# Demonstratives in Discourse

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**Abstract**

There are two influential theories that deal with the role of the context in determining the meaning of sentences: Kaplan's logic of demonstratives and Kamp's discourse representation theory. How Kaplan would deal with the donkey sentences must remain a matter of speculation, but there is an obvious and reasonable answer to the question of how demonstratives should be handled within discourse representation theory. The latter question is addressed in the first part of this paper. The account proposed here makes demonstratives and indexicals a special case of the treatment of definite NPs in terms of presupposition, like the account of names in Geurts (1997) or treatments of definite descriptions like Van der Sandt (1992), Asher & Lascarides (1998) and others. The treatment turns out to be rather different from Kaplan's account of demonstratives and indexicals in that it appears to lack direct referentiality and in that direct referentiality does not entail rigid designation. These problems have been noted before by Kamp and have led to his controversial introduction of external anchors. This paper develops the notion of *intensional anchors* as an alternative and shows that they — for normal indexicals and demonstratives— allow a proper reconstruction of Kaplan's theory that avoids the problems which come with external anchors. Additional evidence for intensional anchors is provided by an application to the problems of intentional identity discussed by Edelberg.

## 1 Discourse Representation of Demonstratives

I develop my theory of demonstratives and indexicals[1] within the version of Discourse Representation Theory (DRT) presented in Kamp and Reyle (1993). This treatment provides us with DRSs $K$ that consist of a set of discourse markers $U_K$ and a set of conditions $CON_K$, where discourse markers are elements of a set $VAR$ of variables and where conditions are either atomic formulas as in first order logic or complex conditions of the form $O(K_1, \ldots, K_n)$, where $K_1, \ldots, K_n$ are DRSs and $O$ is an $n$-place operator. We will consider the one-place operators $\neg$ (negation), $\Box$ (ontological necessity), $B_x$ (x believes that) and $L$ (logical necessity), and a two-place operator $\rightarrow$ (implication). DRT comes with a development algorithm that maps a pair consisting of an utterance and a DRS into a new DRS in which the information provided by the utterance is incorporated. The truth of a DRS $K$ on a model $M$ is defined in two steps. $M, g \models C$ is defined for conditions $C$ in the standard way with $M$ a

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[1] The main advantage in the current context is that there is a direct fit with the presupposition theory of Van der Sandt (1992). Versions of the treatment developed in this paper can be easily adapted to other forms of dynamic semantics.

model for the language of $K$ and $g$ a partial assignment function. $M \models K$ is then defined as $\exists g \ (dom(g) = U_K \wedge \forall C \in CON_K \ M, g \models C)$. The assignment $g$ in the last definition is called a *truthful embedding* for $K$ in $M$.

Further, we adopt Van der Sandt (1992)'s "binding theory of presupposition". According to this theory, certain expressions, the so-called presupposition triggers, induce a presupposition whose content is determined by the expression. For example, the verb *regret* triggers its complement as a presupposition, the noun *bachelor* applying to an object $x$ triggers the presupposition that $x$ is an adult male. The DRS development algorithm first develops the presupposition as a separate presupposition DRS at the site of the expression and then searches the accessible part of the old DRS for an occurrence of the material in the presupposition DRS. If it is found, the discourse markers occurring in the presupposition DRS are unified with the corresponding markers found in the old DRS. This process binds discourse markers in the new material to old markers. When it is not possible to find an antecedent for the presupposition, it is accommodated, i.e. added at some point[2] in the accessible DRS where it does not cause inconsistency. It is natural to assume that if a presupposition can resolve to a number of antecedents, it will prefer the one that is most prominent (i.e. the most recent, or the most connected to the current topic of conversation).

We introduced DRSs as logical expressions. The development algorithm, however, can be interpreted as an idealised model of a language interpreter going about her business of interpreting sentences. The DRS that was developed before the interpretation of the current sentence is a representation of the information that was available to that language interpreter. It is then natural to assume that the interpreter has also stored information about the utterance to be interpreted in the old DRS before interpretation started. In particular, we will assume that she is aware that an utterance event took place when she interprets one.

This corresponds to the presence of a condition (1) in the DRS.

(1)        $utterance(e)$

Since our interpreter may have many similar conditions, it is necessary to have a formal device for identifying the correct one. In order to do that, we consider a new kind of DRSs, the *utterance DRSs*, which are pairs $(K, e)$ with $e$ one of the markers of the DRS $K$ and $K$ containing $utterance(e)$ as one of its conditions.

This is only a minor change: it merely models the fact that an interpreter knows which utterance she is currently interpreting, or even less: which marker represents the current utterance (she may be mistaken about what was uttered).

I am not proposing a separate truth definition for utterance DRSs. A system $(K, e)$ is true on a model $M$ iff $K$ is true on the model $M$. There is something unsatisfactory about that and

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[2]Regarding the place where the addition should take place and opinions diverge. Addition to the local context leads to predictions as in *Karttunen 1974*, predictions that *Gazdar 1979* and more recently Geurts (1998) have convincingly criticized. As noted in Heim (1983), the problems of Karttunen's treatment can be overcome by assuming a preference for global accommodation, a preference that can be overridden by inconsistency. Van der Sandt (1992) generalises this preference as a preference for the geometrically highest DRS in which the addition does not create inconsistencies. Trying to overcome problems with this approach (noted by Beaver (1996)), Blutner (2000) and Zeevat (2000) have proposed an Optimality Theoretic approach which prefers accommodations that lead to the strongest interpretation.

the matter will be taken up later. The task we are considering here is giving an account of the changes that occur in the information of an interpreter if she interprets a certain utterance containing indexicals or demonstratives. The truth conditions of the DRSs created in this process are a different matter.

*Utterance DRSs* make it possible to interpret all classical indexicals in the sense of Kaplan (1989). I will follow Kaplan throughout, even where I do not completely agree with him about the linguistic details. I do this in order to keep the comparison relatively simple. Improvements on the descriptive side are both possible and necessary and are also made easier by the theory defended in this paper.

A sentence of the form $S(I)$ (a sentence schema with an occurrence of the word $I$) generates the presupposition $utterance(e), agent(e, x)$, where $e$ is the special discourse marker. Development proceeds on the sentence schema $S(x)$. If the utterer of the sentence is already represented by a marker $y$, the effect of the presupposition resolution is a new identity condition $x = y$. If she is not represented, accommodation leads to an addition of the trivial information that our utterance event $e$ has an agent.

As an example, consider what happens if

(2)       I am sick.

is added to the nearly empty utterance DRS $(K, e)$. I only display $K$.

(3)
| e x |
| --- |
| utterance(e) |
| agent(e,x) |

(4)
| e x |
| --- |
| utterance(e) |
| agent(e,x) |
| sick(x) |

The story for *you*, *here* and *now* is highly similar: we assign presuppositions using other thematic roles of the utterance event. The presuppositions are: $utterance(e), goal(e, x)$ (you), $utterance(e), location(e, p)$ (here), and $utterance(e), time(e, t)$ (now) respectively. These presuppositions do not need accommodation. The use of utterance DRSs guarantees their resolvability.

Proper demonstratives also use the interpreter's knowledge of the utterance situation. In particular, they require that a pointing gesture by the speaker has been noticed by the interpreter. As before, it is unproblematic to assume that the interpreter represents this information about the utterance situation in her DRS, by a condition (5).

(5)       *point(e)*

Again, we face the problem of finding the right pointing gesture. This can be done by the same mechanism we used above. The presupposition of a demonstrative just is a little more complicated. In particular, $S(this)$ presupposes the combination in (6).

(6)
$$\boxed{\begin{array}{l} agent(e, x) \\ time(e, t) \\ point(e_1) \\ agent(e_1, x) \\ time(e_1, t) \\ goal(e_1, y) \end{array}}$$

Here $e$ is the internal representation of the utterance and $S(y)$ is passed on to the rest of the interpretation process.

The required pointing can be missing and it seems to be a property of proper demonstrative uses of *this* that the presupposition in these cases is not accommodated, at least not under normal circumstances. Under standard circumstances, if there is no pointing, the interpreter knows that there is no pointing and that is why accommodation would lead to inconsistency with other information in the DRS. But in special circumstances, e.g. when one is listening to a conversation on a tape or through a key hole, we do accommodate the existence of a pointing that we cannot see. This is a repair move: we know we have incomplete information, but we get by to some extent by operating under an hypothesized extension to our knowledge. This is not the normal notion of accommodation from the presupposition literature, which requires the necessary accommodations to be planned by the speaker.

