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Locality, Minimalism, and Parasitic Gaps

In this article I adopt Chomsky's (1993) suggestion that the antecedent government clause of his (1981) formulation of the Empty Category Principle (ECP) reduces to an economy principle (section 1.1). I show that this principle substitutes for Locality within the theory proposed in Manzini 1992a (section 1.4).

My central thesis is that Subjacency, as formulated in Chomsky 1986, can also be reduced to the notion of economy, by modifying the c-command requirement on dependencies (section 1.2). The properties of parasitic gaps with respect to subject and adjunct islands, as systematized notably by Kayne (1983), provide a testing ground for this theory (section 1.3).

I also explore some additional properties of parasitic gaps, in particular the fact that they are licensed only by Ā-movement of arguments (section 2.1), their apparent insensitivity to relative clause islands (section 2.2), and their sensitivity to definiteness and tense islands (section 2.3).

1 Locality and Minimalism

1.1 Locality

Adopting and adapting Chomsky's (1993) definition, I shall say that the *domain* of a head X consists of all and only the elements that are contained by, and do not contain, a projection of X. Similarly, I shall define the *minimal domain* of X, which I shall notate (X), by replacing *containment* with *immediate containment* in the preceding definition. The two definitions are given in (1)–(2).

This article is a rewriting of Manzini 1992b and Manzini 1993 that takes Chomsky 1993 into account. I presented various versions of it as part of a cycle of lectures at the University of Paris VIII in 1992, as part of a graduate course and of graduate lectures at the University of Florence in 1993, at the 1992 GLOW Colloquium in Lisbon, and in seminars at the University of Geneva and at the University of Venice in 1993. I am indebted to the organizers and audiences of all these events. I am particularly grateful to M. Brody, whose work (Brody 1991, 1992, 1992/93) helped mine along, and to L. Rizzi, also one of the editors, for his comments.

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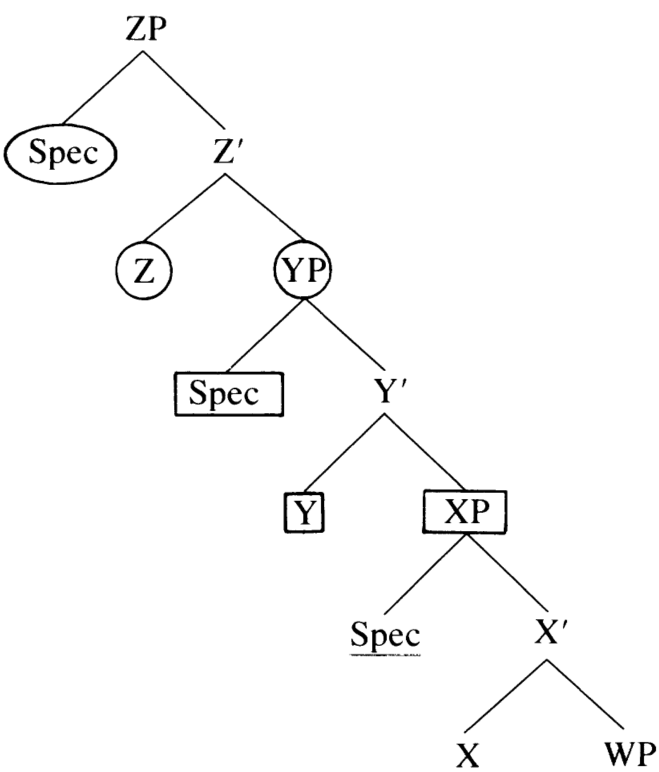
481–508

(1) The minimal domain (X) of a head X consists of all and only the elements that are immediately contained by, and do not immediately contain, a projection of X.

(2) The domain of a head X consists of (X) and of all the elements that the members of (X) contain.

In practice, under (1) the minimal domain (X) of a head X consists of X itself, the specifier and complement of X, plus all elements adjoined to X″. The domain of a head X consists of all these elements plus all the elements they contain. Thus, in a configuration of the type in (3), (X) contains all and only the elements underlined, (Y) all and only the elements boxed, (Z) all and only the elements circled.

(3)



Consider Travis's (1984) Head Movement Constraint. Under this constraint, in a configuration of the type in (3), X can move to Y and Y to Z, but movement from X directly to Z is impossible. Under Rizzi's (1990) Relativized Minimality, movement from A to B is possible only when no potential antecedent intervenes between them. Thus, movement from X to Y is possible in (3) because no heads intervene between them; but movement from X to Z is impossible because of the presence of Y between them. As Chomsky (1993) points out, this is essentially an economy constraint, forcing movement from X to the head closest to it.

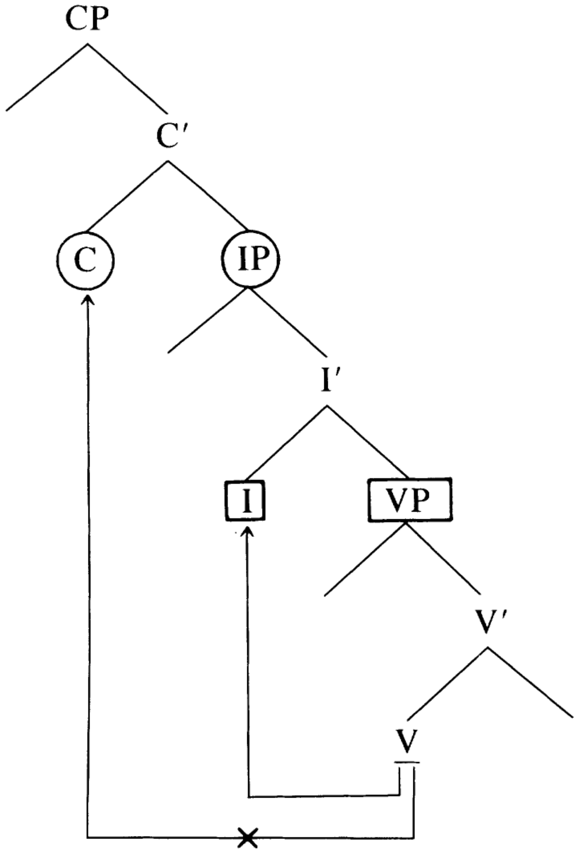
In terms of minimal domains, we can equally well say that in (3), (X), the minimal domain of X, is closest to (Y), the minimal domain of Y, since no members of other minimal domains intervene between them. Specifically, I shall say that two minimal domains (X) and (Y) are *adjacent* to one another just in case there is no member of a third minimal domain that contains (X) and not (Y), or vice versa, as in (4).

(4) (X) and (Y) are adjacent iff there is no (Z) such that some member of (Z) contains (X) and does not contain (Y), or vice versa.

Under (4), (X) and (Z) are not adjacent in (3), since there is a member of (Y)—namely, XP—that contains (X) and not (Z). (X) and (Y) are of course adjacent in that there is no member of a third domain that contains one and not the other.

Given the notion of adjacency in (4), we can conclude that movement from a head X to a head Y is possible only if their minimal domains are adjacent. Thus, in (5) movement from V to I is allowed in that (V) and (I) are adjacent, whereas movement from V to C is blocked in that VP, effectively a barrier in the sense of Chomsky (1986), intervenes between (V) and (C).

(5)



By extending the conclusion that head movement always involves two adjacent minimal domains to movement in general, we obtain the locality condition in (6), which I shall refer to simply as *Locality*, adopting the terminology used in Manzini 1992a.

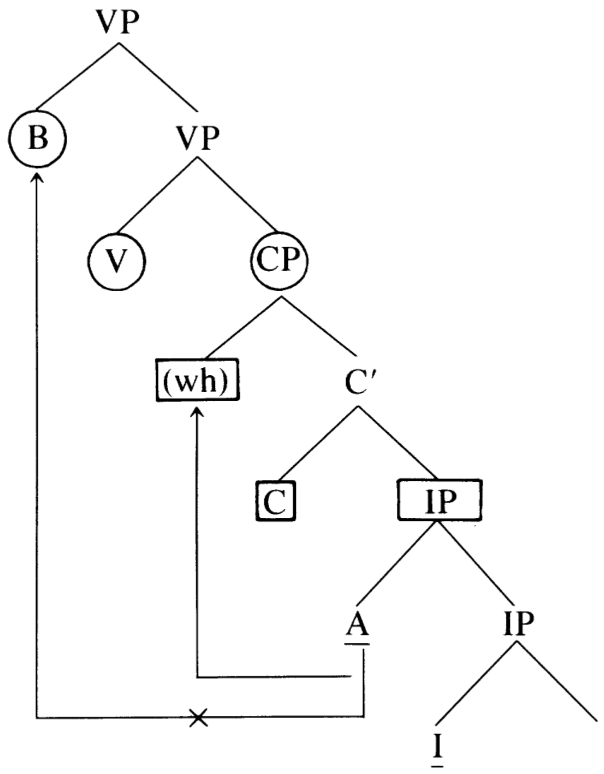
(6) *Locality*
For all i, let A_i be in (X_i). Given a dependency $(A_1, \ldots, A_n)$, for all i, (X_i) and (X_{i+1}) are adjacent.

Like Rizzi's (1990) Relativized Minimality, (6) is an economy constraint in the sense of

Chomsky (1993); intuitively, (6) states that two elements next to one another in a dependency must be minimally distant in the tree, where minimum distance is now defined as adjacency of minimal domains.

