Quantifying into Question Acts

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1. Quantifiers in Questions

Quantified NPs in questions lead to three distinct interpretations that can be recognized in their congruent answers. Assume a potlatch party with three guests, Al, Bill and Carl. Question (1) is asked. The **narrow-scope** reading of (1) requires answers like (2a), the **functional** reading, answers like (2b), and the **pair-list** reading, answers like (2c).

(1) Which dish did every guest make?

(2) a. (Every guest made) pasta.
b. (Every guest made) his favorite dish.
c. Al (made) the pasta; Bill, the salad; and Carl, the pudding.

Evidence that these are indeed three distinct readings of the question comes from the fact that in certain cases, one or two of the answers are ruled out. First, in certain syntactic configurations pair-list readings appear to be absent. This is the case, for example, if the quantified NP occupies the object position. Witness the following contrast:

(3) Which person did every male guest like?
a. Doris.
b. His partner at table.
c. Al (liked) Doris; Bill, Erika; and Carl, Francis.

(4) Which person liked every male guest?

a. Doris.

b. #His partner at table.

c. #Al was liked by Doris; Bill, by Erika; and Carl, by Francis.

c′. #Doris liked Al; Erika, Bill; and Francis, Carl.

Second, many quantifiers do not allow for pair-list readings:

(5) Which dish did most/several/a few/no guests make?

a. Pasta.

b. Their favorite dish.

c. #Al the pasta, and Bill the salad.

The following example shows the same point with a quantifier that triggers singular agreement. To be realistic, assume that there are 26 guests, and (c) lists 24 of them.

(6) Which dish did nearly every guest make?

a. Pasta.

b. His favorite dish.

c. #Al, the pasta; Bill, the salad; … and Xavier, the pumpkin soup.

I take this to be evidence that we indeed have to distinguish between three different readings of questions with quantifiers.

This article will concentrate on pair-list readings. I will start with an overview of previous treatments of such readings, and their problems. Then I will propose a new theory of such readings that analyzes them as **conjoined question acts**. This will explain the quantifier restriction we have observed with (5) and (6). I will also argue that the wide-scope quantifier has to be **topical**, which explains the contrast between (3c) and (4c,d) and a number of other observations, among them the absence of the pair-list interpretation with stressed quantifier:

(7) Which person did évery male guest like?

a. Doris.

b. His partner at table.

c. #Al (liked) Doris; Bill, Erika; and Carl, Francis.

I will also attend to embedded questions and explain why they sometimes exhibit a different behavior:

(8) Doris knows which dish most guests made.

a. (Doris knows that most guests made pasta.)

b. (Doris knows that most guests made their favorite dish.)

c. (Doris knows that Al made the pasta and Bill made the salad.)

The readings are indicated here by possible models, described in parentheses. Notice that (8c) is possible; it corresponds to the reading 'For most guests x, Doris knows which dish x made.'

2. Approaches to Pair-List readings

There are three major approaches to pair-list interpretations, as discussed in the recent overviews of Szabolcsi (1997a) and Pafel (1999). In this section I will discuss them and point out a number of problems.

2.1 Quantifiying into Questions

The pair-list reading of a question like (1) seems to involve **quantifying into a question**, as the following paraphrase suggests:

(9) Which dish did every guest make? (on pair-list interpretation)

‘For every guest x: Which dish did x make?’

But it is difficult to make sense of this paraphrase in a semantic theory of questions. The first who that tried to do so was Karttunen (1977). Karttunen’s theory of question is based on Hamblin (1973). According to Hamblin, the meaning of a question is the set of the meanings of its congruent answers; for Karttunen, it is the set of the meanings of its congruent true answers.

(10) Which dish did Bill make?

λp x[DISH(x) (p) p = [MADE(x)(BILL)]]

If we want to express the paraphrase in (9) in Hamblin’s or Karttunen’s question semantics, we run into a problem. It certainly cannot be (11a), which is ill-formed, as the expression following “→” is not of the truth value type *t*. It also cannot be (11b), which is fine as far as the types go but gives us the wrong reading: Only if every guest made the same dish does (11b) describe a non-empty set of propositions. This may be a way to represent the narrow-scope reading, but certainly not the pair-list reading, which rather invites models in which every guest made a different dish.

(11) a. * y[GUEST(y) → λp x[DISH(x) p p = [MADE(x)(y)]]

b. #λp y[GUEST(y) → x[DISH(x) p p = [MADE(x)(y)]]

In view of this problem, Karttunen proposes that root questions are embedded by a silent speech act verb, following the performative analysis of Ross (1970). This creates an expression of type *t* that satisfies the requirements of the quantifier.

(12) a. Which dish did every guest make?

'For every guest y, I ask you which dish y made.'

b. $y[\textsc{guest}(y) \rightarrow \textsc{ask}(\textsc{i}, \textsc{you}, \lambda p\ \ x[\textsc{dish}(x) \quad p \quad p = \ [\textsc{made}(x)(y)]]])]$

My own proposal will be inspired by this proposal. However, in the form that Karttunen presents it to us, it has a number of problems. First of all, it inherits the problems of the performative analysis (cf. Levinson (1983), pp. 247-263). To mention just one: A question like *Which dish did Al make?*, analyzed as *I ask you which dish did Al make?*, would necessarily be true, just like other performative sentences. While there may be ways to make sense of this (cf. e.g. Lewis (1970)), it is certainly a strange quirk of the theory that questions should be assigned truth values that never play any role. Second, and more to the point, it is unclear how the quantifier restriction observed in (5) and (6) could be explained. Why is it that only universal quantifiers can outscope the silent speech act verb? Notice that the following formula is just fine:

(13) $\textsc{most}(\textsc{guests})(\lambda y[\textsc{ask}(\textsc{i}, \textsc{you}, \lambda p\ \ x[\textsc{dish}(x) \quad p \quad p = \ [\textsc{made}(x)(y)]]])])$

'For most guests y: I ask you which dish y made.'

2.2 Special Interpretation of Quantifiers in Questions

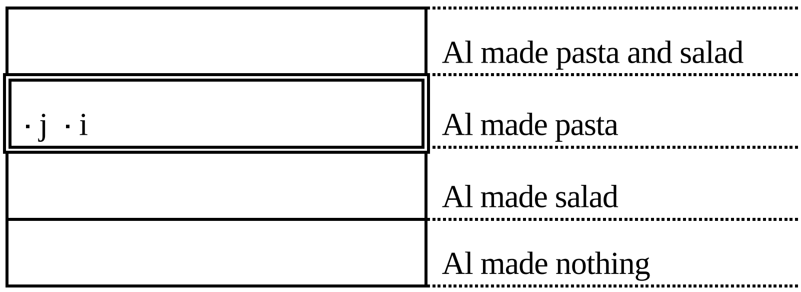
The theory of Groenendijk & Stokhof (1984, (1989) is similar to Hamblin's or Karttunen's, insofar questions denote sets of possible worlds. But it differs insofar they denote sets of equivalence classes (partitions) of the set of possible worlds. More precisely, a question denotes an equivalence relation between possible worlds that corresponds to a partition. Example:

(14) Which dish did Al make?

$\lambda j \lambda i[\lambda x[\text{DISH}(i)(x) \quad \text{MADE}(i)(x)(\text{BILL})] = \lambda x[\text{DISH}(j)(x) \quad \text{MADE}(j)(x)(\text{AL})]]$

This is a relation between possible worlds j and i that obtains iff the dishes that Bill made in i are the dishes that Bill made in j. This equivalence relation corresponds to a partition of possible worlds into disjoint sets such that for all possible worlds within one set, Al made the same dishes. For example, if there are two dishes, pasta and salad, then (14) would contain the following 4 cells (I have illustrated two worlds j, i that stand in the equivalence relation, and I have highlighted one equivalence class):

(15)



The way how the equivalence relations are construed enables us to represent quantification into questions in the fashion of (11a), but this time without any type conflict:

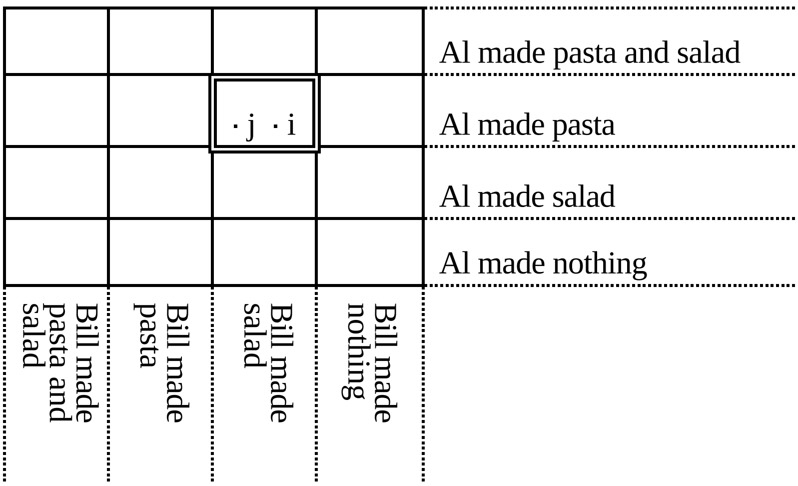
(16) Which dish did every guest make?

