

Indexicality and left-periphery

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According to recent proposals in formal syntax, the left-most position in the C(omplementizer)-layer is dedicated to the representation of the context of utterance (call this hypothesis LP). This idea has had little impact on semantic theories of indexicals. The reason is that indexicals are regarded, after Kaplan's (1989) Logic of Demonstratives (LD), as directly referential and rigid. However, the phenomenon of *shifted* indexicality (Schlenker 2004) cast doubts on LD and, in particular, on the assumption that the descriptive content of indexical terms has no truth-conditional importance. Any extension (or reformulation) of LD that meets this empirical challenge must in fact allow the descriptive content of indexicals to interact with scope taking operators such as *verba dicendi*. Moreover, such a theory must account for the restrictions on these interactions. For instance, shifting-friendly languages allow indexicals to shift only in the scope of specific verbs (Anand 2006). In this contribution we show that LP offers an empirically adequate account of indexical shifting. We propose that: (a) indexical features (such as first-person features) are presuppositional; (b) indexicals features are hosted in the position in the left-periphery that is devoted to the representation of the context of utterance. The proposal shows that a presuppositional analysis is able to provide an elegant modeling of the indexical shifting, if we are ready to develop the basic insight that syntax has precise ways to encode presuppositional values and their locus of resolution. Furthermore, our syntax-oriented presuppositional approach makes good prospects for individuating the logical roots of two-dimensionalism in the semantics of indexicals, in a theory-independent way.

1. Introduction

According to the proposals of Rizzi (1997) and Cinque (1999), the left-periphery of the sentence hosts a set of functional positions encoding the interface between grammar and discourse/context. It has been further hypothesized that the left-most position in the left-periphery encodes the relation between the content of the sentence and the context of utterance (Baker 2008, Delfitto and Fiorin 2011, Giorgi 2010, Sigurðsson 2004, Speas and Tenny 2003). We refer to this hypothesis as LP.¹

If LP is correct, it is expected that those expressions whose meaning is determined by the context of utterance, that is, *indexical expressions*, must be in a syntactic dependency of some sort with the

layer of the CP that is devoted to the representation of context (let's dub this layer U-layer), as exemplified in (1).

- (1) [C-layer [U-layer] ... David doesn't like me...]



This idea, though supported by an interesting body of syntactic evidence, has had little impact, so far, on semantic theories of indexicality. The reason is that, after the influential work by Kaplan (1989), indexicals are regarded as directly referential and rigid, and therefore insensitive to the linguistic context in which they occur (that is, the interpretive properties of indexicals are not expected to depend on the interaction with other – syntactically defined – linguistic elements, in terms of formal dependencies, scope relations, etc.).

On the other hand, a number of recent contributions, among which Anand (2006), Anand & Nevins (2004), Schlenker (1999, 2003), and Sudo (2010), have shown that in a significant number of languages some indexicals can be *shifted* when occurring in indirect reports. For example, in Amharic a sentence of the form *John says that I am a hero* can be interpreted as John saying that John (as the speaker in the reported speech act) is a hero. Furthermore, Anand (2006) has demonstrated that the availability of such *shifted* interpretations is constrained by grammatical factors, which may vary from language to language.

The goal of this paper is to show that LP can provide a principled explanation for the phenomenon of indexical shifting and the way this phenomenon is constrained crosslinguistically.

The paper is organized as follows. In section 2 we briefly introduce the main aspects of Kaplan's (1989) theory of indexicals. In section 3 we discuss the phenomenon of shifted indexicality. In section 4 we review Schlenker's (2003) account of shifted indexicality. According to Schlenker, indexical pronouns can be decomposed into a referential variable and a feature expressing a presupposition which constrains the reference of the variable. The variation between languages resides in the fact that in shifting-friendly languages the presupposition of indexicals contains a context variable that can be bound by verbs of propositional attitude. In section 5 we review Anand's (2006) criticism of Schlenker's theory. Anand shows that the availability of shifted interpretations depends on the grammatical environment in which indexicals occur. He therefore proposes that indexical shifting is mediated by a CP-level, rather

than by a DP-level, operator. In section 6, we review the proposals of Hunter (2010) and Maier (2010), which are also casted in a framework according to which indexicals are presuppositional terms. In spite of the merits of this presuppositional treatment of indexicals within Discourse Representation Theory, it is shown that it fails to account for the constraints described by Anand (2006). In section 7, we formulate our proposal, focusing on first-person pronouns. Following Schlenker, we maintain that first-person pronouns can be decomposed into a referential core and a person feature expressing a presupposition. However, following a suggestion by Baker (2008), we propose that person features are not generated within the pronoun structure; rather they are generated at the CP-level and then induced on the pronoun by means of an agreement dependency. More precisely, following LP, we propose that person features are generated in the portion of the C-layer that is devoted to the representation of context. By treating person features as CP-level presuppositional operators, the theory captures the advantages of the presuppositional analysis as well as the attested constraints on pronominal shifting, by deriving them from structural and selectional properties of syntax. Finally, in section 8 we discuss some semantic consequences of the proposal and the way in which our findings might be relevant for the philosophical discussions on two-dimensionality, insofar the latter is motivated by the interpretive requirements posed by indexicals.

2. Kaplan on indexicals

As anticipated in the introduction, LP has had little impact on semantic theories of indexicality. The reason is that, after Kaplan's (1989) influential work, indexicals are regarded as directly referential and rigid (as proper names according to Kripke 1972).² They are directly referential in the sense that their reference comes about without the mediation of a Fregean sense (modulo two-dimensionality, as we will see in a moment: the context-dependent description associated to indexicals belongs to a distinct semantic tier, which does not contribute to the truth-conditions of the sentence in which indexicals find themselves). And they are rigid in the sense that they denote the same object in all the possible worlds in which they denote something (again, this depends on the fact that the context-dependent description associated to indexicals is not computed for the determination of the relevant propositional values).

Let us see this from a more technical perspective. According to Kaplan's (1989) Logic of Demonstratives (LD), indexicals are evaluated relatively to a context parameter c , which is distinct from the index of evaluation:

$$(2) \quad [[\cdot]]^{c,i}$$

A context of utterance is regarded as a sequence of objects including the speaker (or author) in the context, the addressee, the time at which the utterance takes place, the place where the utterance takes place, and the possible world at which the utterance takes place. Indexical terms are used to refer to those objects. For example, the pronoun I , interpreted relatively to a context in which Jonas is the speaker, refers to Jonas. Accordingly, the sentence I win, uttered in the same context, expresses the singular proposition $Win(jonas)$:

$$(3) \quad [[I \text{ win}]]^{c,i} = Win(jonas)(i)$$

Importantly, the meaning of I corresponds to the individual speaking, as direct reference commands, and not to that of a description such as *the speaker*, as a descriptive analysis would have it. The reason is that – as Kaplan maintains – if the meaning of I were equated to the description *the speaker*, it would fail to define a referent in those circumstances in which there is no event of utterance. In fact, if the descriptive analysis were correct, we would expect the logical equivalence between the counterfactual statements (4a) and (4b), contrary to speakers' intuitions.

- (4) a. If I were not speaking, you'd be outside enjoying the sun.
b. If the speaker were not speaking, you'd be outside enjoying the sun.

Moreover, as Kaplan discusses at length, singular propositions are not sufficient to express the intuitive difference between (5a) and (5b). In Kaplan's famous example, Jonas sees a man in the mirror whose pants are on fire. Pointing at him, Jonas utters (5a). Later on, Jonas looks at his own pants and realizes that he is the man in the mirror; he therefore utters (5b).

- (5) a. His pants are on fire
b. My pants are on fire

As uttered by Jonas, (5b) expresses the singular proposition $Has\text{-}pants\text{-}on\text{-}fire(jonas)$. However, also (5a) expresses the singular

proposition *Has-pants-on-fire(jonas)*, since the man pointed at by Jonas is Jonas himself. Yet, it is intuitive that (5a) and (5b) mean different things. To account for this intuition, Kaplan distinguishes two dimensions of linguistic meaning: content and character. A character is a function from contexts to contents. A content is a function from indexes (typically possible worlds) to truth-values (that is, an intension). Accordingly, the sentences in (5) express the same content, but have different characters:

- (6) My pants are on fire (uttered by Jonas)
 - a. Character: $\{c: \{i: \text{Pants-on-fire}(\text{the speaker in } c)(i)\}\}$
 - b. Content: $\{i: \text{Pants-on-fire}(\text{jonas})(i)\}$
- (7) His pants are on fire (pointing at Jonas)
 - a. Character: $\{c: \{w: \text{Pants-on-fire}(\text{the person pointed at in } c)(i)\}\}$
 - b. Content: $\{i: \text{Pants-on-fire}(\text{jonas})(i)\}$

We can already draw some conclusions. First, adding an additional semantic tier (in Kaplan's case, the *character*) leads to a two dimensional treatment of intensionality: possible worlds are not enough for a proper treatment of the semantics of indexicals (the same holds for technically different approaches, as in Stalnaker 1978 and much subsequent work by the same author). Second, Kaplan imposes an important constraint on characters: Context values cannot be bound by content-level operators. That is, character is autonomous from content (and this is what makes the approach radically two-dimensional). Such a principled separation between content and character is empirically motivated: it is required in order to ensure the rigidity of indexicals, that is, in order to account for the fact that indexicals are not sensitive to intensional contexts, as shown by examples such as (8) and (9), which cannot be interpreted as in (8b) or (9b).