I therefore hold with Kaplan that if somebody uses a demonstrative without the accompanying pointing, the resulting expression is incomplete, because proper accommodation is not possible. For the interpretation to be blocked completely, the pointing must not just be unobserved by the interpreter, it must also be observed by the interpreter that the pointing did not occur. If we accommodated in that case, accommodation would lead to an inconsistent DRS. This would be a dead end for the development algorithm because it cannot construct a consistent DRS incorporating the new sentence.

It seems however that accommodation must be ruled out in a more general way. Consider the following rather strange example (7), uttered without an accompanying pointing (or a salient object in the utterance situation).

(7)      It could have been the case that this was precious.

Here we would expect the existence of a local accommodation (the global one is ruled out in the way just indicated, as it is plain to the interpreter that there is no pointing) under the modal operator. And the sentence would be true under this local accommodation: a precious object could certainly have been at the scene of the utterance and the speaker could have pointed at it while making her utterance. But this prediction is wrong because the utterance is not interpretable at all. An explanation for the absence of accommodation for certain classes of presupposition triggers has been proposed in Zeevat (2000), on the basis of Blutner's Theorem. The theorem predicts that a presupposition trigger that has a simple non-presupposing expression alternative does not allow accommodation. And that is the case for demonstratives: the thought could be expressed by inserting *something* for *this* (or a definite if the speaker has something particular in mind and the common ground allows a definite reference), so Blutner's theorem applies. Notice that Blutner's theorem also predicts that the incomplete perception cases are not proper accommodations.

There are two other kinds of definite NPs that can be treated naturally along the lines of indexicals. These are names and anaphora. The treatment of names I am proposing is natural, but bears little resemblance to some still influential views of names, such as Frege's or Kripke's (cf. Frege 1892, Kripke 1980). In my proposal, the interpretation of names is context-dependent and the semantics of a name is exhausted by its triggering a presupposition.

Interpreting subjects know the names of certain persons and certain things. This knowledge is stored in the old DRS that models the knowledge of the interpreter. So the old DRS contains conditions of the form (8) ($\alpha$ is the name in question).

(8)        $name(x, \alpha)$

The same condition can be associated as a presupposition with expressions like $S(john)$ and their resolution supplies the identity of $x$ in $S(x)$ which is passed on to the development algorithm. The presence of the necessary information in the old DRS is not guaranteed by the nature of utterances as it is for indexicals. Proposals for naming a perceived object by a name (*Let us call this mug Bertie*) and local names introduced in proofs introduce features of the utterance situation that are later employed for reference, in much the same way as indexicals. The possibility of accommodation is clearly present in the case of names (nobody knows all names) and even local accommodation can be shown to play a role. Geurts (1999) gives an excellent overview.

A complication arises from the fact that names often have a number of bearers. An extreme case is the family name Wang which has over a hundred million bearers. We just note that recent reference by means of the same name makes a resolution to the same individual preferred. The presupposition resolution mechanism is naturally geared to consider prominent candidates first.

Anaphora can also be treated by presupposition, as indeed Van der Sandt (1992) has been the first to note. I will provide only a sketch, leaving details for a further study[3]. The treatment diverges from standard DRT in further constraining the relationship between an anaphoric pronoun and its antecedent, by putting such constraints in the presupposition. That these further constraints are necessary is not controversial. The use of presupposition resolution has the advantage over other methods in that we appeal to a general mechanism and not to a mechanism specific for anaphora.

The presupposition associated with an anaphor can be described as in (9).

(9)        $utterance(e)$,
           $(\neg mentioned(e, x) \rightarrow attach(e, e1), mention(e1, x))$

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[3] It is common knowledge among those who have worked on resolving pronouns in a computational context that quite a lot of factors need to be taken into account. The list of the factors is long: DRT accessibility, agreement, interaction with reflexives, linear precedence, resolution loops, paralellism, command, detractors, the position of the pronoun in the sentence. All that we are dealing with here is the locality of the antecedent, which should come from the sentence under interpretation or from the sentence that preceeds it in the sense of being its sister or mother on the right frontier. Yet it is clearly possible to work the other factors into the presuppositional treatment, with all the detail required.

The idea is that the current sentence introduces or uses a number of discourse markers, each of which is a potential antecedent. On top of that, an utterance can either elaborate on an earlier utterance or continue the business of an earlier utterance (the condition $attach(e, e_1)$ is intended to cover both possibilities). In both cases, the discourse markers used to represent this earlier utterance are also good antecedents for the pronoun.

The main advantage over the traditional DRT treatment is that we have a simple explanation of why anaphoric pronouns do not give rise to accommodation. If the current sentence (or the one whose business it carries on) does not refer to any suitable antecedent, in standard circumstances the interpreter knows there is no antecedent. The explanation of why anaphoric pronouns do not accommodate is therefore the same as the explanation for demonstratives that visibly lack an accompanying pointing. Incomplete perception of the utterance situation (e.g. when joining a conversation in the middle) leads to apparent accommodations as for demonstratives. These are better understood as repairs since the accommodations are not intended by the speaker. The example (10)

(10)       It could have been the case that she was pretty.

in the absence of an antecedent does also not allow a local accommodation under the modal operator (a woman could have been mentioned in the previous sentence). The sentence never means that some woman could have been pretty and this shows that a linguistic explanation (e.g. in terms of Blutner's theorem) is necessary for ruling out accommodation of anaphoric pronouns in general.

A third category of referring expressions that can be incorporated in the present treatment are definite descriptions. Indeed, they have been the standard example for presuppositional treatments since Frege and Strawson.

The presupposition generated by $S(the\ N)$ would be DRS developed from the noun $N[x]$, whose resolution causes a binding of $x$. $S(x)$ is passed over to the development algorithm. Accommodation is a standard possibility for the presuppositions, though it requires the uniqueness of descriptive content. There are a number of counterexamples to the presuppositional theory for definite descriptions. They are given in (11).

(11)       The temperature changes.
           It is necessary that John's wife is Jane.

The problem with the first example is that we can know the temperature to be $25^o$ and that the theory would seem to predict that $25^o$ must change somehow. The problem with the second example is that we can know that Jane is John's wife and yet seem to feel that the sentence is false since John could have decided to stay single or to marry somebody else. It would appear from these examples that the standard presuppositional account of definite descriptions is not unproblematic.

For purposes of comparison, I will follow Kaplan in assuming that definite descriptions receive the treatment Kaplan incorporates in his logic of demonstratives: singular terms whose denotation is defined iff the descriptive content is uniquely satisfied in a circumstance of evaluation and which then refer to that unique satisfier.

# 2   A Comparison with Kaplan's Theory

The treatment above seems to me to be the most simple and obvious theory of demonstratives one can formulate in discourse theory or dynamic semantics in general. But simplicity and obviousness are also claimed by Kaplan for his theory of demonstratives and Kaplan's readers —including myself— tend to agree. Yet, at first glance, the two theories have little in common.

The little the two theories do have in common can be stated quickly: in both theories demonstratives refer without the mediation of a Fregean sense. They do not contribute to the content of what is expressed some definite description stating that the thing is pointed at or that it is the speaker. In Kaplan's case, this is because of a rule determining the referent directly, in our case it is because the descriptive content is presupposed (and resolved) and not asserted. As Kaplan points out, the view that the content would contain the descriptive meaning of indexicals or demonstratives leads to the absurd consequence that *I am the speaker*, or *I exist* express necessarily true propositions.

We have avoided the introduction of descriptive meaning for demonstratives into the content by making it a presupposition. As in Kaplan, the descriptions in question pick out the referent but they do not normally become a part of what is said. They were already in the DRS and only pass over the identity of their discourse markers to the interpretation process.

The qualification "normally" is important, since we have seen that demonstratives used in exceptional circumstances allow for the accommodation of a pointing gesture the interpreter cannot perceive. In those cases, the presupposition triggered by the demonstrative becomes part of the content, in the sense that it is part of the new information acquired by the interpretation of the utterance. Similar —but much more marginal— cases can also be considered for indexicals like *I, you, here* and *now*. In these cases, the presupposition triggered by the indexical expression or demonstrative does become part of the new information constructed on the basis of the sentence. But only in the case of demonstratives accommodation leads to information that is really new. The information involved in the accommodation of the presupposition associated with an indexical is unsurprising: it involves the attribution of a speaker, an adressee, a time and a place to the event of uttering a sentence. One has to twist one's brain to imagine utterances that do not have these objects associated with them and it seems reasonable to claim that they would not be utterances at all. (The wind has managed to create in the sand an inscription of *I am the greatest*. Clearly, in order to understand these words as an utterance we have to accommodate a speaker.)

