

# Strategies of relativization in LIS<sup>1</sup>

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## 1 Introduction

In this paper, we focus on what we will label *prorel clauses*, namely a construction of LIS (Lingua Italiana dei Segni, "Italian Sign Language") that is commonly used, in interpreting practice, to translate Italian relative clauses. To our knowledge, this construction has never been systematically investigated by linguists although it presents several puzzling properties if compared to the Italian construction which is used to translate. Here, we'll argue that indeed *prorel clauses* are quite different, both syntactically and semantically, from Italian relative clauses and they are related to correlative constructions investigated for Hindi by Dayal (1996).<sup>2</sup>

Our discussion will proceed in this way. Section 2 briefly addresses some methodological issues concerning the way the data discussed in this paper have been elicited. Section 3 spells out some assumptions concerning the syntactic structure of LIS that will be the background of our proposal. Section 4 presents the data we have collected concerning *prorel clauses*. Our proposal concerning the syntactic structure of these clauses is presented in section 5, while section 6 contains our semantic analysis. Section 7 sums up our conclusions.

## 2 Methodology

By LIS, we mean the language used by native signers belonging to the Italian Deaf community, deaf people who have been exposed to sign language from birth (as is common with sign languages, native signers of LIS are a minority in the community of deaf signers because most deaf people have hearing parents). The investigation on LIS structures that translate Italian relative clauses, which is carried out in this paper, is part of a larger research project on LIS, a language largely neglected for which no descriptive grammar exists (not to mention theoretically oriented work in the generative framework).

In particular, the data we discuss in this paper mainly come from three informants with different backgrounds, who nonetheless largely use the same type of construction to translate Italian relative clauses (there is only one significant difference among them, as we will make clear in our discussion). It is worth mentioning that some non-native Deaf signers we consulted do *not* use this construction (although they understand its meaning), but tend to use a word order that reproduces the word order of Italian relative clauses. In this paper, we do not discuss the linguistic behavior of non-native signers of LIS.

The three Deaf signers who acted as our informants on *prorel clauses* have an excellent knowledge of Italian as a second language, so they have been willing to work with us on a simple basis: they signed for us what they thought was the most natural way to express in LIS the meanings of the Italian sentences that we proposed to them. We videotaped the LIS sentences they produced and studied the videos by using SignStream, a software developed for the purpose of creating sign language databases. One of the authors of this paper is a hearing native signer of LIS and his expertise was critical for the assessment of the data. However, we decided not to use his intuitions, since they occasionally diverge from the intuitions of Deaf native sign-

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<sup>2</sup> Although, as we will see, they also differ from Hindi correlatives from an interpretive point of view.

ers of LIS. A video selection of the data we discuss (or of variants that are equivalent for our purposes) is available at <http://filosofia.dipafilo.unimi.it/~zucchi/materiali.html> The reader is advised to look at the videos while reading this manuscript.

The result of our investigation, as we have already anticipated, is a pattern of sentences in LIS on which the three informants largely agree. A possible concern is that this way of eliciting sentences could induce our informants to produce structures influenced by the Italian input rather than productive LIS sentences. However, our informants do not generally use structures that mimic the word order of Italian relative clauses. In particular, and most significantly, we tested four types of relative clauses that in Italian (like in English) share the same type of structures, namely all of them are externally headed relative clauses (in this paper, we give glosses and translation of LIS sentences directly in English for ease of the reader). We tried to elicit the LIS counterpart of relative clauses on the subject in which the complex NP which contains the relative clause is the subject of the main clause (cf. 1a), the LIS counterpart of relative clauses on the subject in which the complex NP which contains the relative clause is the object of the main clause (cf. 1b), the LIS counterpart of relative clauses on the object in which the complex NP which contains the relative clause is the subject of the main clause (cf. 1c), and the LIS counterpart of relative clauses on the object in which the complex NP which contains the relative clause is the object of the main clause (cf. 1d).

- (1) a. A boy [that *e* called] left
- b. Mary kissed a boy [that *e* left]
- c. A boy [that Mary kissed *e*] left
- d. John hit a boy [that Mary kissed *e*]

The important methodological observation is the following. In Italian (or English) all sentences in (1a)-(1d) are cases in which a noun (in the case at hand, *boy*) immediately precedes the relative clause that contains a gap (indicated by *e*) and modifies the noun. However, our informants, when asked to sign the counterpart of sentences like (1a) to (1d), produced structures that *prima facie* are not uniform. As we will show in detail in this paper, in some cases, they seemed to produce externally headed relative clauses like the ones found in English and Italian, in other cases they seemed to produce internally headed relative clauses like the ones found in many SOV languages, still in other cases no obvious parallelism with these spoken languages was available. This seriously puzzled us during the phase of elicitation of the data but we think that the pattern of LIS is amenable to a unified explanation. Crucially, this explanation, which is the only way we could think of to make sense of such a diversified pattern, assumes that the functional equivalents of relative clauses in LIS are never externally headed relative clauses, that is, the elicited sentences in LIS are structurally quite different from the Italian sentences that have been used to elicit them.

### 3 Some general properties of LIS

In this section we describe some general properties of the variety of LIS spoken by our informants. The section is not, for obvious reasons, an attempt to offer a comprehensive grammar of LIS, but is intended to give just the necessary background to situate the discussion on relative constructions in the proper perspective. In our examples, we follow the standard convention of using capitalized words for signs.

For our informants, the basic word order in a simple LIS sentence like (2) is SOV:

- (2) GIANNI MARIA LOVE  
     "Gianni loves Maria"

Our informants tell us that SOV is the non marked order in spontaneous conversations among native speakers of LIS, although the SVO order is often used when native speakers communicate with non native speakers who are influenced by the dominant SVO order of Italian.

Strictly speaking, LIS does not have auxiliaries but there are some lexical elements that plausibly sit in the functional categories in the clausal domain and allow us to locate these categories in the structure. Interestingly, all these lexical elements are postverbal. One example is modal verbs:

- (3) GIANNI METER 80 JUMP CAN  
     "Gianni can jump 1.80 mt."

- (4) GIANNI APPLY CAN  
“Gianni can apply”

Another example is markers like DONE, whose function is to indicate that the action described by the verb is completed. DONE occurs postverbally too:

- (5) GIANNI HOUSE BUY DONE  
“Gianni bought a house”

Although we refer to Zucchi (2004) for a more complete discussion on this, let us mention that DONE is to be considered as an aspectual rather than as a tense marker. Tense is not expressed in LIS by a modification of the manual sign but in other ways. In some varieties of LIS a non-manual marking (namely the position of the shoulder in the neutral space) explicitly indicates tense. Temporal information may also be contextually determined<sup>3</sup> or, when the context is not enough, time adverbs are introduced. One reason to consider DONE an aspectual rather than a tense marker is its interaction with negation. Negation in LIS is also found after the verb:

- (6) GIANNI MARIA LOVE NOT  
“Gianni doesn’t love Maria”

However, DONE and negation are never acceptable together:

- (7) a. \*GIANNI HOUSE BUY DONE NOT  
b. \*GIANNI HOUSE BUY NOT DONE

The pattern in (7) makes sense if DONE is used to indicate that the action refereed to by the verb has been concluded, for the negative sentences in (7) affirm that the action of house building by Gianni was never completed. If DONE were a marker of past tense, the pattern in (7) would be mysterious, since negative sentences in the past tense are possible in principle. We spent some words on the status of DONE, because in the examples of relative constructions that we will discuss in this paper DONE is not always present in sentences in the past tense. After what we said, this will not surprise the reader.

To sum up, DONE, negation and modals all occur after the lexical verb and this suggests that the functional projections that host them are located on the right side of the VP. Time adverbs like *yesterday*, *in the past*, *tomorrow*, *in the future*, etc. are found in sentence-initial position:

- (8) IN-THE-PAST GIANNI HOUSE BUY.  
“In the past Gianni bought a house”

Other adverbs like *in time* are found in sentence final position, though.

- (9) GIANNI ARRIVE ON-TIME  
“Gianni arrived on time”

Another interesting property of LIS is that, as in other sign languages, *wh*-phrases are found at the right periphery of the sentence:

- (10) GIANNI BUY WHAT  
“What did Gianni buy?”

- (11) HOUSE BUY WHO  
“Who bought a house?”

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<sup>3</sup> For this reason, our translations of some LIS sentences are in the past tense, since they were elicited to describe past events, although there is nothing in the sentence that explicitly indicates that the action is past.

We can now ask about the relative order of lexical elements that follow the verb. There is clear evidence, that *wh*-phrases are ‘more peripheral’ than elements like IN-TIME (cf. 12), negation (cf. 13) , and DONE (cf. 14):

(12) ARRIVE IN-TIME WHO  
“Who arrived in time?”