- (8) Necessarily, I am speaking (uttered by Jonas)
 - a. Every world w is such that Jonas is speaking in w (False)
 - b. #Every context c is such that the speaker in c is speaking (Necessarily true)
- (9) John said that my pants are on fire (uttered by Jonas)
 - a. John said that Jonas's pants are on fire
 - b. #John said that the speaker in the reported speech event has pants on fire

As pointed out by Dever (2004), it follows from Kaplan's constraint on character that context dependency cannot be reduced to

any kind of operator dependency. This conclusion goes in the opposite direction of the predictions made by LP, according to which indexical terms must undergo a dependency with a superordinate layer encoding contextual information. From this perspective, LP is a syntactically oriented approach to indexicality that breaks with one of the main tenets of Kaplanian semantics, that is, the independence of context, formally modeled as the independence of character. It is then of crucial importance that this Kaplanian tenet has been independently challenged, on empirical grounds, in the recent semantic literature. In the next section we consider an important set of data, constituting the phenomenon of *shifted* indexicality, which speaks against the Kaplanian view.

3. *Shifted indexicals*

Kaplan's restriction on characters captures the fact that in (10) *I* can only refer to the author of the whole sentence (in this case Jonas; interpretation 10a), and cannot refer to the author of the reported sentence (that is, John; interpretation 10b).

- (10) John said that I am a hero (as uttered by Jonas)
a. John said that Jonas (i.e. the author of the whole sentence) is a hero
b. John said that John (i.e. the author of the reported sentence) is a hero

However, it has been shown in several recent contributions that in a number of languages a sentence such as (10) can have the interpretation in (10b). In these languages, the first-person pronoun can refer to the speaker in a *reported* speech act (or the author of a reported propositional attitude). This phenomenon, sometimes referred to as *indexical shifting*, has been observed in a number of languages including Amharic (Leslau 1995; Schlenker 1999, 2004), Aghem, Navajo, Slave, Zazaki (Anand 2006), Uyghur (Sudo 2010), Chokwe, Luchazi, Lunda, and Luvale (Kawasha 2007).

Three important observations must be made.

(i) There is ample evidence that indexical shifting cannot be analyzed as a case of direct report. To consider at least one important syntactic fact supporting that conclusion, indexical shifting is compatible with *wh*-extraction (e.g. *who did John say that I love?*), whereas extraction is generally forbidden from direct report contexts.

(ii) In shifting friendly languages, a sentence like (10) has two interpretations. Either *I* is interpreted as the speaker in the actual

speech act (deictic interpretation) or it is interpreted as the speaker in the reported speech act (shifted interpretation).³

(iii) Under the shifted reading, (10) is necessarily interpreted *de se* (in the sense of Lewis 1979). That is, the sentence is true in a situation in which Jonas uttered the sentence *I am a hero*, and is false in a situation in which Jonas uttered a sentence such as “he is a hero” unintentionally referring to he himself.⁴

The main problem for Kaplan’s analysis of indexicality is that the *de se* reading of shifted indexicals requires taking into account the descriptive content of *I*.⁵ However, by imposing his constraint on character, Kaplan renders the descriptive content of indexical inaccessible to propositional content, hence to content-level operators such as verbs of speech.

4. Schlenker (2003)

As a solution to the problem raised by shifted indexicals, Schlenker (2003) abandons Kaplan’s constraint and assumes that attitude verbs and verbs of speech are quantifiers over contexts, rather than over possible worlds. (11) provides the semantics of the verb *say* according to Schlenker’s proposal.

$$(11) \frac{[[\alpha \text{ say } c_i \varphi]]^{c,a}}{[[\varphi]]^{c,a|c \ c'}} = 1 \text{ iff for all } c' \text{ compatible with the claim made by } \alpha,$$

To see an example, consider the two situations in (12). Notice that the contexts compatible with α ’s claim are different in the two cases. In (12a) the contexts compatible with α ’s claim are those in which the speaker in that context is a hero. In (12b) the contexts compatible with α ’s claim are those in which the person pointed at is a hero.

- (12) a. α said: “I am a hero”
 b. α said: “he (pointing at α) is a hero”

First-person pronouns (as well as other indexicals) are analyzed (extending Cooper’s 1983 treatment of gender features) as indexed variables, interpreted relatively to an assignment function a , whose referent is constrained by a presupposition, as shown in (13). The difference between, say, English and Amharic *I* is that in English the referent of the variable must satisfy the property of being the author in the context of utterance c , where c is the actual context of utter-

ance, whereas in Amharic the referent of the variable must satisfy the property of being the author in a context c_i , where c_i can be bound by a quantifier over contexts.

- (13) a. English Υ : $[[x\{+author^*(x)\}]]^{c,a} = a(x)$, provided $g(x)$ is the author in c
b. Amharic Υ : $[[x\{+author(x,c_i)\}]]^{c,a} = a(x)$, provided $a(x)$ is the author in $a(c_i)$

When embedded under an attitude operator, the variable c_i may be bound by the attitude operator. When this is the case, we obtain a logical form in which the individual variable x is bound by a ι -operator (by means of a mechanism of ‘definite closure’; see Schlenker 2003:83), which (i) turns the free pronoun into a definite description (i.e. an individual-referring ι -term) and (ii) turns the presupposition involving c_i into the restriction of the definite description (i.e. the restriction of the ι -term). As a result, (14) expresses the shifted reading of (10).

- (14) $[[\text{John says } c_i \text{ that } x\{+author(x,c_i)\} \text{ am a hero}]]^c = 1$ iff for all c' compatible with the claim made by John, $\text{Hero}(\iota x(x \text{ is the author in } c')) = 1$

5. Constraints on first-person shifting: Anand (2006)

Anand (2006) regards Schlenker’s theory as ‘pronominal-centric’: the interpretation of the pronoun is not affected by the syntactic environment; rather, it depends on the feature make-up of the pronoun itself. Against Schlenker’s ‘pronominal-centric’ theory, Anand shows that there are specific restrictions on indexical shifting that Schlenker’s theory cannot handle. ⁶ Here we consider two of them, restricting ourselves, for simplicity, to those concerning first-person pronouns:

- (PA) Only certain verbs of propositional attitude allow first-person pronouns in their scope to shift.
(ST) All shiftable first-person pronouns within an attitude-context domain must pick up their reference from the same context.

According to (PA) first-person shifting can only take place under the scope of certain verbs of propositional attitude. Moreover, this restriction varies from language to language. As schematically shown

in (15), in Aghem, Amharic, and Zazaki *I* can only shift when in the scope of the verb *say*, whereas in Navajo and Slave it can also shift with verbs such as *want* or *think*.

- (15) a. Aghem, Amharic, Zazaki: *say*.
 b. Navajo: *say, want, think*.
 c. Slave: *say, want, think, tell*.

The *shift-together* constraint (ST) describes the fact that the Slave counterpart of (16) has only the reading in (16a), where both first-person pronouns are deictic, and (16b), where both first-person pronouns are shifted. The ‘mixed’ interpretations in (16c-d) are not available.

- (16) She wants my friend to sew slippers for me
 a. She wants my friend to sew slippers for me
 b. She wants her friend to sew slippers for her
 c. #She wants my friend to sew slippers for her
 d. #She wants her friend to sew slippers for me

To account for (PA) and (ST) Anand proposes that, in some languages, some verbs of speech or propositional attitude (e.g. *say* in Amharic) optionally select for a CP headed by an operator $OP\delta$:

- (17) a. [John say [_{CP} $OP\delta$ [I am a hero]]]
 b. [John say [_{CP} [I am a hero]]]

The structure in (17b) is available both in English and Amharic, whereas the structure in (17a) is available in Amharic but not English.

