

Occurrence-Dependence¹

Manfred Kupffer
Universität Konstanz

Abstract

Within a single sentence, sometimes different syntactic occurrences of the same expression refer differently. This is what I call "occurrence-dependence". The paper compares two frameworks that are able to deal with occurrence-dependence, namely tokenreflexive semantics and occurrence-interpretation. It is argued that the key concept of the latter framework is reducible to the key concept of the first: while tokenreflexive semantics is concerned with the interpretation of *utterances*, *occurrences* should best be understood as certain sets of utterances.

I The Problem

1. Kaplanian semantics and occurrence-dependence

Semantics deals both with utterances and expressions. On the one hand, semantics should tell us how utterances are to be understood. One thing is sure: if a theory does not tell us how to interpret utterances of English it is simply no semantics of English. On the other hand meanings are meanings of expressions, i.e. of words and constructions made out of words.

The relation between the interpretation of expressions and the interpretation of utterances would be simple if we could define, for each expression, a content that is at the same time the content of every utterance of that expression. Unfortunately, the semantics of indexicals tells us that this is not possible. *Content sometimes varies with the utterance*. Take, e.g., the indexical "I". "I" refers differently, if uttered by different persons. If uttered by Erik, "I" refers to Erik; it refers to Fritz, if uttered by Fritz. Now, according to a view of David Kaplan's, one I will presuppose here, indexicals and demonstratives are *directly referential*, i.e. for them, reference and content coincide. But already if content only determines reference, in the sense that it is impossible that two expressions with the same content differ in reference, it follows that "I" has different *contents* if uttered by Erik, or by Fritz. Likewise, a sentence like

(1) I am Fritz

has different contents, if uttered by Erik, or by Fritz. If uttered by Fritz (1) expresses a proposition that could not possibly be false. If uttered by someone else, it expresses a proposition that could not possibly be true.

So how define a semantics for expressions if, for some expressions, content varies with the utterance? To meet this task, David Kaplan has proposed to explicate meaning by the technical notion of *character*. First every utterance uniquely determines a *context*. This notion is aimed at capturing the circumstances surrounding the utterance, e.g. it determines who plays what may roughly be called the speaker-rôle. (Kaplan's notion of context is more abstract and more general than the notion of circumstance of utterance. Therefore, also the characterisation of the distinguished individual of a context in terms of who speaks is not fully correct.) Then

¹ An earlier version of the paper was presented at the "Formal Pragmatics" conference (March 2001, Humboldt University Berlin). The paper has benefitted from remarks by members of the audience, and also from discussions with Ede Zimmermann and Ulli Haas-Spohn. Ulf Friedrichsdorf and Wolfgang Spohn both have read and commented on parts of the paper. I'd like to thank them all.

characters are defined as functions from contexts to contents. E.g., the character of "I" is a function which maps every context on the distinguished individual of the context.

Let me list those characteristics of Kaplanian semantics which are most important for what follows.

1. Meanings are characters. (More precisely, 'character' *explicates* the pre-theoretical notion of 'meaning'.)
2. The content of complex items is determined compositionally, where
3. complex items hand their contexts down to their constituents² (in the absence of so-called *monsters*³).
4. Characters are assigned to expressions (and not to syntactic occurrences).

Kaplanian semantics is able to solve the problem posed by the variability of content for an expression, if the variation happens between different sentences. Simply assume that context has changed! E.g., suppose *u* and *u'* are utterances of (1), corresponding to the contexts *c* and *c'*, respectively. If "I" refers differently in *u* from how it refers in *u'*, then we can safely suppose that *c* and *c'* differ in their distinguished individual. Now if meaning is character, the fact that "I" refers differently in those two utterances does not contradict that "I" has a single meaning. The character of "I" only takes different values for *c* and *c'*.

Kaplanian semantics is unable to deal with cases where the content of an expression varies within one and the same sentence. 3. above implies that context never changes during the evaluation of a complex item, say a sentence. 4. implies that interpretations do not distinguish different syntactic occurrences of the same expression within the same sentence. Every such occurrence receives the same character. Taken together, these facts entail that multiple occurrences of the same expression in the same sentence always agree in content, regardless of the context of use of the sentence. And this means that Kaplanian semantics is unable to deal with what I will call *occurrence-dependence (OD)*. An utterance *u* of a sentence *S* exhibits *OD*, I will say, if and only if there are, in *S*, multiple sub-occurrences of the same expression which, in *u*, differ in content.

There has been a wealth of examples in the literature that purport to show that there is *OD*. Even Kaplan cites an example.⁴ In the next section I will argue that, although most of the examples are inconclusive, it can indeed be shown that there is *OD*. But then, Kaplanian semantics is in need of revision.⁵ In this paper I will compare two alternatives to classical Kaplanian semantics. The first is tokenreflexive semantics (Reichenbach 1947 and his followers, e.g. Kratzer 1978, Perry 1997, García-Carpintero 1998), the second is occurrence-interpretation (von Stechow 1979, Kupffer 2001). These two frameworks can be seen as the two prototypical ways to react to the shortcomings of Kaplanian semantics. Either 3. or 4. above have to be given up. Tokenreflexive semantics may be understood, I will show, as giving up 3. above (and letting context change). Occurrence-interpretation gives up 4. (and makes the interpretation dependent

² E.g. |(1)|(c) = that |I|(c) is Fritz.

³ A complex expression is intensional iff it has the property that its content is only dependent on the contents of the subexpressions, not on the characters of the subexpressions. If an expression is not intensional it is called a *monster*.

⁴see fn. 12 below.

⁵ I'd like to contrast this line of argument with one which can be found in recent literature. Both Braun (1996) and García-Carpintero (1998) agree that Kaplan's way to explain away the *prima facie OD* of certain utterances involving demonstratives leaves something to be desired, and that therefore Kaplanian semantics is in need of revision. – That this issue is largely independent is indicated by the fact that the proposed alternatives vary wrt. whether they admit *OD*.

on the occurrence). The framework may be less well known, but it seems to me to incorporate a straightforward reaction to the existence of *OD*, namely to employ the notion of an occurrence.⁶

In what follows, I have tried to avoid epistemological issues. But I'd like to mention that the question whether there is *OD* is of some importance not only for semantics but for epistemology as well. There has been, in recent years, a renewed interest in a two-dimensional Kaplan-style approach to epistemology (witness, e.g., Chalmers 1996 or Jackson 1998). But, most people would agree that if we abandon a Kaplanian approach in favour of a Reichenbachian one, semantics can no longer be directly used as an epistemological framework. Nothing changes here if we consider occurrence-interpretation instead of tokenreflexive semantics.⁷ Of course the two-dimensional framework may also be applied in epistemology without a semantic justification, but its use tends to be more involved and less compelling, then. Now whether there is *OD* seems to me to be the key empirical issue between Kaplan and the proponents of those alternatives.

2. Is there *OD*?

2.1. Demonstratives

That there is *OD* seems to be easy to establish. The data most frequently discussed comes from the semantics of demonstratives. Suppose sentence (2) below is used in a situation where there are two pointings associated with the two occurrences of "that" which point at different spots, suppose e.g. the speaker points at two different photographs of the same planet, Venus.

(2) That is the same planet as that.

Then it looks like that in such an utterance, the first occurrence of "that" refers to a different thing than the second, hence there is *OD*.

This analysis of the sample utterance is based on two presuppositions. It presupposes (i) that "that" *alone* is the bearer of demonstrative reference, and (ii) that the two occurrences of "that" in (2) are really occurrences of one and the same expression. These presuppositions might seem inevitable on first sight. But there are two influential theories, both by David Kaplan which deny either (i) or (ii). Now this is directly relevant to our question. If, e.g., the two occurrences of "that" are not occurrences of one and the same expression, then (2) does not exhibit *OD*. And if, on the other hand, it is not "that" alone that refers, but rather "that" plus some hidden element, then it depends on the individuation of that hidden element whether what really bears demonstrative reference in this case, occurs twice in (2).

I'm not so much interested in (2), but rather in the question whether there is *OD* at all. Therefore I will first examine Kaplan's views on the individuation of the bearers of demonstrative reference, and whether they can be used to argue against the existence of *OD*.

2.1.1. Kaplan on the individuation of demonstratives

So what does Kaplan say about the individuation of demonstratives and what do his views imply? I will consider this question independently from how these views are implemented by

⁶ There are more contenders to classical Kaplanian semantics around, e.g. the two theories advanced in Braun (1996): the Context Shift Theory, and the Three Meaning Theory. While the second makes incorrect predictions in cases of *OD*, I have left out the first, because tokenreflexive semantics *is* the paradigmatical (and simpler) context shift theory, according to my reconstruction.