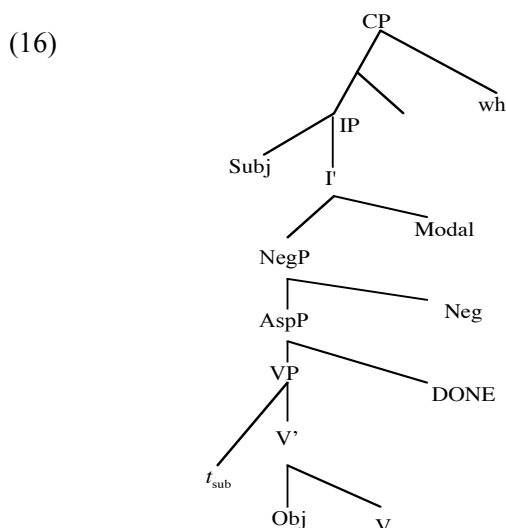
(13) CAKE EAT NOT WHO  
“Who did not eat the cake?”

(14) GIANNI SEE DONE WHO  
“Who did Gianni see?”

A final piece of information concerns the relative position of negation and adverbs like ON-TIME. As (15) indicates, negation must follow ON-TIME:

(15) GIANNI ARRIVE ON-TIME NOT  
“Gianni did not arrive on time”

If we put these pieces together, we can offer a tentative skeleton of the structure of the LIS sentence. We take LIS to be a head final language, at least in the clausal domain, because the verb follows the object and the functional heads that host the aspectual marker and negation follow the verb. As for *wh* phrases, we tentatively propose that they sit in a Spec,CP position which is located on the right branch. We are aware that this assumption is controversial (see Wilbur and Patschke 1999 and Petronio and Lillo Martin 1997 for various objections). However, Neidle et Al. (2000) have offered convincing arguments that Spec,CP is on the right side in ASL. Furthermore, we have presented arguments specifically based on LIS that suggest that the same conclusion holds for this language (see Cecchetto and Zucchi 2004). In the tentative representation in (16) we use the label IP to remain neutral on the issue, which is not crucial for us in this paper, concerning the existence of an autonomous functional projection of agreement (see Chomsky 1995: chapter 4 for discussion on this general issue and section 5.2 below for some discussion of how agreement is realized in LIS). In (16), we also assume that the subject originates in Spec,VP in LIS, as is ordinarily assumed for other languages, and that the object sits in its base position inside the VP.<sup>4</sup>



<sup>4</sup> It should be mentioned, however, the word order facts are also consistent with the possibility that the object has moved to a VP-external position (Spec,AgroP or the outer Spec of the VP, depending on the framework one wants to assume). The choice between the two possibilities is immaterial for our purposes, so, mostly for simplicity sake, we assume that the object does not move from its base position.

As for adverbs like TOMORROW, we assume that they are adjoined to IP, while adverbs like IN-TIME (and ON-TIME) are right adjoined to VP (alternatively, one may assume a more sophisticated hierarchy of functional projections and locate these adverbs in the appropriate projections in the relevant portion of the structure, in the spirit of Cinque's (1999) work).

The structure in (16) is a tentative proposal for the clause internal structure of LIS. Many specific issues are to be explored from scratch. One big issue to be investigated is subordination. In this paper, we explore just one facet of this issue, namely the strategies of relativization.

Another area of the syntax of LIS that still waits to be examined in detailed is the internal structure of the nominal domain. We just offer two pieces of information about this, leaving a more adequate analysis to another occasion. First, LIS does not have articles and the definite or indefinite character of the NP is retrieved from the context. Second, LIS has lexical elements that look like determiners, in particular numerals like TWO, THREE, etc. and ALL. As far we can understand, these determiners may occur postnominally (though they may also precede the noun). The exact reasons for their location before or after the noun are not totally clear:

- (17) STUDENT THREE ARRIVE  
THREE STUDENT ARRIVE  
"Three students arrived"
- (18) STUDENT ALL ARRIVE DONE  
ALL STUDENT ARRIVE DONE  
"All the students arrived"

Lacking an in depth examination, we will use the label NP to refer to the nominal constituent. This does mean that we believe that LIS lacks the functional projection DP. We simply leave the question open and adopt the analysis in terms of NP for the sake of simplicity. Having spelled out the necessary background information, let us move to consider the functional counterparts of relative clauses in LIS.

## 4 Describing the pattern of *prorel* constructions

In this section, we discuss the functional equivalents in LIS of the relative clauses in (1a-d). We start from what is arguably the simplest structure, that is a relative clause on the subject which is contained in a complex NP which is also a subject (cf. 1a). We use this simple structures to illustrate some general properties of *prorel* constructions in LIS.

- (1) a. A boy [that *e* called] left  
b. Mary kissed a boy [that *e* left]  
c. A boy [that Mary kissed *e*] left  
d. John hit a boy [that Mary kissed *e*]

Remember that our choice to describe *prorel* constructions as "LIS functional equivalents of relative clauses" rather than simply as "LIS relative clauses" is deliberate. It should not be taken for granted that *prorel* constructions have the same structures as the corresponding relative structures. Indeed, we will see that LIS *prorel* constructions differ both syntactically and semantically from Italian (and English) relative clauses.

### 4.1 The functional equivalent of a relative clause on the subject

#### 4.1.1 Complex NPs in subject position

Following standard practice, we say that the complex NP *A boy that called left* contains a relative clause on the subject, since, sloppily speaking, the noun *boy* is understood as the subject of the relative clause *that called*. The noun modified by the relative clause (*boy* in the case at hand) is called "head noun". In (1a) the complex NP *a boy that called*, which is formed by the head noun (*boy*), by the relative clause (*that called*), and by the determiner of the head noun, is the subject of the main clause. So, in (1a) the complex NP that

contains a relative clause on the subject is the subject of the main clause. Sentence (1a) is signed by our informants as in (19) or in (20):

(1) a. A boy [that *e* called] left

(19) BOY<sub>i</sub> CALL *prorel*<sub>i</sub> LEAVE DONE

(20) BOY<sub>i</sub> CALL *prorel*<sub>i</sub> HE<sub>i</sub> LEAVE DONE

The sign glossed as *prorel* is a pronominal element whose manual configuration is distinct from that of other personal pronouns. It is signed with the wrist bent toward the floor, the hand closed with the index finger extended that moves from left to right. *Prorel* in (19)-(20) and the pronoun HE in (20) are signed in the same position in the space where BOY is signed. This indicates that these terms are referentially linked. We represent this fact by assigning the same index to them. According to one informant, *prorel* may also naturally occur adjacent to the noun, as shown in (21), although the other two informants consider sentences like (21) only marginally acceptable.

(21) BOY<sub>i</sub> *prorel*<sub>i</sub> CALL LEAVE DONE

This disagreement on the exact position of *prorel* is the only significant difference among our informants. We return to it in section 6. For the time being we focus on the version of *prorel* constructions in which *prorel* is not adjacent to the noun.

As (20) shows, *prorel* may co-occur with a pronoun. However, it cannot co-occur with an overt noun:

(22) \*BOY<sub>i</sub> CALL *prorel*<sub>i</sub> BOY<sub>i</sub> LEAVE DONE

Before proceeding, it is worth pointing out that *prorel* constructions are clearly distinguished from conjunctions in LIS. Sentence (23) is translated in LIS without *prorel*. A pause is needed between the first and the second sentence (the subject of the second clause may be left implicit, since LIS is a pro-drop language).

(23) A boy left and he called.

(24) BOY<sub>i</sub> (HE<sub>i</sub>) CALL DONE (HE<sub>i</sub>) LEAVE

Although the data are not entirely homogeneous, *prorel*-constructions in LIS are also distinguished from plain conjunctions by facial expression. For example, the informants signing (19) to express (1a) display an 'open' expression (raised highbrows) while signing CALL *prorel*<sub>i</sub>.

(19') raised highbrows  
BOY<sub>i</sub> CALL *prorel*<sub>i</sub> LEAVE DONE

On the other hand, no such contrast is ever observed when they sign the conjunction in (24).<sup>5</sup>

Finally, a third argument that positively shows that the *prorel* construction is not the conjunction of two independent sentences is that it cannot be split in two sequences that can be used in isolation. For example, the sequence BOY CALL *prorel* is ungrammatical on its own and the same happens with the sequence *prorel* LEAVE DONE.

To sum up, *prorel* constructions are distinguished from plain conjunctions by the presence of a special sign (*prorel*) and of a non-manual marking that necessarily occurs on *prorel* and can also spread over other parts of the structure. As expected, a sentence that contains *prorel* cannot be split in two autonomous segments.

