Complement set reference

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ABSTRACT. The paper considers the phenomenon of complement anaphora and offers an analysis in the framework of optimality theoretic semantics / pragmatics. I argue that from an interpretation perspective there is a preference for reference to the so-called REFSET over all other sets associated with quantificational structures. Reference to the complement set is thus only possible when two conditions are met: (i) the complement set satisfies a witness-constraint and (ii) the reference set is ruled out as an antecedent for independent reasons.

1   Introduction

Given a quantificational structure $D(A)(B)$, there are three sets that can be associated with it[1]: (i) the reference set (or REFSET), corresponding to the intersection of A and B; (ii) the maximal set (MAXSET) which equals the restrictor A; and (iii) the complement set (COMPSET) which is the set of entities in A which do not have property B. Anaphoric reference to all these three sets is possible.

(1)   a.   Most students went to the party.
            They had a good time.   REFSET

      b.   Most students went to the party.
            They like to have a good time.   REFSET/MAXSET

      c.   Few of the students went to the party.
            They went to the beach instead.   COMPSET

In (1a), the plural pronoun refers to the set of students that went to the party, the reference set. The pronoun in (1b) can also be interpreted as referring to this set, but could also refer to students in general, which corresponds to a MAXSET-interpretation. Finally, in (1c) we encounter reference to the complement set. The pronoun here refers to the students that did not go to the party. This is a case of complement anaphora.

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[1]Here are some formal conventions:

In a structure $D(A)(B)$ we call D a determiner, $D(A)$ a quantifier, A the restrictor and B the nuclear scope. A determiner D is monotone increasing or upward entailing in its right argument if for any $C \supseteq B$ and any A, if $D(A)(B)$ holds, then $D(A)(C)$ holds as well. A determiner D is monotone decreasing or downward entailing in its right argument if for any $C \subseteq B$ and any A, $D(A)(B) \rightarrow D(A)(C)$.

What makes complement anaphora interesting is that their distribution relates to formal properties of the determiner involved in the antecedent sentence. Reference to COMPSET is not possible following non-downward entailing quantifiers. This is in contrast with REFSET reference.

(2) a. Few of the students went to the party.
         They went to the beach instead.   COMPSET

     b. Few of the students went to the party.
         They had a good time.   REFSET

(3) a. Most students went to the party.
         #They went to the beach instead.   COMPSET

     b. Most students went to the party.
         They had a good time.   REFSET

Reference to COMPSET is bad following cardinal downward entailing quantifiers.

(4) a. Less than half of the students went to the party.
         They went to the beach instead.   COMPSET

     b. Less than ten students went to the party.
         ??They went to the beach instead.   COMPSET

Reference to COMPSET is better following partitive cardinal downward entailing quantifiers.

(5) a. Less than twenty-five of the fifty students went to the party.
         ?They went to the beach instead.   COMPSET

These are the basic facts concerning complement anaphora. In section 2 we will discuss the source of the discussion surrounding complement anaphora: a range of psycholinguistic experiments conducted by Moxey and Sanford. Section 3 discusses two analyses that try to explain complement anaphora. In section 4 we will present some new data, focusing on the *interpretation* of plural pronouns. I will argue that from this perspective reference to a complement set is marked. Finally, in section 5 I will give an analysis.

2   Moxey and Sanford's experiments

As we have seen anaphoric links to COMPSET are subject to other constraints than reference to the other sets associated with quantificational structures. This phenomenon has been thoroughly studied in a series of psycholinguistic experiments (see (Sanford and Moxey 1993)). In these experiments subjects were confronted with a single quantified statement and were asked to make up a sensible continuation beginning with the plural pronoun *They*.

(6) Q of the MPs were at the meeting. They . . .

Subjects were also asked to indicate what the plural pronoun referred to in their continuation. Here they could make a choice between five categories: *MPs in general*, *all MPs*, *MPs who went to the meeting*, *MPs who did not go to the meeting* and *none of the above*. Independent judges checked all the utterances and reference indications. In 98% of these cases the judges agreed with the judgments of the subjects.

An alternative experiment tested for intra-sentential complement anaphora, using a structure like (7).

(7)   Q of the MPs attended the meeting, because they ...

The results showed a preference for COMPSET reference following the determiners: *hardly any, not many, very few and few*. This preference was not present with the determiners *a few* and *many*. A special case was *only a few* which only showed COMPSET reference in the task involving a structure like (7).