⁷ E.g., according to Kaplan, *a priori* truth is truth in every context. Now the alternative frameworks discussed here both predict that "I utter something" is true in every context, although it is clearly not *a priori*.

Kaplan in a formal semantics of demonstratives. In fact, as I will point out, sometimes the predictions of Kaplan's views on the individuation of demonstratives, taken together with certain intuitions about the truth-conditions of utterances are at odds with what Kaplan's formal semantics predicts about the truth-conditions of the utterances. Let's first take the *Indexical Theory*, discussed in Kaplan (1989a). It is also the sole theory advanced in Kaplan (1989b). According to that theory, we should replace (2) for the purpose of interpretation with a suitably indexed version, e.g. with

(3) That₁ is the same planet as that₂.

(Indeed, given Kaplan's semantic machinery, demonstratives need to be indexed in order to be interpretable. This is so because, according to his implementation of the indexical theory, context also contains an indexed sequence of *demonstrata*, and the index at a demonstrative indicates, for every context of evaluation, which demonstratum of the context is referred to – always take the one with the same index.)

It is not claimed that speakers actually produce the like of (3). They utter (2). Then (2) is, for the purposes of interpretation, translated into a *disambiguated language* (see Montague 1970), i.e. a language, in which distinctions in type are always reflected in distinctions in form: no two words with different meanings ever look the same. So, if we use (3) for the purpose of interpretation, it is implicitly claimed that "that" is ambiguous, and that the two "that"s in (2) are not occurrences of one and the same type.

Now the use of a disambiguated language leaves it entirely open what the source of the ambiguity is. What licenses the use of different indices (or the same index) with regard to different occurrences of a demonstrative word-form? In Kaplan (1989a) the indices attached to the demonstratives simply reflect the order of occurrences of demonstratives.

We then attach subscripts to our demonstratives and regard the n-th demonstrative, when set in a context, as rigid designator of the n-th demonstratum of the context. Kaplan (1989a, 528)

Kaplan says "the n-th demonstrative" instead of "the demonstrative with index n". Evidence enough for the claim that he simply wants to disambiguate along the lines of occurrences of demonstratives. Every new occurrence of a demonstrative *form* within the same sentence counts as a new word. Therefore, there can't be *OD*, because for *OD*, we need multiple occurrences of the same word.

In Kaplan (1989b), on the other hand, the source of the ambiguity is a difference in *directing intention*.

The directing intention is the element that differentiates the 'meaning' of one syntactic occurrence of a demonstrative from another, creating the *potential* for different referents, and creating the *actuality* of equivocation. Kaplan (1989b, 588)

In the paper from which the quotation is taken, it is directing intentions that determine the reference of demonstratives. But, as I understand the above quote, directing intentions also serve as the source of ambiguity of demonstratives. Whether two utterances of a demonstrative form are utterances of one and the same word depends on whether they are used with the same directing intention.

What is a directing intention? Unfortunately, this is a case for Kaplan philology. Textual clues are rather sparse. Kaplan himself does not seem to be decided about all basic features of these intentions. Are they individuated externally, i.e. with regard to the very objects they are about, or internally, only with regard to the narrow psychological state of the intender? He does not tell. But he declares ignorance on a dependent question, namely whether directing intentions are separable from contexts, i.e. whether the same directing intention may determine a different

object in a different context. This obviously depends on whether demonstrations are individuated externally: if they are, then they are not separable. –Now at one point Kaplan says he does not know whether demonstrations are separable.⁸

How intentions are individuated is of utmost importance now, because the version of the Indexical Theory we're presently looking at says that questions of the individuation of demonstratives *are* questions of the individuation of directing intentions. If directing intentions are individuated externally, by way of their referents, then a difference in referents implies a difference in directing intentions and hence, a difference between demonstratives. But then, there can't be *OD*! The question remains whether the external conception of intentions is appropriate for directing intentions.

If one goes deeper into the details of Kaplan's theory it looks like that this is not so. E.g. Bach (1992a, 143) observes *vis-a-vis* an example by Marga Reimer (1991) that sometimes there are two intentions that compete for the rôle of a directing intention and one should be careful to pick the correct one. "If you intend to refer to Fido, but in fact demonstrate Spot, you end up referring not to Fido, as you intended, but to Spot." Here, the directing intention is not what is perfectly coherently described as the intention to refer to Fido, but rather something like "to refer to the dog you are demonstrating" (*ibid.*) Of course one could describe the relevant directing intention as "to refer to Spot" but this would mean to miss an important generalisation. Consider a second case. Suppose you intend to refer to Spot, but in fact demonstrate Fido. You end up referring to Fido. The case is completely analogous to the first one, and that can be explained by the fact that in both cases the relevant directing intention is the same, namely to refer to the dog you are demonstrating. Only the external factors vary. No such common explanation is forthcoming if the relevant directing intention is described as an intention to refer to Fido.

That it is possible that there is *OD*, given the individuation conditions of the second version of the Indexical Theory, is obscured by Kaplan's claim that, as a matter of fact, there is none.

It is interesting to note that in natural language every new syntactic occurrence of a true demonstrative requires not just a referent-determining intention, but a *new* referent-determining intention. When two syntactic occurrences of a demonstrative appear to be linked to a single intention, at least one must be anaphoric. When we wish to refer to the referent of an earlier demonstrative, we do not repeat the demonstrative, we use an anaphoric pronoun, "He [pointing] won't pass unless he [anaphoric pronoun] studies." The fact that demonstrative and anaphoric pronouns are homonyms may have led to confusion on this point. The case is clearer when the demonstrative is not homonymous with the anaphoric pronoun. Contrast, "This student [pointing] won't pass unless he [anaphoric pronoun] studies" with "This student [pointing] won't pass unless this student [pointing a second time at what is believed to be the same person] studies." The awkwardness of the second, shows that the way to *secure* a second reference to the referents of a demonstrative, is to use an anaphor. *ibid.*, 588-9

Now this is an independent claim about the behaviour of natural languages, based on observations about how we in fact speak. The claim that every occurrence of a demonstrative *requires* a different directing intention may well be false. I think it is, if understood as a claim about what is syntactically or semantically well-formed. It is only pragmatically that the awkward sentences are awkward. They are never used because they simply get the wrong message across. With the exception of identity statements, if someone points twice you normally infer that she thinks the persons pointed at are different. Why, she could have used the simple pronoun to refer to one and the same thing! But that she thinks she points at two different persons is not the message the speaker wants to get across in the above examples. – So the generalisation that speakers never use two occurrences of the same demonstrative when they want to refer to one and the same thing can be derived from pragmatical principles. As usual

⁸ C.f. "if directing intentions are not separable and evaluable at other points (*perhaps they are*), the cognitive uncertainties of "that₁ is that₂" may no longer be an aspect of meaning" Kaplan (1989b, 588, emphasis added).

with generalisations in pragmatics it holds *ceteris paribus*. E.g. an interest in verbal insult could recommend the demonstrative: "If this *** wants trouble, this *** shall get it, mark my words."

But we need not go into these details if we want to defend *OD* against the various versions of the Indexical Theory. It suffices to say that, as an ambiguity theory, any version of the Indexical Theory is misguided, as has been pointed out by Manuel García-Carpintero.

It should be clear that, in the most natural understanding of "ambiguity", there is no ambiguity whatsoever ("exotic" or otherwise) when two different syntactic occurrences of "that" are involved. An expression-type is ambiguous when it is governed by two independent linguistic conventions; to characterize the conventions as independent entails that a competent user could know one without knowing the other, and vice-versa. This is the case regarding the typical examples of ambiguity, like "bank", "cat", and proper names for different people. However, a speaker who can understand the first but not the the second syntactic occurrence of "that" in our stock examples is not a competent user. García-Carpintero (1998, 553)

Let us finally turn to another theory by David Kaplan. It is "the Corrected Fregean Theory" of Kaplan (1989a). According to this theory it is not the demonstrative alone that refers, but rather a syntactic compound consisting of demonstrative *cum* demonstration, where a demonstration is a Fregean manner of presentation: "typically, though not invariably, a (visual) presentation of a local object discriminated by a pointing". Kaplan (1989a, 490). According to that theory, the attached demonstration is also used to determine the referent for every context of use. Then, (2) is only an incomplete rendering of the real sentence. In order to know which sentence has been uttered, we also need to know which demonstrations accompany the two occurrences of the demonstrative. If the accompanying demonstrations differ, then the bearers of reference will also differ, and there will be no *OD*, even if the *demonstrata* (the things demonstrated) differ. This seems to be the case with (2), which should be rendered in the form of (4) below, accordingly.

