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PLURAL PRONOUNS AND THE PARTITIVE CONSTRAINT

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In this paper, I will be concerned with the problem of giving a semantic analysis of plural pronouns contained in partitive NPs where the antecedent of the pronoun is a kind-denoting bare plural. The problem arises if we try to maintain the following two claims:

I) The partitive constraint is a semantic constraint, i.e. definiteness is a semantic notion, and

II) The relation between a plural pronoun and a bare plural antecedent that doesn't c-command the pronoun is coreference.

Bare plurals are not allowed in (count) partitive NPs:

1) a. *each of beetles
   b. *most of cats

However plural pronouns whose antecedent is a bare plural are grammatical in partitives as the examples in (2) and (3) show.

2) Judicial decisions protecting the environment are rare, and the Supreme Court is overturning many of them

3) Raccoons came into my backyard, so I poisoned all of them

So if we think that what rules the bare plurals out of (1) is a semantic constraint, and we assume (II), that the pronoun and the bare plural are coreferential, why doesn't the semantic constraint apply in (2) and (3) and rule out those pronouns?

To answer this question, first I discuss the ambiguity of bare plurals. Next I show why I think bare plurals are not allowed in partitives on either reading on Barwise and Cooper's (1981) and Ladusaw's (1982) analysis of the partitive constraint. For the question of why plural pronouns with bare plural antecedents are allowed in partitives, I conclude that the relation between the bare plural antecedent and the pronoun cannot be coreference and show that seomething like an Evans (1977) E-type analysis will work for these pronouns. Finally, I will briefly discuss Carlson's (1977) theory which relies on the relation being coreference.

1. Ambiguity of Bare Plurals

I have argued in my dissertation (Wilkinson, 1991) that bare plural noun phrases are ambiguous between a kind-denoting and an indefinite interpretation. Two interpretations are exemplified in (4) and (5).

4) Beetles ruined my garden
5) Pandas are almost extinct

Beetles in (4) gets an existential interpretation, which entails, "There were beetles that ruined my garden." In my dissertation I follow a Heim/Kamp approach to indefinites, but the specific choice of treatment of indefinite plural NPs will not matter here.

In (5), pandas is a kind-denoting term, which occurs with the kind-level predicate, extinct. The test by which we know that extinct is kind-level is the fact that it cannot co-occur with an individual denoting subject as in (6).

6) *Lincoln is extinct

So, I reject Carlson's treatment of bare plurals as unambiguous, but I agree with the analysis he gives to

(5), just not with the analysis of (4).

2. Why Bare Plurals Are Ungrammatical in Partitives

Jackendoff (1977) first noticed that partitives must contain a definite complement NP, which he called the Partitive Constraint (He considers the to be a demonstrative specifier and formulates the constraint as, "the NP after the of has to be demonstrative or genitive" (Jackendoff, 1977:111)). A sample of his data is given in (7) and (8).

7) a. *many of all men
   b. *many of some men
   c. *few of many men
   d. *many of men

8) a. many of the men
   b. few of the many men
   c. many of his friends

My main concern will be to account for why bare plurals are not allowed in partitives as in (7d). I will consider two semantic theories of what kind of NPs are allowed as the complement in a partitive NP[1]: Barwise and Cooper's and Ladusaw's.

First let's look at the analysis of partitives on Barwise and Cooper's generalized quantifier theory. NP's like every woman (the whole NP is called a quantifier in B & C's framework) take their denotation in sets of sets of entities. The denotation of every woman is the set of all sets that contain the set of

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[1] For some theories the question has to be phrased, "What are the restrictions on the second determiner in a partitive NP?" since on those theories (e.g. Keenan and Stavi (1986), Chomsky (1965)) the post of material is not an NP. Instead, Keenan and Stavi, as well as Chomsky, give a syntactic rule that forms complex determiners of the form: Det --> Det of Det, where the last Det is plural and definite. Keenan & Stavi adopt Barwise and Cooper's definition of definite determiners. See Stockwell, Schachter and Partee (1973) and Hoeksema (1984) for several syntactic arguments against this view.

woman. The interpretation for an NP containing every is as in (9).