$OP\delta$ is Stalnaker’s (1978) diagonalization operator δ , which overwrites the context with the index. That is, δ takes a character χ and returns the *diagonal* of that character (as shown in (18)). In plain words, this means that the first-person pronoun contained in the complement of *say* in (17a) will be assigned the semantic value that *I* receives when the embedded sentence “I am a hero” is interpreted relatively to the set of indexes in the quantificational domain of *say*. Clearly, these are indexes in which the speaker is John, that is, what we get is the required shifted reading of the indexical.

- (18) [[$OP\delta$]]^{i,c} = $\lambda\chi(\chi(i)(i))$

Apart from this innovation, Anand maintains a Kaplanian semantics of first-person pronouns: *I*, relatively to a context *c*, rigidly denotes the speaker in *c*. More particularly, (PA) follows from the lexically determined, idiosyncratic selection properties of verbs of propositional attitude; indexical shifting is available only in the scope of those verbs that select a CP headed by $OP\delta$. (ST) follows from the semantics of $OP\delta$, which overwrites the context coordinate for all the indexicals in its scope.

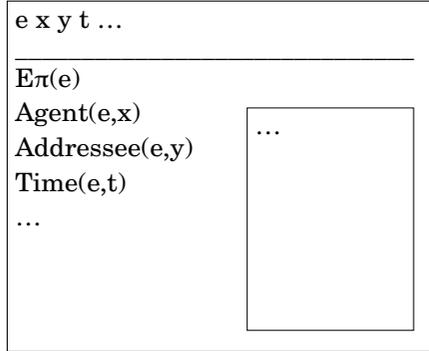
It is worth considering the crucial difference between Schlenker's and Anand's accounts with respect to modeling of linguistic variation. In Schlenker's framework, the source of the variation between, say, English and Amharic resides in the pronoun presupposition. In Anand's framework, the variation depends on the possibility of having a clause-level operator binding the first-person pronouns in its scope. The use of a clause-level operator is arguably preferable, as it accounts for the selection and locality constraints on first-person shifting. On the other hand, we believe that the presuppositional account has some independent advantages and that it is possible to account for the attested grammatical and interpretive restrictions on indexical shifting by enriching the presuppositional approach to indexicals with a syntactic dimension.

6. Presuppositional accounts in DRT

Despite Anand's criticism to Schlenker's account and his appeal to a more conservative Kaplanian semantics supported by the use of a clause-level operator, the presuppositional treatment of indexicals has been recently revived in the Discourse Representation Theory (DRT) literature. In particular, Hunter (2010) and Maier (2010) propose analyses based on Kamp's (1981) DRT combined with van der Sandt's (1992) theory of presupposition as anaphora.⁷ Here we present a synthesis of Hunter's and Maier's proposals, focusing specifically on the phenomenon of shifted indexicality.

Hunter (2010) proposes that discourse representations are framed by a Discourse Representation Structure (DRS)⁸ K_0 representing referents and conditions of the relevant utterance event or speech act, as they are introduced via the extra-linguistic context:

(19) K_0 :



In (19), e is the event of utterance, x , y , and t are, respectively, the agent in e , the addressee in e , and the time at which e takes place. Further referents can be added, such as the place where the utterance takes place and so on.

Each utterance event comes with an individuating condition $E\pi$, which is described as follows: “This is not a descriptive condition that a conversational participant should be expected to report. An individual will in general have no non-indexical means of picking out an utterance event. But such identification is not required by the semantics of indexicals. What is required is that an utterance event be selected [as the event of utterance]” (Hunter 2010:40).

The predicates *Agent*, *Addressee*, etc. are functions mapping an event e into, respectively, the agent in e , the addressee in e , etc. (as are theta-roles in Parsons 1990). Again, other aspects of the context of utterance, such as the place where the event of utterance takes place, can be added in a similar manner.

K_0 is always the most global DRS and the discourse takes place within K_0 (Hunter 2010, see also Zeevat 1999).

Indexical terms are presuppositional. In the framework of van der Sandt (1992), this means that they need to be bound to an appropriate antecedent. For instance, I has the denotation in (20), in which an event variable is marked by a question mark.⁹ The question mark corresponds to the instruction that this event variable needs to be bound to an appropriate event variable (satisfying the condition $E\pi$) introduced (or accommodated) in the preceding discourse.

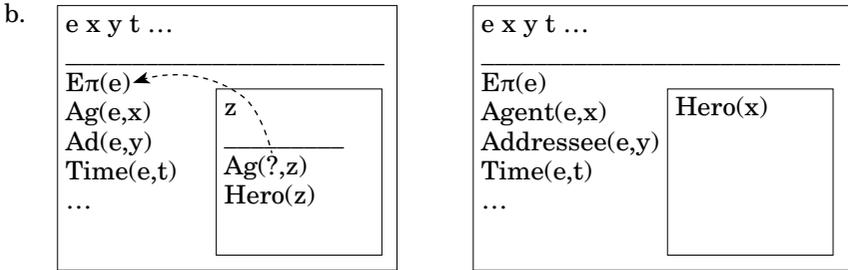
$$(20) \llbracket I \rrbracket = \lambda P(\exists x(\exists e_\pi(\text{Ag}(e_\pi, x) \wedge e_\pi = ?) \wedge P(x)))$$

For easiness of exposition, in the following representations we will make use of the shortened denotation in (21).

$$(21) \llbracket I \rrbracket = \text{Ag}(?,x)$$

Consider now sentence (22a). Its DRS is embedded within a DRS K_0 representing the context of utterance. The condition $\text{Ag}(?,z)$ requires individuating a suitable antecedent event. $\text{Ag}(?,z)$ is bound to e , as represented by the dashed arrow in the leftmost DRS in (22b). As a consequence of this binding at the event-level, the referent z of I is identified with the Agent in e . Since the condition $\text{Ag}(e,x)$ in K_0 says that x is the Agent in e , z can be identified with x , as represented in the rightmost DRS in (22b) (see Hunter 2010:33 for a full derivation). In plain words, this ensures that the individual x (as the bearer of the state of being a hero) is identified with the individual z (as the agent of the utterance event). The presupposition intuitively associated with a first-person pronoun (the fact that its referent is the agent of the utterance event that yields the relevant proposition) is correctly resolved by binding an underspecified variable in an embedded DRS to a variable in K_0 (the DRS that expresses the utterance event). As we have just seen, this happens indirectly, by binding the underspecified event variable introduced by the semantics of I (cf. 20) to the event variable that corresponds to the utterance event.

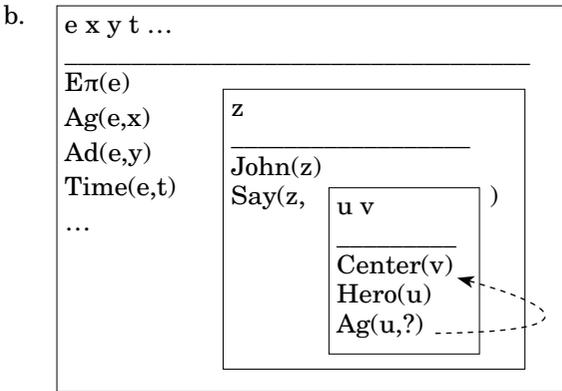
(22) a. I am a hero



Finally, to ensure the rigidity of indexical terms, Hunter (2010) assumes that K_0 is always evaluated relative to a world-assignment pair $\langle w, f \rangle$ such that $w = w_{@}$ (the actual world). In this way, the utterance event that is relevant for the process of presupposition resolution, along the lines sketched above, is always identified with the *actual* utterance event. In other words, I must always satisfy the condition of being the agent in the actual utterance event, as required by rigidity.

At the same time, an advantage of Hunter’s account is that it offers the flexibility needed to account for indexical shifting, under some straightforward technical refinements. For instance, the shifted interpretation can be derived, following Maier (2010), by binding the presupposition of the indexical in the scope of the verb of propositional attitude to the local center of the propositional attitude (under the assumption that either every propositional attitude has a center, representing the first-person experiencer of that attitude, or that an attitude center can be accommodated):¹⁰

(23) a. John says that I am a hero



Notice that this proposal successfully captures the *de-se* nature of shifted indexicals by maintaining their descriptive content within the scope of the verb of propositional attitude. In Maier’s terms, this corresponds to a *de-dicto* interpretation of the presupposition. In fact, according to (23b), (23a) conveys the information that John says that *u* is a hero and that *u* is the attitude holder (that is, the information that John is aware, so to speak, of being the author of the attitude (= *de se*)). Interestingly thus, the *de se* reading is nothing else than the *de dicto* reading.

Concluding these remarks, there remains to account for the variation between shifting-friendly and non shifting-friendly languages. The idea, in a Hunter/Maier framework, is that in non-shifting languages, such as English, indexicals cannot be bound locally (that is, they cannot be bound to the local center of the attitude introduced by the predicate in the main clause). This is captured by adding Hunter & Asher’s (2005) \uparrow -operator to the lexical entries of indexicals. \uparrow forces the presuppositions of indexicals to be bound (or accommodated) in the highest possible context.

