# Singular Donkey Pronouns Are Semantically Singular

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## 1. Introduction

A certain prima facie implausible idea about the semantics of donkey pronouns has found a surprising number of adherents (Davies 1981, Lappin 1989, Neale 1990, Lappin and Francez 1994, Yoon 1994, 1996, Krifka 1996a) and even crept into a textbook (Larson and Segal 1995).[1] According to this idea, syntactically singular donkey pronouns like *it* in (1) are *semantically numberless*, so that (2) provides an adequate paraphrase of (1):

(1) Every farmer who owns a donkey beats it.

(2) Every farmer who owns a donkey beats the donkey or donkeys he owns.

Let us call this idea the *Number Neutrality Thesis*. I argue that the Number Neutrality Thesis is not well-motivated, makes wrong predictions, and does not do the job it is intended to do in some cases—in short, it is unsatisfactory in every respect.

## 2. The Number Neutrality Thesis

The Number Neutrality Thesis has often been put forward as a refinement of the crude E-type analysis of donkey pronouns. According to Evans (1977), a donkey pronoun like *it* in (3a) and (4a) is an instance of an E-type pronoun and is paraphrasable by a definite description as in (3b) and (4b):

(3) a. Every farmer who owns a donkey beats it.
b. Every farmer who owns a donkey beats the donkey he owns.
c. Every farmer who owns a donkey beats every donkey he owns.

(4) a. No farmer who owns a donkey beats it.
b. No farmer who owns a donkey beats the donkey he owns.

* I am indebted to Chris Tancredi for comments and to the audience at Stanford University for useful discussions.

[1] I follow Krifka 1996a in referring to Youngeun Yoon Kang's dissertation as Yoon 1994.

c. No farmer who owns a donkey beats a donkey he owns.

A problem with this paraphrase is that the donkey pronouns in (3a) and (4a) do not have the strong uniqueness presupposition to the effect that every farmer who owns a donkey owns just one donkey. Rather, (3a) and (4a) seem to have the truth conditions roughly paraphrasable by (3c) and (4c).[2] How the quantificational force associated with the donkey pronoun (universal in the case of (3a) and existential in the case of (4a)) arises has been a puzzle ever since the *unselective binding* mechanism of classical DRT and file change semantics was abandoned. The answer given by the Number Neutrality Thesis is that the donkey pronoun *it* is indeed paraphrasable by a definite description—not by the singular, uniqueness-presupposing *the donkey he owns*, but rather the number-neutral *the donkey or donkeys he owns*. Thus, the right paraphrase for (3a) is (5):

(5) Every farmer who owns a donkey beats the donkey or donkeys he owns.

Since *beats the donkey or donkeys he owns* normally means *beats every donkey he owns*, (5) comes out equivalent to (3c).

There's more to be said about (4a), where the quantificational force associated with the donkey pronoun is existential rather than universal. We will come back to the issue of how one adhering to the Number Neutrality Thesis can treat cases like (4a), as well as (6), which has *every* as its initial determiner and yet gets the existential interpretation.

(6) Every man who had a quarter put it in the parking meter.

A rationale behind the Number Neutrality Thesis is that the singular form of the donkey pronoun in donkey sentences like (3a), (4a), and (6) is simply triggered by syntactic agreement. Neale (1990) uses the following examples to make this point:

(7) Every farmer who owns more than one donkey beats it.

(8) Every farmer who owns at lest two donkeys beats them.

The two sentences are truth-conditionally equivalent, and it seems correct to paraphrase the donkey pronoun in the two sentences by *the donkeys he bought*. Thus, both *it* in (7) and *them* in (8) are semantically plural, and the choice between the two forms is purely a matter of syntactic agreement.

Note that plural donkey pronouns are also semantically numberless, at least in some contexts:

[2] (3c) gives the truth conditions standardly associated with (3a), but in my experience, many speakers seem to prefer to interpret this particular sentence in the weaker sense of *every farmer who owns a donkey beats a donkey he owns*. However, looking at more examples makes it clear that donkey sentences with *every* at least has a bias toward the stronger interpretation compared to donkey sentences with other determiners. See Kanazawa 1994 and Jackson 1994.

(9) Every farmer who owns one or more donkeys beats them.

It follows that the difference between singular and plural donkey pronouns is entirely syntactic, so that (3a) and (9) are given the exact same semantics under the Number Neutrality Thesis.