(4) That[δ] is the same planet as that[δ'],

(let δ and δ' be two different demonstrations).

Demonstratives *cum* demonstrations are called *complete demonstratives* by Kaplan. Now the following question arises: Can a complete demonstrative like "that[δ]" exhibit *OD*? This is indeed the case. First, manners of presentation are multiply realisable, consequently Kaplan himself concedes that "[a] given demonstration might [...] be repeated in the same or a different place." (Kaplan (1989a), 525

Therefore nothing bars the same demonstration from occurring twice within the same *sentence*. Hence "that[δ]" can appear multiply within the same sentence. But secondly a manner of presentation is not necessarily tied to the object it in fact presents. A manner of presentation may fail to present a particular object, in case it is hallucinatory. Even if there is a object presented that may vary with world, location of the agent, and with the time of the presentation. At a given time a manner of presentation may present A, but a moment later it may be B it presents. Now in a normal utterance of

(5) That[δ] is the same planet as that[δ],

the two occurrences of "that[δ]" will be uttered at slightly different times. And this is why they may refer differently.⁹ Suppose e.g. that you utter (2) and point twice in exactly the same

⁹ The following example is inspired by one Lalor (1997) uses to argue that the Corrected Fregean Theory is committed to the existence of *OD*. Braun (1996), who wants to deny the existence of *OD*, considers only the very special case of an utterance where the same demonstration *token* is associated with the two occurrences of the demonstrative (imagine, e.g., the speaker simply does not lower his arm again after the first utterance of "that"). – Presented with such an utterance at least I would feel that for the second "that", a second demonstration

direction during the two utterances of "that". The first pointing points at the planet Venus, but while you blink in mid-sentence, an evil demon exchanges the locations of Venus and Mars. Then the second pointing will point at Mars. Suppose further that Mars at the former place of Venus appears exactly to you, as Venus did. Then, the demonstrations connected with the first and with the second use of "that" will coincide, and the utterance will be, according to the Corrected Fregean Theory, an utterance of (5). Now intuitively, the first occurrence of whatever bears the demonstrative reference here refers to Venus, while the second occurrence refers to Mars. Therefore, the utterance in question exhibits *OD* if analysed in accordance with Kaplan's Corrected Fregean Theory.¹⁰ I have no reason to take issue with this theory, so far. Nevertheless, in my formal treatment of "that", I will stick to the simple analysis, presented in the introductory remarks to this section. I will do so because it is the simpler theory, and, unlike Kaplan, I am not forced to look for an alternative.

I conclude that Kaplanian views on the individuation of demonstratives present no challenge to the claim that there is *OD* connected with demonstratives. Those versions of his views that deny it are incorrect, because they posit spurious ambiguities.¹¹

2.2. Indexicals and occurrence-dependence

It is interesting to see whether there are examples of *OD* outside the realm of demonstratives, or to be more precise, outside the realm of demonstrative uses of words.¹² Kaplan himself seems to think that indexicals, too, exhibit *OD*.¹³ In the following I will concentrate on typical examples involving the indexicals "I", "here", and "now". Whether we can add those examples to our stock of cases of *OD*, however, will largely turn out to be a matter of theory.

Suppose an officer gives his men the order to make repeated shots with their rifles in the following form (uppercase letters are meant to indicate stress):

(6) Shoot NOW, NOW and NOW!¹⁴

Or suppose the actions of a suspect are reported on the phone to the FBI by a distant observer.

(7) Hanssen shoots NOW, NOW, and NOW.

In both sentences different occurrences of NOW seem to refer to different instants of time, hence they have different contents, hence the utterances in question seem to exhibit *OD*.

token is missing (or that the second "that" is not used demonstratively). Anyway, the case cannot be used to argue against *OD*, precisely because it is so special.

¹⁰ It is another question whether this conclusion is borne out by Kaplan's own formal treatment of the Corrected Fregean theory in terms of the "dthat"-operator. (It is not.)

¹¹ Similar objections could be used against possible variants of Kaplan's views that do not admit *OD*. E.g., couldn't one combine the central idea of the Corrected Fregean Theory (namely to regard the reference-determiner as syntactic part of a complete demonstrative) with the idea that directing intentions determine the reference of demonstratives and with the external conception of directing intentions? – This would be another case of an ambiguity claim without a corresponding possibility of knowing only some of the meanings of the alleged homonyms, only that now those alleged homonyms are the relevant directing intentions.

¹² There are cases where "that" is clearly used as a pronoun, and not as a demonstrative. On the other hand the prototypical pronoun "he" admits of uses where it is accompanied by a pointing. Kaplan decides to posit ambiguity, and treats the demonstrative uses and the pronominal uses of, say "he", as instances of two different words. This seems to be rather arbitrary, see Braun (1996, fn.9, 170) for the same verdict. Having said this, I will, as almost anybody else, continue to adhere to the arbitrary distinction.

¹³ "If we speak slowly enough (or start just before midnight), a repetition of "today" will refer to a different day." Kaplan (1989b, 587)

¹⁴ Levinson (1983, 95) discusses "Don't shoot now, but now, now and now!"

The same behaviour can be observed with other indexicals. Suppose the manager of a stage company takes you for a walk through the hall where their next performance is supposed to take place. (The following examples improve if we assume that the manager repeats a walk he has made before and only remarks on those circumstances he has noticed on the walk.)

(8) HERE you can see a lot better than HERE.¹⁵

(9) If the view were better HERE, I could perhaps even accept how it is HERE.

It is a somewhat controversial question whether the same also happens with the word "I". One could argue that there are no utterances in which the speaker of "I" changes. At least it is difficult to provide convincing examples for multi-speaker utterances. Consider e.g. the following alleged multi-speaker utterance.

(10)	"Ich komme vom Norden her." "Und ich vom Süden." "Und ich vom Meer."	("I come from the north." "And I from the south." "And I from the sea.")
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This is a piece of Fontane's poem "Die Brücke am Tay" which Angelika Kratzer (1978) uses to argue for the occurrence-dependence of "I". Kratzer holds that the utterance imagined is a single utterance. Complete utterances don't begin with "and"! This does not strike me as a very convincing argument. Given the situation described by the poem (three evil spirits convene to concoct some evil plan), we should perhaps better say we are only in the presence of three different utterances.

¹⁵ Kratzer (1978) reports a similar example by Lutzeier (1974), "Hier ist es lauter als hier" ("Here it is louder than here"), where the speaker changes the room during the utterance.

I think the source of some of the difficulties Kratzer has with providing a convincing example of multi-speaker utterances is that utterances are (partly) individuated by communicative intentions, and it is not easy to imagine a situation in which the communicative intentions of several speakers agree. The intention to address a certain audience, the intention to say something with a certain truth-value, the intention to convey a certain information, all these are examples of communicative intentions. In case of a declarative utterance, none of these should be missing. But in (10) it is plausible that the speakers of the three lines have different audiences in mind (namely each speaker addresses the other two), and although they all intend to say something true, there is no common information all three speakers intend to convey¹⁶. If this is so, then (10) reports no single utterance.

This problem can be avoided if we consider multi-speaker utterances which have been rehearsed before, such that every individual speaker knows what the entire utterance will be (and there is the same audience for every part of the utterance.) Take e.g. what the carol singers performing the Three Wise Men say:

- (11) ICH bringe Weihrauch, ICH Myrrhe, und ICH Gold.
I bring incense, I myrrh, and I gold.

In such a case, I think, it is less contrainuitive to assume that the three carol singers produce a single utterance.¹⁷

So far, it looks like there is indeed *OD* involving indexicals, perhaps even "I". But there is a problem, here. The problem is that all examples considered so far may be considered as cases of *demonstratively used indexicals*.¹⁸ Let me explain why.

Firstly, they are cases of *stressed* indexicals. And stress often has the function to mark a *demonstration*.¹⁹ That should be familiar from the case of demonstratively used pronouns.

- (12) HE is coming, but HE isn't.²⁰
(13) He is coming, but he isn't.

(13) is contradictory, whereas (12) may be not, depending on the accompanying demonstrations. Likewise, my examples appear to be contradictory, or at least very fishy, if we no longer stress the indexicals. The similarities of indexicals and pronouns do not end here, indeed Hans Kamp has developed a treatment of "now" which treats it almost exactly like a pronoun (see e.g. Kamp/Reyle 1993).