It is worth comparing Hunter's presuppositional theory of indexicality with Kaplan's. The presuppositional account offered by Hunter is Kaplanian in that it requires a Kaplanian notion of context. Context values are the context of utterance as represented in K_0 and specific assumptions must be made, as emphasized above, on (the interpretation of) K_0 in order to preserve rigidity. However, the presuppositional account can replace Kaplan's notion of character in the following respect. For Kaplan, (24a) and (24b) express the same content (the proposition expressed is the same). The intuitive difference between the two sentences is described by (or derived from) the sentences' character. This is because the descriptive content of indexicals is relegated to the character, and character is regarded as a 'special, protected' layer of meaning.

- (24) a. My pants are on fire
b. His pants are on fire

In Hunter, the descriptive content of indexicals is integrated in the informational content of the sentence. So, the difference between (24a) and (24b) is expressed by the sentences' contents.¹¹ (24a), as uttered by Jonas, expresses the information that Jonas's pants are on fire and that Jonas is the author in the event of utterance. (24b) expresses the information that Jonas's pants are on fire and that Jonas is the individual pointed at in the mirror.¹²

Let us consider these differences from a more general, philosophical perspective. In particular, one might argue that Hunter's presuppositional approach provides in fact an analysis of indexicals that does not require recourse to two-dimensionalism in the semantics of indexicals, and eliminates thus one of the most solid arguments in favor of two-dimensionalism in semantics. As we have just seen, there is no longer, in fact, a special semantic layer of interpretation where the descriptive content of indexicals is discharged and at the same time 'protected' from contributing to propositional content (this is in fact the position defended by Hunter herself). However, one might reply that what K_0 does is exactly what Kaplan's character was intended to do: K_0 is a special DRS, for which special conditions have to be defined in order to ensure rigidity (and it is in fact rigidity what Kaplan's character is actually about). The variables in K_0 must be evaluated only with respect to $w_{@}$ and this makes K_0 special with respect to the other DRS's: Is that not a distinct, but conceptually similar, form of two-dimensionalism? And can this be taken to entail that even presuppositional accounts of indexicality have to do justice to Kaplan's (and Stalnaker's) central insight, that is, the need for a two-level analysis of intensional phenom-

ena? We believe that a choice between these two options is mainly an issue of philosophical taste, but there is an important technical point that needs, in our opinion, to be enlightened. In Hunter's approach, 'anchoring' is presented as the requirement that the semantic value of the individual variables in K_0 be established only with respect to the actual world $w_@$. However, this interpretive requirement is empirically equivalent to establishing that the semantic value assigned to the individual variables in K_0 has to be kept constant across possible worlds. And this is what happens if the assignment function f is 'rigid', that is, if it interprets all the terms in the logical language of interpretation, including variables, in such a way that it assigns to each term the same semantic value in all possible worlds (rigidity). Of course, we might simply stipulate that f is rigid (and this is essentially what Hunter does). But we might as well raise the more general question whether rigidity has simply to be stipulated (in order to derive the correct results for the semantics of indexicals) or whether rigidity follows from general properties of the model of interpretation that is adopted for the quantified modal language that corresponds to our language of interpretation. It might be the case that the Q-model we choose for our logical language L involves a rigid interpretation of all the terms in L. This conclusion is in our view a positive result, for at least two reasons. First, it opens up an interesting direction of inquiry, in which the issue of rigidity for the individual variables contained in the presupposition of indexical terms has to be decided with respect to the more general issue of what is the most convenient Q-model for the modal language into which we map the relevant fragment of natural language. It might actually turn out that rigidity needs not be stipulated, since it is a general property of the Q-model that needs be selected, on independent semantic grounds. We will come back to this issue in section 7. Second, in this way the important question concerning whether a presuppositional account to indexicals is able to overcome two-dimensionalism becomes susceptible of a clear formulation: the answer is likely to be negative if rigidity remains a stipulation (in this way K_0 remains a distinct semantic tier and two-dimensionalism is not fully overcome), but the answer is probably positive if rigidity is no longer a stipulation at the logical level (in this way there is nothing special about the DRS K_0 and two-dimensionalism is arguably eliminated, given the features of the presuppositional approach to indexicals discussed above).

Be things as they may, there is of course also an empirical side of the issue. Despite these important semantic consequences, Hunter/Maier presuppositional account suffers from the same empirical limitations as Schlenker (2003). In fact, indexical shifting is expected to

be allowed with all verbs of propositional attitude that have an attitude center, contrary to PA.

The situation may be even worse. We should expect, for example, that in a shifting-friendly language, (25a) can be interpreted as (25b), contrary to the facts. The reason is that in (25a) Jonas qualifies as the author of an event of utterance and, therefore, as a suitable antecedent for the first-person pronoun.

- (25) a. Whenever Jonas says something, I disagree completely
b. #Whenever Jonas says something, Jonas disagrees completely

Moreover, Hunter/Maier account cannot do justice to the shift-together constraint (ST), nor it can be easily modified as to account for it. Here, the general problem is that in the framework defined by Hunter and Maier, the only constraints on presupposition resolution are pragmatic in nature, therefore not sensitive to structural conditions.

Once again, it is useful to compare this account with Anand's. In Hunter/Maier account the shifted interpretation results from a dependency between the pronoun and a suitable antecedent (the local-center of a propositional attitude). In Anand (2006), the shifted interpretation is mediated at the structural level by the presence of a clause-level operator whose distribution is derived from the selectional properties of verbs of speech and propositional attitude. Also in this case, Anand's analysis scores better as it captures the attested constraints on indexical shifting.

It seems thus that there are important advantages in enriching the presuppositional approach to indexicals with a syntactic dimension. In particular, there are clear indications that we need to consider the properties of the CP-layer (the LP-hypothesis formulated at the onset), and that the semantics of person features is not only a DP-internal affair. It is this important insight that we intend to develop in the next section.

7. Person features and left-periphery

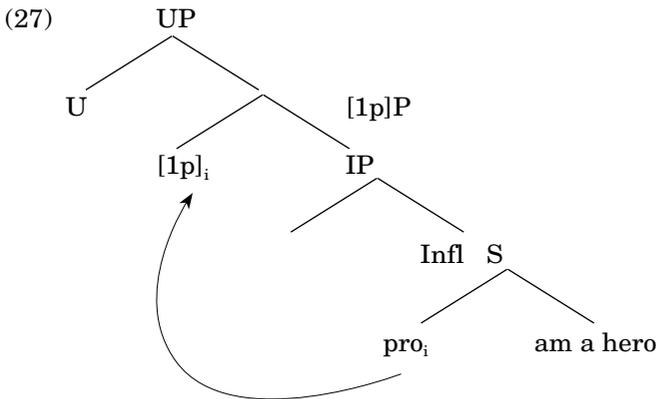
The goal of this section is to propose an alternative analysis of first-person pronouns. Following Delfitto and Fiorin (2011), Hunter (2010), Maier (2010), and Schlenker (2010), we maintain that first-person pronouns are presuppositional. In particular, following Schlenker (2004) and Delfitto and Fiorin (2011), we propose that first-person pronouns can be decomposed into a referential core (an indexed variable over individuals), and a first-person feature denot-

ing a presupposition which restricts the reference of the variable. However, instead of regarding first-person features as nominal features, we treat them as clausal features located in the position in the left-periphery that, according to LP, is dedicated to the representation of the context of utterance. In this way, we capture both the advantages of the presuppositional analysis of indexicals and the detected empirical restrictions on indexical shifting. The reason is that, by treating first-person features as clause-level operators, the interpretation of first-person pronouns can be conveniently constrained on the basis of structural and selectional properties.

Baker (2008) provides strong evidence that person agreement only arises in strictly local noun-verb configurations, as when a nominative first-person pronoun agrees with T. To explain this asymmetry, Baker proposes that person-features are not inherently generated on the agreeing noun, as gender and number features, but are generated at the CP-level and induced on the pronoun from outside by means of a sort of operator-variable agreement, as represented in (26).

(26) $[_{CP} [1\text{-person}] [_{IP} \text{I am a hero}]]$

Following and extending Baker’s proposal, we suggest the structure in (27) for the sentence *I am a hero* (see Bianchi 2006 and Sigurdsson 2011 for independent empirical motivation in favor of the syntactic representation of Person at the clausal level). For simplicity, we take IP to be the direct complement of [1p]. This is of course an oversimplification since, according to standard cartographic assumptions, there are a number of C-level projections occurring between [1p]P and IP (including FocusP, TopicP, and FinP).