With this small concession, our theory matches Kaplan's in denying Fregean senses for indexicals and demonstratives. Now we come to the discrepancies. First of all, it can be argued that the theory of the preceding sections is just an instance of the wide-scope theory of demonstratives that Kaplan so effectively demolished in *Demonstratives*. According to the wide-scope theory, the descriptive content of demonstratives and indexicals correctly gives their meaning, but the descriptions in question always have a scope that is as wide as possible, where the only operators that can have wider scope are other demonstratives and indexicals.

Kaplan's argument against the wide-scope theory is simple and effective: take the proposition expressed by "I am talking" and ask yourself whether it is the same as "the speaker is talking", as the wide-scope theory would have it. It does not, because in a world $w$ where I am not talking, and not me but somebody else is speaking the truth conditions of the two propositions

are not the same. The propositions expressed by the two sentences are therefore not the same.

In our theory, the propositions seem to become the same if we enter the two sentences into a completely empty DRS $K$ plus utterance event $e$. We obtain (by accommodation) the same DRSs (assuming an analysis of the speaker where it is the one who is the agent of $e$). By this process we obtain (12).

(12)

| e x |
| --- |
| utterance(e) |
| the x agent(e,x) |
| talk(x) |

There is nothing that distinguishes the two sentences and Kaplan's argument is as destructive for our theory as for the wide-scope theory.

This, however, is not what I proposed. Interpretation is supposed to happen in proper utterance DRSs, i.e. DRSs with an utterance event $e$ which already contain an utterance condition for $e$. So we cannot assume that the DRS is completely empty. The presupposition associated with $I$ and other indexicals will always resolve[4]. In this way, though the resulting material is almost the same, in the case of indexicals, we are dealing with old information.

(13)

| e x |
| --- |
| utterance(e) |
| agent(e,x) |

(14)

| e x e1 |
| --- |
| utterance(e) |
| agent(e,x) |
| (new) talk(e1) |
| (new) agent(e1,x) |

(15)

| e x y e1 |
| --- |
| utterance(e) |
| agent(e,x) |
| (new) the y agent(e,y) |
| (new) talk(e1) |
| (new) agent(e1,y) |

The content of the sentence must be defined as the new information the sentence brings and should not contain conditions that were already sitting there. If descriptive content is old, it does not belong to the content of the sentence. The new material in the two examples is different, because *the speaker* — and not *I*— leads to new material in the DRS.

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[4]Utterances have agents and adressees, times and locations. So if extra material needs to be added, conceptual structure is working for us. If necessary, it might be possible to demand that the utterance condition is replaced by a combination of conditions that introduces not just the event, but also the agent, adressee, time and place of the utterance.

But we have a problem in saying what the content of *I am talking* is, because the new part of its DRS contains a variable that is bound from the old DRS.

(16)        (new) agent(e1,x)

The contribution of the utterance is an open formula and open formulas do not by themselves express a proposition. We seem to be able to fend off Kaplan's argument because we cannot say what proposition a sentence with an indexical element expresses. Some have even claimed that this is a virtue of the DRT-approach. Good fencing, however, is not always good philosophy. It really is a disaster to have to conclude that a simple intuitive argument like Kaplan's cannot be reconstructed just because DRT is unable to account for the content of certain sentences. If this were true, it would be a good reason for abandoning DRT and our treatment along with it. The next sections therefore present an account of sentence content in DRT in which Kaplan's argument can be fully reconstructed.

There is another problem with our treatment. While it makes many referring expressions directly referential in the sense I explained, direct reference in this interpretation is no guarantee of rigid designation. Our directly referential expressions can have different denotations in different possible worlds.

Consider a minimal utterance DRS $K$ to which we add *I am tall*. Take $K$ to different possible worlds. Our definition of truth says $K$ is true iff there exists a truthful embedding. This definition works in the actual as well as in other possible worlds. The object assigned to $I$ can be called its referent. Now, there is no guarantee that in another possible world, the embedding will assign the same object to the marker as in the actual world. It suffices to find an utterance event $e$ and an agent $x$ of $e$ such that the agent is tall. The utterance event marker $e$ which we added is just machinery that helps us in interpretation: it does not play a role in the truth conditions of the DRS and can therefore be interpreted by different utterance events in different worlds.

A standard move is to fix the reference of $e$ to be some event $E$, let's say the utterance that really happened. I am not sure that this really makes sense, but we can explore the possibility for a moment. $K$ cannot be true in a world where $E$ did not happen. This would hold for any DRS that results from interpreting the utterance $E$. This is strange, because, intuitively,

(17)        I am not speaking.

would seem to be true in a world where I remained silent instead of speaking. In fact so strange that this way of explaining things must be rejected.

But even if we fix the referent of $e$ by considering only the embeddings that map $e$ to some particular event $E$ common to all worlds, it does not seem a foregone conclusion that the agent of $e$ is thereby also fixed. Somebody else could have produced the same utterance or the utterance could have occurred at another place or another time, according to intuition of many.

So, on this level, my DRT account of demonstratives does not lead to rigidity. And —to a large extent— this is as it should be if we take DRT to be a theory about how subjects interpret

sentences and form representations of the information contained in those sentences. There is no place for the notion of objective meaning when we are concerned with the information of subjects: for the subject, objects coincide with what she knows about them. It is natural therefore that the "proposition" expressed by a DRS is the Stalnaker diagonal (cf. Stalnaker 1978), the speaker's criterion for deciding which worlds are compatible with all the information she has in her representation. It is the subjective meaning as defined by Haas-Spohn (1995). But, at the same time, the subjective style of semantics obscures the fact that sentences, thoughts and representations can be about something external and cause actions in the real world. The subjective theory needs to be at least supplemented by an account of the way in which beliefs can influence action. I attempt to do so at the end of this paper.

Our difficulties with reference across possible worlds originate in a well-known problem: not having a distinction between content and character. Because the antecedents of our presuppositions sit with the other conditions, there is nothing special about them and in other circumstances of evaluation they play the same role as all the other conditions. The fact that the antecedents of our presuppositions are just normal conditions accounts for not just a superficial similarity with wide-scope theories of demonstratives, but also for the failure of rigidity. Referents of demonstratives and indexicals are not the objects pointed at or the constituents of the context of utterances but individual concepts of them that vary along with the denotation of the properties and relations in circumstances of evaluation. The DRSs are not about the objects pointed at or about the constituents of the utterance context.

Also at this point, I feel there is something deeply wrong. When I say *I am leaving*, I am talking about myself, and not about somebody else who could have been speaking in my place in another possible world. The absence of propositions and of rigidity are serious defects of the theory we have developed so far and remedies like the ones supplied by the next sections are necessary.

## 3   Propositions in DRT

The intuitive idea behind the notion of a proposition is the thought expressed by an utterance. In more classical approaches to semantics like Montague grammar we find rules to determine that thought on the basis of the syntactic structure of the utterance. In DRT, this is not so, at least superficially[5]: the syntactic structure determines the behaviour of the development algorithm that changes the given DRS into a new one. But the changes are generally additions of markers and conditions. So we can define the contribution of an utterance as the new markers and conditions it adds to the DRS given as the context, i.e. the model of the interpreter's knowledge of the context at the start of the interpretation.

The contribution can be defined as the difference between the DRS before the interpretation

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[5]Zeevat (1989) and Groenendijk & Stokhof (1991) provide ways of interpreting DRT in this more traditional way. But they crucially shy away from incorporating the aspect that makes DRT different, the resolution of presuppositions (in the original version the resolution of pronouns) by relegating that aspect of interpretation to the syntax. The originality of the DRS development algorithms is precisely that within the interpretation process operations on the semantic representation under construction (in particular looking up) are incorporated. The same problem applies to the treatment of names proposed by these authors.

and after the interpretation[6]. The contribution of an utterance is therefore the set of new conditions and discourse markers that are added as a result of interpreting a sentence. If $K_2$ is the DRS after interpreting $S$ in $K_1$, we can define the difference as in (18).

(18)     $K_2 \setminus K_1 = < U_{K_2} \setminus U_{K_1}, CON_{K_2} \setminus CON_{K_1} >$

The difference is typically a DRS where some of the variables occurring in the conditions are not included in the set of markers of the DRS. Though this defect could be easily repaired by including the necessary markers, that would give the wrong result, because it would yield the existential closure of the open DRS. An occurrence of $I$ should not be synonymous with *somebody*.