(6) yields not only the Head Movement Constraint but also *wh*-islands. Thus, in (7) Ā-movement from the IP-adjoined position, which is in (I), to Spec CP, which is in (C), is licensed under (6), in that (I) and (C) are adjacent. However, moving directly from (I) to the VP-adjoined position, which is in (V), violates (6), in that (I) and (V) are not adjacent.

(7)



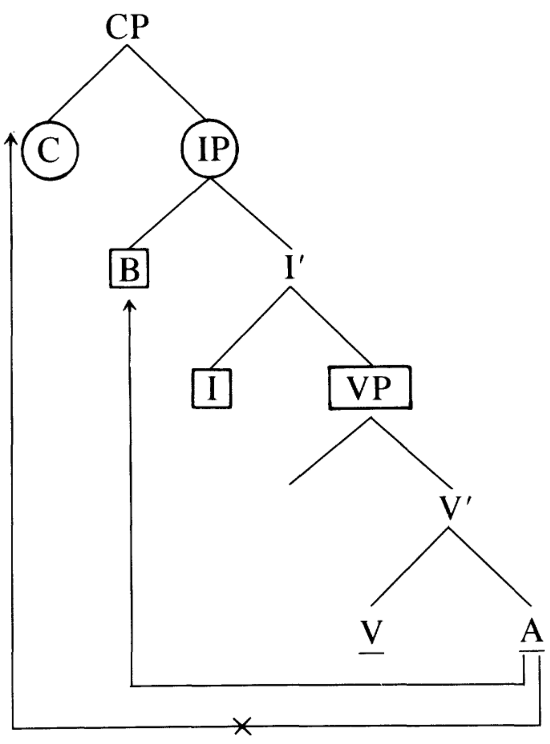
This of course yields *wh*-islands, which arise precisely when the unavailability of an Ā-landing site in (C) forces movement to take place directly from (I) to (V).[1]

Furthermore, (6) predicts the prohibition against superraising, that is, against raising to an A-specifier in a nonadjacent minimal domain across a filled A-specifier in an adjacent one.[2] Thus, in (8) it allows A-movement from the complement of V, which is in (V), to Spec IP, which is in (I), since (V) and (I) are adjacent. But moving from (V) directly to a higher A-specifier again violates (6).

[1] Inner islands and pseudo-opacity, in the sense of Ross (1984), Obenauer (1976), and Rizzi (1990), can also be derived under (6) along the lines that I propose in Manzini 1992a:sec. 3.2.

[2] Notice that the cases that fall under equidistance in Chomsky 1993 do not fall under the present theory. However, nothing prevents us from defining the notion of minimal domain in terms of (two-member) chains of heads, precisely along the lines suggested by Chomsky.

(8)



In short, (6) yields all of the results of Rizzi's (1990) Relativized Minimality and of my (1992a) Locality, which it is meant to replace. It remains to consider the one major type of island that does not (directly) fall under this principle, namely, subject and adjunct islands.

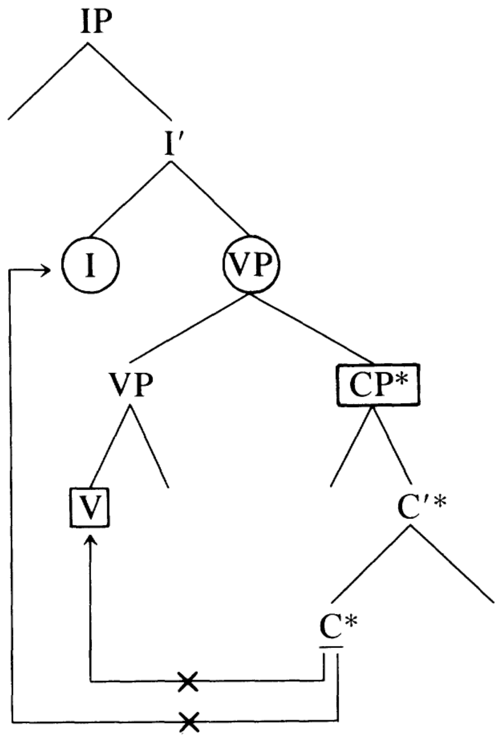
1.2 Ordering

The generalization concerning subject and adjunct islands is generally taken to be Huang's (1982) Condition on Extraction Domain (CED), namely, that a dependency cannot be formed across a maximal projection that is not a sister of a head. I shall show that at least for head movement, subject and adjunct islands can be derived from Locality, as given in (6), and from the independently needed c-command constraint on dependencies.

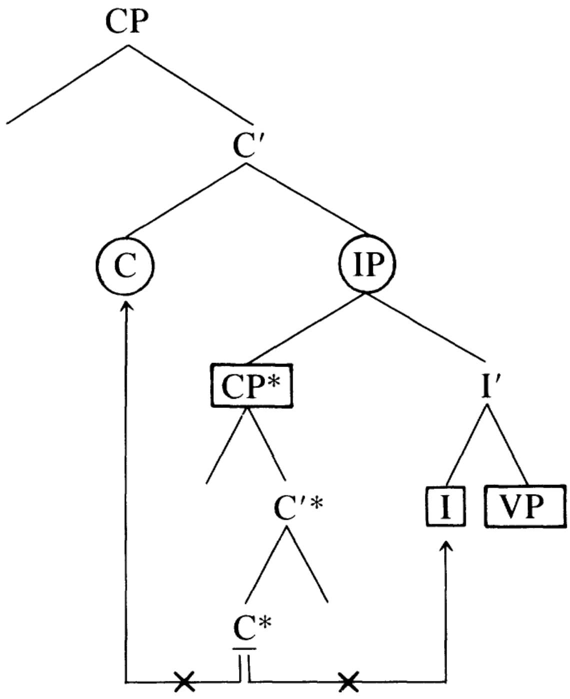
First consider adjunct islands, as in the abstract configuration in (9) on page 486. Suppose we have formed a head dependency reaching the embedded C*, which is of course in (C*). (C*) is adjacent to (V). However, the head position in (V)—namely, V—does not c-command C*. Thus, a dependency (. . . , V, C*, . . .) cannot be formed, because the c-command condition on dependencies is violated. Suppose on the other hand that C* forms a dependency (. . . , I, C*, . . .) with the first head, I, that c-commands it. Since I is of course in (I), Locality is violated, in that (C*) and (I) are not adjacent; indeed, CP*, a member of (V), intervenes between them.

Much the same can be repeated for subject islands, as in the abstract configuration in (10).

(9)



(10)



A dependency including the link (I, C*) satisfies Locality, in that (I) and (C*) are adjacent; but such a dependency cannot be formed, because it violates c-command. On the other hand, a dependency including the link (C, C*) satisfies c-command; but it violates Locality in that CP*, a member of (I), intervenes between (C) and (C*), which are therefore not adjacent.

Thus, (6) derives adjunct and subject islands for head movement, in conjunction with the c-command requirement, which is independently needed to order dependencies. However, the analysis just illustrated for head dependencies fails for phrasal dependencies. Consider an element in Spec CP* in (9). Both (6) and the c-command condition on dependencies can be satisfied if movement takes place to a VP-adjoined position. Similarly, in (10) neither (6) nor c-command is violated if movement takes place from Spec CP* to an IP-adjoined position.

There is, however, a fundamental asymmetry between the notions of locality and of ordering used in the discussion so far. The notion of locality, or adjacency, is defined for minimal domains, which correspond to sets of points in a tree; the notion of ordering, or c-command, is defined for single points in the tree.

Suppose then that the notion of ordering for dependencies is modified so as to involve the ordering of sets of elements. Remember that according to Reinhart (1976), B c-commands A just in case the first node that dominates B dominates A. By analogy, we can define a notion, which I shall refer to as *superiority*, under which (Y) is superior to (X) just in case all nodes that dominate a member of (Y) dominate a member of (X). This definition is given in (11).

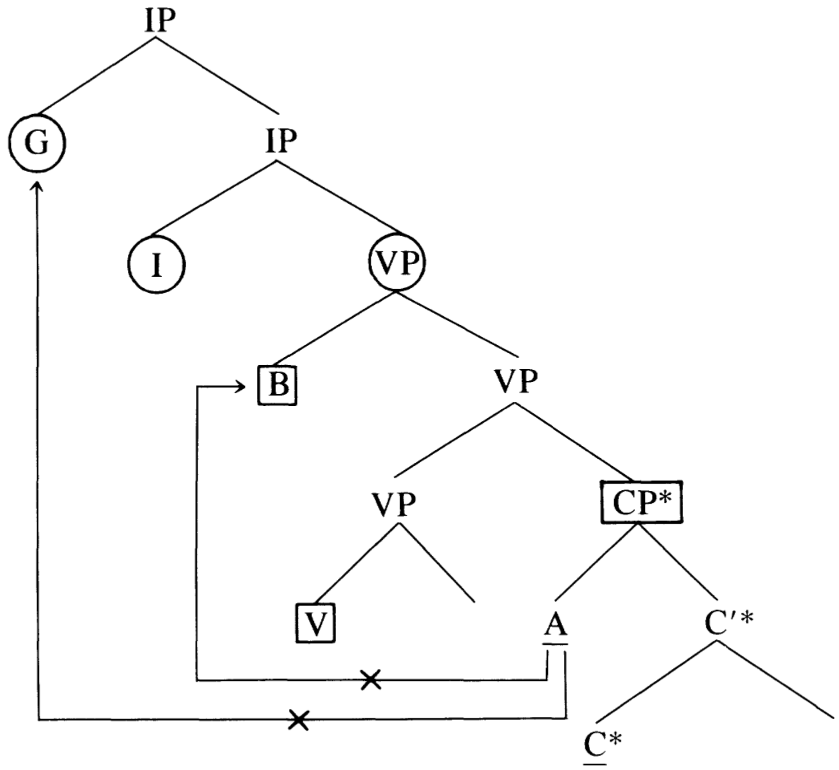
(11) (Y) is superior to (X) iff there is no node that dominates a member of (Y) and does not dominate a member of (X).

