VARIETIES OF ANAPHORA

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June 2000

1 INTRODUCTION

Traditionally, anaphora have been identified with a limited set of words (pronouns such as 'he', 'they', ...), but in the past decades there have been many proposals to interpret other phenomena as anaphora. Here are some of them, each with an example of a discourse involving the phenomenon in question (the purported anaphors are underlined):

- TENSE (e.g., Reichenbach, 1947; Partee, 1973, 1984).

  Sheila had a party last Friday and Sam got drunk.

- NPS OF ALL KINDS (e.g., van Deemter, 1992; Krahmer & van Deemter 1998).

  If the new teacher lectures some pupils, most girls immediately have a crush on him.

- PRESUPPOSITIONS (e.g., van der Sandt, 1992; Geurts 1995).

  If someone solved the problem, it was Julius who solved it.

- MODAL VERBS (e.g., Kibble, 1994; Geurts, 1995: Frank & Kamp 1997).

  A thief might break in. He would take the silver.

- VP ELLIPSIS (e.g., Hardt, 1999).

Susan loves her cat. Jane does too.

- PITCH ACCENTS (e.g., Hendriks and Dekker, 1996; Hendriks ms., Piwek, 1997, 1998; Krahmer & Swerts 2000).

  Now pick up a réd square.

- CORRECTIONS (e.g., Van Leusen, 1997).

  A: John wants an orange. B: No, he wants a banana.

While most people would agree that these phenomena are context-dependent, the claim that they belong to one and the same class, namely *anaphora* is much more controversial. What does it mean to say that these phenomena are anaphoric in nature? What are the consequences of such a view? And even: how could one show that what is going in all these cases is indeed anaphora? What is anaphora anyway? These and related other questions will be addressed in this course.

2 DEFINING ANAPHORA

So what is anaphora? In fact, answering this question is more difficult than one would think. As an illustration of this, compare the following two, more or less randomly chosen definitions. Reinhart (1999) claims that:

(1) "The term anaphora is used most commonly in theoretical linguistics to denote any case where two nominal expressions are assigned the same referential value or range."

Notice that this statement disqualifies most of the aforementioned phenomena as anaphora. What is more, this statement also includes phenomena which are commonly not thought of as anaphora. For instance, in example (2), 'Wim Kok' and 'the prime minister of the Netherlands' are coreferential, but not anaphoric with respect to each other. In particular, neither of the noun phrases *depends* for its interpretation on the other noun phrase (cf. Lee & Stenning, 1998; Kibble & van Deemter, 1999).

(2) *Wim Kok is the prime minister of the Netherlands.*

Another definition is the following from Carter (1987), *op cit.* in van Deemter (1992). According to this definition, anaphora is

(3) "(…) the special case of cohesion where the meaning (sense and/or reference) of one item in a cohesive relationship (**the anaphor**) is, in isolation, somehow vague or incomplete, and can only properly be interpreted by considering the meanings of the other item(s) in the relationship (**the antecedents**)."

Notice that all phenomena mentioned above fall within the scope of this definition. Furthermore, this definition takes into account the fact that there is a relation of dependency between the anaphor and the antecedent. However, the definition is arguably too general. As van Deemter (1992) points out, according to Carter's definition the phenomenon of contextual disambiguation is anaphoric as well. Although certain forms of contextual disambiguation (e.g., the resolution of pronouns) are classical examples of anaphora, there are other forms of contextual disambiguation which are traditionally not thought of in terms of anaphora, e.g., word sense disambiguation. In (4), the sense of the word 'bank' is most likely perceived to be that of a *financial institution*. This interpretation appears to be induced by the direct linguistic context ("needed some cash") and yet we hesitate to say that therefore the word 'bank' is an anaphor.

(4) *John needed some cash so he went to a bank.*

Let us pause here for a moment and reflect on what we are trying to achieve when we attempt to define the notion of 'anaphora'. Basically, we are trying to find a set of properties $P_1, P_2, \ldots, P_n$ such that:

> An expression e is used anaphorically *if and only if* $P_1(e)$, $P_2(e), \ldots$ and $P_n(e)$.

Unfortunately, in the literature there exists no consensus about what the properties $P_1, P_2, \ldots, P_n$ are. To our knowledge, all of the proposed definitions have been subjected to criticism of one of the following two types: (A) It is argued that a particular property is not a *necessary property* of anaphorically used expressions (e.g., that the expression should be nominal, as required by the definition given under 1). This involves contesting the '*only if*' part of the definition. (B) It is argued that the properties in the definition are not *sufficient* (e.g., another criticism of the definition under 1. is that coreferentiallity is not a sufficient property for anaphoricity). This involves questioning the '*if*' part of the definition.

