

Topical Restriction and Answerhood

Paul Dekker*

ILLC/Department of Philosophy
University of Amsterdam
dekker@hum.uva.nl

Abstract

Information structure is the term designating a very lively and active branch of work, which deals with various topics such as anaphora, topical restriction, questions, congruence and exhaustification. This work tends to diverge in many directions which hardly can be seen to be compatible with one another. In this paper we attempt to improve the situation by trying to develop the minimal formal tools required to study the logical properties of the various issues involved and integrate them step by step. We successively deal with anaphoric connections between pronouns and other terms in terms of individual satisfaction by possible witnesses; with questions and topics in terms of sets of possible witnesses; with topical restriction and answerhood in terms of topical satisfaction; we conclude with a compositional deconstruction of Henk Zeevat's exhaustification operation.

Introduction

If we want to put it quite simple, the target of this paper is a compositional analysis of a locution like “else” as it occurs in an example like the following:

- (1) Who gave what to whom? John a book to Mary, Jane a funny hat to some hippie, somebody else all her recordings of “Friends” to Denise, and nobody anything to anybody else.

It may be clear that an adequate interpretation of “else” cannot stand on its own. The term is used in an anaphoric way in (1), it is used in a constituent answer, and it relates to a previously raised issue. In this way “else” participates in quite a number of issues all having to do with information structure. Our tour towards a compositional analysis of “else” will therefore guide us through a number of various topics such as anaphora, topical restriction, constituent answerhood and exhaustification. The approach will be goal-driven though, as we want to lay bare the minimal conceptual tools to deal with these issues.

We take our start from a classical, Tarskian, satisfaction semantics for a language of first order predicate logic. In the first section the system is extended with a treatment of pronouns, which, although it obviously stands in the tradition of systems of discourse representation and dynamic semantics, involves a most minimal and fully conservative extension with witnesses. In the second section we define topically restricted quantification.

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This is a formalization and generalization of Westerståhl’s contextually restricted quantification, and at the same time a minimal reformulation of the type of topically restricted quantification developed by (Gawron 1996; Aloni et al. 1999). In section three we use topical restriction to account for constituent answers in a compositional way. Quantifiers are interpreted in a classical way; they are taken to denote sets of sets of individuals, possibly parametric upon witnesses and witness functions. Section four next presents an interpretation of “else” from which a proper interpretation of in particular “somebody else” and “nobody else” can be derived in a compositional fashion. Section five summarizes the results.

Some issues are not discussed in full detail. For an extensive treatment of indefinite noun phrases and anaphoric pronouns we have to refer the reader to (Dekker 2002); an elaborate treatment of the dynamics of presupposition and quantification is offered in (Dekker 2003b); an update semantic account of the process of raising and resolving issues is presented in (Dekker 2003a). All this work heavily builds upon the seminal (Groenendijk 1999; Roberts 1995; Zeevat 1994).

1 Predicate Logic with Anaphora

The system of *PLA* has grown out of the tradition of discourse representation and dynamic interpretation but it deviates from a classical semantics only minimally (cf., Dekker 2002). It is inspired by (van Rooy 1997; Stalnaker 1998) and formally develops the idea that indefinite noun phrases can be used with referential intentions and that anaphoric pronouns can be coreferential with these indefinites by picking up individuals which may satisfy these intentions.

The language of *PLA* is like that of first order predicate logic except for the fact that it also contains a category of pronouns $P = \{p_1, p_2, \dots\}$. For ease of exposition, we focus on a minimal language which is built up from variables, names, pronouns, and n -ary relation expressions, by means of negation \neg , existential quantification $\exists x$ and conjunction \wedge . As is usual, we use existentially quantified expressions to model the interpretation of indefinite noun phrases. Conditional sentences can be modeled using implication \rightarrow , defined by $(\phi \rightarrow \psi) \equiv \neg(\phi \wedge \neg\psi)$.