The first-person pronoun starts its life as a simpler pronoun *pro_i* endowed with an unvalued first-person feature [*u*1p] and bearing an index *i*; the unvalued feature indicates that the pronoun must undergo Agree with the *closest c-commanding* head bearing a valued [1p] feature. This feature is provided by a dedicated functional projection located in the sentence's left-periphery. The agreement dependency between the pronoun and the first-person feature, represented by the arrow in (27), has three consequences: (i) the unvalued first-person feature on the pronoun is valued, (ii) the pronoun is spelled-out as a first-person pronoun, and (iii) the first-person feature is co-indexed with the pronoun in the logical language of interpretation.

Finally, we propose that the U-projection hosts a pronoun whose semantic content will be clarified in a moment.

Before moving to the interpretive side of our proposal, it is worth considering some implications of the syntax of Person we propose. An anonymous reviewer has pointed out, correctly, that, if the pronominal has an unvalued person feature which is valued through Agree with a position in the left-periphery, and if person (much as number) features are interpretable in nominal expressions (Chomsky 1995, 2000), we would have another case here of dissociation between “interpretability” and “valuation”, much as in Pesetsky & Torrego's (2004) system, which separates interpretability and valuation, giving rise to four possible configurations (whereas the two notions fully overlap in Chomsky 2000). However, the reviewer also notices that the approach raises a potential issue of cyclicity: If the subject pronoun acquires the person feature through Agree with a head in the left-periphery, then, assuming bottom up merge-based computation, when subject-verb person agreement takes place, the person feature has not yet been inserted in the structure. When the subject has acquired person, it is too late to go back to the IP cycle to do subject-verb agreement in person (a violation of Strict Cyclicity, or of the No Tampering Condition). The reviewer suggests as a potential solution to this issue that the left-peripheral Person head values directly both person features on the pronoun and in the verbal inflection, so that subject-verb person agreement is never direct, but always mediated as the result of two direct relations between left-periphery and the pronoun and left-periphery and the functional head in the IP which carries the person feature morphologically expressed on V. The reviewer's proposal may be supported by the cases of “monstrous agreement” in Tamil discussed by Sundaesan (2012). In Tamil, the third-person long-distance anaphor *taan*, when occurring as the sub-

ject of the finite clausal complement of a verb of saying, correlates with first-person agreement on the embedded verb.

Moving now to the interpretive side of our proposal, the pronoun *pro* bearing index *i* is interpreted, relatively to an assignment function *a*, as the individual such that the assignment function *a* maps the number *i* into that individual (in line with the standard Heim and Kratzer’s 1998 semantics of pronouns):

$$(28) \llbracket [pro_i] \rrbracket^a = a(i)$$

The first-person feature, as suggested above, introduces a presupposition. In what follows, we express presuppositions in terms of partial functions.¹³ Specifically, slightly modifying and extending the results achieved in Delfitto and Fiorin (2011), we propose that the first-person feature is a partial function from propositions into a partial function from events to propositions:

$$(29) \llbracket [1p]_i \rrbracket^a = \lambda p \lambda e \lambda w: E\pi_w(e) \wedge Content_w(e) = p \wedge a(i) =_w x (Agent(e) = x). [p(w)]$$

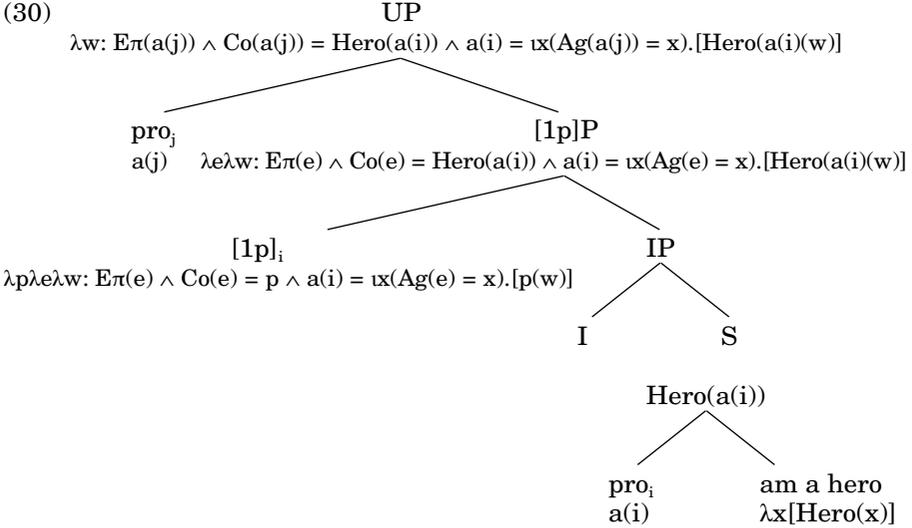
Notice that the first-person feature hosts an index *i*. This index is inherited by the Person-feature through the agreement dependency with the pronoun described above and is used to refer to the individual *a(i)*.

According to the denotation in (29), the first-person feature imposes three constraints: (i) *e* must be an event of type $E\pi$ (that is, an utterance event, in the sense of Hunter 2010); (ii) the content of *e* must be the proposition *p*, and (iii) the Agent in *e* must be the individual *a(i)*. In other words, the function expressed by (29) takes a proposition *p* and an event *e* and gives back the proposition *p*, provided that the condition is satisfied that *a(i)* is the agent in the event *e* of uttering a sentence (or expressing a thought) whose content is *p*.¹⁴ This is, intuitively, the correct empirical result.

Finally, *U* hosts an indexed pronoun *pro_j*, ranging over events.¹⁵

In (30), we offer the full derivation of the truth-conditions of the structure in (27) (for simplicity we are disregarding Tense). The IP node denotes the proposition *Hero(a(i))*. This proposition is the first argument of the function denoted by the first-person feature. Functional application of the first-person feature to the denotation of IP provides the function denoted by $[1p]P$. This is a (partial) function from events into a (partial) function from possible worlds to truth-values. Finally, the event argument is provided by U. The resulting truth-conditions for (27) read as follows: the individual *a(i)* is a hero,

provided that $a(i)$ is the agent in the event $a(j)$ of uttering a sentence whose content is the proposition ‘ $a(i)$ is a hero’. This is, again, the correct empirical result.



Consider now the case of shifted indexicality. Following Anand (2006), we maintain that languages vary depending on whether verbs of speech and propositional attitude can select a UP complement and regarding which verbs are allowed to do that. For example, English simply does not allow any verb of propositional attitude to select a UP complement. Therefore, only the structure in (31a) is legitimate in English. The structures in (31b-c) are not legitimate, because English does not allow the verbs *say*, *think*, or *believe* to select a UP complement.¹⁶ Amharic, on the other hand, allows the verb *say* to optionally select a UP complement. Therefore, both (31a) and (31b) are legitimate structures. However, (31c) is not possible in Amharic, because the verb *think* cannot select a UP complement. Finally, all the structures in (31) are legitimate in Navajo, as Navajo allows both *say* and *think* to select a UP complement.¹⁷

- (31) a. $[_{UP} U 1p_i [_S \text{Jonas says } [_{IP} I_i \text{am a hero }]]$
ok English; *ok* Amharic; *ok* Navajo
 b. $[_{UP} U 1p_i [_S \text{Jonas says } [_{UP} U 1p_j [_{IP} I_j \text{am a hero }]]$
 * English; *ok* Amharic; *ok* Navajo
 c. $[_{UP} U 1p_i [_S \text{Jonas thinks } [_{UP} U 1p_j [_{IP} I_j \text{am a hero }]]$
 * English; * Amharic; *ok* Navajo

To account for the interpretation of the structure (31b) we endorse a Parsonian event semantics for verbs of speech and (at least some) verbs of propositional attitudes. *Say*, to consider an example, is treated as an existential quantifier over events. A sentence of the form α says that S is true iff there is an event of saying whose agent is (the individual denoted by) α and whose content is (the proposition denoted by) S :

$$(32) \llbracket [\alpha \text{ says that } S] \rrbracket = \exists e_i(\text{Say}(e_i) \wedge \text{Agent}(e_i) = \llbracket [\alpha] \rrbracket \wedge \text{Content}(e_i) = \llbracket [S] \rrbracket)$$

We further propose that when a verb of propositional attitude selects a UP complement, it binds the pronoun in U. This provides the truth-conditions in (33) for the structure in (31b), where the event variable introduced by U bears the same index as the event pronoun quantified by *say*.

$$(33) \llbracket [(31b)] \rrbracket^a = \exists e_i(\text{Say}(e_i) \wedge \text{Agent}(e_i) = \text{Jonas} \wedge \text{Content}(e_i) = \lambda w: \text{E}\pi_w(e_i) \wedge \text{Co}_w(e_i) = \text{Hero}_w(a(i)) \wedge (a(i))_{=w} \text{ix}(\text{Ag}(e_i) = x)).[\text{Hero}(a(i)(w))]$$