## 3. The Sum Theory

The precise treatment of donkey anaphora under the Number Neutrality Thesis differs from author to author, depending on how the paraphrase *the donkey or donkeys he owns* is formally captured. Several authors (Lappin 1989, Lappin and Francez 1994, Yoon 1994, 1996, Krifka 1996a) have applied Link's (1983) theory of definite descriptions and assumed that the donkey pronoun denotes the sum individual given by the definite description *the donkey or donkeys he owns* (relative to the value of the 'farmer variable' *he*, that is). In Yoon's (1996) representation, (1) is interpreted like the following formula

(10) $EVERY x\,(\text{farmer}(x) \wedge \exists y(\text{donkey}(y) \wedge \text{own}(x,y)),$
$\text{beat}(x, \sigma y(\text{donkey}(y) \wedge \text{own}(x,y))))$.

Here *EVERY* is the two-place generalized quantifier corresponding to *every*, and $\sigma y\,\varphi(y)$ stands for the sum of all individuals $y$ that satisfy $\varphi(y)$ (Link 1983). I call this treatment of singular donkey pronouns the *Sum Theory*. Certainly, syntactically plural pronouns may denote something like sums in Link's theory, as they are sometimes interpreted collectively. The Sum Theory, then, is a natural way of fleshing out the rough outline given by the Number Neutrality Thesis.

The Sum Theory is most forcefully put forward by Krifka 1996a as a way of explaining the fluctuation between the existential and universal interpretations of donkey sentences. Thus, I will use Krifka 1996a as the main target of my criticisms. In fact, Krifka 1996a does not couch his theory as a refinement of the E-type analysis and assumes a neo-DRT-style representation, but these details are not important for the purpose of this paper.

## 4. The existential and universal interpretations of donkey sentences

As we have seen, the quantificational force associated with donkey anaphora (*every donkey* ... in (3a) and *a donkey* ... in (4a)) is not constant. In the literature, the interpretation given by a paraphrase like (3c) (with universal quantification over donkeys) has often been called the 'strong reading', and that given by a paraphrase like (4c) (with existential quantification over donkeys) the 'weak reading'. This terminology is slightly misleading, so I follow

Krifka 1996a in calling them the *universal interpretation* and *existential interpretation*, respectively. Although there are unclear cases like (11) where neither the universal nor the existential interpretation seems to be clearly the right one (Rooth 1987), for other cases like (4a), (12)–(18), one or the other of the two interpretations is clearly preferred or even the only possible one (Kanazawa 1994).

(11) a. Most farmers who own a donkey beat it.
  b. Most farmers who own a donkey beat every donkey they own.
  c. Most farmers who own a donkey beat a donkey they own.

(12) Every student who borrowed a book from Peter eventually returned it. (universal)

(13) Every graduating student who has a book checked out from the library must return it by June 13 to avoid penalty. (universal)

(14) Every boy who had a quarter got it from his father. (universal)

(15) No parent with a son still in high school has ever lent him the car on a weeknight. (existential)

(16) Every man who had a quarter put it in the parking meter. (existential)

(17) Most men that have a nice suit will wear it to church tomorrow. (existential)

(18) At least three farmers who have a donkey beat it. (existential)

The question is what determines which interpretation is the right one (or preferred).

While recognizing other possible factors, Kanazawa (1994) singled out the monotonicity properties of the head determiner as a main factor in determining the right interpretation for donkey sentences with singular donkey pronouns. Table 4 summarizes the descriptive generalization reached in Kanazawa 1994 (page 120). Note that this is only meant to apply to donkey sentences with singular donkey pronouns.

Table I. Monotonicity of determiners and interpretations of donkey sentences

| | Interpretation | Determiners |
|---|---|---|
| $\uparrow$MON$\uparrow$ | Existential interpretation | *a, some, several, at least n, many* |
| $\uparrow$MON$\downarrow$ | Universal interpretation preferred? | *not every, not all* |
| $\downarrow$MON$\uparrow$ | Universal interpretation preferred | *every, all, any* |
| $\downarrow$MON$\downarrow$ | Existential interpretation | *no, few, at most n* |
| $\not\uparrow\not\downarrow$MON$\uparrow$ | Both/unclear | *most* |

The explanation I gave for the observed pattern involved 'preservation of inferential patterns' due to left monotonicity of the determiner, and ultimately a strategy of interpretation (or evaluation) based on inference. See Kanazawa 1994, especially section 5, for details.

### 5. Krifka's explanation of the existential/universal alternation

The starting point for Krifka (1996a) was the observation made in Yoon 1994, 1996 about the effects of the lexical distinction between *total* and *partial* predicates on the interpretation of donkey sentences. When they apply to plural arguments, total and partial predicates allow contrasting inferences to be drawn. For instance,

> If we apply a total predicate like *closed* to an individual with parts, like the referent of *the windows*, we get a true sentence only if the predicate applies to **every** part. If we apply a partial predicate like *open* to it, we get a true sentence already if the predicate applies to **some** of the parts. In a sense, to be *closed* indicates the absence of openness, whereas to be *open* indicates the mere presence of openness within an object. (Krifka 1996a, page 139, emphasis in the original.)

