0. Introduction

In this paper we will analyze the semantic and syntactic properties of temporal expressions such as *il giorno dopo* (the day after) and *il giorno prima* (the day before) – i.e., the so called *anaphoric* temporal locutions. We will consider their distribution in Italian, given the availability of native intuitions. However, the conclusions which will be arrived at in this work can be extended to other languages as well, among which English, modulo morphosyntactic variation.

The hypothesis to be illustrated is the following: given that these locutions are anaphoric, they require an antecedent in the sentence or in the previous discourse. However, such an antecedent cannot be provided by the utterance time, presumably for inherent semantic reasons.

At first sight, such a generalization does not make the correct predictions – or is at least insufficient – with respect to embedded contexts. In some embedded contexts in fact, the anaphoric locutions cannot appear, somewhat unexpectedly.

We will show that these contexts are (Generalized) Double Access Reading ones, in the sense of Giorgi & Pianesi (2001a). According to these authors, the DAR involves computing two semantic representations of the embedded clause, one adopting, as it were, the point of view of the subject of the reported attitude/dictum, and the other involving the speaker’s point of view. Non-DAR contexts, on the other hand, are limited to the first step. We will show that it is the second step of DAR computation that is responsible for the contrast.

The aim of this work is twofold. On one hand we want to investigate *temporal anaphora* in order to understand what it means for a temporal locution to be anaphoric, as
opposed to indexical, and to better understand the requirements it poses on the antecedent. On the other, we want to shed some further light on Sequence of Tense mechanisms, with respect not only to the properties of tenses, but also to the properties of temporal modifiers.

The perspective adopted here is “from semantics to morphosyntax” – namely, the general question which is addressed in this work is why and how a given relation holds between a certain meaning and a certain morphosyntactic structure expressing it.

The paper is organized as follows: in the first section we will illustrate the basic facts concerning the distribution of the anaphoric locutions in matrix contexts. The second section will delve with embedded ones, focusing on the distribution of anaphoric locutions in Double Access Reading (henceforth, DAR) and non-DAR contexts. In the third, we will articulate an account that will eventually lead to an explanation of the contrast. This will require an (informal) discussion of the meaning of our anaphoric locutions, an analysis of some of the properties of embedded contexts that are relevant for the interpretation of tenses, and details about the properties telling apart DAR and non-DAR contexts. Finally, section four provides some more discussion of aspects related to the semantics of anaphoric temporal locutions.

1. Basic facts

Anaphoric temporal expressions require suitable temporal entities to draw (or build) their reference from. If said in an out-of-the-blue fashion, (1) and (2) are odd, for lack of an antecedent for the anaphoric temporal phrase:

(1)  #Gianni è partito il giorno (mese/ anno / ora) prima/ dopo.
    Gianni left the day (month/ year, hour) before/ after.

(2)  #Gianni partirà il giorno prima/ dopo.
    Gianni will leave the day before/ after.

If a suitable antecedent is provided by the context, utterances of (1) and (2) become acceptable:
(3)  A: Gianni è partito il 23 maggio
    A: Gianni left on May 23rd

(4)  B: Ma no! E’ partito il giorno prima!
    B: Oh no! He left the day before!

(5)  B: Ma no! E’ partito il giorno dopo!
    B’: Oh no! He left the day after!

Discourses (3)+(4) and (3)+(5) are acceptable: the anaphoric locution in the second
sentence can draw its reference from the temporal phrase introduced by the first sentence.
In the following, we will hypothesise that this behaviour is due to the existence of a
phonetically unpronounced temporal variable in the anaphoric phrase, yielding, e.g., il
giorno prima x (the day before x). So we can comment on the data above by saying that
with out-of-the-blue utterances of (1) and (2) there is no temporal referent for the hidden
variable to exploit. In discourses (3)+(4) and (3)+(5), on the other hand, the phrase il 23
maggio (May 23rd) in sentence (3) introduces a temporal referent that the hidden variable
of the following sentence can use to draw its reference from.

When the tense is the imperfect, or the compound tense with the auxiliary in the
imperfect (the so-called pluperfect) the variable of our anaphoric expression can take its
reference sentence-internally, so that out-of-the-blue utterances of (6) are fine:

(6)  Quando l’ho incontrato Gianni era partito il giorno (mese/anno/ora) prima.
    When I have met him Gianni had(IMPF) left the day (month/year,hour) before.

Example (6) features a pluperfect, a compound tense consisting of the auxiliary in the
imperfect and the main verb in the past participle. The latter, as we argued at length in
past works, instantiates a tense projection, T2, distinct from that corresponding to the
tense morpheme of the auxiliary, and contributing a past meaning. The imperfect on the
auxiliary, on the other hand, can be analysed as a present in the past, shifting the current
point of view to a past one which is either explicitly provided in the sentence (in the form of a time topic), or drawn from the context.\(^2\) Using a terminology made famous by Reichenbach (1947) and his followers, one could say that with the imperfect the reference time \(R\) is identified with some past time, possibly provided by the topic phrase. The contribution of \(T2\), on the other hand, locates the event time, \(E\), before \(R\), so that the resulting meaning of a pluperfect verbal form such as *era partito* (was left) is that the leaving (the event time \(E\)) is before \(R\), the past-shifted time.

Returning to (6), the hidden temporal variable of the anaphoric phrase can have the same reference as \(R\), which, in turn, is the time/event corresponding to *quando l’ho incontrato* (when I have met him). The result is that Gianni’s leaving is located one day (month, hour) before the meeting.

The possibility for the hidden variable to corefer with the reference time in these constructions is obviously ruled by a number of intervening conditions. So, if in the presence of a pluperfect tense we use a locution like *il giorno dopo x* (the day after), the very meaning of such an expression prevents \(x\) from coreferring with \(R\), and an out-of-the-blue utterance of (7) is odd:

\[
(7) \quad \#\text{Quando l’ho incontrato Gianni era partito il giorno (mese/ anno / ora) dopo.}
\]

When I have met him Gianni had(IMPF) left the day (month/ year, hour) before/ after.

As with (6), \(R\) is the time/event of the meeting, and the contribution of \(T2\) (the tense morpheme of the past participle) requires it to be after the event time \(E\). If the hidden variable of the anaphoric locution corefers with \(R\), then \(E\) is the day after \(R\), conflicting with the requirements of \(T2\). The only possibility, therefore, is that the hidden temporal variable take its reference from some other entity:

\[
(8) \quad \text{ieri ho incontrato Carlo. Era arrivato in città la settimana prima, e sua sorella lo aveva raggiunto due giorni dopo.}
\]

Yesterday I have met Carlo. (he) had(IMPF) arrived in town the week before, and his sister had(IMPF) reached him two days after.

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\(^2\) See Giorgi and Pianesi (2003) for more on the imperfect tense as a present in the past.
Here the temporal variable of *due giorni dopo* (two days after) can take its reference from the temporal phrase in the second sentence, avoiding clashes with the pluperfect meaning.

There are other restrictions to the possibility for the our hidden variable $x$ to corefer with R. Remember (1) and (2): we said that out-of-the-blue utterances of these two sentences are odd, showing that $x$ doesn’t find any suitable referent. The tense was the present perfect, which, under a a (neo-)Reichenbachian analysis like the one in (Giorgi and Pianesi 1997), yields $S=R$ and $E<R$. So, the oddness of (1) and (2) shows that the temporal variable cannot have the same value as the speech time/event.