$\lambda j \lambda i \quad y[\text{GUEST}(j)(y) \rightarrow$

$\lambda x[\text{DISH}(i)(x) \quad \text{MADE}(i)(x)(y)] = \lambda x[\text{DISH}(j)(x) \quad \text{MADE}(j)(x)(y)]]$

This relation between possible worlds j and i obtains iff for every guest x (in j), the dishes that x made in i are the dishes that x made in j. In terms of partitions, this corresponds to the set of disjoint sets of possible worlds such that for every guest x, the dishes that x made in those worlds are the same. If there is more than one guest in the model, this will result in a more fine-grained partition than the one induced by (15); this reflects that (16) is a more specific question than (14). In particular, we will get the intersection of all the partitions of the question meanings *Which dish did x make?*, where x varies over guests. With two dishes and two guests we have $4 \times 4 = 16$ells, as indicated on the left side of (17) (ignoring world knowledge that dishes are typically made by one person):

(17)



Groenendijk & Stokhof argue that this solution, as it stands, has one drawback: It does not work for non-universal quantifiers. Try quantifying an existential NP into a question:

(18) Which dish did two guests make?

$\lambda j \lambda i \quad {}_2 y[\textsc{guest}(j)(y)$

$\lambda x[\textsc{dish}(i)(x) \quad \textsc{made}(i)(x)(y)] = \lambda x[\textsc{dish}(j)(x) \quad \textsc{made}(j)(x)(y)]]$

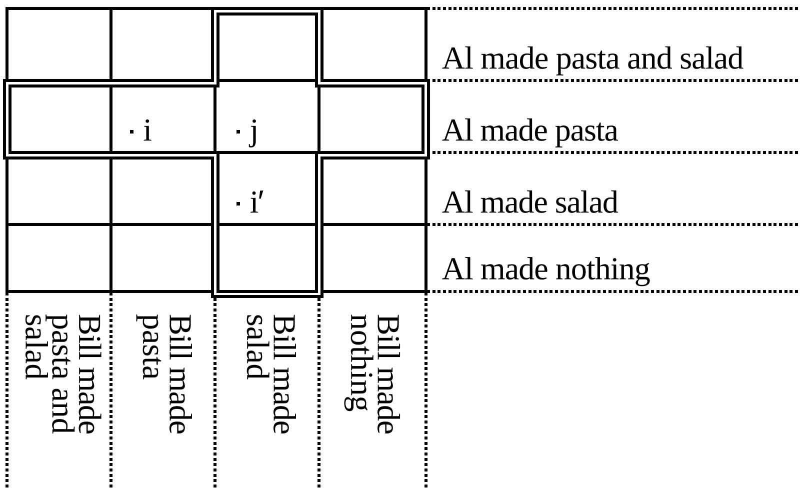
This relation holds between worlds j and i iff there are two guests y′, y″ (in j) such that the dishes that y′ made in i are the same as the ones that y′ made in j, and the dishes that y″ made in i are the same as the ones that y″ made in j. It is an equivalence relation in case there are exactly two guests in the model, but not otherwise. To see this, consider the simpler case (19) in a model with two guests.

(19) Which dish did a guest make?

$$\lambda j \lambda i \ \ y[\text{GUEST}(j)(y)$$
$$\lambda x[\text{DISH}(i)(x) \quad \text{MADE}(i)(x)(y)] = \lambda x[\text{DISH}(j)(x) \quad \text{MADE}(j)(x)(y)]]$$

Consider the following diagram. The worlds j and i stand in the relation (19), and so do j and i′, but i and i′ don't. Hence it is not an equivalence relation (it is not transitive), and we don't get a partition (some cells overlap).

(20)



We may consider it a welcome feature of Groenendijk & Stokhof's representation of questions that we get an equivalence relation, and hence a question, only in case the quantifier that scopes over a question is a universal one. This would explain the quantifier restriction we have observed with examples like (5) and (6). But Groenendijk & Stokhof observe no grammaticality difference between these questions, and hence they have to account for why questions like (18) are possible. The reading that is available for such questions they call **choice reading**; it can be paraphrased as follows:

(21) Which dish did two guests make?

‘Pick out two guests, and tell me which dish did each of them made.’

Notice that the embedded question in the paraphrase contains a universal quantifier, which distributes over the two guests that were picked out. That is, for any choice of two guests, we get a regular question meaning. Hence we could represent the meaning of (21) as a set of simple question meanings (where i_0 is the actual world):

(22) $\lambda Q\ \ z\ \ z'[\textsc{guest}(i_0)(z)\quad \textsc{guest}(i_0)(z')$

$Q = \lambda j \lambda i\ \ y[y\quad \{z, z'\} \rightarrow$

$\lambda x[\textsc{dish}(i)(x)\quad \textsc{made}(i)(x)(y)] = \lambda x[\textsc{dish}(j)(x)\quad \textsc{made}(j)(x)(y)]]]$

Once we have proposed sets of equivalence classes of possible worlds as the meaning of questions with some quantifiers, this should be generalized to the meaning of questions with all quantifiers. For universal quantifiers, the following appears to be a plausible candidate:

(23) Which dish did every guest make?

$\lambda Q\ \ y[\textsc{guest}(i_0)(y) \rightarrow$

$Q = \lambda j \lambda i[\lambda x[\textsc{dish}(i)(x)\quad \textsc{made}(i)(x)(y)] = \lambda x[\textsc{dish}(j)(x)\quad \textsc{made}(j)(x)(y)]]]$

However, this is not the right solution, as it gives us a non-empty set only if every guest made the same dish. Groenendijk & Stokhof rather propose that quantifiers in questions supply

witness sets (cf. Barwise & Cooper (1981)), and that we quantify question-internally over all the elements of the witness set. The universal quantifier *every guest* has as its only witness set the set of all guests; the quantifier *two guests* has as its witness sets all sets consisting of two guests.

(24) Which dish did two guests / every guest make?

‘Pick out two guests / every guest, and tell me which dish each of them made.’

$\lambda Q \quad W[W$ is a witness set of ⟦*two guests*⟧ / ⟦*every guest*⟧

$\quad Q = \lambda j \lambda i \quad y[y \quad W \rightarrow$

$\quad\quad \lambda x[\textsc{dish}(i)(x) \quad \textsc{made}(i)(x)(y)] = \lambda x[\textsc{dish}(j)(x) \quad \textsc{made}(j)(x)(y)]]]$

This leads to the expected result. In the case of *every guest*, the question predicate (24) will apply to a single simple question meaning only; in the case of *two guests*, the question predicate will usually apply to more than one question meaning. It is also predicted that questions with negative quantifiers are out, on the pair-list reading:

(25) *Which dish did no guest make?

The reason is that the witness set of *no guest* is the empty set, which doesn’t give us a suitably restricted question.

The format illustrated in (24) is not the final one that Groenendijk & Stokhof propose. They try to capture a parallel between questions with quantifiers like (1) and multiple *wh*-questions like (26), which indeed have a prominent reading in which they ask for a pair-list answer as well (the so-called **matching question** reading, cf. e.g. Comorovski (1996)).

(26) A: Which guest made which dish?

B: Al (made) the pasta; Bill, the salad; and Carl, the pudding.

In matching questions the second *wh*-element expresses a restriction of a variable just as the first one does. If we want to treat cases with quantification into questions, we arrive at interpretations like (27):

(27) Which dish did two guests / every guest make?

$\lambda Q\quad W[W \text{ is a witness set of } [\![\textit{two guests}]\!] \,/\, [\![\textit{every guest}]\!]$

$Q = \lambda j \lambda i[\lambda y \lambda x[\textsc{dish}(i)(x) \quad W(y) \quad \textsc{made}(i)(x)(y)]$

$= \lambda y \lambda x[\textsc{dish}(j)(x) \quad W(y) \quad \textsc{made}(j)(x)(y)]]]$

One problem with assigning this meaning to questions with quantifiers is that it does not account for the different roles of the *wh*-element and the quantifier. It is unclear, for example, why (4) appears not to have the pair-list interpretation. There is a problem with this analysis meant for matching questions, too: the meanings of (28a,b) come out the same, even though their answers are different, as argued in the literature on matching questions (e.g., Kuno (1982), Bolinger (1978), Comorovski (1996)).

(28) a. A: Which guest made which dish?
B: Al (made) the pasta; Bill, the salad; and Carl, the pudding.

b. A: Which dish did which guest make?
B: The pasta, Al made; the salad, Bill; and the pudding, Carl.

Another problem that the approaches illustrated by (24) and (27) share is that quantifiers are interpreted in a special way, namely, as involving witness sets.

But we should note that Groenendijk & Stokhof could explain the difference in acceptability with quantification into questions that relate to the nature of the quantifier. Only universal quantifiers naturally lead to an equivalence relation on the set of possible worlds (or a singleton set of simple question meanings); questions with universal quantifiers, then, are inherently simpler than questions with other quantifiers.

2.3 Pair-List Questions as Functional Questions

Engdahl (1985) has developed an analysis of pair-list interpretations in which they are not analyzed as involving quantification into questions, but rather as questions that ask for a **function** – that is, in the same way as functional readings. Engdahl's analysis has been further explored and refined by Chierchia (1993).

Functional readings are analyzed as involving quantification over a function. In Hamblin's framework, this amounts to the analysis given in (29). The answer then specifies that function, e.g. by *his favorite dish*, which maps male individuals to their favorite dish, cf. (30a). This is an intensional specification of a function. A pair-list answer is just one way of giving a function, namely extensionally, by a set of pairs, cf. (30b).