¹⁶ This is not meant to say that the specific information to be conveyed should always be available to the speaker(s) beforehand. A case in point is (7), where the speaker does not know at what times Hanssen will shoot. But still there is, beforehand, the intention to convey the information about when Hanssen will shoot. Not even such a general intention existst on part of any of the speakers in (10), as regards the whole of the purported big utterance.

¹⁷ Of course one could still insist that the carol singers make no joint utterance. There seem to be no clear-cut intuitions at stake in such a case. But why should one insist? One cannot appeal to a principle like "different speaker - different utterance", because that would simply be too restrictive. E.g. there are cases of *collective* utterances, e.g. several speakers can make joint promises that do not distribute over the members. (A: "Do you promise to carry the piano away?" B, C, D: "We do!". The "we do" marks a collective promise.) Although here, the principle might still be safed by introducing a collective speaker, it is easy to think of collective utterances with a slightly varying group of speakers, e.g. if members of the group are temporarily silent.

¹⁸ At least this is what various people have replied to the examples. On the other hand the question whether a certain use is demonstrative appears to be highly theoretical in nature.

¹⁹ Not every stressed occurrence of an indexical marks a demonstrative use, though. E.g. it could be a simple focus accent.

²⁰ (12) is taken from von Stechow (1979), where it is discussed as an example of *OD*.

Secondly, the examples may be described as cases of pointing to the *origo*, i.e. pointings to the very speaker, place, or time of the respective utterances. These pointings are easily overlooked, because they go without extending the arm. The only detectable action in addition to the utterance itself is the stress on the utterance.²¹

Thirdly, while all three examples may be uttered without any action in addition to the stress pattern we could well think that there is some. This could be taken to corroborate our analysis of the original examples as cases of a very reduced form of demonstration. E.g. the officer who utters (6) could accompany his utterance by repeatedly raising his finger at the relevant moments. Of course, (6) and (10) could also be uttered with pointings that point to objects not at the *origo*. In the case of (10) the manager could refrain from actually walking through the auditorium and only point to the places he wants to refer to. And (7) could be said in court with the speaker pointing to a time-indexed flip-chart graphics which depicts Hanssen's crimes.

Summing up, we might consider the above examples as cases of demonstrative use, as involving pointing to the *origo*. This, then, could be taken to be evidence for the further claim that *OD* is confined to demonstrative use.

Hypothesis D: If, in an utterance of a sentence, two occurrences of the same expression differ in content, at least one of the occurrences is used demonstratively.

However, since this largely depends on the theory of demonstrative use, and I have none to offer, I will not discuss whether D is true.

If the examples in this section are really all demonstratives, what does this mean for the question whether they exhibit *OD*? It now depends on your theory of demonstratives whether they do. E.g. according to the Corrected Fregean Theory, they don't, because it is plausible that in every of the above examples, the multiple occurrences of indexicals are accompanied by different demonstrations, such that the demonstrations complete different *complete* demonstratives. But according to the simplest theory of demonstratives mentioned at the beginning of section 2.1. the examples exhibit *OD*.

Anyway, since already examples with demonstratives like "that" suffice to show that there is *OD*, let us turn to the question how to treat the phenomenon.

²¹ There has been some disagreement in the literature whether pointings play any part in the determination of the referent of a demonstrative. While the early Kaplan (1978, 1989 a.) and Reimer (1991a., b.) defend this view it is opposed by the later Kaplan (1989b.) and Bach (1992a., b.). According to them, it is demonstrative *intentions* that determine referents. García-Carpintero (1998) achieves a synthesis. While he maintains that it is demonstrations that determine referents he takes "demonstrations to be sets of *deictical intentions* manifested in features of the context of utterance available as such to any competent user" (p.537). However, the presence of a pointing is still the best indication that we are in the presence of a demonstrative use. This should also hold regardless of what is the right theory of demonstratives, at least if the pointings in question are intentional and not merely accidental.

II Two Solutions

3. Tokenreflexive semantics

Tokenreflexive semantics relates to Kaplanian semantics in the following way.²² While characters are still assigned to expressions (and not to occurrences), context is allowed to change during evaluation. How? The main idea is:

Let the context of α be the relevant utterance of α .²³

By this, I mean: if we want to evaluate a sentence S in a context c , then, for the contexts of S 's constituent expressions, we have to look for their utterances in c . The main idea has several important implications. First, the notion of context has to be different from what Kaplan had in mind. Now contexts are utterances. This holds for S 's part expressions, and for reasons of uniformity, for S likewise, therefore it holds for all expressions. Secondly, characters are no longer *total* functions from the set of contexts into the set of contents. They have to be partial: for every α , the character of α is only defined for contexts which are utterances of α . Otherwise we would be unable to find contexts for the part expressions. Thirdly, the structure of utterances ought to match the structure of expressions. Otherwise, "the relevant utterance of α " would not always be defined.

With the main idea in mind, we can already show how to tackle *OD*. Let, for the following $|\alpha|$ denote the character of α .

Suppose, e.g., *that* has the following semantics. For any utterance u of *that*, let $|that|(u)$ be the object indicated by the speaker of u while uttering u . Now, in an utterance of

(14) *that = that*,

the two *thats* are allowed to refer to two different objects because the context of the first *that* is the utterance of the first *that* and the context of the second *that* is the utterance of the second *that* and these two different utterances may be uttered while indicating different objects.

So context changes during evaluation. The change of context follows the *syntax of utterances*: If you want to evaluate a complex expression you will move from the utterance of the complex expression to those *subutterances* of the first utterance which are the utterances of the constituent expressions. Consider, e.g., the semantics of functional application. As indicated above, we will only treat *intensional* expressions. Then the following rule illustrates how the syntax of utterances, via the notion of an *immediate subutterance* enters the semantic rule.

Semantics of functional application for intensional expressions

Let u be an utterance of $\alpha\beta$. Then $|\alpha\beta|(u) = |\alpha|(u^\alpha)(|\beta|(u^\beta))$,

where $u^\alpha :=$ the immediate subutterance of α in u .

²² *Caveat*: I will present tokenreflexive semantics in a way that eases comparison with Kaplanian semantics and occurrence-interpretation. This is not necessarily the way the proponents of the theory like to think of their theory. E.g. García-Carpintero (1998) likes to think of tokenreflexive semantics as assigning Fregean semantic values to what he calls *concrete expressions*. (I think the term is ill chosen: expressions are always abstract.)

²³ This slogan (as well as the subsequent details) may be slightly confusing for those who have learned tokenreflexive semantics from Perry. Perry distinguishes context and utterance, and says that the content of an indexical is determined by utterance *and* context. The following translation may be helpful, though. When I say "utterance" I mean utterance *and* context in Perry's sense. And when I say "context", I mean "what plays, in tokenreflexive semantics, the rôle context plays in Kaplan's theory."

These details should suffice as an introduction to tokenreflexive semantics, for further details the reader is referred to the appendices A (for the syntax) and C (for the semantics).

4. Occurrence-Interpretation

Occurrence-interpretation departs from Kaplanian semantics in the opposite way: While contexts don't change, now characters are assigned to *occurrences* (instead of to expressions).

Suppose the semantics of *that* is defined as follows. For any occurrence \mathbf{o} of *that* and any context c in which \mathbf{o} occurs (i.e. in which an expression in which \mathbf{o} occurs is uttered), $|\mathbf{o}|(c) :=$ the object indicated by the speaker of \mathbf{o} in c while uttering \mathbf{o} in c . Now this opens the possibility that different occurrences receive different characters and hence, different contents within one and the same context. E.g. in some context c

$$(14) \quad \textit{that} = \textit{that},$$

the two occurrences of *that* are allowed to refer to two different objects, because in c , the character of the first and the character of the second may take different values. This is so, because the two occurrences of *that* may be uttered while the speaker indicates different objects.

What is still missing is a compositional semantics. Like every semantics it presupposes a syntax. But since characters are now assigned to occurrences instead of expressions, the syntax referred to during evaluation is a *syntax of occurrences*. So occurrence-interpretation resembles tokenreflexive semantics in that it requires its entities to be syntactically structured. Again, we will only consider intensional expressions. Then, in the clause for functional application, crucial use is made of the notion of an *immediate suboccurrence*.

Semantics of functional application for intensional expressions

If \mathbf{o} is an occurrence of $\alpha\beta$, then $|\mathbf{o}|(c) = |\mathbf{o}^\alpha|(c)(|\mathbf{o}^\beta|(c)$,

where $\mathbf{o}^\alpha :=$ the immediate suboccurrence of α in \mathbf{o} .