The semantics of *PLA* is spelled out in terms of a satisfaction relation $M, g, e \models \phi$, which may hold between an ordinary first order model M , an ordinary variable assignment g , and a sequence of witnesses e on the one hand and a formula ϕ on the other. The sequences of individuals e are the possible referents of terms (indefinite and pronominal) in ϕ . Besides the use of these possible witnesses, the only deviation from a classical semantics is that we also take into account what is referred to as $n(\phi)$, the number of (surface) existentials in ϕ :

$$\begin{aligned} \bullet \quad n(Rt_1 \dots t_m) &= 0 & n(\exists x\phi) &= 1 + n(\phi) \\ n(\neg\phi) &= 0 & n(\phi \wedge \psi) &= n(\phi) + n(\psi) \end{aligned}$$

In the semantics, we use D^n to refer to the set of sequences of n individuals, which correspond to the possible sequences of n individuals which may satisfy referential intentions. Satisfaction is defined as follows:

Definition 1 (Satisfaction in PLA)

$$\bullet \quad [t]_{M,g,e} = M(c) \text{ if } t \equiv c \quad [t]_{M,g,e} = g(x) \text{ if } t \equiv x \quad [t]_{M,g,e} = e_i \text{ if } t \equiv p_i$$

- $M, g, e \models Rt_1 \dots t_m$ iff $\langle [t_1]_{M,g,e}, \dots, [t_m]_{M,g,e} \rangle \in M(R)$
 $M, g, e \models \neg\phi$ iff $M, g, ce \models \phi$ for no $c \in D^{n(\phi)}$
 $M, g, ce \models \phi \wedge \psi$ iff $M, g, e \models \phi$ and $M, g, ce \models \psi$, with $c \in D^{n(\psi)}$
 $M, g, de \models \exists x\phi$ iff $M, g[x/d], e \models \phi$ for $d \in D$
- $M, g, e \models \downarrow\phi$ iff $\exists c \in D^{n(\phi)}: M, g, ce \models \phi$

In *PLA* the so-called ‘dynamics of interpretation’ is located entirely in the dynamics of conjunction, which simply models the fact that if a conjunction is actually used, the first conjunct literally precedes the second. That is, the first conjunct is evaluated before the second conjunct has come up with its possible witnesses and the second after the first has done so.

It is interesting to see out how close indefinites and pronouns are in *PLA*:

Observation 1 (Indefinites and Pronouns)

- $M, g, e \models \exists xFx$ iff $M, g, e \models Fp_1$
 $M, g, e \models \exists x\exists yRxy$ iff $M, g, e \models Rp_1p_2$

The difference between the two types of terms resides in the way in which they are used. Pronouns are supposed to be ‘old’, while indefinites are ‘new’. A pronoun can only be coreferential with an indefinite if it is used ‘later’, in some conjunction. Besides, indefinites are existentially quantified away under a negation, whereas pronouns, of course, are not.

PLA captures the basic results of discourse representation theory and dynamic semantics as can be observed from the following equivalences:

Observation 2 (Anaphoric Relations)

- $\exists x(Dx \wedge \exists y(Py \wedge Fxy)) \wedge Lp_1p_2 \Leftrightarrow$
 $\exists x(Dx \wedge \exists y(Py \wedge Fxy \wedge Lxy))$
 $\exists x(Fx \wedge \exists y(Dy \wedge Oxy)) \rightarrow Bp_1p_2 \Leftrightarrow$
 $\forall x(Fx \rightarrow \forall y((Dy \wedge Oxy) \rightarrow Bxy))$

These formal equivalences correspond to the intuitive equivalence of the following examples, with our apologies for the worn-out second one:

- (2) A diver found a pearl but she lost it again.
A diver lost a pearl she just found.
- (3) If a farmer owns a donkey he beats it.
Every farmer beats every donkey he owns.

We will not go into the ins and outs of anaphoric relations between indefinites and pronouns here, as these are not directly relevant to the main issues of this paper. For discussion and further extensions we refer to the papers mentioned earlier.