I then propose that the c-command requirement on dependencies is eliminated, and that it is replaced by a superiority requirement. The notion of dependency can easily be defined so as to embed this new notion of ordering, as in (12).

(12) For all i, let A_i be in (X_i). $(A_1, \ldots, A_n)$ is a dependency only if for all i, (X_i) is superior to (X_{i+1}).

(12) allows us to account for subject and adjunct islands with all dependencies as a conspiracy between Locality and ordering. Again consider adjunct islands, as in (13).

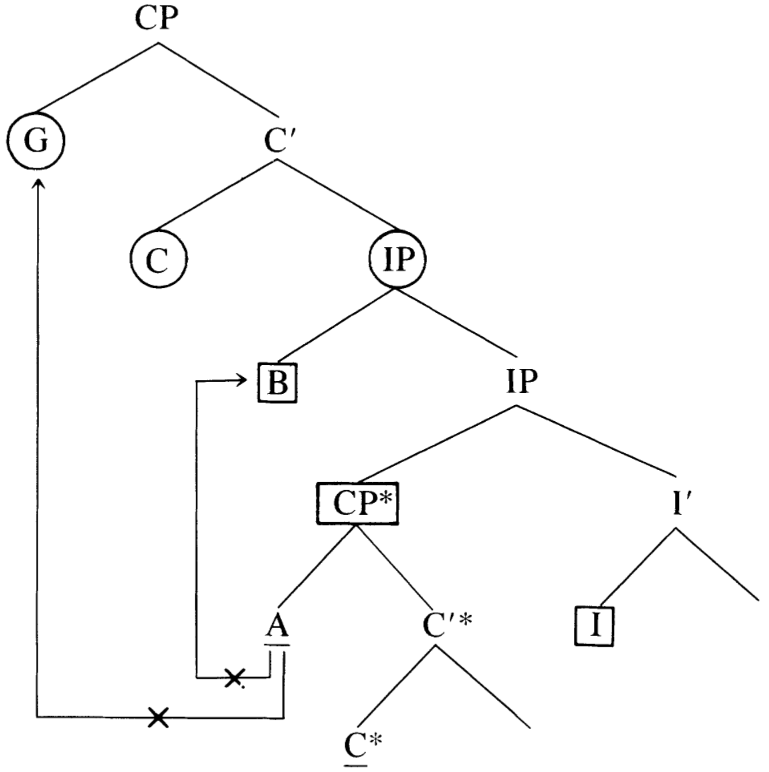
(13)



Suppose a phrasal dependency has reached Spec CP*. If movement takes place to a VP-adjoined position, Locality is satisfied, since (V) and (C*) are adjacent. However, (V) is not superior to (C*), since there is at least one node, V′, that dominates members of (V)—for instance, V—and not (C*); hence, the ordering requirement is not satisfied and no dependency can be formed. The reverse is true if movement takes place from Spec CP* to an IP-adjoined position. Ordering is satisfied, since (I) is superior to (C*), but Locality is violated, since CP*, a member of (V), intervenes between (I) and (C*), and therefore (I) and (C*) are not adjacent.

Essentially the same can be repeated for subject islands, as in (14).

(14)



If movement takes place from Spec CP* to an IP-adjoined position, ordering is violated, in that (I) is not superior to (C*). On the other hand, if movement takes place directly to Spec CP, Locality is violated, in that (C) and (C*) are separated by CP*, a member of (I), and therefore not adjacent.

In short, not only the locality requirement but also the ordering requirement on dependencies can be expressed in terms of (minimal) domains, rather than of points in a tree. If so, then subject and adjunct islands can be derived for all dependencies by the interaction of Locality and ordering. This in turn provides the basic reason for switching from Rizzi's (1990) Relativized Minimality to Locality, since Locality but not Relativized Minimality is sufficient to ensure this result in all cases.

1.3 Locality and Ordering in Parasitic Gaps

Next consider parasitic gaps, in the sense of Taraldsen (1981), Chomsky (1982), and Engdahl (1983). Whereas in (15) extraction out of a subject is ill formed, as an instance of a subject island, in (16) a parasitic gap inside a subject is well formed. In other words, parasitic gaps are apparently insensitive to subject islands. The same can be repeated about examples involving sentential subjects, as in (17)–(18), which I shall take as the basis for my discussion.

(15) *a man that [friends of t] admire me

(16) a man that [friends of e] admire t

(17) *a patient that [operating t immediately] could help me

(18) a patient that [operating e immediately] could help t

Similarly, (19) shows that extraction out of an adjunct is ill formed. However, in (20) a parasitic gap inside an adjunct is well formed.

(19) *a book that people understand linguistics [after reading t]

(20) a book that people buy t [without reading e]

Crucially, in (21)–(22) a parasitic gap inside both a subject and an adjunct is ill formed; similarly, a parasitic gap inside two adjuncts is ill formed in (23).

(21) *a man that I admire t [because [friends of e] become famous]

(22) *a patient that I chose t [because [operating e immediately] could help me]

(23) *a book that people buy t [without understanding linguistics [after reading e]]

Thus, the generalization that can be drawn notably from Kayne 1983 and related literature, including Bennis and Hoekstra 1984, Longobardi 1984, and Koster 1986, is that parasitic gaps are insensitive to one island of the subject/adjunct type; but they are sensitive to two or more.

Chomsky's (1986) Subjacency, as the locality constraint deriving subject and adjunct islands, must be augmented by some further condition in order to derive the facts concerning parasitic gaps. Chomsky (1986) in particular proposes that no barriers must intervene between the highest member of the parasitic gap dependency (a null operator) and some member, specifically the variable, of the real gap dependency. However, this condition appears to be insufficient by itself.

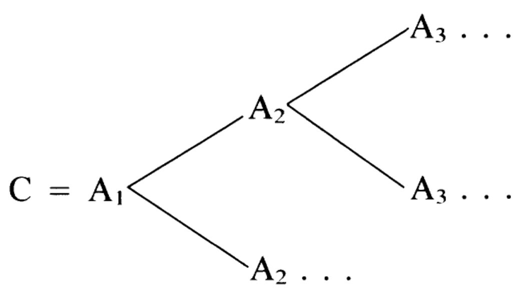
In (20) a null operator binding the parasitic gap can be governed by the real gap only if it is adjoined to the adjunct CP (or PP) so that CP (/PP) ceases to be a barrier for it. But if adjunction is allowed in this case, it is difficult to see how it can be excluded in the case of other extractions, hence how the contrast between (20) and (19) on the one hand, and between (20) and (23) on the other hand, can be predicted. Similarly, the well-formedness condition on parasitic gaps can be satisfied in (18) only if we allow for adjunction to the subject CP. But again this undermines the basis for predicting subject island violations.

A condition such as Frampton's (1990) Head Government Condition on Adjunctions (HGCA), on the other hand, appears to be empirically adequate, but at the cost of further redundancy. In particular, Huang's (1982) CED, which is embedded in Chomsky's (1986) notion of barrier, is also independently embedded in the theory of adjunctions, precisely in the form of the HGCA.

In short, Chomsky's (1986) Subjacency has difficulties in predicting the locality properties of parasitic gaps. It is therefore potentially interesting to consider parasitic gaps in the light of my conclusion that this condition is to be treated as a theorem of two other notions, Locality and ordering.

Structures of the type in (18) and (20) differ from those considered so far in that they contain a forking dependency. In order to allow such dependencies into the grammar, we can either postulate a mechanism for composing ordinary dependencies, or else relax the ordering constraint to allow a dependency to be partially ordered. Here I shall revise the ordering constraint, adopting a definition of the type proposed by Brody (1992/93), as in (24).[3]

(24) For all i, let A_i be in (X_i).

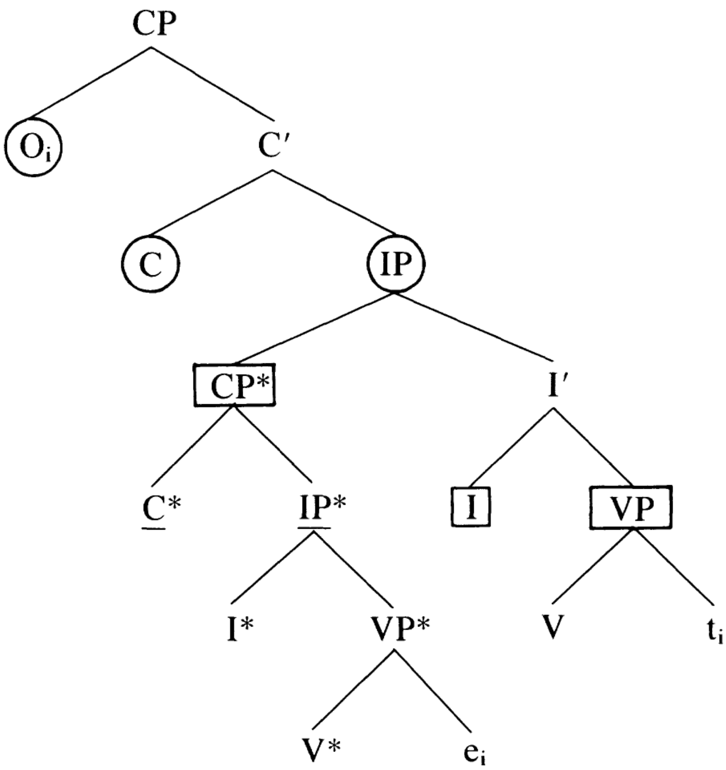


is a dependency only if for all A_i, $i \neq 1$, there is an A_{i-1} such that (X_{i-1}) is superior to (X_i).