According to (33), (31b) is true iff there is an event e_i of saying whose agent is John and whose content is the partial proposition that $a(i)$ is a hero, which is defined only for those possible worlds where $a(i)$ is the agent in the event e_i of saying that $a(i)$ is a hero. Notice that the only assignment under which the sentence is valuable is $a(i) = \text{Jonas}$, since it is only Jonas that satisfies the presupposition according to which the individual being said to be a hero is also the individual asserting that he himself is a hero. Notice also that these truth-conditions correctly capture the *de se* nature of the shifted interpretation of I . In fact, according to (33), the content of Jonas utterance is a *partial* proposition, defined only in the case in which the individual claimed to be a hero identifies himself with the individual making the claim.¹⁸

Finally, and quite importantly, consider how this proposal accounts for the restrictions (PA) and (ST). As in Anand (2006), (PA) follows from the selection properties of verbs of speech and verbs of propositional attitudes. (ST) simply follows from standard locality principles: I must be bound by the *closest c-commanding* first-person feature, pretty much in agreement with the proposal made in Baker (2008). The structure in (34), for example, is illegitimate because *my* is co-indexed with the matrix first-person feature, whereas the closest c-commanding person feature is the embedded first-person feature.

(34) $[_{UP} U 1p_i [_s \text{ Jonas says } [_{UP} U 1p_j [_{IP} I_j \text{ don't like my}_i \text{ shoes }]]$

The proposal put forward in this section captures both the advantages of the presuppositional analysis and the attested restrictions on indexical shifting. The crucial claim is that first-person features are clause-level operators hosted in a dedicated projection located in the portion of the left-periphery that is devoted to the representation of contextual information. This assumption allows us to derive the constraints on indexical shifting from the selectional properties of verbs of speech and propositional attitude plus independently motivated locality constraints. We have also purported to show that the syntax of the left-periphery can be conveniently exploited not only for an adequate empirical account of a well-defined class of fine-grained distributional facts and in order to check to what extent discourse notions such as topichood and focus are grammaticalized (all of this constitutes common practice in the cartographic literature), but also in order to develop a presuppositional theory of indexicality, significantly based on the reinterpretation of Person-features as *clausal* features. This theory elegantly meets the standard compositionality requirements (see also Delfitto and Fiorin 2011), while reinterpreting some of the DRT insights in more classical semantic terms.

Before concluding this section, it is worth comparing our proposal to one put forward by an anonymous reviewer of this article. The reviewer suggests that there is a simpler and more straightforward way of adapting Anand's account to the spirit of our proposal. If pronouns are indeed variables, the first-person feature located in the clause periphery could simply bind these variables. More precisely, the reviewer suggests that the first-person feature has, relatively to a context c , the denotation $\lambda f.f(\text{aut}(c))$. As such, the first-person feature is able to bind the pronouns in its scope, via predicate abstraction, as exemplified in the following derivation of the sentence "I am a hero":

- (35) a. $[[[1pers\ 2\ [pro_2\ \text{be a hero}]]]]^{g,c}$
 b. $[[1pers]]^{g,c} ([2\ [pro_2\ \text{be a hero}]]]^{g,c}$
 c. $[\lambda f.f(\text{aut}(c))](\lambda x.\lambda i.x\ \text{is a hero at time}(i)\ \text{in world}(i))$
 d. $[\lambda x.\lambda i.x\ \text{is a hero at time}(i)\ \text{in world}(i)](\text{aut}(c))$
 e. $\lambda i.\text{aut}(c)\ \text{is a hero at time}(i)\ \text{in world}(i)$

The reviewer suggests also that to account for the Shift Together constraint on this approach, one could simply say that these types of binding dependencies are subject to minimality.

We reject the reviewer suggestion because, contrary to our proposal, it does not capture indexical shifting. Notice that in our framework the first-person feature located in the left periphery of the clause is the element in the grammatical structure of the sentence that is responsible for the shifted interpretation of the first person pronouns within its scope. In other words, in embedded contexts the first-person feature performs the duty that, in Anand's theory, is performed by the diagonalizer. That is, our first-person feature *replaces* Anand's diagonal operator. Now, the denotation proposed by the reviewer in order to adapt Anand's framework to the spirit of our proposal is simply a type raised version of Anand's denotation, whose semantic type has been lifted from $\langle e \rangle$ to $\langle \langle et \rangle t \rangle$. As such, it does not provide any change in interpretation. The denotation proposed by the reviewer introduces an unbound context variable that can only be interpreted relatively to the parameter of evaluation c , representing the context of utterance. Suppose, in fact, that the denotation in (35e) were the argument of a verb of saying. Under Anand's analysis, a verb of saying would bind the two occurrences of the index variable i , but would not bind the context variable c . Therefore, the reference of the first person pronoun would remain unaffected and the pronoun would continue to refer to the author in the *actual* context of utterance. In order to achieve the shifted interpretation of the first-person pronoun it would be necessary to use the diagonalizer. The reviewer's proposal would provide at best a denotation of the first-person feature that is compatible with it being a clause-level feature, rather than a DP level feature. Our proposal is significantly different from that of the reviewer in that we propose that (i) first-person features are located in the left-periphery of the clause and (ii) they are responsible for the shifted interpretation of the first-person pronouns in their scope. This proposal has two main advantages. First of all, as we saw, there is independent syntactic evidence (see, among others, Baker 2008) in favor of the clausal analysis of indexical person features and in favor of an analysis of indexical shifting based on the distribution of such features in embedded contexts. On the other hand, we know of no independent evidence for the existence of a diagonalizing operator in the structure of the clausal complements that allow indexical shifting. Secondly, the suggestion by the reviewer to the effect that, in order to account for the shift together constraint on this approach, one could say that these types of binding dependencies are subject to minimality clashes with the observation that semantic binding is typically constrained by c -command, but not by locality requirements (see Reinhart 1983). On the other hand, in our framework the link

between the (clausal) person feature and the pronoun is one of syntactic Agreement. As such, it is more naturally conceived as subject to locality constraints.

The same reviewer also points out that, according to our theory, in languages where first-person shifting is possible, *say I am hero* should characterize only those individuals who represent their utterance situation as belonging to $\{j: a(i) \text{ is aut}(j) \text{ and aut}(j) \text{ is a hero at time}(j) \text{ in world}(j)\}$, where $a(i)$ is the individual such that the assignment a maps the index i onto that individual, and j is an index over circumstances of evaluation. The set of indices here is a set of indices where a *particular person* constitutes the “author coordinate.” This seems to imply that we should not be able to use *John says I am a hero* to describe a situation where John says from behind the screen: “I’m one of three well-known heroes, John, Bill or Fred”, or where John the amnesiac war hero says: “OK, so clearly I’m one of three people, John, Bill or Fred, but which? Obviously it’s whichever one is a hero, but I don’t know which one that is.” According to the reviewer, this goes against the way shifted readings are generally described in the literature.

Notice, first of all, that this problem is addressed in Schlenker (2003) and solved by the introduction of a mechanism of definite closure (discussed in section 4 of this article). Technically, we could implement a similar mechanism to avoid direct reference in embedded contexts. Nevertheless, we resist from taking a position on this issue for the following reasons.

Firstly, notice that the same argument used by the reviewer could be employed against the use of direct reference in matrix contexts as well. Suppose that John is again aware of being one of three well-known heroes, but does not know which one of them he is. If the reviewer is correct, given the analysis of indexicals as directly referential, John should not be able to say *I am a hero*. But this is indeed incorrect. John’s utterance of *I am a hero* simply *has* the content *John is a hero* for everyone who can identify John as the author of the sentence.

Secondly, we do not have access to conclusive evidence in this respect. Notice, for example, that both Anand’s and Schlenker’s analysis predict that the Amharic counterpart of a sentence such as *John said that if I were not speaking, you’d be outside enjoying the sun* may denote a relation between John and the tautology. We do not know of any evidence in support of this prediction.

8. Semantic considerations

As emphasized above, the proposal put forward in the preceding section is meant to capture the advantages of the presuppositional analysis while providing a principled account of the attested grammatical and interpretive restrictions on indexical shifting. However, it should be noticed that the semantic framework we adopted to implement our proposal is significantly different from that adopted by Hunter (2010) and Maier (2010). In fact, we endorsed an analysis of presuppositions as partial functions, whereas Hunter and Maier operate in the framework of van der Sandt's (1992) theory of presupposition as anaphora (presupposition binding). We adopted partial functions because they are compatible with a compositional semantics, which in turn can be sensitive to structural constraints. This allowed us to develop, in the preceding section, an analysis of the semantics of first-person pronouns (conceived as *pure* indexicals, in Kaplan's sense) as an interface phenomenon, whereby a full understanding of the syntax and semantics of Person-features plays a crucial role. To elaborate a bit on this, consider again sentence (35) below.