3 Properties of Anaphora

The prospects for finding an unequivocal answer to the question 'what is anaphora?' appear to be rather bleak. However, the fact that we can break a definition down into the properties which it uses provides us with a handle for examining the notion of anaphora: instead of trying to compare entire definitions with each other, we can systematically look at the properties which have been associated with anaphora and discuss the pros and cons of them. Thus, we may not obtain an unequivocal answer to the question 'what is anaphora?'. However, we can hope to gain a better insight into why particular phenomena are considered anaphora by some and not by others. Below we briefly discuss a number of proposed 'characteristic properties' of anaphora. To wit:

- the contextual dependency of interpreting anaphors;
- the type of antecedent;
- the location of the antecedent;
- the type of relation between anaphor and antecedent;
- structural constraints on the relation between anaphor and antecedent;
- the range of interpretations the anaphor allows for.

Dependency of Interpretation The idea that anaphora involve dependency of interpretation is, for instance, part of the definition in Carter (1987), (3) above. The property in question could be formulated as follows: an expression is anaphoric only if it depends for its interpretation on a contextually given item.

Type of Antecedent The item on which the anaphor depends for its interpretation is called the antecedent. Very different types of items have been considered to be antecedents:

1. Linguistics expressions, e.g. full noun phrases;
2. Representations of objects (more specifically, for instance, the discourse referents proposed in Karttunen, 1976 and Seuren, 1975). These representations can be thought of as theoretical constructs or models of

the mental representations which hearers employ when interpreting a discourse (e.g., Kamp, 1981);

3. Objects in the real world, in particular, that part of the world in which the communication takes place, i.e., the utterance situation.

On a strict interpretation of anaphora, only expressions which depend for their interpretation on linguistically realized antecedents are proper anaphora. In particular, when an expression relies on the utterance situation, we speak of *deixis* instead of anaphora. But again, a more loose interpretation of anaphora has been advocated. In particular, Partee (1973) suggests that it is characteristic of nominal (and temporal) anaphora that they allow for (salient) non-linguistic antecedents.

The introduction of mental representations as the antecedents of anaphors has been proposed for a number of reasons:

- As a computational model of how human beings process natural language by building a mental representation of what is said to them (e.g., Sidner, 1983; Webber, 1988)
- As an explanation for the fact that we can 'refer' to non-existent entities (such as Santa Claus, see e.g., Kamp 1985);
- As a theoretical device which helps us to model a number of other properties of anaphora, such as the fact that they behave similar to bound variables (e.g., Heim, 1982; Kamp, 1981).

Location of Antecedent Up till this point, in all our examples, the antecedent preceded the anaphor. It is, however, possible to have the anaphor precede the antecedent:

(5) *On <u>his</u> arrival in the capital, <u>the Secretary of State</u> declared support for the government.* (From: Quirk et al., 1985:351)

In such cases we speak of *cataphora* rather than *anaphora*. Cataphora seem to be possible only under certain specific circumstances. Quirk et al. (1985:351) remark that they are typically associated with formal written language and 'generally occur only where the pronoun is at a lower level of structure than its antecedent' (e.g., when the pronoun occurs as part of the complement of an initial prepositional phrase as in (5)).[1]

Type of Relation We have already seen that it has been claimed that an anaphor and its antecedent are coreferential. Unfortunately, coreference does not seem to be a necessary property of anaphora. Consider:

(6) *A few of the prisoners managed to escape, but they didn't get very far.*

According to Kibble and Van Deemter (1999), expressions such as 'A few of the prisoners', 'Most prisoners', 'A prisoner' are strictly speaking *nonreferring*: these expressions are normally not used to single out one or more real world individuals.[2] Therefore they can impossibly be coreferential with some other expression. And yet in our example, 'A few of the prisoners' seems to be the antecedent for 'they'. In other words, 'they' is anaphoric. These considerations lead to the conclusion that coreference cannot be a property of anaphora. This conclusion, however, hinges on the assumption that we speak of coreference on the level of real-world individuals: two expressions are coreferential if their real world referents are identical. Alternatively, we can adopt a notion of coreference which applies to individuals on the level of mental representations. In that case, it seems valid to say that 'A few of the prisoners' and 'they' are coreferential: the expressions refer to the same *discourse referent*.

For instance, consider the discourse in (7). Let us assume that when a hearer processes such a discourse, s/he incrementally builds up a record of the information which the discourse conveys. Now, the idea is that the indefinite noun phrase 'A man' introduces a new discourse referent into this record. The verb phrase contributes the information that the referent 'walks in the park' to the record. Subsequently, when the hearer processes 'he', s/he seeks a referent which was introduced earlier on, in this case, the

[1]Of course, cataphora may also be used to create a kind of suspense, as in a famous Dutch children-song: *Hij komt! Hij komt! Die lieve goede Sint.* (he's coming! he's coming! Dear old Santa.).