Consider the abstract structures for (18) and (20), as in (25)–(26). In both of these structures (24) allows a dependency to be formed whose head is O_i and whose roots, unordered with respect to one another, are e_i and t_i. In particular, the forking dependency in (25) can include the minimal domains indicated in (27), and the forking dependency in (26) can include the minimal domains indicated in (28).

[3] Brody 1992/93 also contains an explanation for why parasitic gaps can only be found in forking dependencies (in other words, for the so-called anti-c-command requirement on parasitic gaps), as well as a detailed discussion of the literature on the topic. Note that the anti-c-command requirement correctly rules out parasitic gaps in complements. As far as I can see, proposals to the effect that adjuncts are complements of abstract heads, such as Larson's (1988) and Stroik's (1990), are unable to account for the contrast between parasitic gaps in real complements and in adjuncts. Kayne (1994), who excludes right adjunction on general grounds, faces the same problem. It appears then that the approach pursued here forces one to reject the conclusions of Kayne (1994) on this particular point.

(25)


CP
O_i
C′
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IP
CP*
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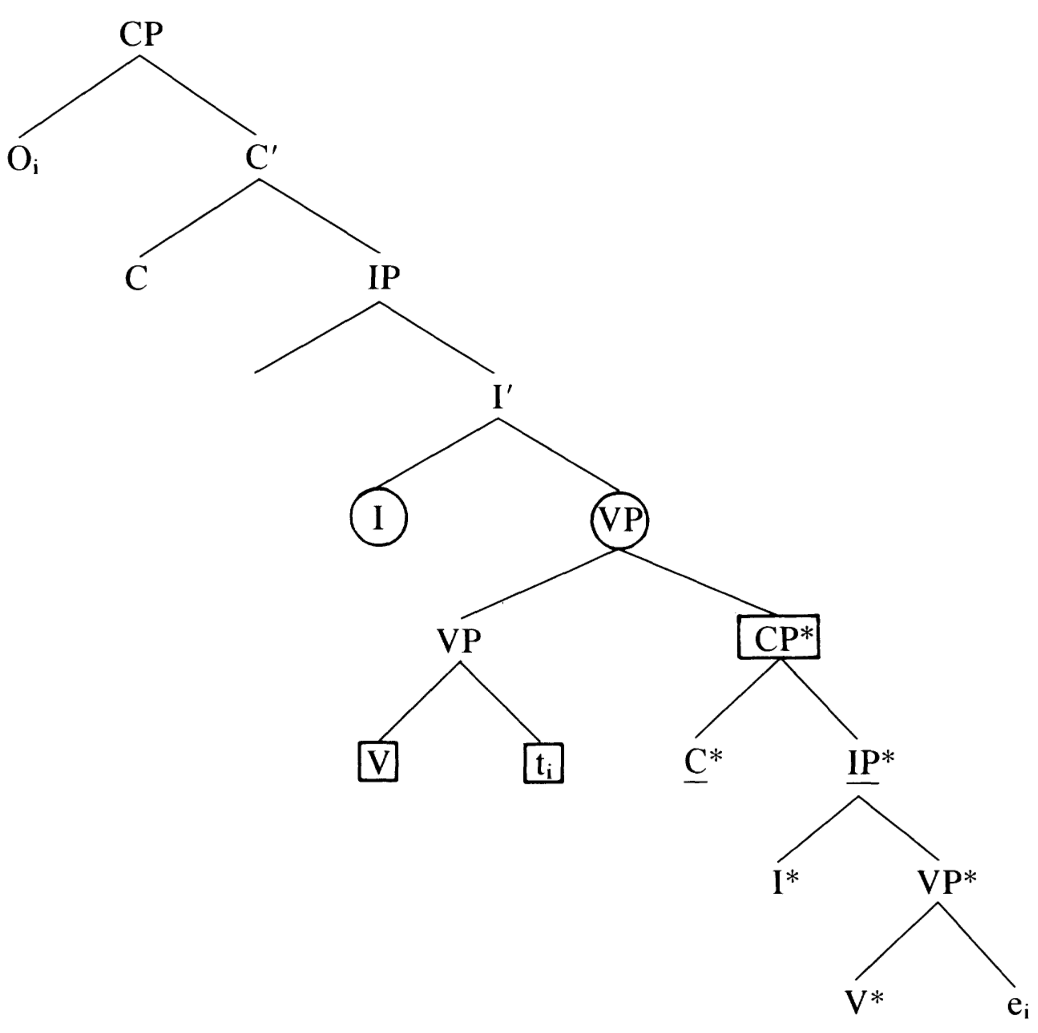
(26)


CP
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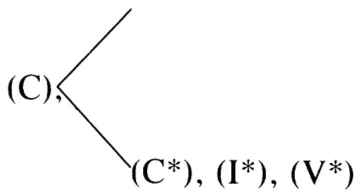
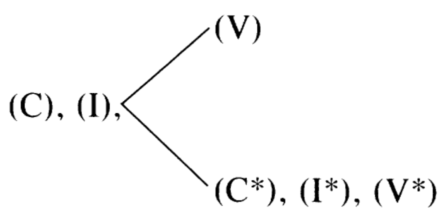
(27) 

(28) 

Now consider Locality. For completely ordered dependencies we have assumed so far that two elements ordered next to one another in a dependency must be in adjacent minimal domains. If so construed, however, Locality is violated in (25)–(26) for exactly the same reasons as in (9)–(10) or (13)–(14). Two positions in (C) and (C*), which are ordered next to one another in the dependency in (27), cannot satisfy Locality, in that (C) and (C*) are not adjacent in the tree. Similarly, two positions in (I) and (C*), which are ordered next to one another in the dependency in (28), cannot satisfy Locality, in that (I) and (C*) are not adjacent in the tree.

Notice however that in (27) the forking dependency includes a position in (I), as part of the main gap branch. Thus, a position in a minimal domain adjacent to (C*)—namely, (I)—is present in the dependency, though (C*) and (I) are unordered with respect to one another. Similarly, in (28) the forking dependency can include a position in (V) as part of the main gap branch. Thus, the dependency includes a position in a minimal domain adjacent to (C*)—namely, (V)—though (V) and (C*) are unordered with respect to one another.

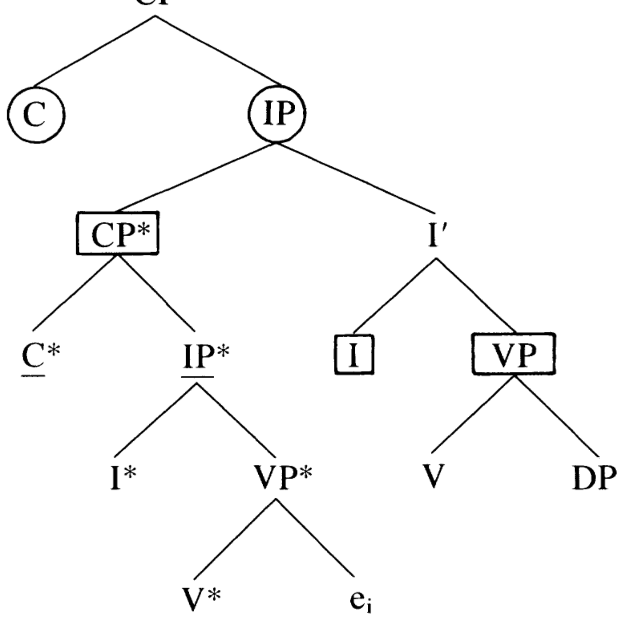
Suppose then that we take Locality to require that given a forking dependency, there is simply a subset of positions relating each of its roots to its head, such that in this particular subset two positions next to one another are in adjacent minimal domains. This is the requirement expressed in (29).

(29) *Locality*
For all i, let A_i be in (X_i). Given a dependency C with head A_1, for every root A_n of C there is a subset of C, $S = (A_1, \ldots, A_n)$, such that for all i, (X_i) is adjacent to (X_{i+1}).

