

Lecture 11 (Week 12): Semantics and Pragmatics of Questions

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Main Readings: (all on your CD)

(Roberts 1996b) On focus and information structure, and questions and answers, and their role in regulating discourse coherence. Read Section 1, pp 1-27, especially the parts about questions. A good readable introduction to the semantics of questions, though not exactly identical to any of the ‘classics’.

(Potts 2006) On deriving the speech-act properties of questions and answers from pragmatic principles

(van Rooy 2003a) The context-dependence of the semantics of questions; deriving relevance with tools from decision theory.

(Karttunen 1977) – one of the classics, and beautifully written. Beautiful arguments for why to separate the semantics of questions from the pragmatics of questioning. Uses attention to different contexts in which embedded questions appear to work out what compositional contribution of embedded questions should be.

Additional readings: (all on your CD)

(Groenendijk and Stokhof 1984) -- This is their joint dissertation, a foundation of most later work in this area

(Groenendijk and Stokhof 1989) – A shorter and more recent article, but hard to read without background on type-shifting and generalized conjunction. Includes a nice summary of the complementary advantages of the two main theories of semantics of questions, and a proposal for a theory that unites the best of both.

1. Questions: Syntax, semantics, pragmatics – terminology and classification

We need to begin by distinguishing **syntactic, semantic, and pragmatic** notions of **question**. Different authors choose different terminology for distinguishing among them, not always the same. When we want to be very explicit, we could use **(syntactic) question-form, (semantic) question-content, and (pragmatic) questioning/answering speech acts**.

Groenendijk and Stokhof (1989), for example, use “Interrogative” to denote a class of syntactic forms (*Who killed Bill? Does Harry love Sally? whether it will rain today, ...*) and “Question” to denote the semantic content of an interrogative expression. They don’t suggest a different term for the pragmatic speech act of asking a question. Other authors make other choices.

In the syntax of questions, which we won’t study separately, there are usually two key morphemes that are posited: an abstract morpheme “Q”, somewhere in the complementizer position, that marks something as a syntactic question-form (possibly realized in some languages as a morpheme like Russian *li* or Chinese *ma*, and/or licensing interrogative word-order or

intonation), and a *wh*- morpheme that forms *wh*-words like *who*, *what*, *where*, *when*, *how*, used in so-called WH-questions. (In Romance languages, it's *qu-*, in Slavic it seems to be something like *k-*; the term *wh*- is often used as an abstract name of this morpheme, leaving the details of its morphophonemics to be spelled out in each language.)

What we'll focus on are the semantics and pragmatics of questions and questioning. In some of the earliest work on the interpretation of questions, semantics and pragmatics were not clearly distinguished, and it was assumed that the interpretation of a question like "Where is Susan?" is something that may be paraphrased as "I ask you to tell me where Susan is", or "I ask you to tell me the place X such that Susan is at X". But starting in the 1970's, and especially clearly in Karttunen (1977), it was pointed out that compositionality requires an account of the semantics of questions that will work not only for a direct question like (1), but also for the contribution of embedded questions as in (2) to the meaning of the larger sentences in which they are contained, and embedded questions normally do NOT include any "I ask you ..." in their meanings.

- (1) Where is Susan now?
- (2)
 - a. Mary knows where Susan is now.
 - b. Mary is wondering where Susan is now.
 - c. Where Susan is now depends on what time it is.

In Section 2 below we'll look at this and other data that a good theory should account for, adding additional data as we discuss some of the competing theories that exist. We'll start in Section 3 with some of the classic theories that gave explicit compositional semantic analyses of questions together with relatively informal accounts of the pragmatics of questioning and answering. Then in Section 4 we'll look at more recent work that makes the pragmatics more explicit as well, in some cases suggesting new views of what's in the semantics and what's in the pragmatics. It's an active and open field!