A solution suggested by Kamp on various occasions[7] is external anchoring. An external anchor is a partial function $f : VAR \rightarrow U$ which is conceived to be part of the model of the interpreter and which is dynamically constructed alongside with the DRS.

The full model of the interpreter is then $(K, e, f)$, with $K$ the DRS, $e$ the utterance and $f$ the anchor. How do we dynamically construct anchors?

It seems sufficient to add to the development algorithm some provisions about the anchor. Crucial for us are the two rules (19) and (20).

(19)     If a new object $a$ is perceived and represented by a marker $x$
         then add $< x, a >$ to the anchor.

(20)     If a new name is encountered and accommodated using a
         marker $x$ then add $< x, a >$ to the anchor where $a$ is the
         object that actually has that name.

It may seem that the first rule is out of place, since it deals not with linguistic interpretation but with perception. But, given the role of perception in the interpretation of indexicals and demonstratives, I see no alternative. It is harmless enough if we take the combination of the DRS and the anchor to be the model of the interpreter. In fact, perception is already essential to our treatment of indexicals and demonstratives, because there is no other way in which we can acquire conditions like $utterance(e)$ or $point(e_1)$. Note that the rule for names only works properly if we make the assumption[8] that names have a single bearer.

These two rules guarantee that at least some free markers involved in the interpretation of indexicals, demonstratives and names are normally tied to the appropriate objects. (The

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[6]This excludes non-monotonic change. Changes of this kind will occur in future treatments of correction and do occur in local and intermediate accommodations of presupposition. I do not know a solution for these that maintains the account as developed here. I am even not fully convinced that it is necessary to have an account that incorporates non-monotonic changes.

[7]Kamp & Reyle (1993) use external anchors for the interpretation of proper names. I am not aware of a systematic defense other than in a number of talks and seminars that I attended over the years.

[8]This assumption is false, but in a formal treatment, we can use names with a subscript. This is acceptable as long as we do not attach a psychological interpretation to anchors. The absence of a natural psychological interpretation is also the kernel of the problems that many —including myself — have had with external anchors. Without such an interpretation they seem *Fremdkörper* within a DRT that is —or should be— just a model of what happens when somebody hears a sentence.

exceptions are the accommodated demonstrations, in which the object pointed at is not perceived.) But it is easy to go further. We can bind new definite description markers in the anchor by specifying that $<x, a>$ is to be added where $a$ is the object actually singled out by the description. And even for indefinites used specifically or occurring in focus position there are strategies for extending the anchor. For specifically used indefinites we have the strategy of speaker reference[9]: we can inquire what is the so-and-so actually intended by the speaker in her use of the indefinite. If this has an answer, we can extend the anchor accordingly. For focussed indefinites, the Evans description is also available. An occurrence of $S(an\ A)$ corresponds to the Evans description: *the x such that A(x) and S(x)*, and focussing can be understood as expressing the speaker's belief that this description is sufficient for singling out the object she intends with her indefinite. But if we have an Evans description, we can anchor the marker to the object that is the actual denotation of the description. As said, we can do this, but it is not required for an account of indexicals and demonstratives. It becomes necessary only if we want to get an account of sentence content with external anchors that functions for a reasonably large fragment of a natural language.

We can now redefine truth as in (21).

(21)     $M \models <K, f>$ iff $\exists g (f \subseteq g \land M, g \models K)$

A consequence of the perception rule is that also the utterance event $e$ of utterance DRSs $<K, e>$ becomes externally anchored.

Anchoring works for most referring devices we encounter but typically not for all. An obvious exception are indefinites that are not used specifically and are not focussed either. More important are the cases where the construction of the anchor does not work as it is supposed to. There is a referring expression but the instructions for anchoring it cannot be carried out, because the description that has to be evaluated does not single out a unique object for anchoring its discourse marker to. Names that do not name anything (or too many things) are a case in point, but similar cases can also be constructed with (faulty) perception and the anchoring conditions for descriptions and indefinites. Anchoring objects can appear to exist to the interpreter without actually being in place. Mistakes by the speaker and lies are typical causes.

Faulty anchors lead to the absence of propositions expressed by sentences if the corresponding difference DRSs contain free markers, and that is so even if the interpreter supposes them to be anchored. In this way, the interpreter can suppose sentences to have a propositional content which they in fact do not have. And the speaker may share the interpreter's supposition. So to both of them it then appears that information is exchanged while in reality this is not the case. This is a real problem which makes it impossible to take this form of anchoring to be the final solution to our problem. But it is important to see what anchoring achieves when it works.

If we have anchors, we can start to make sense of the notion of a proposition. The notion is not very special at all. Propositions can be defined on the basis of an intensional model, the pair of DRSs $K_2$ and $K_1$ with $K_2$ arising through the interpretation of $S$ in $(K_1, e, f)$.

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[9]The treatment of Van Rooy (1997) of indefinites is my source of inspiration for having two mechanisms for reference of indefinites, here and later, though the actual implementation is different.

The proposition expressed by $S$ (under the interpretation given by $(K_1, e, f_1)$ and $(K_2, f_2)$ is the set of those worlds $w$ of $M$ that embed the DRS $K_2 \setminus K_1$ by means of an extension of the anchor $f_2$.

(22)    $\{w \in W : \exists g \ f_2 \subseteq g \ M, w, g \models K_2 \setminus K_1\}$

As an example, consider (23)

(23)    I am tall.

interpreted on a minimal utterance DRS, with a perceived speaker and utterance.

This is (24)

(24)
| e x |
| --- |
| utterance(e) |
| agent(e,x) |

with an anchor $f_1 = \{< x, a >, < e, E >\}$. Interpretation results in

(25)
| e x |
| --- |
| utterance(e) |
| agent(e,x) |
| tall(x) |

with no further addition to the anchor, so $f_2 = f_1$.

The proposition expressed by the sentence is now:

$\{w : \exists g f_2 \subseteq g \ M, g, w \models tall(x)\}$

which for all purposes is the same as Kaplan would have it.

# 4 Back to Kaplan

Let us continue the discussion of the two propositions we considered before.

The proposition expressed by *I am tall* is now definable by the anchor of $K$ since we can assume that the speaker of the utterance has been observed before the interpretation of the utterance started. If no misinterpretations occur (the interpreter does not assume that someone other than the speaker is talking) the discourse marker representing *I* is identified with the anchored marker for one particular observed person, the actual speaker.

The combination of $tall(x)$ and $f$ characterises the proposition that $f(x)$ is tall. By the provisions on the anchor $f(x)$ is the actual speaker. The anchor makes the reference rigid and so brings it about that the actual speaker is rigidly referred to.

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The grasping by the interpreter of that proposition is conditional on correct perceptions of the utterance and its speaker. If misperceptions occur, the interpreter misinterprets the utterance as expressing a different proposition from the one the speaker did express. But we can define the proposition expressed as the proposition that would be grasped if the rules and perceptions governing the interpretation are all carried out without error. They are what an interpreter with a correct perception of the utterance situation would make of the utterance according to the rules. If we generalise to demonstratives, names, anaphora with definite and indefinite antecedents, the correctness must be extended to the correct observation of the pointing, the absence of mistaken assumptions about the name, having no mistaken ideas about what the description picks out or being a victim of wrong identifications when an indefinite is used. This can be spelled out with an arbitrary amount of detail.

By contrast, the proposition expressed by *the speaker is tall*, assuming Kaplan's treatment of descriptions, expresses a proposition consisting of those worlds where the speaker of $e$ can be singled out and where that speaker is tall. A very different proposition. Further, we now have a contrast between character and content. Content is the proposition we just defined and character arises by abstracting over the DRS that is the background of interpretation and the anchor that comes with it.

On the face of it, it seems that we met with full success. The insights of Kaplan can all be restated in our current framework and the discourse theory of indexicals, demonstratives, names etc. is fully conservative over the insights of Kaplan.

But there are still some problems. The most important one is the possibility of faulty anchors ($x$ seems to be anchored to something but actually is not anchored at all). Intuitively, it does not seem that sentences with faulty anchors do not express anything at all or have to be assigned a meaning by existential closure. Take (26).


(26)     Pegasus is a horse. He is beautiful.


Suppose the name Pegasus is new to the interpreter. It follows by our first rule that it has to be anchored to whatever bears the name. In this case that is nothing. The second sentence then does not express a proposition (it needs an anchor to be interpreted) or it must be interpreted by existential closure as *something is beautiful*. Neither option seems to capture our intuitions about the second sentence. And it certainly does no justice to the fact that a normal interpreter —unaware that Pegasus does not really exist— treats it as just a normal sentence with a normal meaning.