This is not easy to explain. The use of the present perfect involves reference to the speech time/event, and this should be enough to raise it to salience. And, possibly independently from this, one might argue that the very fact that a sentence is uttered should be enough for the speech time/event to become salient. But, there is no way: $x$ cannot have the same reference as R when $R=S$ — that is, when the reference/perspective time is the utterance/speech time. In particular, (1) cannot mean that Gianni has left the day before the utterance day. Maybe this is due to some presuppositional feature carried by the hidden temporal variable, which prevents it from taking on the same value as the speech time. But, be it as it may, we can stand with the conclusion that the hidden temporal variable of our anaphoric locutions can have the same value as the reference time, but cannot have the same value as the speech time/event.

2. Anaphoric temporal locutions in embedded contexts

In the previous section we focused on matrix contexts, and showed that there is a contrast between cases in which the anaphoric locutions are in construction with verbal forms in the imperfect or the pluperfect tense, and cases where the verb is in the present perfect. In the former the hidden temporal variable of the anaphoric phrase can have the same reference as Reichenbach’s reference time, in the latter it cannot. The result is that out-of-the-blue utterances of sentences of the first type can be fine, whereas sentences of the second kind yield unacceptable results.

A similar contrast can be found in embedded contexts: certain types of referential relationships seem to be allowed or disallowed, according to the tense of the embedded clause. In particular, the contrast involves the future tense and the present perfect on the

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3. As Schlenker (2002) seems to argue.
one side, and the pluperfect and the perfect conditional on the other. Let us first consider the future tense when embedded under a past tense.

(9) #Ieri/giovedì/quando l’ho incontrato, Gianni ha detto che Mario partirà due giorni dopo.
    Yesterday/Thursday/when I met him, Gianni said that Mario will leave two days after.

(10) Ieri/giovedì/quando l’ho incontrato, Gianni ha detto che Mario sarebbe partito due giorni dopo.
    Yesterday/Thursday/when I met him, Gianni said that Mario would leave two days after.

(11) Ieri Gianni ha detto che Mario partirà/sarebbe partito domani.
    Yesterday Gianni said that Mario will leave tomorrow

Sentence (9) is odd if uttered out-of-the-blue, contrasting with (10). In the former the embedded tense is the future, in the latter it is the perfect conditional, the tense Italian commonly uses for future-in-the-past contexts. The oddness of (9) signals that the hidden variable of *due giorni dopo* (two days after) can’t find a suitable antecedent, despite the presence of the temporal phrase in the matrix. The felicity of (10) signals that in this case the hidden variable has no similar problems. Finally, if in (9) the anaphoric locution is substituted by an indexical one, as in (11), an out-of-the-blue utterance of the resulting sentence is felicitous.

The contrast between (9) and (10) extends to cases where no explicit temporal phrase appears in the matrix clause.

(12) #Gianni ha detto che Mario partirà due giorni dopo.
    (Yesterday) Gianni said that Mario will leave two days after.

(13) Gianni ha detto che Mario sarebbe partito due giorni dopo.
    Gianni said that Mario would leave two days after.
Again, when uttered out-of-the-blue, (13) is fine, locating the reported leaving of Mario two days after the reported speech event. On the other hand, (12) is still odd. It cannot mean what (13) does; in particular, the leaving is not perceived as being located two days after Gianni’s dictum, but there’s the clear feeling that the reference of *due giorni dopo* (two days after) is left undetermined.

Obviously, we should not hasten to conclude that the (embedded) future tense is not compatible with anaphoric temporal expression. For, when a temporal referent is made available by a phrase appearing in another sentence, no conflict arises:

(14) Mario partirà venerdì, e Carlo mi ha detto che sua sorella lo seguirà due giorni dopo.
Mario will leave on Friday, and Carlo has told me that his sister will reach him two days after.

(15) ?Carlo è partito giovedì. (Ieri) Sua madre mi ha detto che la sorella lo raggiungerà dieci giorni dopo.4

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4. This sentence is slightly odd, though, we believe, for reasons that don’t affect our reasoning here. Notice that the problem is not specific to embedded contexts:

(i) ?Carlo è partito giovedì e sua sorella lo raggiungerà dieci giorni dopo.
Carlo has left on Thursday, and his sister will reach him ten days after.

In both cases, the marginality of the examples seems to be related to the fact that the locution *dieci giorni dopo* (ten days after) is used in a clause with the future tense, while its hidden variable picks up a referent introduced in a past tense clause. The oddness is maintained if the distribution of the future and of the past tenses is reversed:

(ii) ?Carlo partirà giovedì; sua sorella era arrivata dieci giorni prima.
Carlo will leave on Thursday; his sister had arrived ten days before.

(iii) ?Carlo partirà giovedì. (Ieri) Sua madre mi ha detto che la sorella era arrivata dieci giorni prima.
Carlo will leave on Thursday. (Yesterday) his mother told me that his sister had arrived ten days before.
Carlo has left on Thursday. (Yesterday) his mother told me that his sister will reach him ten days after.

It seems, therefore, that the embedded future tense is not comfortable with anaphoric phrases that take their reference intrasententially.

The future tense is not isolated in this. A similar behaviour is exhibited by the Italian present perfect tense, this time contrasting with the pluperfect:

(16) #Ieri/giovedì/il 2 febbraio Gianni ha detto che Mario è partito il giorno prima.
    Yesterday/thursday/ February 2, Gianni said that Mario left the day before.

(17) Ieri/giovedì/il 2 febbraio Gianni ha detto che Mario era partito il giorno prima.
    Yesterday/thursday/ February 2, Gianni said that Mario had(IMPF) left the day before.

(18) Questa mattina Gianni ha detto che Mario è partito ieri
    This morning Gianni said that Mario has left yesterday

Much as the future tense in the examples above, the present perfect tense is not comfortable with an anaphoric temporal locution, whereas the pluperfect is, cf. (16)-(17). Again, (16) can be rescued by substituting the anaphoric phrase with an indexical one, as in (18).

The contrast is maintained also when there is no temporal phrase in the matrix, and the intended reading involves directly the matrix’s eventive variable:

(19) #Gianni ha detto che Mario è partito il giorno prima.
    Gianni said that Mario left the day before.

(20) Gianni ha detto che Mario era partito il giorno prima.
    Gianni said that Mario had(IMPF) left the day before.

As it seems, all these sentences are neither ungrammatical, nor non-interpretable, but seem to violated some (pragmatic?) constraint favouring referents that are oriented (with respect to the speaker) the same way as the tense of verb.
If uttered out-of-the-blue, (20) is fine, with the leaving being perceived as located two days before Gianni’s reported utterance. The same does not hold of (19): the embedded anaphoric phrase remains without an available antecedent, and the relevant utterance is non-felicitous.

Finally, as with the future tense, the present perfect too does not prevent the embedded temporal phrase to draw its reference from outside the sentence:

(21) Mario è partito venerdì, e Carlo mi ha detto che sua sorella lo ha preceduto due giorni prima.

Mario has left on Friday, and Carlo told me that his sister has preceded him two days before.

So, in all relevant respects anaphoric temporal phrases give raise to the same type of contrasts with embedded present perfect tenses vs. the pluperfect, as those we saw above with the future tense vs. the perfect conditional: the hidden variable of the temporal locution cannot have the same reference as the matrix event/time when the tense is the present perfect or the future, whereas it can do so with the pluperfect and the perfect conditional. The future tense patterns together with the present perfect, and the perfect conditional with the pluperfect, and the question is whether there is any property that one context has and the other doesn’t, or viceversa.

The answer is in the affirmative. The contexts where the anaphoric temporal locution yields unacceptable results are all contexts of double access readings (DAR), whereas those in which these problems don’t arise do not enforce the DAR.

Typical examples of sentences exhibiting the DAR are the following:5

(22) John said that Mary is pregnant.