2 Topically Restricted Quantification

In this section we introduce topics and topically restricted quantification. We give a, we think most minimal, reformulation of the rather involved notion put forward in (Gawron 1996; Aloni et al. 1999). We employ topics as the meanings of questions, where questions are formed, as is fairly usual, by putting a question marked sequence of variables in front

of a formula. Thus, $?x\phi$ is a question, where \vec{x} is a (possibly empty) sequence of variables. If \vec{x} is a sequence of i variables, we say that $q(?x\phi) = i$. If $q(?\psi) = 0$, then $?ψ$ is a polar question.

In many semantic theories of questions, and in a lot of work on information structure, so-called abstracts are used to model or derive the meanings of questions or topics. We also use such entities as topics here. Just to keep matters simple, we stick to an extensional set up in which topics are sets of sequences of individuals. In case of a polar issue it can only be either $\{\langle \rangle\} = \{\lambda\}$ or $\{\} = \emptyset$, which are the truth values 1 and 0, respectively. Formally, the definition runs as follows:

Definition 2 (Topics)

- $\llbracket ?x\phi \rrbracket_{M,g,e} = \{c \in D^{q(?x\phi)} \mid M, g[\vec{x}/c], e \models \downarrow\phi\}$
(where $g[\vec{x}/c] = g[x_1/c_1] \dots [x_n/c_n]$)

It is easily seen that:

Observation 3 (Topic Satisfaction)

- $\lambda \in \llbracket ?p \rrbracket_{M,g,e}$ iff $M(p) = 1$
- $d \in \llbracket ?xPx \rrbracket_{M,g,e}$ iff $d \in M(P)$
- $cd \in \llbracket ?xyRxy \rrbracket_{M,g,e}$ iff $\langle c, d \rangle \in M(R)$

So we can also see that:

Observation 4 (Wh-phrases and Indefinites)

- $a \in \llbracket ?x\phi \rrbracket_{M,g,e}$ iff $\exists c \in D^{n(\phi)}: M, g, ace \models \exists x\phi$

Thus, also *Wh*-phrases are very much like indefinites and again the two types of terms differ with respect to the different roles they play in discourse. Indefinites are assumed to relate to individuals which are not required to be determinate; *Wh*-phrases relate to individuals which are demanded to be determined.

With our topics on board, we can give a fully general definition of topically restricted quantification. Topical restriction is known from the literature, e.g., (Westerståhl 1984) and (Jäger 1996):

- (4) Swedes are funny. All tennis players look like Björn Borg.
- (5) Which Athenian is wise? Only Socrates is wise.

In (4) the term “all tennis players” can be taken to be restricted to the *Swedish* tennis players, and the second sentence of (5) can be used to claim that Socrates is the only wise man *among the Athenians*. We offer a generalization of this notion of contextually restricted quantification, since it may concern sequences of quantifiers which are restricted by sets of sequences of individuals, as in (Gawron 1996; Aloni et al. 1999). At the same time, it is a vast simplification of the last, because topical information is not hung upon variables which are distributed over various ‘information states’.

For the sake of simplicity, we assume that quantifiers respond to one topic only, and that they simultaneously address all arguments of a topic. That is, we will define $M, g, e \models_{\alpha} \exists \vec{x}\phi$, where α is an n -place topic restricting the values of $\vec{x} = x_1 \dots x_n$ in ϕ .

Definition 3 (Topically Restricted Quantification)

- $M, g, ce \models_{\alpha} \exists \vec{x} \phi$ iff $c \in \alpha$ and $M, g[\vec{x}/c], e \models_{\alpha} \phi$, for $c \in D^{q(\alpha)}$

The definition of $\exists \vec{x}$ is like that of $\exists x$ but for the fact that witnesses for \vec{x} must satisfy α .