Obviously, for this definition to work, the structure of occurrences need to match the structure of expressions. But this is also an important intuitive requirement for any theory of occurrences.

What I have told you so far is only the basic idea. As such it is unsatisfactory. The problem is that now character is no longer useful as an explication of the notion of meaning. This is so, because meanings are meanings of expressions, but now characters are characters of occurrences. Observe, however, that the characters of occurrences of "that" above were not defined piecemeal but in one fell swoop. This instills the hope that there is an equivalent formulation of the theory in which interpretation applies to expressions. We want to combine the two insights that meanings belong to expressions, and that the content of an expression in a context sometimes depends on the occurrence. But such a formulation is easily found: let meanings simply be functions from occurrence-context pairs to contents! Note, that now we also give up on 1. on page 2: strictly speaking, "meaning" is no longer explicated by character (although the replacement looks very much like character).

Accordingly our final formulation of occurrence-interpretation is based on a recursive definition of $\mathbf{o}^\alpha(\mathbf{o}, c) : \text{the content of } \alpha \text{ in context } c \text{ wrt. occurrence } \mathbf{o}$ (see von Stechow 1979). \mathbf{o}^α may realistically be regarded as the meaning of α .

E.g. for any occurrence \mathbf{o} of *that* and c be a context in which \mathbf{o} occurs, $>thatfi(\mathbf{o},c) :=$ the object indicated by the speaker of \mathbf{o} in c while uttering \mathbf{o} in c . This still allows for occurrence-dependence. E.g. let \mathbf{o} be the first and \mathbf{o}' be the second occurrence of *that* in

(14) *that = that.*

Now $>thatfi(\mathbf{o},c)$ and $>thatfi(\mathbf{o}',c)$ may differ because the speaker may indicate different objects while uttering \mathbf{o} and \mathbf{o}' , resp.

When we want to evaluate a complex expression, we will still need the notion of immediate suboccurrence, in order to ensure that the meaning of the constituent expressions is applied to the correct occurrences. The revised semantics of functional application will then look like this.

Semantics of functional application for intensional expressions

If \mathbf{o} is an occurrence of $\alpha\beta$, then $>\alpha\beta fi(\mathbf{o},c) = >\alpha fi(\mathbf{o}^\alpha,c)(>\beta fi(\mathbf{o}^\beta,c))$,

where \mathbf{o}^α is defined as above.

Again, for further details the reader is referred to the appendices.

5. Initial comparison

The two frameworks are strikingly different: in one of them context changes, while in the other it doesn't. – Nevertheless I will show they are equivalent.

The two frameworks also bear some resemblance: both utterances and occurrences have (and need to have) a syntax. – I'd like to explain why the two notions are so similar.

So my aim is to compare the two frameworks. In order to do this I will first try to connect them. My means will be an ontological investigation. So far we have had a great number of primitives: expressions, contexts, utterances, and occurrences. Now I will try to reduce the number by showing how some of these notions can be derived from others. The only ontological primitive remaining will be the notion of an utterance.

Most importantly expressions and occurrences will be reduced to certain sets of utterances, whereas contexts will be identified with utterances themselves (as we have already seen in the case of tokenreflexive semantics). This is inspired by what M.J. Cresswell (1973) does in "Logics and Language". Cresswell also takes the notion of an utterance to be his only primitive and then reduces expressions and contexts to constructions from utterances (he does not treat occurrences, though.) There is a superficial difference in the case of contexts, which he identifies with sets of utterances, rather than with utterances *simpliciter*.²⁴

²⁴ The difference is superficial. Where Cresswell's contexts represent circumstances of utterances, partially specified, our contexts can be taken to represent circumstances of utterances, totally specified. It is a customary move in possible worlds semantics, however, to factor out partial specifications into sets of total specified entities.

III Questions of Ontology

6. What are utterances?

First let me elucidate the notion of an utterance. What do I mean when I say "utterance"?

Utterances are *actions* and, therefore, events. And as actions are usually equipped with agents, locations and times, utterances are usually equipped with unique speakers, locations, times (intervals), and addressees; but not always (witness, e.g., multi-speaker utterances as in (11)).²⁵ I will assume utterances have unique worlds, too. This may be controversial. But if your ontology of events admits of the same event being in many worlds, when I say "utterance", simply translate into "utterance/world pair".

Utterances have a mereological structure. I.e. utterances are sums of other utterances, called their subutterances. E.g. if *u* is an utterance of "Paul is bald", then *u* is the mereological sum of an utterance of "Paul" and an utterance of "is bald". In the following *u-v* denotes that *u* is a subutterance of *v*.

Contrary to what one might gather from the name *token* reflexive semantics, utterances are not tokens. Paradigm examples of tokens include physical objects, like ink on a piece of paper. (Strings of sounds are also tokens.) But the same marks of ink can be used to make more than one utterance.²⁶ Quite generally, I will assume that, whenever there is an utterance, there is also a token such that the token is *used* to make the utterance. This can be used to define certain derivative properties for utterances. In the following I will use the relation of *linear precedence* for utterances, e.g. This notion is derived from the corresponding precedence relation for tokens. Let for every utterance *u* *t_u* be the token that is used to make *u*. We can now define "*u* precedes *v*" as "*t_u* precedes *t_v*". Suppose A utters "I have lost my voice" by showing you a piece of paper with this sentence on it. Then A's utterance consists of several subutterances, e.g. an utterance *u* of "my" and an utterance *v* of "voice" such that *u* precedes *v*. But *u* does not precede *v* in any natural sense. E.g. there is no precedence in time or in space between these utterances. Instead the corresponding tokens on the paper precede each other, and it is therefore, and because of our definition of the technical term "precedes" for utterances that *u* precedes *v*.²⁷

So finally, utterances have syntactic structure, though the syntactic notions might be derivative.²⁸ The syntactic structure of utterances is the structure of *finite trees* (see e.g. Partee et al. 1990 and Backofen et al. 1995). By this I mean that for every utterance there is exactly one maximal finite tree, such that the utterance corresponds to a node of that tree. Thus the relation of immediate dominance and linear precedence (also called "left-of", < for short) are defined for utterances. But there is also a mereological side to this structure: if *M* is the set of *u*'s daughters (those utterances *M* immediately dominates), then *u* is $\sum M$, the mereological sum of *M*. If *u* has no daughters, then it is atomic, i.e. it has no utterances as parts. E.g. if *u* is an utterance of "Paul

²⁵ Angelika Kratzer (1978) has argued that, contrary to common opinion, the interpretation of indexicals like "I", "here" and "now", does not depend on the actual speakers, places, and times of their utterances, but rather on whoever *counts* as the speaker, time, or place of the utterances. The distinction does not matter for the present paper, though.

²⁶ This point is also made in Perry (1997).

²⁷ This sample definition of "precedes" could lead to the impression that we are committed to "concatenation grammars" and to surface interpretation. But it is *only* a sample definition! The relations between tokens and utterances could well be much more difficult. E.g. whereas the tokens are tokens of surface structure (or rather "phonetic form") items, utterances may be taken as utterances of logical forms, LFs in the sense of Chomsky (1981).

²⁸ Below, in Appendix A, I will show how to define a syntax within an ontology equipped with expressions and utterances. The primary syntactic notion will still be that of a wellformed *expression*, though utterances enter in the definition of what exactly a certain complex expression *is*.

is bald", the subutterance of "Paul" precedes the subutterance of "is bald" and both of them are immediately dominated by *u*. The relevant utterance of "Paul" has no subutterances as parts since it does not dominate any utterance.

7. What are expressions?

Expressions are properties of utterances. Why? First, unlike utterances, expressions may be multiply realised, i.e. multiply instantiated. Therefore they are universals (i.e. properties), not particulars. Secondly, their instances are utterances. Therefore expressions are properties of utterances. Following a usual practice in possible-worlds-semantics, I will represent them as sets of utterances, here.²⁹

More precisely, expressions are equivalence classes of utterances. An expression is, for some utterance *u*, the set of utterances with the same structure as *u*.

Put more formally

Let *U* be the set of utterances as described above, *U*₀ be the set of atomic utterances. Now we will show how to define expressions. Let us start with some set of atomic (i.e. lexical) expressions *E*₀. The elements of *E*₀ are mutually disjoint non-empty subsets of *U*₀. We will take *E*₀ as primitive, although, intuitively, each member is not just any subset of *U*, but exactly, for some atomic expression, the set of utterances of that expression, and for every atomic expression there is a member of *E*₀. Now we are able to define the notion of an (utterance-) isomorphism, the key formal notion of this paper.