(23) Gianni ha detto che Maria è incinta.

The feeling is very clear that whatever the meaning of the embedded clause is, the pregnancy state attributed to Mary/Maria holds both at the speaker’s time and at the time of the reported speech. Thence the oddness of (24)-(25):

(24) Ten months ago John said that Mary is pregnant.

(25) Dieci mesi fa Gianni ha detto che Maria è incinta.

Sentences such as (22) and (23) contrast with cases like the following, where there is no requirement for the pregnancy state to overlap the speaker time, being enough that it overlap the saying time (notice the use of the imperfect in the Italian sentence):

(26) John said that Mary was pregnant.

(27) Gianni ha detto che Maria era(IMPF) incinta.

According to the intuitive criterion we have used so far, sentences where a future tense is embedded under a past tense have double access readings as well:

(28) John said that Mary will leave.

(29) Gianni ha detto che Maria partirà.

Both in the Italian and in the English version, Mary’s/Maria’s leaving is located after both the current and the reported speech times. The contrast, this time, is with the English would-future and the Italian perfect conditional:

(30) John said that Mary would leave.

(31) Gianni ha detto che Maria sarebbe partita.

In this case, all is required of the leaving is that it takes place after John’s/Gianni’s saying so.

So, the future tense gives raise to double access readings when embedded under a past tense, whereas the would-future/perfect conditional, and the simple-past/the imperfect, don’t. As to the present perfect, it is a little bit harder to appeal to the same intuitions we have used so far in order to show that it gives raise to the DAR too. Notice, however, that if it is the case that Mary actually left, and that that leaving was the one John referred to with his dictum, then for an utterance of the following sentence to be fine it is necessary
that the consequent state of the leaving be still present — that is, that Mary hasn’t returned.\(^6\)

(32) John said that Mary has left.

It seems possible, therefore, to conclude that the present perfect too, when embedded under a past tense, creates a DAR context. Eventually, we have shown that the contrast we are discussing — the possibility/impossibility for embedded anaphoric phrases to draw their reference from (certain) material in the matrix clause — indeed corresponds to the DAR/non-DAR divide.\(^7\)

\(^6\) For the notion of consequent state see (Parsons 1990).

The corresponding Italian example doesn’t behave in the same way. But this doesn’t show that the Italian counterpart of (32) is not a DAR sentence. The fact is that whereas it is generally not appropriate to use the English present perfect tense to inform about Mary’s leaving in case she has returned, the same doesn’t hold of Italian. So (i) is odd, but (ii) is fine:

(i) John has left and she has just returned.

(ii) Gianni è partito ed è appena ritornato.

This well-known contrast points to a partially different meaning for the two verbal forms. The English present perfect is more sensitive to what Parsons (1990) called the ‘resultant state’ of an event: the possibly transitory state that comes about as a consequence of the mentioned event. In our case, the event is a leaving and the resultant state is the state of John being away. The Italian present perfect seems to exploit a more abstract notion of ‘consequent state’ (Parson 1990), which is a state that ensues automatically once an event has terminate: the state consisting in the event being over. Despite these differences, both the Italian and the English present tenses feature a present tense auxiliary, the present tense providing the paradigmatic cases of DAR. Hence we straightforwardly extend that property to the Italian present perfect.

\(^7\) Another piece of evidence in this direction is provided by the following minimal pair:

(i) (Giovedì) Mario dirà che sua sorella è partita il giorno prima.

Thursday Mario will say that his sister has left the day before.
In this section we have shown that certain types of referential relationships involving anaphoric locutions such as *il giorno prima* (the day before) are allowed/disallowed in embedded contexts. The relevant relationships involve the matrix event/time and, we have concluded, the contrast seems to pattern together with the presence/absence of the DAR. Whenever the latter is enforced, the hidden variable of *il giorno prima* cannot have the same value as the matrix’s event/time, whereas this is possible in non-DAR contexts. It seems, therefore, that in order to understand the nature of the contrast we must consider the formal properties telling apart DAR from non-DAR contexts.

3. Toward a solution

3.1. Cross-clausal or local reference?

The generalisations we arrived at are the following:
- in matrix contexts, the hidden variable of *n giorni prima* (n days before) can have the same reference as Reichenbach’s R.\(^8\)
- the variable cannot refer to the speech time/event.

(ii) #(Giovedì) Mario ha detto che sua sorella è partita il giorno prima.

Thursday Mario has said that his sister has left the day before.

Both sentences feature an embedded present perfect, but their matrix verbal forms are in the future tense and in the present perfect, respectively. Matrix future tenses do not support the DAR; hence (i) isn’t, and (ii) is, a DAR context. An out-of-the-blue utterance of (ii) still gives rise to the same problems we have become accustomed to: even in the presence of an overt temporal phrase in the matrix, the hidden temporal variable of the anaphoric locution doesn’t manage to find a suitable antecedent. On the other hand, an utterance of (i) in the same conditions is perfect, signalling that the variable of *il giorno prima* (the day before) can have the same reference as the matrix temporal phrase/event, yielding the following meaning: Mario will say that his sister had left the day before Thursday.

\(^8\) Given the similarities between *n giorni/settimane/ mesi prima* (n days/weeks/months before) and *n giorni/settimane/ mesi dopo* (n days/weeks/months after) our discussion will focus on the former.
The problem we have introduced in the last section involves subordinate contexts: if the DAR is enforced, the hidden variable of an embedded anaphoric locution is disjoint from the matrix’s event/time, whereas in non-DAR contexts it can be assigned that value.

Before going on, we want to bring some other evidence in favour of the idea that the problem turns around whether the hidden variable can or cannot have the same reference as the matrix time/event, and that this doesn’t depend on structural facts; in particular, that c-command is not an issue. Consider the following two cases:

(33) #Quando giovedì gli ho parlato, mi ha detto che Carlo è arrivato il giorno prima.
    When I talked to him on Thursday, he has told me that Carlo has arrived the day before.

(34) Quando giovedì gli ho parlato, mi ha detto che Carlo era arrivato il giorno prima.
    When I talked to him on Thursday, he has told me that Carlo had(IMPF) arrived the day before.

Differently from examples such as (16) and (17), in (33) and (34) the temporal phrase giovedì does not c-commands the anaphoric locution. Yet the pattern is identical to that exhibited by (16)-(17); in particular, (33) is odd, if uttered out of the blue, showing that the temporal variable of il giorno prima cannot have the same reference as giovedì (Thursday).

Further evidence is provided by (35)-(36) below: giovedì (Thursday) appears in a different sentence, yet the contrast is reproduced. Despite the general possibility for the temporal variable of il giorno prima to draw its reference from the extrasentential context, this move is prevented in (35).9

(35) Ho incontrato Mario giovedì. #Mi ha detto che Carlo è arrivato il giorno prima.
    I met Mario on Thursday. He has told me that Carlo has arrived the day before.

(36) Ho incontrato Mario giovedì. Mi ha detto che Carlo era arrivato il giorno prima.
    I met Mario on Thursday. He has told me that Carlo had(IMPF) arrived the day before.

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9. See the discussion in §1.
What unifies (33)-(36) with, e.g., (16)-(17) is the fact that irrespective of its position, giovedì (Thursday) contributes to determine the temporal location of the event of the main clause. It does so directly in (16)-(17), being the temporal argument of the matrix verb;\(^{10}\) indirectly, through the mediation of the when-clause, in (33)-(34); and indirectly again in (35)-(36), where discourse factors conspire to favour a reading of the second sentences whereby Mario’s dictum is located on Thursday. As soon as the temporal phrase does not determine the location of the event of the main clause, the contrast disappears, and the referent provided by giovedì (Thursday) becomes available even with embedded present perfect tenses, as in (37):

(37) Il ragazzo che hai incontrato giovedì, ieri mi ha detto che Carlo è arrivato il giorno prima.