(29) Which dish did every guest make?

$\lambda p\ \ f[\text{range}(f) = \text{DISH}\quad p = {}^\wedge\ \ y[\text{GUEST}(y) \rightarrow \text{MADE}(f(y))(y)]]$

'Which f (a function to dishes) is such that every guest y made f(y)?'

(30) a. His favorite dish.

$f = \lambda x[\text{THE FAVORITE DISH OF } x]$

b. Al the pasta, Bill the salad, and Carl the pudding.

$f = \{\ \text{AL, PASTA}\ ,\ \ \text{BILL, SALAD}\ ,\ \ \text{CARL, PUDDISHNG}\ \}$

Crucially, quantification over a function f enables us to treat pair-list interpretations as involving a narrow-scope quantifier. Of course, this is why such Skolem functions were proposed originally; they generally allow us to replace wide-scope universals, as in x y[R(x,y)], by narrow-scope ones, as in f x[R(x,f(x))].

Chierchia argues that this analysis can explain why (4) is bad under both the functional interpretation and the pair-list interpretation. It leads to a Weak Crossover violation, which he interprets as involving a configuration in which a quantifier over a variable x first binds a function applied to x, and then x itself. I illustrate two standard cases of weak crossover violation in (31) and (32), and the violation in functional / pair-list readings in (33).

(31) *Which guest$_1$ does his$_1$ mother love?

‘For which guest x: mother(x) loves x?’

(32) *His$_1$ mother loves every guest$_1$.

‘For every guest x, mother(x) loves x.’

(33) Which guest made every dish?

*‘For which f (a function to guests): for every dish x, f(x) made x.’

But there are a number of problems with this analysis (cf. also Beghelli 1997). First, quantifiers based on the determiner *each* allow for pair-list readings, cf. (34), but they lead to violations in standard Weak Crossover configurations, cf. (35).

(34) Q: Which guest made each dish?

A: The pasta was made by Al; the salad, by Bill; and the pudding, by Carl.

(35) *His$_1$ mother loves each person$_1$.

Furthermore, many quantifiers allow for functional readings but not for pair-list readings (cf. Liu (1990)). Recall that this was a reason why we distinguished between pair-list readings and functional readings in the first place.

(36) Q: Which dish did most guests make?

A: Their favorite dish.

(37) Q: Which dish did no guest make?

A: His least favorite dish.

Chierchia does not identify pair-list readings with functional readings. He assumes that the two are distinguished in their logical form. In pair-list-readings, the *wh*-question and the quantifier undergo **absorption** into one complex question constituent that is then answered by an extensionally given function. They are similar to matching questions, as analyzed by Higginbotham & May (1981).

(38) Which dish did every guest make?

a. LF, functional reading: $[_{CP}$ Which $dish_2$ $[_{IP}$ every $guest_1$ $[_{IP}$ t_1 made $t_2(t_1)]]]$

b. LF, pair-list reading: $[_{CP}$ [Which $dish_2$ every $guest_1$] $[_{IP}$ t_1 made $t_2(t_1)]]$

The absorbed *wh*-constituent in (38b) denotes a complex question operator that ranges over the domain of the quantifier and the domain of the *wh*-element. The problems with this refinement are: First, it still predicts Weak Crossover violations in cases like (34). Second, it does not explain why we have the quantifier restrictions as in (36) and (37). We could perhaps amend this by saying that the complex question operator is construed not with the domain of the quantifier, but with a witness set, and by pointing out that only universal quantifiers have a unique witness set, hence lead to a unique question. However, this requires, again, a special interpretation of quantifiers.

3. A New Approach: Conjoined Question Acts

3.1 Pair-List Questions as Conjoined Questions

I would like to suggest that pair-list interpretations are to be analyzed as **conjoined questions**. That is, a pair-list question like (39) that uses a quantifier, *every guest*, is short for a conjoined question like (40) (if there are three guests, Al, Bill and Carl), just as *Every guest came* is short for *Al came and Bill came and Carl came*.

(39) Which dish did every guest make?

(40) Which dish did Al make, which dish did Bill make, and which dish did Carl make?

Question (39), in its pair-list reading, allows for the same answer as question (40). As the semantics of questions typically is derived from the semantics of their congruent answers, this constitutes an important argument to identify the meanings of (39) and (40).

Notice, also, that overtly conjoined questions do not easily allow for functional answers. We cannot answer (40) by *His favorite dish*. This may be a matter of the singular pronoun *his*, which cannot have a plural agreement. But the answer *their favorite dish* or *their favorite dishes* does not sound quite appropriate either. The question seems to require an answer that gives, for each mentioned individual, a dish; every other type of answer has the ring of a shortcut to that expected answer. But this type of answer, of course, is the same that the pair-list interpretation of a question with a quantifier expects.

3.2 Conjoined Speech Acts

What are conjoined questions? In the theory of Groenendijk & Stokhof (1984), the conjunction of two questions is the intersection of the partitions induced by these questions, which is again a partition, that is, a proper question. Here I would like to explore the idea that conjoined questions are **conjoined speech acts**, which will lead us to a more general picture, as it applies to other speech acts as well.

I consider speech acts as moves in **conversational games**, in the spirit of Wittgenstein (1958). Speech acts lead from one set of social commitments to another set (e.g., commitments may be added, as with questions and commands, or removed, as when a question is answered or a command is carried out). Let us call such sets of social obligations **conversational states**. I will not try to develop anything like a full-fledged theory of conversational games and conversational states here, as what I have to say is largely independent of how such a project would be carried out. In any case, I take this picture to be a very natural one. It has inspired work in dynamic interpretation for declarative sentences, which were analyzed as context-change potentials (cf. Stalnaker (1974), Heim (1982)). It is also underlying the “algebra of social acts” developed by Merin (1994), which deals with a variety of other speech acts in an automata-theoretic setting.

We assume that conversational games can be described by a set of states, and transitions between those states. If s is the current state in a conversational game, then the performance of an appropriate act A leads to a new state, s′. Of course, not every act will be appropriate for a given state; acts come with presuppositions for the states in which they can be uttered felicitously.

(41) A(s) = s′, if A is appropriate for s; else A(s) is undefined.

Some acts require **corresponding** acts; reference to these corresponding acts is part of their definition. Examples are questions and their corresponding answers, and commands and actions that carry out the commands (which need not be speech acts). I will talk of **initi-**

ating acts and **responding** acts, respectively. The conversational states after initiating acts are characterized by the expected response. For example, if s is a neutral state and Q is a question act, then Q(s) = s′ is a state in which a particular reaction, an answer A, is expected that will lead back to a neutral state.

(42) A(Q(s)) = Q(s′) = s″,

where Q is appropriate for s, and A is appropriate for s′.

Now it appears that speech acts in general can be conjoined. We can conjoin assertions, questions, commands, exclamations, baptisms, curses, and more.

(43)
a. My dog loves chicken soup. And my cat likes chopped liver.
b. Which dish did Al make? And which dish did Bill make?
c. Eat the chicken soup! And drink the hot tea!
d. How beautiful this is! And how peaceful!
e. I hereby baptize you John. And I hereby baptize yóu Mary.
f. You are an idiot! And you are a crook!

The **conjunction** of acts is obviously equivalent to the **consecutive performance** of those acts. Using “&” as the symbol for act conjunction, we can express this as follows:

(44) [A & A′](s) = A′(A(s))

This is the classical rule of conjunction in dynamic interpretation, which dealt with assertions. It can be generalized to other speech acts as well. If A changes the commitments of a discourse state and A′ changes the commitments of a discourse state, then [A & A′] is simply the combination of the changes of the commitments induced by A and by A′.

However, we must pay special attention to initiating and responding acts, such as questions and answers, for we must make clear what the responding act to a conjunction of initiating acts is. Obviously, it is a conjunction of acts that respond to each of the conjuncts of initiating act.

(45) If A(Q(s)) is a valid conversational move,
and if A′(Q′(s′)) is a valid conversational move, where s′ = A(Q(s)),
then [A & A′]([Q & Q′](s)) is a valid conversational move;
it is equivalent to A′(Q′(s′)), i.e. A′(Q′(A(Q(s)))).

We can illustrate this with questions and answers, and commands and actions that carry out commands. The act sequences in (46a,b) and (47a,b) are equivalent:

(46) a. A: Which dish did Al make?
B: The pasta.
A: Which dish did Bill make?
B: The salad.

b. A: Which dish did Al make? And which dish did Bill make?
B: Al (made) the pasta, and Bill the salad.

(47) a. A: Pick up the ball!
B: [Picks up ball.]
A: Throw it to me!
B: [Throws ball to A.]

b. A: Pick up the ball! And, throw it to me!
B: [Picks up the ball and throws ball to A.]

3.3 Disjunction of Speech Acts?

If speech acts can be conjoined, we would expect that they can also be disjoined. (48) is a good candidate for the disjunction of two questions.

(48) Which dish did Al make or which dish did Bill make?

Now, the status of such sentences is unclear. Szabolcsi (1997a) judges them ungrammatical, and consider sentences like (49) as devices to revoke the first question and replace it by the second (*or rather…*). That is, we don't really have a disjunction of questions; the linguistic device that should have this meaning is interpreted differently, as a cancelling operation.

