Negated Polarity Questions as Denegations of Assertions

Manfred Krifka [1,*,2]

Email mkrifka@yahoo.com

[1] Humboldt-Universität, Berlin, Germany

[2] Zentrum für Allgemeine Sprachwissenschaft (ZAS), Berlin, Germany

Abstract

The paper offers a new proposal for so-called high negation in questions like *Isn't there a vegetarian restaurant around here?* It develops a theory of speech acts that allows for certain semantic operators, like negation, to scope over them. It is argued that high negation is negation over an assertion (here, 'there is a vegetarian restaurant around here'), and that the question is a request by the speaker to refrain from asserting that proposition. In doing this, the speaker checks whether the addressee would exclude that there is a vegetarian restaurant around here. This rhetorical move is justified under certain circumstances, which explains the biases that have been observed with such questions, and also with questions with low negation such as *Is there no vegetarian restaurant here*? The paper also introduces a more fine-grained notion of polarity questions; in addition to the standardly assumed "bipolar" questions that present two propositions, one being the negation of the other, it also assumes "monopolar" questions that present just one proposition, and hence allow for the expression of a bias.

Keywords

Negation
Speech act
Assertion
Questions
Polarity questions
Question bias
Common ground

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aware of my later paper, Krifka (2015), that develops a different take on high negation questions within the general overall framework.

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I dedicate this paper to the memory of Susanne Anschütz, the resourceful guardian of linguistics in Germany at the DFG, who passed away in February 2012.

1. Introduction: Negated Polarity Questions

Since Ladd (1981), negation in questions continued to be a challenge for semantics and pragmatics. Ladd observed that questions like (1) are systematically ambiguous:

(1) *Isn't there a vegetarian restaurant around here?*

a. Speaker wants confirmation that there is a vegetarian restaurant here.

b. Speaker wants confirmation that there is no vegetarian restaurant here.

Prosody might shift the interpretation into one or the other direction, and particles have a similar effect: adding *too* shifts the interpretation toward (a), adding *either* shifts it toward (b). Reading (b) can also be expressed by *Is there no vegetarian restaurant around here?* In other languages, the two interpretations tend to be expressed in morphosyntactically different ways, as, e.g., in German (cf. Büring and Gunlogson 2000), where the readings (1)(a) and (b) tend to be expressed as in (2)(a) and (2)(b).

(2)	a.	*Gibt*	*es*	*hier*	*nicht*	*ein*	*vegetarisches*	*Restaurant*	*?*
		exist-3SG	it	here	NEG	INDEF.SG	vegetarian	restaurant	
	b.	*Gibt*	*es*	*hier*	*k-ein*		*vegetarisches*	*Restaurant*	*?*
		exist-3SG	it	here	NEG-INDEF.SG		vegetarian	restaurant	

'Is there no vegetarian restaurant here?'

Another difference was pointed out in Repp (2009, 2013): If negation precedes the additive particle *auch*, hence has scope over it, we get the interpretation corresponding to (a); if negation follows, and hence the particle has scope over negation, we get the interpretation corresponding to (b). In (3), please align b. under a.

(3) a. *Schläft Peter nicht auch?*
'Doesn't Peter sleep too?'

b. *Schläft Peter auch nicht?*
'Doesn't Peter sleep either?'

Romero and Han (2004) discuss differences in other languages. In Korean, negation in the (a) reading is expressed by an auxiliary (long form negation), whereas (b) is expressed with a short form negation: In (4), please align b under a.

(4) a. *Suni-ka coffee-lul masi-ess.ci anh-ni?*
Suni-NOM coffee-ACC drink-PAST NEG-Q
'Didn't Suni drink coffee?'

b. *Suni-ka coffee-lul an masi-ess-ni?*
Suni-NOM coffee-ACC NEG drink-PAST-Q
'Didn't Suni drink coffee?'

Ladd proposes that the two readings of (1) are due to a scope difference of negation, something that is made plausible by the German examples. In (b), the scope of negation is internal to the proposition that is questioned, whereas in (a), it is "somehow outside the proposition under question." I will call this structure **negated polarity question**.

Ladd sees that the assumption of a negation outside of a proposition "raises some fairly major difficulties for logical representation," as it is not clear how negation, a propositional operator, should be interpreted outside of the proposition. Indeed, Ladd's observation has turned out to be a major challenge to semantic theory, especially for the way how semantics and pragmatics interact.

In this paper, I will propose a novel solution to the interpretation of negated polarity questions. I will do so in the context of other question types, like declarative questions as in *There is a vegetarian restaurant around here?* (cf. Gunlogson 2002). The solution is rooted in a general theoretical framework for speech acts in which they are analyzed as transitions between commitment spaces (cf. Cohen and Krifka 2011). In essence, "outer" negation will be analyzed as an instance of speech act denegation that we also find in cases like *I don't promise to come*. Such speech act denegation express that a speaker refrains from performing a speech act (here, the promise to come). I will argue that in the case of (1) with outer negation, the speaker asks whether the addressee would refrain from making the assertion that there is a vegetarian restaurant around here. It will be shown that this explains the various biases that have been observed with such sentences.

The paper will proceed as follows: In Sect. 2, I will give a short overview of existing accounts of negated polarity questions and their problems.[1] In Sect. 3 I will present the framework for the interpretation of speech acts that the analysis proposed here uses. Section 4 shows how assertions and reactions to assertions work in this framework, and Sect. 7 discuss how regular questions work, in particular constituent questions and simple polarity questions like *Is there a vegetarian restaurant around here?*. Section 8 then turns

to declarative questions like *There is a vegetarian restaurant around here?*, Sect. 9 to biased polarity questions like *Is there no vegetarian restaurant here?*. After these preliminaries, we will be able to explain, in Sect. 10, negated polarity questions like *Isn't there a vegetarian restaurant around here?*

In addition to looking at a wider range of polarity questions, I will also develop an explanation of the sometimes quite confusing answer patterns that polarity questions with and without outer or inner negations engender. Furthermore, I will point out the role of the so-called incredulity contour in the construction of biases of such questions.

2. Previous Accounts

Ladd (1981) pointed out a puzzle, and it took a number of years till the first attempts at a solution appeared. Here, I will discuss four such accounts. I should mention that I cannot do full justice to these works here. My main goal is to characterize their basic approach and point out certain problems with them.

There is one account that essentially treats negation in negated polarity questions such as propositional negation, contrary to Ladd's intuition, by van Rooij and Šafařová (2003). It assumes that if a polarity question based on a sentence *p* that denotes a proposition p, the proposition p should have a greater "pragmatic utility" than ¬p. In the case of (1) under the interpretation (a), the question is based on the negation of the sentence *There is a vegetarian restaurant around here*, hence the proposition ¬φ = ¬ 'there is a vegetarian restaurant around here' should have a greater "pragmatic utility" than the proposition φ. This explains the pragmatic bias of negated polarity questions: If the speaker thinks that it is likely that φ, then learning that ¬φ would be of high utility, as it would help to detect, and correct, a blatant error in the speaker's assignment of probabilities to propositions.

One major problem of this account is that it does not explain the high syntactic position of negation in cases like (2)(a). According to van Rooij and Šafařová, the negation in negated polarity questions is simple propositional negation. Ladd's proposal that the negation in (1) under reading (a) is outside of the proposition also explained why it is not compatible with negative polarity items like *either*; this prediction appears to be lost under van Rooij and Šavařovás account.

The second account to be discussed is Romero and Han (2004), cf. also Romero (2006). It assumes that preposed negation in questions results in the availability of a VERUM operator, as proposed in Höhle (1992) for cases of predicate focus and *do*-support. VERUM is an epistemic operator that relates to the strength with which a proposition should be added to the common ground; VERUM(p) states that the proposition p should be added "for sure" to the common ground CG, that is, the speaker considers the evidence for p as high. The two readings of sentences with high negation in (1) result from a scopal ambiguity of negation with VERUM, which is expressed in the underlying propositions as follows:

(4) a. ¬VERUM(φ): 'It is not for sure that φ should be added to the CG'
b. VERUM(¬φ): 'It is for sure that ¬φ should be added to the CG'

Romero and Han assume, following Hamblin's framework for questions, that polarity questions arise from a proposition p by forming a set of propositions {p, ¬p} as possible answers. In the case at hand, we get interpretations (6)(a), (b) for the two readings of (1), to be contrasted with reading (6)(c) for the simple question *Is there a vegetarian restaurant around here?*

(6) a. {¬VERUM(φ), VERUM(φ)}

b. {VERUM(¬φ), ¬VERUM(¬φ)}

c. {φ, ¬φ}

In (1) under reading (a), the speaker has a bias toward φ. The interpretation (6)(a) captures this: The speaker already tends toward φ and now asks whether φ can be assumed with a high degree of certainty. Conversely, in (1) under reading (b), the speaker has a bias toward ¬φ and asks, according to (6)(b), whether ¬φ can be assumed with a high degree of certainty. In contrast, the question *Is there a vegetarian restaurant around here?* lacks such bias, which is captured by (6)(c).

Romero and Han's analysis explains the high syntactic position of negation in (1)(a). It makes sense of the intuition that this negation is interpreted outside of the proposition, and it gives a decent explanation of the pragmatic bias of the interpretations of (1)(a, b). However, the analysis also has its problems. First, there is no account how the negation preposed to an auxiliary makes available the VERUM operator (to be sure, VERUM can arise by other means, e.g. by the sentence adverb *really* and by focus on a negation). Second, it is unclear how the bias in questions like *Is there no vegetarian restaurant around here?* originates, which appears to be similar to (1)(b). Romero and Han discuss such sentences where focus is on the negation, but focus on the negation is not required to obtain this bias. Furthermore, notice that VERUM is essentially a pragmatic operator that indicates what should be done with a proposition in conversation (e.g., add it to the common ground with a particular strength). But then it is actually not clear what negating VERUM(φ) means, as negation is a propositional operator, and VERUM(φ) is not obviously a proposition. The nonpropositional status of VERUM(φ) is not quite clear in Romero and Han's account, as they render it technically as a modal statement, similar like 'it is sure that φ', or 'φ should definitely be part of the common ground'. But if this is to be taken seriously, then we have a problem, as questions based on *it is sure*… and questions with outer negation are not equivalent, as the following example shows:

(7) *They say that it is raining, but I don't quite believe that.*

a. *Is it certain that it is raining?*

b. *#Isn't it raining?*

The third account has been developed by Asher and Reese, see Reese (2007) and Asher and Reese (2007). In this account, negated polarity questions are complex speech acts; they are combinations of assertions and questions, just like tag questions (*There is a vegetarian restaurant around here, isn't there?*) and rhetorical questions based on emphatic negative polarity items (*Is there even a SINGLE vegetarian restaurant around here?*). For such combinations, the authors provide for speech act combinations with a dot operator, like ASSERTION · QUESTION. In such combined speech acts, Gricean principles link one speech act type to the other. In the case of negated polarity questions, Asher and Reese assume that these questions are basically assertions, and that the question part adds to that assertion a request for acknowledgment, for confirmation, or for contradiction.

The theory of Asher and Reese explains the lack of NPIs, which do not occur in assertions without being licensed by an operator-like negation. It also explains why negated polarity questions pass certain tests for assertions proposed by Sadock (1971, 1974). For example, *after all* marks assertions, but can also occur in negated polarity questions:

(8) *We can go out here.*

a. *After all, there is a vegetarian restaurant around here.*

b. **After all, is there a vegetarian restaurant around here?*

c. *After all, isn't there a vegetarian restaurant around here?*

One problem, however, is that Asher and Reese's account does not explain how a negation in a polarity question, in particular a syntactically high negation, leads to the assertive component of the question. Also, the explanation of the effect of combining ASSERT and QUESTION is not really worked out in their theory.

The most recent account is due to Repp (2013). Repp assumes that in addition to Romero and Han's operator VERUM there is an operator FALSUM that, like VERUM, indicates the status of a proposition relative to the common ground: they are "common ground managing" operators. Repp assumes that the outer negation reading of (1) is not an instance of negation scoping over VERUM, but rather that negation expresses the FALSUM operator, which states that the degree of strength with which the proposition should be added to the common ground is zero. This is the same operator that occurs in denials, a certain type of reactive speech act. Repp analyzes negated polarity questions as questions that ask

whether the degree to which a proposition should be added to the common ground is zero, that is, whether the addressee would deny the proposition. For example, in (1)(a), the speaker asks the addressee to decide between the options FALSUM(φ) and ¬FALSUM(φ). Evidence for this analysis over the one by Romero and Han comes from the following answer pattern in German:

(9) S_1: *Gibt es hier nicht ein vegetarisches Restaurant?*

S_2: *Doch, ich glaube schon, aber ich bin mir nicht sicher.*

"Yes, I think there is, but I'm not sure."