The boy you met on Thursday, yesterday told me that Carlo has arrived the day before.

In this case, giovedì doesn’t specify the temporal location of the matrix event, and the hidden variable of il giorno prima (the day before) can corefer with it, so that the meaning of the temporal locution is: ‘the day before Thursday’.

So it seems that we can adopt the following generalisation:

(38) **Generalisation:** The hidden variable of il giorno prima (the day before) can have the same reference as the matrix event/time in non-DAR contexts, but cannot do so in DAR ones.

This, in turn, seems to entail that DAR contexts disallow, and non-DAR contexts allow, the following indexations, where Temp-phrase in (39) is any temporal phrase specifying the time of the matrix event:

(39) a. Temp-phrase\(_i\) ....V che .... V il giorno prima \(x_i\).

b. .... V\(_i\) che .... V il giorno prima \(x_i\).

But, we argue, (39) need not be what underlies (38). Notice, in the first place, that there is a certain amount of redundancy between (39a) and (39b), for whenever the former is

\(^{10}\) See Giorgi and Pianesi (1997) and Delfitto and Bertinetto (2000) on temporal arguments.
descriptively appropriate, so is the latter, but there are examples in which (39b) applies that don’t fall under (39a). We will see this in more detail in the next section.

3.2. Eventive reference and the unit mismatch constraint

We have tacitly assumed that both temporal and eventive antecedents can be relevant for computing the meaning of *il giorno prima*. This move seems justified by the fact that our anaphoric locutions can be in construction both with event-referring phrases, cf. (40)-(41), and with time referring ones, cf. (3):

(40) Due anni prima (de) la quarta crociata  
Two years before (of) the fourth crusade.

(41) Il giorno prima (de) la dichiarazione d’indipendenza/il suo arrivo.  
The day before (of) the declaration of independence/his arrival.

(42) Due giorni prima di domenica  
Two days before of Sunday

Whatever the meaning of (40) or of (41) is, the relevant computations must take into account the fact that *la quarta crociata* (the fourth crusade) or *il suo arrivo* (his arrival) pick up events. Thus, our tacit assumption seems justified that the hidden temporal variable of *il giorno prima* can pick both temporal and eventive referents.

Suppose that temporal reference is involved. Then we analyse *il giorno prima x* as ‘the day that lies one day before x (for x=t a given time)’, taking these expressions as functions associating a given time t (the value of x) with the unique time that lies n days/hours/etc. before t. If reference to events is involved, we can hypothesise that the time of that event is to be extracted, say, by means of a definite description, so that *il giorno prima x* amounts to ‘the day that lies one day before the time of x (for x=e, a given event)’. In both cases, computing the value of *il giorno prima x* always involve a temporal entity, be it directly provided as the value of the hidden temporal variable, or by means of a covert definite description.

Interestingly, the reference /denotation of the covert definite description is not free:
B’s reply is odd, showing that the anaphoric phrase in the second sentence cannot find a suitable antecedent. It cannot find an eventive referent, given that the second speaker denies the existence of the event mentioned in A’s utterance. It also fails anaphoric reference to giovedì (Thursday), though, despite the fact that this is an available temporal referent. The reason, we argue, is due to a constraint we call the unit mismatch constraint: the temporal referent for x in ‘the hours that lies one hour before x (for x a time)’ must be of the type ‘hours’, so that a more appropriate paraphrase is ‘the hour that lies one hour before x (for x an hour-type entity)’. So, for temporal reference we have:

(44) If x refer to a time span, and Y is an expression classifying time spans, then expressions of the form \(n \ Y \ before \ x\), amount to ‘the Y that lies n Y(s) before x, where x is a Y’.

When eventive reference is involved, on the other hand, the paraphrases discussed above suggest the following:

(45) If x refer to an event, and Y is an expression classifying time spans, then expressions of the form \(n \ Y \ before \ x\), amount to ‘the Y that lies n Y(s) before the time of x’.

The unit mismatch constraint can be seen at work also in cases like (46), which contrasts with (47):
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(47) A: Mario è partito ieri.
    A: Mario left today.
    B: Ma no! E’ partito il giorno prima.
    B: No! He left the day before.

Example (47) is felicitous, showing that the temporal referent introduced by *ieri* (yesterday) is available for the hidden variable of the temporal locution to pick. This is as expected, since that referent is of the type required by *il giorno prima* — that is, a day. The unacceptability of (46), therefore, shows that the referent introduced by *oggi* (today) is not of the right type. Indeed, it can be seen that for any relevant type, hours, days, weeks, etc., *oggi* always fails to provide a suitable referent:

(48) A: Mario è partito oggi.
    A: Mario left today.
    B: #Ma no! E’ partito il giorno/la settimana/un’ora prima.
    B: No! He left the day/the week/one hour before.

Indeed, *oggi* refers to a contextually relevant portion of the day of the utterance, where the choice of such a portion is strongly affected by the tense:

(49) a. Oggi Mario è partito.
    Today Mario has left.
 b. Oggi Mario partirà.
    Today Mario will leave.

As it turns out, such a portion is neither of the hour-type, nor of the week-, day-, etc., type.

The unit mismatch constraint is less visible when eventive reference is at stake:

(50) A: Mario è partito giovedì.
    A: Mario left Thursday.
    B: Vero! e suo fratello è arrivato un’ora prima.
    B: True! And his brother arrived one hour before.

The anaphoric locution in B’s reply cannot draw its reference from Thursday for the same reasons as above: *un’ora prima* (one hour before) requires that the time antecedent be hour-like. The reply, however, is felicitous, showing that the variable can get to a referent
in such a way that the unit mismatch constraint is not violated. The only open possibility here is that the referent be the event mentioned in A’s utterance. Now, (45) had it that cases of eventive reference involve the covert definite description the time of x (for x an event). Given the felicity of (57), it must be admitted that such a definite description can be made more precise by the linguistic context, yielding the paraphrase: ‘the hour that lies one hour before the hour of x (for x a given event)’. Eventually, we can modify (45) as follows:

(51) If x refer to an event, and Y is an expression classifying time spans, then expressions of the form n Y before x, amount to ‘the Y that lies n Ys before the Y of x’.

The consequence of (51) is that there is the choice of the referent for the hidden variable is much freer in the case of eventive reference than in the case of temporal one: in the latter case, the unit mismatch constraint directly applies to the temporal referent, ruling out cases like (43) and (46). When eventive reference is at stake, on the other hand, the mediating definite description in (51) can provide for the right temporal unit. This greater latitude of eventive reference with respect to temporal reference in our temporal locution is further exemplified by the following example:

(52) A: Carlo è arrivato ieri.
   A: Carlo is arrived yesterday.
   B: Ma no! Oggi suo fratello mi ha detto che era arrivato un’ora prima.
   B: No! Today his brother has told me that Carlo is arrived one hour before.

One reading of B’s reply has it that Carlo’s brother said today that Carlo had arrived one hour before his (the brother’s) saying. This reading is not obtained by letting the hidden temporal variable of un’ora prima (one hour before) draw its reference from oggi (today). According to the discussion above, oggi is generally unable to provide a suitable referent for the temporal variable of our temporal locutions, because of it always gives rise to unit mismatch. So in this case too the mentioned reading of B’s reply must be due to the fact that un’ora prima is spelled out as ‘the hours that lies one hour before the hour of x (for x the saying event)’, with the definite description read attributively.