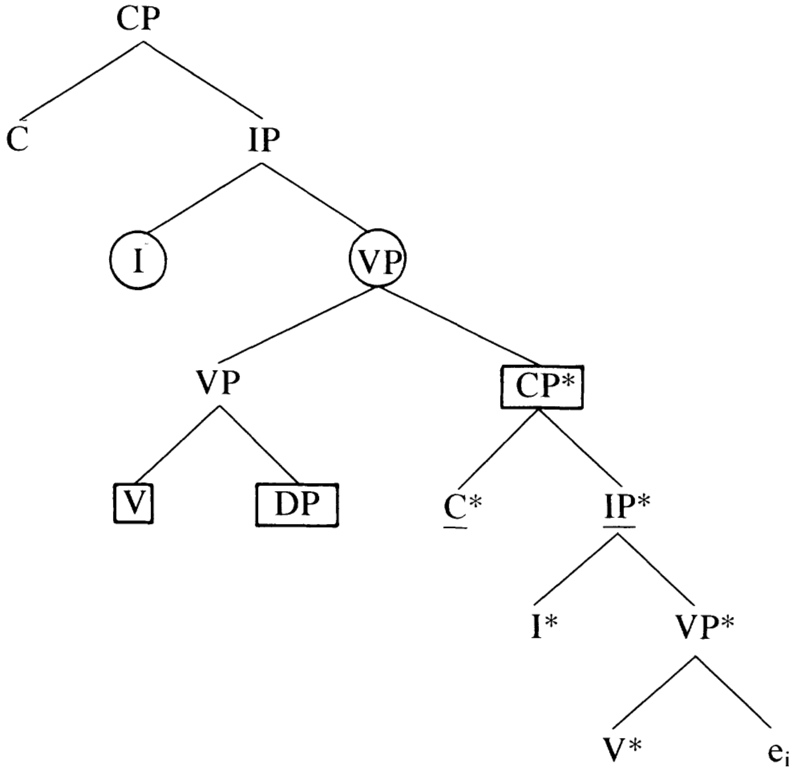
Under the formulation in (29), Locality is satisfied by the forking dependencies in (25)–(26). In (25) Locality is satisfied by a subset of the dependency in (27) including positions in (C*) and in (I), unordered with respect to one another in the dependency as a whole. Similarly, two positions in (V) and in (C*) in (26) satisfy Locality in the relevant subset of the forking dependency in (28), though they are unordered with respect to one another in the dependency as a whole.

Let us now turn to the ill-formed examples of parasitic gaps in (22) and (23). These are associated with abstract structures of the type in (30) and (31), respectively.

(30)



(31)



If the weakening of Locality from (6) to (29) is correct, (29) ought to derive the ill-formedness of both (30) and (31).

Consider (30). Suppose the dependency formed by e_i has successfully reached a position in (C*). A position in (I) cannot be part of it, in that it is unordered with respect to (C*); nor can it be part of some other branch of the dependency. In the absence of a position in (I), Locality is violated. Similar considerations apply to (31). We suppose once again that the e_i dependency has successfully reached a position in (C*). A position in (V) cannot be part of it in that it is unordered with respect to (C*), nor can it be part of some other branch of the dependency. In the absence of a position in (V), a violation of Locality is then forced.

In short, I tentatively conclude that the locality properties of parasitic gaps can be accounted for on the basis of the same principles of Locality and ordering that account for ordinary subject and adjunct island violations, provided the ordering constraint is modified to allow for forking dependencies, and pairs of elements unordered with respect to one another in a dependency are allowed to satisfy Locality. In essence, the first of these two moves is theory-independent. The second move amounts to saying that there is no necessary connection between ordering and Locality, so that they can be satisfied by different subsets of a forking dependency. If the dependency does not fork, Locality and ordering will of necessity be satisfied by the same elements. Nevertheless, this can be taken to be a special subcase of the truly general requirement revealed by forking dependencies.[4]

Compare this theory with the Connectedness theory of Kayne (1983). The principle of ordering that I have introduced in (11), superiority, is in fact similar to the one embedded by Connectedness, which also subsumes c-command. Nevertheless, Connectedness also embeds, in nonmodular fashion, what in the present framework is the separate Locality constraint. It is precisely the modular nature of the latter that constitutes the advantage of the present system over Connectedness. Indeed, the Connectedness Condition cannot subsume *wh*-islands, superraising, and the like, as explicitly recognized by Kayne (1983), whereas Locality does.

1.4 Argument Ā-Dependencies

The present discussion cannot be deemed complete before we take one further problem into consideration. Ā-movement of arguments, as opposed to Ā-movement of non-arguments, does not display sensitivity to *wh*-islands; this is exemplified by the well-known contrast in (32)–(33).

(32) What$_i$ do you wonder [how$_j$ to repair t$_i$ t$_j$]?

(33) *How$_i$ do you wonder [what$_j$ to repair t$_j$ t$_i$]?

The grammaticality of (32) has been taken to mean that argument Ā-movement does not obey the antecedent government clause of the ECP, as in Chomsky 1986, or Relativized Minimality, as in Rizzi 1990. However, apart from any other consideration, the logic of the explanation for subject and adjunct islands proposed here requires argument Ā-dependencies to be subject to Locality like all other dependencies.

[4] Needless to say, we expect to find all properties exemplified here with parasitic gaps in all other cases in which forking dependencies are created, hence in the cases of *wh*-in-situ and negation studied by Kayne (1983), Longobardi (1991), and Brody (1992/93), among others.

In Manzini 1992a I assume that there are two types of indices in the grammar, categorial indices and addresses, the latter term borrowed from Vergnaud (1985). On the one hand, every lexical head is assigned a categorial index, which in the case of DPs can be identified with a referential index, in the standard sense of the term.[5] On the other hand, a position made visible by a head is assigned an address; this, I assume, consists of a pair of indices, corresponding to the categorial index of the head and that of the visible position, respectively.[6] Formally, I say that a categorial index and an address are associated with A when the conditions in (34) and (35), respectively, are satisfied.

(34) i is licensed as the categorial index of A iff A is lexical.

(35) (j, i) is licensed as the address of A iff A = A_i, and there is a head B, B = B_j, such that A is made visible by B.

I assume that since dependencies can standardly be formed on the basis of categorial coindexing, and since addresses are just another type of index, dependencies are definable on the basis of coaddressing as well. Both a categorial index dependency and an address-based one can be defined simply as a set of coindexed positions of which the ordering and Locality constraints hold.[7]

I also assume that apart from movement, there is a second fundamental mechanism through which coindexing takes place, namely, percolation. Percolation is a standard device of all current theories to the extent that it is accepted that heads project their properties to maximal projections and vice versa. Generalizing this mechanism, an index (i.e., the property it represents) can be assumed to percolate freely until it is blocked by an incompatible index (or property).

Now consider the basic sentential structure in (36) on page 496. None of the maximal projections, VP, IP, and CP, that dominate, say, a complement of V in (36) has an address of its own, since none of them is Case-marked, hence visible.[8] Thus, the address of a complement trace can percolate to VP, IP, and CP recursively, and from there to their heads, V, I, and C, as indicated in (36), so that all and only these elements are coaddressed. Given the ordering requirement on dependencies, it will of course be the heads that form an address-based dependency with the trace.

Since adjuncts are not Case-marked by a head, and hence not addressed, they cannot form address-based dependencies. This explains their sensitivity to *wh*-islands, as in

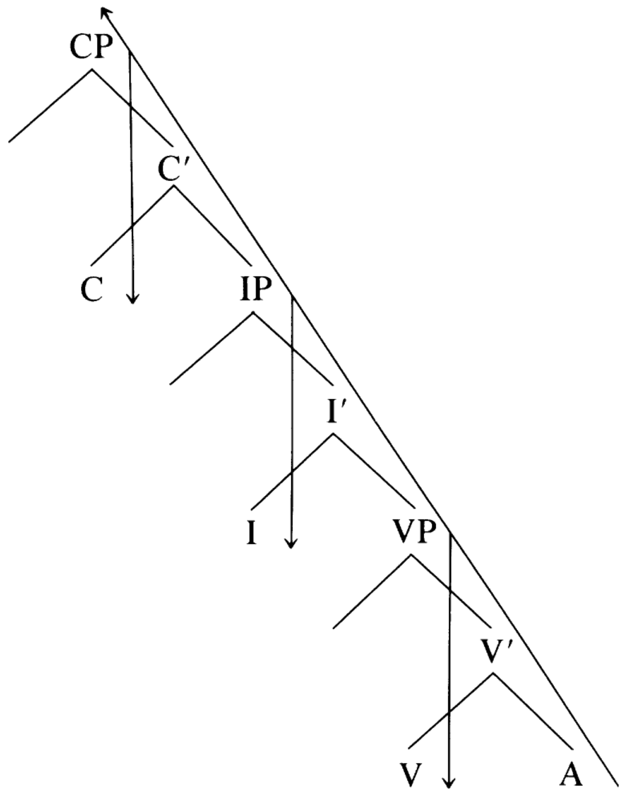
[5] As detailed in Manzini 1992a, anaphors and pronouns are associated with a variable categorial index, which is compatible with other indices, and can form dependencies with them if dependencies are defined in terms of compatibility of indices, rather than of coindexing. Expletive dependencies can also be expressed by the same mechanism.

[6] Following Chomsky (1981), a visible position is a Case-marked position; on this, see also footnote 8.

[7] The notion just suggested subsumes binding dependencies as well, on which see Manzini 1992a:sec. 4.1. In this article I am concerned solely with those unwanted dependencies that are excluded on ordering or Locality grounds. Notice that this doesn't mean that there aren't other constraints on dependency formation, only that I abstract from them.

[8] That CPs are not visible is essentially the line taken in Chomsky 1981, as well as in Stowell 1981.

(36)



(33), since the only derivation open to them is the successive-cyclic one, as illustrated in (37).