Thus, (19) tends to suggest that all the windows are closed, and (20) can be judged to be true even when some of the windows are closed, as long as the others are open.

(19) The windows are closed.

(20) The windows are open.

Necessary conditions for predicates $P$ and $Q$ to be a total and a partial predicate, respectively, then, are for the following conditions to hold (Yoon 1996):

(21) a. $P(x) \wedge y \sqsubseteq x \rightarrow P(y)$
     b. $Q(x) \wedge x \sqsubseteq y \rightarrow Q(y)$

Yoon also requires that $P$ and $Q$ be lexical antonyms, but this aspect need not concern us here. Besides *closed*/*open*, other examples of pairs of total and partial predicates are: *healthy*/*sick*, *clean*/*dirty*, *spotless*/*spotted*. Yoon (1996, page 228) identifies more than 20 such pairs.

What is relevant here is that total and partial predicates have a similar influence on the interpretation of donkey sentences.

(22) a. Every farmer who owned a donkey kept it healthy during the rainy season.

b. Every farmer who owned a donkey let it get sick during the rainy season.

According to an admirable study involving 50 subjects reported in Yoon 1994, judgments of the majority of her informants indicate that (22a) tends to be understood with the universal interpretation and (22b) tends to be understood with the existential interpretation, just like when the predicates *healthy* and *sick* are applied to plural arguments.[3] Yoon's study shows a high degree of correlation between simple subject-predicate sentences with plural subject and donkey sentences when total and partial predicates are involved, and this led her and Krifka to treat donkey pronouns as sum-denoting expressions. If donkey pronouns denote plural sums (when there is more than one relevant donkey, that is), then these preferences in interpretation can be regarded as one and the same phenomenon, and no principle applying specifically to donkey sentences need be invoked to explain it. Since Kanazawa 1994 had no explanation about the influence of the predicate to the interpretation of donkey sentences, this is a point in favor of the Sum Theory.

Yoon 1994, 1996 also discusses a similar correlation involving another lexical distinction, between *stative* and *episodic* predicates. According to her, plural arguments of a stative predicate tend to be interpreted universally, while an episodic predicate tends to induce an existential interpretation. She uses this principle to account for the existential interpretation of sentences like (6), where the predicate is episodic.[4]

What about the effects of the determiner? Krifka (1996a) assumes a generalization different from Table 4, which he calls *Rooth's Generalization*, but which is stronger than the generalization called by the same name and attributed to Rooth (1987) in Kanazawa 1994. What Krifka (1996a) calls Rooth's Generalization is the combination of the following:

(23) a. If the head determiner of a donkey sentence is MON$\downarrow$, then it gets the existential interpretation.

b. If the head determiner of a donkey sentence is MON$\uparrow$, then it gets the universal interpretation.

What Kanazawa (1994) attributed to Rooth (1987) is just the first part, (23a). Krifka adds (23b), but this has not been claimed by anybody except perhaps

[3] Actually, I think in these particular examples the influence of the main verb *keep*/*let* may be just as strong. Compare:

(i) Every farmer who had a sick donkey kept it sick throughout the rainy season.

(ii) Every farmer who had a sick donkey got it healthy by the end of the rainy season.

[4] This explanation is not convincing for (6), since *put the quarters in the parking meter* seems to favor a universal interpretation. Krifka (1996a) discusses an additional principle (*Domain Narrowing*, attributed to Barker (1993)) to account for the apparent existential interpretation of senteneces like (6). Yoon (1994) also discusses this account but rejects it.

Lappin and Francez 1994. Krifka's assumption that donkey sentences with *most*, which is MON↑, clearly prefers the universal interpretation is not consistent with the received wisdom (Heim 1982, Kadmon 1987, Rooth 1987, Kamp 1991, Kanazawa 1994, Jackson 1994). Also, he does not discuss ↑MON↑ determiners, which, according to Table 4, contradict (23b), except that he suggests in passing that singular *some* needs a different treatment than other quantifiers. This is an important point, as it is one place where singular and plural donkey pronouns seem to behave differently (see section 6.3).

Krifka's (1996a) explanation of (his strengthening of) Rooth's Generalization is that it 'follows from the way predications on sum individuals are understood in general'. The generalization (called *Lappin's Generalization* by Krifka) is:

(24) A non-collective predication $P(x)$ on a sum individual $x$ is preferably interpreted as

(i) $\forall y[y \sqsubseteq x \to P(y)]$ if $P(x)$ is in an upward entailing environment,

(ii) $\exists y[y \sqsubseteq x \wedge P(y)]$ if $P(x)$ is in a downward entailing environment.