(27)     That man there is ill.


*That man there* just corresponds under our theory to a complex presupposition, to be resolved to a representation of observations by the interpreter. Now suppose that, instead of a man, at the place where the speaker is pointing there is a clay statue of a dog. To the interpreter as well, this statue appears to be a man. We can let the sentence express no proposition, we can let it express the proposition that something is ill, but, in neither case, we do justice to the fact that the interpreter understands the speaker's intention.

(28)     You are crazy!

Suppose John seems to see a person in front of him behaving strangely and shouts (28)  at him. Does it follow that John said something which was meaningless? It certainly does not seem so to him or to somebody who watches him and who cannot see the facts of the matter either.

The problem with these examples is we are making a false prediction about the truth-conditions of the thought that the interpreter is building up. We either predict that she has no thought at all or that she has a thought that is much weaker than what it seems to be to her. It may be correct to deny that these sentences are true or false in the actual world or that they express classical propositions, but it is false to claim that these sentences do not express thoughts that have truth-conditions.

A second problem is to account for belief sentences and intensional contexts in general. Are all anchored propositions directly referential with respect to referential expressions? This seems absurd when one thinks e.g. about the Geach sentence or Kripke's puzzle.

(29)     Hob believes a witch killed his pig. Nob believes she poisoned
         his well.

Without an external anchor for the witch of the first sentence, the second sentence is meaningless or existentially closed and neither of these options seems to accord with our intuitions.

(30)     Pierre believes that Londres is beautiful.

By its external anchor, (30)  in this option would be a belief about London and coincide with

(31)     Pierre believes that London is beautiful.

.

Yet (31)  is false on Kripke's story while  (30)  is true.

Both of these problems with external anchors are serious and must be addressed.

There is also a third problem. Not all uses of demonstratives behave as Kaplan predicts[10] and not all uses of names and anaphoric pronouns are directly referential and rigid. The same problems occur when we treat definite descriptions as presupposition triggers, which are not considered to be rigid designators by anybody.

While the first two problems are solved in the next section, this last problem is not one we want to solve. It seems to me that the discourse theory of referring expressions is far superior to Kaplan's insights on demonstratives or to Kripke's insights on names. While direct referentiality is a feature of nearly all uses of demonstratives and indexicals, it is only a feature of one —admittedly important— use of names and happens sometimes only with definite descriptions and anaphora. That we can bring out this flexibility is a virtue and

not a vice of the treatment. It has been widely noted that Kripke's theory gives up where the going gets a little bit rougher (see e.g. Geurts 1997) and while Kaplan's treatment of demonstratives is more robust, there are also cases where problems arise.

Though it is immaterial to the argument of this paper, I disagree with the view that Kaplan's theory of demonstratives always gives the correct semantical account though it must still be supplemented with a pragmatic account if it is to deal with several nasty cases. In my view, the semantical predictions are already problematic. Compare (32).

(32)     I think that I am ill

The speaker is looking at the analysis of the blood of patient 14367A who, unknown to him, happens to be himself. In Kaplan's theory (32) is true: the thought that 14367A is ill is a thought of the speaker and it expresses the same proposition as the one expressed by the complement sentence. In my treatment, two thoughts can expressed by the sentence: in the first one, the internal $I$ is resolved directly to the utterance agent, in the other one, $I$ is resolved to the internal $I$ belonging to the speaker's mental state. (The precise way in which the two are identical needs to be clarified, but that is not our concern here.) Let us make the perhaps dubious assumption that the internal subject is tied to the concept *who thinks all this* a concept that in the actual world refers to our speaker. Under this interpretation, the sentence is false, as it rules out any belief alternatives in which the thinker of the thoughts is not ill. The resolution to the internal "I" also is the preferred reading, since the internal $I$ is the closest antecedent. It is not possible either to interpret the sentence by the resolving to the utterance agent, because that would contradict the assumption that the speaker does not know that he is patient 14367A.

A similar case is (33).

(33)     John thinks that Bill is here.

This example is bit harder. Bill and John are in two different but similar pubs at two different sides of the street. John sees Bill in the pub across the street, but, mistakenly assumes that he himself is in the other pub. He therefore thinks that he is in pub $A$, and that Bill is in pub $B$, where, in fact, he is himself. Again it seems that we can mean pub $B$ with *here* only if we somehow manage to introduce the location in that way. Not completely impossible but again quite unlikely.

Simply changing thoughts for propositions allows to treat the problematic examples with semantics only. Kripke's puzzle in Kripke (1977) already is sufficient ground to doubt the wisdom of basing a semantics of belief on classical propositions. Our discourse theory is far superior in these cases.

# 5   Intensional anchoring

The dynamics of anchors is characterised by giving instructions to a third party on how to build the anchor. Under certain conditions, anchor the marker $x$ to the object $a$ that so-and-soes in the actual world.

That means that the instructions can be followed not just with respect to the actual world but with respect to any world whatsoever. Intensional anchoring is the proposal of doing just that. An intensionally anchored discourse marker will be associated with a partial function from worlds to objects in those worlds. It is defined in a world $w$ if in $w$ there is a single object that meets the description, and if it is defined in $w$, it denotes that single object in $w$. All we have to do is to give instructions for anchoring. I list some of these instructions in the following table without claiming that these constitute the final wisdom. As it turns out, the analysis of intentional identities in the next section forces us to reject several possible formulations. Other tests would be very welcome.

(34)    If a new object is introduced by a perception, the description
        is derived from the content of the perception, e.g. *the man
        sitting over there.*

(35)    If the new object is first referred to by an unknown name $\alpha$,
        it is *the object that bears that name.*$(name(x, \alpha))$

(36)    If the object is first referred to by a definite description *the N*,
        it is the description itself that does the anchoring.  $N(x)$
        (unofficial)

(37)    If the object is first referred to in an indefinite description in a
        sentence $S(a(n)\ N)$ the description is the Evans' description
        $S(x), N(x)$

(38)    Any new object is also anchored to *the object the speaker
        would pick out.*

In essence, this gives a pragmatic solution to the question of which individual concept to associate with a marker. It is the context of introduction that fixes one or more descriptions: one in case the interpreter concludes that the speaker's reference coincides with the standard description, two in case of an assumed distinction.

Intensional anchoring is the solution to the problem of faulty external anchoring and it explains the intuition that even where external anchoring gives up, the sentence still has a content (or at least an interpretation).

It is not necessary to implement intensional anchoring by means of functions outside the DRS itself, as we did with external anchors. Intensional anchors record the information that a particular discourse marker is bound to a description. This can be represented as a special condition which we can enter into the DRS. The semantic effect of the special condition is to bind the marker to the description in all possible worlds. Let us use the condition (39) for this purpose.

(39)    $def(x, K)$

It demands of an embedding $f$ to assign the object $u$ to $x$ in $w$ if and only if the value $u$ is the unique value for which $K$ is true in $w$ under $f$ and otherwise to nothing. The definability of the truth conditions of $def(x, K)$ requires $K$ to be extensional with respect to $x$, i.e. $x$ must have occurrences that are not under an intensional operator in $K$. The formal notion is given in (40).

$f \models def(x, K)$ iff
$\forall w \in W \ (\exists! u \in dom(w) \ M, w, f_u^{x,w}, w \models K \Rightarrow M, w, f, w \models K) \wedge$
$(\neg \exists! u \in dom(w) M, w, f_u^{x,w}, w \models K \Rightarrow f(x)(w) \text{ is undefined})$

Here $f_u^{x,w}$ is the assignment just like $f$, except that $f_u^{x,w}(x)(w) = u$. The notion $M, w, f, v \models \varphi$ is defined below.

This possibility makes it clear that the epistemic problems of extensional anchoring do not arise with intensional anchoring at all. The subject is fully aware of the anchor of her discourse marker and the anchoring is part of her information and not a result of her standing under some causal influence of which she herself is not aware. Contrary to the classical semantics of Kaplan and Kripke —or Kamp's external anchors— we do not assign meanings that are inaccessible to the subject who is supposed to entertain them.

Intensional anchoring by means of the new condition opens the way for a new kind of DRT, one without discourse markers. The new defining conditions take over their role. One obstacle we need to take into account is the fact that discourse markers are also important in the DRT theory of negation and quantification. This is an interesting matter, but one only indirectly connected to the issues adressed in this paper. We will adopt the proposal of omitting discourse markers and let our DRS be sets of conditions only from now on, with the new possibility of conditions $def(x, K)$.