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

But opinions about disjoined questions like (48) vary. Belnap & Steel (1976) assume that questions can be disjoined; they discuss examples like the following one:

(50) Have you ever been to Sweden or have you ever been to Germany?

Without further discussion, they understand it as a disjoined question. My impression is that this is a misanalysis. (50) does not give the addressee the choice of answering one question or the other. If the addressee has been to Sweden and to Germany, but answers *I have been to Sweden,* this is an incomplete answer. It is rather a question that asks whether the addressee has ever been to Sweden or to Germany. It can be answered by *yes* or *no*; an answer like *I have been to Sweden* appears to be an answer that gives more than just the required information (if the addressee has been to Sweden but not to Germany).

Groenendijk & Stokhof (1984) discuss so-called **choice readings** of questions, as in the following example:

(51) Which dish did two guests make?

The underlying idea is that the addressee is supposed to pick out two guests, and then answers the question which dish every one of these boys made. This appears to be a more convincing example. But notice that we could describe it by assuming two independent acts: first, two guests should be picked out, and then, a question with a universal quantifier should be answered. I will come back to this in section (5).

Perhaps disjoined questions indeed exist, but only as a minor type. We do find question disjunction, for example, in exams that require that a qualified subset of questions should be answered. The setting of such questions is fairly complex, and it may be that, even though we may come up with such questions in complex interactions, we cannot express them with simple means. Imagine a geography exam which lists the countries of Africa and states the task that, for more than half of the countries, the capital should be specified. We could express this by (52a), a conjunction of two commands, but not by (b).

(52) a. Here is a list of 20 African countries. (…). Choose at least 11 of them and write down their capitals.

b. Here is a list of 20 African countries. (…) #Which capital do most of them have?

The situation with other types of speech acts is similar. Take commands. The conjoined command (53) can be understood in two ways, as illustrated by the paraphrases (53a) and (b):

(53) Pick up the ball or pick up the racket.

a. ‘Act to make true: You pick up the ball or you pick up the racket’

b. ‘Pick up the ball, or pick up the racket, I don’t know which.’

In (53a), *or* disjoins the underlying proposition and not the commands; hence this is not an example of command disjunction. In (53b), the speaker hasn’t made up his or her mind, and the result is not a command (cf. Merin (1992) on ‘weak’ readings of permission sentences). Neither is a true disjunction of commands.

Consider now baptisms and curses. Clearly, (54) is not a proper baptism, and (55) is not a curse, rather a description.

(54) #I hereby baptize you John, or I hereby baptize yóu Mary.

(55) You are an idiot, or you are a crook!

Assertions turn out to be no different. Disjunction is interpreted as a disjunction of the asserted propositions, not of the acts of assertion:

(56) Al made the pasta, or Bill made the salad.

a. ‘I assert: Al made the pasta or Bill made the salad.’

b. #‘I assert: Al made the pasta, or I assert: Bill made the salad.’

Another case of apparent speech act disjunction that undergoes reinterpretations are examples like the following, which are not disjunctions of a command and an assertions, but commands that are backed up by a threat.

(57) Get out of here or I will call the police.

We conclude that, while coordination is well-defined operation for speech acts, disjunction is not. Syntactic forms that look like disjunction of two speech acts typically are interpreted in special ways, e.g., by lowering the disjunction to the propositional level, or by interpreting it as replacement of the first speech act.

Why are there no natural cases of speech act disjunctions? If we see speech acts as operations that, when applied to a conversational state, deliver the commitments that characterize the resulting conversational state, then we can give the following answer: Speech act disjunction would lead to disjunctive sets of commitments, which are difficult to keep track of. Take commands as an example. Uttering a conjoined command [A & A′](s) leads, in general, to the union of the commitments that A(s) and A′(s) would have led to: A(s)   A(s′). But a disjunction of A and A′ at the state s could only be captured by a set of commitments which we would have to understand disjunctively, {A(s), A(s′)}. This is of a higher type than a simple conversational state, and further disjunctive speech acts would lead to still higher types. Hence, we cannot have speech act disjunction and a uniform type of conversational states, namely sets of commitments, at the same time.

The lack of a disjunction means that acts do not form a Boolean algebra. Of course, acts also lack complement formation or negation, the third Boolean operation. They form a simpler algebraic structure with just one operation, conjunction. Presumably, this operation is associative, that is, we have A&(A′&A″) = (A&A′)&A″. It is also idempotent, that is, A&A = A. It appears that it is not commutative, that is, A&A′ = A′&A does not generally hold. For one thing, there may be anaphoric bindings between elements of A and elements of A′ that are order-sensitive. But it may also be that A′ is conditional on the execution of A, as e.g. in the conjoined command (47b).

3.4 *Restriction for Quantifiers in Questions Explained*

The analysis of pair-list interpretations as conjoined questions, and the analysis of speech act conjunction as involving a semi-lattice at most, and not a full Boolean algebra, immediately explains why only universal quantifiers can scope out of speech acts. The reason is that **universal quantifiers** are **generalized conjunctions**, whereas other quantifiers cannot be reduced to conjunction but require operations like disjunction or negation (cf. Keenan & Faltz (1985)):

(58) a. Every guest came. ⇔ Al came **and** Bill came **and** Carl came.

b. A guest came. ⇔ Al came **or** Bill came **or** Carl came.

c. No guest came. ⇔ **Not**: Al came **or** Bill came **or** Carl came.

d. Most guests came. ⇔ Al came and Bill came, **or**
Al came and Carl came, **or**
Bill came and Carl came.

This explains why we have robust pair-list interpretations only with universal quantifiers – they are the only ones that can be reduced to conjunction.

(59) Which dish did every guest make?

⇔ For every guest x: Which dish did x make?

⇔ Which dish did Al make, which dish did Bill make,
and which dish did Carl make?

(60) #Which dish did most guests make?

⇔ For most guests x: Which dish did x make?

⇔ Which dish did Al make and which dish did Bill make, **or**
which dish did Al make and which dish did Carl make, **or**
which dish did Bill make and which dish did Carl make?

We find the same situation for other speech acts as well. Universal quantifiers, but not others, can scope out of commands, baptisms and curses:

(61) a. Confiscate every book on dinosaurs!

b. #Confiscate most books on dinosaurs!

(62) a. I hereby baptize everyone of you John.

b. #I hereby baptize most of you John.

(63) a. Everyone of you is a crook! (a possible curse)

b. Most of you are crooks! (not a curse, a description).

The explanation of the quantifier restriction proposed here should be reminiscent of the work of Szabolcsi and Zwarts (e.g., Szabolcsi (1992-1993), who explained the restrictions for quantification out of weak islands by the semantic properties that the quantifiers are based on. Take the following example:

(64) a. Which man didn't you invite?

b. *How didn't you behave?

(64a) is possible because the operation of negation is defined for the domain of entities (namely, complementation). (b) is not possible because negation is not defined for manners. In the words of Szabolcsi (1997a), "What range of quantifiers participates in a given phenomenon is suggestive of exactly what that phenomenon consists in". The claim here is that quantification into questions is possible only for universal quantifiers because it consists in conjunction of speech acts.

3.5 Why Conjunction?

One important question at this point is: Why do we call the speech act conjunction & a **conjunction**? The reason is, of course, because we can express it by *and*, which is used for classical Boolean conjunction, . But why is it that the same word can be used for two quite different operations? In intensional propositional logic, is an operation that gives us the intersection of possible worlds, which corresponds to the union of truth conditions. But & gives us the union of context-change potentials on conversational states, and this appears to be something very different.

The reason is that when we **describe** conjoined speech acts, which yields truth-functional expressions, we use Boolean conjunction:

(65) a. A, to B: Which dish did Al make? And, which dish did Bill make?
b. A asked B which dish Al made, and A asked B which dish Bill made.

(66) a. A, to B: Pick up the ball. And, throw it to me.
b. A told B to pick up the ball, and A told B to throw it to A.

The same holds for the use of universal quantifiers. The universally quantified question act (67a) can be described by using a universal quantifier as in (b):

(67) a. A: Which dish did every guest make?
b. For every guest x, A asked which dish x made.

Of course, we can use other Boolean operators to describe situations concerning speech acts, like disjunction, negation or quantifiers not solely based on conjunction:

(68) a. A asked B which dish Al made or A asked B which dish Bill made.

b. A told B to pick up the ball, or A told B to pick up the racket.

c. For most guests x, A asked which dish x made.

d. A didn't ask B which dish Al made.

But these descriptions do not correspond to speech acts in the same way as conjunctive descriptions. In (68a,b), one speech act is described in a disjunctive way; either one description holds of it, or the other. In (c), the quantifier *most guests* also contains a hidden disjunction. And in (d), it is expressed that a certain speech act did not occur.

I have argued that the use of *and* to express speech act conjunction is generalized from the Boolean use of *and* in descriptions of speech acts. This gets us quite close to the performative hypothesis, which analyzed a question like (69a) by a formula that could express a truth or falsity:

(69) a. A, to B: Which dish did Al make?

b. ASK(A, B, Which dish did Al make)

The mistake of the performative hypothesis was to assume that speech acts **are** propositions just because we can **describe** them by propositions. We can, instead, assume that we can describe every speech act, and that linguistic means that serve in the description of speech acts can sometimes also be used to express aspects of the performance of these acts. This has been proposed by Bierwisch (1980) for performative speech acts. We typically use those verbs to perform such acts that would also be used to describe these acts, such as *baptize*:

(70) a. A: I baptize you *John.*

b: A baptized him *John.*

Similarly, speech act adverbials and constructions gain their speech-act modifying meaning by their truth-functional use:

(71) a. A: Quite frankly, I hate broccoli.

b. A said quite frankly that he hates broccoli.

