Headed relative clauses in generative syntax – Part I

By Valentina Bianchi

1. Introduction

A headed relative clause is a syntactically complex modifier involving abstraction over an internal position of the clause (the **relativization site**) and connected to some constituent it modifies (the **relative ''head''**). In the standard approach, abstraction is syntactically implemented by means of an unbounded dependency between the relativization site and a **relative operator** taking scope over the whole clause:

(1) the article *which* John believes that I wrote *e*

The most important criterion for the classification of relative clauses is the nature of the semantic relation holding between the ''head'' and the clause itself. Grosu & Landman (1998) extended the familiar restrictive/non-restrictive distinction to the following three-way typology (see also Grosu 2000, 2002 for further refinements):

(a) **restrictive relatives** are interpreted as intersective modifiers of the nominal ''head'' and contribute to determining the restriction of the determiner;
(b) **non-restrictive (appositive) relatives** modify the whole noun phrase ''head'', rather than contributing to the restriction;
(c) **maximalizing relatives** do not modify the ''head'': the latter is interpreted within the relative clause, where it provides a degree variable, and an operation of maximalization applies at the clausal level:

(2) the books that there were *e* on the table
(3) MAX [λd.there were [d many books] on the table]

In this paper I will not be concerned with maximalizing relatives: see the State-of-the-Article by A. Grosu (2002). Note that on Grosu & Landman's account, this class includes free relatives, as well as correlatives and a subset of internally headed relatives; the latter two will be briefly discussed in §4.

Besides this basic semantic classification, a number of descriptive and typological classifications have been advanced, which distinguish various **relativization strategies** along the following dimensions:

i. the nature of the relativization site (e.g., gap vs. resumptive pronoun);
ii. the nature of the relative operator (e.g., phonologically overt or not);
iii. the syntactic relation holding between the ''head'' and the relative clause.

Some classic references are Downing (1978), Keenan & Comrie (1977), Keenan (1985), Maxwell (1979). A recent, very detailed typological survey is provided in de Vries (2002, chapter 2 and Appendix II).

At the level of descriptive adequacy, at least one important fact must be accounted for: different relativization strategies may co-exist within one and the same language, and their distribution is constrained with respect to the nature of the relativization site (Keenan & Comrie 1977) and with respect to the semantic type of the relative clause (Carlson 1977, Cennamo 1997; see §2.2). At the level of explanatory adequacy, however, the great deal of intra- and cross-linguistic variation in the syntax of relativization has not been considered a major challenge. The position commonly adopted – if only implicitly – is that each type of relativization is a unitary phenomenon at the semantic level, but it can be implemented by different syntactic mechanisms (Keenan & Comrie 1977, 63); these mechanisms are made available by UG and do not have to be stated in a construction-specific fashion (Chomsky 1981, 7).

In my view, all the approaches to headed relatives developed in the generative tradition have been confronted with two basic issues. The first issue is what I will call the **connectivity problem**: the relative ''head'' seems to play a double role in the overall structure. On the one hand, it is a constituent of the matrix clause: this is shown by the fact that in languages with overt Case marking, it bears the Case assigned by the matrix clause predicate, and satisfies its selectional requirements (cf. Borsley 1997, 2001).

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Valentina Bianchi's State-of-the-Article on Headed relative clauses appears in two installments. Here is the complete table of contents of both Part I and Part II.

(4) Widziałem tego pana
saw-1SG the-ACCman-ACC
który zbił ci szybę
who-NOM broke your glass
'I saw the man who broke your glass.' (Polish; Borsley 1997)

On the other hand, the relative ''head'' also satisfies the selectional requirements of the predicate internal to the relative clause: this is particularly clear in the case of idiom relativization (Vergnaud 1974/1985).

(5) The headway that John made *e* was impressive.

Furthermore, with respect to a number of tests, like e.g. anaphor binding and scope assignment, the ''head'' behaves as if it occurred directly in the relativization site (Vergnaud 1974/1985; Schachter 1973):

(6) The interest in each other$_i$ that John and Mary$_i$ showed *e* was fleeting.

The underlying question is how the surface ''head'' is connected to the relativization site. As we will see, much of the debate on the syntax of relative clauses has revolved around this question; and the history of the problem has had an almost cyclic development.

The second issue I will call the **modification problem**: this concerns the way in which the relative clause is syntactically related to the modified phrase. Recall that restrictive relatives fall in the restrictive term of the determiner of the ''head'', whereas appositive relatives do not. On a certain view of compositionality, this semantic difference has been related to a different syntactic attachment: the restrictive relative is c-commanded by the determiner (Partee 1975); the appositive relative is not. In some approaches, appositive relatives have even been assimilated to parentheticals, attached to the root clause rather than to the ''head'' (Emonds 1979; McCawley 1982). However, the strict correlation between the syntactic c-command domain of a determiner and its semantic restriction faces some problems, to be discussed in §3.2.