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<sup>5</sup> In other types of *prorel* clauses, the open expression is present on *prorel*, but does not necessarily spread over other elements in the sentence. We have to postpone to another occasion the analysis of the reasons that motivate the extent of spreading. We will not signal anymore the spreading on *prorel*, but the reader should be aware that it is always present.

#### 4.1.2 Some general properties of *prorel* constructions

We now use simple *prorel* constructions of the type so far introduced to illustrate some general properties that apply to other types of *prorel* constructions as well.

We have said that (19) translates a sentence containing a complex NP which is indefinite. However, as we said, LIS does not have overt definite and indefinite determiners like English *the* and *a*. Bare NPs may be generally understood as definite or indefinite depending on the context. This possibility is also preserved in constructions with *prorel*, since BOY in (19) may also be understood as definite in appropriate contexts. Universal quantifiers can also be construed with *prorel*. Sentence (25) is signed by our informants as (26):

(25) All the boys that left called.

(26) ALL BOYS<sub>i</sub> LEAVE *prorel*<sub>i</sub> THEY<sub>i</sub> CALL

However, at a closer look, it turns out that (25) is not the exact translation of (26), since (25) and (26) differ in interpretation in one important respect. We have discovered that, while English sentence (25) does not entail (27), LIS sentence (26) does.

(27) All the boys left.

This is an important difference between relative clauses in languages like English and Italian and *prorel* constructions in LIS. All native signers that we have consulted have sharp judgments on this point and think that (26) implies that all the (relevant) boys must have left. For example, (25) may be uttered to describe a situation in which John, Bill, and Peter are the boys, John and Bill left, Peter didn't leave, and John and Bill called. LIS sentence (26), on the other hand, cannot be uttered truthfully in this situation. In other terms, *prorel* constructions are not restrictive. If anything, they are semantically closer to non-restrictive relative clauses or to plain conjunctions ((26) roughly means "all the boys left and called"). We will present a more precise semantic analysis of *prorel* constructions in section 6.

Another interesting semantic property of *prorel* sentences is that negative quantifiers like *no one* cannot be construed with *prorel*. A sentence with a negative subject like the ones in (28) can be signed either as (29a) or as (29b). However, the *prorel* sentences corresponding to (31) are both out.

(28) a. No one arrived  
b. No one left

(29) NO-ONE ARRIVE DONE

(30) LEAVE NO-ONE

(31) No one that left called

(32) \*LEAVE NO-ONE *prorel* CALL DONE

(33) \*NO-ONE LEAVE *prorel* CALL DONE

Finally, NPs with numerals can be construed with *prorel*:

(34) Three boys that left called.

(35) THREE BOYS<sub>i</sub> LEAVE *prorel*<sub>i</sub> (THEY<sub>i</sub>) CALL

(36) BOYS<sub>i</sub> THREE LEAVE *prorel*<sub>i</sub> (THEY<sub>i</sub>) CALL

### 4.1.3 Complex NPs in object position

Let us now move to the second relevant case of *prorel* constructions, namely the functional equivalent of (1b): a complex NP that still contains a relative clause on the subject (as in the cases considered so far) but sits in the object position. Interestingly, our informants use (37) or (38) to express (1b):<sup>6</sup>

- (1) b. Mary kissed a boy [that *e* left]
- (37) MARIA BOY<sub>i</sub> cl-person KISS *prorel<sub>i</sub>* LEAVE DONE
- (38) MARIA KISS cl-person<sub>i</sub> *prorel<sub>i</sub>* LEAVE DONE

These data are interesting since in LIS sentences like (19) or (20) the complex NP *a boy that left* seems to be translated by the sequence [BOY<sub>i</sub> LEAVE *prorel<sub>i</sub>*].

- (19) BOY<sub>i</sub> LEAVE *prorel<sub>i</sub>* CALL DONE
- (20) BOY<sub>i</sub> LEAVE *prorel<sub>i</sub>* HE<sub>i</sub> CALL DONE

Given the SOV character of LIS, a priori one might expect our informants to translate *Maria kissed a boy that left* by using a LIS sentence like (39). However, our informants consider (39) ungrammatical (with the partial exception of one informant who accepts it as a non-preferred variant).

- (39) \*MARIA [<sub>NP</sub> BOY<sub>i</sub> LEAVE *prorel<sub>i</sub>*] KISS DONE

In section 5, we will offer an account for why the very same complex NP *a boy that left* is translated in two different ways in LIS depending on its placement in subject or in object position.

## 4.2 The functional equivalent of a relative clause on the object

We have seen so far how relative clauses on the subject are translated in LIS. Let us now look at relative clauses on the object. NPs like *a boy that Mary kissed* are usually called relative clause on the object because the head noun *boy* corresponds to the object position inside the relative clause. Let us start from a sentence like (1c). In this sentence, the complex NP that contains a relative clause on the object sits in the subject position of the main clause. Sentence (1c) is signed in LIS as in (40):

- (1) c. A boy [that Mary kissed *e*] left
- (40) BOY<sub>i</sub> MARIA KISS *prorel<sub>i</sub>* LEAVE

The structure in (40) sounds familiar to an English (or Italian) speaker for, as in the sequence *a boy that Maria kissed*, in the LIS sentence the head noun seems to precede the clause by which it is modified. So, it is tempting to consider the sequence [BOY<sub>i</sub> MARIA KISS *prorel<sub>i</sub>*] as the translation in LIS of the complex NP *a boy that Mary kissed*. However, as we have already observed for the case of relative clauses on the subject, the pattern becomes murkier if one considers cases in which the very same complex NP *a boy that Mary kissed* appears in the object position. For example, (1d) is signed by our informants as in (41):

- (1) d. John hit a boy [that Mary kissed *e*]
- (41) GIANNI BOY<sub>i</sub> HIT *prorel<sub>i</sub>* MARIA KISS DONE

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<sup>6</sup> In (37), our informants elicited the classifier for person next to BOY. The presence of this classifier is optional in this case.

In (41) the sequence [BOY<sub>i</sub> MARIA KISS *prorel*<sub>i</sub>], which allegedly corresponds to the complex NP *a boy that Mary kissed*, is discontinuous. A simple parallelism with the English and Italian structures cannot be maintained.

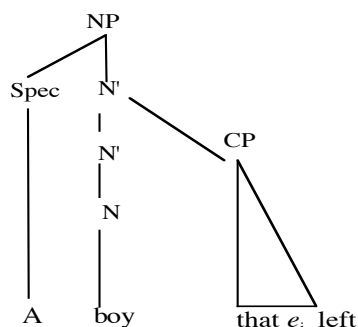
## 5 A syntactic analysis of *prorel* constructions

In this section, we consider three alternative syntactic analyses for *prorel* constructions. According to the first analysis they are externally headed relatives, that is, they are structurally similar to relative clauses in English or Italian. We will show that, despite some initial evidence in its favor, this analysis is inadequate and is to be rejected. The second and the third analyses take *prorel* constructions to be internally headed relatives and correlatives, respectively. These two analyses are both much more empirically satisfactory than the first one. Although there is no overwhelming evidence in favor of one over the other, some considerations suggest that *prorel* constructions are better treated as correlatives. We will postpone a conclusive choice between the latter two analyses after considering the semantics of *prorel* constructions in section 6.

### 5.1 *Prorel* constructions are not externally headed relatives

English relative clauses are traditionally called externally headed, since, informally speaking, the head noun is located outside the relative clause that modifies it. A structure often assumed for a complex NP like *a boy that left* (cf. Partee 1975 and much following work) is given in (42) below ( $e_i$  is the empty subject of the relative clause; for simplicity sake, we leave out various functional categories and we do not give a more complete representation in terms of DPs):

(42)



For our purposes, it is not necessary to choose a specific implementation of this analysis. In particular, we won't discuss if the head noun and the empty category inside the relative clause are transformationally related (cf. Vergnaud (1974) and Kayne (1994)) or are linked by the mediation of a null operator located in Spec,CP whose trace is the category  $e_i$ . The question we have to address, which is not dependent on any specific implementation of the analysis sketched in (42), is whether *prorel* constructions are externally headed or not.

In order to test this hypothesis, one is better advised to look at relative clauses on the object, since in relative clauses on the subject the head noun is expected to occupy the clause initial position no matter which analysis the *prorel* constructions is given. As we saw, our informants sign a relative clause on the object like the one in (1c) as in (40):

(1) c. A boy [that Mary kissed  $e$ ] left

(40) BOY<sub>i</sub> MARIA KISS *prorel*<sub>i</sub> LEAVE

In (40), the object BOY of the *prorel* construction precedes the subject MARIA. It is therefore tempting to say that the structure [BOY<sub>i</sub> MARIA KISS *prorel*<sub>i</sub>] is an externally headed relative clause, much like its English counterpart *a boy that Maria kissed* (shortly, we will offer motivation for not putting *prorel* in the main clause).