2. Some key data that need to be accounted for by a good theory

2.1. Questions and their answers

Among the most basic data are our intuitions about what kinds of answers are asked for with different kinds of questions. We have intuitions about what question-answer pairs are well-formed or "felicitous", and intuitions about what the conditions are for a true answer. We also have some intuitions about what constitutes a "true and complete" answer, although these intuitions are not always quite so clear.

2.1.1. Alternative questions

- (3) Is John going with you or will you go alone?

Alternative questions present two or more propositions among which the answer should select. A felicitous answer to question (3) is either *John is going with me* or *I will go alone*.

Their standard embedded form uses *whether ... or ...*, although it is not uncommon to encounter a second *whether* (sometimes regarded as non-standard, but quite common.)

- (4) I need to know whether John is going with you or (whether) you will go alone.

2.1.2. Yes-no questions

- (5) Is your mother at home?

The standard answer to a Yes-no question like (5) is *yes* or *no*. What are these words? They are often viewed as elliptical or anaphoric.

Yes apparently stands for a repetition of the proposition that corresponds directly to the question – its corresponding declarative form. Syntactically that's usually derivable from the same underlying form without the Q morpheme, though there can be complications: not every yes-no question can be straightforwardly transformed into a declarative and vice-versa. (*Did anyone say anything?* **Anyone said anything.* For the reverse problem, consider various complex sentences such as *Unless he has his GPS device with him, he may have gotten lost.* But let's ignore those interesting problems.)

No seems similarly to stand for the negation of the corresponding declarative, though there are complications we won't discuss in cases where the question itself is in negative form (cf. French contrasts between *si* and *oui*; the existence of *si* makes a 'non' answer to a negative question unambiguous in French (I think). There is no unambiguous one-word answer to a negative question in English.)

So most linguists regard Yes-no questions as a species of alternative questions; see, for instance (Stockwell et al. 1973), which argued for that conclusion both from English-internal evidence and from the syntax of Chinese ("Is not-is your mother at home?"). And semantically, the two possible answers are normally considered to be two full propositions that are negations of one another: *Your mother is at home, your mother is not at home.*

The embedded form of a *yes-no* question in English may be expressed with *whether* or with *if*, mostly in free variation. (*whether* is slightly more formal.)

- (6) a. It was unclear whether /if her mother was at home.
b. I asked him whether /if he would help us.
c. Whether/*if we can go tonight depends on what time the train leaves.

Yes-no questions, direct or embedded, may have an added "or not", which makes them explicit alternative questions. (Whether plain yes-no questions are also alternative questions is a theoretical issue; we'll assume yes.)

- (7) a. Is John going with you or not?
b. I don't yet know if/whether John is going with me or not.

2.1.3. WH-questions

- (8) a. What did John buy?
b. Which book did John buy?
c. Who brought the chocolate?
d. Who brought chocolate?

Wh-questions raise many interesting issues. With respect to the question-answer relation, one part is clear but several parts aren't. What's clear is that somewhere in the analysis there will be a variable corresponding to the *wh*-word; but what operator binds it varies with different theories, as we'll see in Section 3.

Short answers vs. propositional answers

What is a well-formed answer to question (8a)? Well, there are "short answers", like *War and Peace*, and there are "propositional answers", like *John bought War and Peace*. In a sense these are equivalent, and one may be regarded as elliptical for the other. But as we'll see in Section 3, Hamblin and Karttunen take propositional answers as the basis for the semantics of *wh*-questions, while Hausser takes the short answers as the literal answers and analyzes the

semantics of questions quite differently.

“Mention-all” answers vs. “mention-some” answers

An even trickier question arises concerning the notion of “true and complete answers”. It has often been noted that with some questions in some contexts the asker clearly doesn’t want a maximally complete answer. For example, with a question like (9), normally naming one good place will be enough.

(9) Where can I get a cup of coffee?