The history of the modification problem is tightly related to the development of X′ theory (from Jackendoff 1977 to Kayne 1994), to the issue of derivation vs. representation (Lebeaux 1988, Chomsky 1993) and to the problem of the interface between syntax and semantics.

A detailed survey of the generative approaches to headed relatives can be found in de Vries (2002, chapter 3 and appendix III); Alexiadou, Law, Meinunger & Wilder (2000) also provides a useful synthetic overview. Here I will sketch out a brief history of each of the two main problems, and then I will point out some empirical issues currently under debate. I will also try to show how throughout the history of these problems, details of implementation and focus on different aspects of the structures were related to the main theoretical concerns of the relevant stages of the ''generative enterprise''.

2. The connectivity problem

2.1 A little history

The initial solution to the connectivity problem (e.g. in Chomsky 1965, 145) was the **matching analysis**:

I. the relative clause contains a noun phrase coreferential to (or identical to) the commanding ''head'' (henceforth the **relative NP**).
II. The relative NP is replaced by the appropriate relative pronoun.
III. The relative pronoun moves to the front of the relative clause.
IV. The relative pronoun is optionally deleted (subject to certain constraints).

The double role of the relative ''head'' was captured by the presence of two coreferential noun phrases in Deep Structure (the level of representation accessible to semantic interpretation).

A major problem for this approach was the notion of coreferentiality or identity between the ''head'' and the relative NP. As noted by Stockwell, Schachter & Partee (1973, 428 ff.), when the ''head'' is generic or quantificational, the quantifier is not included in the relative NP inside the relative clause: in fact, (8) does not entail (9).

(8) All the boys who left early missed the fun.
(9) All the boys left early.

The alternative was to take the ''shared'' constituent to be a proper subpart of the noun phrase ''head'', not including the determiner (see §3).

The solution that eventually won out was the one proposed by Jackendoff (1977, 194–197): in the interpretation of restrictive relatives, the relative pronoun is replaced by a variable bound by the determiner of the ''head''; in this case, the relative pronoun is neither indefinite nor definite, in fact it is not referential at all. In appositive relatives, instead, the relative pronoun is anaphoric to the whole relative ''head''. Jackendoff proposed an **interpretive theory** whereby the relative pronoun is directly inserted in Deep Structure, rather than replacing a fully specified relative NP.

Even under the interpretive theory, some notion of identity between the ''head'' and the relative pronoun was required in the analysis of the following paradigm:

(10) a. the book which I read
b. the book that I read
c. the book I read
d. the book [$_{S'}$ [$_{COMP}$ which that] [I read *t*]]

As shown in (10d), the relative pronoun is fronted by the rule of *wh*-movement to the Comp position, which also contains the complementizer *that* (Chomsky 1977, 85–86). At this point, a **deletion rule** applies and deletes either the complementizer (10a), or the relative pronoun (10b), or both (10c), the co-occurrence of both elements in Comp being ruled out by the ''Doubly

Filled Comp Filter'' (Chomsky & Lasnik 1977; see also Kayne 1976 on French). Crucially, the deletion rule is subject to the **Recoverability Condition**, which states that deleted material must be recoverable from the structure. Chomsky & Lasnik (1977, 447) proposed that the relative pronoun of restrictives, as opposed to that of appositives, has no semantic content and therefore can be deleted without violating the Recoverability Condition. This idea was criticized by Maling (1978) and Cinque (1982), because many languages allow for the deletion of the relative pronoun in appositives as well. Kayne (1976, 272) and Cinque (1982) maintained that a relative pronoun can be deleted in that it is non-distinct from the relative ''head'' (in the sense of Chomsky 1965, 177–184); Cinque also assumed that the relative pronoun must be c-commanded by the ''head'': this second condition is not satisfied in those appositive relatives that have a parenthetical structure (see §3.1). Thus, recoverability amounted to non-distinctness plus c-command.