We think that LIS does *not* have externally headed relatives, though. To show why it is so, we need to consider the distribution of time adverbs like YESTERDAY, which, as anticipated, are found in clause-initial

position (cf. sentence (8) in section 3). Keeping the position of time adverbs in mind, it is easy to see that (44), which is the LIS counterpart of (43), shows that, contrary to what might seem at a first glance, HOUSE is not an external head of the relative clause:

(43) The house Mary saw yesterday burnt today.

(44) YESTERDAY HOUSE<sub>i</sub> MARIA SEE *prorel*<sub>i</sub> TODAY BURN

If HOUSE were an external head, it should precede rather than follow the time adverb YESTERDAY, contrary to fact.

The same conclusion can be extended to the noun BOY in (40). Moreover, sentence (46), which is the LIS counterpart of (45), shows that BOY is not the external head of LIS sentence (19) either. We conclude that the head of *prorel* constructions is not external either in *prorel* constructions that translate relative clauses on the subject or in *prorel* constructions that translate relative clauses on the object.

(45) A boy that left yesterday called today.

(46) YESTERDAY BOY<sub>i</sub> LEAVE *prorel*<sub>i</sub> TODAY CALL.

The distribution of time adverbs allows us to draw another important conclusion. A priori, it is not totally clear whether *prorel* belongs to the main clause or to what we have been calling *prorel* construction. For example, since the manual configuration of *prorel* resembles (although it is distinct from) a demonstrative pronoun, it is not unconceivable that *prorel* is the subject of the main clause. However, this hypothesis can be discharged by giving a closer look at sentences like (44) and (46). In (44) and (46), *prorel* precedes the time adverb TODAY, which modifies the main clause. This shows that *prorel* does not occupy a position in the main clause, but is positioned in the right periphery of what from now on we will call *prorel* clause.

This conclusion about the position of *prorel* is reinforced by another observation. Remember from sentence (20) that *prorel* can coexist with an overt pronominal subject in the main clause. Since LIS is a pro-drop language, it is very natural to assume that, whenever an overt subject is absent, the subject position of the main clause is occupied by *pro*. But, in (20), the subject position of the main clause is occupied by an overt pronominal, therefore, there could be no slot for *prorel* in the main clause.

(20) BOY<sub>i</sub> LEAVE *prorel*<sub>i</sub> HE<sub>i</sub> CALL DONE

In this paragraph, we have reached a negative conclusion (*prorel* clauses are not externally headed) and a positive one (*prorel* sits somewhere in the right periphery of the *prorel* clause). Let us try to move on to reach a more precise characterization of the structure under consideration.

## 5.2 Are *prorel* constructions internally headed relatives?

If LIS *prorel* clauses are not externally headed relative, an obvious alternative comes to mind, namely that they are internally headed. Basically, internally headed relative clauses appear to be NPs dominating a sentence and lacking an (overt<sup>7</sup>) external head. The noun that is modified by the relative clause sits in its canonical position inside the relative clause.

Since internally headed relative clauses are typically found in many verb final languages (see Keenan 1985, Grosu 2000 for a typological discussion), their presence in LIS would be consistent with typological generalizations. Furthermore, Liddell (1980), Miller (1990) and Fontana (1990) have suggested that relative clauses in ASL are internally headed and have proposed different structural implementations of this idea.<sup>8</sup> So, let us carefully explore the plausibility of this idea by considering all the LIS sentences that our informants produced when asked to sign the relative clauses in (1a-d).

<sup>7</sup> We need this qualification because Cole (1987) and others propose that so-called internally headed relatives are parified at LF to externally headed relatives by movement of the head noun to an external *empty* head position.

<sup>8</sup> On ASL relative clauses, see also Wilbur and Patschke (1999) for discussion.

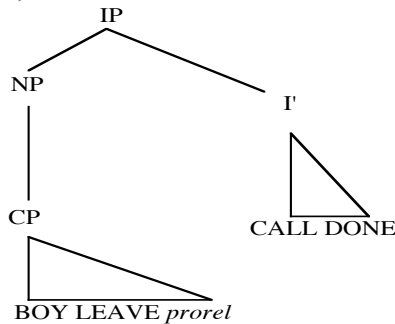
➤ **The case in (1a)**

If LIS *prorel* constructions are internally headed relatives, LIS sentence (19) (which translates sentence (1a)) should receive representation (19'):

(1) a. A boy [that *e* called] left

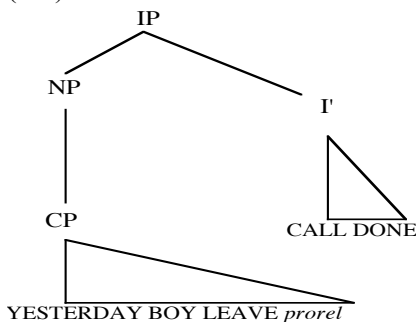
(19) BOY<sub>i</sub> LEAVE *prorel*<sub>i</sub> CALL DONE

(19')



A structure like (19') can easily explain the distribution of time adverbs with respect to the head noun. As we know from sentences like (46) above, the head noun (BOY, in the case at hand) follows a sentence initial adverb like YESTERDAY. This is expected if the head noun in (46) sits in the subject position inside the *prorel* clause rather than being an external head:

(46')



We conclude that the account that takes *prorel* clauses to be internally headed relatives is able to explain the structure of LIS sentences that translate the type of relative clause found in (1a).

➤ **The case in (1b)**

Let us now confront this analysis with the LIS sentence signed as a translation of (1b):

(1) b. Mary kissed a boy [that *e* left]

As we saw, our informants produced (37):

(37) MARIA BOY<sub>i</sub> KISS *prorel*<sub>i</sub> LEAVE DONE

This structure does not follow immediately from the hypothesis that *prorel* clauses are internally headed but is consistent with it if one is willing to make a couple of auxiliary assumptions. In particular, our explanation for the pattern in (37) capitalizes on the fact that *prorel* constructions are not restrictive. First, notice that even in English a sentence like *Maria kissed a boy that left* is truth-conditionally equivalent to a sentence like *a boy that Maria kissed left*. Of course, in English the equivalence between the two types of sentences breaks down with other sentence pairs, as shown for example by the cases in (i):

- (i) *Maria kissed the boy that left* versus *the boy that Maria kissed left* (the former sentence presupposes that just one boy left in the relevant context, while the latter sentence presupposes that Maria kissed just one boy in the relevant context)

However, *prorel* constructions are not restrictive (cf. section 4.1.2 above). And the non-restrictive counterparts of sentence pairs like those in (i) are still equivalent: *Maria kissed the boy, who left* is truth-conditionally equivalent to *the boy, who Maria kissed, left*.

With this in mind, look again at (37). As a matter of fact, if *prorel* clauses are internally headed relatives, (37) is the closest possible translation in LIS of the English sentence *a boy that Maria kissed left*. In (37') this is made explicit by the bracketing. The head noun BOY sits in the position intermediate between the subject MARIA and the verb KISS inside the *prorel* clause, because (as we assume) the SOV order typical of LIS holds inside the *prorel* clause as well.

(37') [IP [NP [CP MARIA BOY<sub>i</sub> KISS *prorel*<sub>i</sub>]] LEAVE DONE]

So, a plausible hypothesis is that when we asked our informants to sign the sentence *Maria kissed a boy that left* they signed (the LIS counterpart of) the sentence *a boy that Maria kissed left* instead. This is a very natural move since the two types of sentences are never distinct in LIS. So, the hypothesis that *prorel* clauses are internally headed can explain why (37) is produced as a LIS counterpart of (1b).

Still, one question remains open. If *prorel* constructions are internally headed, one expects to find another possible LIS counterpart of the sentence (1b), namely (39). In (39), the *prorel* clause, as ordinary object NPs do in LIS, sits between the main subject and the main verb, as required by the SOV order of LIS. Indeed, informally speaking, (39) should be the most literal translation of *Maria kissed a boy that left*.