Is that a separate meaning of the question, or just a pragmatic fact about answers? Is a question like (8d) ambiguous? Or does the answerer just make a “pragmatic” choice between giving a complete answer or a partial answer, depending on what he thinks the asker is interested in – is the asker making a list, or just looking for some chocolate? There have been debates about this. Probably the dominant view has been that the question is semantically unambiguous, but at the pragmatic level there is a choice to be made as to whether a complete answer is wanted. Van Rooy (2003) is a recent example of someone arguing for putting the distinction into the semantics itself, but without making (8d) straightforwardly ambiguous.

Note that some questions, like (8b,c) seem inherently to call for a single answer, in which case there wouldn’t be any “mention-some”/“mention-all” pragmatic ambiguity, while others like (8a,d) do seem to have such a pragmatic ambiguity. The difference can be seen to correspond to whether the “question variable” *x* is presupposed or implicated to have multiple different values that would make the corresponding proposition true. Most of the theories we will look at have ways of capturing this difference.

2.1.4. Multiple WH-questions and questions with quantifiers

- (10) a. Who bought what?
b. Who bought each of these books?

There are lots of issues with such questions to keep semanticists busy, but let’s skip them today!

2.1.5. Identity questions

- (11) Who is Mohammed Ali?

Possible kinds of answers: is the question itself “ambiguous”, or not? (van Rooy 2003a)

- (12) a. Mohammed Ali is Cassius Clay.
b. Mohammed Ali is the heavyweight boxing champion of the seventies.
c. Mohammed Ali is that man over there [pointing].

Questions like these raise a pile of interesting issues, but we will just stay away from them. The philosophical literature has a lot about “knowing who”. (In fact it’s the study of epistemology – the nature of knowledge – that is responsible for a good part of philosophers’ interest in the semantics of questions. Hintikka was one of the pioneers in the study of questions, and also one of the pioneers in the analytic philosophical study of knowledge and belief.)

I’ll just mention that some of the puzzles about questions like (11), and associated embedded questions as in *Mary knows who Mohammed Ali is*, reflect puzzles about the semantics of “NP is NP” sentences themselves; both are topics of quite a lot of very interesting semantic research.

2.2. Embedded questions

Karttunen (1977) made a great advance in the study of questions by emphasizing the importance of studying all the different kinds of constructions that involve embedded questions as an important means for identifying the semantic contribution of the questions themselves. As

Karttunen notes, some proposals work well for direct questions and for questions embedded under ‘ask’; others work well for questions embedded under ‘know’ but not under ‘wonder’, etc. So it’s important to look at the full spectrum of embedding constructions, figure out their semantics, and then in a sense “solve for the meaning of the question” – what invariant meaning can provide what’s needed for all those different constructions?

Here is Karttunen’s (1977) (non-exhaustive) list of kinds of embedding verbs and adjectives.

- (13)
- a. verbs of retaining knowledge: *know, be aware, recall, remember, forget*
 - b. verbs of acquiring knowledge: *learn, notice, find out, discover*
 - c. verbs of communication: *tell, show, indicate, inform, disclose*
 - d. decision verbs: *decide, determine, specify, agree on, control*
 - e. verbs of conjecture: *guess, predict, bet on, estimate*
 - f. opinion verbs: *be certain about, have an idea about, be convinced about*
 - g. inquisitive verbs: *ask, wonder, investigate, be interested in*
 - h. verbs of relevance: *matter, be relevant, be important, care, be significant*
 - i. verbs of dependency: *depend on, be related to, have an influence on, be a function of, make a difference to* (These take two embedded questions as arguments.)

2.3. Conjunctions of questions, entailments of questions

Groenendijk and Stokhof (1989) use some quite subtle intuitions about conjunctions and disjunctions of questions to impose additional criteria that a good theory should meet. One simple but important point about conjoinability, made by many researchers, is that it is perfectly normal to have conjunctions of Yes-no questions and WH-questions, both as direct questions and in embedded contexts of all sorts.

- (14)
- a. How many nights are you staying and do you need a room with a bath?
 - b. I wondered how old he was and whether he was married.