Some notion of identity was also required in the **unbounded deletion** analysis advocated by Grimshaw (1975), Bresnan (1976) and Maling (1976) as an alternative to Chomsky's (1977) successive cyclic *wh*-movement: the relativized NP is deleted *in situ* under identity to the ''head'', across an unbounded distance. Evidence for this approach came from relativization facts of Old and Middle English, where relative pronouns obligatorily pied-piped a preposition to Comp (11a), whereas relative clauses introduced by the indeclinable complementizer allowed for preposition stranding (11b):

(11) a. rod *on ðære ðe* Crist wolde ðrowian
cross on which that Christ would suffer
'the cross on which Christ would suffer'
b. ðæs aelmihtigan Godes *ðe* hi
the-GEN almighty God-GEN that they
on gelyfdon
in believe
'of the Almighty God in whom they believe'
(Bresnan 1976, 359)

The asymmetry was accounted for by assuming that *wh*-movement of a relative pronoun required pied-piping, whereas *that*-relatives were derived by unbounded deletion of the relativized item in its base position. The problem of (11) was taken up by Chomsky & Lasnik (1977, 496–500), who proposed a filter-based solution, and by Vat (1978). Although both proposals were criticized by Allen (1980), Chomsky's successive cyclic movement analysis eventually prevailed, and the pied-piping asymmetry fell into oblivion.

The relative pronoun of restrictives was analysed as a predication operation (Chomsky 1977; 1982, fn. 14; Browning 1987; Fabb 1990; Rizzi 1990, chapter II). Starting from Chomsky (1981), deletion of the relative pronoun in Comp was replaced by the assumption of a phonetically null operator lacking any intrinsic specification (though Borer 1984, 228–233 and Stowell 1986 defended the deletion analysis). This overcame the problem of explicitly defining identity, but an extra assumption was required to the effect that the null operator must be identified by the antecedent ''head'' under strict locality (cf. Browning 1987, 123–127).

Meanwhile, apart from the Chomsky/Bresnan debate, two other analyses had emerged in the literature. On Perlmutter's (1972) **shadow pronoun** analysis, the relativization site of French relative clauses contained a pronominal copy of the moved constituent, subsequently deleted at the phonological level. The second one was the **raising** or **promotion** analysis, proposed by M. Brame in an unpublished (1968) paper, and developed by Carlson (1977), Schachter (1973) and especially Vergnaud (1974/1985). Based on the evidence illustrated in (5) and (6) above, this approach assumed that in restrictive relatives the ''head'' is inserted directly in the relativization site and moves to a position external to the relative clause. Connectivity effects arise because in Deep Structure the ''head'' is an internal constituent of the relative clause. An interesting piece of evidence comes from the relativization of predicate nominals (Vergnaud 1974) and adjectives (Rivero 1980, Ojeda 1982), in which a predicative ''head'' necessarily agrees with a subject internal to the relative clause. (12b-c) are both ill-formed because the predicate ''head'' should simultaneously agree with the internal (masculine) subject of predication and with the external (feminine) one, which is impossible:

(12) a. No puedes imaginar lo [inteligentes]$_i$
not can-2SG imagine the-3SG intelligent-PL
que *pro* dicen que *pro* son t_i.
that (they) say that (they) are
'You cannot imagine how intelligent they say that (they) are'.
(Spanish; Rivero 1980, 437)
b. *Marie n'est pas la comédienne que
Marie is not the comedian-FSG that
son père était *t*.
her father was
c. *Marie n'est pas le comédien
Marie is not the comedian-MSG
que son père était *t*.
that her father was
(French; Vergnaud 1974, 65)

It is impossible here to discuss the details of this analysis (see Bianchi 1999, chapters II–III). The reasons why it was soon dismissed are not easy to assess, and are perhaps related to a ''mainstream effect'': Chomsky's (1977) theory of *wh*-movement, which unified various unbounded dependencies and locality constraints, was a higher-order theoretical achievement, and the evidence illustrated in (5), (6) and (12) fell out of focus.

A parallel and independent development was the approach to unbounded dependencies in the

framework of unification-based grammars (GPSG and later HPSG), based on the **percolation of nonlocal features**, and incorporating an idea of Gazdar (1981): the trace in the relativization site is endowed with a nonlocal SLASH feature, which is inherited by the containing phrases up to the point where it is bound off by an appropriate filler (either the relative pronoun itself, or a pied-piped phrase). Furthermore, the relative pronoun is endowed with a nonlocal REL feature, which percolates to the top of a pied-piped phrase and ultimately gets as its value the index of the relative ''head'' modified by the relative clause (see Pollard & Sag 1994, ch. 5). An important modification, proposed in Pollard & Sag (1994, ch. 9) and Sag (1997), was the elimination of traces: the relativization site is the argument slot itself, which gets endowed with the SLASH feature by a lexical rule.

Within the Chomskyian tradition, the *wh*-movement analysis of the paradigm in (10) remained essentially unchallenged up to such works as Safir (1986), Fabb (1990), Rizzi (1990, chapter II), Demirdache (1991), Toribio (1992). The data coverage was considerably extended: cross-linguistic surveys were attempted in the early Seventies (Peranteu, Levi & Phares 1972; Andrews 1975, ch. 1), and subsequent research was extended to less familiar relativization strategies (see also §4).