9) $\|\text{every}\|(A) = \{ X \subseteq E: A \subseteq X \}$
(Barwise and Cooper 1981:169)

The family of sets in the denotation of every N is called the "universal sublimation." There also "existential sublimations" and "individual sublimations." The first is the family of set containing atleast one N ($\|\text{some}\|(A) = \{ X \subseteq E: X \cap A \neq \emptyset \}$) and the second is the family of sets containing the individual. A universal sublimation is a principal filter, since there is a "core" set, a set that is a subset of every set in the family of sets that form the sublimation. Ladusaw defines a principal filter as follows:

10) Ladusaw's Definition of a Principal Filter

An NP denotation Q is a principal filter iff
Ep Aq ϵ Q [p is a subset of q].

The set p is called the generator set.

Both universal and definite NPs denote principal filters, but only the universal ones are proper, i.e., universal NPs can have the empty set as generator, whereas definite NPs are not defined on the empty set. The n men just means the same as every man in models where the cardinality of the set of men is n, otherwise it is undefined. (Every man is the set of all subsets of the universe, E, in a model where there are no men.)

For Barwise and Cooper, the definition of definite determiner is:

11) Barwise and Cooper's Definition of Definite Determiner

A determiner D is definite if for every model $M = \langle E, \| \| \rangle$ and every A for which $\|D\|(A)$ is defined, there is a non-empty set B so that $\|D\|(A)$ is the sieve $\{X \subseteq E : B \subseteq X\}$.
(Barwise and Cooper (1981:184))

They state concerning definite NPs that, "when the cardinality of the set B of generators is greater than 2, these NPs can occur in frames like: all of ___, most of ___, some of ___, many of ___." They interpret of NP as the intersection of all the sets in the

denotation of Q. Thus, of NP is interpreted as the generator set of NP which is a CN denotation.

Turning to Ladusaw's theory, he explains a fact that is unaccounted for on Barwise and Coopers theory of partitives, namely, why both men is ungrammatical as the complement of a partitive NP while the two men is acceptable.

12) a. *one of both men
b. one of the two men

On Barwise and Cooper's theory both men and the two men have the same meaning, which is the same as the meaning of every man in models where the cardinality of the set of men is two, otherwise they are undefined. Thus, Barwise and Cooper, by their own admission, predict that both (12a) and (12b) should be grammatical.

To explain the difference, Ladusaw argues that the complement NP in a partitive denotes a group. Both men cannot occur as the subject of a collective predicate and does not have a group interpretation. The two men does have a group interpretation and is acceptable with predicates such as met in (13a).

13) a. The two men met
b. *Both men met

Ladusaw modifies Barwise and Cooper's account by adding entities that are groups to the model. Groups are non-empty, non-singleton sets of entities. Ladusaw follows Keenan (1982) in observing that the power set of the set of individuals forms a (complete and atomic) Boolean algebra in which common nouns take their denotation. For Ladusaw, there is an analogous algebra on the domain of groups. Plural definite NPs such as the two students are generalized quantifiers over groups, that is sets of sets of groups.

Ladusaw defines an "individual" using the following definition:

14) Ladusaw's Definition of an Individual

> For atoms x of the set of possible CN denotations, I_x (the individual generated by x) is $\{ p \in D_{CN} : x \subseteq p \}$.

Singular definite NPs, if defined, and proper names denote proper principal filters generated by a

singleton set containing one entity. Plural definite NPs are also individuals, since they denote proper principal filters generated by a singleton set containing a group-level entity (a non-empty, non-singleton set of entities). The NP complement in a partitive NP must denote a group-level individual.

The interpretation of of NP is g(a) if NP denotes the individual generated by a, I_a, and is undefined otherwise. The function g is a consists-of function that has as domain the atoms of D_{GCN} and whose range is included in D_{CN}. For any non-empty non-singleton set p, g maps {p} onto p. The generator a is found by intersecting the sets in the denotation of the NP just as in Barwise and Cooper's theory. Thus, on Ladusaw's analysis, only definite plural NPs, excluding NPs containing the determiner both, are allowed in the complement of partitive NP's. Not all proper principal filters are allowed in partitives, only those that have singleton sets, which are atoms in the possible CN denotation algebra, as their generators.