(35) Jonas says that I am a hero

In Hunter and Maier's framework the ambiguity of the (Amahric counterpart of the) sentence depends on whether the presupposition of *I* is resolved globally or locally. The decision between the two resolution strategies is intended to depend on pragmatic factors, in agreement with the status of DRT as an explicitly non-compositional theory.¹⁹ On the contrary, in our framework the point of resolution of the first-person presupposition depends on an explicitly defined syntactic factor: the position that the closest c-commanding first-person feature occupies in the structure. This idea can only be expressed within a framework that manages presupposition resolution in a compositional fashion.

In this section, we point out some further consequences of the semantic implementation that has been proposed in the preceding section.

Kaplan's theory is two-dimensional: the interpretation function is relativized to two distinct indexes, more precisely a possible world and a context of utterance. The reference of indexicals depends on the context of utterance; the reference of descriptions depends on the possible world index.²⁰ As pointed out in the introduction, the use of two distinct indexes accounts for the fact that *I* is not truth-conditionally

equivalent to a description such as *the speaker*. This is shown by the sentences in (36). Sentence (36a) is contingently true, that is, true whenever uttered, but it is not necessarily true. Sentence (36b), on the other hand, denotes a logical necessity.

- (36) a. I am speaking
b. The speaker is speaking

The double index theory accounts for this intuitive difference quite naturally, as shown in (37). Sentence (36a), interpreted relatively to a possible world w and a context c , is true iff the speaker in c is speaking in w . Intuitively, these conditions are satisfied by every context, but not by every possible world, as there may be possible worlds in which the speaker in the *actual* context of utterance is not speaking. On the other hand, (36b) is true iff the speaker in w is speaking in w . These conditions are satisfied by every logically conceivable possible world.

- (37) a. $[[\text{I am speaking}]]^{w,c}$ = the speaker in c is speaking in w
b. $[[\text{the speaker is speaking}]]^w$ = the speaker in w is speaking in w

In a Kaplanian framework, the rigidity of indexicals naturally follows from the assumption that indexicals are interpreted relatively to a dedicated parameter of interpretation. Since the reference of indexicals depends on a dedicated index, their interpretation is insensitive to operators quantifying over possible worlds. For example, sentence (38a) is correctly predicted to be false (at least in natural circumstances), whereas (38b) is correctly predicted to be true.

- (38) a. $[[\text{Necessarily, I am speaking}]]^{w,c}$ = every w' (accessible from w) is such that the speaker in c is speaking in w'
b. $[[\text{Necessarily, the speaker is speaking}]]^w$ = every w' (accessible from w) is such that the speaker in w' is speaking in w'

As we have seen, DRT theorists explicitly argued that a presuppositional approach to indexicals is able to overcome Kaplan two-dimensionality. In Hunter's framework, for instance, the rigidity of indexicals follows from specific assumptions about the interpretation of K_0 . In particular, Hunter assumes that K_0 is always evaluated relative to a world-assignment pair $\langle w, f \rangle$ such that $w = w_{@}$. In this way, the utterance event is always identified with the *actual* utterance event (see the discussion in section 5 above). Under this condition, there is no need for two independent tiers of semantic interpretation, since

first-personal and third-personal pronouns lead to distinct propositional content even when they accidentally refer to the same individual, as discussed above.

In the theory presented in the preceding section, the rigidity of indexicals depends on the assumptions we make about the assignment function a and, more generally, about the model of quantified modal logic adopted for the interpretation of natural language expressions.²¹ This is because indexicals are treated as variables in our analysis. According to the semantics we have proposed, sentence (36a) is true iff $a(i)$ is speaking, provided $a(i)$ is the agent in the event $a(j)$ of uttering a sentence whose propositional content is ‘ $a(i)$ is speaking’. Formally, the truth-conditions may be as in (39).

$$(39) \quad [[(36a)]]^a = \lambda w: E\pi(a(j)) \wedge Co(a(j)) = Speak(a(i)) \wedge a(i) = ix(Ag(a(j))) = x].[Speak(a(i)(w))]$$

To correctly capture the fact that the referent of I is rigidly designated we need to ensure that the assignment function a is rigid, that is, it assigns to the numerical index i the same value in all possible worlds. Notice that, once the assignment function is assumed to be rigid, (36a) is correctly predicted to be true whenever uttered (that is, true *a priori*, as desired). The reason is that, given the truth-conditions in (39), the presupposition in (36a) (i.e. $a(i)$ is involved in an event of speaking) entails the assertion (i.e. $a(i)$ is speaking), to the effect that the sentence is true whenever the presupposition is satisfied, that is, one might say, whenever the sentence is felicitously uttered. At the same time, (36a) is not necessary, since there certainly are worlds where $a(i)$ is not speaking. This amounts to an elegant reformulation of some of Kaplan’s basic insight in a presuppositional framework.

Importantly, there is some independent evidence suggesting that the assignment function used for the interpretation of individual-referring natural language expressions is in fact rigid. Consider for instance an observation discussed at length in Buring (1998). Let us assume the following context: Upon coming back to your hotel in a holiday period, you learn from the receptionist that one of the friends you are spending your holiday with had an accident down at the harbor. You are supposed to see her or him in the hospital, but in the hectic course of events the receptionist forgot to take down the name of your friend, and since there’s a bunch of them, it is unclear which of your friends is the actual victim. In this context it is appropriate to utter (40a), but not (40b).

- (40) a. It might be my best friend
b. # He might be my best friend

(40b) sounds odd because it is a statement about a particular person rather than about the concept ‘the friend of mine who had an accident’. In other words, (40b) means that the referent of *he* could be my best friend (that is, that there are possible worlds where the actual referent of *he* is my best friend), which is inappropriate in the context; it doesn’t mean that it could be that the referent of *he* is my best friend (that is, that there are possible worlds where the referent of *he* in that world is my best friend), as seems required by the context. The conclusion to be drawn is that modal quantifiers do not quantify over assignments (*pace* Groenendijk, Stokhof, and Veltman 1996); that is, the assignment function *is* rigid.²²

If this conclusion is correct, the rigidity of indexicals can be conceived as following from the general fact that the assignment function used to assign values to natural language *terms* is rigid. In other words, the rigidity of indexical terms can be regarded as a consequence of a more general property of the model of quantified modal logic used for the interpretation of natural language expressions. In particular, if we want a Q-model that captures the intuition that different things exist in different possible worlds, Q1R is a model of quantified modal logic with the required properties (see Garson 1984). Q1R is defined as a sequence $\langle W, R, D, Q, a \rangle$, where W is a set of possible worlds, R a binary function on W (that is, an accessibility relation), D a set of possible objects, Q a function that assigns a subset $D(w)$ of D to each world w , and a meets the condition in (41), establishing that each term, crucially including *variables*, is rigid:

- (41) $a(t)(w)$ is $a(t)(w')$ for all w, w' in W and for any term t

Now, Q1R is a *free logic* with world-relative domains and rigid terms (for a full discussion of its axioms and rules, see Garson 1984:252-55). Is Q1R thus a suitable model for the fragment of natural language, crucially containing indexicals, that we are considering here? One might be inclined to a negative answer, since, for instance, we certainly do not want *definite descriptions* to be rigid. However, a way out might be to exclude definite descriptions (i.e. all *functional* terms, whose reference is achieved by means of functional application) from the inventory of terms in the logical language. Is this step feasible and independently motivated (given, for instance, the *functional* semantics of iota-terms, whose reference is achieved

by means of a function applying to a property)? Which are its logical implications? More generally, is *free logic* a convenient frame of interpretation for other fragments of natural language? Clearly, this requires extensive research. However, it also means that deciding whether presuppositional approaches to indexicality have good prospects for fully overcoming *two-dimensionality* is a kind of complex, holistic question: it involves deciding whether we can adopt models of interpretation with generalized rigid terms, and also deciding, on reasonable grounds, which are the *terms* in our language of interpretation. Significantly, this conclusion holds both for pragmatically-oriented presuppositional approaches (as in Hunter's model, where the fact that the utterance event e in K_0 remains constant across possible worlds w is simply stipulated) and for syntactically-oriented presuppositional approaches (as in our model, where we must have a way of guaranteeing that $a(i)$, in formulas such as (39), is rigid). In this case, going pragmatically or going syntactically are just two different paths towards the very same point of arrival: the core of purely *logical* issues that hinge on the necessity (or dispensability) of two-dimensionality.²³ We regard this as a nice result and an interesting lesson.