Under Romero and Han's proposal, the speaker S_1 in (9) would ask the addressee S_2 to identify the option ¬VERUM(φ) or VERUM(φ); an answer marked by *doch* would identify VERUM(φ), that is, that φ should be added for sure to the common ground. However, as (9) shows, the speaker is not committed to that high degree of certainty. Under Repp's account, a *doch*-answer identifies the option ¬FALSUM(φ), and this is compatible with a reduced degree of certainty.

Under Repp's account, there is no problem with interpreting negation as a non-propositional operation, as it is assumed that high negation is interpreted as FALSUM; what we would have to account for is why negation can either express propositional negation or ~~the~~ FALSUM ~~operator~~. The distributional difference between negated polarity questions and questions based on *sure* observed in (7) does not constitute a problem for Repp either. However, there is a problem, which is directly linked to the predictive advantage over Romero and Han: If a question like (9)(S_1) is answered affirmatively, by *ja*, without any modification, then according to my intuition this is not just understood as the weak commitment that ¬FALSUM(φ) would indicate. Rather, a simple affirmative answer indicates a commitment to the proposition φ, without modification. As Repp has shown that Romero and Han's analysis as VERUM(φ) does not work either, an obvious conclusion is that negated polarity questions do not address the strength of the answerhood condition at all. Assuming that the question itself asks for strong or weak answers appears to be on the wrong track.

In the following, I will present a novel solution that takes Ladd's insight of a syntactically high negation in negated polarity questions seriously. It follows the accounts of Romero and Han and of Repp, in assuming that negation scopes over a speech act related operator, but it also provides for a theory for what it means for speech acts to be "negated." It takes on the suggestion of Asher and Reese that negated polarity questions combine a question with an assertion, and it provides a precise account how this combination can be understood.

3. A Framework for the Interpretation of Speech Acts

Speech acts have been analyzed in a variety of ways, e.g., as expressing beliefs, or as

moves in language games, or as intentions to communicate. Here, I will assume a "normative" approach to speech acts: Speech acts create **commitments** by the interlocutors. That speech acts change commitments has been proposed by a wide variety of authors, for example by Hamblin (1971), Stalnaker (1978), Gazdar (1981), Alston (2000), and Gunlogson (2001), and is discussed more recently in Harnish (2005) and Beyssade and Marandin (2006). For example, in the speech act of asserting a proposition φ, the speaker takes on a commitment to be responsible for the truth of φ, and in the speech act of a promising the speaker takes on a commitment to act in a particular way in the future. Such commitments have social consequences. For example, in the case of an assertion the speaker has to present evidence for φ if asked for, and can be held liable for the truth of φ.

More formally, speech acts can be seen as enacting **changes of commitments**, and linguistic forms that are conventionally related to a certain speech acts can be seen as **functions from input commitments to output commitments**. The current proposal follows Cohen and Krifka (2011), which models the development in the commitments in form of a game tree, but there are important differences in detail. It is also inspired by the account in Merin (1994), where speech acts are seen as transitions between states of automata.

Let c be a representation of the commitments, rendered in some formal language, that have accumulated up to the current point in discourse. This will be called **commitment state**. Then the **update** of c with a speech act $A_{S1,S2}$ by the speaker S_1 directed to the addressee S_2 can be represented as in (10), where $com_c(A_{S1,S2})$ is the set of commitments introduced when the speech act A is performed by S_1_S_2 at the commitment state c.

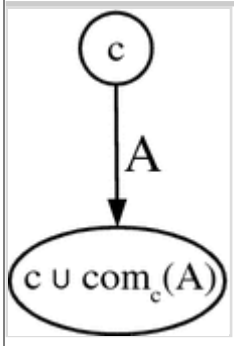
(10) Update of c with speech act $A_{S1,S2}$, where S_1: Speaker, S_2: Addressee:

$$c + A_{S1,S2} = c \cup com_c(A_{S1,S2})$$

Updating c by $A_{S1,S2}$ consists of adding the commitments expressed by the act $A_{S1,S2}$ to the commitment state c that represents the commitments at the current point in conversation c, where the commitments that are generated by $A_{S1,S2}$ might depend on c (as in the case of context-sensitive, "particularized" conversational implicatures). See Fig. 1 for a graphical representation.

Fig. 1

Update of commitment state c by speech act A



Typically, updates like c + A indicate that $com_c(A)$, the new commitments expressed by A, are not already present in c (more precisely, $c \cap com_c(A) \neq \emptyset$), otherwise there would be no point in performing A in the first place (the "first principle" in Stalnaker 1978). However, we would not want to express this as a strict condition for updates, *pace* Hamblin (1971); rather, it should follow from Gricean reasons, perhaps as a consequence of the Maxim of Manner, "Be brief!" In fact, Speakers repeat themselves, and often with good reason, as they might assume that the commitments expressed by the speech act already be there, but still have to be stressed and made salient.

It should be stressed that A is not a concrete speech act, or a speech act **token**, but rather an abstract operation that can be used to perform speech acts—a speech act **type**. The speech act type can be rendered as a function $\lambda c[c + A]$, a function from commitment states to commitment states. If a speaker applies A to a specific commitment state c, the commitments of speaker and/or addressee change, and an actual speech act ensues. This change of commitments is actually a change of the world itself. This was observed in Szabolcsi (1982), who treated speech acts as functions from worlds to worlds.

Commitment states, and transitions between commitment states, are not sufficient to represent all conversational acts. One case in point is **speech act denegation** (cf. Searle 1969):

(11) *I don't promise to come.*

Following Hare (1970), such denegations are explicit refusals to perform a certain speech act, here the commissive speech act expressed by *I promise to come*, which adds the commitment of the speaker to come. To model denegations, we have to consider the possible future developments of commitment spaces. Cohen and Krifka (2011) introduce the notion of **commitment spaces** to model such admissible continuations of commitment states. We assume that commitment spaces are sets of commitment states that are **rooted** in a (non-empty) commitment state with respect to the relation of continuation.

(12) C is a commitment space iff

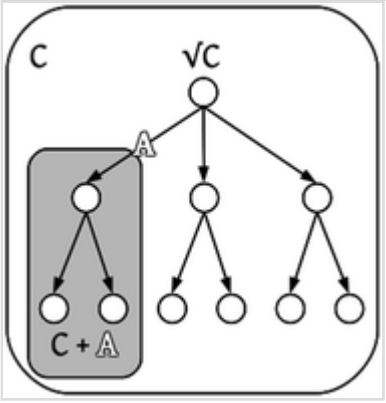
a. C is a set of commitment states;

b. $\exists c \in C\ \forall c' \in C\ [c \neq \varnothing \wedge c \subseteq c']$

In the given model, the root of a commitment space is its intersection, provided that it is nonempty; we will write √C instead of ∩C. The update of a commitment space C with a regular speech act A then can be defined as in (13), and illustrated as in Fig. 2.

Fig. 2

Update of commitment space C with speech act A; √C: root of C

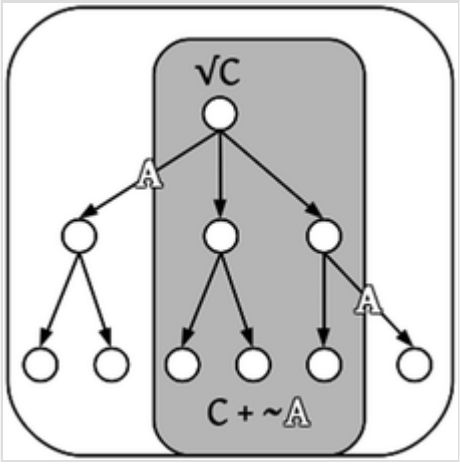


(13) $C + A = \{c \in C \mid \sqrt{C} + A \subseteq c\}$

Now, denegation of a speech act A can be represented as excluding the speech act A from a commitment space C. The resulting set of commitment states is a commitment space, with the same root as the original commitment space, cf. (14) and illustrated in Fig. 3.

Fig. 3

Denegation of commitment space with ~A



(14) C + ~A = C—{c | ∃c′[c′ + A] ⊆ c}

Cohen and Krifka (2011) assume a less restrictive version of denegation: C + ~A = C + A, the complement of C + A. This is because denegations of speech acts can be retracted: *I don't promise to come. But if you really insist, I might change my mind.* However, performing A after a denegation of A can also be considered a case of nonmonotonic update, similar to asserting that it is not raining after asserting that it is raining, due to a change of mind. So, a stronger version of denegation appears to be justified, and it will be assumed here.

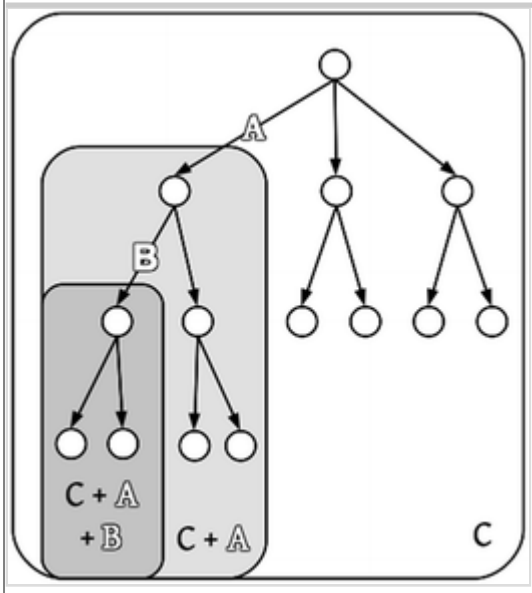
One might ask here why denegation is expressed by the same morpheme as propositional negation, namely, *not* or *n't*, clitized to the highest auxiliary. This is part of a more general phenomenon: Expressions that are used to express speech acts can often also be used to describe speech acts (cf. Krifka 2001a). In the case at hand, we can describe (11) as *the speaker did not promise to come.*

Denegation obviously is not a simple move in the speech act game, which is reflected by the fact that it does not change the root of a commitment space. But it restricts the admissible future moves. It is as if, in a game of chess, a stronger player promises the weaker player not to use the queen. As a restriction on future moves, it is a **meta speech act** (cf. Cohen and Krifka 2011). Such restrictions of future conversational moves can be expressed in a wide variety of ways—for example, *I wouldn't bother you further if you give me one last hint to solve this puzzle*. This is because we can freely talk about conversational moves, just as we can talk about other things in the world. But I would like to claim that denegation is a somewhat special way to talk about conversation; it can be given a particularly simple interpretation, similar to conjunction and conditionalization of speech acts. Hence, it should be part of the speech act algebra.

Commitment spaces develop during conversation. This is captured by assuming **commitment space developments** as the proper structures at which speech acts are interpreted. A commitment space development is a **sequence** of commitment spaces $\langle C_0, C_1,\ldots,C_n\rangle$, where C_n is the current commitment space, and $C_0,\ldots C_{n-1}$ are the preceding commitment spaces. The update of a commitment space development by a speech act is then defined as in (15), and illustrated in Fig. 4.

Fig. 4

Commitment space development



(15) $\langle\ldots, C\rangle + A = \langle\ldots, C, C + A\rangle$

The notion of commitment space development allows us to record every move in the conversational game. It might very well be that this representation is too fine grained; ultimately, only the last few moves in a commitment state development are accessible for straightforward discourse manipulation, and everything else is collapsed into the last commitment space. We will be concerned here with the phenomena that need to look back just one step (namely, the REJECT operation discussed below). But there are strategies of discourse development that clearly need to look farther back, e.g., the discourse trees involving contrastive topics in Büring (2003).

Commitment space developments also distinguish different paths that lead to the same commitments and to the same commitment spaces. The updates of a commitment state do not form a tree; that is, it might be that c + A + B = c + B + A, depending on the context-sensitivity of the acts A and B. Consequently, update of commitment spaces do not form a tree either; it might be that C + A + B = C + B + A. However, commitment state developments record these different ways of reaching the same commitment state, or commitment space: The developments $\langle C, C + A, C + A + B\rangle$ and $\langle C, C + B, C + B + A\rangle$ are

different.

4. Assertions and the Notion of Common Ground

In the preceding section, we have laid the grounds by introducing the notions of commitment states, commitment space, and commitment space development. We now can turn to the treatment of specific speech acts. In this section, we will deal with assertions and various ways to react to them.

I assume that assertion expresses not one, but two commitments. In asserting a proposition, the speaker first expresses a commitment to the proposition, and then the speaker calls on the addressee to be also committed to that proposition, with the result that the proposition becomes part of the common ground. Here, I would like to propose that this is a two-stage process.

In the first move, the **speaker expresses a commitment** to stand behind the proposition asserted. That is, the speaker is to be held responsible for the truth of the proposition. This means that the speaker has to provide evidence for its truth, if asked for, and can be blamed to be a liar if the asserted proposition turns out to be false. I will write "[S_1: φ]" for "S_1 is liable for the truth of φ." We could also specify the addressee of this liability, which will be skipped here.

In the second move, the speaker expresses an expectation that the **addressee accepts the truth** of φ, that is, to treat it as **common ground**, as part of what the interlocutors take to be true, and of which they mutually know that they take to be true. This component of assertions has been stressed, e.g., by Farkas and Bruce (2010).