Returning to our main topic, (52) is a case in which (39a) doesn’t apply, whereas (39b) apparently does. Another interesting contrast is the following, which exploits the properties of the DAR/non-DAR divide:
What is interesting here is that the contrast between DAR and non-DAR contexts is maintained despite the unit mismatch constraint. The acceptability of (53) shows that the hidden variable of the embedded anaphoric locution takes its reference from the matrix event. Temporal reference, in fact, is ruled out by unit mismatch constraint.

Quite generally, our account has the following consequence for (39a) and (39b): whenever there is no violation of the unit mismatch constraint, there is no ground to decide whether the hidden variable of an embedded anaphoric temporal locution draws its reference from the temporal phrase fixing the location of the matrix event or from the event itself. However, the unit mismatch constraint allows us to isolate cases in which only eventive reference is operative. So, the redundancy between (39a) and (39b) seems well established: whenever the former works, so does the latter, but not vice versa.\(^{12}\)

The next question is whether the eventive reference we are after is appropriately captured by (39b) — that is, by having the two share their indices. Consider the following cases:

(55) #Mario ho sognato che in quel momento sua madre dormiva.
Mario has dreamed that in that moment his mother dreamed(IMPF).

(56) #Mario ha sognato che il giorno prima/un’ora prima c’era stato un terremoto.
Mario has dreamed that the day/one hour before there was(IMPF) been an earthquake.

There is a clear sense in which out-of-the-blue utterances of these sentences are odd. In the first sentence, the anaphoric expression *in quell momento* (in that moment) cannot

\(^{12}\) We are not saying that (39a) is impossible, but, simply that referential processes that directly pick the time of the event independently from the event itself don’t have a great explanatory value, in view of our data. We will see in a while why this conclusion is important for our considerations. For the time being, let us keep to the fact that we have proven that explanation of the data can be pursued by resorting to eventive reference alone.
find a suitable antecedent. Example (56), on the other hand, contrasts with, e.g., (20), out-of-the-blue utterances of which are acceptable, signalling that the hidden variable of the anaphoric phrase of (56) cannot find an antecedent. What is relevant is that eventive reference to the matrix event seems to fail in both cases. If we were to maintain that (39b) is adequate for (20), it would be very difficult to explain (56): why should the coindexation be blocked in one case and be allowed in the other?

In Giorgi and Pianesi (2001b), we related examples like (55) and (56) to the fact that contexts created by the verb *sognare* (to dream) do not enforce temporal anchoring. Our conclusion was that the absence of temporal anchoring and the unavailability of suitable referents in (55)-(56) can be explained by hypothesising that reference to the matrix event from within a subordinate clause is never direct, but is always mediated by whatever mechanism is responsible for temporal anchoring. Eventually, temporal anchoring is responsible for making the matrix event available from within the embedded clause. If this conclusion is correct, (39b) can be rejected, for, quite generally reference to the matrix event is not a matter of cross-clausal anaphora, but must find a local mediation.

If reference to the matrix event is the relevant factor, and if it is locally (within the subordinate clause) realised, according to the properties of temporal anchoring, then the acceptability/ non-acceptability of anaphoric temporal locutions in the embedded clauses of non-DAR/ DAR sentences (as exemplified by (19)-(20)) must be due to the fact that in the former local reference is fully operative, whereas in the latter it is somehow hampered.

### 3.3. Temporal anchoring

In the previous section we argued that there is something special to the way the matrix event is made available within subordinate clauses. In this section we will further investigate this point, introducing our favourite theory for temporal anchoring.

Following Higginbotham (1995) we hypothesise that in propositional attitude contexts, the interpretation of tenses crucially involves reference to the matrix event. In the previous section, we have shown that this is not done directly, by means of a

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13. For more data and discussion about dream context, see (Giorgi and Pianesi 2001b).

coindexation/anaphoric link between the two entities, but that the relationship goes through the interpretative properties of the local context, crucially involving the notion of *temporal anchoring*. The latter refers to the fact that if tenses are taken to be relational, then they connect the event of their clause to some other entity, the temporal anchor. In matrix contexts, the temporal anchor is the utterance itself, and in subordinate clauses it is the matrix event.\(^{15}\) What those two entities have in common is that they can play the role of the (egocentric) temporal coordinates of the speaker (the utterance) and of the attitude’s subject. So, tenses relate events with the current egocentric temporal coordinate, this way ultimately relating them with the agent who is responsible for the content of the speech/attitude episode.

Thus, in an utterance of a sentence like *John is sick*, the temporal anchor is the speaker’s coordinate (the utterance) and the tense relates this entity to the sickness, requiring that they overlap. From an utterance of a sentence such as *John said that Mary was sick*, on the other hand, we recover that according to John, Mary’s sickness was simultaneous to the temporal anchor (the subject’s coordinate=the reported speech episode).\(^{16}\) In the case of *John believed that Mary was sick*, pretty much the same considerations apply. The temporal coordinate for the subordinate clause is the belief state John was in — i.e., the temporal coordinate of the subject. Quite generally, in these subordinate contexts the matrix event localises (reported) thoughts and dicta in time, tying them together.

In (Giorgi and Pianesi 2001a) we framed those ideas within an ILF semantics for subordinate clauses, according to which verbs such as *say*, *believe*, etc. establish a relationship between individuals (attitude’s subjects) and syntactic objects (LFs) annotated with semantic values, yielding so-called Interpreted Logical Forms (ILFs). Nodes, besides carrying the usual categorical labels, are also adorned with semantic

\(^{15}\) Actually, this is true only of subordinate clauses in contexts of propositional attitude. In dream contexts there is no temporal anchor, and no temporal anchoring. In Giorgi and Pianesi (2001b) we have proposed an explanation for why this should be so.

\(^{16}\) Notice that this is so independently of whether John was correct or mistaken about his localization along the objective time series. That is, simultaneity is something which John could not be wrong about, showing that such a relationship does not obtain with respect to times (for which ignorance or error is always possible, see below), but with respect to the very attitude episode.
values, the latter being provided by appropriate assignment sequences.\textsuperscript{17} For instance, the ILF of the subordinate clause of (57a) is (57b):

(57) a. Mary thinks that John is sick.
    b. [CP, t C [[DP, John] [VP, \langle e \rangle sick]]]

The theory takes the form of a recursive theory of truth where lexical axioms establish, e.g., that \textit{sick} is true of a state, \( e \), and an individual, \( x \), just in case the state is a sickness and the individual is affected by it, etc. Phrasal axioms, on the other hand, compute the values for non-lexical nodes, for instance requiring that the combination of the DP and of the VP in (57b) yield truth just in case Mary is the individual whom the sickness affects, etc.