If *u* and *v* are utterances, an *isomorphism from u to v* is a 1-1 function *f* from *–u* onto *–v*, such that for arbitrary *u'*, *u''* – *u*:

- (i) for every α in *E*₀, $f(u') \in \alpha$ iff $u' \in \alpha$
- (ii) $f(u') = f(u'')$ iff $u' = u''$,
- (iii) $f(u') < f(u'')$ iff $u' < u''$.

So an utterance isomorphism is a bijective function that preserves atomic expressions, subutterancehood, and linear precedence.

For every utterance *u*, [*u*] is the set of utterances isomorphic to *u*. α is an *expression* iff $\alpha = [u]$, for some utterance *u*. If $v \in [u]$, then *v* is called *an utterance of [u]*.

8. What are occurrences?

Occurrences of expressions are properties of utterances, too. Why? Like expressions, occurrences are multiply realisable. The first occurrence of "Paul" in "Paul is Paul", e.g., is realised by the first subutterance of every utterance of the sentence. So, like expressions, occurrences are instantiated by utterances. Accordingly, I will represent occurrences as sets of utterances, likewise.³⁰

But while an expression is, for some fixed utterance *u*, the set of utterances of the same structure as *u*, and thus an *intrinsic* property of utterances, occurrences are *relational* properties. An

²⁹Remember that my notion of 'utterance' comprises all possible utterances and not just actual ones.

³⁰ Here I depart from von Stechow (1979), who identifies occurrences with pairs of an expression and a node of tree, nodes being represented by sequences of natural numbers. I think the definition is cumbersome and arbitrary (nodes of a tree can be identified in various, but equivalent ways, so why prefer one such way over the others). Finally it misses the important point that occurrences and expressions are ontologically on a par.

occurrence is, for some utterance u and some expression α , the set of utterances of the same structure *and the same place in* α than u .

Put more formally

Let us first define $[u']^u$, the set of v' which appear in the same place (and expression) in which u' appears in u .

If $u' - u$, then $[u']^u := \{v' | \text{there is a } v \text{ and an isomorphism } g \text{ from } u \text{ to } v, \text{ s.t. } g(u') = v'\}$.

Finally \mathbf{o} is an occurrence of β in α iff there is a $u \in \alpha$ and a $u' \in \beta$, s.t. $u' - u$ and $\mathbf{o} = [u']^u$.

The definition has the puzzling feature that in a sentence where α occurs only once, there exist, nevertheless, several formally different occurrences of α .³¹ This is slightly unintuitive, because, if you are presented with the sentence "Hans smiles" and someone asks, "how many occurrences of 'Hans' do you perceive?" you will probably want to answer "one". But our formal ontology says "two"; first there is the occurrence of "Hans" in "Hans", then there is the occurrence of "Hans" in "Hans smiles".

In such cases, however, the spurious occurrences will all stand in a subset-relation. E.g. if $u \neq v$, but both $u' - u$ and $u' - v$, then $[u']^u$ and $[u']^v$ will differ. In this case either $u - v$ or $v - u$, and it holds that if $v - u$, then $[u']^u \subset [u']^v$. Now we are wont not to distinguish subsets when counting, as in: "how many groups of sheep do you see here?" If we are presented with one group of three, we will not answer "four groups, namely one of three sheep and three of two sheep", although the three subgroups of two sheep each may be present in our ontology of groups. – Note also that the definition gives at least the intuitively correct answer "one" to the question "how many occurrences of "Hans" in "Hans smiles" are there?"

9. What are contexts?

Contexts are utterances. We have already seen this idea at work in tokenreflexive semantics. But it stays appropriate with regard to occurrence-interpretation. Already in von Stechow (1979) $\text{>}\alpha\text{fi}(\mathbf{o}, c)$ is only defined for contexts c in which an expression is uttered in which α occurs. Now contexts to which the definedness condition applies can safely be identified with utterances, namely utterances of some expression in which α occurs.

And it makes little sense to lift that definedness condition. *How could a context ever distinguish two occurrences of an expression that is not even uttered in that context?*

³¹ This feature is shared by von Stechow's alternative ontology.

IV Comparison of the two Frameworks

10. The syntax of occurrences

First let me answer the question why occurrences and utterances are so similar. This is so, because the syntactico-merological structure of occurrences may be directly defined from that of utterances, witness the following definitions.

Let \mathbf{o} and \mathbf{p} be occurrences and u, v, w be utterances.

- $\mathbf{o} < \mathbf{p}$ iff there are u, v , and w such that $\mathbf{o} = [u]^W$ and $\mathbf{p} = [v]^W$ and $u < v$.
- \mathbf{o} is an *immediate constituent* of \mathbf{p} iff there are u, v , and w such that $\mathbf{o} = [u]^W$ and $\mathbf{p} = [v]^W$ and u is an immediate constituent of v .
- $\mathbf{o} - \mathbf{p}$ iff there are u, v , and w such that $\mathbf{o} = [u]^W$ and $\mathbf{p} = [v]^W$ and $u - v$.³²

11. The equivalence of the two frameworks

Now let us turn towards the question whether the two frameworks can do the same. They can. This may be shown in the following way.

Let us say \mathbf{o} *occurs* in u iff $\mathbf{o} = [u']^u$ for some u' . Now, it is easily seen that an occurrence \mathbf{o} and a context u taken together uniquely define the subutterance of u which instantiates \mathbf{o} , if \mathbf{o} occurs in u at all. What part of utterance u instantiates \mathbf{o} ? The answer is easy: if $\mathbf{o} = [u']^u$, simply take u' !

This, then, can be used to show that the two frameworks are equivalent, i.e. that, given an interpretation function for one, we can always define a matching interpretation for the other. I owe the idea for the following sketch of an equivalence proof to Ede Zimmermann.³³ His ideas were cast within a different ontology of occurrences (and a reformulation of tokenreflexive semantics), though.

- (i) First, given an interpretation for tokenreflexive semantics, let's define one for occurrence-interpretation:

Define $>\alpha\text{fi}(\mathbf{o}, u)$ to be $|\alpha|(u')$, where u' is that subutterance of u , s.t. $\mathbf{o} = [u']^u$.

- (ii) Then, the other way round:

Define $|\alpha|(u)$ to be $>\alpha\text{fi}([u]^{u^*}, u^*)$, where u^* is the maximal utterance, s.t. $u - u^*$.³⁴

In a passage that admits the existence of *OD*, David Kaplan seems to favour tokenreflexive semantics. The discussion is aimed at distinguishing *OD* from the kind of ambiguity that Kaplan thinks demonstratives display.

Why do we not need distinct symbols to represent different syntactic occurrences of "today"? If we speak slowly enough (or start just before midnight), a repetition of "today" will refer to a different day. But this is

³² There are other possible ways to define these syntactic relations. I have chosen to restrict the relations to the case where the *relata* are occurrences of the same expression. This will facilitate the applicability of the definitions, e.g. in Appendix B, when it comes to define a semantics based on occurrences. Especially the *uniqueness of immediate suboccurrences* is secured this way.

³³ I am grateful to Ede for his permission to use that idea here.

³⁴ u^* is always welldefined, because utterances have the structure of *finite* trees, see section 6. above.

only because the context has changed. It is a mere technicality that utterances take time, a technicality that we avoid by studying expressions-in-a-context, and one that might also be avoided by tricks like writing it out ahead of time and then presenting it all at once. It is no part of the *meaning* of "today" that multiple syntactic occurrences must be associated with different contexts. Kaplan (1989b, 587)

Kaplan thinks that the imagined utterance of "Today is before today" with "is" uttered precisely at midnight exhibits *OD*. Let me repeat that I think this depends on whether the two utterances of "today" bear the appropriate stress. Let this be granted. Kaplan then says context has changed between the two "today"s. This is what tokenreflexive semantics says (according to my reconstruction). But I have just shown that *whether context has really changed is totally a matter of theory, of no empirical import*. Occurrence-interpretation denies that context has changed and occurrence-interpretation and tokenreflexive semantics are equivalent! So one might as well say that context has not changed but that it is part of the meaning of "today" that multiple syntactic occurrences of "today" may be associated with different *referents*. Kaplan is right in maintaining that it is not part of the meaning of "today" that such occurrences must be associated with different *contexts*, though. (Even according to tokenreflexive semantics this is rather part of the semantics of functional application.)