Here, it will be implemented in the following way: For each commitment state c, there is a common ground CG(c) that consists of a set of propositions that are mutually taken to be true. This set CG(c) contains all elements of c, that is, all commitments that are present in c. For example, after S_1 asserts φ, the commitment [S_1: φ] will become an element of c, and it will also be an element of CG(c), as it is mutually known that S_1 is committed to C. In general, we have:

(16) $c \subseteq CG(c)$

Furthermore, a proposition φ may become part of the common ground if one speaker asks the other to treat it as such. I will write "[$\varphi \in CG$]" to express the commitment to treat φ as part of the common ground of the commitment state that this commitment is added to. As the common ground is shared between all speakers, reference to particular speakers can be omitted. But there is something special with the commitment [$\varphi \in CG$]: If this is in a commitment state, and hence in the common ground of this commitment state, the proposition φ itself becomes part of the common ground of this commitment state.

(17) If [φ ∈ CG] ∈ c, then φ ∈ CG(c)

There are other ways in which propositions may become part of the common ground—by accommodation ~~of presuppositions~~ or by being part of the shared cultural and world knowledge of the participants. We might be tempted to also assume that propositions that are easily inferrable are part of the common ground. But notice that the common ground is not closed under logical inference—this would be beyond the computational capacity of humans. Accepting easily inferrable propositions as part of the common ground will, by transitivity, lead to such super human common grounds. For this reason, I will assume that the common ground just contains things that are made explicit in the discourse, by commitments, by presuppositions, and by conventional and perhaps some conversational implicatures, such as scalar implicatures.

One requirement of the common ground is that it stays **consistent**. In particular, it is ruled out that a proposition φ and commitments like [S: ¬φ] or [S: BEL(¬φ)] are jointly part of the common ground. Furthermore, updating c with [φ ∈ CG] comes with a **novelty condition**, namely that φ is not part of CG(c) already; otherwise, this request would be superfluous. I see this as a pragmatic condition following from Grice's maxim of relevance, and not as a strict semantic requirement for the interpretation of assertions.

With the condition that commitment states are contained in their common grounds (cf. (16)), what follows could well be formulated in terms of this extended notion of common ground. This will not be done here in order to highlight the role played by the commitments of the speakers, but everything that stated in the following could be rephrased in this way.

I will not go into details of syntax or prosody in the current paper, except for a few points. In particular, I will assume that propositions are reflected on the level of a syntactic category TP, which then are turned into speech acts by illocutionary operators, for which I assume a syntactic category Force Phrase, or ForceP (in the spirit of Rizzi 1997). The syntactic structure of an assertion then is as indicated in the following example:

(18) $[_{\text{ForceP}}\ [_{\text{ForceP'}}\ \textit{ASS}\ [_{\text{TP}}\ \textit{there is a vegetarian restaurant here}]]]$

This corresponds to the proposed structure of sentence radical and illocutionary operator in Stenius (1967), where the sentence radical is the TP, and the illocutionary operator is *ASS*. In addition, prosodic features express certain ways how sentences are interpreted in conversation. Here, I will make use of the tonal analysis of prosody of the TOBI system, which distinguishes between nuclear stresses like H* and L*, and edge tones for prosodic phrases like L-/H- and into national phrases like L% and H%, respectively.

The two steps that are involved in an assertion will be implemented as follows. Assume that S_1 utters an expression $[_{\text{ForceP}}\ \textit{ASS}\ [_{\text{TP}}\ \varphi]_{H^*}]$ to S_2. With the declarative clause syntax (the syntactic operator *ASS*), the speaker S_1 expresses the commitment to the proposition, [S_1:

φ]. The second commitment, [φ ∈ CG], that the asserted proposition φ should become part of the common ground, is due to prosody, in particular the nuclear stress H* (cf. Pierrehumbert and Hirschberg 1990, Truckenbrodt ~~to appear~~2012). Recall that c + [φ ∈ CG] implicates that φ is not part of the common ground yet, φ ∉ CG(c). The nuclear accent H* stands in paradigmatic variation to L*, which does not express the condition c + [φ ∈ CG], which can mean, among others, that S_1 thinks that φ is already part of the common ground, and that S_1 just reminds S_2 about it, as in (20) (notice that L* + L- will result in a rise after L*).

(19) *There's a vegeTArian RESTaurant around here.*
H* H* L- L%

(20) *Of course we can find a decent place to eat. Just remember!*
There's a vegeTArian RESTaurant around here.
L* L* L- L%

The position of the H* accents (there can be more than one of them) depend on the focus of the assertion, which is used to indicate alternatives (cf. Jacobs 1984 for the assumption that illocutionary operators can bind focus, and Rooth 1992 for the concept of alternatives). Even though this is of major importance for how discourse works, it will not be of special concern in this paper, to keep things simple.

Combining the two steps involved in assertions in one operator ASSERT, the proposed analysis of assertions can be rendered as follows:

(21) $\langle \ldots, C \rangle + \text{ASSERT}_{S1,S2}(\varphi)$

$= \langle \ldots, C \rangle + [S_1: \varphi] + [\varphi \in CG]$

$= \langle \ldots, C, C + [S_1: \varphi], C + [S_1:\varphi] + [\varphi \in CG] \rangle$

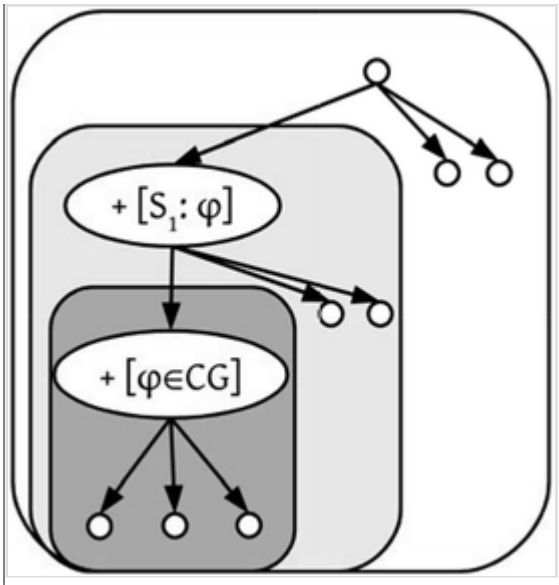
$= \langle \ldots, C, \{c \in C \mid \surd C \cup \{[S_1: \varphi]\} \subseteq c\},$

$\{c \in C \mid \surd C \cup \{[S_1: \varphi]\} \cup \{[\varphi \in CG]\} \subseteq c\} \rangle$

The representation of the resulting speech act sequence can be illustrated as in Fig. 5. The initial commitment space is used to construct an intermediate commitment space with the condition $[S_1: \varphi]$ at its root, which differs from the root √C by the liability of S_1 for φ. This is then followed by the commitment state with [φ ∈ CG] at its root, which means that the proposition φ is now introduced in the common ground of the commitment state.

Fig. 5

Assertion of φ



5. Reactions to Assertions: Acceptance and Rejections

The final commitment change in (21), + [φ ∈ CG], imposes a commitment on the interlocutors, to treat φ as common ground. Of course, the addressee S_2 has a say in this. S_2 can agree with this proposed commitment change, by uttering *aha*, or *okay*, or *mhm*, by nodding, or implicitly by lack of any reaction that would involve a rejection. This reaction by S_2–S_1 will be called **acceptance**, and to make things clear, I will propose an operation $ACCEPT_{S2,S1}$; it expresses that S_2 takes on the obligation imposed by S_1 on S_2 in the most recent conversational move:

(22) 〈…, C′, C〉 + $ACCEPT_{S2,S1}$ = 〈…, C′, C〉,

provided that C differs from C′ insofar as it contains an obligation imposed on S_2.

The addressee can also **reject** the imposed obligation, for which I assume an operation REJECT:

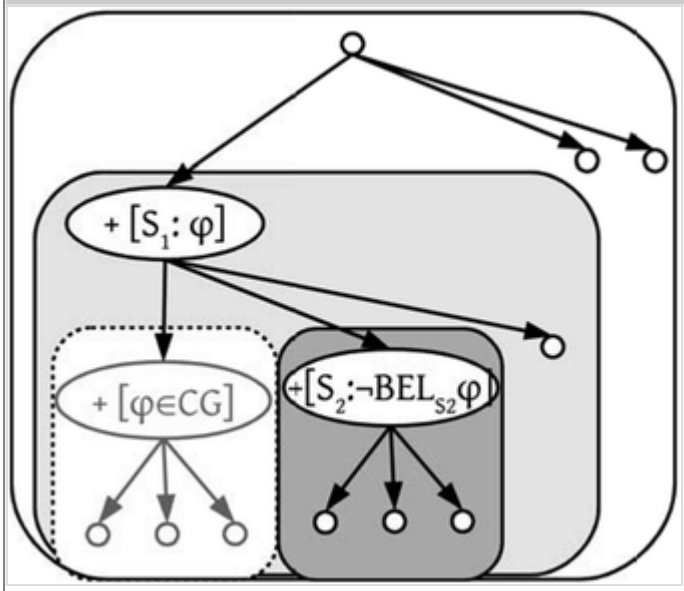
(23) 〈…, C′, C〉 + $REJECT_{S2,S1}$ = 〈…, C′, C, [C′ – C]〉

provided that C differs from C′ insofar as it contains an obligation imposed on S_2.

Rejections have to be expressed overtly, of course, but there is no simple expression that expresses rejection and nothing else. The addressee S_2 must always indicate some reason for the rejection; this can be seen as a conventionalized consequence from the general cooperation principle in communication. For example, S_2 can assert *I don't believe that*. The commitment [S_2: ¬BEL_{S2}(φ)] cannot be added to the commitment space C (effectively, to its root √C), as this would lead to a contradictory common ground, containing both φ and [S_2: ¬BEL_{S2}(φ)]. Hence, a rejection has to be performed first before the speaker can assert *I don't believe that.* See Fig. 6 for illustration.

Fig. 6

REJECT + ¬BELIEVE(φ)



Notice that it is just the last move that is rejected by the addressee. The first move, that the speaker is liable for the proposition, is not affected. This is to capture the fact that after a rejection, the first speaker remains liable for the proposition asserted; he or she could be accused to be a liar, for example, if it turns out to be false. We can express this due to the factorization of assertion into two components, one for the liability of the speaker for the proposition, one for the speaker's attempt to make the addressee treat the proposition as common ground.

We can explain Moore's paradox, the oddity of assertions like *It is raining but I don't believe it,* as follows: The second clause is inconsistent with the commitment expressed by the first clause, [φ ∈ CG], and the reason for this lies with the speaker, the instigator of the action. In contrast, it is possible to construct valid instances of assertions like *It is raining, but you don't believe it* or *It is raining, even if you don't believe it*: The speaker still calls on the addressee to add the proposition to the common ground, but indicates that the addressee will reject this, resulting in the sole commitment of the speaker.

The common ground of the resulting commitment state in Fig. 6 contains the propositions [S_1: φ] and [S_2: BEL_{S2}(¬φ)], but not the proposition φ itself. Hence, we distinguish between commitments of all participants, and discourse commitments for particular individuals (cf. also Hamblin 1971; Ginzburg 1995; Farkas and Bruce 2010).

Besides acceptance, there is another reaction to an assertion in which the addressee indicates his or her own commitment to the proposition in question. This I take to be distinct from mere acceptance, and I will call this move **confirmation**. I assume that confirmations work typically by picking up a **propositional discourse referent** that was introduced by the

assertion of the first speaker (see e.g. Asher 1993 for propositional discourse referents, and Krifka 2013 for a treatment of response particles as propositional anaphors). This discourse referent refers to the proposition of that assertion; syntactically, it corresponds to the sentence radical, the TP. Evidence for such propositional discourse referents comes from anaphoric expressions like *that*, which pick them up, as in the following example:

(24)	S_1: *There is a vegetarian restaurant here.*	$ASSERT_{S1,S2}$('there is a vegetarian restaurant around here'),	sentence radical introduces a discourse referent	φ = 'there is a vegetarian restaurant around here'

S_2: *I believe that too.that* picks up φ.

This propositional discourse referent is also taken up with reactions like *That's right*, as well as with the simple answers *Yes* or *Right*. I propose that *yes* has the same interpretation as *that's right*, that is, it **refers to a salient propositional discourse referent** and **asserts its proposition**. Cf. Kramer and Rawlins (2009) for an alternative view assumes that *yes* and *no* are remnants of ellipsis of full clauses like [*yes*].

(25) S_2 to S_1: *Yes./That's right.*

$ASSERT_{S2,S1}(\varphi)$, where φ: a salient propositional discourse referent.