(39) \*MARIA [NP BOY<sub>i</sub> LEAVE *prorel*<sub>i</sub>] KISS DONE

However, as we already saw in section 4.1.3 above, (39) is not attested. When asked to sign a sentence like (1b), our informants produce only structures like (37). In order to explain the ungrammaticality of (39), we would like to extend to LIS an observation that has been initially proposed for relative clauses in ASL by Neidle (2003). She argues that ASL relative clauses are always in focus position, an IP-external position in the left periphery of the sentence. This is independently supported in ASL by the fact that relative clauses share the same facial expressions as focused NPs (see Neidle 2003 for more complete evidence). Now, suppose that, like ASL relative clauses, LIS *prorel* clauses must occupy a position of the same kind in the left periphery of the clause. In this case, the position occupied by the *prorel* clause in (37) is not an option. This would explain the ungrammaticality of (39)<sup>9</sup>.

Taking stock, it is possible to explain the LIS counterpart of the English sentence in (1b), if *prorel* clauses are internally headed and if they, as relative clauses in ASL, must be obligatorily fronted in a sentence initial position.

### ➤ The case in (1c)

Let us now consider (1c), the case in which the complex NP that contains a relative clause on the object sits in the subject position of the main clause. Remember that (1c) is signed as in (40), reported here with a new bracketing.

- (1) c. A boy [that Mary kissed *e*] left

(40) [IP [NP [CP BOY<sub>i</sub> MARIA KISS *prorel*<sub>i</sub>]] LEAVE DONE]

<sup>9</sup> This account predicts correctly that a sentence like (a) should be acceptable as a translation of *Maria kissed a boy that left*:

(a) [NP [CP BOY<sub>i</sub> LEAVE *prorel*<sub>i</sub>]]<sub>i</sub> MARIA *t*<sub>i</sub> KISS DONE

If *prorel* constructions are internally headed, it is not clear why the object BOY precedes the subject MARIA inside the *prorel* clause in (40).<sup>10</sup> In fact, (40) is *prima facie* evidence for the hypothesis that *prorel* clauses are *externally* headed (although this hypothesis cannot be maintained for reasons that we have already discussed). However, it is possible to make sense of the pattern in (40), if one considers how agreement and passives are expressed in LIS. Let us see why.

In the spirit of the work on ASL done by Bahan (1996), we assume that LIS verbs express agreement with their arguments by spatial movement. For example, sentence (47) is expressed in LIS by signing (48) with KISS moving from the position in space where GIANNI was signed to the position in space where MARIA was signed.

(47) Gianni is kissing Maria

(48) GIANNI<sub>i</sub> MARIA<sub>j</sub> KISS<sub>i→j</sub>

Following Bahan, we take the orientation of the verb to be the expression of subject and object agreement.<sup>11</sup> Crucially for our purposes, alongside (48) another sentence is possible in LIS that has the same truth-conditions:

(49) MARIA<sub>j</sub> GIANNI<sub>i</sub> KISS<sub>i→j</sub>

In (49) KISS is signed with the same orientation in the neutral space as KISS in (48), namely the dominant hand moves from the position where GIANNI is signed to the position where MARIA is signed. We may think of (49) as a case in which the object has been promoted to subject position and the theta-roles of the verb, as indicated by the movement, have been switched: the subject is the patient of the kissing and the object is the agent of the kissing. Under this analysis, (49) is simply a case of *passive*.<sup>12</sup>

Let's now come back to (40). In (40) the object BOY precedes the subject MARIA but KISS is signed from the position of MARIA to the position of BOY, as the reader can verify by looking at the video. Given what we said on passivization, one very natural way to explain the order in (40) is to assume that the *prorel* clause is a case of passive. In informal terms, we can say that, when we asked our informants to sign *a boy that Maria kissed left*, they signed *a boy that was kissed by Maria left* instead.

<sup>10</sup> Basilico (1996) mentions similar facts for internally headed relative clauses in Diegueño and Mojave. In these languages, the head of an internally headed relative clause can move to the front of the relative clause with the result that, when the relative clause is on the object and the complex NP that contains the relative clause is in subject position, the head does not occupy the object position but is found at the beginning of the sentence, just like in LIS sentence (40). Basilico's explanation for this fact is that internally headed relative clauses introduce their own quantifier, a *iota* operator that binds variables within the subordinate clause. According to this account, the head must move out of the VP, overtly or covertly, in order to provide a variable for the operator to bind (if the head remained in its base position inside the VP, this would result in vacuous quantification). One problem with extending this account to LIS, however, is that LIS allows for the internal head to be universally quantified, something which we would not expect if *prorel* constructions were internally headed relative clauses introducing their own operator binding the head of the clause.

<sup>11</sup> Although we have to postpone to another occasion a comprehensive study of how agreement is expressed in LIS, let us briefly mention that even verbs signed on the body of the signer and not in the space in front of the signer (the neutral space) can show agreement. For example, THINK is signed on the body of the signer, so agreement cannot be expressed by movement in the neutral space by linking the places where the subject and the object have been signed. However, object agreement in this case may still be expressed by other means: the signer may signal agreement with the object of THINK by turning the head toward the object position while signing THINK.

(a) Gianni thinks about Maria

(b) GIANNI MARIA THINK<sup>head turned</sup>

<sup>12</sup> Interestingly, one informant told us that she always thought of the form in (49) as the LIS counterpart of the Italian passive construction. However, note that our analysis of relative constructions in LIS would not be significantly affected if forms like (49) were cases of topicalization of the object.

As in the previous case, there is one missing piece before considering the puzzle solved. We now know that (40) is a good functional equivalent in LIS of sentence (1c). However, (1c) should be expressed in LIS by another sentence as well, namely (50):

(50) [IP [NP [CP MARIA BOY<sub>i</sub> KISS *prorel*<sub>i</sub> ]] LEAVE DONE]

As a matter of fact, (50) *is* attested. As the reader can verify, (50) is identical to sentence (37) above, which our informants produce when they are asked to sign *Maria kissed a boy that left*. All in all, since *Maria kissed a boy that left* and *a boy that Maria kissed left* are equivalent (and these sentence types are always equivalent in LIS), we can safely conclude that (50) is produced as a way to express *a boy that Maria kissed left*, as the hypothesis that *prorel* constructions are internally headed correctly predicts.

Summarizing, sentence type (1c), in which the complex NP that contains a relative clause on the object sits in the subject position of the main clause can be expressed in LIS by two different structures, according to the passive or active voice of the *prorel* clause. Both structures are amenable to an explanation if *prorel* clauses are internally headed.<sup>13</sup>

### ➤ The case in (1d)

Remember that (1d) is signed by our informants as in (41), reported here with the bracketing required by the internally headed relative clause analysis:

(1) d. John hit a boy [that Mary kissed *e*]

(41) [IP [NP [CP GIANNI BOY<sub>i</sub> HIT *prorel*<sub>i</sub> ] ] MARIA KISS DONE ]

The structure in (41) is expected, given what we have said so far. Remember that sentence type *John hit a boy that Mary kissed* and sentence type *Mary kissed a boy that John hit* are signed the same way in LIS, given the non-restrictive character of the *prorel* construction. The structure in (41) becomes clear if one looks at it as the most direct counterpart of *Mary kissed a boy that John hit*. The head noun BOY occupies a preverbal position inside the *prorel* clause, in accordance with the SOV order of LIS. As for the NP that contains the *prorel* clause, it surfaces in sentence initial position although it is the object of the main clause. This is explained by the assumption that we have made following Neidle's (2003) analysis of ASL relative structures, namely that *prorel* constructions must be obligatorily preposed in a sentence initial position. Of course, we expect that sentence (1)d be expressed also by LIS sentence (40), a prediction confirmed by our informants:<sup>14</sup>

(40) [IP [NP [CP MARIA BOY<sub>i</sub> KISS *prorel*<sub>i</sub> ]] GIANNI HIT DONE ]

## 5.2 Are *prorel* constructions correlatives?

In the typological literature on relative constructions, a third type of structure is described which can be used as a functional equivalent of relative clauses, in addition to externally headed and internally headed relative clauses. The structure is correlative constructions. Correlatives, strictly speaking, are not relative clauses because they are not complex NPs containing an S that modifies a noun. Rather, the correlative construction is a sort of complex coordination between two separate clauses, the correlative clause and the main clause.

The structure of correlatives can be schematized as in (51) (see Keenan 1985 for a more precise typological presentation):

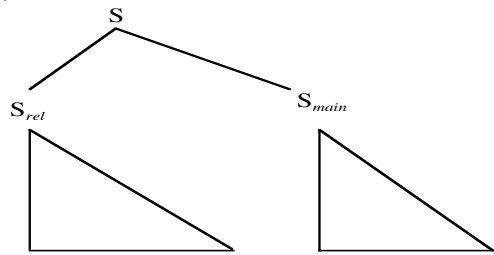
<sup>13</sup> We should mention, however, that sentence (38) remains an open issue for this account: the postverbal position of the object is not explained by anything said so far.