The use of *and* as speech-act conjunction, or of *every guest* as speech-act quantifier, is no different. Its meaning is fixed by its truth-conditional meaning when describing speech acts.

As far as *and* is concerned, this is not the only generalization of the Boolean meaning of *and*. It is well-known that *and* can also be used to denote sum individuals, as in the following example:

(72) Mary and Bill own a boat together.

Arguably, the use of *and* to form sum individuals can be reduced to Boolean *and* in many cases, as in (73).

(73) Mary and Bill are asleep.

⇔ Mary is asleep and Bill is asleep.

This appears to be the reason why sum formation in general can be expressed by Boolean *and*, even in cases where this reduction is not possible, as in (72). We could tell a similar story for *and* in the reading in which it expresses addition, as in *two and two is four.*

4. An Implementation of Speech Act Quantifiers

In this section I will show how the idea of quantification into acts as involving act conjunction can be implemented in a formal system. The problem is that the quantifier, and often also overt conjunction, does not appear where it is supposed to be. Rather, the quantifier or the conjunction are placed in argument positions:

(74) a. Which dish did every guest make?

b. Which dish did Al, Bill and Carl make?

If the conjunction is speech act conjunction, these expressions cannot be interpreted in situ, but have to scope out of the speech act operator. Let us assume the general format due to Stenius (1967), according to which an **illocutionary operator** combines with a **sentence radical** meaning (typically, a proposition) to form a speech act. We want to express this in a type system. Assume the basic types as in (75a) and the general type-formation rule as in (b).

(75) a. Basic types: *e* entities, *t* truth values, *p* (=*st*) propositions, *a* speech acts.

b. Derived types: If τ, σ are types, then (σ)τ is a type (the type of functions from elements of type σ to elements of type τ). If σ is basic, I write στ.

Sentence radicals are not of a uniform type. For assertions or commands, they are arguably propositions, type *p*. The type of illocutionary operators then is *pa* (a function from propositions *pt* to speech acts).

(76) a. It is raining.

ASSERT(RAINING)

pa *p*

a

b. Get up!

COMMAND (GETUP(YOU))

pa *p*

a

The sentence radical of questions cannot be reduced to type *p*. I will assume here the question representation of Hamblin (1973), according to which the sentence radical for questions is a set of propositions, type *pt*. Of course, other representations would be compatible with the general approach outlined here, for example the Structured Meaning approach advocated in von Stechow (1990) and Krifka (2001). With Hamblin-style question representations, the type of the question operator is not *pa*, but (*pt*)*a*, where *pt* is the type of sets of questions.

(77) Which dish did Al make? QUEST (λp x[DISH(x) p = MADE(x)(AL)])

(*pt*)*a* *pt*

a

Speech act coordination is of type *aaa*: It takes two speech acts and yields a speech act. I write τ^{+} for types (τ)(τ)τ.

(78) Which dish did Al make and which dish did Bill make?

a a^{+} *a*

a

In (74a,b), the conjunction is embedded in the expression that denotes the set of propositions. It cannot be interpreted as is, but must be type-lifted. This type lifting is well-known from Boolean conjunction and disjunction, cf. Partee & Rooth (1983) and Keenan & Faltz (1985). In the following example, Boolean conjunction, type p^{+}, is lifted to accommodate quantifiers of type (*ep*)*p*.

(79)	Al	and	Bill	came.		
	e	p^+	e	ep		basic type assignment
	$(ep)p$	$(ep)p^+$	$(ep)p$			type lifting
		$(ep)p$				functional application
			p			

Speech act conjunction can be treated the same way. For simplicity of exposition, I assume LF movement of the conjoined NP; *Quest* stands for the syntactic realization of the interrogative operator.

(80)	[Al	and	Bill]$_1$	λt_1	[*Quest*	(which dish did t_1 make)]	
	e	a^+	e	e	$(pt)a$	pt	
						a	
				ea			basic type assignment
	$(ea)a$	$(ea)a^+$	$(ea)a$				type lifting
		$(ea)a$					functional application
			a				

On the basis of these types we can derive the following interpretation. I use b as variable of type *ea*, and A, A′ as variables of type (*ea*)*a*; the symbol & stands for act conjunction, ie. consecutive performance.

(81) [Al] and Bill]$_1$ λt_1[*Quest* (which dish did t_1 make)]

AL λaλa′[a & a′] BILL

λP[P(AL)] λAλA′λP[A(P) & A′(P)] λP[P(AL)]

λP[P(AL) & P(BILL)] λy[QUEST(λp x[DISH(x) p= MADE(x)(y)])]

QUEST(λp x[DISH(x) p= MADE(x)(AL)]) &

QUEST(λp x[DISH(x) p= MADE(x)(BILL)])

Cases involving a universal quantifier are treated in the same fashion. Let me give here the interpretation of *every guest* as a quantifier that scopes out of speech acts (type (*ea*)*a*). I will write **&A** for the conjunction of all speech acts in a set of speech acts **A**. We get the conjunction of speech acts of the form *Which dish did y make*?, with y varying over guests.

(82) [every guest]$_1$ λt_1[*Quest* (which dish did t_1 make)]

λP[**&**{P(y) | GUEST(y)}] λy[QUEST(λp x[DISH(x) p= MADE(x)(y)])]

&{QUEST(λp x[DISH(x) p= MADE(x)(y)]) | GUEST(x)}

Notice that the only point in which this interpretation of *every guest* differs from the Boolean interpretation of the quantifier is the use of speech-act conjunction, **&**. The Boolean version of this quantifier is based on Boolean conjunction generalized to sets of propositions, λP[{P(y) | GUEST(y)}]. Similarly, *and* as an operation that forms individual sums, , can be generalized to express the meaning of the determiner *all*; the NP *all guests*, which allows for collective interpretations, can be represented as {y | GUEST(y)}, which is of type *e.*

I have assumed here that we can generalize two-place speech-act conjunction & to a conjunction operator **&** that applies to sets of speech acts. Is this justified? It is for Boolean conjunction and sum-formation *and* because these operators are assumed to be associative, commutative and idempotent, that is, the bracketing of elements, their order, and repetitions of the same element do not matter. This is exactly what we have with sets; a set like {a, b, c} does not indicate any internal structure, and it is the same set as, say, {b, a, c} or {a, b, c, a}. With speech act conjunction things may be different, as we have seen; in particular, speech act conjunction is not, in general, commutative (cf. section 3.3). However, even for Boolean *and* and for sum-formation *and* commutativity does not hold, in general:

(83) a. John took off his boots and went to bed.
≠ John went to bed and took off his boots.

b. John and Mary are seven and nine years old, respectively.
≠ Mary and John are seven and nine years old, respectively.

The lack of commutativity appears to be a problem not only for generalized speech act conjunction, but for the standard definitions of Boolean quantifiers and generalized sum formation as well. But this doesn't appear to be a problem. Even though conjunction is not commutative in the general case, universal quantifiers impose commutativity when they are unfolded into conjunctions.

5. Wide-Scope Speech Act Quantifiers as Topics

5.1 Evidence for Topichood

There is evidence that quantifiers that scope out of speech acts must satisfy another requirement, in addition to the one that they be universal: they must **topics**. The evidence for this includes the following observations:

First, we do not find wide scope for quantifiers that are in focus. This is as expected, as the topic cannot be the main focus of a sentence. Example (84a) only has a narrow-scope or a functional reading, not a pair-list reading.

(84) a. Q: Which dish did EVERYONE make?

b. A: Everyone made pasta.

c. A: Everyone made his favorite dish.

a. A: #Al the pasta, Bill the salad, and Carl the pudding.

Second, we have seen that quantifiers in subject position facilitate wide-scope readings, in contrast to object quantifiers (cf. (3) vs. (4)). This can be explained by the fact that subjects are prototypical topics, whereas objects are not (cf. e.g. Chafe (1976)). It is then to be expected that subject quantifiers allow for wide-scope readings more easily than object quantifiers.

Furthermore, it has been observed by Beghelli (1997) that indirect objects allow for wide-scope interpretation more easily than direct objects, as in (85). This reading is, predictably, facilitated if *every guest* is deaccentuated.

(85) Q: Which painting did you show to every guest?

A: To Al, the Picasso, to Bill, the Klee, and to Carl, the Mondrian.

Also, Kim & Larson (1989) noticed that objects of psych verbs allow for wide-scope interpretation, cf.(86).

(86) Q: Which painting impressed every guest most?

A: Al, the Picasso, Bill, the Klee, and Carl, the Hundertwasser.

A plausible explanation for these observations is that indirect objects and the objects of psych verbs are animate, and animate NPs are more likely topical (cf. Comrie (1981) p. 197ff.).

Another asymmetry relates to the nature of the quantificational NP. Even regular direct object NPs can quantify into question acts if they are based on the quantifier *each.* In contrast to NPs based on *every*, these NPs presuppose a given set of entities, and hence are naturally construed as topical (cf. e.g. Lambrecht (1994) p. 155f.).

(87) A: Who made each of these dishes?
B: The pasta, Al made; the salad, Bill; and the pudding, Carl.