We redefine $K_2 \setminus K_1$ as $\{C \in K_2 : \exists x \in VAR \ \exists K_3 \in DRS \ C = def(y, K_3) \vee C \notin K_1\}$

I am assuming the following treatment of attitudes and ontological necessity. Attitudes are sensitive to the contextually determined intensional anchors. The interpretation of a discourse marker in a belief alternative depends on how the anchoring concept evaluates in the belief alternative. One can even believe in a discourse marker: that is the fact that the associated anchoring concept denotes in all of one's belief alternatives.

Ontological necessity and causal necessity are different. If we consider ontological or causal alternatives of a particular world we are looking at alternative ways that particular world could have developed, one time given just ontological principles, the other time given the causal laws. That means that, for spatio-temporal continuants, the normal identity criteria across time obtain. Spatio-temporal continuity determines not just why $x$ at $t$ is the same as $x$ at $t'$ but also why $x$ at $w$ is the same as $x$ at $w'$.

This difference can be captured by distinguishing the world of evaluation from the world that sets the reference, much like Kaplan's distinction between circumstance of evaluation and context of utterance. The difference is that now all information is in the assignment function (which is uniquely determined by the $def(x, K)$ statements) and that all the second world parameter does is to consult the assignment function to find the referents of the discourse markers.

The idea is that ontological necessity and —consequently— objective meanings will keep the

denotation of the discourse markers constant. The arguments for this have been provided by Kaplan and Kripke and I agree with them. It could not have been the case that Aristotle and Plato were the same philosopher, the sentence "Aristotle was the teacher of Alexander" is about Aristotle and not about somebody else bearing the same name. "This book" refers to the book I am pointing at and it could not have been the case that this book was that book.

But at the same time, that is not the end of the story. An operator like *it is logically true that* or *John believes that* does not give its discourse markers a constant denotation. Although it is impossible that Aristotle could have been Plato, it is not logically false that Aristotle was Plato. John in his ignorance can surely believe that Aristotle and Plato are identical. John can also believe that this cat is a plastic toy cat and may be unable to keep me and my colleague apart. Following Haas-Spohn, we can use the disquotation principle to argue that belief attribution follows the subjective information expressed by the sentence, because it is the information that the sentence expresses to the subject that decides whether the subject is going to assent to a sentence.

We have models $M = <W, U, bel, nec, V, a>$ with $W$ a non-empty set of worlds, $a \in W$, $U$ a non-empty set of objects, $bel(u, w) \subseteq W$ for $u \in U$ and $w \in W$ (the belief alternatives of $u$ in a world $w \in W$), $nec(w) \subseteq W$ (the ontological alternatives of $w$) and $V$ a function that maps pairs of worlds and relations to appropriate relations over $U$.

The general notion is the truth of DRS $K$ on a model $M$ with respect to worlds $w$ and $v$ and an assignment $f$:

$M, w, f, v \models K$

which is defined as: $\forall \varphi \in K \; M, w, f, v \models \varphi$

In terms of the general notion, we can define the truth of a DRS on a model $M$ as in (40).

(40)        $M \models K$ iff $\exists f \; M, a, f, a \models K$

Truth for conditions is defined below.

1. $M, w, f, v \models Rx_1, \ldots, x_n$ iff $< f(x_1)(v), \ldots, f(x_n)(v) > \in V(R)(w)$

2. $M, w, f, v \models def(x, K)$ iff $f \models def(x, K)$

3. $M, w, f, v \models x = y$ iff $f(x)(v) = f(y)(v)$

4. $M, w, f, v \models \Box \varphi$ iff $\forall u \in nec(w) M, u, f, v \models \varphi$

5. $M, w, f, v \models B_x \varphi$ iff $\forall u \in bel(f(x)(v)) M, u, f, u \models \varphi$

6. $M, w, f, v \models L\varphi$ iff $\forall u \in W \; M, u, f, u \models \varphi$

In terms of this model, we can now redefine the thought (the subjective meaning, not the proposition or the objective meaning) expressed by a sentence $S$ in a development from $K_1$ to $K_2$ as:

$\{w \in W : \exists f \; w, f \models K_2 \setminus K_1\}$

The definition is again the subjective notion of information we had initially for our DRSs. But we are now in a position where we can also define objective propositions.

The set of ontological alternatives $nec(a)$ of the actual world $a$ in a model $M$ is our starting point for defining classical propositions. These ontological alternatives represent ways the world $a$ could have been given the way our world is organised. In particular, the alternatives are the same as the actual world up to a certain point in the past after which they diverge. The following definition gives a definition of the classical proposition expressed by a sentence leading to a development from $K_1$ to $K_2$.

$\{w \in nec(a) : \exists f \; M, w, f, a \models K_2 \setminus K_1\}$

We can strengthen this by noting that functions $f$ satisfying this condition are uniquely determined by the intensional anchors of the DRS. Let $f_{anchor}$ be the function that satisfies the intensional anchors of $K_2 \setminus K_1$. We can then reformulate the definition of classical proposition as:

$\{w \in nec(a) : M, w, f_{anchor}, a \models K_2 \setminus K_1\}$

This completes my reconstruction of Kaplan's notion of proposition within DRT.

*Excursus*

This excursus presents a possible way of adding negation and quantification to our new DRT. (41) denies that we can satify

(41)      Mary does not have a boyfriend

the DRS (42).

(42)
> $def(x, \text{Mary's boyfriend}(x))$
> $exist(x)$

We can introduce a notion "is false on " ($=\!\!\mid$) between models and (new-style) DRSs. The intuition is that we can form the discourse marker for Mary's boyfriend without any problem, but that we will run foul of the other condition in the DRS. In negation, the intensional anchors can be formed but they do not give us objects that extensionally satisfy the other conditions.

$M, w, f, v =\!\!\mid K$ iff $M, w, f, v \models def(x, K_1)$ for all conditions $def(x, K_1) \in K$ and $M, w, f, v =\!\!\mid A$ for some other condition of $K$.

$M, w, f, v =\!\!\mid A$ has to be spelled separately for each condition.

This same idea also allows a treatment of universal quantification. We extend first of all the definition of $def(x, K)$ to allow plural objects (sets), indicated by capital letters.

$M, f \models def(X, K)$ iff $\forall w \in W f(X, w) = \{a \in U : M, w, f_X^{a,v}, w \models K\}$

This assigns to the discourse marker the concept of a set that denotes in a world $w$ the set of the $K$-satisfiers. We further need a predicate $nonempty(X)$ that tests whether the extension is empty.

We can then represent (43)

(43)        Every man is happy.

as we would (44),

(44)        not(some men are not poor)

I.e. as the negation of (45).

(45)
$$\boxed{\begin{array}{l} def(X, [man(X), \neg poor(X)]) \\ nonempty(X) \end{array}}$$

The full definition of $\models$ is straightforward.

# 6   Intentional Anaphora

It will become clear that we need speaker's reference for dealing with intentional anaphora. It is related to a test, like the one of *Haas-Spohn 1995* for epistemic alternatives. We put the speaker in an alternative world and allow her the possibilities of unlimited investigation. The task is to identify the object she intended with her utterance of a referential expression. Clearly, the results of the test depend on what the speaker assumes about the referent, i.e. on the way the speaker intends the referent.

In our theory, such a way of intending an object is represented by a condition $def(x, K)$ and the way the interpreter can connect it to the utterance $e_1$ of a referring expression is by another condition: $intend(y, e_1, x, K)$ (speaker $y$ intends $x$ with $e_1$ under $K$). Assuming variables for DRSs we can have two conditions:

$def(K, intend(y, e_1, x, K))$
$def(x, K)$

and the net effect is that $x$ is bound to $K$ and $K$ is how the speaker intended $x$. The problem is however that the value of $K$ will vary with the world in which it is evaluated: the speaker may intend $x$ differently in different possible worlds.

The way out is presumably to make the reference to a speaker's concept $K$ a presupposition rather than an intensional anchor.

If (46)

(46)        $intend(y, e_1, x, K)$

is presupposed and resolved to a concept $K$ we have solved the problem after adding a new intensional anchor $def(x, K)$ using the $K$ found by presupposition resolution. If one starts considering the possibility of accommodating the postulated $K$, a new complication arises. An accommodated presupposition —we must rule now— has an intermediate status between old and new material. It is new, but it is not taken on board when we determine the propositional content of sentences. This is not impossible and it is in line with the presupposition literature.

Without it, we would land in exactly the same situation we had before. The statement that the speaker intends $x$ under the intention $K$ would be a constituent of the content. It is also good to notice that per force the accommodation about the speaker is global. The only inconsistency at the global level that could arise is that it is somehow known that the speaker does not intend $x$ under any concept. But that is guaranteed to be false given that the speaker intends $x$ under the concept associated with the referential device she has selected for $x$.