(37) . . . $[_{IP}\ t'_i\ [_{VP}$ wonder $[_{CP}$ what$_j$ C $[_{IP}\ t_i\ [_{IP}$ to . . .

In (37), in the absence of a landing site in (C), movement is forced to take place from (I) to (V). This of course means that Locality is violated, since (C) is skipped.

The crucial property of argument Ā-traces with respect to extractions, on the other hand, is their visibility, and hence the fact that they are addressed. Because they are addressed, they can form address-based dependencies. This explains the well-formedness of (32), which, taking the address of t_i to be (k, i), can be associated with a structure of the type in (38).

(38) . . . $[_{VP}$ wonder$_{(k,\ i)}$ $[_{CP}$ how$_j$ C$_{(k,\ i)}$ $[_{IP}$ to$_{(k,\ i)}$ . . .

In (38) there is no need for the specifier of the embedded CP to be empty, since the address-based dependency can make use of the C position instead. If so, the address-based dependency includes members of (I), (C), (V), and so on, satisfying Locality.

Two other major classes of traces pattern with adjunct Ā-traces in not being visible, hence in not being addressed—namely, A-traces and head traces. This explains their locality behavior, as seen in superraising and Head Movement Constraint violations of the type in (39) and (40), respectively.

(39) *[$_{IP}$ Mary$_i$ seems that [$_{IP}$ it is likely [$_{IP}$ t$_i$ to leave]]].

(40) *[$_{CP}$ Have$_i$ [$_{IP}$ John will [$_{VP}$ t$_i$ left]]].

In (39) Locality is violated in that movement skips at least the intermediate (I), whose A-specifier is already filled by *it;* nor can this problem be circumvented by the formation of an address-based dependency, given the lack of an address on *t*. Similarly, (40) violates Locality in that *have* is forced to move directly to (C), skipping (I), whose head is already filled by *will*. Crucially, the absence of an address on *have* makes it impossible for the address-based strategy to be applied.[9]

Alternative formalizations of the notion of address-based dependency are also possible. One is suggested by Chomsky's (1986) notion of extended chain. Under current theories, V enters a head chain with its associated functional categories—say, I—and via I with C. It is possible furthermore for C itself to be dependent on a superordinate V, via selection, which can lead to the formation of extended chains (C, I, V)*. If operators and variables can be linked to one another via extended chains of heads, then the resulting extended chains (O, (C, I, V)*, e) overlap with address-based dependencies as defined above. Similarly, the contrasting behavior of arguments and nonarguments with respect to *wh*-islands can be predicted in terms of the availability or unavailability of extended chain derivations; in particular, the final link (V, e) in the extended chain can be assumed to be licensed just in case the head has a (visibility) relation to the empty category; and so on.

This reconstruction of the notion of address-based dependency as extended chain appears to be worth pursuing particularly in the light of Chomsky's (1993) minimalist framework. Doing so, however, goes beyond the scope of this article. For present purposes it is sufficient to have shown that it is possible to construct an empirically adequate grammar in which Locality applies to all dependencies and can therefore contribute to derive subject and adjunct islands for all of them. Needless to say, although the address-based strategy can circumvent pure Locality violations, such as *wh*-islands, it cannot circumvent ordering violations, hence subject and adjunct islands.[10]

[9] Subject Ā-traces are addressed, and can therefore form address-based dependencies, exactly like object Ā-traces. A discussion of *that-t* and related phenomena, which introduce apparent asymmetries between subjects and objects, can be found in Manzini 1992a:sec. 2.6. The same asymmetries are expected to characterize parasitic gaps, since parasitic gaps do not differ in any essential respect from traces. The prediction appears to be correct; thus, parasitic gaps in subject position are sensitive to the *That-t* Filter. In Manzini 1993 I also point out some consequences that notions of ordering such as superiority have for subject extraction.

[10] If the very restrictive construal of the distribution of left branches in Kayne 1994 is correct, the possibility arises that landing sites will be unavailable where they are required by spec-to-spec movement under the present, equally restrictive construal of Locality. This suggests to me that the role of extended head dependencies (of various types) in licensing other (long-distance) dependencies is even more pervasive than envisaged in the text. For a proposal along these lines and some independent motivation, see Manzini 1994.

2 Parasitic Gaps

2.1 Argument Ā-Dependencies Again

If the discussion so far is correct, all island phenomena are explained either as a consequence of Locality (*wh*-islands and the like) or as a consequence of the interaction of ordering and Locality (adjunct and subject islands). The latter type of explanation also subsumes parasitic gap patterns of the type in (15)–(23). However, several other behaviors of parasitic gaps remain unexplored; and some of them are clearly locality-related.

To begin with, all well-formed examples of parasitic gaps, including (18) and (20), involve Ā-movement of arguments. Other types of movement do not license parasitic gaps. In particular, parasitic gaps are never licensed by A-movement of arguments, as shown in (41), and by Ā-movement of adjuncts, as shown in (42).[11]

(41) *Mary$_i$ was rejected t$_i$ [without seeing e$_i$].

(42) *the way O$_i$ he chose his tools t$_i$ [before repairing the car e$_i$]

Under the present theory, argument Ā-movement differs from other types of movement in exactly one respect, namely, in that it can proceed via the formation of address-based dependencies. We are therefore led to hypothesize that parasitic gaps must correspond to argument Ā-traces in that they must be addressed.

If so, we predict that parasitic gap dependencies, like address-based dependencies in general, can cross *wh*-islands. This is correct, as shown in (43).

(43) Which book$_i$ did you wonder [how$_j$ to review t$_i$ t$_j$ [without reading e$_i$]]?

More significantly, we predict that "nonreferential" *wh*-phrases, in the sense of Rizzi (1990) and Cinque (1990), are not able to license parasitic gaps, since they cannot cross *wh*-islands, which means in present terms that they are not addressed.[12] This is again correct, as shown with measure phrases in (44).

(44) *How many kilos must she weigh t [before admitting to weigh e]?

Data of the type in (42)–(44) find confirmation in Cinque 1990. However, Cinque (following Chomsky (1982, 1986), among others) argues that parasitic gaps are limited to members of the category DP. If true, this is potentially problematic for the hypothesis

[11] These data bear directly on treatments of parasitic gaps under which they are assimilated to across-the-board extractions, as in Ross 1967, Pesetsky 1982, Huybregts and Van Riemsdijk 1984, Haïk 1985, and Williams 1986. What is worth noticing in this respect is that although Ā-movement of adjuncts does not license parasitic gaps, it apparently licenses ATB extractions, as in (i).

(i) the way O$_i$ I selected my tools t$_i$ and I repaired the car t$_i$

Munn (1992) argues, however, that the true generalization is that ATB extractions are not licensed by adjunct Ā-movement either, and are in fact to be treated as a subcase of parasitic gaps. I believe this to be the correct conclusion.

[12] An explanation of "referentiality" phenomena compatible with the present framework is presented in Manzini 1992a:sec. 3.1.

proposed here. Indeed, the fact that at least some PPs can be extracted from *wh*-islands means that they must be addressed. We then expect these same PPs to be able to license parasitic gaps.

In Italian, the language used in Cinque's (1990) examples, my own intuitions are that at least dative and genitive PPs display the relevant contrast between ordinary extraction from an island and a parasitic gap inside it, as in (45)–(48); in this respect my intuitions coincide with those of Engdahl (1983) on Swedish.

(45) *A che medico sei stata curata [senza dare un soldo t]?
to which doctor have you been cured without giving a penny

(46) A che medico ti sei rivolta t [senza dare un soldo e]?
to which doctor did you turn without giving a penny

(47) *Di che professore sei stato promosso [senza leggere i libri t]?
of which professor have you been passed without reading books

(48) Di che professore hai consultato gli articoli t [senza leggere i libri e]?
of which professor did you consult articles without reading books

It is worth emphasizing that like all of the judgments in this article, those in (45)–(48) are not meant to be absolute, but relative. There is then no doubt that (45) and (46) contrast, as do (47) and (48). This is only explained if (46) and (48) embed parasitic gap dependencies; otherwise, given their increased complexity, we expect them to be worse, if anything, than (45) and (47).

In short, the empirical evidence reviewed so far is compatible with the hypothesis that parasitic gaps must be addressed. It remains to be explained why this must be the case. Suppose that empty categories in general must be identified. Notice then that when a dependency forks, its two roots cannot be uniquely identified by their common antecedent. Thus, we can assume that they must each be identified by a different address. If they cannot have an address, then identification fails, whence the impossibility of forking dependencies headed by adjuncts. We can take the relevant principle to be simply (49).

(49) Every empty category must be uniquely identified.

In fact, the unique identification condition on empty categories in (49) prevents any two traces in a forking dependency from being antecedent-identified. If so, we can conclude not only that parasitic gaps must be addressed, but also that parasitic gap dependencies as a whole must be address-based.[13]

In conclusion, the restriction of parasitic gaps to arguments does not undermine the

[13] The conclusion that parasitic gap dependencies must be address-based introduces a link with pied piping, on the standard assumption that this involves some percolation mechanism, naturally interpreted in the present framework in terms of addresses. The factual links between the two constructions are discussed notably by Kayne (1983) and Cinque (1990).