This fact is used to argue that Yes-no questions and WH-questions should be assigned the same semantic type (as they are by Hamblin, Karttunen, Groenendijk and Stokhof, but not by Hausser), since a general principle of conjunction is that the conjuncts must be of the same type. But then there is a problem with the fact that sometimes declaratives and questions can be conjoined, and no-one assigns them the same semantic type; so there must be some additional mechanism (perhaps “conjunction of speech acts”, a sort of “pragmatic conjunction”).

- (15)
- a. We’re happy tonight but will you still love me tomorrow?
 - b. It’s time for the first session to begin, and where is the session chair?

Groenendijk and Stokhof (1989) also introduce a notion of entailment between questions: Question Q1 entails questions Q2 if every true and complete answer to Q1 determines a true and complete answer to Q2. So for instance, “Who solved the problem?” entails “Did John solve the problem?”, and the conjoined questions in (14) entail each of their conjuncts.

Their analysis of conjunction and disjunction of questions and of entailment between questions gives them a basis for arguing for a slightly more complex theory of the semantics of questions which manages to capture the best of the two main competing theories – we’ll mention it briefly below.

3. Theories of the semantics of questions

3.1. Hintikka: knowing whether/who and knowing that

Hintikka (1976) gave a game-theoretical analysis to indirect questions like those in (16a) and (17a), treating them as equivalent to the sentences (16b, 17b).

- (16) a. John remembers whether it is raining.
b. If it is raining, then John remembers that it is raining, and if it is not raining, then John remembers that it is not raining.
- (17) a. John remembers who came.
b. Any person is such that if he came, then John remembers that he came.

Hintikka provides a compositional analysis that delivers this result, and which has the advantage that the verb *remember* has the same meaning whether it combines with an embedded question or an embedded declarative. But Karttunen (1977) uses his list of embedding constructions to show that Hintikka's analysis does not generalize to the full range of cases. There are in fact quite a few constructions for which such paraphrases either do not exist or do not give the right meaning correspondences, including examples with *wonder* (**wonder that ...*), and the verbs of asking, and most significantly with the *depend on* constructions, which cannot be rescued by any sort of semantic decomposition as might be possible for the other verbs.

I would add that Karttunen's own analysis, and other later analyses, can account for the mutual entailment between (16a) and (16b), and likewise between (17a) and (17b), without trying to derive one from anything like the other.

3.2. Hamblin: questions denote sets of possible answers

Hamblin (1973) was the first to suggest letting a question denote a set of propositions. Hamblin proposed that analysis for direct questions, whereas Karttunen (see below) adopted that idea for embedded questions, adding something more for direct questions. And Hamblin let a question denote the set of all its **possible** answers, whereas Karttunen argued that there were advantages to letting it denote the set of all its **true** answers, especially considering the semantics of the predicates in the *depend on* class, where it's simplest to be able to say, in effect that “the true answers to Q1” depends on “the true answers to Q2”; that wouldn't work so easily for “possible answers”. Hamblin's sets of ‘all possible answers’ was brought back into service in another role as “Hamblin alternative sets” in the analysis of indefinites by Kratzer and Shimoyama (2002); their work was extended and applied to Russian in (Yanovich 2005, 2006).

3.3. Karttunen: questions denote sets of true answers

Karttunen (1977) analyzes a question as denoting, in each possible world (or possible situation) “the set of propositions which in that situation jointly constitute a complete and true answer to the question. The denotation of *whether John walks* in a given situation, is a set whose only member is either the proposition that John walks or the proposition that John doesn't walk, depending on which of these happens to be the true one. The denotation of *who walks* is the set of true propositions expressed by sentences of the form “x walks”.”

Informally:

- (18) [[whether John left]] = {John left, John didn't leave}
(19) [[who solved the problem]] = {John solved the problem, Mary solved the problem, ...}
(20) [[whether Ede wants coffee or tea]] = {Ede wants coffee, Ede wants tea}

Karttunen suggests analyzing direct questions as involving a covert performative verb, and in effect equivalent to “I ask you to tell me α ”, where α is the corresponding indirect question. So a direct question like (8a) *What did John buy?* is analyzed as if it were *I ask you to tell me what John bought*. As Potts has recently emphasized, a good theory of pragmatics should make it unnecessary to posit such covert structure in the syntax or the semantics.