A particularly important development was the analysis of **resumptive relatives** featuring a pronoun in the relativization site, as in the following Irish example (see Suñer 1998 for a recent cross-linguistic overview):

(13) am girseach ar ghoid na síogaí *í*
the girl aN stole the fairies her
'the girl whom the fairies stole' (McCloskey 1990, 240)

Resumptive relativization was assumed not to involve movement, because it does not respect island constraints (Chomsky 1977, Borer 1984, Safir 1986); it was analysed in terms of a **representational chain** connecting the resumptive pronoun to a null operator base-generated in Comp (except for Perlmutter 1972, who analysed resumptive pronouns as undeleted shadow pronouns). Chao & Sells (1983) and Sells (1984) drew an important distinction between resumptive pronouns proper, like the one in (13), and **intrusive pronouns** that appear only within syntactic islands as a last resort repair of an island violation (see Kroch 1981). Safir (1984) pointed out that resumptive relatives, contrary to *wh*-movement relatives, do not show Weak Crossover effects.

McCloskey (1990) provided empirical evidence in support of the non-movement derivation of resumptive relatives, based on Irish data. In Irish, relative clauses with a gap in the relativization site have a special complementizer (*aL* in the gloss of (14)) in **all** the Comp positions intervening between the relativization site and the highest Comp of the relative clause. This supports a successive cyclic movement derivation (*contra* McCloskey 1979; see also Watanabe 1997, Sasaki 2000 for recent discussion):

(14) an t-ainm *a* hinnseadh dúinn *a* bhí
the name aL was-told to-us aL was
ar an áit
on the place
'the name that we were told was on the place'
(McCloskey 2001, 5)

On the other hand, resumptive relatives feature a distinct complementizer in the highest Comp of the relative clause (*aN* in the gloss of (13)) and typically show no signs of a successive cyclic derivation: they involve a representational A′ chain between the resumptive pronoun and a base-generated null operator (see however McCloskey 1990 and 2001 on the possibility of ''mixed'' chains).

Note that this view of resumption introduces a bifurcation in the realm of unbounded dependencies: these can be established either via movement or via representational binding. See Cinque 1990, Safir 1996 and McCloskey 2001, among others, for various developments of this hypothesis. On the relevance of resumptive relativization in the acquisition of relative clauses, see Labelle (1990), Guasti & Shlonsky (1995).

An alternative approach, consistent with a purely derivational view of unbounded dependencies, was proposed by Demirdache (1991): resumptive pronouns are *in situ* relative pronouns that move in covert syntax (LF) and cliticise to C°. The crucial piece of evidence is the observation that Hebrew resumptive pronouns can be overtly fronted to an IP-adjoined position (15a) and then cliticize to C°, in the absence of the lexical complementizer *Se* (15b).

(15) a. kol gever [$_{CP}$ Se [$_{IP}$ ʔoto [$_{IP}$ rina ʔohevet *t*]]]
every man that him Rina loves
'every man that Rina loves'
b. kol gever [$_{CP}$ ʔoto [$_{IP}$ *t* [$_{IP}$ rina ʔohevet *t*]]]
every man him Rina loves
'every man that Rina loves'

From this perspective, the asymmetry between gap and resumptive relativization concerns the level of representation at which A′ movement applies, parallel to the asymmetry between moved vs. *in situ* interrogative phrases (Huang 1982; see also Cole & Hermon 1994 for relevant discussion). One prediction of Demirdache's approach is that resumptive pronouns can never co-occur with *wh*-relative operators (but see Boeckx 2001, 65). A question that remains open is why *in situ* relative operators lack a morphological *wh*-feature and are akin to personal or demonstrative pronouns (see Suñer 1998, 355–60).

Shlonsky (1992) examined the distribution of resumptive relativization with respect to gap relativization in Hebrew and Palestinian Arabic. In Hebrew, resumptive pronouns are banned from the highest subject position of the relative clause (see also McCloskey 1990, Suñer 1998); they optionally alternate with a gap in direct object and embedded subject

positions, and are obligatory in possessive or prepositional complement position.

