

## SALIENCE, INFERENCE AND PLURAL ANAPHORA \*

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### Abstract

In this paper, I argue that the DRT Construction Rules for plural antecedents are redundant, because they are subsumed by an inference mechanism that must be made generally available for anaphora resolution. While Kamp and Reyle originally argued against a general inference mechanism for plural anaphora, I argue that the facts of compset anaphora require inference. Furthermore, I observe that compset anaphora is *blocked* by refset anaphora. I consider an alternative DRT account, in which inference coexists with Construction Rules. I argue that the Construction Rules are not necessary to capture the blocking generalization; rather, I argue that refset *descriptions* are semantically primed, thus deriving the blocking generalization in terms of general inference, together with an independently required mechanism of semantic priming. I argue that this alternative is to be preferred on grounds of theoretical parsimony. Furthermore, I present an argument that the general inference account correctly captures the fact that plural descriptions can be interpreted at the position of the plural pronoun, while the DRT account incorrectly requires that they be interpreted at the position of the antecedent.

### 1 Introduction

Occam's razor provides a general motivation for simplifying linguistic theories: whenever possible, redundancies are to be eliminated in the theory. In the Minimalist Program this general impulse is given a particular slant: "Conditions on representations... hold only at the interface, and are motivated by properties of the interface" (Chomsky 1995)[p 170-171]. In this paper, I argue that the structural conditions on plural anaphora in DRT (Kamp and Reyle 1993) can be eliminated in terms of general properties of the semantic, or Conceptual-Intentional interface: namely *Inference* and *Saliency*.

In what follows, I first describe the DRT account, in which two Construction Rules define the antecedents for plural pronouns. Next, I examine the phenomenon of compset anaphora, which goes beyond the limitations imposed by the DRT account. I argue that compset anaphora is indeed possible, but is subject to a blocking constraint. I then consider an alternative DRT account, in which Construction Rules coexist with inference. Next, I turn to my proposal, which eliminates the Construction Rules. According to this proposal, any inferable antecedent is available for a plural pronoun, subject to preferences that result from priming effects. In addition to being more parsimonious than the DRT accounts, I argue that my proposal has an empirical advantage: it correctly permits plural

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descriptions to be interpreted at the position of the plural pronoun, while the DRT account does not permit this.

## 2 The DRT Account: Plural Construction Rules

According to the DRT account of plural anaphora (Kamp and Reyle 1993), two explicit Construction Rules support plural anaphora. These rules are Summation and Abstraction. (Kamp and Reyle 1993) illustrate Summation with the following example:

- (1) **John** took **Mary** to Acapulco. **They** had a lousy time.

Here, Summation constructs the set {John, Mary}, which is the desired antecedent for *They*. In general, Summation allows plural reference to any subset of currently accessible discourse referents.

(Kamp and Reyle 1993) illustrate Abstraction with the following example:

- (2) Susan has found **every book** which Bill needs. **They** are on his desk.

Here, Abstraction constructs the set of books **which Susan has found and Bill needs**. This is the desired referent for *They*. In general, Abstraction can apply to a sentence *S* containing a quantified NP (QNP). It constructs a property *P* from *S* by abstracting over the position of the QNP. Then it constructs a set consisting of all individuals that satisfy *P*. So, in (2), the property is  $\lambda x.[book\ x\ and\ Susan\ has\ found\ x\ and\ Bill\ needs\ x]$ .

As Kamp and Reyle point out, the Construction Rules deal with sets "... whose existence is entailed by the antecedent text but is not denoted by any one NP ...". (Kamp and Reyle 1993)[p 307]. In general, Summation constructs subsets of the set of accessible individuals, while Abstraction constructs a set of individuals that satisfies an abstracted property.<sup>1</sup> So if the hearer was in general able to construct inferable sets as antecedents for plural pronouns, the Construction Rules would simply be redundant.

Kamp and Reyle argue against defining a general inference rule for plural pronouns. Their intention is to construct some, but not all, of the inferable antecedents for plurals, because, in their view, not all inferable antecedents are available as potential antecedents. In particular, they point to the following limitation on plural anaphora: "subtracting one set from another is not a permissible operation for the formation of pronominal antecedents." [p. 307] For example, note that in (2), *they* cannot mean "the books *x*, such that it is not the case that Susan has found *x* and Bill needs *x*".