(26) a. S_1: *There is a vegetarian restaurant here.*

introduces discourse referent for proposition φ

$\langle \ldots, C \rangle + ASSERT_{S1,S2}(\varphi)$

$= \langle \ldots, C \rangle + [S_1: \varphi] + [\varphi \in CG_{S1,S2}]$

$= \langle \ldots, C, C + [S_1: \varphi], C + [S_1: \varphi] + [\varphi \in CG_{S1,S2}] \rangle$, abbreviated as Γ

b. S_2: *Yes./That's right.*

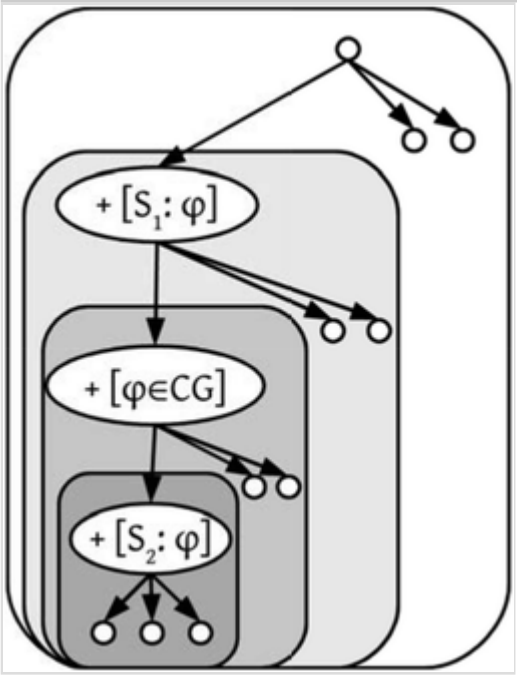
$\Gamma + ASSERT_{S2,S1}(\varphi)$

$= \Gamma + [S_2{:}\varphi]$ $(+ [\varphi \in CG_{S1,S2}])$

The last move, that the interlocutors treat φ as part of the common ground, is already satisfied, and hence can systematically be dropped for the interpretation of *Yes*. This is illustrated in Fig. 7. The common ground of the root of the resulting commitment space includes the commitments $[S_1: \varphi]$, $[S_2: \varphi]$, and the proposition φ itself.

Fig. 7

Confirmation with *yes* and *no*

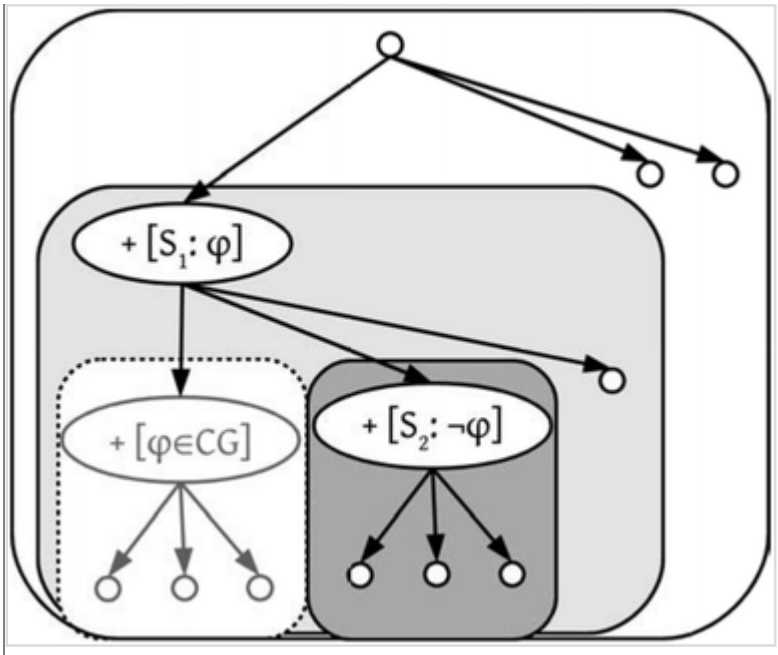


Previous assertions can also be negated, or **denied**. Again, this is different from mere rejection by statements like *I don't believe that,* that do not necessarily express a commitment either way toward the proposition. With a **denial**, the addressee expresses a commitment toward the negation of the proposition that was asserted by the first speaker (cf. van der Sandt and Maier 2003). But just as the reaction *I don't believe that*, denials require a prior rejection of the conversational move of the first speaker, in particular, the attempt to make the second speaker treat the proposition as common ground. The reason is that φ and [S_2: ¬φ] cannot be both part of the CG of a commitment state, hence a prior commitment [φ ∈ CG] has to be rejected first before the commitment [S_2: ¬φ] can be entered.

We assume that the answer particle *no* picks out the propositional discourse referent introduced by the precedent sentence and asserts its negation, ASSERT(¬φ). The use of *no* and equivalent phrases as denial is illustrated in (27) and in Fig. 8.

Fig. 8

Negation of an asserted proposition



(27) a. S_1: *There is a vegetarian restaurant here.*

introduces discourse referent for proposition

φ = 'there is a vegetarian restaurant around here'.

$\langle \ldots, C \rangle + \text{ASSERT}_{S1,S2}(\varphi)$

$\langle \ldots, C \rangle + [S_1: \varphi] + [\varphi \in CG_{S1,S2}]$

$= \langle \ldots, C, C + [S_1: \varphi], C + [S_1: \varphi] + [\varphi \in CG] \rangle$, abbreviated as Γ

b. S_2: *No./That's not true./No, there isn't.*

$\Gamma + \text{ASSERT}_{S2,S1}(\neg\varphi)$: not interpretable,

due to inconsistency of $[\varphi \in CG]$ and $[S_2: \neg\varphi]$,

hence prior reject operation: $\Gamma + \text{REJECT}_{S2} + \text{ASSERT}_{S2,S1}(\neg\varphi)$.

$= \langle \ldots, C \rangle + [S_1: \varphi] + [\varphi \in CG_{S1,S2}] + \text{REJECT}_{S2} + [S_2{:}\varphi]$

$= \langle \ldots, C, C + [S_1: \varphi], C + [S_1: \varphi] + [\varphi \in CG], * C + [S_1: \varphi], C + [S_1: \varphi] + [S_2: \neg\varphi] \rangle$

Notice that at the position marked * in the last line, the REJECT operation removes the last update, with $[\varphi \in CG]$, creating a commitment state at which then $[S_2: \neg\varphi]$ can be interpreted. In a diagram:

The common ground of the resulting commitment state contains both [S_1: φ] and [S_2: ¬φ], that is, S_1 is liable for φ, and S_2 is liable for ¬φ. It will not contain φ or ¬φ. This is not a direct contradiction; it just means that φ is not part of the common ground. Often, one of the two liabilities will eventually have to be retracted if the participants choose to argue about this issue. Alternatively, the participants can agree to disagree, and turn to other points.

6. Reactions to Assertions of Negated Sentences

Before we turn to questions, it is worthwhile to consider affirmations and denials of assertions that are based on negated propositions, as in the following case:

(28) S_1: *There is no vegetarian restaurant around here.*

The reactions to such assertions is quite puzzling, both within a language and across languages. Consider the following answer options for English:

(29) a. S_2: *No, there isn't.*

b. S_2: *Yes, there isn't.*

c. S_2: *No, there is!*

d. S_2: *Yes, there is!*

Agreement to S_1's assertion in (28) is typically expressed by *no,* sometimes with a reduced clause, as in *no there isn't*, cf. (29)(a). But interestingly, it is also possible to express affirmation with *yes* and a clarifying reduced form as well, as in *Yes, there isn't* (cf. experimental data in Brasoveanu et al. ~~2012~~2013). Denial of S_1's assertion can also be expressed by *no* and *yes* with appropriate reduced forms.

This is not the place to discuss and compare the proposals that have been offered to account for this behavior of *yes* and *no* (see e.g. Cooper and Ginzburg 2011 and Brasoveanu et al. 2012 for recent proposals). Rather, I would like to sketch an account in which *yes* and *no* have exactly the same meaning as with non-negated antecedents. For this, it has to be assumed that clauses with sentential negations introduce **two** propositional discourse referents, one for the unnegated proposition, one for the negated propositions. Assuming that a negated declarative sentence radical has the structure [$_{NegP}$ … [$_{TP}$ …]], where both TP and NegP are interpreted as propositions, then both NegP and TP should introduce propositional discourse referents, where the discourse referent of the NegP refers to the negation of the discourse referent of the TP. Evidence for the introduction of two propositional discourse referents comes from examples like the following. In (30), in (a) *that* picks up the TP proposition 'two plus two is five', and in (b) *that* picks up the NegP

proposition ¬'two plus two is five'. In (31), *that* picks up the TP proposition 'Bill came to the party' in (a) and the NegP proposition ¬'Bill came to the party' in (b).

(30) a. *Two plus two isn't five. That would be a contradiction.*

b. *Two plus two isn't five. Everyone should know that.*

(31) a. *Bill didn't come to the party, even though everyone had expected that.*

b. *Bill didn't come to the party, and everyone had expected that.*

The answer patterns in (29) now can be explained under the assumptions that (28) introduces two propositional discourse referents, one the negation of the other, and that *yes* and *no* can apply to either one of these discourse referents.

(32) S_1: *There isn't a vegetarian restaurant around here.*

$[_{ForceP}\ [_{Force'}\ ASS\ [_{NegP}\ there_i\ [_{NegP'}\ is_j\text{-}n't\ [_{TP}\ e_i\ e_j\ a\ vegetarian\ restaurant\ here]]]]]$

Introduces TP discourse referent φ = 'there is a vegetarian restaurant around here',

introduces NegP discourse referent ψ = ¬'there is a veg. restaurant around here'

$\langle \ldots, C\rangle + \text{ASSERT}_{S1,S2}(\psi) = \langle \ldots, C, C + [S_1\colon \psi], C + [S_1\colon \psi] + [\psi \in CG]\rangle$, abbr. as Γ.

Let us first consider the two agreeing reactions. They just differ in that *no* picks up the TP discourse referent φ, and *yes* picks up the NegP discourse referent ψ.

(33) a. S_2: *No, there isn't.*

$\Gamma + \text{ASSERT}_{S2,S1}(\neg\varphi)$

$= \langle \ldots, C, C + [S_1: \psi], C + [S_1: \psi] + [\psi \in CG], C + [S_1: \psi] + [\psi \in CG] + [S_2: \neg\varphi] \rangle$

b. S_2: *Yes, there isn't.*

$\Gamma + \text{ASSERT}_{S2,S2}(\psi)$

$= \langle \ldots, C, C + [S_1: \psi], C + [S_1: \psi] + [\psi \in CG], C + [S_1: \psi] + [\psi \in CG] + [S_2: \psi] \rangle$

The net effect of these two reaction is the same, as $\psi = \neg\varphi$. It is just that *no* picks out the TP discourse referent introduced by the S_1's assertion, and negates that proposition, whereas *yes* picks up the NegP discourse referent.

The two disagreeing reactions require a prior REJECT operation, which is visible by the protest prosody of such answers. Again, as $\neg\varphi = \psi$, the two changes of commitment spaces are effectively the same.

(34) a. S_2: *Yes, there is!*

$\Gamma + \text{REJECT}_{S2,S1} + \text{ASSERT}_{S2,S1}(\varphi)$

$= \langle \ldots, C, C+[S_1: \psi], C+[S_1: \psi]+[\psi \in CG], C+[S_1: \psi], C+[S_1: \psi]+[S_2: \varphi]+[\varphi \in CG] \rangle$

b. S_2: *No, there is!*

$\Gamma + \text{REJECT}_{S2,S1} + \text{ASSERT}_{S2,S1}(\neg\psi)$

$= \langle \ldots, C, C + [S_1: \psi], C + [S_1: \psi] + [\psi \in CG], C + [S_1: \psi],$ C Line break here; please align with ⟨ in preceding line. $+ [S_1: \psi] + [S_2: \neg\psi] + [\neg\psi \in CG] \rangle$

While all these reactions are possible, *No there isn't* in (33)(a) appears to be the most straightforward; we can even skip the clarifying elliptic clause *There isn't* in this case. The

reason is that the competing interpretation of *no* in (34)(b) is complex, as it involves the negation of the propositional discourse referent ψ, which is already negated. So, this interpretation of *no* is blocked by the simpler interpretation (33)(a). There is no clear blocking relationship between the *yes* answers. As the expression of interpretation (34) by *no* is blocked by the simpler interpretation of *no* as in (33), one could perhaps assume that (34) would rather be interpreted as *yes*, which should surface as a possible form according to the rules of Bidirectional Optimality Theory (cf. Jäger 2002), but it seems that it doesn't quite do that. In any case, as *yes* is ambiguous even after pragmatic reasoning, clarifying the meaning by an elliptical clause appears to be required.

As Brasoveanu et al. (2012) argue, clauses with negative determiners like *There is no vegetarian restaurant around here* have essentially the same syntactic structure as (32), and consequently induce the same answer patterns. They also point out that the syntactic form, and not just the interpretation, matters. For example, while *John didn't pass the test* induces the answer pattern discussed here, the logically equivalent assertion *John failed the test* is treated like the assertion of an ordinary non-negated proposition, and answers like *no, he did* or *yes, he didn't* are impossible.

It is well known that languages differ in their set of denial particles. For example, *doch* in German can be interpreted as REJECT + ASSERT(φ); this blocks the use of the particles *ja* and *nein* in (34), see (35).