(38) MARIA KISS BOY<sub>i</sub> HIM<sub>i</sub> *prorel*<sub>i</sub> LEAVE DONE

<sup>14</sup> We also expect, what is confirmed by the data, that the following should also occur:

(i) [IP [NP [CP BOY<sub>i</sub> MARIA<sub>j</sub> KISS<sub>j→i</sub> *prorel*<sub>i</sub> ]] GIANNI HIT DONE ]

(51)



$S_{main}$  indicates a sentence that can stand alone as a well-formed sentence, while  $S_{rel}$  is a clause that cannot stand on its own.  $S_{rel}$  is never introduced by a determiner or by a pre(post)-position, is never Case marked and looks like a clause, rather than an NP.  $S_{rel}$  contains a distinctive marker on some NP, typically a demonstrative morpheme (without this marking,  $S_{rel}$  might be used as an independent clause). Informally speaking, the function of the distinctive marker is to say that the NP marked by it will be referred to by another NP in  $S_{main}$ .

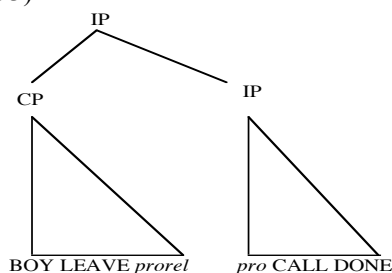
This sort of structure has been proposed, for example, by Srivastav (1991) and Dayal (1996) for Hindi left-adjoined relative clauses and by Bach and Cooper (1978) for Hittite relative clauses. Sentence (52) is a correlative in Hindi. We bracket the glosses, for convenience, in a way which is consistent with the schema in (51). *Jo* is the marker on the noun *laRkii* ("girl") which indicates that this noun is "talked about" in the main clause:

- (52)            *jo laRkii khaRii hai vo lambii hai*  
                 [S<sub>rel</sub> REL girl standing is] [S<sub>main</sub> DEM tall is]  
                 "The girl who is standing is tall"

Correlatives, according to Downing's (1973) typological study, only occur in verb-final languages (more precisely, in "loose" verb-final languages, languages that allow some NPs, especially heavy ones, to occur after the verb). So, the presence of correlatives in LIS would be consistent with the general properties of this language.

In fact, LIS *prorel* constructions fit pretty well the schema in (51). If *prorel* clauses are correlatives, a LIS sentence like (19) should receive the representation in (53):

(53)



Let us comment on the structure in (53). First, notice that the *prorel* clause is taken to be a clausal structure (specifically a CP, for reasons that we will consider shortly), not an NP. In fact, the sequence *BOY LEAVE prorel* would have the semblance of a main clause but for the presence of the *prorel* marking. As for the sequence *CALL DONE*, it can be used as a main clause (the subject can be null in LIS). This is why we have labeled this structure (with an empty category in the subject position) IP. *Prorel* looks like the marker, which is found in correlatives in other languages, which indicates that some NP (*BOY* in the case at hand), will be referred to by another NP in the main clause (in (53), the NP in the main clause is the empty subject). Finally, we assume that the *prorel* clause is IP-adjoined to the main clause.

There is an important property shared by internally headed relatives and correlatives which sets them apart from externally headed relatives: both in correlatives and in internally headed relatives, the head noun (*BOY* in (53)) is internal to the (cor)relative structure. What changes is the categorial status of the *prorel* clause: NP if the analysis in terms of internally headed relative is adopted, CP (or IP) if the analysis in terms

of correlatives is adopted. In section 5.1, we have shown that *prorel* clauses are not externally headed. However, the arguments we have been giving do not discriminate between the hypothesis that *prorel* clauses are internally headed relatives and the hypothesis that they are correlatives, since both these hypotheses assume that the head noun is internal.<sup>15</sup> Similarly, our analysis of the LIS sentences that translate sentences in (1a-d) can be straightforwardly reformulated in terms of the hypothesis that *prorel* constructions are correlatives.

Still, we believe that there is one consideration that favors the analysis in terms of correlatives. Remember that, in order to explain the positioning of the *prorel* clause at the beginning of the main clause in (40) and the ungrammaticality of (39), we needed an auxiliary assumption, namely that *prorel* clauses must be obligatorily fronted. This assumption is independently motivated for relative constructions in ASL, but direct evidence supporting it is not available in LIS (pending a better understanding of the different types of facial expressions in this language). But note that, if *prorel* constructions are correlatives, their sentence initial position is just what we expect and it is not necessary to appeal to any kind of fronting. For this reason, we tentatively conclude that, although there is no evidence that indisputably favors it, the hypothesis that *prorel* clauses are correlatives must be embraced, as it is the less theoretically costly.<sup>16</sup>

#### 5.4 The position of *prorel*

Let us study more closely the position of *prorel*. We have already shown evidence that *prorel* belongs to what we tentatively consider a correlative, rather than to the main clause. This was shown by sentences like (46). In (46) *prorel* precedes the adverb TODAY, which sits in clause initial position of the main clause.

- (46) YESTERDAY BOY<sub>i</sub> LEAVE *prorel*<sub>i</sub> TODAY CALL  
 “A boy that left yesterday called today”

Let us now try to determine which position *prorel* occupies inside the correlative clause. In fact, *prorel* always occupies the clause final position, even when some lexical material follows the verb in the *prorel* clause. There are cases in which *prorel* follows the aspectual marker DONE, which by assumption sits in AspP.

- (54) STUDENT MOVIE SEE DONE *prorel* LEAVE  
 “A student that saw the movie left”

*Prorel* also follows negation, as shown by (55):

- (55) BOY<sub>i</sub> HE<sub>i</sub> LEAVE NOT *prorel*<sub>i</sub> CALL  
 boy-def. did not leave, called

In LIS, some adverbials, like IN TIME, appear in a clause final position, as shown in (9). *Prorel* follows these adverbs as well:

<sup>15</sup> This fact should not come as a surprise. Internally headed relatives and correlatives are similar enough to lead scholars to suggest that they are instances of the same construction (see Grosu 2000).

<sup>16</sup> One might wonder whether the interpretive properties of LIS *prorel* constructions mentioned in section 4.1.2 provide relevant evidence for deciding between the correlative hypothesis and the internally headed hypothesis. Shimoyama (1999) shows that Japanese internally headed relative clauses, like LIS *prorel* constructions, are not interpreted as restrictive relative clauses but as simple sentences. Hindi correlatives, on the other hand, have been claimed by Dayal to have restrictive interpretations. Yet, the match between the syntactic types of relative constructions and the restrictive/simple sentence interpretations is not as perfect as one would like for the purpose of diagnosing syntactic type. For example, according to Williamson (1987), Lakota internally headed relatives are interpreted as restrictive relatives. Moreover, we are not aware of any typological generalization to the effect that correlatives have restrictive interpretations. On the other hand, the fact that the relative construction investigated by Shimoyama for Japanese has DP distribution and is case-marked provides just the kind of evidence for the internally relative clause analysis that is missing for LIS *prorel* clauses, which do not occur in DP position and have no nominal marking.

- (9) GIANNI ARRIVE IN-TIME  
"Gianni arrived in time"
- (56) BOY<sub>i</sub> LEAVE IN TIME *prorel*<sub>i</sub> CALL DONE  
"A boy that left in time called"

So, *prorel*, as far as we can test, is the rightmost lexical element in the correlative clause. This suggests that it is located in COMP. Like the element *jo* in Hindi correlatives, we'll assume that it occupies the Spec,CP position, which, as we have anticipated in section 3, is located on the right side of the tree in LIS.<sup>17</sup>

## 6 A semantic analysis of *prorel* clauses

We are now ready to turn to the semantic analysis of *prorel* constructions. There are at least three types of facts that are still unaccounted for and that a semantic analysis of *prorel* constructions should explain. First, as we saw, *prorel* clauses have non-restrictive interpretations, namely (26) entails (27):

- (26) ALL BOYS<sub>i</sub> LEAVE *prorel*<sub>i</sub> THEY<sub>i</sub> CALL
- (27) All the boys left

Second, *prorel* clauses may co-occur with a pronoun in the main clause, but not with an overt noun:

- (20) BOY<sub>i</sub> LEAVE *prorel*<sub>i</sub> HE<sub>i</sub> CALL DONE
- (22) \*BOY<sub>i</sub> LEAVE *prorel*<sub>i</sub> BOY<sub>i</sub> CALL DONE

Finally, negative quantifiers like *no one* cannot be construed with *prorel*

- (32) \*LEAVE NO-ONE *prorel* CALL DONE
- (33) \*NO-ONE LEAVE *prorel* CALL DONE

The account we propose is based on the following assumptions:

- the *prorel* clause needs to combine with a property-denoting clause (as it is the case for Hindi left-adjoined correlatives in Dayal's proposal);
- *prorel* introduces an e-type pronoun picking out the supremum of the intersection of the set denoted by the noun with the set denoted by the predicate of the *prorel*-clause.