12. Beyond

Both frameworks seem to be committed to radical partiality. $|\alpha|$ is only defined for contexts which are utterances of α , i.e. elements of α . And $\succ \alpha fi$ is only defined for those contexts c and occurrences \mathbf{o} , s.t. \mathbf{o} is an occurrence of α and occurs in c . These conditions are well motivated, but they have certain undesirable consequences.

First, both conditions imply

(LCP) No two different expressions could ever have the same meanings.
(Zimmermann 97)

This follows from the fact that every two different expressions have disjoint domains, according to the two approaches. The LCP (short for "Less Certain Principle"³⁵) is a very peculiar consequence of the two frameworks and one should do something about it (see Kupffer 2001 for an extended discussion of this point). We simply know that sometimes different expressions have the same meaning ("I" and German "ich", e.g.), and if a semantics says they have not, then it is in deep trouble. Something which one could do about it would be to extend the domains of expressions to utterances (or occurrence/context pairs) that are not utterances of these expressions (not composed of occurrences of these expressions), something which is advocated in the abovementioned paper.

Secondly, sometimes the context of evaluation seems to be shifted (see e.g. Cresswell 1990 and Schlenker 1999). But these shifts are such that sometimes one needs to be able to evaluate expressions in contexts in which neither they nor anything else is uttered. (Maybe, after all, the notion of context as utterance is too restrictive. Even if this is true the notion of context as utterance stays appropriate as an analysis of the notion of context *of utterance* and, arguably, demonstratively used words are always evaluated in the context of utterance as opposed to a shifted context in Schlenker's sense. So, our notion of context stays ok for the semantics of the expressions discussed in this paper.)

Anyway, both difficulties seem to indicate we ought to extend the domains of our meanings. Given that, can both frameworks be extended in the required ways? I doubt that this is really

³⁵ The term alludes to Cresswell's term "Most Certain Principle" for the fact that a difference in truthconditions implies a difference in meaning, see Cresswell (1982, 69).

possible for tokenreflexive semantics, at least without borrowing the notion of a syntactic occurrence. My rationale for thinking so derives from Kupffer (2001). The paper tries to deal with *OD* and avoid the consequences of the LCP. The resulting system is a generalisation of occurrence-interpretation and makes crucial use of the notion of a syntactic occurrence. Now, if the reference to occurrences proves to be ultimately ineliminable, this spares me an embarrassing conclusion. That tokenreflexive semantics and occurrence-interpretation are equivalent might be taken as a reason to abandon the latter. Tokenreflexive semantics can do the same, and it is simpler! This would mean that in the semantics of context, we should do without the very notion of a syntactic occurrence I have tried to analyse in this paper. But since we cannot get rid of this notion, it keeps being interesting. Semantics deals with utterances, expressions, *and occurrences*.³⁶

³⁶ A further reason to prefer occurrence-interpretation might be its ability to address the so-called logic problem. Braun (1996), following Kaplan (1989a), has complained that tokenreflexive semantics cannot evaluate more than one sentence in the same context, something which is crucial for Kaplan's conception of logic. Now occurrence-interpretation can. On the other hand, if occurrence-interpretation has a logic that is acceptable to the Kaplanian, then tokenreflexive semantics can borrow it, via the above translation. – For a full-fledged account of logical validity in Kaplan's vein we only need to generalise the notion of an expression, such that arguments count as single expressions and we can talk about occurrences in arguments. Suppose this is done. We could now define an argument *A* to be logically valid iff (in every model) for all utterances *u* of *A* and every world *w*, if $w \in \text{>Pfi}(\mathbf{o}, u)$ for every premise *P* and occurrence **o** of *P* in *A*, then $w \in \text{>Cfi}(\mathbf{o}, u)$ for the last occurrence **o** in *A* of the conclusion *C*. The predictions of this logic could be further assimilated to that of Kaplan's by considering only what Zimmermann (1991) calls *homogeneous* utterances. These are such that the parameters like speaker, time, and demonstrated object do not change during the utterance. (Kaplan admits some actual utterances are homogeneous in this sense, see the quotation on p.18 above.)

Appendix A: The Syntax of Type Theory

In this appendix I will first give a syntax for a system of intensional type theory. The system is classical in the sense that it does not mention utterances. Afterwards I will add the idea that expressions are really sets of utterances.

The syntax of $\mathbf{1}$

Types

- (i) p and e are types
- (ii) If σ and τ are types, so is $\langle \sigma, \tau \rangle$.

For every type σ , there is a set of constants Con_σ of that type. In particular $\text{that} \in \text{Con}_e$, \neg , $\in \text{Con}_{\langle p, p \rangle}$, $\& \in \text{Con}_{\langle p, \langle p, p \rangle \rangle}$. Then there is, for every type σ , a denumerably infinite set of variables Var_σ of type σ . Finally, for every type σ there will be a set Ex_σ of the expressions of type σ .

Expressions

The sets Ex_σ of expressions of type σ are defined to be the smallest sets jointly satisfying the following conditions.

- (i) For every type σ $\text{Con}_\sigma, \text{Var}_\sigma \subseteq \text{Ex}_\sigma$.
- (ii) If $\alpha \in \text{Ex}_{\langle \sigma, \tau \rangle}$ and $\beta \in \text{Ex}_\sigma$, then $\alpha\beta \in \text{Ex}_\tau$.
- (iii) If $v \in \text{Var}_\sigma$ and $\alpha \in \text{Ex}_\tau$, then $\lambda v(\alpha) \in \text{Ex}_{\langle \sigma, \tau \rangle}$.
- (iv) If $\alpha \in \text{Ex}_p$ and $v \in \text{Var}_\sigma$, then $\forall v\alpha \in \text{Ex}_p$.

We will treat $\lambda, \forall, (, \text{and})$ as *special expressions* (of no type). " ${}_\sigma \text{Ex}_\sigma$ " $\{\lambda, \forall, (,)\}$ is the set of *expressions* (of $\mathbf{1}$, but we will usually omit that qualification), " ${}_\sigma \text{Con}_\sigma$ " " ${}_\sigma \text{Var}_\sigma$ " $\{\lambda, \forall, (,)\}$ the set of *atomic expressions* (of $\mathbf{1}$).

But if expressions are really sets of utterances, then locutions like " $\alpha\beta$ " above are still in need of definition! I will now show how to define them recursively. Let U be the set of utterances (not necessarily belonging to $\mathbf{1}$). Let us assume the set of atomic expressions is a set of mutually disjoint subsets of U . We will again presuppose that the relation of left-of is defined in U , i.e. that some subsets of U are linearly ordered by $<$ and that some mereological sums of utterances are again utterances. $+$ is mereological summation.

The internal structure of expressions

- (a) $\alpha\beta := \{u+v \in U \mid u \in \alpha, v \in \beta, \text{ and } u < v\}$
- (b) $\lambda v(\alpha) := \{u+v+w+x+y \in U \mid u \in \lambda, v \in v, w \in (, x \in \alpha, y \in), \text{ and } u < v < w < x < y\}$
- (c) $\forall v\alpha := \{u+v+w \in U \mid u \in \forall, v \in v, w \in \alpha, \text{ and } u < v < w\}$

For the above definitions to work, we need an additional axiom. We want to ensure that there are enough utterances, in order to avoid the collapse of intuitively different expressions into the empty set. So let us assume

Plurality: Every expression is non-empty.

Finally, a couple of auxiliary definitions that will become important below. If $u \in \alpha$ for some expression α we will also say that u is an utterance of α . The set of utterances of $\mathbf{1}$ is the set of those utterances which are utterances of expressions of $\mathbf{1}$. An utterance of $\mathbf{1}$ is *atomic* iff it is an utterance of some atomic expression.

Appendix B: Facts about Expressions and Occurrences

The definitions and axioms in Appendix A can be shown to yield the following consequences.

Facts about expressions

Fact 1: Every atomic expression is an expression.

Fact 2: Every utterance of $\mathbf{1}$ is an utterance of exactly one expression.
(Expressions are disjoint.)

Facts about occurrences

Now, let us turn to occurrences. Sometimes I will omit one (or two) of the final two places of the predicate "occurrence". This should be taken as indicating existential quantification over the places I have omitted. E.g. " \mathbf{o} is an occurrence of β " abbreviates "there is an α , such that \mathbf{o} is an occurrence of β in α ". We will presuppose the definitions of the syntactic notions from section 9., repeated here for convenience.