This reading could be thought of as the *complement* of the set constructed by Abstraction, and this sort of anaphora is normally called *compset* anaphora. The reading where *they* refers to the set constructed by Abstraction is called *refset* anaphora.

In this example, only the refset reading is possible; the compset reading is ruled out. Furthermore, Kamp and Reyle present the following example in arguing against compset readings:

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<sup>1</sup>We set aside some problematic cases, in which Abstraction incorrectly introduces sets which may be empty; see Nouwen 2003 for discussion.

- (3) Eight of the ten balls are in the bag. They are under the sofa.

Clearly, the existence of the compset, ie., the remaining two balls, is entailed by the discourse. But, Kamp and Reyle argue, reference to this set is not possible here. This supports their proposal for Construction Rules: inferred antecedents should not be generally made available, since compsets are inferable but not possible antecedents.

However, it should be noted that (3) is perhaps not as infelicitous as Kamp and Reyle suggest; many theorists (see (Neale 1990)) have argued that examples like (3) are acceptable in the right context: in a context where both speaker and hearer are focused on the task of collecting all ten balls – the hearer pauses to think, and then says “I bet they’re under the sofa!”.

In fact, it is widely accepted that *compset* anaphora is possible under certain conditions. The next section concerns itself with some of the main claims put forward concerning compset anaphora.

### 3 Compset Anaphora and Blocking

In this section, I will argue that compset anaphora is indeed possible under certain conditions. The main condition is what I will call the Blocking Generalization: compset anaphora is blocked by refset anaphora.

Consider the following example:

- (4) **Few MP’s** attended the meeting. **They** stayed home instead. (Nouwen 2003, p44)

Here, *they* refers to the MP’s who didn’t attend the meeting. This is the complement of the set associated with the quantified NP, *few MP’s*.

Note that the quantified NP *few MP’s* is non-increasing: there is a limit, albeit a somewhat fuzzy one, on the proportion of MP’s that could be denoted by *few MP’s*. It has been widely noted<sup>2</sup> that such non-increasing NP’s facilitate compset anaphora. This is because a non-increasing NP entails the existence of a non-empty complement set. If one replaces *few* with a determiner that lacks this property, such as *many*, *some*, or *most*, the compset reading is no longer possible.

In general, a plural pronoun can refer to a compset whose existence is entailed. Of course, this is a consequence of the General Inference view, and conflicts with the view put forward by Kamp and Reyle.

However, despite the existence of examples like (4), several authors have claimed that compset anaphora does not really exist. Instead, apparent cases of compset anaphora in fact involve a kind of sloppy reference to the entire set. So, in (4), “They stayed home instead” might be interpreted to mean “(pretty much) All the MP’s stayed home instead”. This seems to have been Kamp and Reyle’s view, and similar claims have been discussed by (Corbin 1996) and (Geurts 1997). This is not an entirely implausible position, since there is undoubtedly some looseness or sloppiness in the way sets are referred to. For

<sup>2</sup>See (Nouwen 2003) for discussion and references.

example, (Nouwen 2003), citing (Geurts 1997), mentions the phenomenon of *collective reference*, as in the following:

- (5) The soldiers withstood the attack.

As Nouwen remarks, a speaker might well utter (5) without verifying that all the soldiers were in fact able to cope with the attack.

It may well be that some apparent cases of compset anaphora involve such sloppy reference to the entire set. However, I don't see how one could explain away the entire phenomenon of compset anaphora in this way. There is in fact quite a bit of variety in the acceptability of compset anaphora. It's hard to see how the sloppy reference view could account for this variety.

Consider the following example:

- (6) - How are things going with your class?  
 (7) - Really good. **Almost none of my students** skipped the review session. And **they** all came prepared with interesting questions, too.