(35)

S_1: *Es gibt hier kein vegetarisches Restaurant.*	'There is no vegetarian restaurant here'.		
S_2: *Doch (es gibt eines).* 'DOCH, there is one'.	(?) *Ja, es gibt eines.* 'Yes, there is one'.	(?) *Nein, es gibt eines.* 'No, there is one'.

In Romanian, according to Farkas and Bruce (2010), denials are marked by the particle *ba*, which is combined with the particles *nu* 'no' and *da* 'yes'. They illustrate the reactions to assertions as follows:

(36) a. S_1: *Ana a plecat.* 'Ana left'.

S_2: *Da./Da, a plecat.* 'Yes.'/'Yes, she left'.

S_2: *Ba nu, n-a plecat./*Nu, n-a plecat.* 'No, she didn't'.

b. S_1: *Ana nu a plecat.* 'Ana didn't leave'.

S_2: *Nu, n-a plecat.* 'No, she didn't leave'.

S_2: *Ba da./Ba a plecat./Ba da, a plecat.* 'You're wrong, she did'.

This answer pattern follows if we analyze *da* as ASSERT(φ), *nu* as ASSERT(¬φ), and *ba* as an expression of REJECT. That is, *ba da* is REJECT + ASSERT(φ), and *ba nu* is REJECT + ASSERT(¬φ).

The well-known agreement/disagreement systems have just two particles. This is the case with Japanese *hai* and *iie*. In the current theoretical framework, *hai* expresses AGREE + ASSERT(ω) and *iie* expresses REJECT + ASSERT(ω), where ω is a propositional discourse referent—either a TP discourse referent like φ above, or a NegP discourse referent like ψ above.

7. Questions and Answers

We now turn to questions. Questions differ from assertions in two respects. First, they have a more complex sentence radical. There are two prominent families of theories, one assuming **functions into propositions**, the other assuming **sets of propositions**; see Krifka (2011) for an overview. While I think there are good theoretical reasons to use the former (cf. Krifka 2001b), here I will assume the simpler proposition set format, which was proposed in Hamblin (1973) and much subsequent work, e.g., Rooth (1992). The underlying idea is that the sentence radical of a question denotes the set of all propositions that are possible congruent answers to that question, regardless whether they are true or false. I assume that the syntactic category of **question radicals** is TPQ, as question radicals have a different syntax (e.g., they express *wh*-movement) and differ from assertion radicals in their semantic type (set of propositions instead of propositions). We find this sentence radical in **embedded questions** with *know* as the embedding predicate. Sentences with this structure can be interpreted along the following lines:

(37) a. *John knows where there is a vegetarian restaurant.*

b. Question sentence radical: *where there is a vegetarian restaurant*.

{'there is a vegetarian restaurant at l'| l ∈ LOCATION}

c. *John knows* φ: ∀p ∈ φ[p is true → John knows that p]

That is, question-embedding *know* is derived from proposition-embedding *know.* (37)(c) states that *John knows* φ iff John knows the true propositions in φ, the set of propositions to which φ is interpreted. We can explain why *believe* does not embed questions: In the environment where 'know' is interpreted in (37)(c), the proposition p is true, allowing for the factive predicate 'know' instead of the non-factive *believe*. Also, we can derive that (37) implicates that there is a vegetarian restaurant: The propositions in the sentence radical are all of the form 'there is a vegetarian restaurant at l', where l is a location (where 'no where' is not a location), and the universal quantification in (37)(c) is understood to be nonvacuous. There is a stronger notion of knowing which also entails that for all false propositions p in φ, John knows that ¬p (cf. Groenendijk and Stokhof 1984, and subsequent work).

Root questions are formed by an illocutionary operator *QU* that takes a question sentence radical TPQ as an argument. In English, the *wh*-element moves to the specifier of the ForceP, and the head of the ForceP has to be occupied by an auxiliary or copula verb, leading to the following structure:

(38) $[_{\text{ForceP}}$ *where*$_i$ $[_{\text{ForceP}'}$ *QU-is*$_j$ $[_{\text{TPQ}}$ e_i [*there* e_j *a vegetarian restaurant* e_i]]]]

The second point in which questions differ from assertions is that with a question, the **speaker imposes on the addressee a restriction on future continuations** of the conversation. Only those continuations are admissible in which **the addressee makes an assertion that answers the question**. If φ is a question sentence radical, then a root question $[_{\text{ForceP}}$ *QU* $[_{\text{TPQ}}$ φ]] is interpreted as follows:

(39) $\langle \ldots, C\rangle + QU_{S1,S2}(\varphi)$

$= \langle \ldots, C, C + QU_{S1,S2}(\varphi)\rangle$

$= \langle \ldots, C, \{\surd C\} \cup \{c \in C \mid \exists p \in \varphi[\surd C + [S_2\text{: } p]] \subseteq c\}\rangle$

The commitment state development will be extended by adding a new commitment state that consists of the root √C of the previous commitment state C, and all the commitment states equal or following the update of the root with the liability of the second speaker for a proposition p, where p is a possible answer to the question. This is illustrated in the following example, with a root question that has undergone movement of the auxiliary *is*.

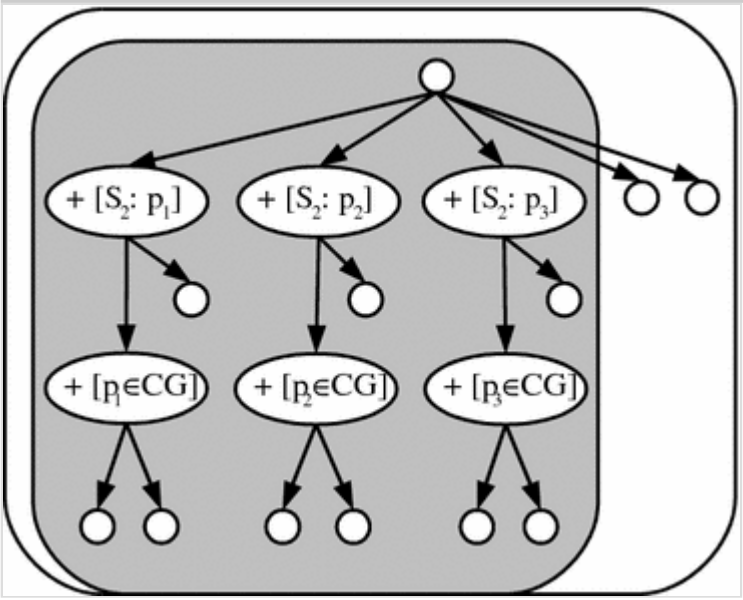
(40) S_1, to S_2: *Where is there a vegetarian restaurant?*

$\langle \ldots, C \rangle + QU_{S1,S2}(\{\text{'there is a vegetarian restaurant at l'} \mid l \in \text{LOCATION}\})$

Assuming that there are three relevant locations, Elm Street, Oak Street, and Maple Street, this amounts to (41), graphically represented in Fig. 9.

Fig. 9

Asking a constituent question

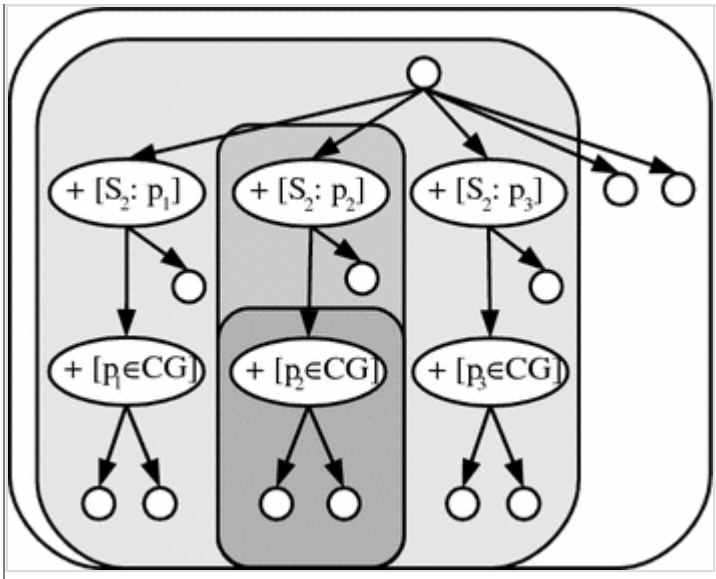


(41) $\langle \ldots, C \rangle + QU_{S1,S2}(\{\text{'there is a veg. rest. on Elm St.', '... Oak St.', '... Maple St.'}\})$
$= \langle \ldots, C, \{\surd C\} \cup \{c \in C \mid \surd C + [S_2: \text{'... on Elm St.'}] \subseteq c$
$\vee \surd C + [S_2: \text{'... on Oak St.'}] \subseteq c$
$\vee \surd C + [S_2: \text{'... on Maple St.'}] \subseteq c\}\rangle$, abbreviated as Γ

The addressee S_2 can reject this imposition, e.g., by *I don't know.* This can be modeled, as usual, by REJECT followed by an assertion of the proposition 'S_2 does not know where there is a vegetarian restaurant'. But the regular way to continue is for S_2 to make one of the assertions proposed by S_1, as specified in (42) and illustrated in Fig. 10. In doing so, S_2 will accept liability for one of the propositions, and in addition attempt to make it part of the common ground. The root $\surd C$ of the last commitment space is included here because the assertion by the second speaker has to be made with respect to that commitment state.

Fig. 10

Answering a constituent question



(42) S_2 to S_1: *There is a vegetarian restaurant on Oak street.*

Γ + $ASSERT_{S2,S1}(p_2)$,

= Γ + $[S_2: p_2]$ + $[p_2 \in CG]$

The way how the proposition is referred to varies. There are term answers, like *On Elm street*, complete answers like *There is a vegetarian restaurant on Elm street*, or indirect answers, like *People say that there is a nice one on Elm street.* I will not go into the details of such answers here, but instead turn to polarity questions.

The sentence radical of polarity questions denotes a set of two propositions, one the negation of the other. This is what we find in embedded questions headed by the complementizer *whether*:

(43) *John knows whether there is a vegetarian restaurant around here.*

Sentence radical: {'there is a veg. rest. here', ¬'there is a veg. rest. here'}

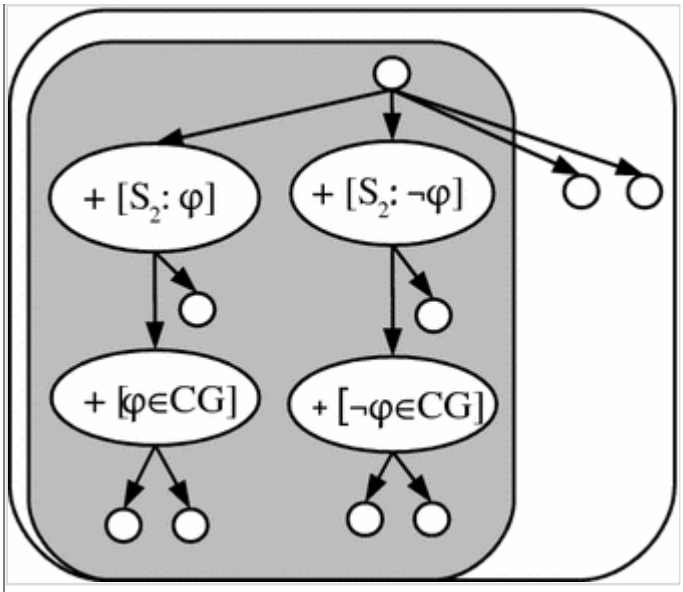
$\forall p \in$ {'there is a veg. rest. here, ¬'there is a veg. rest. here'}

[p is true → John knows p]

The interpretation rule for polarity questions as speech acts is just the same as for constituent questions, cf. (39). Notice that, syntactically, we have auxiliary inversion, and *wh*-element *whether* drops. The following example and Fig. 11 illustrate this.

Fig. 11

Polarity question; QU({φ, ¬φ})



(44) S_1 to S_2: *Is there a vegetarian restaurant around here?*

With φ = 'there is a vegetarian restaurant around here':

$\langle \ldots, C \rangle + QU_{S1,S2}(\{\varphi, \neg\varphi\})$

$= \langle \ldots, C, \{\surd C\} \cup \{c \in C \mid \exists p \in \{\varphi, \neg\varphi\}[\surd C + S_2\text{: } p \subseteq c]\}\rangle$, abbreviated as Γ.

Polarity questions can be rejected, but the categorical reaction to them is to answer them with *yes* or *no.* We can explain this by assuming that a question like *Is there a vegetarian restaurant here?* introduces a discourse referent for the proposition 'there is a vegetarian restaurant here'. If in the course of derivation of this question a TP [*there is a vegetarian restaurant here*] is formed, this is consistent with our previous treatment of assertions, where such TPs, as proposition-denoting expressions, introduce propositional discourse referents. We can indeed assume that the sentence radical of a polarity question is formed with the help of a TP and a wh-operator *whether* which takes a proposition p and delivers a set of propositions {p, ¬p}. This operator is spelled out as a complementizer with embedded questions but not in root questions. What is important is that the TP introduces a propositional discourse referent for p and not for ¬p, as there is no syntactic constituent corresponding to ¬p. This explains the following answering patterns; notice that *yes* and *no* pick up the propositional discourse referent, where *yes* asserts its proposition, and no asserts the negation of its proposition. This is just as with reactions to assertions. This is shown in (45) and in Figs. 12 and 13.