NPs based on *each* necessarily refer to a given set of entities. They share this property with topics. We can assume, then, that NPs based on *each* typically are topical, and therefore can scope out of speech acts more easily than NPs based on *every.*

A further observation that can be explained with our assumptions is due to Szabolcsi (1997a). She observes that sentences like (88a) are more easily interpreted as a pair-list question than sentences like (88b).

(88) a. Who / which guests did every dog bite?
b. Which guest/what guest did every dog bite?

Arguably, the *wh*-elements *which guest* and *what guests* presuppose a given set of entities, which is the natural topic of these sentences, at least when contrasted with *who* and *which guests*. Hence *every dog* in (88b) is slightly disfavored as the topical constituent, which means that a reading in which it quantifies into the question act and induces a pair-list interpretation is disfavored. In this paper, I mostly used singular *wh*-phrases like *which dish*; some of the judgements may come out crisper with *wh*-elements like *what.*

5.2 Topics and Speech Acts

If quantifiers indeed can scope out of speech acts, then speech acts need not be islands for movement. At first sight, this appears remarkable: It means that the semantic material of the moved element is interpreted outside of the speech act that is being performed. But there is evidence that such movement out of speech acts is indeed possible:

(89) a. As for Al, which dishes did he make?
   b. The hamburger, please hand it to me.
   c. This guy, he should go to hell!

In (89a), movement is out of question; in (b), out of a command, and in (c), out of a curse. In all these cases, the moved constituent is a topic. I take this as support of the assumption that topics can be interpreted outside of speech acts.

Going one step further, one could argue that topics even *have to* scope out of speech acts. Topic selection is a speech act itself, an initiating speech act that requires a subsequent speech act, like an assertion, question, command, or curse about the entity that was selected. This was suggested, for example, in Jacobs (1984), where topics are assigned illocutionary operators on their own. We can illustrate this schematically in the logical form of expressions, as in (90b):

(90) a. As for Al, which dish did he make?
   b. $\textit{Topic}[\text{Al}]\,\lambda t_1[\textit{Quest}[\text{which dish}_2 \text{ did he}_1 \text{ make } t_2]]$

In this representation, the illocutionary operator *Topic* would select a given entity (here, Al); the comment would be applied to the topic, which, in the case at hand, leads to the question which dish the selected topic entity made.

One potential empirical problem for our analysis is that quantifiers do not allow for the explicit topic constructions illustrated in (89):

(91) a. *As for every guest, which dish did he make?

b. *Each guest, which dish did he make?

It appears that these constructions are restricted to topics that are referring expressions, hence disallow universal quantifiers. This restriction also holds for other kinds of topic markers, like *wa*-phrases in Japanese or NPs that occur in the topic position of Hungarian (cf. Szabolcsi (1997b)).

A potential theoretical problem that is related to the restriction observed in (91) is that the notion of topichood is often explicated in such a way that appears to exclude quantifiers: A topic refers to an entity about which a predication, the comment, is made. How should we then deal with sentences that, as we have argued, have a universal quantifier as a topic? Obviously, the predication cannot be about the quantifier. Rather, the predication is about the element in the restrictor set of the quantifier, and the universal determiner expresses that each element is subjected to the predication expressed in the comment. Hence, the determiner denotes a relation between the topic set and the predication expressed by the comment.

(92) a. Which dish did every guest make?

b. *Topic*[every guest] λt_1[*Quest*[which dish_2 did t_1 make t_2]]

≈ For every x   GUEST:

Topic[x] λt_1[*Quest*[which dish_2 did t_1 make t_2]]

The restriction to universal quantifiers can be deduced, as we have seen, from the fact that the only general operation that is applicable to speech acts is conjunction.

5.3 *Implicit Distributivity with Definite Plural NPs?*

We have seen that conjoined NPs allow for pair-list readings in questions; like universal quantifiers, they can be based on speech act conjunction. We also know that the referents of conjoined NPs can be denoted by definite plural NPs. The question now is, do such NPs support pair-list readings as well, and if so, which mechanism is responsible for it.

(93) a. Which dish did Al, Bill and Carl make?

b. Which dish did the guests make?

There appears to be a difference in these cases; (93b) presupposes that each guest made the same dish, and hence a pair-list answer appears to be odd. (93a), on the other hand, has one reading in which there is no such presupposition, and hence a pair-list answer is fine. This would follow if we assume that NPs can be explicitly conjoined by speech-act conjunction, but that the formation of plural NPs employs formation of sum individuals, which are not related to speech act conjunction.

Sometimes things appear to be different. Pritchett (1990) has argued that pair-list readings are possible with definite plural NPs, cf. (94), and that we do not find the usual subject-object asymmetries as in the cases with universal quantifiers, cf. (95):

(94) A: What did the boys rent last night?

B: John rented ‘Casablanca’ and Bill rented ‘Titanic

(95) A: Who rented these movies last night?

B: ‘Casablanca’ was rented by John, and ‘Titanic’, by Bill.

The answers suggest that both questions have a pair-list interpretation. However, as Krifka (1992) and Srivastav Dayal (1992) have shown, these answers appear to be cooperative answers that give more information than a straight answer would give; see also Beghelli (1997). A straight answer to (94a) would be *The boys rented 'Casablanca' and 'Titanic'*, and a straight answer to (95a) would be *These movies were rented by John and Bill.* Notice that the *wh*-elements in (94) and (95) are neutral with respect to number, and do allow for corresponding plural NPs in the answer. This is not the case in (93b), as *which dish* presupposes that the answer mentions one particular dish. If the guests indeed made more than one dish, then the straight answer would already be infelicitous, and could not be expanded to a more informative cooperative answer. This is the reason why we are less tempted to assume a pair-list interpretation with (93b) than with (94a,b).

The only conceivable way in which (93b) could be assigned a pair-list interpretation is by a silent distributive operator, as in a prominent reading of (96).

(96) The guests got a key and a towel.
'For each guest x: x got a key and a towel.'

This distributive operator is analyzed as an operator that induces a universal quantification over the atomic elements of an individual sum (cf. Link (1983)). This universal quantifier could be understood as a quantifier based on speech act conjunction, which would allow for a pair-list interpretation of questions like (93b). That is, the theory developed here could explain pair-list interpretations of questions with definite plural NPs. If they are indeed lacking, as the evidence suggests, we would have to assume that speech act conjunction has to be expressed overtly.

5.4 *The Nature of Choice Readings*

Let me come back to the so-called choice readings of questions with quantifiers, which seem to be at odds with the thesis proposed here that the quantifiers that scope out of questions must be universals.

Some cases of choice readings can be explained in a similar way as we explained the apparent pair-list readings of questions like (94) and (95). For example, the question (97a) could be answered by (B). But this may well be an over-informative answer; a straightforward answer is given in (B′).

(97) A: What did two boys rent last night?
B: John rented ‘Casablanca’, and Bill, ‘Titanic’.
B′: Two boys rented ‘Casablanca’ and ‘Titanic’.

The crucial feature here is that the NP *two boys* is interpreted with narrow scope; no quantification into the question is necessary.

This argument can be extended to questions with disjoined NPs. Consider the following example:

(98) Where is your father or your mother?

(98) can be fully answered by (*My father or my mother are) in the kitchen*; answers like *My father is in the kitchen* are over-informative answers. This suggests that such questions are not based on disjoined speech acts, but rather questions based on a disjunctive NP that is interpreted with speech act internal scope. Notice that (98) does not exhibit the deaccentuation on *your father or your mother* that is characteristic for bona fide cases of quantification into questions.

6. Embedded Questions

6.1 Wide-Scope Readings in Embedded Questions

We have seen that non-universal quantifiers do not scope over questions, and we have explained this by explaining quantification into questions by speech act conjunction. Now, Szabolcsi (1993) discovered that this does not hold for **embedded** questions; cf. also the discussion in Szabolcsi (1997a). The following examples all have a reading in which the quantifier appears to take wide scope, and the embedded question appears to have a pair-list reading:

(99) a. Doris knows which dish most guests made.
[She knows that Al made the pasta and Bill the salad.]
b. Doris found out which dish three guests made.
c. Doris told Elizabeth which dish several guests made.

However, this only holds for verbs like *know*, *find out* and *tell* that Groenendijk & Stokhof (1984) called **extensional**. These are verbs that also embed *that*-clauses. With **intensional** verbs like *ask, wonder* or *want to find out* (a complex construction that has a meaning similar to *wonder*) we find the same quantifier restrictions as in root questions. That is, there is no pair-list reading with non-universal quantifiers.

(100) a. #Doris wondered which dish most guests made.
[not: She wondered which dish Al made and which dish Bill made.]
b. #Doris asked which dish three guests made.
c. #Doris wants to find out which dish several guests made.

We may be tempted to assume that the pair-list interpretation in cases like (99) originates by scope taking of the quantifier over the matrix predicate, that is, over a Boolean domain for which non-universal quantifiers can be interpreted:

(101) most guests λt_1 [Doris knows [which dish t_1 made]]

We would then have to explain why this movement is blocked in cases like (100), when the embedding verb is intensional. In Krifka (1999) I suggested that intensional verbs embed question acts, and that non-universal quantifiers cannot be extracted from question acts because each position in the cyclic LF movement must be interpretable.