Examples are:

(25) a. The windows are made of security glass.

b. $\forall x[x \sqsubseteq \textsc{the windows} \to \textsc{made of security glass}(x)]$

(26) a. The windows are not made of security glass.

b. $\neg\exists x[x \sqsubseteq \textsc{the windows} \wedge \textsc{made of security glass}(x)]$

Krifka proposes that (24) is a consequence of the following two principles:

(27) If a predicate $P$ applies to a sum individual $x$, grammar does not fix whether the predication is universal ($\forall y[y \sqsubseteq x \to P(y)]$) or rather existential ($\exists y[y \sqsubseteq x \wedge P(y)]$), except if there is explicit information that enforces one or the other interpretation.

(28) If grammar allows for a stronger or a weaker interpretation of a structure, choose the one that results in the stronger interpretation of the sentence, if consistent with general background assumptions.

(28) is an extension of Dalrymple et al's (1998) *Strongest Meaning Hypothesis*. Given the Yoon-Krifka representation of singular donkey pronouns, Krifka's strengthening of Rooth's Generalization is explained by these principles: if the initial determiner is MON↑, the universal interpretation gives the stronger reading, while if it is MON↓, the existential interpretation is stronger than the universal interpretation. However, as we saw above, the empirical status of Krifka's strengthening of Rooth's Generalization is dubious at best.

## 6. The Number Neutrality Thesis is not well-motivated

One can make a pretty convincing case against the Sum Theory. In this section, I argue that the Number Neutrality Thesis is not well-motivated, independently of how it is implemented precisely. I then proceed to show in the next section that the Sum Theory makes wrong predictions and fails to do the job that it is intended to do in some cases.

### 6.1. Syntactic agreement is not necessary

Recall that plural donkey pronouns must be semantically numberless, at least in some cases:

(29) Every farmer who owns one or more donkeys beats them.

In this sentence, the donkey pronoun is syntactically plural, yet there is no presupposition or implication to the effect that every farmer who owns a donkey owns more than one. If singular donkey pronouns are also semantically numberless, the difference between singular and plural donkey sentences must be entirely syntactic, so that (29) and the following sentences have identical semantics:

(30) Every farmer who owns at least one donkey beats it.

(31) Every farmer who owns a donkey beats it.

All this is reasonable if the singular form in (30) and (31) is syntactically forced. However, the truth is that it is quite natural to use the plural *them* instead of *it* in (30):

(32) Every farmer who owns at least one donkey beats them.

In fact, in Neale's (7), the sentence becomes much more natural when *it* is replaced by *them*:

(7) (?)Every farmer who owns more than one donkey beats it.

(33) Every farmer who owns more than one donkey beats them.

It is not trivial to account for the exact range of facts here—for one thing, replacing *it* by *them* is not possible in (31)—but the data indicates that the choice of the singular form over the plural cannot be explained simply as a matter of syntactic agreement.

### 6.2. The uniqueness presupposition is not entirely absent

One motivation for the Number Neutrality Thesis was to avoid unwanted uniqueness presupposition of the crude E-type approach. However, it is far from clear that dispensing with uniqueness presupposition altogether is the right move. Even a standard example like (3a) seems to involve some degree of uniqueness implication. People tend to be reluctant to judge the truth of (3a) when the uniqueness condition is not met; if they have to say whether it is true or false, the answer tends to be consistent with the paraphrase (3c), but then there is a strong feeling that one is judging it against a situation it is not intended for.[5] See Kadmon 1987 and Jackson 1994 for discussions of uniqueness presuppositions in donkey sentences.

### 6.3. Singular and plural donkey pronouns behave differently with respect to the existential/universal alternation

The preferences as to which of the existential and universal interpretations gives the right truth conditions are not exactly the same between donkey sentences with singular pronouns and those with plural pronouns. Jackson (1994), in noting that plural donkey pronouns behave like plural definite descriptions, records his judgments about sentences like the following:

(34) Every farmer who owns some donkeys beats them.

(35) Some farmer who owns some donkeys beats them.

(36) No farmer who owns any donkeys beats them.

(37) Most farmers who own some donkeys beat them.

His judgments for different choices of determiners are as follows (Jackson 1994, page 106):

(38) universal: every, some, most, at least *n*, exactly *n*
existential: no, few, at most *n*

The difference shows up in the first and the last row of Table 4. (*Exactly n* is not represented in Table 4, but Kanazawa (1994) shows that it prefers the existential interpretation with singular donkey pronouns.) For example, (39a) seems to have the existential interpretation, while (39b) seems to get the universal interpretation.

[5] This seems to be a commonly misunderstood point; the misunderstanding is perhaps due to the conflation with the conditional version *If a farmer owns a donkey, he beats it,* which has no such uniqueness implication. I am indebted to Chris Tancredi here for confirming my assessment of the native speaker's intuitions.