Karttunen argues (footnote 4) that indirect questions do not have any “mention-some”/“mention all” ambiguity, but are always interpreted as involving complete and exhaustive answers. His evidence is the contradictoriness of a sentence like (21).

(21) #John remembers who came although he doesn't remember that Mary came.

This may be disputable, though, in light of examples like (22).

(22) #John knows where you can get a good cup of coffee, although he doesn't know that you can (also/actually/even) get a good cup of coffee right down on the eighth floor.

So Karttunen makes the semantics of questions uniformly give the set of *all* true answers, and appeals to pragmatics treat “mention-some” examples as instances of “partial answers”, something we need to allow for pragmatically in any case. As Potts (2006) discusses, the combined pragmatic constraints of quality and relevance often force us to give partial answers when we don't have enough information to give a true complete answer. And Karttunen is treating “mention-some” answers as analogous to other partial answers. Van Rooy (see below) later argued that some of this should be in the semantics.

But overall, Karttunen's analysis was very successful and very influential, and the methodological points that he pioneered have continued to prove their usefulness. The moral of his work is “to figure out the meaning of some expression, look at all the ways it can be combined with other expressions, and use that to work out what its compositional contribution must be.”

3.4. Hausser: questions as lambda-abstracts

Hausser (Hausser and Zaefferer 1979, Hausser 1983) is one of the prime examples of the “categorical approach” to the meaning of questions. Hausser takes the short answer as primary, and designs his semantics so that the question denotes a function, a corresponding answer denotes a possible argument for that function, and if and only if the answer is a true one, applying that question meaning to that answer meaning will result in a true proposition (which will correspond to the meaning of the “long answer”).

(23) a. Who solved the problem? John.

b. [[Who solved the problem?]] = λx [solved (x, the problem)]

c. λx [solved (x, the problem)] (j) \equiv solved (j, the problem)

Question (short ans) = Function (argument)

So on Hausser's analysis, the *wh*-word acts like a lambda operator on the corresponding variable. (Sometimes people with similar analyses posit a ‘question operator’, sometimes written “?”: $?x$ [solved (x, the problem)].)

The type for question (23) on Hausser's analysis is $\langle e, t \rangle$ -- in fact it's the same type (and the very same semantics) as for a relative clause, which it syntactically resembles. But a question with two *wh*-words will have a different type, because each one will be lambda-abstracted: the type for (10a) *Who bought what?* will be $\langle e, \langle e, t \rangle \rangle$. In general, a question with *n* WH-words will denote an *n*-place relation. A yes-no question, with 0 question words, denotes a 0-place

relation, which is just a proposition. (There are technical details about how to make the 0-place work: one version is to switch function-argument order, and make Yes and No the function taking the proposition as argument. Then they can be of type $\langle t, t \rangle$: Yes is the identity function and No is the negation function.)

Advantages: Question-answer relation is very directly modeled. Getting from the form of the question to its interpretation is very straightforward. Similarity of WH-questions and relative clauses is captured nicely.

Disadvantage, the biggest one: Different kinds of questions are of different types. So (a) the question-embedding verbs have to have a whole set of different meanings, to be able to take complements of all these different types, and (b) the natural conjoinability of questions of different types is unaccounted for and in fact quite hard to account for.

4. The interplay of pragmatics and semantics in the interpretation of questions and of answers

4.1. Groenendijk and Stokhof: a type-shifting approach with partitions and more

Groenendijk and Stokhof have a whole series of works on questions; the first several joint articles are collected in their dissertation (Groenendijk and Stokhof 1984), and this was followed by more work (Groenendijk and Stokhof 1989, 1992, 1997). Two of their big themes have been (i) separating the semantics of questions from the pragmatics of answers, and (ii) arguing for an enriched semantics of questions that takes intensionality seriously and makes a closer link between the semantic content of questions and the semantics of definite NPs.