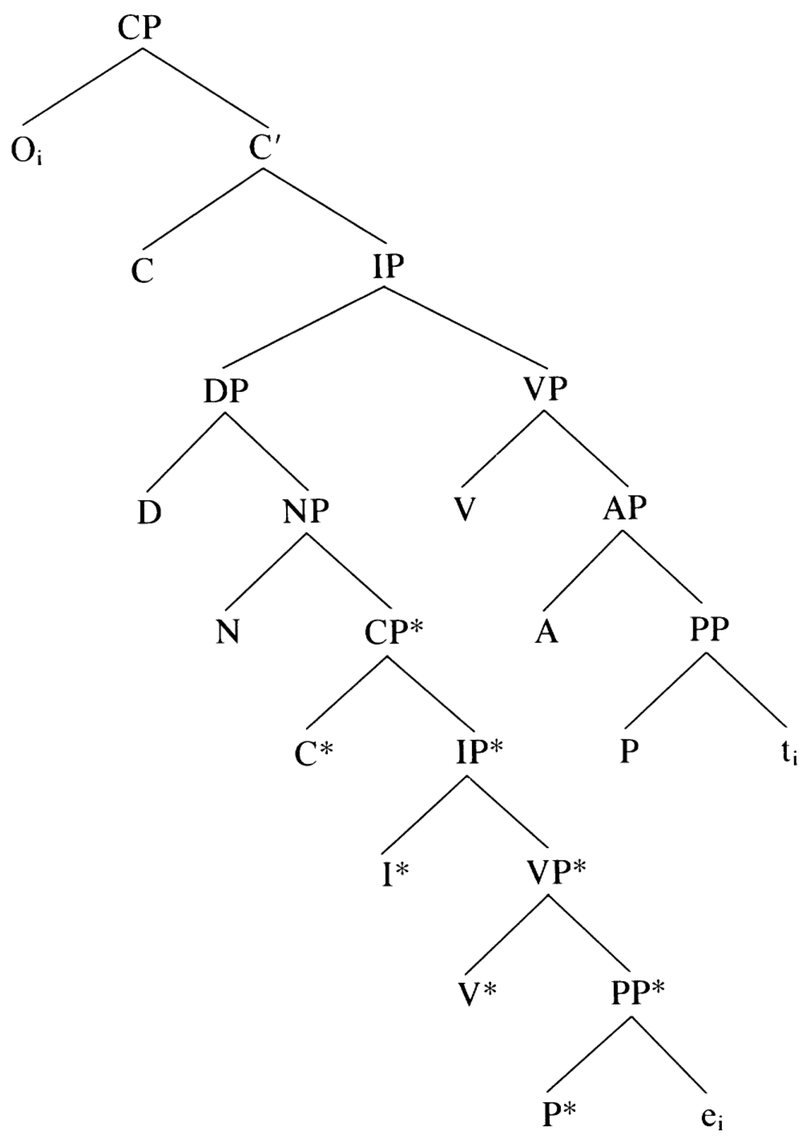
central proposal of this article, since it can be explained by the identification requirement on empty categories in (49), which can independently be assumed to exist.

2.2 Complex NP Islands

Now consider a construction of the type in (50), which is associated to a first approximation with the abstract structure in (51).

(50) a person that [people [that talk to e]] usually end up fascinated with t

(51)



From a descriptive point of view, the (relative) well-formedness of (51) is problematic, in that the parasitic gap is apparently embedded under not one, but two, islands of the subject/adjunct type; one is of course the subject DP, the other the relative clause, CP*, which is standardly taken to be an adjunct.

Under Kayne's (1983) Connectedness, g-projections are blocked only at left branches. Hence, the g-projection of the parasitic gap in (51) is blocked only at DP; here it can connect with the g-projection of the main gap, leading to a correct prediction of well-formedness. But if Connectedness must be revised to include a head government requirement, as argued by Longobardi (1984), then the g-projection of the parasitic gap is blocked at CP*, which is not head-governed. Here it can no longer connect to the g-projection of the main gap, leading to an incorrect prediction of ill-formedness.

Similarly, consider Frampton's (1990) barriers-based theory. In (51), under the HGCA, movement cannot take place from Spec CP* to an NP-/DP-adjoined position, because CP* is not head-governed. On the other hand, movement from Spec CP* across CP* itself and NP/DP is blocked on locality grounds; hence, the presence of a trace belonging to the main gap dependency in IP-adjoined position cannot lead to well-formedness. The only way to predict the well-formedness of (50) is to postulate that the relative clause is adjoined to DP, so that there is no longer any NP/DP barrier for extraction from CP*.

An argument can easily be constructed against this solution, however. On the assumption that nonrestrictive relatives are adjoined to DP, and in general must be attached at least as high as restrictive relatives, the theory predicts that, everything else being equal, substituting a nonrestrictive relative for the restrictive relative in (50) also yields a well-formed result. This prediction is obviously wrong, as shown in (52).

(52) *a person that many people, who talked to e, ended up fascinated with t

Within the present theory, we can assume that since c-command is defined for branching nodes (Reinhart 1976), superiority is also defined in this way. In particular, we can say that (B) is superior to (A) just in case the first branching node that dominates a member of (B) dominates a member of (A). It follows that in (51), as long as CP* is attached under NP and N′ does not branch, (N) is superior to (C*); for the first branching node, NP, that dominates any member of (N), dominates (C*). In other words, CP* can effectively be equated to a sister of N, rather than to an adjunct. In turn, since (D) is superior to (N) and (C) is superior to both (D) and (I), a dependency including positions in the minimal domains indicated in (53) satisfies the ordering requirement.

(53) $(C), \left\langle \begin{array}{l} (I), (V), (A), (P) \\ (D), (N), (C^*), (I^*), (V^*), (P^*) \end{array} \right.$

Given (53), Locality is also satisfied, since each minimal domain is adjacent to the next one in the dependency; and (D), which is not adjacent to (C), is nevertheless adjacent to (I). Hence, it appears that the well-formedness of (50) is correctly predicted.

This account also predicts that parasitic gaps are not found in relative clauses that are sisters of a branching N′. This prediction appears to be correct, as shown by the contrast between (50) and (54)–(55).

(54) *a man that [[lovers of conversation] that talk to e] end up fascinated with t

(55) *a man that [[colleagues of my husband] that talk to e] end up fascinated with t

The impossibility of parasitic gaps in nonrestrictive relatives, as in (52), can be accounted for in the same way. In particular, suppose that nonrestrictive relatives are attached under DP. D′ always branches because D obligatorily selects NP. Hence, nonrestrictive relatives can be equated only to adjuncts, never to sisters of D.[14]

Now, nonparasitic dependencies out of restrictive relatives must be predicted to be ill formed, as in (56), even if N′ does not branch, and hence the relative clause can effectively be equated to a sister of N.

(56) *the only woman that I found presents [to give to t]

Descriptively speaking, however, (56) still involves a complex NP island. In particular, (56) is comparable to complex NP island violations with sentences in the object position of N, as in (57).[15]

(57) *Who did you see [attempts [to portray t]]?

Current theories of extractions in general derive complex NP islands to the extent that they stipulate a difference in head government properties between N and V (see, for instance, Kayne 1981, Cinque 1990). Under the present theory, VPs and DPs differ in that VPs are not visible and hence not addressed, whereas DPs are generally both visible and addressed. If so, it is possible for Vs to be included in address-based dependencies, because Vs do not have an address of their own; but this is impossible for Ns, which in general do have one.

In (56)–(57) I make the standard assumption that DP is not associated with any Ā-escape hatch, whether specifier or adjoined position, so that a successive-cyclic movement dependency must skip (D), giving rise to a Locality violation. Additionally, successive-cyclic movement is blocked by Locality in (56) because of the presence of a *wh*-island.

Suppose on the other hand that in (57) the argument *wh*-phrase—say, of address (j, i)—moves by forming an address-based dependency. Suppose this dependency reaches the embedded C head, as in (58); crucially, it cannot include the head *attempts*, on the assumption that this already has an address of its own—say, (l, k)—that it shares with its DP projection.

(58) . . . $[_{DP(l,\,k)}$ attempts$_{(l,\,k)}$ $[_{CP}$ $C_{(j,\,i)}$ . . .

This means that no position in (D) can be part of the dependency, and Locality is violated.

[14] Recall that the absolute grammaticality status of (54)–(55) is not what is relevant here. What matters is the contrast with (50). If the judgment of one of the reviewers is correct, on the other hand, extraction out of a nonrestrictive relative, as in (52), is further degraded. This problem, if indeed it is one, is not crucial to the present discussion, since nonrestrictive relatives are incidental to it.

[15] Even granting that complex NP violations with complement sentences, as in (57), are mildly ill formed, one of the reviewers judges that there is a contrast with the stronger ungrammaticality of relative clause island violations, as in (56). If this problem is a real one, I have nothing to add to it.

Thus, the impossibility of extracting an argument from complex NP islands follows, as desired, under the address-based derivation as well.

Like (57), (56) is also excluded under the address-based derivation. Under this derivation, extraction from DP is blocked by the fact that DP has an address of its own and so does the head *presents*, as in (59). Thus, no member of (D) can enter an address-based dependency with the argument *wh*-trace, and Locality is violated, as desired.

(59) . . . [$_{DP(l, k)}$ presents$_{(l, k)}$ [$_{CP}$ C$_{(j, i)}$ . . .