Let's see how this works in detail. First, we'll assume that at LF *prorel* is always represented in combination with a pronominal element. Namely, in absence of overt pronominals doubling *prorel*, the LF representation of the *prorel* constituent is *prorel*(he<sub>i</sub>). The meaning of *prorel*(he<sub>i</sub>) is the result of functionally applying the denotation of *prorel* to the denotation of he<sub>i</sub>, a pronominal element that, as it is not c-commanded by the expression it is construed with, is interpreted as an e-type pronoun.<sup>18</sup> It is not our task here to specify how e-type pronouns get interpreted. For illustrative purposes, the following euristic principle, adapted from Neale (1990), will do the job:

<sup>17</sup> Recall that one of our informants prefers to locate *prorel* in a position adjacent to the NP. We come back to this issue in the next section.

<sup>18</sup> In this respect, the interpretation we assume for *prorel* recalls the interpretation of the Japanese morpheme *–no* assumed by Shimoyama. We can exclude that *prorel* is a referential pronoun denoting a contextually salient individual, since referential pronouns of this sort can occur without linguistic antecedents (as when one opens a discourse with a friend by saying "she left me"), while in *prorel* constructions *prorel* is always associated to a nominal element.

- (P) If  $x$  is a pronoun that is anaphoric on, but not c-commanded by a quantifier  $[\text{D}x: Fx]$  that occurs in an antecedent clause  $[\text{D}x: Fx](Gx)$ , then  $x$  is interpreted as  $\text{sup}(\lambda x(F(x) \wedge (Gx)))$  (where  $\text{sup}(\lambda x\phi)$  denotes the individual, if there is one, obtained by summing all singular individuals in the denotation of  $\lambda x\phi$ , and is undefined otherwise).

Intuitively, the antecedent clause for the pronominal occurring with *prorel* is the subordinate IP of the correlative structure (BOY<sub>i</sub> LEAVE in (19)). The covert pronominal that combines with *prorel* is specified as a singular pronominal, thus it carries the presupposition that the element it denotes will be an atom, not a plural individual. This means that, if this covert pronominal denotes at all, the intersection of the set denoted by the noun with the set denoted by the predicate of the *prorel*-clause must be a singleton set. Namely, there must be a unique individual that satisfies both the property denoted by the noun and the property denoted by the predicate of the *prorel*-clause.<sup>19</sup>

Let's suppose that, from a semantic standpoint, *prorel*(he<sub>i</sub>) is the element that has the function of connecting the *prorel* clause with the main clause. Let's assume that, for this reason, in order to be interpreted *prorel*(he<sub>i</sub>) must have sentential scope, and thus *prorel* moves from its base position, which is NP-adjoined, to SPEC,CP, where it can take a sentential argument. This movement can either occur overtly (the preferred option for most of our informants) or it can occur covertly at LF, which accounts for the fact that *prorel* can appear adjacent to the NP (the preferred option for one of our informants). Under this account, *prorel*(he<sub>i</sub>) combines semantically with an expression of type  $t$  (the semantic type of the IP of the *prorel*-clause) and yields an expression of type  $\langle\langle e, t \rangle, t \rangle$ , namely an expression that looks for a property  $R$  (an object of type  $\langle e, t \rangle$ ) to yield an expression of type  $t$ . Semantically, this makes the *prorel* clause a generalized quantifier, like left-adjoined Hindi correlatives in Dayal's proposal.

Unlike Hindi left-adjoined correlatives, however, LIS *prorel* clauses are non restrictive. This must be reflected in the interpretation we assume for *prorel*. The interpretation of *prorel* is thus be specified as follows:

$$(57) \quad \textit{prorel} \Rightarrow \lambda x_e \lambda p_t \lambda R_{\langle e, t \rangle} (p \wedge R(x))$$

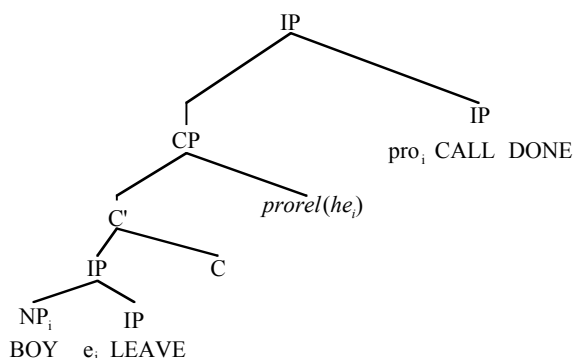
The  $\lambda$ -expression in (57) combines with the translation of the pronoun that occurs with *prorel*, then the result is combined with the translation of the subordinate IP, and finally the resulting expression is combined with the property denoting expression obtained from the translation of the main clause by  $\lambda$ -abstracting over the variable corresponding to the pronoun in the main clause co-indexed with *prorel*. We'll assume that this option of creating a property denoting expression out of an IP is subject to the following constraint:

- (58) pronouns may be bound (thus, they can be abstracted over by a  $\lambda$ -operator), full NPs may not.

Let's see an example of how this works. The LF configuration corresponding to (19) will be (19') (where the NP BOY is Q-raised):

(19) BOY<sub>i</sub> LEAVE *prorel*<sub>i</sub> CALL DONE

(19')



<sup>19</sup> The uniqueness presupposition associated with e-type pronouns is often a source of trouble. There are various proposals in the literature to supplement the e-type account in such a way as to weaken this presupposition. See Heim (1990) for discussion.

The interpretation of (19') is derived as follows:

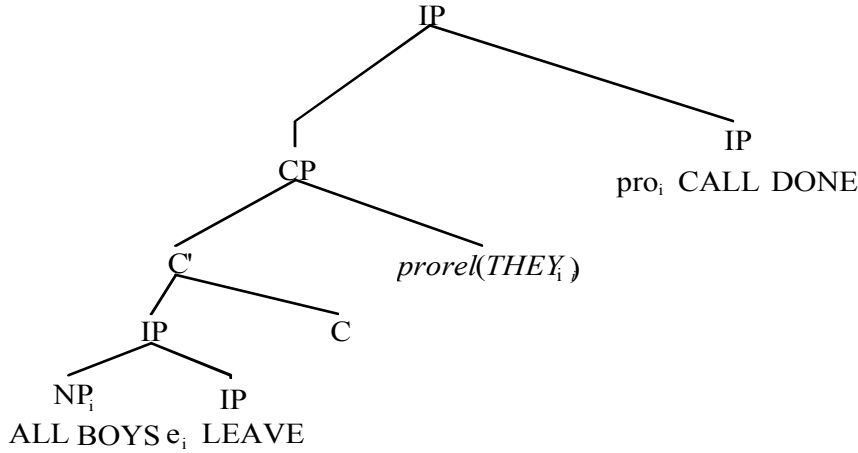
- (19'') a.  $[_{IP} \text{BOY}_i e_i \text{LEAVE}] \Rightarrow \exists y[\text{boy}'(y) \wedge \text{leave}'(y)]$   
b.  $\text{prorel} \Rightarrow (\text{by } 57) \lambda x_e \lambda p_t \lambda R_{\langle e, t \rangle} (p \wedge R(x))$   
c.  $\text{he}_i \Rightarrow (\text{by } P) \sup(\lambda x(\text{boy}'(x) \wedge \text{leave}'(x)))$   
d.  $\text{prorel}(\text{he}_i) \Rightarrow \lambda p_t \lambda R_{\langle e, t \rangle} (p \wedge R(\sup(\lambda x(\text{boy}'(x) \wedge \text{leave}'(x))))$   
e.  $[_{CP} \text{BOY}_i e_i \text{LEAVE } \text{prorel}(\text{he}_i)] \Rightarrow \lambda R_{\langle e, t \rangle} (\exists y[\text{boy}'(y) \wedge \text{leave}'(y)] \wedge R(\sup(\lambda x(\text{boy}'(x) \wedge \text{leave}'(x))))$   
f.  $[_{IP} \text{pro}_i \text{CALL DONE}] \Rightarrow (\text{by } 58) \lambda y \text{call}(y)$   
g.  $[_{IP} \text{BOY}_i e_i \text{LEAVE } \text{prorel}(\text{he}_i) \text{pro}_i \text{CALL DONE}] \Rightarrow \exists y[\text{boy}'(y) \wedge \text{leave}'(y)] \wedge \text{call}(\sup(\lambda x(\text{boy}'(x) \wedge (\text{leave}'(x))))$