In a different study complement set reference was studied with proportional numerical expressions. The continuation method and the use of judges was as in the experiment above (cf. (Sanford and Moxey 1993):77). Here it was found that COMPSET continuations were favored following the determiners: *less than n%*. The other determiners (*n%, only n% and more than n%*) showed few to no continuations containing complement set reference.

It is important for the current paper to note that *preference* for a certain continuation should be interpreted rather weakly as roughly indicating that more than half of the subjects use a complement anaphor. That is, REFSET continuations *did* occur following downward monotone quantifiers.

In their analysis Moxey and Sanford's basic assumption is the functional usefulness of COMPSET. Earlier experiments have shown that expressions like *few, not many, a few* and *only a few* roughly specify the same quantity (see (Sanford and Moxey 1993):ch2). There is however a fundamental difference between these determiners in that some of them seem to report on a deviation from expectation, while others do not. Moxey and Sanford link this observation to the notion of *negativity* (cf. (Klima 1964)). Negative determiners, the argument continues, put *focus* upon their COMPSET. This means that in a discourse the COMPSET is more prominent than the REFSET. There will be a preference for reference to the set focused by the determiner. Moreover, this focus will have the thematic effect that, following a COMPSET-licensing quantificational structure a reason is given why REFSET is smaller than was to be expected. This is confirmed by a series of experiments showing that COMPSET-continuations generally are (in Moxey and Sanford's terminology) of a *reason-why-not* nature. In these experiments independent judges were asked to indicate which of four types a produced continuation belonged to. The COMPSET continuations were dominantly classified as indicating "the reason why the predicate is not true of the refset" (see (Sanford and Moxey 1993):66).

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3 Explaining COMPSET reference

A common reaction within the (formal) semantic community on the results of Moxey and Sanford's experiments was that complement anaphora do not *really* involve complement set reference, but instead are a case of some sort of *pseudo-reference* established by a generalization over the maximal set (see especially (Corblin 1996)). This view still enjoys considerable popularity although it creates some fundamental problems. For one, the generalization seems to be allowed since the antecedent sentence expresses the inferiority of the REFSET. Problematic then is that this generalization should also be allowed following a sentence like *Not all A B*, where the COMPSET might consist of but a few exceptions. Other authors have proposed other variants of pseudo-reference (e.g. (Geurts 1997)) and the result is an interesting discussion on the *reality* of complement set reference. Due to space considerations I will not go into that discussion here and presuppose the reality of complement anaphora. (For a detailed elaboration on this issue as well as more arguments against pseudo reference cf.(Nouwen 2001)).

Once we accept that complement anaphora involve reference to the complement set, the question arises how this anaphoric link comes about.

3.1 Emptiness

In their presentation of optimality theoretic semantics (de Hoop and Hendriks 2001) suggest that the data can be explained by the interaction of pragmatic constraints.

The basic assumption behind optimality theoretic semantics is the free interpretation hypothesis. This is nothing but the driving force behind the generator of the optimality theoretic system of finding the most optimal interpretation for a certain linguistic form. Relevant to our story is that given this hypothesis a generalized quantifier can take any domain of quantification. Thus REFSET reference and COMPSET reference of a pronoun compete in the candidate set of the interpretation of a continuation following a quantificational structure.

The basis of de Hoop and Hendrik's explanation is the constraint EMPTINESS.

(8)   EMPTINESS: As the antecedent of an anaphoric expression, do not choose a set that is or may be empty

By itself, this constraint can already explain the correlation between downward monotonicity and complement set reference. The reference set of a downward monotone quantifier can, of course, be empty. Reference to this set will thus violate EMPTINESS. The violation pattern is reversed for monotone increasing quantifiers.

The constraint is especially interesting with respect to cardinal downward monotone quantifiers. In those cases both REFSET and COMPSET can be empty: the first due to downward monotonicity; the second due to the fact that for all these quantifiers $D(A)(A)$ holds. Both interpretations thus violate EMPTINESS. The optimality

decision is now left to a constraint which is ranked lower. De Hoop and Hendriks have a constraint called *forward directionality* (or FORWD), which expresses a preference for referring to the REFSET.[2]

There is however a complication. Emptiness is not the only constraint in competition with forward directionality. There is also the high ranked *avoid contradiction* or AVOIDC. If ranked higher then forward directionality, avoid contradiction can explain the facts in (9). In the second sentence in (9a), the determiner is interpreted as quantifying over the reference set of the preceding sentence. Only when a contradiction is encountered, as in (9b), does interpretation prefer returning to the larger domain, namely that of students (cf. (de Hoop and Hendriks 2001):(28)/(32)).