The core of Shlonsky's proposal is that resumptive pronouns always constitute a **last resort** that UG makes available whenever a movement derivation is impossible. This last resort option is required for relativization into a possessive or prepositional complement position, which disallow movement. The apparently optional alternation between a gap and a pronoun in the direct object position and in embedded subject positions is reduced to the availability of two types of complementizer: a ''pure'' complementizer, whose Spec qualifies as an operator (A') position, and a complementizer endowed with agreement features (morphologically overt in Arabic), whose Spec qualifies as an A position. The ''pure'' complementizer generally allows for A' movement to SpecCP. In the case of the agreement-bearing complementizer, A movement to SpecCP is possible only from the highest subject position, due to Relativized Minimality (Rizzi 1990); hence a last resort resumptive pronoun is always excluded. A movement from the lower direct object and embedded subject positions, however, is blocked by Relativized Minimality, and a resumptive pronoun must be inserted as a last resort. Shlonsky's proposal is especially interesting in that it copes with a set of phenomena that fall under Keenan & Comrie's (1977) NP Accessibility Hierarchy; on the other hand, note that his notion of last resort requires a theory of grammar with transderivational power (see Collins 1997 for relevant discussion).

An independent line of analysis relates the realization of resumptive pronouns to the discourse prominence or accessibility of the referent of the relative ''head'': see especially Prince (1990) and Ariel (1999).

Besides resumptive vs. gap relativization, the nature of the complementizer position also played a crucial role in the analysis of other aspects of ''surface'' variation, for instance, in Rizzi's (1990, chapter II) analysis of *that* vs. zero relatives. Hoekstra (1992) proposed a split Complementizer system to account for the different distribution of *wh-* vs. demonstrative relative pronouns in Dutch; see also Alber (1994), Bianchi (1999), Rizzi (1997), Zwart (2000).

Chomsky's (1993) minimalist paper constituted a turning point in the history of the connectivity problem. Connectivity effects like (5) and (6) were analysed by Barss (1986) as a chain effect. Chomsky (1993) proposed an alternative derivational analysis based on the **copy theory of traces**. Under this hypothesis, movement leaves as traces literal copies of the moved element that fail to be phonologically spelled out, but remain available in the LF branch of the derivation (see also §2.2).

Chomsky's approach to connectivity effects was taken by Kayne (1994, 86) to support a **revised** version of the **raising analysis**. The motivation for Kayne's proposal was directly related to the modification problem in the framework of his antisymmetry theory (§3.1), but his proposal crucially relied on the hypothesis that the ''head'' originates directly in the relativization site and moves to SpecCP of the relative clause. Thus, the relativization chain is completely assimilated to a standard A'-movement chain, leaving identical copies of the relative ''head'' in the relativization site as well as in any intermediate chain link; this accounts for reconstruction effects like (5) and (6):

(16) the [$_{CP}$ [interest in each other] [that [John and Mary]$_{i+k}$ showed <[interest in each other$_{i+k}$]>]]

One problem for this approach is the status of the *wh*-relative pronoun. Kayne (1994, 87–92) assumed that in non-*wh*-relatives like (10b-c) the raised ''head'' originates as a determinerless NP (17a). In *wh*-relatives like (10a), instead, the ''head'' consists of the *wh*-morpheme in the D° position taking the NP as its complement; the *wh*-phrase moves to SpecCP, and the NP subsequently moves to the Spec of the *wh*-phrase itself (17b):

(17) a. the [$_{CP}$ [$_{NP}$ book] [that [$_{IP}$ I read <[book]>]]]
b. the [$_{CP}$ [$_{DP}$ [$_{NP}$ book][which t_{NP}]] [C° [I read <[which book]>]]]

The difference between *wh-* and non-*wh*-relatives is not a matter of phonetic deletion but involves different constituent structures of the raised ''head''. This aspect of Kayne's proposal was criticized by Borsley (1997). Borsley argued convincingly that with respect to a number of tests the relative ''head'' in non-*wh*-relatives behaves as a DP rather than as a determinerless NP. Bianchi (1999) and de Vries (2002) independently proposed that the relative ''head'' is always generated as a DP with a relative morpheme in the D° position; the two approaches differ as to the way in which the relative D° is phonologically deleted in non-*wh*-relatives.

Another view of the problem was independently proposed by Åfarli (1994), who argued that *wh*-relatives, contrary to *that*-relatives, do not give rise to connectivity effects like (5) and (6). Åfarli hypothesized a raising derivation for *that*-relatives only, and retained the usual relative operator analysis for *wh*-relatives (see Bianchi 1999, 71–74 for discussion).