This predicts correctly that (19) is true just in case a boy left and the boy that left called. Now, let's turn to sentence (26), which showed that the interpretation of *prorel* clauses is non restrictive:

- (26) ALL  $\text{BOY}_i$  LEAVE *prorel*<sub>i</sub>  $\text{THEY}_i$  CALL

A question raised by (26) concerns the function of the pronoun *THEY*: why is *prorel* doubled by this pronoun? Let's suppose that *THEY* is an overt realization of the pronominal element introduced at LF by *prorel*. The plural form of the pronoun indicates that the supremum denoted by *prorel* cannot be an atom, but must be a plural individual. I assume that, as for the singular pronoun, this should be regarded as a presupposition rather than as part of the truth-conditional content of *THEY*. The interpretation of (26) is now derived in a way which parallels the derivation of (19):

- (26')



- (26'') a.  $[_{IP} \text{ALL BOYS}_i e_i \text{LEAVE}] \Rightarrow \forall y[\text{boy}'(y) \supset \text{leave}'(y)]$   
b.  $\text{prorel} \Rightarrow (\text{by } 57) \lambda x_e \lambda p_t \lambda R_{\langle e, t \rangle} (p \wedge R(x))$   
c.  $\text{THEY}_i \Rightarrow (\text{by } P) \sup(\lambda x(\text{boy}'(x) \wedge \text{leave}'(x)))$   
d.  $\text{prorel}(\text{THEY}_i) \Rightarrow \lambda p_t \lambda R_{\langle e, t \rangle} (p \wedge R(\sup(\lambda x(\text{boy}'(x) \wedge \text{leave}'(x))))$   
e.  $[_{CP} \text{ALL BOYS}_i e_i \text{LEAVE } \text{prorel}(\text{THEY}_i)] \Rightarrow \lambda R_{\langle e, t \rangle} (\forall y[\text{boy}'(y) \supset \text{leave}'(y)] \wedge R(\sup(\lambda x(\text{boy}'(x) \wedge \text{leave}'(x))))$   
f.  $[_{IP} \text{pro}_i \text{CALL DONE}] \Rightarrow (\text{by } 58) \lambda y \text{call}(y)$   
g.  $[_{IP} \text{ALL BOYS}_i e_i \text{LEAVE } \text{prorel}(\text{THEY}_i) \text{pro}_i \text{CALL DONE}] \Rightarrow (\forall y[\text{boy}'(y) \supset \text{leave}'(y)] \wedge \text{call}(\sup(\lambda x(\text{boy}'(x) \wedge (\text{leave}'(x))))$

This derivation correctly predicts that (26) is true just in case all the boys left and they called, thus accounting for the non-restrictive interpretation of *prorel* clauses.

Given the constraint in (58), according to which pronouns may be bound, while full NPs may not, we can also account for the second fact mentioned above, namely that *prorel* clauses may co-occur with a pro-

noun in the main clause, but not with an overt noun. In other words, the presence of an overt noun in (22) blocks the possibility of deriving a property meaning for the main clause, and, as a result, this clause is of the wrong semantic type to combine with the *prorel* clause (a similar account is also proposed by Dayal for similar facts concerning Hindi correlatives).

(20) BOY<sub>i</sub> LEAVE *prorel*<sub>i</sub> HE<sub>i</sub> CALL DONE

(22) \*BOY<sub>i</sub> LEAVE *prorel*<sub>i</sub> BOY<sub>i</sub> CALL DONE

Finally, let's consider the lack of negative quantifiers like *no one* in *prorel* clauses, contrasting with the occurrence of a quantifier like *all*:

(26) ALL BOYS<sub>i</sub> LEAVE *prorel*<sub>i</sub> THEY<sub>i</sub> CALL

(32) \*LEAVE NO-ONE *prorel* CALL DONE

(33) \*NO-ONE LEAVE *prorel* CALL DONE

Notice that these data parallel some data we find with conjunction both in English and in LIS, as (59-60) and (61-62): show:

(59) All boys left and they called.

(60) ??No boy left and he called.

(61) ALL BOYS<sub>i</sub> LEAVE THEY<sub>i</sub> CALL

(62) ??LEAVE NO-ONE HE<sub>i</sub> CALL

The IP-constituent LEAVE NO-ONE<sub>i</sub> in (32-33) is true only if the set of individuals in the domain intersected with the set of individuals that leave is empty. Thus, given the semantics we assumed for *prorel*(he<sub>i</sub>), whenever this IP is true, the denotation of *prorel*(he<sub>i</sub>) is undefined (since there is no individual of the type required by *prorel*(he<sub>i</sub>)). This explains why (32-33) should be anomalous, as asserting (32-33) would amount to assert something that lacks a truth-value. Assuming that intersentential anaphora is also e-type, a similar account can be extended to (62) to explain why this conjunction is anomalous.<sup>20</sup>

## 7 Conclusions and loose ends

We argued that *prorel* constructions of Italian Sign Language (LIS) differ, both syntactically and semantically, from restrictive relative clauses of Italian and English. From a syntactic standpoint, *prorel* construc-

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<sup>20</sup> McCawley (1988) observes a similar parallel between English non-restrictive relative clauses and conjunction:

- (a) No person who knows everything is perfect.
- (b) \*No person, who knows everything, is perfect.
- (c) \*No person<sub>i</sub> is perfect. He<sub>i</sub> knows everything.

However, it is not clear that this fact should be accounted for by the same device that accounts for the intersentential anaphora facts (and the *prorel* facts), as the parallel between non-restrictive relative clauses and conjunctions breaks down if we look at other cases, as (d)-(e) show:

- (d) \*Someone, who admires Jespersen, should write a book about him.
- (e) Someone admires Jespersen. He should write a book about him.

tions are correlatives: sentential constituents containing an NP marked by an anaphoric element (*prorel*), which needs to be correlated with an NP in the main clause. Semantically, they are generalized quantifiers, like left-adjoined Hindi correlatives in Dayal's proposal. Unlike Hindi correlatives, however, LIS *prorel* clauses lack restrictive interpretations and are interpreted instead as subject-predicate structures. In this respect, they are similar to Japanese internally headed relative clauses investigated by Shimoyama. Like Japanese IHRCs in Shimoyama's proposal, LIS *prorel* clauses are related to the main clause via e-type anaphora.

Thus, if our analysis is correct, LIS *prorel* constructions attest the existence of correlative clauses with simple sentence interpretation, showing that correlatives have the same range of interpretations as internally headed relative clauses, which also have restrictive semantics in some languages (Lakhota) and simple sentence interpretations in other languages (Japanese).

Our discussion of LIS *prorel* constructions, finally, suggests some reflections concerning the specific typological features of sign languages. From the LIS data we examined, it may be observed that LIS *prorel* constructions do not occupy the canonical argument position, but are located peripherally in the sentence. While in our analysis this fact is expected to some extent, since *prorel* constructions are not arguments, a similar phenomenon occurs in LIS also with complement clauses, which, arguably, are arguments of verbs. Thus, for instance, sentence (63) would be translated in LIS either as (64) or as (65):

(63) John says that Mary left

(64) MARY LEAVE DONE JOHN SAY

(65) JOHN SAY MARY LEAVE DONE

As LIS is an SOV language, (64)-(65) show that the complement clause never occurs in argument (preverbal) position. These facts together with the fact that we described for *prorel* clauses seem to indicate that 'staying peripheral' is somehow a general strategy LIS uses to deal with center-embedded structures.

Although at the moment we are still exploring the import of this observation for sign language typology, we would like to anticipate a speculation which should be assessed in future research. Various works on working memory (cf. Wilson and Emmorey 2003 for a recent survey) have established that the memory span of deaf signers who are requested to recall a list of ASL signs in a given order is lower than the memory span of hearing people who have to recall the same (or a comparable) list of English words (interestingly, with free recall the two groups perform equally well). This suggests a possible explanation for why embedded structures are left peripheral in LIS. If they were not so, they would be a case of center-embedding, which is arguably not tolerated by the performance system, which has to deal with the limited capacity to remember lists of linearized signs. According to this hypothesis, the grammar of LIS (and possibly of other sign languages) is organized to avoid center-embedding as much as possible, in order to facilitate the processing of complex sentences.

In order to evaluate the plausibility of this speculation and its implications, more work on subordination structures in sign languages (especially SOV sign languages, in which center-embedding is potentially triggered also by complement clauses) is needed. We hope to explore this hypothesis in future work.

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