Here, the pronoun *They* denotes *the students who didn't skip the review session*. The refset reading *the students who skipped the review session* is blocked because it is inconsistent – students can't both skip the review session and come prepared with questions. Note also that the modifier *all* commits the speaker to a claim concerning every element of the compset, that is every student who didn't skip the session. This is difficult to reconcile with a sloppy reference view.

I will therefore conclude that compset anaphora is indeed possible, under the right conditions. One condition, discussed above, is that the existence of the compset must be inferable. This is why increasing quantifiers like *many* do not support compset anaphora. A second condition is what I am calling the Blocking Generalization: refset anaphora blocks compset anaphora. What this means is that compset anaphora is possible only when the refset reading is ruled out for some reason. This captures the fact that the compset reading is not present in (2), since the refset reading is perfectly felicitous. On the other hand, for (7), the compset reading is felicitous, because the refset reading is inconsistent: if "they" means the students that *skipped* the review session, it is inconsistent to assert that they came to the session with interesting questions.

#### 4 The DRT Alternative: Construction Rules and Inference

Based on our examination of compset anaphora, one could modify the DRT account by allowing inference in addition to the Construction Rules. This is essentially the proposal in (Nouwen 2003), where it is argued that refset readings have accessible antecedents, described by explicit rules, while compset readings require inference.<sup>3</sup>

I will call this the DRT Alternative Account: refset anaphora involves an accessible antecedent, as defined by a DRT Construction Rule (Summation and Abstraction), while

<sup>3</sup>Nouwen develops his explicit account of refset readings in terms of dynamic semantics rather than DRT. I will ignore that difference for the purposes of this paper.

compset anaphora requires a special inference to produce the antecedent (Nouwen 2003)[page 71]. Together with a stipulation that compset inference is more difficult than the Summation/Abstraction mechanisms, this accounts for the basic facts of compset anaphora, including the Blocking Generalization. On this view, the difference between compset and refset anaphora reflects a difference in underlying mechanisms: Construction Rules for refset anaphora, and inference for compset anaphora.

Note that this alternative is quite different from Kamp and Reyle's original argument for the Construction Rule account: Kamp and Reyle argued for explicit construction rules instead of appealing to inference, because inferable antecedents such as complement sets were not possible antecedents for plural pronouns. According to the DRT Alternative account, inferable antecedents such as complement sets must be made available, subject to a variety of pragmatic and processing constraints. Since the refset antecedents produced by Construction Rules could also be produced by inference, it is clear that there is redundancy associated with the DRT Alternative. In what follows, I will remove that redundancy, arguing that all plural antecedents are produced by general inference, with preferences regulated by a general priming mechanism.

## 5 An Alternative: Inference and Salience/Priming

The simplest possible alternative to the DRT account is this: all inferable antecedents are available for plural pronouns, subject to a general preference for the most salient antecedent. My goal is to show that uncontroversial aspects of salience preferences are sufficient to derive the Blocking Generalization for compset anaphora.

Now, it is widely acknowledged that *explicit* antecedents are more salient than *implicit* antecedents. For example, in Centering theory (Grosz, Joshi and Weinstein 1995), implicit antecedents are permitted for singular pronouns, but are ranked lower than all explicit antecedents<sup>4</sup> Now, it seems reasonable to claim that refsets are explicit antecedents, while compsets are implicit. Given this, the Blocking Generalization could be seen as a special case of the fact that explicit antecedents are more salient.

However, this assumes a characterization of the refsets explicitly made available in discourse. Of course, one way to do this is in terms of the DRT Construction Rules. But in this case, the Salience preference requires for its very formulation the Construction Rules that we are attempting to eliminate. Thus our question remains: can the Blocking Generalization be captured without Abstraction/Summation or equivalent mechanisms?

## 6 Salience as Description Priming

To retain our maximally simple account of plural anaphora, I propose a general mechanism of semantic priming, according to which reference to a set raises its salience, because its *description* is primed.

Let us assume that a plural pronoun is represented as *they* (*P*), where *P* is any description. Now the Salience preference is this: *they* (*P*) is preferred over *they* (*Q*) if *P* has been primed more recently than *Q*. How do descriptions get primed?

<sup>4</sup>(Grosz et al. 1995) use the terms *indirectly realized* and *directly realized*.