Observation 5 (Topical Restriction)

- $M, g, e \models_{\vec{x}\phi} \exists \vec{y} \psi$ iff $M, g, e \models_{\vec{x}\phi} \exists \vec{y} (\downarrow[\vec{y}/\vec{x}] \phi \wedge \psi)$
 $M, g, e \models_{\vec{x}\phi} \forall \vec{y} \psi$ iff $M, g, e \models_{\vec{x}\phi} \forall \vec{y} (\downarrow[\vec{y}/\vec{x}] \phi \rightarrow \psi)$

The following examples show our notion of topical restriction at work. Suppose we are talking about the people at the party P yesterday:

- (6) Some girl was absolutely fabulous, and all boys went mad.
 $M, g, de \models_{\vec{x}Px}$ (6) iff $M, g, de \models \exists x ((Px \wedge Gx) \wedge AFx)$ and
 $M, g, de \models \forall y ((Py \wedge By) \rightarrow WM y)$
- (7) Only students drank beer.
 $M, g, e \models_{\vec{x}Px}$ (7) iff $M, g, e \models \forall z (Sz \leftarrow (Pz \wedge DBz))$

We see that “some girl” comes to mean “some girl who was at the party” and “all boys” “all boys who were at the party.” It is important to note that this is not the general pattern though. For “Only students” in (7) does *not*, unconditionally, come to mean “only students who were at the party.” In the given context the whole sentence says, rather, that among those who were at the party, only students drank beer. Please observe that this is exactly as it should be.

3 Quantified Constituent Answers

Before we can give a suitable interpretation of quantified constituent answers, we of course have to introduce generalized quantifiers in the *PLA*-framework in the first place. All by itself, this is a routine enterprise, which, however, is complicated somewhat because we want to preserve the special treatment of indefinites. We will not go into the details here as they have been motivated elsewhere (Dekker 2003b).

We extend *PLA* with first order abstraction and with generalized quantifiers D (or determiners). Determiners are taken to denote the familiar relations $\llbracket D \rrbracket_{M,g,e}$ between pairs of sets of individuals. Determiners \mathbf{D} will also be applied to sets, so that $\mathbf{D}(P)$ is that quantifier $\mathbf{T} = \{Q \mid \langle P, Q \rangle \in \mathbf{D}\}$. In order to treat multiple constituent answers, we will also use (keenian) compositions $\mathbf{T}_1 \circ \mathbf{T}_2$ of quantifiers (cf. Keenan 1992).

The only thing which is not fully standard is that noun phrases and determiners are associated with (sequences of) witnesses, sometimes witness-sets. Thus, like the existential quantifier in *PLA*, the interpretation of *SOME* requires an associated witness: $\llbracket \text{SOME} \rrbracket_{M,g,de} = \{\langle P, Q \rangle \mid d \in (P \cap Q)\}$. Proper names $NAME_c$ are true of a set iff it contains the value of the associated individual constant c : $\llbracket NAME_c \rrbracket_{M,g,de} = \{Q \mid \llbracket c \rrbracket_{M,g,e} = d \in Q\}$. Pronouns presuppose a witness for an antecedent term $\llbracket PRON_i \rrbracket_{M,g,de} = \{Q \mid e_i = d \in Q\}$. Besides, genuinely quantifying noun phrases are assumed to come with witness sets (Dekker 2003b). Using $D^{w(\alpha)}$ for the domain of possible witnesses or witness sequences for an expression α , the interpretation of the new expressions is defined in the following way:

Definition 4 (Generalized Quantifiers in QPLA)

- $\llbracket D(\pi) \rrbracket_{M,g,dce} = \llbracket D \rrbracket_{M,g,de}(\llbracket \pi \rrbracket_{M,g,ce}) \quad (d \in D^{w(D)}; c \in D^{w(\pi)})$
 $\llbracket T_1 \circ T_2 \rrbracket_{M,g,dace} = \llbracket T_1 \rrbracket_{M,g,dce} \circ \llbracket T_2 \rrbracket_{M,g,ace} \quad (dc \in D^{w(T_1)}; a \in D^{w(T_2)})$
 $M, g, dace \models T(\rho) \text{ iff } \llbracket \rho \rrbracket_{M,g,ace} \in \llbracket T \rrbracket_{M,g,dce} \quad (dc \in D^{w(T)}; a \in D^{w(\rho)})$