Another problem for the revised raising analysis, stressed by Borsley (1997, 2001), is the status of the raised ''head'' with respect to the Case and selectional requirements of the matrix clause (cf. the discussion around (4)). On Vergnaud's original analysis, the ''head'' was promoted to a nominal position of the matrix clause; in the revised raising analysis, instead, the ''head'' is raised to a peripheral position but not actually promoted into the matrix clause. The matrix Case and selectional requirements on the raised ''head'' are mediated by the external determiner (*the* in (17)): this selects the relative CP (see §3.1), and also establishes an ''almost selectional'' relation with the ''head'' raised to SpecCP. This analysis assumes that the left periphery of the relative clause is transparent for agreement relations with the external structure

(see Harbert 1982, Bianchi 1999, chapter 3 for some evidence based on Case attraction phenomena, and Borsley 2001 for a criticism).

A related problem is the trigger of raising, and more specifically, of the movement of NP to the left of the relative Determiner in (17b). Kayne (1994, 90), Bianchi (1999, 77–79) and de Vries (2002, 116–126) assumed that this step is triggered by the need for the NP to establish a checking/agreement relation with the external Determiner. For Zwart (2000), instead, the trigger is semantic: after raising of the relative DP to SpecCP, the NP strands the relative D° and moves to a higher CP layer where it receives a restriction interpretation (i.e. its denotation is intersected with that of the relative clause).

Borsley (1997, 2001) pointed out that the last two problems do not arise in the standard analysis (or, for that matter, in any analysis in which the relative ''head'' is generated outside the relative clause: cf. also Platzack 2000, Schmitt 2000, Citko 2001).

Yet another problem is the possibility of extending the raising analysis to appositive relatives. Kayne (1994) argued that appositives show reconstruction effects for anaphor binding, parallel to (5), and proposed a raising derivation (see §3.1 for details). Bianchi (1999, ch. 4 and forthcoming) called into question the reality of reconstruction effects in appositives (see also §2.2). Alternative non-raising derivations consistent with the Antisymmetry theory were explored by Bianchi (1999, ch. 5), Koster (2000), Platzack (2000) and de Vries (2002, chapter 6); see below §3.1.

Kayne's revised raising analysis had a strong impact, as shown by the papers in Alexiadou, Law, Meinunger & Wilder (2000), as well as Alexiadou & Anagnostopoulou (2001), Bhatt (2000), Bianchi (1999), Borsley (1997, 2001), Hornstein (2000), Kalluli (2001), Safir (1999), among many others. One advantage of this analysis is that it can establish a relation between headed relatives and some head-internal relativization strategies like correlatives and internally headed relatives (cf. Bianchi 2000, Mahajan 2000, Kayne 1994, 95-97; see §4).

On the other hand, the raising analysis cannot easily account for resumptive pronouns that apparently fill the relativization site. Boeckx (2001) proposed that the resumptive material is initially attached to the relative ''head'' and is stranded by the movement of the latter (see Aoun, Choueiri & Hornstein 2001 for a similar idea). Various alternative views of resumptive pronouns are explored in Bianchi (forthcoming), Broihier (1995), McCloskey (2001), Pesetsky (1998), Rouveret (2000), Safir (1996, 1999), Sharvit (1999), Suñer (1998), de Vries (2002, 165–169).

It is fair to say that the revival of the raising analysis had mainly theoretical motivations. The next step was Sauerland's (1998, 60–88) detailed analysis of connectivity effects in restrictive relatives. Based on Munn (1994) and Safir (1999), Sauerland argued that these connectivity effects are not completely equivalent to those found in interrogative *wh*-chains: although the relative ''head'' shows reconstruction effects for anaphor binding, idiom interpretation and scope assignment, it does not show Principle C effects:

(19) the pictures of $John_i$ he_i likes

Therefore, Sauerland argued that restrictive relatives allow for a **matching** structure in which the internal ''head'' is elided in PF under identity with the external ''head''. However, this is not literal identity: in particular, the internal ''head'' of (19) may contain a pronoun coreferential to the R-expression *John* rather than the R-expression itself (cf. the *vehicle change* of Fiengo & May 1994 and Safir 1999). This is how the Principle C effect is avoided (see Munn 1994, 403 for an alternative):

(20) the picture of $John_i$ λx he_i likes [x, picture of him_i]

A raising structure – with an empty external ''head'' and a fully specified internal ''head'' in the relativization site at LF – only obtains in a subset of ''special interpretation'' relatives, where it is forced by some independent LF requirement: when the ''head'' contains a pronoun to be bound by a quantifier internal to the relative clause, as in (21), and when it has an amount, kind or possibility modal interpretation (Sauerland 1998, 68–69). In these structures, Principle C effects do emerge (cf. (24) below).

(21) a. the book on her_i desk that every $professor_i$ liked best
b. LF: the [*e*] [$_{CP}$ [*e*] λx every $professor_i$ liked [x book on her_i desk] best]

It is impossible here to fully report Sauerland's discussion of reconstruction effects. See also Citko (2001), Cresti (2000) and Fox (2002) for a generalization of the matching analysis, Bhatt (2000) for a criticism.