One of their main ideas is that in order to capture both the close link between questions and answers of a categorial theory like Hausser's and the uniform typing of a propositional theory like Karttunen's, it's better to treat the semantics of questions as providing a partition of the set of possible worlds into subsets of worlds where the answer to the question is the same.

Answering a question then involves indicating which cell in the partition contains the actual world. Giving a partial answer to a question involves narrowing things down, eliminating at least some of the cells of the partition, without necessarily narrowing it down to just one cell.

We need an example. This one is from G&S (1989), pp. 442-3 in Portner and Partee, eds., (Portner and Partee 2002). (Note – the entire contents of this book are on your CD, in djvu form: you can download the free djvu reader – for instance from <http://djvu-reader.ru/> .)

(24) Who walks?

If our model has exactly 3 individuals, *j*, *b*, and *m*, then there are 8 different possible complete answers, because there are 8 subsets of the set of individuals. These 8 different possible answers divide up the set of all possible worlds into a partition of 8 subsets. (Review: what's a partition?)

All the possible worlds within a given cell of the partition may differ from each other in all sorts of other ways, but they are all alike with respect to the "subject matter of the question", i.e. with respect to who walks. We can picture the partition as follows; I'm not indicating the possible worlds themselves, just the partition – each row contains a subset of the possible worlds.

Table 1:

no one walks
j is the one who walks
b is the one who walks
m is the one who walks
j and b are the ones who walk
j and m are the ones who walk
b and m are the ones who walk
everyone walks (j, b, and m walk)

Note: we wrote “j is the one who walks”, etc., rather than just “j walks”, to indicate that each cell of the partition specifies a complete and exhaustive answer to the question.

Groenendijk and Stokhof’s “partition semantics” for questions then assigns the following meaning to the question in (24).

$$(25) \quad \lambda w \lambda w' [\lambda x [\text{walk}(w)(x)] = \lambda x [\text{walk}(w')(x)]]$$

To help show how that works, suppose we evaluate the question at the actual world w_0 . Applying the formula above to w_0 , we get:

$$(26) \quad \lambda w' [\lambda x [\text{walk}(w_0)(x)] = \lambda x [\text{walk}(w')(x)]]$$

This gets us a proposition – a set of possible worlds – namely the proposition that says that the ones who walk are the ones who walk in the actual world. If in the actual world, John and Mary walk and no one else, then this proposition is the proposition that the ones who walk are John and Mary.

The partition semantics has something in common with both the propositional semantics and the categorial semantics of questions. You can see the lambda-expression from the categorial approach “inside” formula (25): it provides the “subject matter” of the question. But the whole formula (25) is of the type “relation between worlds” (an equivalence relation, hence a partition), and all questions can be of the same type. The partition approach also reconciles the difference between Karttunen and Hamblin – they make use of both the set of all possible complete answers and the true complete answers in their semantics.

In G&S (1989) they provide additional possible types for questions, in the spirit of (Partee 1986), along with general type-shifting principles, arguing that in different contexts one needs different types, but that the question meanings in the different types are all systematically connected and derivable. Thus they can be said to have captured what is best about both the categorial and the propositional approaches, and have improved on both.

4.2. Roberts: the role of questions and answers in discourse coherence

We discussed this a bit last week. I won’t say anything more here, but I just mention that Roberts’ work has been influential in clarifying the interrelations among the semantics and pragmatics of questions, the semantics of focus, and the principles that govern coherent discourse. She has made good use of the similarity between the sets of alternatives evoked by focus and the sets of alternatives involved in questions and their answers. Relevant works include Roberts (1995, 1996a, 1996b, 2004, in preparation).