The following is an example where we might need accommodating speaker's reference. There is a tramp sitting by the side of the road and the speaker says:

(47)    You see that fellow? Bill thinks he used to be a millionaire.

Here the context associates the referent with the common ground perception of the fellow. Since Bill is not present, he has no part in the perception. So perforce, the pronoun in the second sentence must be associated with a referential concept of the speaker, which can also carry Bill's belief. E.g. the speaker may falsely assume with Bill that the man is Mr. So-and-so, the once well-known millionaire.

I am assuming that new markers are represented by two discourse markers $x$ and $y$ tied to conditions $def(x, K)$ and $def(y, K_1)$ with an assumed extensional identity $x = y$, where one of $K$ and $K_1$ represents the speaker's intention. The interpreter may decide that $K$ and $K_1$ are in fact the same. In addition to the problems we face in this section there are two other arguments for setting up things in this way. The first is the ambiguity problem. We noted that names may have many bearers, and anaphora can often be resolved in different ways. A double representation offers a simple way of expressing the idea that the name or pronoun must refer to who the speaker intended. In addition, the double representation makes it possible to deal with Donnellan's and Kripke's examples of speaker's referents that are distinct from the literal referents of the expressions, and that we as charitable interpreters —as a repair strategy— interpret by ignoring the literal meaning.

The theory of intensional anchors has to meet a crucial test: intentional anaphora. The classical case is the Geach sentence about Hob and Nob. Edelberg (1992) has noted that many of the accounts of the Geach-sentence fail on the asymmetric examples he discusses.

Let us start with (a simplified version of) the Hob-Nob example.

(48)    Hob believes that a witch killed his pig and Nob believes that
        she poisoned his cow.

We are considering the case where the witch does not exist and where Hob and Nob never talk and Nob does not accept that his witch killed Hob's pig.

The first two clauses rule out giving a wider scope to *a witch*. The last clause rules out an Evans interpretation (based on the complement of the first conjunct), as that would make the second conjunct equivalent to (49).

(49)     Nob believes that the witch that killed Hob's pig poisoned
         his cow.

So the remaining interpretation can only be based on speaker reference. Who would the speaker pick out as the referent in a world $w$?

It is necessary that in Hob's belief alternatives the intensional object intended by the speaker exists and that that same intensional object also exists in Nob's belief alternatives.

Some examples of successful possible intentions of the speaker are: the witch of the rumour going around in the village, the witch from the newspaper etc. They are successful because we find these suggestions in the literature as glosses for what the sentence could mean and are convinced by them.

The interpretation we are describing is one where the speaker has an intention that does not denote in the actual world, but denotes across the belief alternatives of both Hob and Nob. The relationship between the discourse marker of the pronoun and those of its antecedents is that one of the discourse markers of the antecedent is intensionally identical to the other.

In one of the Edelberg examples, we find the opposite situation.

Arsky and Barsky are two detectives investigating the alleged murders of Smith and Jones. Arsky believes the murderer of Smith is the guy who killed Jones, but Barsky does not and, moreover, Barsky believes the murderer of Smith has left town. Smith and Jones were both victims of an accident and not murdered.

The problem is the sentence (50).

(50)     Arsky believes somebody killed Jones and Barsky believes he
         left town.

Intuition has it that (50) is not true in the circumstances described. It is of the murderer of Smith that Barsky believes that he left town and not of the murderer of Jones. So we have to answer the question: why cannot the speaker intend the referent of *somebody* as *the murderer of Smith*? (Free accommodation of speaker intentions would seem to allow this.) Obviously Arsky believes of the murderer of Smith that he killed Jones and Barsky believes that the murderer of Smith left town.

We can bring out the problem also in the following way. Example (51) is obviously true,

(51)     Arsky believes that the murderer of Smith murdered Jones
         and Barsky believes that he left town.

and the problematic example seems to follow from it by a simple application of existential generalisation under the belief operator, a totally innocent inference.

How do we explain this? My explanation is based on the assumptions we make about the speaker. Suppose it is somebody who —like Arsky— assumes that there is a single murderer of Smith and Jones. Then the person is sincere and reporting the facts, when she reports as in the example (50) .

But if we do not agree with Arsky —by not believing that any murders took place or by being like Barsky in assuming that the murderers may well be different persons— we cannot understand what the speaker says as a true report. Understanding seems to require that the murderer of Jones is given to us as the murderer of Smith. But this cannot be satisfied if we do not accept Arsky's identification of the two murderers.

If the speaker has the information we have (we are asked to check the correctness of the report, given the data) there is no basis for making the assumption that the speaker can intend the murderer of Jones as the murderer of Smith. The speaker has no more information about the murderer of Jones than we do. Her intention therefore forcibly coincides with the Evans description. And under the Evans description, the sentence is obviously false.

On the view I have been defending it is not the case that the second conjunct means the same if we replace one antecedent by the other. It is either the speaker's referent (how the speaker would identify the "someone") or the Evans description that is available. The speaker's referent is not identical with *the murderer of Smith*. The Evans description is *the murderer of Jones*. So we meet with an interesting case of contextuality, comparable to Quine's *Giorgone was so-called because of his size* where *so-called* refers to the name *Giorgone*. This is also what blocks the seemingly innocent existential generalisation under the belief operator in the first conjunct.

Another example of Edelberg is also unproblematic using the Evans description. Here somebody has staged a car accident by putting a car against a tree, smashing the windshield and throwing ketchup on the surrounding grass. Harry and Muriel are two independent passers-by who witnessed the resulting scene.

(52)     Harry thinks that somebody crashed that car into a tree and
         Muriel thinks he is wounded.

*def (x,person x crashed that car)* binds $x$ to a concept that also works for Muriel.

The Edelberg papers and intentional identity are important because they offer strong constraints on the kind of concept which can serve as an explanation of intentional identity, especially in the case of speaker reference: a concept under which the speaker intends the object in question. The Evans description in the other case also gives the only solution that explains the other two examples.

Speaker's reference is not only a possibility for the interpretation of indefinites. (53) can be a statement about a misrecognised Muriel.

(53)     Harry is having a good time.

The concept under which the speaker intends the discourse marker can be used when the speaker uses a definite to pick out objects in the immediate environment. A charitable hearer

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infers the statement that the speaker wanted to make, noting the mistake (the speaker believes that she sees Harry). Moving to the speaker's concept is a repair strategy, not a different interpretation.

# 7   Recapitulation

The following eight theses try to give an overview of where we have landed at this point in the paper.

1. Demonstratives and indexicals are interpreted by resolving a presupposition that refers to the representation of the utterance in which the demonstrative or indexical occurs. The content of the presupposition can be equated with the descriptive meaning of the demonstrative or indexical as given in Kaplan's theory of demonstratives, but the role it plays in determining the referent is different. In Kaplan, the descriptive meaning fixes the referent with respect to the context of utterance, the first parameter in a bi-dimensional truth-conditional account of natural language. Contexts of utterance have more structure than the values of the second parameter, the circumstance of evaluation. In our theory, the context of utterance is just a part of the hearer's representation of the common ground information that serves as the background against which interpretation of utterances takes place. By means of presupposition resolution, the descriptive meaning of demonstratives and indexicals identifies material that is already available to the interpreter as part of the common ground.

2. The objects that are found by presupposition resolution in the common ground are anchored by an intensional anchor. These objects come equipped with a criterion of identification that determines whether they have a counterpart in another possible world and which object it is. The criterion of identification is determined by the way the object enters into the common ground, as a perceived object or as the reference of something that somebody said. In this way, the identifying concept depends on the way of introduction. So, although demonstratives, indexicals, names, and certain uses of definite descriptions find their referent by presupposition resolution and do not contribute descriptive meaning, that does not mean the individual concept corresponding to the referent is a rigid one. With respect to the alternatives relevant for the attitudes, rigidity is not a possibility.

This allows us to have the following view on attributive uses of definite descriptions. It is possible to have attributive uses pick up a criterion of identification from the common ground that does not have more information than the definite description has itself. An attributive use does not differ from a referential use in picking up a discourse marker tied to a criterion of identification, but in the nature of the criterion picked up.

3. Rigidity makes sense only over a limited class of alternative possible worlds, the ontological variants of a given possible world. The objects in these variants can be tracked by means of spatio-temporal continuity under a sortal concept, i.e. the way we re-identify objects through time. 'Ways the world could have been' are also ways our objects could have been. Of the modalities that quantify over these alternatives —ontological and causal necessity— we require that the reference of markers is fixed by the their intensional anchor in the world over whose alternatives we quantify.