It is relatively easily established that indefinites, proper names, and pronouns behave the way they did in *PLA*:

Observation 6 (Terms in QPLA)

- $JOHN_j(\lambda x \psi) \Leftrightarrow \exists x(x = j \wedge \psi)$
 $SOME(\lambda x \phi)(\lambda x \psi) \Leftrightarrow \exists x(\phi \wedge \psi)$
 $HE_i(\lambda x \psi) \Leftrightarrow \exists x(x = p_i \wedge \psi)$

Now we have got our quantifiers on board, we can turn to a definition of a (quantified) constituent answer, using an answerhood operator *ANS*:

Definition 5 (Constituent Answerhood)

- $ANS(T_1 \dots T_n) = (T_1 \circ \dots \circ T_n)(\lambda \vec{y} \exists \vec{x}(\vec{x} = \vec{y}))$

The interpretation of *ANS* is not as involved as it may seem. If a sequence of n noun phrases answers an n -ary topic, we take the Keenan composition of the quantifiers and we feed it the n -ary relation which holds between the individuals which satisfy the restriction. Thus, in the absence of further context dependence, we find that:

Observation 7 (Topical Constituent Answers)

- $M, g, e \models_{\vec{x}\phi} ANS(T_1 \dots T_n) \text{ iff}$
 $M, g, e \models (T_1 \circ \dots \circ T_n)(\lambda \vec{x}\phi)$

Suppose the question is “Who gave what to whom” ($?xyzGxyz$, abbreviated as α). Then consider the interpretation of the following answers:

- (8) Mary a picture (to) a boy.
 $ANS(MARY \ SOME(PIC) \ SOME(BOY))$
 $M, g, mpbe \models_{\alpha} (8) \text{ iff}$
 $M, g, mpbe \models \exists x((x = m) \wedge \exists y(Py \wedge \exists z(Bz \wedge Gxyz)))$
- (9) Every boy no CD to any girl.
 $ANS(ALL(BOY) \ NO(CD) \ SOME(GIRL))$
 $M, g, bcge \models_{\alpha} (9) \text{ iff}$
 $M, g, bcge \models \forall x(Bx \rightarrow \neg \exists y(CDy \wedge \exists z(Gz \wedge Gxyz)))$

The reader can see that we have indeed provided an adequate compositional interpretation of a constituent answer. Although it is most minimal (because extensional), it is rooted in the uniform, so-called propositional approach to questions advocated by Hamblin, Karttunen and Groenendijk and Stokhof. At the same time it shares the merits of the structured meanings approach by allowing a direct interpretation of constituent answers in response to topics. There is, however, one basic difference with for instance Groenendijk and Stokhof’s notion of answerhood.

Groenendijk and Stokhof’s notion of an answer has a form of exhaustivity built into it, which is very attractive from a purely logical perspective, as Groenendijk and Stokhof have very well explained over the years, but also from a pragmatic, or decision-theoretic perspective (van Rooy 1999, among many other publications by the same author). Our notion of an abstract (which is also used by Groenendijk and Stokhof, by the way) clearly has a form of exhaustivity built into it, but our notion of an answer has not. The reason is that we want to allow for sequences of (partial) constituent answers, which, of themselves, do not come with a claim for exhaustivity. But after all, we also do want to be able to say at some point: “That was it, folks, now we have exhausted the topic.” In order to account for this we take our inspiration from (Zeevat 1994), who has proposed such a closure or exhaustification operator in an update semantics. As a matter of fact, as we will show in the final section, Zeevat’s exhaustifier can be *derived* from our notion of a constituent answer together with an independently motivated interpretation of a relatively abstract element “else”.

4 Something Else

We have gone quite a way to arrive at one of the main targets of this paper, the interpretation of “else.” Take a look again at our first example, which is repeated here for convenience:

- (1) Who gave what to whom? John a book to Mary, Jane a funny hat to some hippie, somebody else all her recordings of “Friends” to Denise, and nobody anything to anybody else.