For example, the analysis of the complement NPs in (12) is as follows: the NP both students (in models where it is defined, that is, in models where there are just two students) has as generator the set of students, which is not a group. The NP the two students is generated by the set of the set of students, which is a group. The definite article is what makes the NP into a group.[2]

One empirical problem with Ladusaw's account pointed out by Roberts (1987) is that it doesn't rule out *one of John and Mary. John and Mary, like the two students, can denote a group level individual.

A technical problem of number for Barwise and Cooper's and Ladusaw's account is why doesn't some of the boys mean the same as some boy? In general, some can be either singular or plural, e.g. some boy or some boys. But on their analysis of the partitive NPs, the plurality is not recoverable from 'of the boys'. In

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[2] I think Ladusaw means for the definite article to introduce his group-consisting-of function, f, which maps a non-empty, non-singleton sets, p, in the set of possible CN denotations to the singleton set, {p}. The consists-of function, g, discussed in the text is the inverse of f.

general, it is possible to have the whole partitive NP singular or plural as the verb agreement in (15) shows.

15) a. One of the boys is hungry
    b. Two of the boys are hungry

Thus, some of the boys ought to mean either "some boy" or "some boys," but it only agrees with a plural verb.

16) Some of the boys are/*is at the door

The plurality of some in the partitive correlates with the use of some with an empty common noun (on a count interpretation).

Leaving these observations aside, what predictions are made for kind-denoting bare plurals in partitive NPs on Barwise and Cooper's and Ladusaw's theories? Recall for Barwise and Cooper, the complement NP has to be a proper principal filter, and kind-denoting bare plurals are proper principal filters. The singleton {d}, where d is the dog-kind will be the generator for the principal filter, $\{ X \subseteq E : d \in X \}$. So, bare plurals count as definite according to this definition, but still *some of dogs is ungrammatical. Instead, what rules out kind-denoting bare plurals in partitives is the requirement that the cardinality of the generator set be atleast two. The generator for kind-denoting bare plurals is a singleton set.

Ladusaw builds the same requirement into his system by requiring that the complement NP be a group and only letting groups be non-empty non-singleton sets of individuals. Kind-denoting bare plurals are semantically singular. They name individuals just as John does. An NP denoting a singleton set containing one individual (ordinary individual or kind) is not allowed in a partitive on Ladusaw's account.

Since we are using the fact that bare plurals are semantically definite and singular, there is a further unresolved issue, namely, why partitives containing bare plurals do not get a mass interpretation. Definite singular NPs are acceptable in partitives with determiners that cooccur with mass nouns, some, all, most. I do not have an explanation for this.

I conclude that kind-denoting bare plurals are semantically singular and definite. This accounts for why they are not allowed in (count) partitives.

3. Why Are Plural Pronouns with Bare Plurals Antecedents Allowed in Partitives?

Having considered the behavior of bare plurals in partitives, I now return to the examples with pronouns. Notice that if the bare plural gets an existential interpretation, where it is the antecedent for a non-c-commanded plural pronoun, as in (17), then the pronoun behaves like what Evans calls an E-type pronoun.

17) Raccoons came into my backyard last night, so I poisoned all of them,

Evans argues that there are pronouns that are neither bound nor coreferential with their antecedents based on examples such as (18).

18) John owns some sheep and Harry vaccinated them

The NP some sheep and the pronoun do not corefer because quantificational NPs are not referring (he also gives examples with other quantifiers such as no), and the pronoun cannot be bound, because if it were we would get an interpretation that can be paraphrased as in (19).

19) There are some sheep that John owns and Harry vaccinated

Evans noticed that (18) entails (20).

20) Harry vaccinated all the sheep which John owns

The bound reading paraphrased in (19) does not have that entailment. Evans proposed that the pronoun in (18) instead picks out the group that satisfies the clause that contains the antecedent, namely "the sheep that John owns." Similarly in (17) the raccoons that are poisoned are all and only the ones that came into my backyard. The pronoun is not bound or coreferential. It can't corefer because its antecedent raccoons is quantificational (it has the same denotation as some raccoons). The attempt to give a bound paraphrase of (17) has the same problem as (19), as we can see from (21).