(9) a. Ten students attended the meeting. Three spoke.

b. Ten students attended the meeting. Twelve spoke.

This additional interaction causes problems for the analysis of cardinal decreasing quantifiers. As we have seen, both the reference set and the complement set of these structures violate emptiness. Forward directionality then prefers the reference set. But in the examples of interest, like (4b) repeated below, avoid contradiction has an unwanted decisive preference for the complement set.

(4b) Less than ten students went to the party.
    [??]They were too busy.

There is another problematic side effect of their proposal. There seems to be no room for optionality. Remember that the results from Moxey and Sanford's experiments did not show that REFSET reference does not occur following downward monotone quantifiers. They merely showed there to be a preference. The optimality model proposed by de Hoop and Hendriks suggests that REFSET continuations will never follow non-cardinal downward entailing quantifiers.

We will return to de Hoop and Hendrik's analysis but next consider another explanation of the complement anaphora phenomenon. As we will see in this approach optionality does play an important role.

3.2 Dynamic Quantifiers

Rodger Kibble ((Kibble 1997a)) gives a technical explanation for Moxey and Sanford's experimental results. In dynamic semantics, quantifiers are made dynamic by giving them an existential structure, as in (10).

(10) $Q(A)(B) = \exists x \wedge \exists y \wedge \max_y(A[x/y]) \wedge \max_x(x \leq y \wedge B) \wedge Q'(y)(x)$

This says that a quantificational structure $Q(A)(B)$ is to be interpreted as the introduction of two (maximal) sets, one satisfying the restrictor A and the other, a

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[2]This constraint is actually a much more general constraint expressing the preference for an ongoing reduction of topic range.

subset of the former, satisfying the scope. The quantification succeeds if the two introduced sets are in the quantificational relation Q' (the extension of the determiner Q). The effect is that every quantificational structure introduces MAXSET and REFSET into the context. A well-known problem, however, is that this mechanism only works for MON↑ determiners. Because of the existential nature of the construction, it merely desires there to be *some* pair of maximal sets satisfying restrictor and scope and the Q'-relation. It does not enforce *all* pairs of maximal sets satisfying A and B to be in this relation. Kibble takes this problem to be the source of complement anaphora. A natural way of solving the problem is by defining MON↓ determiners in terms of their duals. There are, however, two possible constructions of duals for each determiner D: one based on the so-called *complement* $-D$ and one based on the *contradual $D-$*. The first can be compared with ordinary wide scope negation of the quantificational structure. This way, the complement of *few*$(A)(B)$ will be *not few*$(A)(B)$ or *many*$(A)(B)$. To return to *few* we simply negate once more: *not many*$(A)(B)$. Now we have an alternative to *few* in terms of the (unproblematic) MON↑ determiner *many*. The other way of doing this is by using the contradual: *few*$(A)(notB)$. It is easy to see that $D-$ (just like $-D$) is MON↑ whenever D is MON↓ . Negating once more gives us the second alternative to *few*. All this is illustrated in (11).

(11)   Few of the students went to the party.

   a. Not many of the students went to the party.

   b. Many of the students did not go to the party.

Using these insights to come to a dynamic interpretation for MON↓ determiners results in an ambiguity. When the complement is used, the dynamic structure introduces the reference set $A \cap B$ into the context. But when the contradual is used the reference set will be $A - B$. This, according to Kibble, explains why (and why only) we encounter complement anaphora with downward entailing quantifiers.

At first sight, Kibble's solution to the complement anaphor puzzle might seem a side effect of a technical oddity. But there is an important insight hidden behind all this. The correlation between monotonicity properties of a determiner and its possibility to license complement set reference follow from logical inference. As Kibble puts it: "[A] plural pronoun can pick up an antecedent which is either explicitly introduced or logically inferable from antecedent information, provided that the referent functions as a *witness set* which serves to verify the antecedent sentence(s)." ((Kibble 1997b):126). Thus, while a small proportion of MPs being absent is not a witness for *Most MPs attended the meeting* (there could be more of them), a large set of absentees will verify that *few of the MPs attended the meeting* (Kibble refers to such witnesses as *negative witnesses*). With cardinal quantifiers there is no way of knowing whether a large set verifies the antecedent sentence or not, simply because the domain is not known. Thus, COMPSET can only be a witness set for a downward entailing proportional quantification.