(39) a. At least two farmers who own a donkey beat it.
b. At least two farmers who own some donkeys beat them.

Jackson (1994) observes that sentences like (34)–(37) show the same pattern of interpretational preference as sentences like the following:

(40) Every farmer beats his donkeys.

(41) Some farmer beats his donkeys.

(42) No farmer beats his donkeys.

(43) Most farmers beat their donkeys.

If this is true, then *plural donkey pronouns behave like sum-denoting definite descriptions, but singular donkey pronouns do not*.[6] It would seem that Krifka's strengthening of Rooth's Generalization and his derivation of it from general principles more aptly apply to plural donkey anaphora.

## 7. Arguments against the Sum Theory

### 7.1. Sage-plant sentences

The following sentence (44a), from Neale 1990, is modeled on Heim's (1982) celebrated sage-plant sentence:

(44) a. Every man who bought a beer bought five others along with it.
b. Every man who bought any beer bought at least six beers.

Even though it may not be the most natural way to say it, (44a) can be understood to mean (44b). Neale (1990) discusses a potential problem posed by this sentence for the view that singular donkey pronouns are semantically numberless and denote the sum of individuals satisfying the descriptive material provided by the antecedent clause. For, if *it* in (44a) is represented like

(45) $\sigma y(\text{beer}(y) \wedge \text{buy}(x,y))$

and if

(46) $x$ bought five other beers along with $y$

implies the existence of five beers $z$ such that $x$ bought $z$ and $z$ does not overlap with $y$, then it would seem like (44a) would express a contradiction. Neale's (1990, pages 257–258) solution was to assume that while *it* in (44a) does denote sums, it is interpreted distributively, so that (44) is interpreted like

[6] Of course, another observation made by Jackson (1994) was that singular donkey pronouns are like singular definite descriptions.

(47) For every man *x* who bought a beer, and for each beer *y* that *x* bought, *x* bought five other beers along with *y*,

which yields the desired interpretation.

But where does the distributivity come from? Not from the semantics of *buy* or *along with*, since the sentence

(48) Every man who bought a beer bought five others along with the beers he bought

does sound like a contradiction.

Also, consider the following sentence with a plural donkey pronoun, adapted from Lappin and Francez 1994:

(49) Every man who bought two beers bought four others along with them.

This sentence can be interpreted to mean

(50) Every man who bought at least two beers bought at least six beers,

and here, as Lappin and Francez (1994) point out, Neale's distributive strategy is of no help. If *them* in (49) denotes the sum of all beers bought by a man and is interpreted distributively, then (49) should mean not (50), but rather

(51) Every man who bought at least two beers bought at least five beers.

In fact, this last example illustrates two points. In the construction *buy . . . along with . . .*, the plural argument of *along with* has to be interpreted collectively, and the pronoun *them*, when anaphoric to *two beers*, has to denote a sum consisting of just two beers. The latter point is consistent with an observation made by Kadmon (1987). Consider her examples:

(52) Ten kids walked into the room. They were making an awful lot of noise.

(53) At least ten kids walked into the room. They were making an awful lot of noise.

Suppose exactly twelve kids walked into the room. Then the first sentence in each discourse is true, but *they* in the second sentence can refer to all the twelve kids that walked into the room only in the second discourse (53). In (52), *they* must refer to a group consisting of just ten kids.

Corresponding to this difference between bare numerals like *two* and modified numerals like *at least two*, some native speakers seem to find the following sentence hard to accept:

(54) Every man who bought at least two beers bought four others along with them.

Others find them acceptable, but this may be related to the ambiguity of the construction *at least n* discussed in Kadmon 1987. Compare also

(55) Every man who bought two or more beers bought four others along with them,

which some speakers find funny also.[7,8]

The moral here is that donkey pronouns in sage plant sentences cannot refer to the maximal sum of individuals satisfying the relevant description, not even plural pronouns. To put it crudely, donkey anaphora poses a problem to semantics since there are in general multiple possible values that the donkey pronoun can take (when there are more than one donkey per farmer), and you don't know what to do with all those possible values. Choosing the maximal sum of donkeys belonging to a given farmer was proposed as a solution to this problem, since then one can uniquely identify the denotation for the donkey pronoun. If a plural donkey pronoun has to denote non-maximal sums, there are a number of them and uniqueness is again lost. Thus, the puzzle about how the range of possible values for a donkey pronoun is to be used in the interpretation of donkey sentences does not disappear even when the pronoun is plural and sum-denoting. It cannot be answered by just saying 'Look at the general properties of plural predications!'

### 7.2. Singular donkey pronouns lack readings typically associated with sum-denoting expressions

Arguments in this subsection are all of the same character: If singular donkey pronouns are interpreted like sum-denoting expressions, it is puzzling that certain readings typically associated with sum-denoting expressions are missing.