21) There are raccoons such that they came into my backyard and I poisoned all of them

because (21) allows that there might be raccoons that

came into my backyard that I didn't poison, while (17) does not. In (17), them is paraphrased "the raccoons that came into my backyard." So, in cases where the antecedent is a bare plural that gets an existential interpretation the pronoun is an E-type pronoun.[3]

There are both syntactic and pragmatic ways of spelling out Evans' analysis (see discussion in Heim (1990)). For our purposes either one will do.

If the antecedent is kind-denoting as in examples like (22), the relation between the pronoun and the antecedent cannot be coreference.

22) Decisions protecting the environment are rare, and the Supreme Court is overturning many of them.

We saw above (p. 8) that kind-denoting bare plurals are not allowed in partitives, because they are semantically singular. Notice we cannot substitute decisions in for the pronoun in (22) as the ungrammaticality of (23) shows.

23) Decisions protecting the environment are rare, and the Supreme Court is overturning many of decisions protecting the environment.

Coreference would be possible, however, if the pronoun occurred with a kind-level predicate like be common in (24).

24) Decisions protecting the environment are rare, but they used to be quite common

For (22), since the pronoun is not c-commanded, the pronoun cannot be bound. Even if there wasn't a c-command constraint, there doesn't seem to be a grammatical paraphrase of the sentence with the pronoun bound.

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[3] I intend for this to be also extended to cases where the antecedent is indefinite, so that sentences like (i) also have an E-type analysis of the pronoun.
i) Even though spiders are not normally a garden pest, some of them ruined Mary's garden this year.
Here the variable introduced by the noun, spiders, is bound by the adverb normally.

So, like the examples Evans discusses, we have found pronouns that are neither bound nor coreferential with their antecedents. Unfortunately, we can't give exactly Evans analysis to these pronouns either. Notice the antecedent is not quantificational according to what I've said. In (22), them is not equivalent to "the decisions protecting the environment that are rare." The pronoun can not pick out a group of entities that verify the sentence in which the antecedent is contained, because the antecedent occurs with a kind-level predicate and the pronoun occurs in a non-kind-level context.

Evans himself doesn't analyze pronouns with definite antecedents as E-type pronouns anyway, because there are cases where the pronoun only picks out the individuals that verify (the descriptive content of) the NP, not the whole clause, for example Karttunen's "paycheck" sentence, which I give a modified version of in (25).

25) The man who gave his paycheck to his son was wiser than the one who gave it to his dog.

Here the "it" cannot be analyzed as an E-type pronoun, since it does not mean "the paycheck he gave to his son." (He didn't give the paycheck to his son to his dog). "It" simply means "his paycheck." For this reason Parsons, Evans, and Heim treat pronouns with definite antecedents differently from those with quantificational antecedents. When the antecedent is definite, the copying rule copies just the NP.

Taking the pragmatic approach to E-type pronouns, it seems plausible that if we mention a kind, the set of instances of that kind are made salient.

If LF's for sentences containing E-type pronouns are given by a syntactic copying rule such as in Heim (1990), then plural pronouns with kind denoting bare plural antecedents can not be handled by her rule. In these cases, we don't simply repeat the whole NP, nor do we take the set of individuals that verify the antecedent clause. In this case, the antecedent is definite, but denotes a kind. What gets copied is a noun (or common noun phrase). The way to get a predicate out of a kind is to switch to instances of the kind. So, the plural pronoun has the meaning, "the (unique, maximal) set of instances of the kind x,"

as in the paraphrase of (22) given in (26).[4]

26) Decisions protecting the environment are rare, and the Supreme Court is overturning many of the decisions protecting the environment

Notice that there is another construction that is sensitive to definiteness, where bare plurals and plural pronouns with bare plural antecedents differ in their distribution, namely, there-insertion sentences. Generally, in there-insertion sentences the post-copular NP must be indefinite. Bare plurals are allowed in there-insertion sentences on their indefinite interpretation (discussed in section 1).