There is however a gap between the formal explanation and Kibble's conceptual story involving witnesshood. Formally, nothing prevents us from forming the

duals of a monotone increasing quantifier and such a dual would also output a complement set. The only reason why it is not there is because MON↑ quantifiers do not have the same problems with existential structure as the downward ones have. On the conceptual side, then, it is not clear what it means for a set to *verify* its antecedent sentence and why we wouldn't assume such a set to be maximal. One also can start wondering whether REFSETs are always witnesses. Following Kibble's analysis a small set of party going students, for instance, would not verify a sentence expressing that few of the students attended the party, but still pronominal reference to this set *is* possible. So apparently reference sets have unconditional witnesshood. Moreover, a set of students not going to a certain party can only count as a negative witness for few of the students attending that party, once we have established that this set is a large proportion of the whole set of students. But in order for us to know that, we have to know the cardinality of the (contextual) domain of students. Genuine complement sets are thus also in need of cardinality information. But exactely this was why Kibble excluded non-proportional determiners from producing negative witnesses.

Although Kibble makes clear that some sense of witnesshood is needed to explain complement set reference, his formulation of this key notion seems to raise a lot of questions. In the next section, however, we will see that accounting for the class of COMPSET licencing determiners is not the only problem for the two analyses we have considered.

4   COMPSET **from the hearer's perspective**

Notice a detail in both Hendriks and de Hoop's analysis and that of Kibble's. Both implement the insights in a framework meant to describe natural language interpretation, while Moxey and Sanford's data shows us primarily facts of production. Although this data clearly has repercussions for comprehension (e.g. the expectation of a certain kind of reference following a certain type of determiner), I will try to show here that from an interpretation perspective the data is more subtle.

We have already seen that Moxey and Sanford found a thematic effect in COMPSET continuations: they usually specify the reason why a relatively large proportion of the domain did *not* satisfy the predication. From an interpretation perspective it is interesting to see what happens if we use complement anaphora in continuations other than the thematic preference found by Moxey and Sanford. Consider the examples in (12).

(12)   a. Few of the students went to the party.
            I know who they are.

        b. Few of the American presidents in the 20th century were in power for
            two consecutive terms. My history teacher made me learn their names
            by heart.

        c. Few of these balls are blue.
            Can you point them out for me?

In all these discourses the predications in the first and second sentence are neutral with respect to one another. Resolving the plural pronoun shows a clear preference for REFSET reference. It appears then that the default interpretation for plural pronouns is the intersection of restrictor and scope no matter the formal properties of the determiner. As far as I know, this asymmetry between production and interpretation has not been noticed.

The point made here is that REFSET is (if possible) the preferred resolution of a plural pronoun. The complement set has no such status. During resolution it is overruled by the reference set in neutral situations. It seems to me that COMPSET interpretation is the result of a last resort strategy. Notice that a side effect of *reason-why-not* continuations is that resolving the plural pronoun to refer to the REFSET results in a contradiction. The only non-contradictory resolution is, of course, the COMPSET.

In (Moxey and Sanford 1987), we find an example showing that *reason-why-not* continuations are not obligatory. In (13), there is a clear case of complement set reference, but the fact that the members of COMPSET send their apologies does not really indicate why so few MPs were at the meeting.

(13)   Few MPs were at the meeting. They sent apologies for being absent.

Still, once again we see that resolving the plural pronoun to REFSET reference would result in a contradiction.

Notice how both accounts given in the previous section are not able to cope with the general preference for REFSET reference. De Hoop and Hendriks' analysis will always prefer the non-empty set over the (possibly) empty one, no matter the predications involved (i.e. ignoring the problematic interaction with avoid contradiction, but more on that later). Following Kibble's story, COMPSET *is* a reference set, so the desired difference between the two sets does not exist.

More support for the view that the interpretation of anaphora shows a preference for REFSET comes from explicit reference to the complement set. Notice the following contrast.