9. Conclusions

In this contribution, we have proposed a syntax-based approach to indexical expressions, by exploiting some independently established properties of the left-periphery of the clause and by crucially capitalizing on Baker's insight that person-features are of a clausal nature. Moreover, we have offered a detailed comparison between this approach and the pragmatically-oriented presuppositional approaches to indexicality that have been recently developed in DRT.

At least three important results emerge. First, the syntax of the left-periphery appears worth developing not only for syntax-internal reasons, but also for the significant contribution it can make to compositional semantics. Second, the syntax-based presuppositional approach has some empirical advantages over the DRT approaches (it responds better to Anand's empirical constraints on shifting and scores thus better to model linguistic diversity within this empirical domain). Third, the two presuppositional approaches have something important in common: overcoming Kaplan's and Stalnaker's two-dimensionality is not a matter of theory-bound technicalities, rather a matter of the basic logical features of our model of interpretation,

that is, it hinges, so to speak, on the *logic* of the interpretive systems underlying language.

Last but not least, we have offered further motivations in favor of a presuppositional approach to indexicality as a valid alternative to Kaplan's LD and some first motivations in favor of a *syntactic* implementation of this presuppositional approach.

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Notes

¹ Alternatively, the context values (in Kaplan's sense, that is, *speaker*, *addressee*, etc.) are encoded in a fixed array of dedicated positions in one or more layers of clausal structure, as in Bianchi (2006) and Sigurðsson (2011).

² See Soames (2011) for a recent assessment of the differences between demonstratives and proper names.

³ With the exception of Slave, where first-person pronouns *must* shift when occurring in the scope of the verb *say* (see Anand 2006).

⁴ Evidence for this conclusion is provided by Anand (2006), Schlenker (1999), Sudo (2010). For a dissenting view see Malamud (2006).

⁵ By 'descriptive content of *I*' we refer to a description such as 'speaker' or 'author', or, at any rate, any description that corresponds to a necessary and sufficient condition for determining the reference of *I*. Notice that, as made clear by Soames (2005), the two-dimensional semantics described in section 2 corresponds to a *descriptive* account of indexicals. It differs from a Fregean account in that it has two dimensions of meaning, instead of one: an index dependent dimension, where the content of *I* corresponds to a rigidly designated individual (i.e. a Kaplanian *content*), and a context dependent dimension, where the content of *I* corresponds to a description (i.e. a Kaplanian *character*). Notice, in this respect, that the main motivation for this type of two-dimensional semantics, which, as argued by Soames (2005), may not have been Kaplan's original own goal, is that of explaining the *apriori* nature of contingent claims such as "I am speaking".

⁶ For easiness of exposition we do not discuss von Stechow's (2002) binding account, nor the criticism in Anand (2006). We refer the reader to Anand (2006, §2.6.1), where it is shown that von Stechow's theory cannot account for (ST).

⁷ An earlier proposal in the framework of DRT is Zeevat (1999).

⁸ Discourse Representation Structures are the logical forms of DRT. Each DRS consists of a set of discourse referents, called the universe, and a set of conditions on these referent. DRSs are represented as boxes where the referents are represented on top and the conditions are listed below.

⁹ As Hunter (2010:29) points out "λ-terms are not used in standard DRT.

However, I am interested in showing how the semantics of indexicals effect the semantics of sentences in which they figure; using compositional lexical entries for indexicals allows me to do this.”

¹⁰ There is one technical problem that makes it difficult to combine Hunter’s and Maier’s proposals into a unified framework. In Hunter, indexicals require an antecedent *event* variable, whereas in Maier the local center of a propositional attitude is an *individual*. We do not address this problem in this article.

¹¹ See Hunter 2010, ch. 4 for a discussion of why her theory does not qualify as a *wide-scope* theory.

¹² It is important to stress that Hunter’s attempt to overcome Kaplan’s two-dimensionalism is not shared by Maier (2010), who explicitly maintains a two-dimensional semantics (see also Maier 2009).

¹³ For simplicity, we adopt partial functions from possible worlds to truth-values. However, we trust that the proposal can be framed within a dynamic framework that employs partial functions from contexts to contexts (that is context change potentials; see Heim 1982, Beaver 2001).

¹⁴ As said above, in this contribution we restrict ourselves to the analysis of first-person pronouns. It is easy to see, however, that the proposal could be extended to other indexicals by modifying the feature in (29) as to encode reference to other participants in (or aspects of) the event of utterance, in the same vein as Hunter (2010). Accordingly, the second-person feature would look as follows: $\lambda p \lambda e \lambda w: E\pi(e) \wedge \text{Content}(e) = p \wedge a(i) = \lambda x (\text{Addressee}(e) = x). [p(w)]$ (see Delfitto and Fiorin 2011 for a conceptually similar, though technically different, proposal). It is far from clear, however, that an analysis along these lines would account for the full range of interpretive properties of second person pronouns. There are non-trivial suggestions in the philosophical and linguistic literature (see a.o. Schlenker 2003, Soames 2011) according to which second-person pronouns do not really count as *pure* indexicals (in Kaplan’s sense), as first-person pronouns do. For instance, two second-person pronouns can be used in the same sentence (accompanied by a demonstration) to refer to *distinct* individuals; as in ‘you (pointing at person A) are elected, but you (pointing at person B) are not’. This might be taken to be a major difference with respect to first person pronouns. This conclusion is not straightforward, however, since reference to different individuals in the same sentence is not always possible. Consider, for instance, the following sentences: ‘You (pointing at A) love your (pointing at B) brother’, ‘You (pointing at A) think that you (pointing at B) are intelligent’. In these sentences, reference to different individuals is extremely marginal in all languages we are familiar with, if not impossible (thanks to Giorgos Spathas for drawing our attention to these examples; notice, incidentally, that such cases would follow naturally from the account we propose as cases where the two occurrences of the second-person pronoun are within the scope of a single c-commanding UP and, as such, cannot refer to different addressees; we thank an anonymous reviewer for pointing this out to us). Moreover, singular second-person pronouns are crosslinguistically attested as expressing an ‘arbitrary’ reading, whereas singular first-person pronouns are not. In conclusion, this is an issue that deserves a specific treatment on his own, and for this reason we prefer to leave it to future research.

¹⁵ See Asher (1993) for independent motivations in favor of the introduction of pronominal reference to events in natural language.

¹⁶ With the structure in (31a) we do not intend to suggest that the complement of *say* is an IP. We simply propose that *say* selects a chunk of structure that is smaller than a full-fledged UP.

¹⁷ Another interesting case is that of Slave, where all occurrences of *I* must necessarily shift within the scope of *say*. Slave can be described, as Anand (2006)

does, as the mirror image of English: *say* must select a UP complement. Therefore, in Slave (31b) is legitimate whereas (31a) is not.

¹⁸ In this respect, the present account shares the same spirit of Maier's account. The *de se* nature of the shifted interpretation follows from the fact that the presupposed descriptive content of *I* is interpreted *de dicto*, that is, within the scope of the verb of speech.

¹⁹ More precisely, quoting Maier (2010:445): 'PA [i.e. van der Sandt's (1992) theory of Presupposition as Anaphora] induces a two-stage interpretation architecture: from the syntactic analysis of a sentence a preliminary DRS is constructed fully compositionally, and then a pragmatic/semantic resolution mechanism connects that preliminary structure with the context DRS by resolving its presuppositions.'

²⁰ The first double index theory was proposed in Kamp (1971) *for now*.

²¹ Even though in this section we focus on the existence of empirical arguments in favor of adopting a rigid assignment function for the evaluation of natural language expression, it is worth considering that there may also be model-theoretical advantages. Garson (1984) offers a review of the various types of quantified modal logic that can be constructed on the basis of the parameters W (the set of indices/possible worlds), R (the accessibility function), D (the set of possible objects), Q (the domain of quantification), and *a* (the assignment function). Garson shows that a model such as Q1R, with *world-relative* domains and a *rigid* assignment function (plus the use of free-logic) is complete and allows maintaining the rule of universal instantiation of quantified (free) logic, whereas the same model with a world-relative assignment function does not validate the rule of universal instantiation and its completeness has (to Garson's knowledge) never been proved.

²² Büring analyzes (41a) as a reduced cleft: It might be my best friend *who had an accident*.

²³ This is not to deny, of course, that the possible choice for a model with rigid terms, that would make two-dimensionality dispensable in the semantics of indexicals (both in pragmatically-oriented and in syntactically oriented frameworks like those discussed in the present contribution), should be justified on empirical grounds, on the model of Büring's argument that we have briefly sketched above. This makes in fact the prospects, in our view, of a quite exciting research program.

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