4.3. Van Rooy: beyond Roberts: Goals affect interpretation of questions

Van Rooy (2003a) has a different idea about the semantics-pragmatics division of labor in considering the semantics of questions and the pragmatics of answers. He is interested in the context-dependence of the interpretation of questions. The context-dependence of appropriate answers is not so controversial – many have suggested that context is the main thing that determines whether one should “mention some” or “mention all”, and whether a partial or a complete answer is appropriate. But van Rooy goes further and argues that the content of a question itself is context-dependent, using evidence not from question-answer pairs but from examining embedded questions in the context *John knows* _____. Van Rooy argues that the “mention-one”/ “mention-all” ambiguity extends into embedded questions, and hence isn’t just a matter of pragmatics.

(27) Gennaro probably knows where you can buy an Italian newspaper in Cambridge.

He concludes from this that we have to give up the assumption behind the partition-based “mention-all” semantics for questions of G&S that in each possible world there is just one “resolving answer”.

And even in cases where there might be just one answer, context may be needed to appropriately determine what that answer should be. Van Rooy gives a pair of related scenarios to illustrate that if Jill knows that she is in Helsinki, she may or may not be truly said to know where she is.

(28) a. Context: Jill about to step off a plane in Helsinki. (van Rooy 2003, p.4)

Flight attendant: Do you know where you are?

Jill: Helsinki.

b. Flight attendant: Ah ok. Jill knows where she is.

(29) a. Context: Jill about to step out of a taxi in Helsinki.

Driver: Do you know where you are?

Jill: Helsinki.

b. Driver: Oh dear. Jill doesn’t (really) know where she is.

His own proposal is to provide an **underspecified** uniform meaning for questions, augmented by a mechanism for further specifying the meaning *in the given context*, taking into account factors including the presumed *goals* of the information exchange. For example, if person A asks where he can buy an Italian newspaper, it may be relevant that he is trying to decide whether to walk to the museum or to the station; in that case a “resolving answer” would be one that specifies whether there’s a place to buy an Italian newspaper on the way to the museum, on the way to the station, or both. If there is one, then mentioning other places far away from either would be providing irrelevant extra information. In answering a direct question, this can all be considered purely pragmatics, and would be compatible with a G&S partition semantics; but if the same things apply in embedded question – *The hotel concierge will know where you can buy an Italian newspaper*, for instance – then it can be argued that pragmatic factors intrude even into the semantics. This is a controversial stance, but similar claims have been made elsewhere, for instance from quite early on by Ruth Kempson (Kempson et al. 1997).

He accepts many aspects of Roberts’ picture of how question-answer exchanges, explicit and implicit, structure the discourse, but goes a step further, arguing there too that our interpretation of those question-answer exchanges itself depends on our understanding of the *goals* of the conversational participants. (Roberts would probably recast that in terms of “higher-order questions”, which she uses anyway, for instance to distinguish between a normal informational exchange and a teacher-student “quiz” context, where there is a higher order question “How much does the student know?” at work, which has a big impact on the usual pragmatic requirement to make your response informative, i.e. not to tell your addressee something they

already know.) He does this by bringing in considerations of information theory, and quantitative measures corresponding to informativeness and probability of truth of a proposition relative to a person's information state. I will illustrate these notions in Potts's version in the next section.

4.4. Potts: on deriving the pragmatics of asking and answering

One of the most interesting things in Potts's short paper (Potts 2006) is the way he derives all the parts of the "I want you to tell me ..." 'content' of direct questions directly from Gricean principles without any stipulations in the syntax, semantics, or conventional implicatures. Work that he draws on includes defining "relevance" in terms of "the immediate question under discussion" (Roberts 1996b, 2004, van Rooy 2003a). He also shows that a well-articulated general pragmatic theory can make correct predictions about where partial answers are preferred over complete answers.

Some of the notions he uses are somewhat technical (as is the case with van Rooy); I will provide oversimplified approximations to try to convey some of the intuitions behind them. You should consult the actual paper for the full details.

The first thing he wants to capture is the speech-act part of direct questions, often represented as in (30).

(30) "Speaker S wants addressee A to make it common ground ...".