We can use the Abstraction Rule as a basis for the priming of descriptions. Thus, a sentence of the form “Q students skipped the review session” primes the description  $\lambda x.x$  *skipped the review session*. In general, for a sentence S containing a QP, the description  $\lambda x.S[QP/x]$  is primed. In other words, explicit reference to a set raises its salience, because its description is primed.

This derives the Blocking Generalization concerning refset and compset anaphora: the refset reading is preferred, because its description was primed, as desired. Again, the question must be raised, is this in fact simpler than the DRT account? After all, one might claim that some Abstraction-like mechanism is required to support the contention that the refset description is primed, while the compset description is not.

I cannot definitively refute this claim here, but my intention is that the priming of descriptions results from whatever mechanism underlies semantic priming in general. An Abstraction-like mechanism might well find a place in the underlying mechanism for semantic priming, although undoubtedly with a much different role than that conceived of in DRT.

Rather than further speculate on this issue, I would like to turn to one concrete empirical issue that distinguishes the current proposal from the DRT view. This concerns the question of where the plural description is evaluated.

## 7 An Empirical Issue: Where is Plural Description Interpreted?

According to the DRT account of Abstraction, the plural description is evaluated in the context of the quantified antecedent, and the elements of the refset are determined at that point. According to the General Inference account, this is not the case. No set is constructed at the position of the quantified antecedent. Rather, a salient description is produced at the position of the plural pronoun, at which point the description is evaluated to determine the members of the set.

Of course, in many cases there is no observable difference. But, by carefully constructing examples, one can force the description to correspond to different sets at the two positions. This is shown by (Evans 1977) with singular pronouns. The following is a variant of one of Evans’ examples:

- (8) I have a meeting with **the Mayor of Boston**.
- (9) a. **He** used to be a Democrat.
- b. **The Mayor of Boston** used to be a Democrat.

Consider the two continuations, (9)a and (9)b. In (9)a, **he** is the *same* individual, who has switched party affiliation, while (9)b concerns a *different* individual, who was the Mayor in the past. Based on such observations, Evans concludes that, for *singular* pronouns, the relevant description is *not* evaluated at position of pronoun.

Inspired by Evans’ argumentation, we can develop similar examples for plural pronouns, like (10).

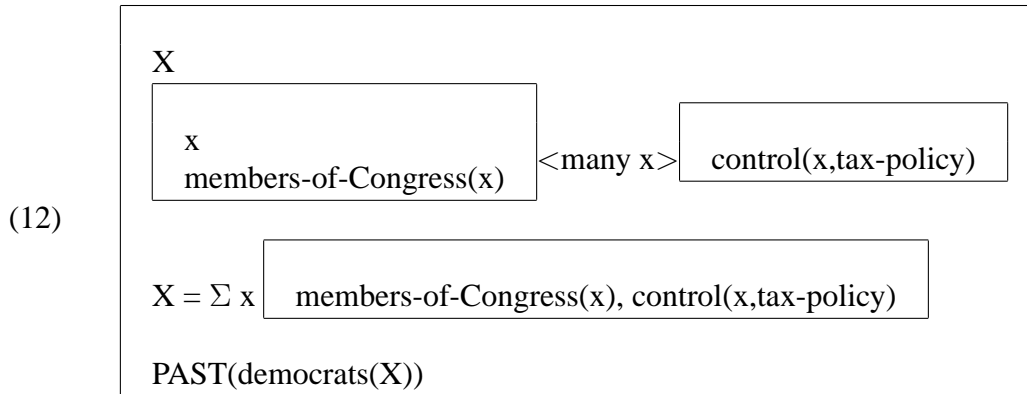
- (10) **Many members of Congress** have some control over tax policy. **They** used to be Democrats (but now most of them are Republicans).

The quantified antecedent for the plural pronoun *they* is *Many members of Congress*, and the description associated with the antecedent is *members of Congress who at present have some control over tax policy*. Here, it is natural to interpret *They* as *individuals who in the past were members of Congress with some control over tax policy*.

