. Any constituent that can be focused can form a non-*wh* echo, for example prepositions and quantifiers.

(47) A: I sleep under my bed.

B: You sleep UNDER your bed?

(48) A: I gave ice cream to most of the children.

B: You gave ice cream to MOST of the children?

(can imply, for instance, "I find it hard to believe you gave it to most of the children, rather than just some or all of them".)

It is impossible, however, to form appropriate *wh*-echoes to the initial utterances in the above two examples.

(49) A: I sleep under my bed.

B:*You sleep WHAT your bed?

(50) A: I gave ice cream to most of the children.

B:*You gave ice cream to WHAT of the children?

(cannot be used to imply "I didn't hear if you gave it to some, most, or all of the children" or "I find it hard to believe you gave it to most but not all of the children".)

The last example improves somewhat if we replace the echo *wh*-phrase *what* with *how many*, but it is still not very good, as the question implies that a specific number had been mentioned. The problem seems to be simply that English has no question words corresponding to prepositions or quantifiers, so *wh*-echoes cannot be formed.

A similar thing happens when an echo response to a question, which normally results in a second-order question, targets the question word itself as the disputed constituent. Here too the only way to ask an echo question is by focusing the original constituent, not by replacing it with another *wh*-phrase.

(51) A: I found out where Jessie bought the schnapps.

B: You found out WHERE Jessie bought the schnapps?

(can imply, for instance, "I find it hard to believe you found out where he bought it rather than when".)

(52) A: I found out where Jessie bought the schnapps.

B:*You found out WHAT Jessie bought the schnapps?

(cannot be used to imply "I didn't hear whether you found out where or when he bought it" or "I find it hard to believe you found out where he bought it rather than when".)

Here too the problem is not with the intended meaning of an echo like that in (52): after all, the echo in (51) is perfectly coherent. Rather, an echo like (52) cannot be formed because English lacks a question word for questioning other question words.

Focus semantics for echo questions broadens the coverage of the theory to echo questions of types that were not dealt with in previous accounts, including non-*wh* echoes that lack a *wh* counterpart. Focus semantics gives *wh* and non-*wh* echoes a uniform treatment; differences lie in the contextual requirements and answerability, not in the question denotation. The absence of *wh*-echo questions of certain types is the result of gaps in the English lexicon, which does not have a suitable question word for every type of constituent that can be echoed.

References

Abraham, Werner (ed.) (1991). *Discourse Particles: Descriptive and Theoretical Investigations on the Logical, Syntactic, and Pragmatic Properties of Discourse Particles in German*. Amsterdam: John Benjamins.

Anderson, Steven R. (1972). How to get *even*. *Language* **48**(4), pp. 893–906.

Artstein, Ron (2002). *Parts of Words: Compositional Semantics for Prosodic Constituents*. Ph.D. thesis, Rutgers University.

Bolinger, Dwight L. (1987). Echoes reechoed. *American Speech* **62**(3), pp. 261–279.

Comorovski, Ileana (1996). *Interrogative Phrases and the Syntax-Semantics Interface*, vol. 59 of *Studies in Linguistics and Philosophy*. Dordrecht: Kluwer.

Dayal, Veneeta (1996). *Locality in Wh Quantification: Questions and Relative Clauses in Hindi*, vol. 62 of *Studies in Linguistics and Philosophy*. Dordrecht: Kluwer.

Groenendijk, Jeroen and Martin Stokhof (1982). Semantic analysis of *wh*-complements. *Linguistics and Philosophy* **5**(2), pp. 175–233.

Groenendijk, Jeroen and Martin Stokhof (1984). On the semantics of questions and the pragmatics of answers. In Fred Landman and Frank Veltman (eds.), *Varieties of Formal Semantics*, vol. 3 of *Groningen-Amsterdam Studies in Semantics (GRASS)*, pp. 143–170. Dordrecht: Foris.

Halle, Morris and Jean-Roger Vergnaud (1987). *An Essay on Stress*, vol. 15 of *Current Studies in Linguistics*. Cambridge, MA: MIT Press.

Hamblin, C. L. (1973). Questions in Montague English. *Foundations of Language* **10**(1), pp. 41–53. Reprinted in Partee (1976), pp. 247–259.

Hockey, Beth Ann (1994). Echo questions, intonation and focus. In Peter Bosch and Rob van der Sandt (eds.), *Focus and Natural Language Processing, Volume 1: Intonation and Syntax*. Heidelberg: IBM.

Janda, Richard D. (1985). Echo-questions are evidence for what? *CLS* **21**, pp. 171–188.

Karttunen, Lauri (1973). Presuppositions of compound sentences. *Linguistic Inquiry* **4**(2), pp. 169–193.

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

McCawley, James D. (1987). The syntax of English echoes. *CLS* **23**, pp. 246–258.

Moulton, William G. (1987). On the prosody of statements, questions, and echo questions. *American Speech* **62**(3), pp. 249–261.

Nishigauchi, Taisuke (1990). *Quantification in the Theory of Grammar*, vol. 37 of *Studies in Linguistics and Philosophy*. Dordrecht: Kluwer.

Parker, Frank and John Pickeral (1985). Echo questions in English. *American Speech* **60**(4), pp. 337–347.

Partee, Barbara (1976). *Montague Grammar*. New York: Academic Press.

Pierrehumbert, Janet (1980). *The Phonology and Phonetics of English Intonation*. Ph.D. thesis, MIT, Cambridge, MA.

Pope, Emily Norwood (1976). *Questions and Answers in English*. The Hague: Mouton.

Reis, Marga (1990). Zur Grammatik und Pragmatik von Echo-w-Fragen. *Sprache und Pragmatik* **20**, pp. 1–72.

Reis, Marga (1992). Zur Grammatik und Pragmatik von Echo-w-Fragen. In Inger Rosengren (ed.), *Satz und Illokution, Band 1*, vol. 278 of *Linguistische Arbeiten*, pp. 213–261. Tübingen: Max Niemeyer. Revised version of Reis (1990).

Rooth, Mats (1985). *Association with Focus*. Ph.D. thesis, University of Massachusetts, Amherst.

Rooth, Mats (1992). A theory of focus interpretation. *Natural Language Semantics* **1**(1), pp. 75–116.

Schwarzschild, Roger (1999). GIVENness, avoidF and other constraints on the placement of accent. *Natural Language Semantics* **7**(2), pp. 141–177.

von Stechow, Arnim (1989). *Focusing and Backgrounding Operators*. Tech. Rep. 6, Fachgruppe Sprachwissenschaft, University of Konstanz. Reprinted in Abraham (1991), pp. 37–84.