Fig. 12

Answer *Yes*

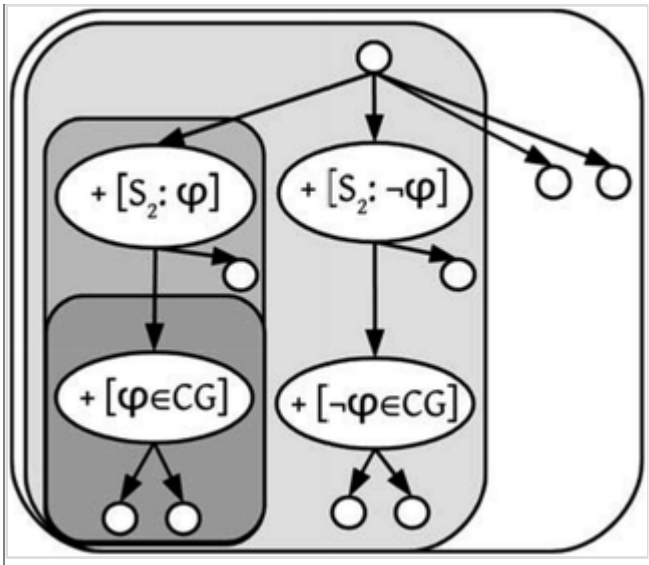
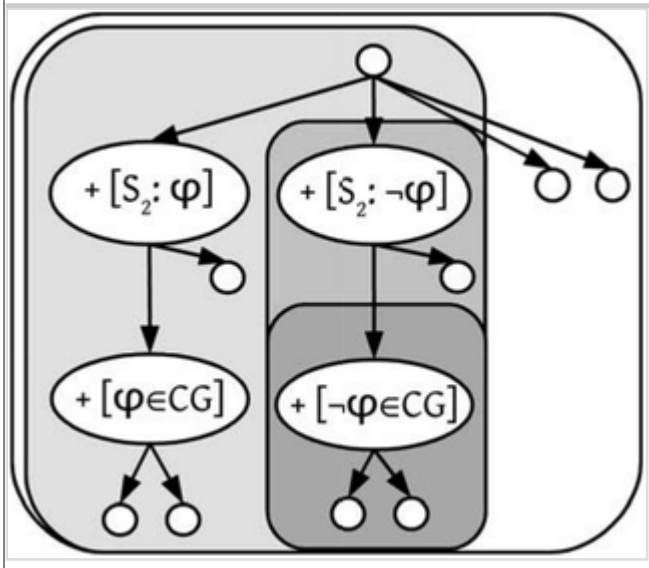


Fig. 13

Answer *No*



(45) S_1 to S_2: *Is there a vegetarian restaurant here?*

[$_{ForceP}$ [$_{ForceP'}$ *QU-is*$_i$ [$_{TPQ}$ [$_{TP}$ *there* e$_i$ *a vegetarian restaurant here*]]]],

the TP introduces a propositional discourse referent

φ = 'there is a vegetarian restaurant here'

a. S_2: *Yes.*

$\Gamma + ASSERT_{S2,S1}(\varphi)$

$= \Gamma + [S_2: \varphi] + [\varphi \in CG_{S1,S2}]$

b. S_2: *No.*

Γ + $ASSERT_{S2,S1}(\neg\varphi)$

= Γ + $[S_2: \neg\varphi]$ + $[\neg\varphi \in CG_{S1,S2}]$

It is worthwhile to point out a fundamental difference between assertions and questions. Assertions can be interpreted at the level of commitment states, c. If applied at commitment spaces C, they change the root √C, a commitment state. As such, assertions have an effect on the common ground of a commitment space, if we define the common ground of a commitment space as the common ground of its root: CG(C) = CG(√C). We also can define the common ground of a commitment space development as the common ground of its last commitment space: CG(〈…, C〉) = CG(C). In general, we will have: CG(C) ≠ CG(C + ASSERT(φ)). Questions, on the other hand, cannot be interpreted at the level of commitment states, as they rather have an effect on the possible future development of commitment spaces. In our framework, questions do not change the root of a commitment space. With the exception of presuppositions or implicatures introduced by questions, the common ground remains the same: CG(C) = CG(C + QU(φ)). This reflects a distinction between **common ground content** and **common ground management** argued for in Krifka (2008): The common ground content is CG(Γ), and operations on a commitment space development Γ that change CG(Γ), like assertions, are operations on the common ground content. Common ground management, on the other hand, are operations that affect Γ without changing CG(Γ). As we have seen, questions are one example of such operations; as questions may be indicated by the focus of assertions, this kind of focus contributes to common ground management as well. Another example is topic, which is arguable a speech act in its own right (cf. Krifka 2001a).

The treatment of questions proposed here also offers a straightforward account of certain shifts of indexical expressions such as the interpretation of evidential particles (cf. e.g. Zimmermann 2004 about German *wohl*, expressing uncertainty of speaker in assertions and uncertainty of addressee in questions) or so-called conjunct person marking (cf. Hale 1980 about Newari verb agreement, identifying the speaker with assertions and the addressee with questions). In the proposed system, questions are essentially assertions by the addressee, hence the indicated shifts appear quite natural.

8. Declarative Questions

We now turn to a type of question that comes with the syntax of declarative sentences, but whose prosody, with a final rise, indicates the question interpretation. Gunlogson (2002) calls them **declarative questions**.

(46) *There is a vegetarian restaurant here?*

Declarative questions differ from standard polarity questions insofar as they express a certain bias of the speaker. For example, in a job interview, a question like *Have you been convicted of a felony?* is fine, but a question like *You have been convicted of a felony?* is decidedly odd, as it suggests that there is evidence that the underlying proposition may well be true.

While the bias of declarative questions is generally acknowledged, it hasn't been discussed that the nature of the bias depends on the precise nature of the prosodic contour. With a simple rise (e.g., L* H- H%), the speaker has independent evidence that the proposition is true, assumes that the addressee has more definite knowledge, and wants to check with the addressee whether the proposition is indeed true. But such questions can also be uttered with a fall-rise, the so-called **incredulity contour** identified in Pierrehumbert and Hirschberg (1990), here assumed to be L* L- H%, here rendered with "!?." In this case, the speaker expresses doubt that the proposition is true, and challenges the addressee to assert it.

I assume that in either case, declarative questions can be rendered similar to polarity questions, except that they **propose only one continuation to the addressee**—the assertion of the proposition. We can call such questions **monopolar** questions, to distinguish them from the **bipolar** questions that are commonly assumed. The addressee can either take up this proposal by the first speaker and assert the proposition, for example with *yes*, or reject it and react with a different assertion, for example with *no*, which would assert the negation of the proposition.

How does this interpretation come about? I assume that declarative questions are exactly what their syntax tells us: They are assertions. At the same time, they are what their prosody tells us: Their final rise H%, together with the L* nuclear accent, marks them as questions. The final rise can be seen in the way suggested by Merin and Bartels (1997), as indicating that the speaker offers a choice to the addressee, whereas L* can be seen as indicating the lack of expression of the speaker that the addressee should take the proposition as part of the common ground.

There is no evidence for any question sentence radical in declarative questions. For example, declarative questions cannot be embedded; at least, *John knows (that) there is a vegetarian restaurant around here?* cannot be distinguished from a declarative question with an embedded proposition. Therefore, I assume that declarative questions are not expressed by QU, but by an operator **REQUEST**. This operator is **applied to a speech act** (a commitment change potential), not to a proposition, or set of proposition. If REQUEST(A) is performed at a commitment space development by a speaker S_1 to an addressee S_2, then S_1 restricts the continuations to those that start with a performance of A by the addressee, S_2.

(47) $\langle \ldots, C \rangle + \text{REQUEST}_{S1,S2}(A) = \langle \ldots, C, \{\surd C\} \cup C + A_{S2,S1} \rangle$

If A is an assertion, we have the following:

(48) $\langle \ldots, C \rangle + \text{REQUEST}_{S1,S2}(\text{ASS}(\varphi))$

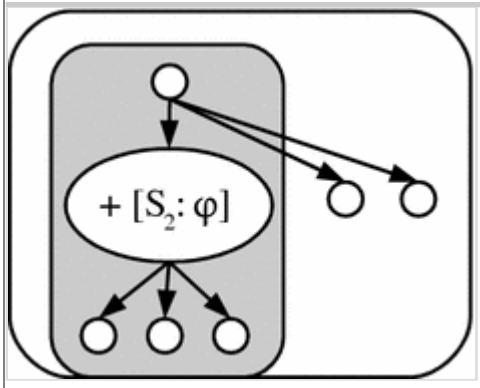
$= \langle \ldots, C, \{\surd C\} \cup C + \text{ASS}_{S2,S1}(\varphi) \rangle$

$= \langle \ldots, C, \{\surd C\} \cup C + [S_2: \varphi] \rangle$

The conversational effect of a request of an assertion is illustrated in Fig. 14. Syntactically, a REQUEST act should contain another speech act, like an assertion. That is, we assume that ForceP can be recursive: $[_{\text{ForceP}}$ *REQUEST* $[_{\text{ForceP}}$ *ASS* $[_{\text{TP}}$ φ]]]. I have assumed here that the REQUEST operator just embeds the effect of the *ASS* operator, that is, the commitment $[S_2: \varphi]$, as declarative questions lack the H* tone that is responsible for the second commitment, $[\varphi \in CG]$.

Fig. 14

Asking a declarative (monopolar) question



The reactions to a declarative question are illustrated in the following example, where *REQUEST* is realized by the specific prosodic contour, and does not have a syntactic exponent.

(49) S_1 to S_2: *There is a vegetarian restaurant here?*

REQUEST $[_{\text{ForceP}}$ $[_{\text{ForceP}'}$ *ASS* $[_{\text{TP}}$ *there is a vegetarian restaurant here?*]]]

introduces φ = 'there is a vegetarian restaurant here'

$\langle \ldots, C \rangle + \text{REQUEST}_{S1,S2}(\text{ASS}(\varphi)) = \langle \ldots, C, \{\surd C\} \cup C + [S_2: \varphi] \rangle$, abbreviated as Γ

a. S_2 to S_1: *Yes.*

$\Gamma + [S_2: \varphi] + [\varphi \in CG]$

b. S_2 to S_1: *No.*

Γ + REJECT + [S_2: $\neg\varphi$] + [$\neg\varphi \in$ CG]

These two answers are illustrated in Figs. 15 and 16.

Fig. 15

Answering a declarative question with *yes*

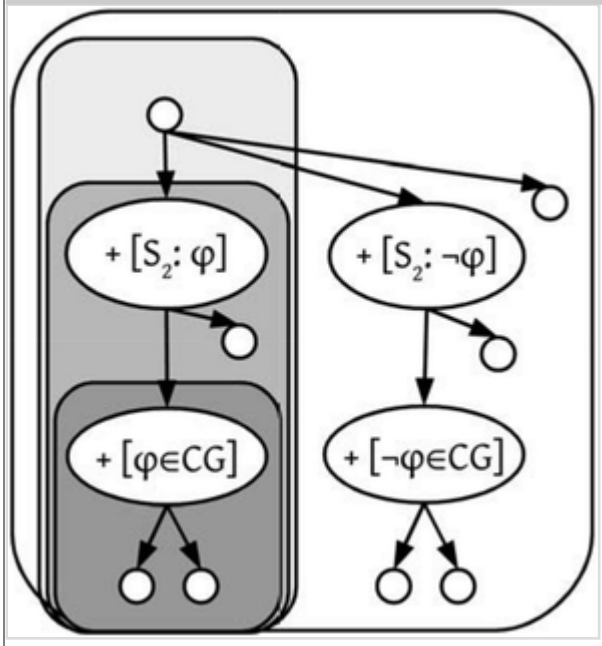
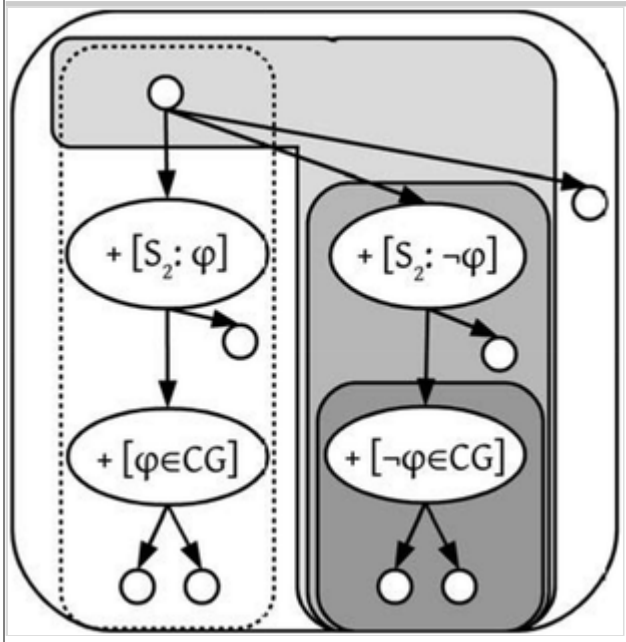


Fig. 16

Answering a declarative question with *no*



The bias of declarative questions against a background in which φ and ¬φ are considered equally plausible arises as follows: The speaker has a choice between a regular polarity question involving QU, which presents both options equally, and REQUEST, which just presents the φ option. The reason for the second option is to indicate that the two options are not considered equal. The asymmetry in declarative questions also shows up in the fact that assertion of φ is easier than assertion of ¬φ, as the latter requires a prior REJECT operation. In this way, the speaker can make it "easy" for the addressee to answer a question in one way. Hence, the bias of declarative questions comes about as a **conversational** implicature.