This brief history of the problem is extremely sketchy and incomplete, but it served two purposes. The first one was to show how the focus of attention shifted to different sets of data along the way. In the course of this process, genuinely new data were discovered; however, it is my impression that at various turning points, the abandonment of one approach in favour of another one was motivated more by theory-internal concerns than by the pressure of irreducible new evidence. The second purpose was to highlight the almost cyclic development up to this date: it started out with a matching analysis and eventually came back to it.

2.2 Some empirical issues related to the connectivity problem

In this section I wish to point out some interesting empirical ramifications of the connectivity problem.

(a) **Observation 1.** In contemporary English, *wh*-relative pronouns are obligatory in appositive relatives, optional in restrictive relatives (subject to stylistic factors), marginal or impossible in maximalizing relatives (Carlson 1977, Heim 1987, Grosu & Landman 1998):

(22) a. This book, which/*that I read thoroughly, is by Ian McEwan.
b. The book which/that I read thoroughly is by Ian McEwan.
c. *I took with me every book which there was on the table.

(b) **Observation 2.** In anti-pronominal contexts (Postal 1994), e.g. in the existential *there* construction, appositive relativization is excluded (23a) and amount relativization is possible (23b) (Carlson 1977, Heim 1987, Grosu & Landman 1998). According to Carlson (1977), restrictive relativization is excluded, cf. (23c) (whose determiner is incompatible with a maximalizing interpretation); however, restrictive relativization seems to be allowed in anti-pronominal contexts when the ''head'' has a kind interpretation, as in (23d-e) (cf. the ''special interpretations'' of Sauerland 1998, and Grosu 2002).

(23) a. *This book, which there was _ on the table,...
b. I took with me every book that there was _ on the table.
c. *Five/Most/several men there were _ here disagreed. (Carlson 1977, 525)
d. The beer that there was _ for sale was too expensive (Sauerland 1998, 69)
e. the kind of people that I expected there would be _ at the party

(c) **Observation 3.** Principle C effects under reconstruction are not found in appositive relatives like (24a) (Bianchi 1999, ch. IV and forthcoming; Safir 1999), nor in normal restrictive relatives like (24b), but they emerge in ''special interpretation'' restrictive relatives like (24c, d) and in amount relatives like (25e) (Bianchi forthcoming, Sauerland 1998):

(24) a. this picture of $John_i$, which I think he_i likes _, ...
b. the picture of $John_i$ he_i likes _ (Sauerland 1998, 76)
c. *The headway on $Mary_i$'s project she_i had made _ pleased the boss. (Sauerland 1998, 76)
d. *The letters by $John_i$ to her_j that he_i told every $girl_j$ to burn _ were published. (Sauerland 1998, 71).
e. *It would have taken us all year to read the letters for $John_i$ he_i expected there would be _. (Sauerland 1998, 72)

(d) **Observation 4** (Bianchi, forthcoming). In a sample of 11 languages, optional resumptive pronouns alternating with gaps are not found in maximalizing relatives; if a language allows them in restrictive relatives, it also allows them in appositives, but not vice-versa. When they appear in restrictive relatives, they force a specific interpretation of the ''head'' (cf. Doron 1982, Sells 1984). An example is the following paradigm from Hebrew:

(25) a. ha-bendod Sel-i, Se rina ʔohevet (*ʔoto*), haya baxur nexmad.
the-cousin of-mine, that Rina loves him, was guy nice
'My cousin, who Rina loves, was a nice guy.'
b. ha-ʔiS Se rina ʔohevet (*ʔoto*)
the-man that Rina loves him
haya ha-bendod Sel-i.
was the-cousin of-mine
the man who Rina loves was my cousin.'
c. ʔani micta ʔer ʔal ha-zman
I sorry about the-time
Se-bizbazti (*ʔoto*)
that-[I] wasted (it)
'I regret the time that I wasted.'
d. 'samti ba-kis ʔet kol ha-kesef
[I] put in-the-pocket ACC all the-money
Se-yaxolti la-sim (*ʔoto*).
that [I] could put (it)
'I put in my pocket all the money I could.'

These empirical observations are summarized in the following table.

(26)

	Appositive rel.	Restrictive rel.	Maximalizing rel.
Wh pronoun	+	±	−
Existential *there*	−	±	+
Principle C effects	−	±	+
Hebrew res. pron.	+	±	−

Concerning restrictive relatives, the above data suggest that they tend to pattern with maximalizing relatives when the ''head'' has a ''special'' (non-specific?) interpretation, and with appositive relatives otherwise. However, the data are yet controversial and require further investigation.