But consider (51) again. The assumption that CP* effectively functions as a sister of N is no longer sufficient to ensure that (50) is well formed. Descriptively, indeed, (51) also embeds a complex NP island. In particular, C* can enter an address-based dependency with the parasitic gap, because it does not have an address of its own; but the N/D head does have an address of its own and hence cannot be part of the dependency, giving rise to a Locality violation.

So far I have assumed that heads and maximal projections share all of their indices. Suppose instead that in (51) the address of DP—say, (l, k)—does not percolate down to the N/D head. Rather, it is the address of *e*—say, (j, i)—that percolates up to the N/D head, as in (60), so that the N/D head is in the parasitic gap dependency. If so, the dependency includes a member of all of the domains in (53), and Locality is satisfied.

(60) . . . [$_{DP(l, k)}$ people$_{(j, i)}$ [$_{CP}$ that$_{(j, i)}$ . . .

The contrast between (50) and a subject island violation is then predicted. Suppose on the other hand that the presence of mismatching addresses on head and maximal projection in (60) represents a residual violation. This allows us to predict the marginality of (56)–(57), on the basis of representations analogous to (60). We expect of course that a similar marginality is associated with (50); we must assume that it is simply difficult to detect.

In summary, all theories of parasitic gaps face a problem in explaining why both an adjunct island (the relative clause) and a subject island can apparently be crossed by the parasitic gap dependency in (51). In the analysis I just presented, however, only a subject island is crossed, since relative clauses can effectively be construed as objects of N; the residual ill-formedness of extracting from them can be imputed to the fact that they are complex NPs. In particular, I construe complex NP islands as involving an indexing violation, as in (60), thus differentiating them from adjunct islands, which involve a Locality violation. The essential difference between the present theory and others is that the present theory derives complex NP islands on principled grounds from the existence of address-based dependencies.

2.3 *Definiteness and Tense Islands*

All of the well-formed examples of parasitic gaps inside DPs considered so far involve zero Ds. The presence of an overt D does not in fact change the grammaticality status of examples like (16), as shown in (61). However, definiteness islands, which affect extractions in general, affect parasitic gaps as well. Thus, substituting a definite D for the indefinite D in (61) yields a (relatively) ill formed result, as in (62).

(61) a man that [some friends of e] admire t

(62) *a man that [the friends of e] admire t

Since ordinary movement out of DP is blocked by the absence of an Ā-escape hatch in DP, only address-based dependencies can be sensitive to definiteness islands. In particular, we can assume that (61) is associated with a structure of the type in (63); in (63) the address of the parasitic gap—say, (j, i)—percolates as high as the D position *some,* so that the potential subject island violation can be rescued by the main gap branch of the dependency.

(63) . . . $[_{DP(l,\,k)}$ $\text{some}_{(j,\,i)}$ $[_{NP}$ $\text{friends}_{(j,\,i)}$ $[_{PP}$ $\text{of}_{(j,\,i)}$ . . .

Consider on the other hand (62). I tentatively assume a theory of DPs under which the representations of indefinite and definite DPs differ at an appropriately abstract level. Roughly speaking, an indefinite DP as a whole can correspond to a logical variable; however, the logical variable in a definite DP corresponds to the D position. Remember in turn that addressing simply encodes visibility; as a result, no unaddressed position is visible. We can assume that the fact that *some* is not visible in (61) is immaterial, in that the whole DP can correspond to a logical variable. But the fact that *the* must correspond to the logical variable in (62) forces the addressing structure in (64), where *the* has an address of its own.

(64) . . . $[_{DP}$ $\text{the}_{(l,\,k)}$ $[_{NP}$ $\text{friends}_{(j,\,i)}$ $[_{PP}$ $\text{of}_{(j,\,i)}$ . . .

On the assumption that (64) is the structure relevant for (62), the parasitic gap dependency cannot include a position in (D), and a Locality violation is predicted to result, as desired.

However, the question arises why the mismatching of addresses on D and DP in examples of the type in (63) does not create even a marginal violation. An alternative analysis of (61), which does not present this drawback, has recourse to a form of reanalysis. The idea is that if an element A is addressed by a head B that is itself addressed, the address of A can correspond to the address, rather than the categorial index, of B followed by the categorial index of A itself. In practice, this can be the case only if the addressing head is N and the addressed element is DP. Under the appropriate definition of compatibility of indices in a dependency, then, an N head—say, of address (k, j)—

can be assumed to be able to form a dependency with a variable of address, say, ((k, j), i) embedded under it.

Concretely, consider a structure of the type in (65) for (16).

(65) . . . [friends$_{j, (k, j)}$ (of) e$_{i, ((k, j), i)}$] . . .

In (65) both *e* and the N head of DP, *friends*, have an address of their own; but because *e* is an argument of *friends*, the address of *friends* is part of the address of *e*. Assuming that inclusion is sufficient for index compatibility, we can allow sequence formation between *e* and *friends*. Since *(friends)* in turn is adjacent to (I), the *e* dependency can be rescued by the *t* dependency in (16), as desired.

The explanation of definiteness islands given in (64) does not automatically work under the restructuring mechanism in (65). Indeed, in order to predict the contrast between (61) and (62), it is no longer sufficient to say that D must have the same index as DP, as in (64); it is necessary to say that it must have the same index as DP to the exclusion of N, which cannot then "reanalyze" with its argument. Conceivably, the abstract variable status of D is again sufficient to impose such a requirement.[16]

It is worth noticing that the way of construing definiteness islands suggested here is compatible with the tradition in the study of (in)definiteness represented notably by Heim (1982). Another treatment of the definiteness data within the same general conception of (in)definiteness is presented by Diesing (1992). According to Diesing (1992), all definites must be raised to an operator position, so that at LF definite objects are on a left branch exactly as subjects are. But the fact that parasitic gaps are sensitive to definiteness undermines this attempt to reconstruct it in terms of strong islands; for it is a property of parasitic gaps precisely to be able to circumvent strong islands.

Let me now turn to one final set of data. Well-formed examples of parasitic gap dependencies typically involve embedded untensed clauses. The introduction of T(ense) renders parasitic gaps (relatively) unacceptable even in the most canonical configuration, as in (66).

(66) *a book that I taught t [after my students read e]

This at least is the intuition shared by (among others) Hoekstra (1988) for Dutch, Frampton (1990) for English, and Cinque (1990) for Italian.[17]

According to Enç (1987), among others, T is an element with denotational properties, hence an argument in the sense of Chomsky (1981). If all arguments must saturate an

[16] Further details on this can be found in Manzini 1992a:secs. 2.8, 3.4.

[17] Examples of tensed parasitic gaps of the type in (i) have also been reported to be well formed, for instance by Chomsky (1982).

(i) This is food that you must cook t [before you eat e].

Perhaps the embedding of a present, rather than of a past, is significant for the increased acceptability of (i) against (66). Here I shall keep considering (66) the core case, and (i) the case to be explained away.

argument position and if visibility is a precondition for saturation, then T must also be visible. As for the argument position that T saturates, I assume a framework of the type proposed by Higginbotham (1985), where an extra temporal role can be associated with the argument structure of V. As for visibility, following an insight of Baker (1988), I assume that incorporation, like Case marking, can make an argument visible. I will then assume that T is systematically made visible and hence addressed by V, which has incorporated into T. Since address-based dependencies are sensitive to intervening addressed heads, I predict them to be sensitive to an intervening T. Hence, if parasitic gap dependencies are always address-based, as suggested by the discussion surrounding (49), I expect them to be blocked in the presence of T. This correctly predicts that (66) is ill formed.

Quite independently of parasitic gaps, notice that the presence of a T head leads to stronger violations in complex NP contexts, both with and without relative clauses, as in (67) and (68).

(67) *Who do you disapprove [rumors [that Mary loves t]]?

(68) *the only woman that I found [a present [that I wanted to give to t]]

Crucially, remember that the absence of an Ā-escape hatch in DPs and the presence of a *wh*-island in relative clauses forces an address-based strategy for extraction in both contexts; this forms the basis for the sensitivity to T islands. The decrease in acceptability from (57) to (67) is well known from Stowell 1981, but is attributed there to the fact that only the untensed sentence in (57) is a genuine complement of N, the tensed sentence in (67) being an adjunct. On the other hand, the decrease in acceptability from (56) to (68), though not equally familiar, can be attributed to hardly anything but the presence or absence of T.

The other context independent of parasitic gaps where the present theory predicts sensitivity to T islands arises when successive-cyclic movement is blocked by *wh*-islands. That extracting an argument out of a tensed *wh*-island, as in (69), yields a degraded result is a conventionally accepted judgment.

(69) *What$_i$ do you wonder [how$_j$ John repaired t_i t_j]?

This is as predicted because the presence of a *wh*-island blocks the ordinary movement derivation out of the embedded sentence and forces the address-based derivation; but the address-based derivation is blocked precisely by T.[18]

By way of a conclusion, the factual correlation that emerges from the discussion so far is worth emphasizing. The basic empirical argument in favor of the notion of address-based dependency is that it predicts that denotational heads create islands for argument extraction. In particular, they do so when the successive-cyclic strategy is independently blocked, notably in extraction from DPs and in the presence of *wh*-islands.

[18] Further predictions can be found in Manzini 1992a. On the expected interactions between inner islands and T, see Roussou and Tsimpli 1993.

Now, parasitic gap dependencies are on the one hand address-based, and on the other hand sensitive to definiteness and tense islands. My theory predicts this correlation, or at the very least provides a straightforward framework for stating it, whereas for other theories it must remain an accident.

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