Inspection of this example reveals, we think, that “somebody else” must denote somebody besides those already listed and that “nobody else” excludes anybody beyond those listed. The common contribution which “else” seems to make is that it is a predicate applying to all not (yet) included. The following definition gives us precisely this:

Definition 6 (ELSE)

- $ELSE = \lambda \vec{y} \diamond \forall \vec{x} (\vec{x} \neq \vec{y})$

The \diamond here is an ordinary modal operator with an indexical interpretation. It refers to the current state of discourse, as it has been established publicly and which is easily defined in terms of an update semantics (Veltman 1996; Dekker 2002). Relative to an n -ary topic α , *ELSE* holds of any n -tuple of individuals which, in the current state of the discourse, is not known (asserted, claimed, ...) to satisfy α .

In case of a single constituent issue like, for instance, who will come to the party, *ELSE* holds of any individual which, in the current state of discourse, is not (yet) asserted or implied to go there:

Observation 8 (Else)

- $M, g, e \models_{?xPx} ELSEc$ iff $M, g, e \models \diamond \neg Pc$

Composing *ELSE* with *SOME* in an answer we get the interpretation sketched above:

Observation 9 (Somebody Else)

- $ANS(SOME(ELSE)) \Leftrightarrow \exists y(\Diamond \forall x(x \neq y) \wedge \exists x(x = y))$

In response to the above question this has the following effect:

- $M, g, de \models_{?xPx} ANS(SOME(ELSE))$ iff $M, g, de \models \exists y(\Diamond \neg Py \wedge Py)$

After a sequence of constituent answers we find that:

(10) John, an undergraduate, and somebody else.

$ANS(JOHN) \wedge ANS(SOME(UNDG)) \wedge ANS(SOME(ELSE))$

- $M, g, duje \models_{?xPx} (10)$ iff
 $M, g, duje \models \exists x(x = j \wedge Px) \wedge \exists y(Uy \wedge Py) \wedge \exists z(p_1 \neq z \neq p_2 \wedge Py)$

Observe that the phrase “somebody else” in example (10) indeed means somebody else besides John *and* the mentioned undergraduate, so it is not an ordinary anaphoric phrase with one antecedent. Notice, too, that in order for this to work out fine, we definitely need a witness for the undergraduate, as indeed is provided in *PLA* and *QPLA*. Notice, finally, that *ELSE* can also be used in answers to multi-constituent topics, like “Who saw whom?” ($?xySxy$):

(11) John Mary, and somebody else somebody else.

$ANS(JOHN MARY) \wedge ANS(SOME(ELSE) SOME(ELSE))$

- $M, g, bdjm \models_{?xySxy} (11)$ iff
 $M, g, bdjm \models \exists x(x = j \wedge \exists y(y = m \wedge Sxy)) \wedge \exists x(x \neq p_1 \wedge \exists y(y \neq p_2 \wedge Sxy))$

Before we can take a look at “nobody else”, one final remark is in order. “Else” does not need to univocally answer one and the same issue under discussion. Consider the following example, which is inspired by one given by Katrin Schulz:

(12) Who ate from the pudding? Well, John was in the garage, and Bertha was in the study, so it must have been somebody else.

Obviously, “somebody else” here relates to a person besides John and Bertha, and, in line with our analysis, it indeed relates to somebody not (yet) listed. But the issue is, of course, that (12) does not serve to list John and Bertha as persons who have eaten from the pudding, quite the opposite! Our analysis works out fine though if we can construe the answers in (12) as answers to the question who (among a relevant set of candidates) is or is not the person who ate from the pudding, which seems to be fairly intuitive.

We have seen that an answer with “somebody else” says that somebody besides those listed satisfies a certain topic, so one with “nobody else” does precisely the opposite:

Observation 10 (Nobody Else)

- $ANS(NO(ELSE)) \Leftrightarrow \neg \exists y(\Diamond \forall x(x \neq y) \wedge \exists x(x = y))$

An answer with “Nobody else” says, in response to the question who comes to the party, that those who are not yet known to come, do not come:

(13) John, an undergraduate, and nobody else.