Tenses connect events with the temporal coordinate of the attitude’s/dictum’s subject. In ‘ordinary’ matrix contexts the relevant subject is the speaker, and her coordinate is the utterance. Following Larson and Segal (1995), we let the utterance be the value the assignment sequence, \( \sigma \), associates to a distinguished index, 0, so that \( \sigma(0)=u \), for \( u \) the utterance. With this, we can write axioms for tenses like the following ones for the present and the simple past tenses:

(58) a. \( \text{Val}(e, \text{Pres}, \sigma) \text{ iff } \text{overlaps}(\sigma(0), e) \)
    b. \( \text{Val}(e, \text{Past}, \sigma) \text{ iff } e<\sigma(0) \)

They state that a given event is the value of a tense morpheme just in case it overlaps the temporal anchor/utterance (present tense), or precedes it (past tense). If we generalize the role of index 0 in such a way that, for any assignment, it is associated with the relevant temporal coordinate, then we have that tenses are always evaluated with respect to the latter. Finally, for the purposes of this paper, we hypothesise that the eventive variable contribute by the verb is (implicitly) existentially closed at the level of TP:

(59) \( \text{Val}(x, [_{TP} T \text{ VP}], \sigma) \text{ iff for some } e \text{ Val}(e, T, \sigma) \text{ and Val}(\langle x, e \rangle, \text{ VP}, \sigma) \)

In subordinate contexts we might need to consider different temporal coordinates than in matrices, as required by temporal anchoring; hence the current assignment must be

\textsuperscript{17.} For ILF theories of propositional attitude contexts, see Higginbotham (1991), Larson and Ludlow (1992) and Larson and Segal (1995).
changed into one that associates index 0 to a different entity — i.e., the very attitude/dictum. We can then distinguish between speaker-oriented, $\sigma_{sp}$, and subject-oriented, $\sigma_{sub}$, assignment sequences, taking these as ways to isolate the specific contribution different entities, the utterance and the reported attitude/dictum, make to semantic computation, and keeping in mind that in both cases those entities play the role they do because they are the temporal coordinates of the relevant agents. Hence, $\sigma_{sp}$ is such that $\sigma_{sp}(0) = u$, where $u$ is the utterance, whereas $\sigma_{sub}$ is such that $\sigma_{sub}(0) = e$, for $e$ the event of the matrix clause.$^{18}$

We can model the passage from $\sigma_{sp}$ to $\sigma_{sub}$ as the selection of an appropriate assignment sequence. The starting point is the fact that an assignment sequence is appropriate for the evaluation of a sentence only if it correctly incorporates facts about the context of utterance — e.g., by associating index 0 with the utterance, index 1 with the utterer, and so on.$^{19}$

(60) If $u$ is an utterance of $S$, then $\sigma$ is appropriate for $S$ iff $\sigma(0) = u$, $\sigma(1) =$ the utterer, etc.

We then generalize this to clauses expressing the content of attitudes — as they are ascribed to subjects by means of verbs such as believe, think, etc., and verbs of communication, such as say — by requiring of an appropriate assignment sequence that it associate index 0 with the attitude/saying episode:

(61) If $e$ is any episode of propositional attitude/saying with structural representation $S$, then $\sigma$ is appropriate for $S$ iff: $\sigma(0) = e$, ….

So, $\sigma_{sub}$ is an assignment that is appropriate to evaluate a clause embedded under a verb of propositional attitude: its temporal coordinate (the value of the 0 index) is the matrix

$^{18}$ Subject-oriented assignments are not meant to represent subjects’ referential intentions. The point of our construction is that assignments, as used in actual utterances, reflect the speaker’s intentions; when turning to propositional attitudes what the speaker intends is that the event/state figuring in the content of the subordinate clause be connected to the subject’s attitude episode, which is the same temporal anchor the subject used — that is, the subject’s temporal coordinate. The actual connection is performed through (the interpretation of) tenses.

$^{19}$ See Larson and Segal (1995).
event (the attitude/saying episode). Statement (61) incorporates the conclusions we reached above: the attitude/saying episode plays a special role in the evaluation of the embedded clause, which is similar to that played by the utterance for the matrix context; in particular, the attitude/saying episode is made available through the assignment sequence, this way becoming the new temporal coordinate. Eventually, (61) (and (60)), together with (58), provide an account of temporal anchoring — namely, the fact that embedded tenses invariably relate the event they are in construction with to the attitude episode/dictum/utterance.

Before closing this section, let us spend a few words about the imperfect (and the pluperfect). In (Giorgi and Pianesi 2003) we proposed that the imperfect tense has two features: *past and present. When such a tense combines with a temporal phrase (the time-topic), as in (62b), axiom (62a) requires that the current assignment be updated to one whose temporal coordinate is the value of the time topic.

\[(62)\]
\begin{align*}
\text{a. } & \text{Val}(t, [T-term F'], \sigma) \text{ iff there is a } \sigma' \text{ and an } x \text{ such that Val}(x, T.-term, \sigma), \\
& \sigma' \text{ is like } \sigma \text{ but for the fact that } \sigma'(0)=x, \text{ and Val}(t, F', \sigma') \\
\text{b. } & \text{[time-topic [F0-}^\text{*past} \text{ [Mario present dorme]]]}
\end{align*}

The feature *past contributes only a presuppositional check to the effect that the new temporal coordinate is past with respect to the old one; the second feature, present, is (roughly) interpreted as an ordinary present. The result is that an imperfect behaves as a present in the past.

Given this account of the imperfect, it can be expected that assignment updates due to temporal anchoring in contexts of propositional attitude suffice to satisfy its requirements. This is what happens with the so-called simultaneous readings of subordinate imperfects:20

\[(63)\]
\begin{align*}
\text{a. } & \text{Mario ha detto che Maria era incinta.} \\
& \text{Mario said that Carlo slept(IMPF).} \\
\text{b. } & \text{[…..[C-}^\text{*past} \text{ [XP … T-pres…]]]}
\end{align*}

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20. This is not meant to provide a full account of sequence of tense phenomena, but simply give enough background for our discussion. For recent theories of the sequence of tense, see (Schlenker 2002; von Stechow 2002).
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It can be shown (Giorgi and Pianesi 2001a) that the complementiser of the embedded clause, C, can attract (some or all of) the temporal features of T. E.g., in (63a) this process involves the feature *past, so that the LF for (63a) is (63b). For subordinate contexts, we can use the following axiom:

(64) \( \text{Val}(\langle e, x \rangle, [V \ [CP \ C [XP \ldots]]], \sigma) \) iff for some \( y \), \( \text{Val}(\langle e, x, y \rangle, V, \sigma) \) and \( y = /XP/_{\sigma'} \)
where \( \sigma' \) is an appropriate sequence.

This axiom is used to compute the semantic value of phrases of the form \([V \ [CP \ [XP \ldots]]]\), where \( V \) is a verb of propositional attitude, and \([CP \ [XP \ldots]]\) is its complement. It requires the ILF of the complement clause to be computed by means of an appropriate sequence, skipping the C node. According to (61), the subject-oriented one is appropriate, so it is used.

In (63b) the only temporal feature within XP is present, hence the ILF of the embedded clause of (63a) talks about a pregnancy state which is simultaneous to \( \sigma_{\text{sub}} \)'s temporal coordinate — that is, the matrix event. As to *past, it simply checks that the XP is evaluated by means of an assignment sequence \( \sigma' \) such, if \( \sigma'(0) \) is defined, then \( \sigma'(0) < u \). The test is successful: \( \sigma' \) is \( \sigma_{\text{sub}} \), and \( \sigma_{\text{sub}}(0) < u \). Eventually, we have that the content attributed to Marios’s speech is such that there’s a pregnancy state involving Maria, and that state overlaps Mario’s temporal coordinate (the reported utterance).

3.4. Double Access Readings

One way to understand the DAR consists in hypothesising that there is actually a double evaluation of the embedded clause (Giorgi and Pianesi 2001a). Skipping details, this view maintains that the meaning of:

(65) Gianni ha detto che Maria è incinta.

(66) John said that Mary is pregnant

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21. For reasons why the C node should be skipped, see Giorgi and Pianesi (2001a) and Higginbotham (1991).
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requires a two stage process: the first constructs an interpreted logical form (ILF1) for the embedded clause that purports to describe the subject’s original dictum/thought; therefore, it is computed by means of the subject-(John’s/Gianni’s) oriented assignment sequence. The resulting ILF1 is truth-conditionally equivalent to the ILF of the embedded clause of the English sentence *John said that Mary was pregnant*, and of the Italian sentence *Gianni ha detto che Maria era incinta*, considered at the end of the previous section. That is, ILF1 is true just in case Mary/Maria was pregnant at Gianni’s/John’s temporal coordinate. ILF1 is then compounded with the meaning of the matrix verb, to recover one part of the meaning of (65)-(66): there was a past utterance by Gianni/John whose content is as conveyed by ILF1, and to the effect that Mary’s/Maria’s pregnancy held at the reported saying time.