However, the LF movement suggested in (101) is problematic, as it violates syntactic island restrictions. It assumes that *most guests* has moved out of a clause, but such movement is impossible in other cases. Moltmann & Szabolcsi (1994) contrast cases like the following:

(102) a. Some librarian or other found out which book every student borrowed.
b. Some librarian or other found out that every student borrowed *Ulysses.*

Here, (102a) has a reading, 'For every students x, some librarian y found out which book x borrowed', which is consonant with the wide-scope analysis. But (102b) lacks the corresponding reading, 'For every student x, some librarian y found out that x borrowed *Ulysses*'.

Moltmann & Szabolcsi (1994) suggest that the wide-scope effect in cases like (102a) originates in a type-lifting of the entire embedded clause, which consequently takes wide scope over quantifiers in the matrix clause. If the embedded clause has a pair-list reading, then this will result in a reading that is similar to the wide-scope interpretation of the quantifier.

(103) $[_{\text{pair-list}}$which book every student borrowed] λt_1 [some librarian found out t_1]

But then the problem arises why non-universal quantifiers allow for apparent wide-scope readings with extensional verbs (cf. (99)). We have seen that these questions do not admit for pair-list interpretations as root questions; so, from where do these interpretations suddenly appear when the questions are embedded?

6.2 Embedding Question Acts

The solution of the various problems presented in the last section should be found in the systematic meaning differences between the two types of question-embedding verbs.

First, I would like to maintain that intensional question-embedding verbs indeed **embed a question act**, cf. (104a). This explains why they allow for pair-list readings with embedded quantifiers, cf. (104b), but not for pair-list readings with non-universal quantifiers, cf. (104c): They are not defined for question acts, hence cannot be interpreted within the embedded question. They also cannot scope out, as embedded clauses in general are islands for LF movement.

(104) a. Doris wondered [*Quest* [which dish Bill made]].

b. Doris wondered [every guest λt_1[*Quest* [which dish t_1 made]]]

c. *Doris wondered [most guests λt_1[*Quest* [which dish t_1 made]]]

The notion of embedded speech acts may be considered problematic. However, notice that there are *bona fide* cases of embedded speech acts, e.g. direct speech and embedded performatives (cf. Lee (1975)):

(105) a. Doris said: “Al made the pasta.”

b. I regret [that I must inform you [that you are hereby dismissed]].

From a theoretical point, embedded speech acts need not be considered strange creatures either. If we define a speech act as a function from conversational states to conversational states, then it is not strange, in any way, to assume that there are linguistic meanings that operate on such functions. This is no more remarkable than, say, the analysis of embedded *that*-clauses by propositions that capture the truth conditions of a sentence, or, in a dynamic setting, the context-change potential of a sentence (cf. Heim (1992) for a treatment of propositional attitudes in a dynamic setting).

6.3 Embedding True Answers

Now we have to turn to the question why **extensional** verbs allow for non-universal quantifiers. I would like to suggest that extensional question-embedding verbs initiate a systematic meaning shift of the embedded question, from the question act to **the propositions that are true answers to the question act**. The essence of this proposal is not new, of course. That extensional verbs relate to the true answers to a question is the essential insight of Karttunen (1977); he took this to mean that the meaning of a question is the set of all true answers. In the framework of Groenendijk & Stokhof (1984), extensional verbs take the extension of a question denotation, which, again, is its true (and complete) answer.

In the current framework, in which questions are taken to be speech acts, we can assume a type-shifting operator TA that, when applied to a question act, yields the propositions that are true answers to that question. This idea can be carried out in a number of different ways: It may be the **set** of the true answers (cf. (106a)), or the **conjunction** of yjr true answers (cf. (106b)):

(106) a. TA(QuestionAct) = {p | p is a true answer to QuestionAct}

b. TA(QuestionAct) =   {p | p is a true answer to QuestionAct}

One important difference between these two representations relates to their type; it is a set of propositions in (106a), and a simple proposition in (106b). As extensional question-embedding verbs take *that*-clauses as arguments, which are propositions, the latter format is to be preferred.

A third representation, which also gives us propositions, is to assume that TA yields the **sum** of the propositions that are true answers. With   as the sum operator, we can assume that any two propositions p, p′ form a sum p p′, which is also a proposition. The truth conditions of p p′ are the same as the Boolean conjunction p p′, but p p′ cannot be reduced to p p′ — we can ask what the parts of a sum proposition p p′ is, but we cannot ask for the parts of a proposition that we specified as p p′, as this just stands for a set of possible worlds. For example, while we have p p′ = p p′ [p p′], we have p p′ ≠ p p′ [p p′]; the first part of the equation consists of two propositions, and the second one of three. With proposition sums, the true answers of a question can be defined as follows (where $\{p_1, p_2, \dots p_n\} = p_1$ p_2 … p_n):

(106) c. TA(QuestAct) = {p | p is a true answer of QuestAct}

We will see that it is this definition that is the most useful one when it comes to the treatment of embedded questions.

We can assume now that intensional and extensional question-embedding verbs differ in one crucial respect: The former take speech acts as their complement, the latter take propositions. This captures the fact that extensional question-embedding verbs always embed *that*-clauses, in contrast to the intensional ones. In case an extensional verb has a question as a complement, it must be coerced to the right type, and the operator TA provides the shift from question acts to propositions. Using *TA* as the indicator of TA in logical form, for specificity, we have the following representation:

(107) Doris found out [*TA* [*Quest* [which dish Bill made]]]

There is independent evidence for something like this operation. Berman (1989) observed that sentences with extensional question-embedding verbs can be modified by adverbials like *for the most part*, but sentences with intensional question-embedding verbs cannot:

(108) a. Doris fond out, for the most part, what Bill ate.

b. *Doris wondered, for the most part, what Bill ate.

We can explain this by assuming that *find out* shifts the meaning of the embedded question to the true answers, and that *for the most part* indicates the proportion of those answers within the true answers that are known by Doris. This suggests that we understand TA either as in (106a), providing a set of answers, or as in (106c), providing a sum of answers, but not as in (106b): This provides a simple (atomic) proposition as an answer, and we cannot talk about "parts" of that proposition. The shift (106c) is perhaps the one with the greates theoretical appeal: Quantifiers like *for the most part* also occur in cases like (109) in which the adverb clearly indicates the amount of the direct object referent that is affected by the verb.

(109) Doris ate the pudding, for the most part.

A meaning shift like (106c) was proposed in Chierchia (1993), who assumed a shift operator from question meanings to the proposition that constitutes the maximal answer. Lahiri (2000) objects against this implementation and suggests a meaning shift to sets of answers similar to (106a). Lahiri's empirical argument is that Chierchia would predict, in the absence of any overt adverb of quantification, a universal interpretation, that is, *finding out* *what Bill ate* would mean ‘finding out all what Bill ate’; this is problematic in view of possible existential interpretations, like in *finding out where one can get gas*, which does not require finding out all the places in which one can get fas, for most uses. But Lahiri has to stipulate non-overt adverbs of quantification anyway to get the universal or existential interpretation. If such silent adverbs are stipulated, then there appears to be no problem with the assumption that the complement of extensional verbs is a sum of propositions. This is the representation that I will assume here. Example (107) will get the following interpretation:

(110) FIND-OUT({p | p is a true answer to

QUEST(λp x[DISH(x) p = ^MADE(x)(BILL))})(DORIS)

In this example, the question has only one true answer, due to the uniqueness presupposition of *which dish* (not captured in the representation (110)). With questions like *what Bill ate*, more than one true answer is possible, and adverbials like *for the most part* quantify over the extent to which the embedding verb applies to the sum proposition. In the case of *for the most part*, it is expressed that the verb applies to the greater part of the sum of the true answers, which we can measure by counting the atomic propositions that are part of this sum. Using $\leq$ as the part relation and $\leq_a$ as the relation of atomic part, we can write:

(111) FOR THE MOST PART (KNOW) (p)(x) iff

$p' \leq p$[KNOW(p′)(x) $\#\{p'' \mid p'' \leq_a p'\} > {}^1/_2\, \#\{p'' \mid p'' \leq_a p\}$]

That is, x knows p for the most part iff there is a part p′ of p that contains more than half of the atomic propositions of p, and x knows p′.

Let us now turn to questions with quantifiers, a case that Lahiri also considers. Take the following example:

(112) Doris knows, for the most part, which dish every guest made.

Given three guests, this should be true if Doris knows which dish two guests made. We have analyzed *which dish every guest made* as a conjoined question act. We may assume that an answer to a conjoined question act is an answer that is a conjunction of propositions that answer each conjunct. However, in order to deal with cases like (112) we have to allow that even a proposition that answers only one conjunct is an answer to the conjoined question act – it is a partial answer. That is, we have to assume the following:

(113) If p is an answer to question act Q,

then p is also an answer to the conjoined question act Q & Q′.

With this definition of answers to conjoined question acts, we can analyze (112) as follows:

(114) a. Doris found out, for the most part,

TA [every guest λt_1[*Quest* [which dish t_1 made]]]

b. FOR THE MOST PART(FOUND OUT)

({p | p is a true answer to

$\lambda P[\mathbf{\&}\{P(y) \mid \text{GUEST}(y)\}](\lambda x_1[\text{QUEST}(\lambda p\ \ x[\text{DISH}(x)$

$p = \text{MADE}(x)(x_1)])]\})$

(DORIS)

6.4 Non-Universal Quantifiers in the Complement of Extensional Verbs

Now let us turn to our main issue: How can we explain that non-universal quantifiers allow for pair-list readings in questions embedded by extensional verbs? The basic idea that I would like to propose is the following: Extensional verbs coerce the embedded question to the sum of propositions that are true answers to the question. This sum of propositions is of a Boolean type, that is, a type for which conjunction, disjunction and negation are defined. Hence the full range of quantifiers is supported.