This allows a reconstruction of classical propositions as $\{w \in nec(a) : M, a, f_{anchor}, a \models K\}$

if $K$ is the difference DRS representing $S$ to which sufficently many anchors are added.

4. The thought expressed by a sentence $S$ is a diagonal over the set of all alternative worlds. If we represent its content as a difference DRS $K$ with sufficient intensional anchors, it is (54).

(54)  $\{w \in W : f\ M, w, f_{anchor}, w \models K\}.$

The individual realisations of thoughts are limitations of this intension to the set of belief alternatives of the individual belief subjects. They give the information that the sentence supplies to the particular subject.

But the individual realisation cannot be equated with the thought itself. Individuals can entertain thoughts they do not or cannot accept and they must do so in order to make sense of the thoughts of others and in order to engage in counterfactual reasoning. So the thought must be equated with the intension itself. The intension is determined by anchors on the one hand and by representational content on the other hand.

Thoughts so conceived are almost as fine-grained as the property theoretic reconstructions of propositions like the ones in e.g. Bealer (1982). DRT reconstructs thoughts, as it should, since thoughts rather than propositions are the basis of accounts of communication. But it is not impossible to reinterpret DRSs as also denoting propositions.

5. Aboutness is a relation between objects in reality and thoughts. Thoughts here are conceived as intersubjective entities that have subjective realisations.

A thought $P$ is about an object $u$ iff $P$ depends on an anchored discourse marker $x$ such that $x$ denotes $u$ in $a$ under any $f$ that satisfies the anchor.

$P$ depends on a marker $x$ iff $P$ is only defined on those worlds on which $x$ is.

6. Kripke's puzzle asks us to explain why the two sentences in (55) are both true, even though the thoughts Pierre entertains —one for believing it, the other for disbelieving it— are both about London.

(55)  Pierre believes that London is ugly.
      Pierre does not believe that Londres is ugly.

That is achieved by our notion of aboutness. Pierre has two concepts of London: the city I now live in and the city praised by the travel brochure. The one concept is identified in Pierre's beliefs because it is the one that Pierre associates with the name London, the other because it associates in Pierre's beliefs with the name Londres.

The Paderewski problem is slightly different because it avoids translation. Here a person believes that Paderewski is highly musical and at the same time believes that Paderewski is not musical at all. The person has failed to realise that the two Paderewskis are one and the same man who is both a politician and a pianist.

There are two resolutions available in the belief state of the person for the presupposition $name(x, Paderewski)$ though both concepts (the politician Paderewski, the pianist Paderewski) are about one and the same man. Kripke's puzzle is a paradox if one equates

thoughts and classical propositions, but it largely disappears if one thinks of propositions and thoughts as different semantic objects.

7. It is essential in interpretation to take the speaker's point of view. The hearer tries to make sense of what the speaker says. That is the essence of the hearer's task. That is also where speaker's reference comes in. The speaker gives an indication in her words but may be wrong in different ways or may lack the means to characterise the concept adequately to the hearer. Identity between the new discourse marker and the concept of the speaker is the condition that expresses the success of the enterprise of establishing what the speaker is talking about.

8. The theory is compatible with Frege's clarifications of his distinction of sense and reference for proper names. Frege makes an analogy between introducing a proper name in a proof by a line: $a = the\ so\ and\ so$. In natural languages this concept is not so clear. (We can misinterpret Kripke's account of proper names as supplying a standard sense of proper names.) A pragmatic reconstruction, however, is much more in line with the proof-theoretic account of Frege.

The Fregean sense of a proper name is then not something that is grasped by every competent user of the name, but something which is fixed over and over again for every common ground into which the name enters. The sense plays a role in attributions of knowledge and belief, not in attributions of necessity.


# 8    Actions and Thoughts

An account of natural language communication should primarily provide an explanation of how thoughts can arise in another person because of verbal communication. The notion of classical proposition is beside the point when it comes to predicting the behaviour of speaker and hearer in producing and interpreting verbal utterances.

This changes dramatically if we look at their actions. In the notion of action, we find an attribution not just of behaviour but also of thoughts and purposes that led to that behaviour or made it possible.

Let us have a look at a small example: John's eating a boiled egg. In eating it, John must have a concept of the particular egg which is about the egg in the actual world. He must have various beliefs about the egg which link into his desire of eating something. He must have formed the goal of eating the egg and started to carry out various actions to prepare for his eating. These involve various beliefs about causal necessities. If you uncap the egg, you can take the soft part out, you can take the soft bits out successfully with a spoon, etc. Now if the action is successful (which we assume it is) the causal beliefs must be true, the concept must denote the actual egg and the beliefs John has about it must be sufficiently close to the actual properties of the egg. The fact that a causal belief is true involves the truth of the causal necessity of the proposition corresponding to the belief. There must be a good deal of correspondence between John's beliefs about the egg and what is the case with the egg. In particular, John's causal beliefs must correspond to causal necessities, John's concept of the egg must correspond with the egg he is eating and his beliefs about the egg must correspond with true propositions.

The success of the behaviour depends on the truth of certain causal and ontological necessities. If eggs could suddenly turn out to be consisting of rubber, or if John would unaccountably find himself back in bed again instead of at the breakfast table, the action would fail. My claim here is that if we want to account for the success of actions we need both thinking and causal necessity. The planning and monitoring by the subject of his action requires that the subject uses causal necessities in his reasoning. If we want to account for success, part of the explanation is the truth of the causal assumptions of the agent. But without thoughts, the reasoning and plan formation required by the action is not possible.

In my formal system, the concept of necessity cannot be applied to thoughts. A thought is true or false, but there is not a set of alternatives in which the thought should be true for it to be necessary. The thought expressed by a sentence is necessary because in the actual world, the sentence expresses a necessary proposition. The thought itself does not know to which proposition it corresponds. It is not possible to define thoughts in terms of propositions either, so both notions are necessary for a complete account of action.

# 9    Demonstratives and Indexicals

The perceptual anchors on which the interpretation of demonstratives and indexicals depends do not give us a special relationship with the actual world. Perception is just a way in which the object may be given, it does not give the object itself.

Information must be effective for it to help us with our intended actions. The information that Tom is the thief suffices for grabbing the man in front of you, if you are aware of the essential necessity that they are the same. Otherwise it does you no good at all. If communication is to help in determining action, it must not just be truthful, but also effective for the action in question. The objects involved in the possible action must be recognisable as the denotation of the intensional anchors of the discourse markers in the way required by the action. (We need a name if we want to enter somebody on a list of students, we need a face if we want to shake hands, etc.) It is not enough that anchors are about objects, they must anchor the objects in relevant ways.

Demonstratives and indexicals are special because they supply us with anchors for which the mapping is particularly easy and reliable, because they recover perceptions of the immediate environment and thereby do not rely on various kinds of memory (memory of names, of facts, of the earlier discourse, etc.). They are means of referring effectively to the objects that are at hand and in sight and so guarantee that they can be directly causally influenced by the agents. Our theory of indexicals and demonstratives makes their interpretation (normally) dependent on prior and continuing perception of these objects. To the extent that prior perception provides us with the basis for keeping track of an object or for recognising it again, demonstrative and indexical reference (normally) guarantees the effectiveness of the thoughts (at least with respect to the referents of these expressions) expressed by sentences in which they occur.

This would be the explanation of the thought experiment of Bar-Hillel (1954) about the (non-)eliminability of indexicals from discourse. He finds himself unable to explain to his wife that he would like her to bring him a boiled egg in bed, on one Sunday morning, without recourse

to indexicals. The non-indexical expressions that could be used to refer to the place or the moment of utterance all require information that we do not have naturally available: the precise time needs a correct clock, the date a calendar and the precise geographical position measurements that we have normally not carried out.

It seems that it is precisely this relation to the actions we can carry out immediately on the objects we have at hand (eat them, pick them up, kiss them etc.) that makes demonstratives and indexicals special. The way in which the interpretation of other referential devices takes place is much the same: presuppositions are evaluated over the common ground to find common ground objects. But the knowledge that these other devices employ is much more varied and much less directly related to basic actions. Names are great if you have to look up telephone numbers, knowing that the referent is the dean helps if you want to sort out certain legal issues, but it insufficient if you want to recognise the person at the railway station. At the same time, these other devices have a far wider range and are necessary for referring to all those objects that are not at hand and in sight.

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