So, the first step takes care of the relationship between the subject and the content she is said to have expressed. The second step, in turn, involves the speaker, requiring the computation of another ILF (ILF2) from the same material as before, by using the speaker-oriented assignment. ILF2 talks about a current (from the speaker’s point of view) pregnancy of Mary. Such an object is not linked to the embedding verb as ILF1 was, though, this way avoiding to attribute John the content corresponding to ILF2. At the same time, ILF2 is not interpreted as being part of the speaker’s assertion. Rather, it is used to form part (and only part) of the propositional content of a speaker’s attitude.

What is relevant for our purposes is that according to this account, the embedded clause is evaluated twice: once from the perspective of the subject (by using the subject-oriented assignment) and then from the perspective of the speaker (by using the speaker-oriented assignment). We argue that it such a double evaluation process crucially explains the contrast we are discussing.

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22. If we are right, this would not only be mistaken (John might well have been only interested in Mary’s pregnancy state at his own temporal location, and completely disinterested about what could happen later) but also impossible. The very practice of anchoring thoughts/dicta content to the temporal coordinate of their subjects clashes with the possibility of having a content attributed to X which includes anchoring to the temporal coordinate of a different subject Y.

23. See Giorgi and Pianesi (2001a) for details.

24. Or, to be more precise, once to form the ILF expressing the propositional content attributed to the subject, the other time to form part of the content of the speaker attitude.
3.5. Explaining the contrast

When we talked Reichenbachian, we said that the hidden variable of our anaphoric locutions, \( x \), can have the same reference as R, provided that \( R \neq S \). When \( R = S \), \( x \) has to look around to find a different, suitable antecedent. \( S \) is the speech time/event — that is, the speaker’s temporal coordinate, \( \sigma_{sp}(0) \). So, when the current assignment sequence is the speaker-oriented one \( x \) cannot bear index 0.

In the present framework we can dispense with \( R \): it is a side-effect of the shift of temporal coordinates induced by the imperfect, which is obtained by updating the current assignment sequence to one whose temporal coordinate is in the past. Accordingly, \( R \) is nothing but the temporal coordinate of the new sequence — that is \( \sigma'(0) \) in (62), for some updated \( \sigma' \). Moreover, we know that in subordinate contexts the hidden variable of \( il \) giorno dopo can have the same reference as the attitude event. We know, by now, that this is possible only if it bears index 0, being then given the right value by the subject-oriented temporal assignment. Eventually, our previous observations in terms of \( S \) and \( R \) can be recast by saying that when the current assignment sequence is different from the speaker-oriented one, the variable of our anaphoric phrase can bear index 0.

(67) If a speaker uses \( x_0 \) in clause \( S \), then \( \sigma \) is appropriate only if \( \sigma \neq \sigma_{sp} \).

Putting (67) together with the discussion in the previous section, we have all the necessary ingredients for an account of our contrast.

(68) a. (Giovedì) Gianni ha detto che Mario era partito il giorno prima \( x \).
   Thursday Gianni has said that Mario was left the day before \( x \).

b. [(giovedì)…..[C-*past [XP … T-pres…x]]]

(69) #Giovedì Gianni ha detto che Mario è partito il giorno prima \( x \)
   Thursday Gianni has said that Mario is left the day before \( x \).

Let us start from (68a), which has the LF in (68b). The embedded CP is interpreted by means of \( \sigma_{sub} \), which, in accordance with (61), is such that \( \sigma_{sub}(0) \) is the attitude/saying event. If the variable \( x \) in \( il \) giorno prima has index 0, (67) allows it to be assigned the local temporal coordinate, \( \sigma_{sub}(0) \). The resulting ILF is the right one: it says that the content of Gianni’s dictum was that Mario left the day before the (day of the) dictum itself. That is, the ILF for the subordinate clause of (68a) has the following truth conditions (to be computed by means of \( \sigma_{sub} \), and in accordance with (51)): 

(70) \( \exists e (\text{leave}(e) \land \ldots \land \text{at}(e, \text{the-day-before}(x_0))) \)

Turning to (69), this is a DAR context. Suppose that the variable \( x \) has index 0. After going through the first phase (to compute ILF1) the resulting value for \( x_0 \) is \( \sigma_{\text{sub}}(0) \), the local temporal coordinate — that is, Gianni’s utterance. This yields a meaning close to the one we arrived at for (68a) under the same choice of indexation: the content of Gianni’s dictum was that Mario left the day before the dictum itself. When we turn to the second step, to compute ILF2 by means of \( \sigma_{\text{sp}} \), the presence of index 0 on \( x \) clashes with (67). As a consequence, no value is assigned to the hidden variable and, eventually, the computation of ILF2 fails.

In conclusion, our contrast is explained by a combination of the following factors:

- Reference to the matrix event in subordinate clauses is always mediated by appropriate assignment sequences, whereby the matrix event becomes the new temporal coordinate (temporal anchoring). As a consequence, there is no (direct) reference to the matrix event as such, but only to it as being the local anchor.
- In the readings that are crucial to our contrast, the hidden variable of *il giorno prima* bears index 0. Hence, it is subject to the (presuppositional) constraint in (67), to the effect that the speaker-oriented sequence is not appropriate.
- Double access sentences involve a double evaluation of the embedded clause: by means of the speaker-oriented sequence (the temporal anchor is the utterance), to reconstruct the subject’s attitude; and by means of the subject-oriented one (the temporal anchor is the attitude/saying episode), to account for the speaker’s one.
- In DAR contexts, the unavailability of our anaphoric expressions is due to the failure of the computation of the speaker-oriented ILF (ILF2): (67) prevents the hidden variable of *il giorno prima* from being assigned any value when it bears index 0 and the current assignment sequence is the speaker-oriented one.
4. Consequences and conclusions

Up to now, our discussion has focused on the role of the temporal anchor (an event), disregarding its temporal location on the time axis. According to the proposed theory, the temporal location of temporal anchor doesn’t seem to play an explanatory role in the different behaviours anaphoric expressions have in DAR vs. non-DAR contexts.

The temporal location of the anchor, however, is obviously relevant to compute the value of the whole anaphoric expression. According to the in the previous section, in our contrast the hidden variable of il giorno prima \( x \) (the day before \( x \)) has eventive reference: it bears index 0, and it is assigned the temporal anchor by the relevant appropriate. In the light of the discussion in §3.2, the whole anaphoric expression can therefore be paraphrased as the day that lies one day before the day of \( x \) (for \( x \)=the temporal anchor).

So, understanding what meaning the whole anaphoric expression contributes requires computing the day (hour/month/..) of \( x \), for \( x \) being the temporal anchor.

Now, temporal anchors and their temporal location behave differently. The former are manipulated and controlled by assignment sequences, under the condition that they be appropriate; moreover, for a given utterance of, say, (68a), all the possible appropriate subject-oriented sequences behave uniformly, agreeing on the value of the temporal anchor (=the subject’s temporal coordinate). This reflects the fact that there is no way for a subject uttering or thinking something to be confused or mistaken about its temporal coordinate, as long as this is the very utterance/thought she is involved in; and there is no way for her to be confused about the relationship between that entity and the event/state figuring in her dictum/thought, as such a relationship is deployed by the tense. In other words, the temporal anchor isn’t subject to error through identification.\(^{25}\)

The time of the temporal anchor — that is, the localisation of the saying/thought episode on the temporal axis — is subject to such an error, though, as much discussion in the literature about the ascription of attitudes to time-confused subjects have made clear. Hence, usual concerns about de-re/de-dicto/de-se readings of the relevant expression arise. We are not going to delve into these issues here; however, we can try to highlight possible directions for future analysis within the developed framework.