(14)   a. Few of the students went to the party.
            The others stayed at home instead.

        b. Few of the students went to the party.
            The others had a good time.   non-party-goers$>>^{??}$party-goers

In (14a) we see that we can replace the complement anaphor with an explicit reference to the complement set: *the others*. This definite description takes the complement of the REFSET relative to some domain of quantification (the MAXSET). If we take Kibble's analysis serious, there is really no difference between COMPSET and REFSET other than that they are the reference set of dynamically different but logically equivalent representations of a quantificational structure. In other words, there is no apparent reason why *the others* would not accept the COMPSET as an antecedent reference set. This however gives us the odd (14b).

Summarizing, for the interpretation of plural anaphora, we find the following paradigm in terms of emptiness. (A) corresponds to monotone increasing contexts; (B) to cardinal downward monotone ones and (C) represents the cases with true COMPSET licensers (proportional monotone decreasing determiners).

(A) COMPSET possibly empty, REFSET non-empty: *COMPSET/REFSET

(B) COMPSET and REFSET both possibly empty: *COMPSET/REFSET

(C) REFSET possibly empty, COMPSET non-empty: REFSET>COMPSET

5   Analysis

The first question arising from all this is how to derive the potential cancelling of the preference for REFSET. One way to account for this is to return to an optimality approach and add the high-ranked constraint *avoid contradiction* (henceforth: AVOIDC). This constraint seems fit for accounting for the last-resort strategy necessary for resolving pronoun reference to COMPSET. But it is easy to see that there can be no ranking of AVOIDC, FORWD and EMPTINESS such that it accounts for the data. The reason is that if we rank EMPTINESS higher than AVOIDC we get no preference for REFSET when it is potentially empty but lacking contrast in predication. So would we now choose to rank the two constraints the other way around, then we predict COMPSET readings in cases like (3a), repeated here.

(3a) Most students went to the party. #They went to the beach instead.

The obvious problem is that EMPTINESS is only supposed to be decisive for COMPSET reference. As we have seen, we actually prefer referring to the possibly empty REFSET over reference to the guaranteed non-empty COMPSET. Thus the proper role of EMPTINESS appears not to be a general constraint on reference at all, but it appears to tell us which sets are potential antecedents and which are not.

Here we stumble on an important relation between emptiness and witness-hood. Both show us the logical accessibility of a set. EMPTINESS seems to exclude possibly empty reference sets. We also saw that the formalization of witness-hood predicted that REFSETs are always available as an antecedent. Let us therefore replace EMPTINESS with a new constraint, a reformulation of what it means to be a witness:

(15) WITNESS: Be a witness, i.e. as an antecedent of an anaphoric expression choose an accessible referent or choose a constructed referent which is guaranteed to be non-empty.

The intuition behind this constraint is that reference to an introduced referent is less dangerous than reference to a constructed one, since the properness of such a construction is not guaranteed. Kamp and Reyle proposed that in discourse representation theory subtraction is not a permissible operation for the forming of an

		WITNESS	AVOIDC	FORWD
Most(A)(B). They ¬B	REFSET		*	
Most(A)(B). They ¬B	COMPSET	*		*
Most(A)(B). They $C_{neutral}$	REFSET			
Most(A)(B). They $C_{neutral}$	COMPSET	*		*
Few of the (A)(B). They ¬B	REFSET		*	
Few of the (A)(B). They ¬B	COMPSET			*
Few of the (A)(B). They $C_{neutral}$	REFSET			
Few of the (A)(B). They $C_{neutral}$	COMPSET			*
Less than ten (A)(B). They ¬B	REFSET		*	
Less than ten (A)(B). They ¬B	COMPSET	*		*
Less than ten (A)(B). They $C_{neutral}$	REFSET			
Less than ten (A)(B). They $C_{neutral}$	COMPSET	*		*

Figure 13.1: Tableau for the paradigm

antecedent (see (Kamp and Reyle 1993):307). (Kibble 1997b) already suggested that this is a far too strong a constraint on antecedent formation and proposed his *witness* alternative. I propose to alter this again into a constraint which is more like Hendriks and de Hoop's emptiness, with the key difference that it is only applied to constructed plurals. Following the current constraint WITNESS and given some sort of ontology (like for instance the upper semi-lattice structure used by (Kamp and Reyle 1993)) summation of referents is always allowed, subtraction is only allowed once it is defined.

WITNESS is thus a powerful constraint on anaphoric reference. Ranking AVOIDC over FORWD accounts for the data in the previous section, i.e. only contradictive meaning can force us to interpret a pronoun as referring to a complement set. From (3a) it follows that if the complement set is not a suitable antecedent due to WITNESS we should accept any reading resulting from resolving the pronoun to REFSET, even a contradictive one. Hence, AVOIDC is ranked below witness-hood.[3] The effects of this ranking are illustrated in the tableau in 13.1.