[2]Note that, nevertheless, sometimes indefinites are used to refer to specific entities. For instance, Quirk et al. (1985) discuss the following example: '*An intruder* has stolen *a vase*. *The intruder* stole *the vase* from *a locked case*. *The case* was smashed open'. They comment that '... Hence *a/an* is typically used when the referent has not been mentioned before, and is assumed to be unfamiliar to the speaker or hearer'. See also Strawson (1950:49) and Ludlow and Neale (1990).

aforementioned referent, and adds the information that this referent also whistles.

(7) *A man walks in the park. He whistles.*

Even if we assume that coreference should be thought of as operating on some kind of representational level, it might be too strong as a necessary property of anaphora. Clark (1975) provides a number of examples illustrating various other, non-corefential relations (*bridges*) which a hearer might have to infer between the antecedents and anaphors:

- (Set membership) I met two people yesterday. The woman told me a story.
- (Necessary part) I looked into the room. The ceiling was very high.
- (Probable part) I walked into the room. The windows looked out to the bay.
- (Inducible part) I walked into the room. The chandeliers sparkled brightly
- (Necessary role) John was murdered yesterday. The murderer got away.
- (Optional role) John died yesterday. The murderer got away.
- (Reason) John had a suit on. It was Jane he hoped to impress.
- (Cause) John fell. What he did was trip on a rock.
- (Consequence) John fell. What he did was break his arm.
- (Concurrence) John is a Republican. Mary is slightly daft too.

Interestingly, Clark's examples are not restricted to object type antecedents. The three last items in the list involve events and a state rather than individuals.

Constraints on the Relation One of the first systematic studies of the constraints on the relation between antecedents and anaphors is Karttunen (1976). Karttunen provides a characterization of when an indefinite noun phrase can function as the antecedent of a pronoun.

> ... We concluded that, in general, an indefinite NP establishes a permanent discourse referent [a referent which can be referred to by means of a pronoun, K&P] just in case the quantifier associated with it is attached to a sentence that is asserted, implied, or presupposed to be true, and there are no higher quantifiers involved. ... There are a couple of special problems - "other worlds" and short-term referents. ... there is a class of "world-creating" verbs, such as *believe*, that also establish referents of another kind. ... Second, there are short-term referents, whose lifespan may be extended by continuing the discourse in the proper mode. ... For example, every successive sentence may have to contain (i) a modal as the main verb, (ii) a quantifier of a certain type, or (iii) be in the counterfactual mood. ... (Karttunen, 1976:383)

Some of the constraints mentioned by Karttunen have been formalized by Kamp (1981) and Heim (1982), see also Groenendijk & Stokhof (1991). These theories exploit the formal similarity between the scoping domain of a quantifier (i.e., the domain in which it can bind variables) and the domain in which a discourse referent can bind an anaphor. For instance, Kamp predicts that negation constrains the scope of a discourse referent which has been introduced by an indefinite NP:

(8) $\star$ *John didn't give Mary <u>a bunch of roses</u>. She like <u>them</u>.*

However, it has been questioned whether all anaphors are constrained by such scoping domains. Van Leusen (1997) proposes that corrections, as in (9), should be thought of as anaphors and notes that '... corrections are anaphors that are not sensitive to scoping domains that normally function as barriers to anaphora resolution' (van Leusen, 1997).[3]

(9) *A: John didn't give Mary a bunch of roses.*
B: No, he gave her a bunch of súnflowers.

[3] But see, for instance, Piwek (1998) for a non-anaphoric analysis of corrections.

Similarly, Hardt (1999) proposes to treat Verb Phrase Ellipses (VPE) as anaphoric, and notes that, unlike 'ordinary' anaphors, a VP introduced in the scope of a conditional is accessible outside the scope of this conditional, which is in line with the proposals of Asher (1993) and Gardent (1991). Contrast (10.a) with (10.b), the latter taken from Hardt (1999):

(10) a. *If Tom was having trouble in school, he would go and buy a book to relax, ?? It is a detective.*

b. *If Tom was having trouble in school, I would help him. If Harry was having trouble, I wouldn't VPE.*

Range of interpretations It has been noted that anaphors can be interpreted very much like bound variables, as in:

(11) *Every farmer loves his wife.*

Related to these are the notorious donkey-sentences (Geach, 1962):

(12) *Every farmer who owns a donkey, beats it.*

Arguably, this sentence has at least an interpretation that every farmer beats every donkey that he owns (but see Geurts 2000). The possibility of bound variable interpretations of such sentences has become very closely associated with certain theoretical frameworks such as DRT and dynamic semantics.[4] This does however not necessarily mean that it is a characteristic property of anaphora in general, although it has been pointed out in Partee (1973,1984) that bound variable readings seem to generalize to temporal anaphora.