Consider the scenario below and the two possible utterances (71a) and (71b):

\(^{25}\) For the notion of ‘being subject to error through identification’, see Shoemaker (1968), Evans (1982), and Higginbotham (2003).
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(71) Gianni speaks on Wednesday, but he thinks it is Thursday. He says ‘Maria è arrivata lunedì (Maria has arrived on Monday)’

a. Gianni ha detto che Maria era arrivata due giorni prima.
   Gianni said that Mary had(IMPF) arrived two days before.

b. Gianni ha detto che Maria era arrivata tre giorni prima.
   Gianni said that Maria had(IMPF) arrived three days before.

Both (71a) and (71b) are appropriate reports of what Gianni said, though for different reasons. Informally speaking, we can say that given the background story, when uttering (71a) the speaker adopts her own perspective on the temporal axis: the time of the subject’s temporal coordinate is Wednesday, and the leaving about which the subject reports is located two days before it (on Monday); this makes for a correct report of Gianni’s dictum. On the other hand, given the same background story, (71b) invites the adoption of the subject’s (=Gianni’s) point of view: the temporal anchor, the dictum, is located on Thursday, and the reported leaving occurs three days before it, again, on Monday. Thus, (71a) and (71b) yield two ILFs with similar truth conditions. They differ because of the lexical material they contain (due giorni prima vs. tre giorni prima), although the relevant nodes are annotated with the same semantic value — namely, Monday.

The possibility of using both (71a) and (71b) in the given scenario relies on knowledge about Gianni’s problems (or absence thereof) in locating himself in time, which the background makes available to both the speaker and the hearer. Hadn’t the relevant information been supplied, one could hardly interpret (71b) the way suggested above.

We can develop these ideas by hypothesising that the two anaphoric expressions in (71a) and (71b) differ in their hidden portions. That of (71a) simply amounts to the day of x (for x=the temporal anchor), in line with the discussion in §3.2 and with (51). The hidden description of (71b), on the other hand, would be the more verbose the day the subject thinks x (for x=the temporal anchor) to be located at. These unspelled descriptions can then be interpreted as directly picking up the relevant values from the context, e.g., by means of the following axiom:

(72) \text{Val}(x, [\text{det NP}], \sigma) \iff x \text{ is the unique object such that } \text{Val}(x, \text{ NP}, \sigma).

We have are readings very close to E-type ones, with the variable referring to an event (in the way discussed above), and the context supplying a suitable descriptive material,
according to what is salient in the given context: the missing NP corresponding to the day of \( x \), for (71a), and the day Gianni thinks \( x \) is located at for (71b).

Now suppose that Gianni was so confused that, despite being able to utter ‘Maria è arrivata lunedì (Mary arrived on Monday)’, he cannot tell whether the day he so does is Tuesday, Wednesday, etc. The dictum can be reported by using an anaphoric expression, e.g., as in (71a), and interpreting it as containing the hidden description the time of \( x \) (for \( x=\)the temporal anchor), provided that the context makes available knowledge about when Gianni so uttered. So, we might still know that he spoke, say, on Wednesday, and we can get the correct value for the hidden part of the anaphoric expression by means of (72). Obviously, given the overall context, and what Gianni says (he refers to a particular day in his dictum), it makes no sense to interpret the anaphoric expression as we did for (71b).

Another possibility is that Gianni, despite being completely confused about his localisation in time, is capable of correctly tracing the passage of time, so that he can use an indexical expression and truthfully say:

\[
(73) \text{Non so che ore siano, ma Carlo è arrivato due ore fa.}
\]

I don’t know what time it is, but Carlo has arrived two hours ago.

This can be reported in the usual way:

\[
(74) \text{Gianni ha detto che Carlo era arrivato due ore prima.}
\]

Gianni said that Carlo had arrived two hours before.

Here we have two options: either the contexts makes available the ‘true’ time of the temporal anchor, so that the hidden part of the anaphoric expression is the time of \( x \) (for \( x=\)the temporal anchor), and (74) is, again, on a par with (71a). Or, there is no cue in the context about that time, and/or the speaker herself is similarly confused about time, as in the following case:

\[
(75) \text{Non so a che ora l’ho incontrato, ma mi ha detto che Carlo era arrivato due ore prima.}
\]

I don’t know at what time I met him, but he told me that Carlo had arrived two hours before.
In these cases it seems that we must read the hidden part of the anaphoric expressions in (74) and (75) as: *the hour of* $x$ (*for* $x$ = *the temporal anchor*), *whatever that might be* — that is, with the hidden description used attributively. The modal strategy is a possible one for cases like these, and consists in considering the possible alternative localisations of the dictum/thought episode (in terms of contextual indices) that could be compatible with the subject’s thoughts/dicta.

However, some caution should be exercised to better assess the acceptability of (74) in the given conditions. Indeed, informants report that its English counterpart, e.g., (76), is acceptable insofar as there is the presupposition that either the speaker knows about the time of the saying (and by this, we mean, the real time or the subject’s one) or the subject’s does.

(76)  John said that Mary had left two hours before

If neither is the case, then (76) is unintelligible. Our judgments of Italian sentences corresponding, or similar to (76), e.g., (75), is that they are fully acceptable. If so, the oddity of the English counterpart could be traced back to stronger constraints on the acceptability of attributively-used definite descriptions in the course of the process leading to spelling out the meaning of temporal anaphoric phrases.

To sum up, in this paper we have discussed some of the properties of anaphoric temporal locutions such as *il giorno prima* (*the day before*) in Italian, focusing on their behaviour in clauses embedded under verbs of propositional attitude and of communication. We discovered an interesting contrast: when the DAR is enforced, the hidden variable of an embedded anaphoric phrase doesn’t seem capable to pick up the same referent as the matrix event, whereas this is possible in non-DAR contexts. To explain this fact we argued that:

- Reference to the matrix event in subordinate clauses is always mediated by appropriate assignment sequences, whereby the matrix event becomes the new temporal coordinate (temporal anchoring), being assigned to index 0. The notion of appropriateness for assignment sequences can be elucidated by extending Larson and Segal’s (1995) account.
- As a consequence, there is no (direct) reference to the matrix event as such, but only insofar as it is the temporal anchor. We can distinguish, therefore, between speaker-oriented sequences, which associate index 0 with the utterance, and subject-oriented ones, which link index 0 with the very attitude/saying event.
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- 0-indexed variables are subject to a (presuppositional) constraint, cf. (67), that excludes speaker-oriented sequences as not appropriate.
- We relied on Giorgi and Pianesi’s (2001a) theory of the DAR, according to which double access sentences involve a double evaluation of the embedded clause: by means of the speaker-oriented sequence (the temporal anchor is the utterance), to reconstruct the subject’s attitude; and by means of the subject-oriented one (the temporal anchor is the attitude/saying episode), to account for the speaker’s one.
- Such a theory has the consequence that in DAR contexts the second step of the computation cannot be accomplished, because: a) it exploits the speaker-oriented assignment, and b) the presuppositional constraint mentioned above prevents the hidden variable of _il giorno prima_ from being assigned any value when it bears index 0 and the current assignment sequence is the speaker-oriented one.

Finally, we discussed problems related to providing a full semantics for anaphoric locutions in embedded clauses.
References