[7] Compare also

(i) Every farmer who owns two donkeys beats $\left\{\begin{matrix}\text{both}\\ \text{all}\end{matrix}\right\}$ of them.

(ii) Every farmer who owns at least two donkeys beats $\left\{\begin{matrix}\text{both}\\ \text{all}\end{matrix}\right\}$ of them.

[8] Lappin and Francez's (1994) own explanation of (49) is different. According to them, the donkey pronoun denotes, by default, the maximal sum satisfying the relevant description (relative to the farmer), but the maximality condition can be suspended when it is incompatible with the requirement of the predicate (the VP); it is then interpreted by a choice function giving a non-maximal sum. This account leaves the difference between (49) and (54) unexplained, as well as giving the wrong truth conditions to

Every man who bought two beers bought exactly four other beers along with them.

#### 7.2.1. *Absence of collective interpretation*

This point is mentioned in Krifka 1996a. Since in his approach a singular donkey pronoun has to be spelled out by a potentially plural noun phrase, ‘it seems to predict that the predicate of the donkey pronoun may be collective, which is clearly not the case’ (page 142). His example is:

(56) *Every farmer who owns a donkey rounds it up at night.

His explanation of the unacceptability is that ‘the pronoun *it* must, of course, accommodate cases in which a farmer just owns a single donkey, and in this case the collective predicate *round up* could not be applied.’ Note that from his explanation it follows that (57) should be just as bad as (56), and (58) should be perfect. In fact, according to my informants, (57) sounds fine, and (58) is awful.

(57) Every farmer who owns one or more donkeys rounds them up at night.

(58) Every farmer who owns more than one donkey rounds it up at night.

Krifka’s (1996a) theory can be put to a more effective test if one can find a predicate that can apply collectively to plural arguments but can also apply to singular arguments without shift in meaning. In fact it is rather difficult to find suitable examples, but the following may be cases in point:

(59) a. Every farmer who owns a donkey isolates it.
b. Every farmer who owns one or more donkeys isolates them.

(60) a. Every farmer who had a donkey exchanged it for a horse.
b. Every farmer who had one or more donkeys exchanged them for a horse.

(61) a. Every girl who baked a cake shared it with her friends.
b. Every girl who baked one or more cakes shared them with her. friends

For (59), the two sentences are to be evaluated with respect to a situation in which each farmer isolates his donkey(s), as a whole, from all other donkeys. For (60), imagine a situation where farmers with multiple donkeys gave up all their donkeys to get a single horse. For (61), suppose that some girl baked several cakes, gave all but one of them to her friends, and ate the remaining one by herself. Intuitions about the two sentences differ in such situations, and they point to the absence of collective interpretation for singular donkey pronouns.

7.2.2. *Absence of cumulative interpretation*

The point is similar to the preceding section. The singular version in the following pairs of sentences does not seem to admit of a cumulative interpretation (Scha 1984), unlike the plural version.

(62) a. Every thief who stole a painting from the museum earned at least one million dollars by selling it.
b. Every thief who stole any paintings from the museum earned at least one million dollars by selling them.

(63) a. Every man who brought a friend to the party introduced him to at least four people.
b. Every man who brought one or more friends to the party introduced them to at least four people.

7.2.3. *Lack of narrow scope reading*

In (64b), distribution over *them* can be understood to apply within the clause *to feed them*, but the parallel interpretation is lacking in (64a).

(64) a. Every farmer who owns a donkey spends more than $300 a month to feed it.
b. Every farmer who owns any donkeys spends more than $300 a month to feed them.

7.3. Difficulty of distribution

When an argument to a predicate denotes a sum but the predication is felt to be over atomic individuals, one has to posit the operation of distribution somewhere in the semantic analysis. There are cases of donkey sentences with singular donkey pronouns where it is difficult to account for the observed interpretation using such an analysis. Perhaps the clearest type of example is one where a donkey pronoun is hidden inside a sum-denoting plural pronoun.[9]

(65) Every man who introduced a friend to me thought we had something in common.

Here, the pronoun *we* is interpreted like ‘he or she and I’ (disregard the other reading), where ‘he or she’ is a donkey pronoun anaphoric to *a friend*. That is,

[9] This example was inspired by an example by Barbara Partee:

Every man I danced with seemed relieved when we stopped.

(If my memory is correct, I heard this example in her talk at the ASL/LSA conference on Logic and Language at Santa Cruz in 1991.)

assuming the universal interpretation, (65) means that each friend introduced to the speaker was thought to have something in common with the speaker; it doesn't talk about groups of three or more people having something in common. A straightforward extension of the Sum Theory would take *we* to stand for something like 'the friend or friends he introduced to me and I', and it is not at all clear how one can smuggle in a distribution operator to get the desired interpretation.[10]

### 7.4. DONKEY SENTENCES WITHOUT DONKEY PRONOUNS

Consider the following sentence:

(66) Every student who submitted two abstracts to the same conference got both abstracts rejected.