In the case of declarative questions with **incredulity contour**, there is a **conventional** implicature that the speaker does not believe that the addressee will be able to perform the indicated assertion. We can assume an operator I-REQUEST here that works like REQUEST but in addition carries this conventional implicature. As a result, the suggested move is a challenge imposed by the first speaker. Such conventional implicatures can be seen as hints in a conversational game. They are not proper moves in their own right, but nevertheless influence the course of actions, just as, e.g., hints in a card game. In the following, I will mark moves that are meant as a challenge by double underlining.

(50) S_1 to S_2: *There is a vegetarian restaurant here?!*

$\langle \ldots, C \rangle + \text{I-REQUEST}_{S1,S2}(\text{ASS}(\varphi))$

$= \langle \ldots, C \rangle + \underline{\{\surd C\} \cup C+[S_2: \varphi]}\rangle$

The reply patterns are essentially similar as to cases of REQUEST, except perhaps that they have a more emphatic prosody.

It is to be expected that declarative questions can also be constructed on the basis of sentence radicals that are themselves negated.

(51) S_1 to S_2: *There is no vegetarian restaurant around here?*
There isn't any vegetarian restaurant around here?
Introduces propositional discourse referents
φ = 'there is a vegetarian restaurant here',
ψ = ¬ 'there is a vegetarian restaurant here'
$\langle ..., C \rangle + \text{REQUEST}_{S1,S2}(\text{ASS}(\psi)), = \langle ..., C, \{\surd C\} \cup C+[S_2: \psi]\rangle$, abbreviated as Γ.

a. *No (there isn't).*
$\Gamma + [S_2: \neg\varphi] + [\neg\varphi \in CG]$

b. *Yes, there isn't.*
$\Gamma + [S_2: \psi] + [\psi \in CG]$

c. *No, there is!*
$\Gamma + \text{REJECT} + [S_2: \neg\psi] + [\neg\psi \in CG]$

d. *Yes, there is!*
$\Gamma + \text{REJECT} + [S_2: \varphi] + [\varphi \in CG]$

We find the four answer possibilities that we have already identified in reactions to assertions based on negated sentences, cf. Sect. 6. The most straightforward answer is *no*, with interpretation (a). The operator *no* has to express negation, and negating φ is

easier than negating ψ, as the latter would involve double negation (recall that ψ = ¬φ), and in addition a REJECT operation. Hence (a) is preferred over (c). As (b) would express the same as (a), the answer *yes* would rather be interpreted as in (d). But this preference appears to be only weak, and *yes* typically will have to be specified by elliptical clauses, as in *Yes, there is.* In German, *doch* is used in this case, lexically expressing REJECT and assertion of the negation of an accessible propositional discourse referent; this corresponds to option (c) above.

In closing this section, I would like to point out that the theory developed here allows for a novel way of representing questions with question tags, which also express bias questions.

(52) S_1: *There is a vegetarian restaurant around here, isn't it?*

Such questions can be expressed as proposing first a commitment of S_1 to the truth of the proposition. It then restricts the legal moves to either [φ ∈ CG], where φ is accepted as part of the common ground, or to the move [S_2: ¬φ], a move of the other speaker to assert the negation of φ. Hence, S_1 offers S_2 a way to negate φ without first undergoing a reject operation. In this sense, assertions with question tags are more conciliatory than regular assertions.

9. Biased Polarity Questions

I have argued that there is a REQUEST operator that can be applied to an assertion, and that is expressed by prosodic means, H%. In this section, I would like to argue that **REQUEST can also be expressed syntactically,** in a similar way as QU, by triggering head movement of auxiliary verbs or copulas. That is, I assume that a question like *Is there a vegetarian restaurant around here?* does not only have the interpretation in (44) but also the following one:

(53) S_1 to S_2: *Is there a vegetarian restaurant around here?*

$[_{ForceP}$ *REQUEST-is*$_i$ $[_{ForceP}$ *ASS*-e_i $[_{TP}$ *there* e_i *a veg. restaurant here?*]]]

〈…, C〉 + $REQUEST_{S1,S2}$(ASS('there is a vegetarian restaurant around here'))

= 〈…, C〉 + {√C} ∪ C+[S_2: 'there is a vegetarian restaurant here']

The standard polarity question presents two options equally (φ and ¬φ); the REQUEST polarity question presents only one option, φ; the other option, ¬φ, can be asserted in a slightly more complex way, by applying a REJECT operation before. Normally, the simpler regular interpretation of polarity questions (44) blocks the REQUEST interpretation (53), and so is not easily detectable. But I will argue below that the REQUEST interpretation in English is detectable in certain contexts as well, cf. (65). And there is evidence for this interpretation coming from questions based on negated propositions, from questions

marked with the incredulity contour, and from questions marked with *or not*.

As for questions based on negated propositions, it has been a puzzle for standard theories of polarity questions why they exist at all, as they should have exactly the same interpretation as questions based on non-negated propositions.

(54) S_1 to S_2: *Is there no vegetarian restaurant around here?*

(alternatively, *Isn't there any vegetarian restaurant around here?*)

As a standard polarity question expressed with QU, we predict a meaning of this expression that is exactly the same as with the simpler question, *Is there a vegetarian restaurant here?* Hence questions like (54) should be blocked. But they are, in fact, possible. And in addition to standard polarity questions, they express a bias; in our example, S_1 expects that there is vegetarian restaurant here. We can explain this by assuming an interpretation based on REQUEST, just as the declarative question based on a negated sentence radical, cf. (51).

(55) $\langle \ldots, C \rangle + \text{REQUEST}_{S1,S2}(\text{ASS}(\neg\text{'there is a vegetarian restaurant around here'}))$

$= \langle \ldots, C \rangle + \{\surd C\} \cup C + [S_2: \neg\text{'there is a vegetarian restaurant around here'}]$

As before, the sentence radical introduces two propositional discourse referents, one for the TP, one for the NegP, and we find the same answer patterns as for the declarative question based on a negated sentence radical, discussed in (51).

A second case in which the REQUEST interpretation becomes detectable is under the incredulity contour, that is, when the operator I-REQUEST is applied:

(56) S_1 to S_2: *Is there a vegetarian restaurant around here?!*

$\langle \ldots, C \rangle + \text{I-REQUEST}_{S1,S2}(\text{ASS}(\varphi))$

$= \langle \ldots, C \rangle + \underline{\{\surd C\} \cup C + [S_2: \varphi]}$

As before (cf. (50)), double underlining signals that S_1 challenges S_2 to perform the speech act ASS(φ). That is, S_1 conventionally implicates that S_2 will probably not be able to perform it. This bias could not easily be explained on the basis of the standard derivation, which presents the two propositions φ, ¬φ equally (with the exception that also a standard polarity question only introduces one propositional discourse referent, φ). So, the distinct interpretation of I-REQUEST is evidenced that polarity questions can be interpreted in a way that highlights one option.

A third case that poses problems for standard theories are questions with the question tag *or not*.

(57) S_1 to S_2: *Is there a vegetarian restaurant around here, or not?*

It is difficult to see how the tag *or not* is to be interpreted if the polarity question presents both options {φ, ¬φ}. We can assume that *or not* is either interpreted at the formation of the sentence radical of the question, leading to the interpretation {φ, ¬φ}, which then can be used as an argument to QU. Alternatively, we can assume that questions with question tags expresses REQUEST questions. Without going into details, if *or* corresponds to the union operation of commitment spaces, then (57) can be interpreted as follows:

(58) 〈…, C〉 + REQUEST(ASS(φ) ∨ ASS(¬φ))

= 〈…, C〉 + {√C} ∪ [C + [S_2: φ] ∪ C + [S_2: ¬φ]]

This leaves two options to the addressee S_2: to assert φ or to assert ¬φ, which are ranked equally. We have, effectively, the same requirement as with the regular polarity question, *Is there a vegetarian restaurant around here?* However, we now have two propositional discourse referents, φ and its negation ψ. Hence, the answer patterns become more difficult: Simple *yes* and *no* do not suffice, we need expanded answers like *yes, there is* or *no, there isn't.*

The two ways to construct polarity questions can be fruitfully applied to differences in the formation of such questions. For example, Chinese A-nonA-questions, which present two options equally and explicitly, can be seen as representing the question type (58), whereas questions marked with the particle *ma* either represent simple polarity questions or declarative questions (cf. Li and Thompson 1981). In German, polarity questions marked with the particle *denn* appear to mark REQUEST polarity questions, as they highlight one option as being of particular interest.

10. Negated Polarity Questions

We now return to the original problem of this article, the interpretation of high negation in polarity questions.

(59) S_1 to S_2: *Isn't there a vegetarian restaurant around here?*

(interpretation with high negation)

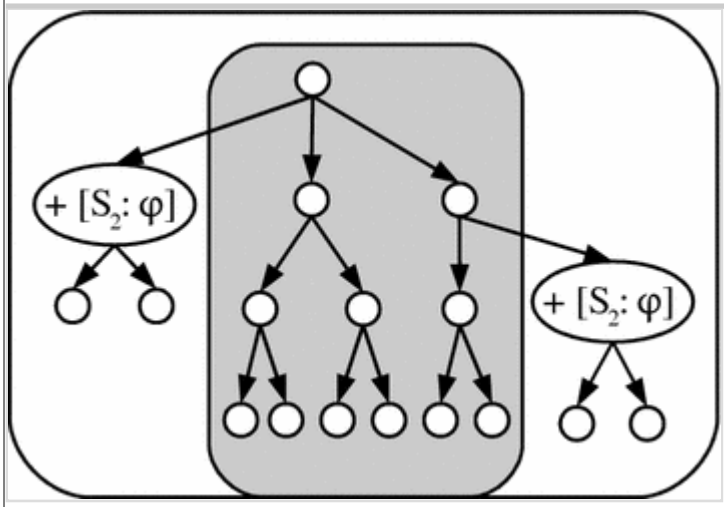
I propose that this is a **request question**, with a **denegation that scopes over the assertion operator**. This captures the high position of negation: The negation phrase actually embeds the force phrase of assertion. I assume the following structure:

(60) [$_{ForceP}$ *REQUEST* [$_{NegP}$ *is*$_i$*-n't* [$_{ForceP}$ *ASS* [$_{TP}$ *there* e_i *a vegetarian restaurant here*]]]]

Here, negation is a speech act operator, meaning that the NegP in this case has the same type of interpretation as the ForceP. I propose the following interpretation for (59); cf. (14) for the interpretation of denegation, and Fig. 17 for illustration.

Fig. 17

Isn't there a vegetarian Restaurant? Denegation of Assertion



(61) ⟨…, C⟩ + $REQUEST_{S1,S2}$(~ ASS(φ)),

where φ = 'there is a vegetarian restaurant around here'

= ⟨…, C⟩ + ~ $ASS_{S2,S1}$(φ)

= ⟨…, C, C — {c | ∃c′[c′ + [S_2: φ] ⊆ c}⟩, abbreviated as Γ.

Negated polarity questions can also be uttered with incredulity contour, indicating that S_1 proposes a challenge to S_2 with the imposition to denegate the assertion of φ:

(62) S_1 to S_2: *Isn't there a vegetarian restaurant around here?!*

⟨…, C⟩ + I-$REQUEST_{S1,S2}$(ASS(φ))

= ⟨…, C⟩ + ~ $ASS_{S2,S1}$(φ)

= ⟨…, C⟩ + ~ [S_2: φ]

With questions like (59) and (62), S_1 asks S_2 whether S_2 would exclude the assertion of φ, where in (62) S_1 considers this as a challenge to S_2. Such questions can be rejected, as usual, with *I don't know.* They can also be answered with *yes* and *no*. These answers do not give rise to potential ambiguities as with polarity questions with propositional negation, as illustrated in (51). This is predicted, as in the case of polarity questions with high

negation, only one propositional discourse referent can be introduced, namely φ. This is because negation is interpreted at the speech act level, which does not result in a second proposition. See the analysis in (63) and the illustrations in Figs. 18 and 19.