$ANS(JOHN) \wedge ANS(SOME(UNDG)) \wedge ANS(NO(ELSE))$

- $M, g, uje \models_{?xPx} (13)$ iff
 $M, g, uje \models \exists x(x = j \wedge Px) \wedge \exists y(Uy \wedge Py) \wedge \neg \exists z(p_1 \neq z \neq p_2 \wedge Py)$

Example (13) shows that we get the right exhaustification effects of answers to single constituent issues. Although the interlocutors may be unsure about the identity of the undergraduate, the example, on our analysis, clearly entails that only two persons come, John and an undergraduate. The analysis not only works for single-constituent issues though. For:

Observation 11 (Nobody Anybody Else)

$$ANS((NO\ SOME)(ELSE)) \Leftrightarrow \neg\exists yz(\diamond\forall uv(uv \neq yz) \wedge \exists uv(uv = yz))$$

Consider again the question “Who saw whom?” ($?xySxy$), with the following sequence of answers:

(14) John Mary, Pete Greta, and nobody anybody else.

$$ANS(JOHN\ MARY) \wedge ANS(PETE\ GRET) \wedge ANS((NO\ SOME)(ELSE))$$

- $M, g, pgjm \models_{?xySxy} (14)$ iff
 $M, g, pgjm \models \exists xy(xy = jm \wedge Sxy) \wedge \exists xy(xy = pg \wedge Sxy) \wedge$
 $\neg\exists xy(p_1p_2 \neq xy \neq p_3p_4 \wedge Sxy)$

This combination of “no” and “else” serves to express that a list of (multiple) constituent answers indeed exhausts the interpretation of a given (multiple) constituent question, in an entirely compositional fashion.

5 Conclusion

In this paper we have started out from an independently motivated satisfaction semantics *PLA*, we have added a traditional notion of a topic, we have added generalized quantifiers, and we then have given a direct and compositional definition of constituent answerhood. Armed with these tools, we have formulated a single, polyadic, interpretation of “else” which has been shown to behave as required in constructions like “Somebody else,” “Nobody else,” and “Nobody somebody else.” To conclude this paper, we want to mention one further subject that naturally suggests itself, and add a final observation.

A system of interpretation like the one given here of course calls for an extension which accounts for the earlier mentioned process of raising and resolving issues. But that seems to be a somewhat routine exercise once we have a good idea of the intricate interaction between topical restriction and constituent answerhood as we have given in this paper. Such an extension is indeed provided in (Dekker 2003a).

We want to end with an inspiring observation. Since both *ANS* and *ELSE* are defined as polyadic predicates, they have zero-place instances. Interestingly, these correspond to affirm (“Yes.”) and deny (“No.”) respectively:

Observation 12 (*ANS*₀ and *ELSE*₀)

- $ANS_0 \Leftrightarrow (\lambda p\ p)\exists\top \Leftrightarrow \top$
 $ELSE_0 \Leftrightarrow \diamond\forall\perp \Leftrightarrow \perp$

Zero constituent *ANS* and *ELSE* correspond to a topically restricted top- and bottom-element. And indeed they figure as our familiar answers “yes” and “no.” Observe:

- (15) Is it raining? {Yes. / No.}
- $$M, g, e \models_{?p} \text{ANS} \quad \text{iff } M, g, e \models_{?p} \perp$$
- $$\quad \quad \quad \text{iff } M, g, e \models p$$
- $$M, g, e \models_{?p} \text{ELSE} \quad \text{iff } M, g, e \models_{?p} \perp$$
- $$\quad \quad \quad \text{iff } M, g, e \not\models p$$

This is interesting because the proper treatment of “Yes.” and “No.” has been a matter of struggle and debate in the literature. Here they fall into place as two borderline cases of some much more general notions.

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