WITNESS rules out all references to COMPSET where COMPSET is possibly empty. This only leaves the proportional downward entailing quantifiers. In general REFSET reference is preferred, but this can be overruled in the non-neutral cases, where the predication in the continuation contradicts the predication in the antecedent sentence.

Following a downward entailing cardinal quantifier, WITNESS is violated by COMPSET reference. This is because the set *A* is unknown and thus $D(A)(A)$ could be valid. In the introduction I mentioned that following these quantifiers COMPSET reference is not plainly out, but *bad*. The reason for this is that contrary to increas-

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[3]See (de Hoop 2000) for more on unintelligibility, optimality theory and avoid contradiction.

ing quantificational structures there is an indirect way the complement set can still be a witness. Sometimes, there is an implicit domain available triggering a partitive reading and making the complement set into a negative witness. Consider for example (16), where the fact that we know how many nominees there are for an Oscar category (five) provides the implicit partitive reading.

(16)   Less than two nominees for the Oscar for best actor wore a tuxedo. They simply wore a suit and tie.

Moreover, it seems to me that sometimes a domain can be accommodated. Consider (17):

(17)   Less than ten students handed in their essay.
       They had all sorts of excuses.

We do not know how many students there are, but there is no real reason to assume there only to be ten. The continuation seems to provide evidence for the existence of more than ten students. This allows the COMPSET to be a witness set for the first sentence.

Let us briefly consider the case of *the others*. Notice first how it differs from a complement anaphor in that it can occur following increasing environments.

(18)   a.   Most students went to the party. The others stayed in.
       b.   Less than ten students went to the party. The others stayed in.

It seems plausible to characterize *the others* as signaling a shift from the preferred reference to its complement. This behavior follows directly from our analysis once we assign *the others* a semantics like: $\lambda P.P(X - A)$, where X is a context set (the maximal set) and A is the antecedent for *the others*. Notice that WITNESS, since it is a constraint on antecedent-hood, already blocks COMPSET as a potential antecedent for X in increasing and cardinal environments. What is left to be explained is the fact that *the others* cannot refer to REFSET even in the remaining cases. One way to go would be to say that forward directionality (like WITNESS is and like emptiness was) is a constraint on antecedents, i.e. it prefers anaphoric expressions to select a forward directional antecedent. At first, this might seem a break with the original intention of FORWD, viz. reduction of topichood, but notice that such a break only occurs in case the anaphoric expression expresses a shift of some sort. Of course, that is exactly what we want. I leave it to the reader to check that the current proposal indeed covers all the data.

6   Conclusion, reflection, further research

Complement sets are marked antecedents for plural pronouns. Their construction is only permitted once they are guaranteed to be non-empty, but even in this case resolution to COMPSET only occurs once REFSET reference is out for independent reasons.

The interpretation of pronouns referring to a part of a quantificational domain now sums up to the following: interpret the pronoun as a referent or as a necessarily non-empty constructed referent; next –if there is a choice– interpret the pronoun in such a way that there arises no contradiction; finally, if there still is a choice, choose REFSET over all other alternatives.

Reflecting on this resolution strategy we could say that the task of optimality theory here is nothing but mediating between different modules of language use. WITNESS could thus be seen as a hard constraint saying that we should only refer to that which is available or safely inferable. Making sense is thus only possible once we have obeyed witness-hood. Finally, pragmatic preference for a certain type of information flow is only important once we have an intelligible interpretation.

I have remained quiet on one complicating issue. It concerns a problem with reference to the maximal set. In (19) we prefer a maximal set reading over a resolution to COMPSET.

(19)   Not all of the animals in this zoo are dangerous.
        More than half can be stroked.

Clearly, more than half of the animals can be stroked, not more than half of the non-dangerous ones. If we assume that the maximal set is present as a referent, then following our analysis presented here we predict MAXSET reference to be immune to WITNESS. This, however, poses the question how MAXSET and COMPSET are in competition in examples like (19). A possible solution would be to assume that in addition to forward directionality (violated by both COMPSET and MAXSET) there is a constraint which represents the costs of constructing a new referent out of existing ones. This would account for examples like (19). However, there is little data known involving maximal set reference, so the details will have to be part of further research.

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