I claim that this has all characteristics of donkey sentences except that it has no donkey pronoun in it. The noun phrase *both abstracts* is somehow anaphoric to *two abstracts*,[11] but this is not the problematic type of anaphora that gives rise to problems associated with donkey sentences. The sentence is problematic even when no student submitted more than two abstracts to the same conference. The familiar problem arises when some students submitted two abstracts each to two or more conferences. Suppose that student $s_1$ submitted abstracts $a_1$ and $a_2$ to conference $c_1$, and abstracts $a_3$ and $a_4$ to conference $c_2$. $a_1$, $a_2$, and $a_3$ got rejected, while $a_4$ was accepted. Suppose moreover that no other student submitted abstracts to more than one conference, and everyone who submitted two abstracts got both abstracts rejected. Would you say that (66) is true or false? How about if *every* is replaced by *no* and the students other than $s_1$ got at least one of their abstracts accepted?

The point is that the domain of quantification associated with *both abstracts* varies depending on which instantiation of *the same conference* is under consideration, and yet there is no direct anaphora to the latter phrase, and in particular there is nothing that can be taken to denote the sum of all conferences that a given student submitted two abstracts to. It seems that the Sum Theory is of no help in treating cases like this.[12]

[10] Compare

(i) Those people and I have nothing in common.

(ii) We have nothing in common.

where *we* in (ii) is understood to refer to the same group of people as *those people and I* does in (i). Distribution over *those people* may be possible in (i), but I take it that it is difficult to construe (ii) in the same way.

[11] This type of anaphora is analyzed extensively in Chris Tancredi's unpublished work (Tancredi ms.).

[12] It could be suggested that in (66) there is an implicit agent argument to *rejected*, which does not appear in the surface form of the sentence but nevertheless present at the level

On the other hand, it is relatively easy to come up with an appropriate extension to the dynamic approach to handle cases like (66). See the appendix for a simple illustration of how it might be done.

## 8. Summary of the criticisms

1. *The Number Neutrality Thesis is not well-motivated.* Syntactic number agreement is not always necessary between the donkey pronoun and its antecedent. The uniqueness presupposition associated with singular E-type pronouns is not entirely absent in donkey sentences. The preference of singular donkey pronouns for existential and universal interpretations is different from that of plural donkey pronouns.

2. *The Sum Theory makes wrong predictions.* Singular donkey pronouns lack interpretations normally associated with sum-denoting NPs.

3. *The Sum Theory is wrong even for some cases of plural donkey anaphora.* Even plural pronouns do not always denote maximal sums. If a donkey

where semantic interpretation takes place, and this implicit argument is interpreted as donkey anaphora to *the same conference*. According to this suggestion, (66) is like *Every student who submitted two abstracts to the same conference got both abstracts rejected by it*. Perhaps a case can be made for the need to interpret some implicit arguments as donkey anaphora. Then, to the extent that the Sum Theory can be defended for this type of donkey anaphora, (66) will not count as an additional argument against it. On the other hand, the possible presence of an implicit argument is just an incidental feature of this example. In the following example, the presence of an implicit argument is much less likely:

(i) Every student who submitted two abstracts to the same conference wrote both abstracts on the same day.

Note also that the present problem essentially shows up even in a sentence like the following:

(ii) Every student who borrowed just one book from some professor read it.

In the intended interpretation of (ii), *some professor* scopes over *just one book*, so the usual E-type strategy ends up constructing a description with an unwanted free variable in it: *the book x borrowed from y* (*x* is bound by *every* but *y* is free in the position of *it*). One is then forced to somehow interpret this *y* like a donkey pronoun anaphoric to *some professor*. According to the Sum Theory, this yields *the book or books x borrowed from the professor or professors from whom x borrowed just one book*. To get the universal interpretation of (ii), one must distribute over *the professor or professors from whom x borrowed just one book* from outside this description; how that is possible is far from clear. The story is essentially the same with (66) or (i), but in the case of (ii), one might try to salvage the Sum Theory by somehow interpreting *it* to denote the sum of all those unique books *x* borrowed from some professor or other. The same avenue is implausible in (66) because of the use of *both* (*both* is quantificational and presupposes that its domain consists of two individuals). With (i) above, it is impossible to construe *both abstracts* to denote the sum of all groups of two or more abstracts submitted to the same conference, since not all such abstracts need be written on the same day for (i) to be true.

pronoun does not denote the maximal sum of individuals satisfying the relevant description, the existential/universal alternation has to be accounted for by some means other than resorting to general principles governing the interpretation of plural NPs.