Our explanation will be complicated by the fact that there is a certain ambiguity with sentences like (115).

(115) Doris found out which dish most guests made.

Assume that Al made the pasta, Bill made the pudding, and Carl, the salad. Then (115) can be interpreted in one of the following ways:

(115) a. Doris found out that Al made the pasta and Bill made the pudding,
or Doris found out that Al made the pasta and Carl made the salad,
or Doris found out that Bill made the pudding and Carl made the salad.

b. Doris found out that
Al made the pasta and Bill made the pudding, or
Al made the pasta and Carl made the salad, or
Bill made the pudding and Carl made the salad.

Obviously, reading (a) involves some sort of quantification into the matrix question, whereas in reading (b) the embedded clause is interpreted in situ. The latter reading is considerably more difficult to get, possibly because it is semantically weaker than the former. Nevertheless, I will start with that reading and then consider reading (a).

As indicated, I assume that the quantifier *most guests* can scope over the embedded question in case it is coerced to a Boolean reading:

(116) a. Doris found out which dish most guests made.

b. Doris found out [most guests λt_1[*TA* [*Quest* [which dish t_1 made]]]]

c. FOUND OUT

(MOST(GUEST)(λx_1[{p | p is a true answer to

QUEST(λp x[DISH(x) p= MADE(x)(x_1)])}]))

(DORIS)

Here, MOST(GUEST) is to be understood as a specific combination of conjunctions and disjunctions of propositions, as indicated in (58d). To get familiar with this meaning, consider first EVERY(GUEST) as a Boolean quantifier based on conjunction (cf. Keenan & Faltz (1985)):

(117) EVERY(GUEST)(P) = $_{x \ \text{GUEST}}$ P(x)

= P(x_1) P(x_2) … P(x_n), where GUEST = {x_1, x_2, … x_n}

In a similar format, MOST(GUEST) can be given as follows:

(118) MOST(GUEST)(P) = $_{Y \ \text{GUEST} \ \ \#(Y) > 1/2\#(\text{GUEST})}$ [$_{x \ Y}$ P(x)]

To illustrate: If GUEST = {a, b, c}, then we have:

(119) MOST(GUEST)(P) =

[P(a) P(b)] [P(b) P(c)] [P(b) P(c)]

[P(a) P(b) P(c)]

The last conjunct, in the last line, follows from the first three and can be omitted. We can now try to simplify (116c) a bit. Making use of the fact that for each choice of x_1 there is only one true answer, due to the uniqueness presupposition of *which dish*, we get the following meaning:

(116) d. $\textsc{found out}(\textsc{most}(\textsc{guest})(\lambda x_1 \iota p \;\; x[\textsc{dish}(x) \quad p \quad p = \textsc{made}(x)(x_1)]))$

$(\textsc{doris})$

If there are three guests, a, b, c, then the complement of FOUND OUT will be the following proposition, which gives us reading (115b):

(120) $[\iota p \;\; x[\textsc{dish}(x) \quad p \quad p = \textsc{made}(x)(a)] \quad \iota p \;\; x[\textsc{dish}(x) \quad p \quad p = \textsc{made}(x)(b)]]$

$[\iota p \;\; x[\textsc{dish}(x) \quad p \quad p = \textsc{made}(x)(a)] \quad \iota p \;\; x[\textsc{dish}(x) \quad p \quad p = \textsc{made}(x)(c)]]$

$[\iota p \;\; x[\textsc{dish}(x) \quad p \quad p = \textsc{made}(x)(b)] \quad \iota p \;\; x[\textsc{dish}(x) \quad p \quad p = \textsc{made}(x)(c)]]$

For reading (115a) we will make use of the idea of Moltmann & Szabolcsi (1994) and assume that it is the embedded clause, and not just the quantifier, that gets a wide-scope interpretation over the matrix clause. By this, the disjunctive clauses in (120) should distribute over the matrix clause:

(121) [most guests λt_1[*TA* [*Quest* [which dish t_1 made]]]] λt_2[Doris found out t_2]

The quantifier *most guest* must be type-lifted to accommodate this interpretation. Instead of just taking a predicate of type *ep*, it will now also take the meaning of a clause out of which a complement clause was abstracted, type *pp*. Let S be a variable of this type, then the type-lifted version of *most guests* that we need is the following:

(122) $\textsc{most}(\textsc{guest})(P)(S) \;=\; {}_{Y \;\; \textsc{guest} \;\; \#(Y) > 1/2\#(\textsc{guest})} [\;\; {}_{x \;\; Y}\, S(P(x))]$

With this, (121) gets the following interpretation, which is the interpretation illustrated with (115).

(123) $\text{MOST}(\text{GUEST})(\lambda x_1 \iota p\ \ x[\text{DISH}(x)\ \ \ p\ \ \ p =\ \text{MADE}(x)(x_1)])\ (\lambda p'[\text{FOUND OUT}(p')(\text{DORIS})])$

$= \quad {}_{Y\ \ \text{GUEST}\ \ \ \#(Y) > 1/2\#(\text{GUEST})}$

$[\ \ {}_{x\ \ Y}\ \text{FOUND OUT}(\iota p\ \ x[\text{DISH}(x)\ \ \ p\ \ \ p =\ \text{MADE}(x)(x_1)])(\text{DORIS})]$

Of course, the same interpretation that was sketched here with *most guests* is possible with universal quantifiers like *every guest* as well.

The scope interactions observed by Moltmann & Szabolcsi (1994) with sentences like (124a) can now be described if we assume logical forms like (124b):

(124) a. Some detective or other found out which dish every guest made.

b. [every guest λt_1[*TA* [*Quest* [which dish t_1 made]]]]

λt_2[some detective or other λt_3 [t_3 found out t_2]]

In our standard model, this reading can be spelled out as follows:

(125) Some detective found out which dish Al made, and
some detective found out which dish Bill made, and
some detective found out which dish Carl made.

Such wide-scope readings also appear with non-universal quantifiers, even though these readings are a bit harder to get. The following examples illustrate.

(126) a. Sooner or later, some detective or other will find out which dish most guests made.
'Sooner or later, it will hold for most guests x that some detective found out which dish x made.'

b. Every detective found out which dish most guests made.
'For most guests x, every detective found out which dish x made.'

Recall that Moltmann & Szabolcsi (1994) observed that wide-scope readings are not possible with *that*-clauses. The issue then arises, why not? Why does (127a) not have the logical form (b)?

(127) a. Some detective or other found out that every guest made pasta.

b. *[every guest λt_1 [t_1 made pasta]] λt_2 [some detective found out t_2]

Presumably, quantifiers in embedded *that*-clauses cannot scope out of their proposition. This may be related to the fact that a complementizer is present; in order to get a reading that allows to quantify the complement clause into the matrix, the quantifier would have to take scope over *that.*

The absence of wide-scope interpretations in this case may be related to the fact that they are also absent with embedded *yes/no*-questions:

(128) Some detective or other found out whether every guest made pasta.

In conclusion, I have argued in this section that the general considerations on quantification into questions that I developed with root questions also apply to embedded questions. They generalize in a straightforward way to questions embedded by intensional verbs, like *wonder*. For questions embedded by extensional verbs, like *find out*, we have to assume that they are coerced into the propositions that represent true answers; this explains why they support non-universal quantifiers. We also have explained apparent widest-scope interpretations of quantifiers in questions by assuming that it is the complement question itself that takes wide scope, and that the apparent wide scope of quantifiers in the complement question is just inherited.

7. Conclusion

In this paper, I have argued that we can, and should, take seriously the notion of quantification into questions: It is possible to quantify into questions, and into other speech acts. The operations defined for speech acts are more limited than the operations defined in the Boolean domain; conjunction is the only operation that is generally available for speech acts. This explains why only quantifiers based on conjunction, that is, universal quantifiers, can scope out of questions and out of other speech acts.

In addition, I have argued that elements that scope out of speech acts should have speech act status themselves. In particular, NPs that scope out of speech acts should be topics. This explains a number of additional restrictions for quantifiers that quantify into questions, for example, certain subject-object asymmetries and the fact that focus on the quantifier prevents it from taking wide scope.

I have developed a type system in which quantification into question acts can be formally described. Also, I have argued that the general picture developed here can be extended to embedded questions, both questions embedded by intensional verbs like *wonder*, and questions embedded by extensional verbs like *find out.* As for the latter class, I have argued that it coerces its complement into a Boolean type, which explains why a wider range of quantifiers is possible.

The theory developed in this paper requires a rethinking of the role of speech acts in linguistic semantics. I argued that speech acts cannot be reduced to truth conditions (in contrast to the description of speech acts), but should be considered as acts that modify conversational states. Nevertheless, they can be part of the recursive semantics of natural language; I have argued that expressions can take scope over them, and that they can be embedded. In this paper, I could develop the underlying theory of speech acts only in a very rudimentary way. But for the phenomenon under discussion, quantification into questions, all that was required was that speech acts in general can be conjoined, but not disjoined or negated; hopefully, any theory of speech acts that does not reduce them to truth conditions will deliver at least that much.

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