27) There were cats in my room

Plural pronouns are, however, ungrammatical in there insertion sentences whether the antecedent is kind-denoting or not.

28) *There were them/they in my room

Heim (1987) argues that pronouns are represented as variables at LF, and variables are strong even if the antecedent to the pronoun is weak. She discusses cases where a pronoun whose antecedent is a weak NP is not

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[4] Heim (pc) observes that this proposal makes a further prediction that with the pronouns contained in partitive NPs that we should only get the proportional reading of many of them and few of them. Partee (1988) shows that many of the N and few of the N only get proportional readings. Assuming that many and few do not get cardinality readings in partitive NPs, examples like the following are predicted to be ungrammatical.

i) Rhinos are my favorite species of animal, but we saw very few of them in Africa. That's because there ARE few rhinos. The species has become quite rare.

We expect only the cardinality reading when there are few in existence (Partee attributes this diagnostic for the cardinality reading to Huettner (1984)). Thus, we may suspect that when what follows the of is a plural pronoun, as in few of them, that the whole NP, despite appearances, is not a true partitive. In other words, few of them just means "few rhinos" in (i), allowing a cardinality reading. Them is standing in for a common noun (phrase), and the of is inert.

allowed in a there insertion sentence, but putting the full NP after the be is acceptable:

29) *No perfect relationship is such that there is it
30) There is no perfect relationship.

Her conclusion from this example and others like it, is that variables are strong (using strong as the characterization of what is not allowed in there insertion constructions).

Another argument that variables are strong comes from scope facts. Heim cites examples from Milsark (1977) such as (31) which only gets a narrow scope interpretation for the indefinite.

31) There must be someone in John's house,

Sentence (31) cannot mean, "There is someone who must be in John's house." If the definiteness restriction applies at LF and variables are strong, then wide-scope readings of quantificational NPs will be ruled out. Narrow-scope readings are accounted for by leaving the quantificational NP in-situ (In a footnote, Heim shows how her treatment of indefinites is not incompatible with this account of pronouns).

Heim's account of pronouns in there-insertion sentences is compatible with the fact that plural pronouns are allowed in partitive NPs. Pronominal NPs are strong and definite, so they are not ruled out by the partitive constraint.[5]

4. Comparison to Carlson's Theory

Carlson offers an analysis of plural pronouns with kind-denoting antecedents that relies on their being coreference between the bare plural and the plural pronoun. So, he is led to expect bare plurals to be grammatical in partitives, but they are not.

The examples he discusses are similar to (32), where the pronoun is not contained in a partitive, and he maintains the claim that the bare plural and the

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[5] But i) shows that the whole partitive NP is weak. (cf. Comorovski (1988))
i) Chinese graduates students are rare, but there are many of them in my class. (Heim, pc)

pronoun are coreferential.

32) Judicial decisions protecting the environment are rare, and the Supreme Court is overturning them.

He allows a pronoun to get the same two interpretations he offers for the bare plural itself. In every case, the pronoun is coreferential with the kind, but it is allowed to get existential force from the context. He introduces existential quantification over instances of the kind in the meaning of the VP to get a non-generic reading of the pronoun in (32). For Carlson, (32) is equivalent to (33).

33) Decisions protecting the environment are rare, and the Supreme Court is overturning some.

Instead I analyze the pronoun in (32) as I did for the partitive examples, where it is equivalent to the paraphrase with a definite plural NP in (34).

34) Decisions protecting the environment are rare, and the Supreme Court is overturning the decisions protecting the environment

We can account for Carlson's intuition that the pronoun gets an existential interpretation, if we look at other examples of full definite plural NPs. Dowty, (1986) shows that lexical properties of the verb can influence how many of the individuals in the denotation of the NP have to have the property expressed by the verb. His example is (35).

35) At the end of the press conference, the reporters asked the president questions. (Dowty, 1986)

Sentence (35) can be true in a situation where only a few reporters asked questions.

In conclusion, I hope to have shown that since we can have a pronoun with an antecedent that is a kind denoting bare plural, that itself does not occur in a kind-level context, we must be able to interpret it without introducing existential quantification over stages as Carlson does.

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