4. *The Sum Theory is of no help in some cases.* There are cases where the sum individual cannot play a role in the interpretation of donkey sentences.

## 9. Conclusions

I hope I have made a convincing case against the Number Neutrality Thesis in general and the Sum Theory in particular. It seems to me that what is wrong with this line of thinking is that it is counterintuitive from the start. Semantic intuitions are not limited to intuitions about properties of (uses of) sentences like truth conditions, presuppositions, and anomaly; I believe what type of object a given use of an anaphoric pronoun can take as its value is accessible to direct intuitions (consider Kadmon's examples (52) and (53)). To claim that a singular donkey pronoun denotes a sum is to deny these intuitions.

I believe that overall, the facts are still in favor of my 1994 treatment of donkey sentences with singular pronouns despite Yoon's and Krifka's criticisms. I did not develop a treatment of plural donkey pronouns in that paper, but some of the data reviewed here are amenable to a straightforward treatment in dynamic semantics. For example, bare numerals like *two* can be analyzed in terms of a usual dynamic existential quantifier ranging over two-element sums, whereas quantifiers like *at least two* would give rise to an externally dynamic quantifier that deterministically changes the value of a certain variable to the sum of all individuals satisfying a certain description. A simplified treatment of the latter type of quantifier is given in the appendix. A precise formulation would require something like Krifka's (1996b) parametric sum individuals. I hope to elaborate on this elsewhere.

## Appendix

Notations in this appendix follow Kanazawa 1994. To avoid complications that are not crucial for the purpose of illustration, let us consider the following variant of (66):

(67) [Every student who submitted [more than two abstracts]$_z$ to [one conference]$_y$]$_x$ got [them]$_z$ all rejected.

In (67), *them* is anaphoric to *more than two abstracts* from outside its scope and is in that respect like donkey pronouns. However, the value that *more than two abstracts* provides for *them* is always unique once you decide which student and which conference you are talking about, so this anaphora itself is not problematic.

A dynamic logical translation of sentences like (67) will be something like the following:

(68) $\mathcal{Q}_1 x\,(P(x); \mathcal{Q}_2 y\,(R(y); \mathcal{Q}_3 z\, S(x,y,z)),\, T(x,z))$

In the case of (67), $\mathcal{Q}_1$ is the internally dynamic two-place quantifier corresponding to *every*, and $\mathcal{Q}_2$ and $\mathcal{Q}_3$ are externally dynamic quantifiers corresponding to *one* and *more than two*, respectively. (I represent the latter two as one-place quantifiers for the sake of simplicity.) The pronoun *them* is represented by the variable $z$ in $T(x,z)$. One can take $\mathcal{Q}_2$ to be identical to Groenendijk and Stokhof's dynamic existential quantifier $\mathcal{E}$, and interpret $\mathcal{Q}_1$ as the strong version of the dynamic $\mathcal{EVERY}$ given in Kanazawa 1994. We can model the potential of *more than two Ns* to antecede a pronoun outside its scope by the following semantics for $\mathcal{Q}_3$:

(69) $s\,[\![\mathcal{Q}_3 z\,\varphi]\!]_{\mathbf{M}}\, s' \Leftrightarrow s' = s(\bigoplus A/z)$
where $A = \{\, a \mid \mathbf{M} \models \varphi[s(a/z)] \,\}$, provided $|A| > 2$.

Here, $\bigoplus A$ denotes the sum of all individuals in the set $A$, and $s(\bigoplus A/z)$ is the assignment just like $s$ except that it assigns $\bigoplus A$ to $z$. The above clause is a simplification for the case $\varphi$ is a test. The general case requires a more complicated treatment. The idea is that, given an assignment $s$, the processing of *[more than two abstracts]$_z$* (along with its scope) in (67) deterministically changes the value of $z$ to the sum of all abstracts $s(x)$ submitted to $s(y)$. Since *one* induces the usual externally dynamic effect, the overall effect of *student who submitted [more than two abstracts]$_z$ to [one conference]$_y$* is to nondeterministically change an input assignment $s$ to an output assignment $s'$ which is just like $s$ except that $s'(y)$ is a conference $s(x)$ submitted more than two abstracts to and $s'(z)$ is the sum of all abstracts $s(x)$ submitted to $s'(y)$. The quantifier *every* collects all assignments you can get this way starting from an assignment differing from the one given by the context only in the value of $x$, and uses each of them to evaluate *got them$_z$ all rejected*, assigning the suitable sum individual to *them*. Crucially, the construction effectively quantifies over all three variables $x$, $y$, and $z$, since an internally dynamic two-place quantifier involves quantification over output assignments of its first argument.

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