Fig. 18

S_1: *Isn't there a vegetarian restaurant here?* S_2: *Yes, there is*

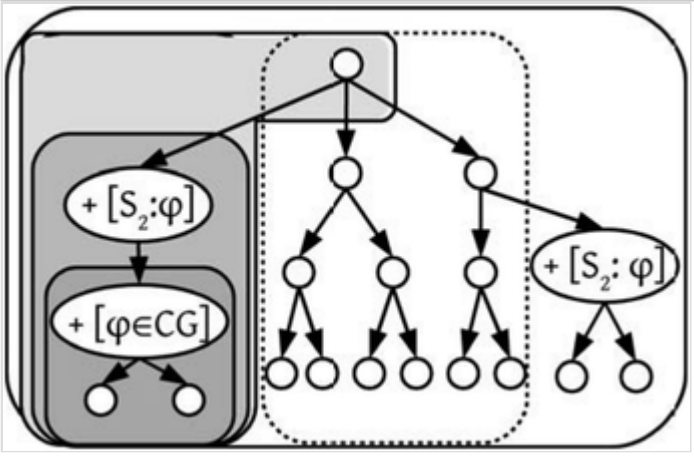
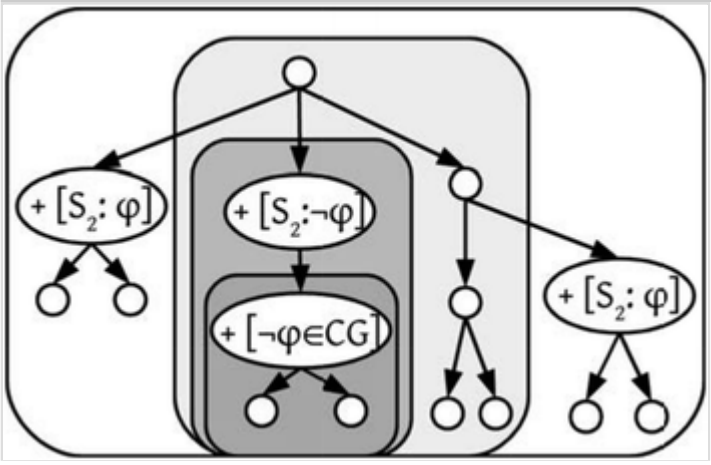


Fig. 19

S_1: *Isn't there a vegetarian restaurant here?* S_2: *No, there isn't*



(63) S_1 to S_2: *Isn't there a vegetarian restaurant around here?*

(interpretation with high negation).

Introduces propositional discourse referent\

φ = 'there is a vegetarian restaurant around here'

a. *Yes (there is).*

Γ + REJECT + [S_2: φ] + [φ ∈ CG]

b. *No (there isn't).*

$\Gamma + [S_2: \neg\varphi] + [\neg\varphi \in CG]$

The answer *Yes (there is)* requires a reject operation because it cannot be interpreted directly at Γ, as the last commitment space has excluded S_2's assertion of φ. In contrast, the answer *No* (*there isn't*) is a regular move after a negated polarity question, as it does not require REJECT to be interpreted. One might ask why an arbitrary assertion by S_2, like *It is raining*, is not possible here; after all, it could be interpreted at the commitment state after the negated polarity question. The reason is that S_1 imposed a restriction for future moves of S_2 that S_2 either has to accept or to reject. An arbitrary assertion like *It is raining* does not count as an acceptance, as it would be compatible with later assertions of φ. The only way to exclude later assertions of φ is to assert the negation of φ.

Notice that qualified answers are possible, like *Yes, I think so, but I'm not sure*, yet a simple answer like *yes* will be an unqualified positive answer. This is in contrast to Romero and Han (2004), who assume that such an answer indicates strong evidence, and Repp (2013), who assumes that the answer would indicate weak evidence—see discussion of (9) above. There are two ways to model such qualified answers: Either by allowing high negation to exclude all kinds of modified assertions of φ; an answer like *Yes, I think so* would then pick out one of the excluded conversational moves. Or by assuming that such modified answers remain within the options presented by the person that asked the negated polarity question. At the current point, I will not go further into such evidentially modified answers.

Romero (pers. comm.) pointed out a potential problem with the analysis of negated polarity questions as denegations. It seems like a question like *Don't you promise to come?* should be analyzed as a request to denegate a promise to come. A possible reaction to that is *Correct.* However, it appears to be odd for the addressee to react to a negated polarity question like (63) with *Correct*, meaning that the addressee indeed excludes that assertion. This can be explained, however, as the overall intention of the speaker is to ask for confirmation for the proposition, and a reaction like *correct* would naturally support the speaker. In the case of negation into questions with incredulity contour, the reaction *Correct* would indeed state that the addressee is excluding the assertion, and thus it is willing to go along with the addressee.

One question that arises at this point is why high negation only arises when REQUEST is expressed syntactically, triggering interrogative syntax. The reason is that in case REQUEST is realized just by prosody, as in (49) and (50), there is no syntactic node at which negation can be expressed. Hence, a question like *There isn't a vegetarian restaurant around here?* can only be interpreted with narrow, propositional negation. Also, if we assume that REQUEST can be interpreted in syntax, triggering AUX movement just like the regular question operator QU,

For completeness, it should be mentioned here that negated polarity questions can be based on a sentence radical that is itself negated. This is evident if the latter negation is expressed by a negative determiner, like *no*. Consider the following example, which can be derived in a regular way, as REQUEST(~ASS(¬'there is a vegetarian restaurant there')). Notice that the first negation is denegation, whereas the second is propositional negation.

(64) *We can't suggest to go out to Fifth Street to our vegetarian friends.*

Isn't there no vegetarian restaurant there?

Let us now consider how, under the current theory, negated polarity questions get the bias they are reported to have. According to Büring and Gunlogson (2000), they do **not occur in a context that is biased to a positive answer**. This is illustrated with the following example, where negated polarity questions are compared with other question types that were discussed in this article.

(65) S_2: *There are all kinds of restaurants in this town, it won't be difficult to find something nice to eat out.*

a. S_1: *Is there a vegetarian restaurant here?*

b. S_1: *There is a vegetarian restaurant here?*

c. S_1: #*There is no vegetarian restaurant here?*

d. S_1: #*Is there no vegetarian restaurant here?*

e. S_1: #*Isn't there a vegetarian restaurant here?*

f. S_1: *Isn't there no vegetarian restaurant here?*

The negated polarity question (e) is odd here because from the context we cannot infer a reason for S_1 to find out whether S_2 would exclude the assertion of φ, that there is a vegetarian restaurant. S_2 had made it clear that presumably, there is one. Simple polarity questions (a) and positive declarative questions (b) are possible. I would like to argue that the simple polarity question (a) actually is based on REQUEST, just like the declarative question (b), and hence is a monopolar question. This question is good in the context given because it suggests that there is a good possibility that φ, and the question REQUEST(ASS(φ)) is biased toward a positive answer: This is the option that the speaker presents to the addressee as the only regular continuation, whereas all other continuations require a prior REJECT operation. With these questions, S_1 double-checks if the context is indeed such that φ follows. Interestingly, the negated polarity question with negated sentence radical (f), though quite complex, is good as well. This is as predicted: Just as the

context allows for S_1 to double-check whether φ is assertable, it allows to double-check whether the assertion of ¬φ can be excluded.

Another observation by Büring and Gunlogson (2000) is that negated polarity questions do occur in a **neutral context** in which there is an interest in a positive answer. The following example gives again the fuller paradigm:

(66) S_1: *Remember, we were once at Mooswood restaurant, and we liked it a lot.*

a. *Is there a vegetarian restaurant in this town?*

b. #*There is a vegetarian restaurant in this town?*

c. #*There is no vegetarian restaurant in this town?*

d. *Is there no vegetarian restaurant in this town?*

e. *Isn't there a vegetarian restaurant in this town?*

f. #*Isn't there no vegetarian restaurant in this town?*

Here, (a) can be understood as a regular polarity question, suggesting both options φ and ¬φ equally, which is predicted to be fine, given that the context is neutral with respect to the issue whether there is vegetarian restaurant in this town or not. For the same reason, (b) and (c) are bad because they select, for no good reason, the assertion of φ or the assertion of ¬φ over the other. According to Büring and Gunlogson, the negated polarity question (e) is good in this case, where it is crucial that there is an expressed interest in the positive answer, φ. This can be explained if the speaker wants to check whether, under the neutral context, φ is an option to be considered. The rhetorical strategy behind this move is to appeal to the addressee to exclude certain options in order to find a solution, here the best restaurant choice. The negated polarity question, though complex, might be preferable to the standard polarity question (a), as that question suggests a sole interest in the issue whether φ or ¬φ. Answers (d) and (e) appear to be quite good in the given context as well. I assume that (d), like (c), is a REQUEST question, which asks the speaker to assert ¬φ. The strategy behind that is the same as with the negated polarity question (e), namely to check whether the option φ is to be considered. In contrast to (e), it does so by checking whether the addressee would assert ¬φ. The negated polarity question based on a negated sentence radical (f) is odd in this context. It would express an interest to exclude the option φ, but in the given context, this is not a "positive" option. However, it should be stressed that examples can be found where such sentences work fine, as they present a "positive" option:

(67) S_1: *The police still* *According to the evidence,* S_2: *Doesn't Miller have*

don't know much about this murder case.	*Jones, Miller, and Smith could have done it.*	*no proper alibi for the time of the murder?*

Büring and Gunlogson (2000) finally observe that negated polarity questions occur in contexts with a **negative bias** towards a positive answer. Again, we consider the larger paradigm of answers here:

(68) S_2: *As you don't eat meat, we can't go out in this town.*

a. S_1: #*Is there a vegetarian restaurant here?*

b. S_1: #*There is a vegetarian restaurant here?*

c. S_1: *There is no vegetarian restaurant here?*

d. S_1: *Is there no vegetarian restaurant here?*

e. S_1: *Isn't there a vegetarian restaurant here?*

f. S_1: #*Isn't there no vegetarian restaurant here?*

The context creates here a strong bias toward ¬φ, as it entails that φ is unlikely. This is not compatible with question (a) under its regular polarity reading, as this presents the proposition φ, ¬φ equally. The REQUEST reading of (a) and the declarative question in (b) should be even worse, as they are biased toward the unlikely answer φ. In contrast, the declarative question in (c) and the REQUEST reading of the polarity question with negated sentence radical (d) are fine: The speaker S_1 double-checks whether the answer φ indeed is to be excluded. For the same reason, the negated polarity question (e) is fine. The negated polarity question based on ¬φ is predictably bad, because in the context biased toward ¬φ there is no obvious reason to check whether the speaker would exclude an assertion of ¬φ. It is remarkable that in all the good questions of (68), there is a strong tendency toward a realization with the incredulity contour (which should be marked by?*!*). This can be easily explained: The typical context in which double-checking that φ indeed is to be excluded is when S_1 has information that runs contrary to the bias that S_2 suggests, and hence S_1's questions will typically be challenges of S_2.

AQ1

11. Conclusion

In this paper, I have presented a way how to interpret polarity questions with outer negation, as *Isn't there a vegetarian restaurant around here (too)?* I have argued that they

are based on a REQUEST operation that asks the addressee to perform a certain speech act. In the case of negated polarity question, this speech act is a meta speech act: the denegation of the speech act *There is a vegetarian restaurant around here* (*too*). I have argued that the observed biases of such negated polarity questions follow from this assumption.

I have presented a theory for speech acts, especially for assertions and their denegation, and for questions. I have argued that in addition to the regular question based on the illocutionary operator QU, questions can also be based on the REQUEST operator. We find REQUEST in the case of biased questions, that is, with declarative questions like *There is a vegetarian restaurant around here?*, but also with polarity questions in certain contexts, and in particular with polarity questions with negated sentence radical, as in *There is no vegetarian restaurant around here?*

I have also presented a theory about the sometimes puzzling ways how speakers can react to assertions and answer polarity questions with *yes* and *no*. For one thing, I argued that we have to distinguish between the mere acceptance or rejection of assertions and reactions by *yes* and *no* that has signal independent evidence. Furthermore, I proposed that *yes* and *no* pick up propositional discourse referents introduced by assertions or questions. The various ways how *yes* and *no* can be used could be explained, under the assumption that when the sentence radical is negated, it introduces two discourse referents, one for the positive clause, and one for its negation.
AQ2

The work presented here is preliminary in many respects. While I tried to be explicit about the underlying model of conversational game, which is based on the notion of commitment states, commitment spaces, and commitment space sequences, I glossed over the syntactic representation of speech acts. Also, I did not deal with other kinds of question bias, as with negative polarity items or the use of question tags. This, and other applications of the underlying framework of modeling conversation, has to wait for other occasions.
AQ3

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[1] The current paper was finished in 2012, and could not take into account two recent publications on the topic, AnderBois (2011) and Sudo (2013).