So for a direct question like (5) *Is your mother at home?*, the speaker wants the addressee to tell him either that her mother is at home or that her mother is not at home, whichever is true. All formal semanticists agree that (30) should not be part of the semantic content of a question, but it is frequently assumed that something like that needs to be given ("stipulated") as the pragmatic content of the speech act of asking a question. Potts wants to see whether he can do it without any stipulation. That's a very interesting challenge. Let's see how he does it.

Step one: from propositions to probabilities.

His first step is to draw on the insight that there we can move from propositions to probability distributions, following ideas of Merin (1997) and more recently van Rooy (van Rooy 2003b). We're accustomed to modeling a proposition as a set of possible worlds: the possible worlds in which it is true, i.e. has value 1. Instead of assigning to a proposition just the value 0 or 1 at each possible world we could use probability distributions to assign values in the interval [0,1]. With such a conceptual shift, we can say much more about the maxims of quality, quantity, and relevance.

Quality. Suppose each context comes with a *Quality Threshold*, a real number in the interval [0,1]. (Typically .9, say, but in some contexts it may be lower or higher.) Then the maxim of quality becomes, roughly:

(31) **Quality with thresholds:** An utterance U by speaker S in context C satisfies quality iff its quality rating (the probability of its truth for speaker S in C) is above the quality threshold for C.

Quantity. "Be as informative as is required". "As is required" will be relevance. Informativity involves making a guess about what your hearer already knows; so you should tell him relevant things which have *low* probability in (what you take to be) his current state. I won't try to replicate Pott's formula, but just call his Quantity Rating $QR_C(U)$, and remember that it depends on the context C and the information state of the addressee A in U.

(32) **Quantity rating:** $QR_C(U)$

Relevance. Potts follows Roberts and van Rooy in taking relevance to be *relevance to a question*. He assumes the partition semantics of Groenendijk and Stokhof for the semantic

content of questions. Answering a question involves picking out part or whole of one or more of the partition cells in the question content. The more complete an answer is, the closer it comes to picking out exactly one cell, and the more relevant it is.

Following van Rooy, Potts defines an “Answer value” for a proposition based on this partition semantics; a smaller number is a more relevant answer. I omit details.

In order to work out the desired relevance ranking, he sorts the space of utterances first by quality, then by quantity, and then by their Answer value ordering (low numbers most relevant.)

Felicitous utterances. “The above considerations define a procedure for arriving at a set of felicitous utterances for each stage in a discourse:

(33) **Felicitous utterances**

The set of felicitous utterances in a context *C* is obtained as follows:

- i. From the set of all propositions, eliminate those that have quality ratings at or below the quality threshold for *C*.
- ii. With the resulting set, determine relevance rankings and throw out all utterances without such rankings. (That is, throw out every utterance that is not among the least informative members of its Ans-equivalence class.)
- iii. From the resulting set of relevance-ranked utterances, extract the utterances with the lowest Ans values.
- iv. From the resulting set, select the utterances with the highest quantity ratings. These are the felicitous utterances for *C*.” Potts (2006, p.7)

The steps are ordered, as Grice imagined. Quality has primacy, then relevance (which includes attention to quality and quantity), then quantity enters directly.

In Section 3 of his paper, Potts shows how that algorithm can be used to derive all of the parts of “S wants A to make it part of the common ground that ...”.

In Section 4, he shows how to treat German ‘matrix verb-final interrogatives’, which express wondering about a question rather than asking it; the construction itself presumably has a meaning that includes something like “I wonder that”.

In Section 5, he gives a cute example to show how partial answers work – the example is all about the question “Which city does Barbara live in?”, and shows what happens if the answerer knows that Barbara lives in Moscow or in St Petersburg but doesn’t know which, and shows how under his algorithm, “Barbara lives in Russia” will be the best answer: it will narrow things down as far as quality permits. (That’s in a little model in which Moscow and St Petersburg are the only cities in Russia, and there are also two German cities in the model. Of course in a bigger model, the best answer would be “Barbara lives in Moscow or St Petersburg.”)

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