All of these phenomena are sensitive to Grosu & Landman's typology. As mentioned in §1, the restrictive/non-restrictive divide has often been discussed in connection with the modification problem, but not in connection with the nature of the relativization site.

In this respect, Postal's (1994) work on extraction dependencies was innovative. Postal argued that certain dependencies (including appositive relativization) are banned from anti-pronominal contexts because they necessarily involve a silent definite pronoun in the gap position (cf. Perlmutter's shadow pronouns). Other dependencies, including restrictive relativization, have a silent resumptive pronoun only optionally: in particular, the silent pronoun is required when the extraction crosses a weak island. This explains why a dependency crossing a weak island cannot terminate in an anti-pronominal context:

(27) ?*the kind of people that I wondered whether there would be _ at the party

Finally, a subset of dependencies (including comparatives and free relatives) do not allow for a silent definite pronoun; perhaps this class also includes amount relatives (which Postal 1994 does not explicitly distinguish from restrictives; see Bianchi, forthcoming for discussion).

Heim (1987) proposed a different perspective on the data in (23). On her account, restrictive relativization is excluded from the existential *there* context because the relativization site must contain an **individual variable**, which is inherently strong and violates the Definiteness Constraint. Amount relativization instead involves partial reconstruction of the ''head'' and a degree variable in the relativization site, which does not violate the Definiteness Constraint. Frampton (1991) argued that an A' chain crossing a weak island necessarily involves an individual variable: this is why (27) violates the Definiteness Constraint. This line of analysis has been developed by Rizzi (2001), Bianchi (forthcoming), Sauerland (1998): in amount (and ''special''/non-specific) A' chains, the NP part of the ''head'' is only represented in the relativization site; in other restrictive relatives, all the copies of the NP are available in the LF representation. The lowest degree of ''structure sharing'' between the surface ''head'' and the relativization site amounts to sharing a referential index only (Bianchi forthcoming): this is equivalent to (non-accidental) coreference, and it seems an appropriate solution for appositive relatives (cf. Jackendoff 1977, Grosu 2002).

This line of analysis can establish a relation between the data in (23) and the reconstruction effects in (21) and (24). An alternative **semantic reconstruction** mechanism was proposed by Sharvit (1997, 1999), based on Chierchia's (1993) functional dependencies (see also Alexopoulou & Heycock, forthcoming).

Another facet of the connectivity problem is the phenomenon of **pied-piping**:

(28) the person [*whose mother's dog*] we were all fond of

The pied-piped noun phrase has a contradictory status. On the one hand, it must stand for a *wh*-phrase: otherwise, it would not be allowed to appear in a left-peripheral position. On the other hand, at the interface with the semantic system it should not be represented in the left-peripheral position: the latter should contain only the relative pronoun, acting as a sort of lambda-abstractor.

In order to solve this paradox, Safir (1986) distinguished the A' binding relation holding between the moved phrase and the gap from the R-binding relation between the ''head'' and the relative pronoun. Fabb (1990) proposed an analysis of pied-piping based on a complex coindexing mechanisms, which was criticized by Borsley (1992). In the copy theory of traces, the obvious solution is to delete the higher occurrence(s) of the pied-piped phrase at LF and fully reconstruct it in the base position (cf. Chomsky 1993). In HPSG, pied-piping is analysed in terms of an unbounded (REL) dependency distinct from the extraction (SLASH) dependency. See also Sharvit (1998) for a solution in terms of semantic reconstruction.

In my opinion, none of these proposals addresses the more basic question of why pied-piping exists in the first place (see Chomsky 1995, 265). Furthermore, it is not clear why pied-piping is more liberal in relative clauses than in interrogatives, and even among relatives, it is more liberal in appositives than in restrictives (see Cinque 1978, 1982; Fabb 1990; Ishihara 1984; Ross 1967, 197 ff.; Stockwell Schachter & Partee 1973, 456–465).

2.3 Concluding remarks

The core of the connectivity problem is how the relative ''head'' is related to the relativization site. We have briefly reviewed a number of solutions, based on a variety of formal mechanisms: matching plus deletion; coindexing between the ''head'' and a relative operator; movement leaving copy-traces; nonlocal features percolation; gap vs. silent resumptive pronoun. I believe that independent of the specific implementation, recent research is converging on the idea that the amount of reconstruction effects that are found in a relative clause depends on its semantic interpretation; thus, the connection between the relative ''head'' and the relativization site is different in appositive vs. restrictive vs. maximalizing (and ''special interpretation'') relatives. How the difference can be best expressed is still an open question for further research.