(13) *Whenever Mary telephoned on a Friday, Sam was asleep.*

One other suggested property of anaphora concerning their interpretation is the observation that they give rise to sloppy identity in particular configurations. Thus, a sentence like (14) is ambiguous between a strict reading (Bill loves Bill's wife and John loves Bill's wife) and a sloppy reading (Bill loves Bill's wife and John loves John's wife).

[4] Still, donkey-sentences are a linguistic reality, even when looking at anaphora in general. In part VI of Het Bureau (Voskuil 2000:466), Beerta is quoted as saying: "Als een heer een man ontmoet, dan geeft de heer de man een fooi." (That is: if a gentleman meets a man, the gentleman tips the man.)

(14) *Bill loves his wife, and so does John.*

The suggestion that sloppy identity is a characteristic property of anaphora in general is due to Hardt (1999), see also Stone and Hardt (1997). The sloppy identity is possible for any "proform", provided that the antecedent contains a proform itself. Thus:

$$[_{C_1} \ldots [_{XP} \ldots [_{YP} \ldots] \ldots] \; [_{C_2} \ldots [_{XP'} \ldots] \ldots]$$

Here C_1 and C_2 may be thought of as sentences. XP' is the proform which takes XP as its antecedent, where XP contains another proform YP (the "sloppy variable"). According to Stone and Hardt (1997) sloppy identity readings not only arise for NPs, but also for VP ellipsis, tense and modals. Examples are:

(15) a. [NP [NP]] *Smith spent his paycheck. Jones saved it.*

b. [VP [NP]] *Susan loves her cat. Jane does too.*

c. [VP [Tense]] *You thought I was crazy. You probably still do VPE.*

d. [Modal [NP]] *John would use slides if he had to give the presentation. Bill would just use the chalkboard.*

As an example, consider (15.c). Here the antecedent for the VP ellipsis in the second sentence (VPE) is the VP [thought I was crazy], which, according to Stone and Hardt contains a proform (namely a past tense). The example indeed gives rise to the predicted ambiguity (You probably still think I was crazy (*strict*) vs. You probably still think I am crazy (*sloppy*). So, sloppy identity seems to be a good candidate for a test for anaphora-hood. At this point it is interesting to ask whether 'contextual disambiguation' may give rise to sloppy identity ambiguities (cf. the discussion of definition (3) above). Consider the following examples:

(16) a. *The engineer constructed a bridge and so did the dentist.*

b. *John ate a pizza with mozzeralla and Mary with knife and fork.*

The word "bridge", of course, is a lexical ambiguity (it can be a structure carrying a roadway over an obstacle, but also a partial denture anchored to adjacent teeth). Arguably, example (16.a) has two interpretations: The engineer constructed a bridge across some obstacle and so did the dentist (the strict reading) vs. The engineer constructed a bridge over some obstacle and the dentist constructed a bridge anchored to adjacent teeth (the sloppy reading). A similar story can be told about the PP attachment ambiguity in (16.b). This seems to imply that the sloppy identity test is not restrictive enough.

4 Contents of this reader

In this introduction, we have discussed a collection of potential properties of anaphora and attempted to fit them into a number of natural groups. In the course, each of these properties will be examined in more detail on the basis of the selected readings. A common thread of all these readings is that they employ some form of Discourse Representation Theory (DRT; Kamp & Reyle, 1993) as a framework to formalize and examine the properties of anaphora. For the reader who is unfamiliar with DRT, an introduction can be found in the chapter immediately following this one.

The use of DRT for the analysis of various types of anaphora has been stimulated particularly by the work of Partee (1984) and Van der Sandt (1992). Van der Sandt (1992) proposed that presuppositions can be treated by the same mechanism (i.e., binding of discourse referents as formalized in DRT) that handles prototypical anaphoric expressions (e.g., pronouns). Such an approach shifts the emphasis from the somewhat unhelpful question 'What are anaphora?' to the, in our opinion, more fruitful questions: 'Can a particular phenomenon be accounted for by the mechanism which was originally devised to deal with prototypical anaphors?' and 'Which changes are required to the aforementioned mechanism in order to extend its scope to such new phenomena?'.

Acknowledgements and Sources

Thanks are due to CSLI Publications (chapter 2 of Krahmer, 1998), the Editors of the Proceedings of the 11th Amsterdam Colloquium (Piwek, 1997), Journal of Semantics / Oxford University Press (Krahmer & van Deemter, 1998) , the Editors of the SALT 7 Proceedings (Frank & Kamp, 1997), and Kluwer Academic Publishers (Partee, 1984; Piwek & Krahmer, 2000) and the editors of IWCS II (Stone & Hardt, 1997) for the permission to reuse material from their publications in this reader.

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