- $\mathbf{o} < \mathbf{p}$ iff there are u , v , and w such that $\mathbf{o} = [u]^W$ and $\mathbf{p} = [v]^W$ and $u < v$.
- \mathbf{o} is an *immediate constituent* of \mathbf{p} iff there are u , v , and w such that $\mathbf{o} = [u]^W$ and $\mathbf{p} = [v]^W$ and u is an immediate constituent of v .
- $\mathbf{o} - \mathbf{p}$ iff there are u , v , and w such that $\mathbf{o} = [u]^W$ and $\mathbf{p} = [v]^W$ and $u - v$.

Furthermore, for Fact 9 below we will need the following definition from section 10:

- \mathbf{o} *occurs* in u iff $\mathbf{o} = [u']^u$ for some u' .

Fact 3: If α is an expression, then there is exactly one occurrence of α in α .

Fact 4: If \mathbf{o} is an occurrence of α , \mathbf{o}' is an occurrence of β , and $\alpha \neq \beta$, then $\mathbf{o} \neq \mathbf{o}'$.

Fact 5: $-$ is a binary relation on the set of occurrences that is transitive and antisymmetric.

Fact 6: If \mathbf{o} is an occurrence of β in α and $\mathbf{o}' - \mathbf{o}$ is an occurrence of γ , then \mathbf{o}' is an occurrence of γ in α .

Fact 7:

- (a) If \mathbf{o} is an occurrence of $\alpha\beta$, then there is exactly one occurrence \mathbf{o}' of α and exactly one occurrence \mathbf{o}'' of β such that \mathbf{o}' and \mathbf{o}'' are immediate constituents of \mathbf{o} .
- (b) If \mathbf{o} is an occurrence of $\lambda v\alpha$, then there is exactly one occurrence \mathbf{o}' of α , such that \mathbf{o}' is an immediate constituent of \mathbf{o} .
- (c) If \mathbf{o} is an occurrence of $\forall v\alpha$, then there is exactly one occurrence \mathbf{o}' of α , such that \mathbf{o}' is an immediate constituent of \mathbf{o} .

Fact 8: If \mathbf{o}' is an immediate constituent of \mathbf{o} , then $\mathbf{o}' - \mathbf{o}$.

Fact 9: If \mathbf{o} and \mathbf{p} are occurrences in α and \mathbf{o} occurs in context c , then \mathbf{p} occurs in c .³⁷

³⁷ 3.-8. are taken from Kupffer (2001).

Appendix C: Semantics

In this appendix I am going to define a semantics for the above syntax. It will come in two varieties, one for tokenreflexive semantics, the other for occurrence-interpretation. Both will be simplified insofar as there will be only a modest amount of partiality. In particular I will neglect the possibility that a demonstration could fail to point at anything. I will assume that every utterance of an atomic expression has a content (or, equivalently, for every occurrence of an atomic expression: if it occurs in a context, then it has a content in that context). The semantics makes our language intensional in the way of the lambda-categorial languages of Cresswell (1973), i.e. there is no separate type of truth-values. Instead sentences are assigned propositions. In contrast to Cresswell, I have used a functional syntax and the usual functional semantics.³⁸ The semantics for occurrence-interpretation does not presuppose the correctness of my ontological analysis of occurrences. Instead it presupposes that the facts about occurrences in Appendix B hold.

Denotations

For every type σ , there is a set of denotations D_σ of that type. $D_p := Pow(W)$, where W is the set of worlds; D_e is the set of possible individuals.

I will use the following abbreviations: $D_{\langle\sigma,\tau\rangle} := D_\tau^{D_\sigma}$. $D := \text{"}_\sigma D_\sigma$.

Meanings

Let α be an expression of type σ .

f is a *t-meaning* for α iff f is a function from α into D_σ .

f is an *o-meaning* for α iff f is a function from the set U^*_α into the set D_σ , where

$$U^*_\alpha := \{\langle \mathbf{o}, c \rangle \mid \mathbf{o} \text{ is an occurrence of } \alpha \text{ which occurs in } c\}.$$

V is a *t-valuation* iff it is a function that assigns to every atomic expression a t-meaning and

- (i) for every $u \in \neg$ and every $p \in D_p$: $V(\neg)(u)(p) = W \setminus p$;
- (ii) for every $u \in _$ and every $p \in D_p$: $w \in V(_)(u)(p)$ iff for all $v \in W$, $v \in p$;
- (iii) for every $u \in \&$ and every $p \in D_p$: $V(\&)(u)(p) = p \cap q$;

V is an *o-valuation* iff it is a function that assigns to every atomic expression an o-meaning and

- (i) for every $u^* \in U^*_\neg$ and every $p \in D_p$: $V(\neg)(u^*)(p) = W \setminus p$;
- (ii) for every $u^* \in U^*__$ and every $p \in D_p$: $w \in V(_)(u^*)(p)$ iff for all $v \in W$, $v \in p$;
- (iii) for every $u^* \in U^*_\&$ and every $p \in D_p$: $V(\&)(u^*)(p) = p \cap q$;

An *assignment* is a function g from the set Var into the set D , such that $g(v) \in D_\sigma$ if $v \in Var_\sigma$.

³⁸ There is another important difference to Cresswell's approach. For reasons of expressibility, Cresswell collapses all domains into the domain of individuals and is therefore forced to use partial functions as elements of his domains in order to avoid paradox. I have not implemented these steps for reasons of simplicity, here.

Recursive definition of contents

Now we will define, given valuations, the meanings for every complex expression. In the absence of monsters we can do so in terms of a recursive definition of contents.

(A) Tokenreflexive semantics

Let V be a t -valuation. As before, u^α is the unique *immediate subutterance* of α in u . For arbitrary $\alpha \in Ex$ and $u \in \alpha$ we now define $|\alpha|^g(u)$, the content of u wrt. assignment g .

- (i) If α is a constant, then $|\alpha|^g(u) = V(\alpha)(u)$,
- (ii) if α is a variable, then $|\alpha|^g(u) = g(\alpha)$,
- (iii) if $\alpha = \beta\gamma$ then $|\alpha|^g(u) = |\beta|^g(u^\beta)(|\gamma|^g(u^\gamma))$,
- (iv) if $\nu \in Var_\sigma$, $\beta \in Ex_\tau$, and $\alpha = \lambda\nu(\beta)$ then $|\alpha|^g(u) =$ that function $f \in D_{\langle \sigma, \tau \rangle}$,
such that for any $a \in D_\sigma$, $f(a) = |\beta|^{g[a/\nu]}(u^\beta)$,
- (v) if $\nu \in Var_\sigma$, $\beta \in Ex_p$, and $\alpha = \forall\nu\beta$, then $|\alpha|^g(u) = \bigwedge_{a \in D_\sigma} |\beta|^{g[a/\nu]}(u^\beta)$.

Since every utterance uniquely determines the expression it belongs to, and hence the character that can be applied to it, we could well omit the expression in the definition of the content of an utterance and directly define $|u|^g$, the content of u wrt. assignment g . This would further decrease the complexity of the semantic definitions. – I have chosen the slightly more complicated version above in order to emphasise the similarities to Kaplanian semantics.

(B) Occurrence-interpretation

Let V be an o -valuation. As before, \mathbf{o}^α denotes \mathbf{o} 's unique immediate suboccurrence of α . Now we are able to define $>\alpha fi^g(\mathbf{o}, c)$, the content of occurrence \mathbf{o} in context c wrt. assignment g . $>\alpha fi^g(\mathbf{o}, c)$ is defined iff \mathbf{o} is an occurrence of α which occurs in c . If it is defined, then

- (i) if α is a constant, then $>\alpha fi^g(\mathbf{o}, c) = V(\alpha)(\mathbf{o}, c)$,
- (ii) if α is a variable, then $>\alpha fi^g(\mathbf{o}, c) = g(\alpha)$,
- (iii) if $\alpha = \beta\gamma$, then $>\alpha fi^g(\mathbf{o}, c) = >\beta fi^g(\mathbf{o}^\beta, c)(>\gamma fi^g(\mathbf{o}^\gamma, c))$,
- (iv) if $\nu \in Var_\sigma$, $\beta \in Ex_\tau$, and $\alpha = \lambda\nu\beta$, then $>\alpha fi^g(\mathbf{o}, c) =$ that function $f \in D_{\langle \sigma, \tau \rangle}$,
such that for any $a \in D_\sigma$, $f(a) = >\beta fi^{g[a/\nu]}(\mathbf{o}^\beta, c)$,
- (v) if $\nu \in Var_\sigma$, $\alpha \in Ex_p$, and $\alpha = \forall\nu\beta$, then $>\alpha fi^g(\mathbf{o}, c) = \bigwedge_{a \in D_\sigma} >\beta fi^{g[a/\nu]}(\mathbf{o}^\beta, c)$.

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