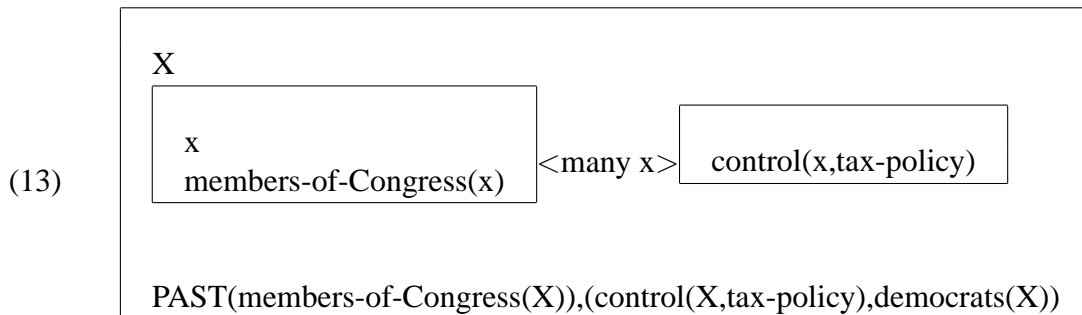
Let us look at this reading in more detail. Assume (contrary to fact) that the members of Congress with control over tax policy are the Dennis Hastert (Speaker of the House), and Jim Nussell and Rob Portman, leaders of the House Budget Committee. They are all Republicans. Under the previous administration these positions were held by Democrats. This scenario makes (10) true, under the reading paraphrasable as follows:

- (11) In the past, the members of Congress with control over tax policy were Democrats.

To see why this reading is not permitted by the DRT account, look at the following DRS. (Note that I deploy a PAST operator for simplicity, instead of a more elaborate system involving event variables and temporal relations, as advocated by Kamp and Reyle.)



Here, the extension of the set X is determined with reference to the present time, in accordance with the Abstraction operation. But the desired reading requires X's extension to be determined under the scope of the PAST operator. Under the proposed approach the desired reading is made possible, since the relevant description is evaluated at the position of the pronoun. This is represented by the following DRS:



Here, the set X is determined under the scope of PAST, since the description appears at the position of the plural pronoun *they*. One apparent failing of the above DRS is that it does

not capture *exhaustiveness*: it simply asserts the existence of a set of Congressmen that controlled tax policy and were Democrats. The natural reading is that *all* such Congressmen were Democrats. This is an issue that arises in general for the proper interpretation of definite descriptions, and I assume that plural pronouns with implicit descriptions are treated as definite descriptions. So whatever solution to exhaustiveness one proposes for definite descriptions, would also apply to plural pronouns as in the above example.

In my view, (10) is ambiguous, and the reading given by Abstraction is a perfectly acceptable one. This is to be expected under the current proposal, since the PAST operator can its scope restricted to the verb phrase, or have scope over the entire sentence, as shown below:

(14) They (members of Congress with control over tax policy) PAST be Democrats.

(15) PAST They (members of Congress with control over tax policy) be Democrats.

What example (10) shows is that the Construction Rules of the DRT account are not only redundant, they also lead to the wrong reading in certain cases.

## 8 Conclusions

The general argument of this paper is that DRT construction rules for plural antecedents are redundant, because a general inference mechanism must be made available for plural anaphora. Kamp and Reyle proposed Construction Rules instead of inference, because they did not want to provide for compset readings. However, the subsequent literature on compset anaphora strongly suggests that Kamp and Reyle's view must be modified in some way – at least in some cases, compset readings are possible or even preferred. I consider an Alternative DRT view, in which a general inference mechanism coexists with Construction Rules, to capture the fact that refset readings generally block compset readings. I argue that the Construction Rules are not necessary to capture the Blocking Generalization; rather, I argue that refset descriptions are semantically primed, thus deriving the Blocking Generalization in terms of General Inference, together with an independently required, general mechanism of semantic priming. I argue that this alternative is to be preferred on grounds of theoretical parsimony. Furthermore, I present an argument that the General Inference account correctly captures the fact that plural descriptions can be interpreted at the position of the plural pronoun, while the DRT account incorrectly requires that they be interpreted at the position of the antecedent.

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