

*Syntactic dependencies and their properties: a note on strong islands**

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Among the properties of syntactic dependencies, locality is perhaps the most controversial one. Chomsky (1993; 1994) explicitly mentions one locality condition, the Shortest Movement Principle or Minimal Chain Link condition, which, though not formalized, appears to be a derivational counterpart of Rizzi's (1990) Relativized Minimality. Both of these conditions are meant to rule out weak islands. Rizzi (1990) apparently accounts for strong islands under Kayne's (1984) Connectedness Condition; while no mention of strong islands can be found in Chomsky (1993; 1994).

Another major property of dependencies, already identified by Fiengo (1974), is order. This is a much less controversial notion, being in general defined in terms of Reinhart's (1976) c-command. According to Manzini (1994), strong islands are in fact accounted for by the interaction of the locality principle that derives weak islands with the ordering principle.

In this article, I shall argue first that locality can be reduced to immediate order, hence it need not be an autonomous notion at all. I shall then show how the resulting theory still accounts for strong islands as well as for parasitic gaps.

1 Locality as immediate ordering

Consider Rizzi's (1990) Relativized Minimality, as a possible realization for Chomsky's (1993; 1994) Shortest Movement/ Minimal Chain Link principle. Relativized Minimality operates essentially in the following way. Take the set of all heads, or of all A-Spec's, or of all A'-Spec's in a given tree. Within one of these sets, the antecedent for an element X must be a Y such that Y c-commands X, and there is no other member of the set, Z, such that Z c-commands X and is c-commanded by Y. Thus Relativized Minimality reduces to some notion of immediate c-command within the set.

*This article represents part of a larger work (Manzini, in preparation). During the winter of 1994, related material was presented in seminars at the University of Siena, the University of Pavia, the Dipartimento di Scienze Cognitive of the Ospedale San Raffaele (Milan) and at the Inaugural Conference of the Forschungsschwerpunkt Allgemeine Sprachwissenschaft (Berlin).

A similar link between locality and order turns out to characterize other theories. Suppose that, following Manzini (1994), the Locality principle is taken to require that any two adjacent members of a dependency are in adjacent minimal domains, as in (1):

(1) *Locality*

Given a dependency (A_1, \dots, A_n) , for every i , A_i and A_{i+1} are in adjacent minimal domains

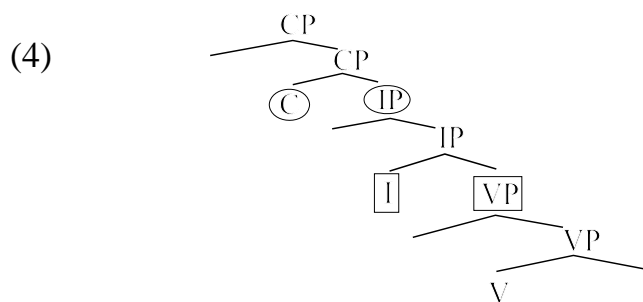
Adjacency can be defined as in (2), where the minimal domain of head X , notated (X) , and the minimal domain of head Y , (Y) , are said to be adjacent just in case there is no member of some third minimal domain that dominates the members of (X) and not of (Y) or viceversa:

(2) Two minimal domains (X) and (Y) are adjacent iff there is no minimal domain (Z) such that some member of (Z) dominates (X) and not (Y) or viceversa.

Suppose furthermore we characterize the minimal domain of a head X as the set including all and only the elements that are immediately dominated by a projection of X , and do not immediately dominate one, as in (3):

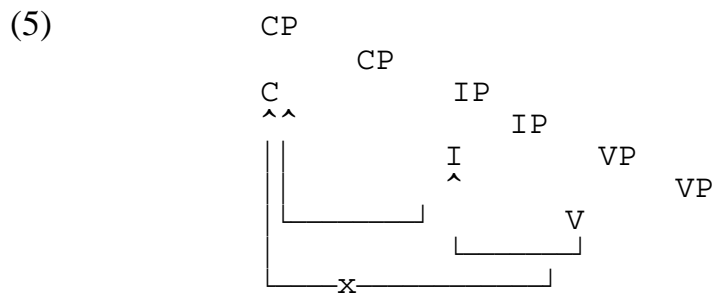
(3) The minimal domain of a head X , notated (X) , includes all elements that are immediately dominated by, and do not immediately dominate, a projection of X .

Under (3), the minimal domain of a head X includes X itself, as well as its Complement and its Spec, if there are any; adjunctions to X and to any non-maximal projection of X also obviously belong to (X) . On the other hand, if dominance holds of categories and not of segments, then adjunctions to XP are not in (X) , but in the minimal domain of the next head up. Concretely, consider the basic sentential tree created by the projections of V , I and C , as in (4):



In (4), the minimal domains of V, I and C correspond to the elements underlined, boxed and circled respectively.

Thus in (4), (V) and (C) are not adjacent, since there is at least one member of (I), namely VP, that dominates (V) and does not dominate (C). On the contrary, the minimal domains (V) and (I), as well as (I) and (C), are adjacent. It is on this basis, then, that (1) allows movement from (V) to (I), and then from (I) to (C), but prevents movement from (V) directly to (C), as indicated in (5):



Now, it is part of the proposal in Manzini (1994) that the notion of ordering relevant for dependencies should be revised from c-command, which is defined for points in a tree, to a notion defined like locality in terms of minimal domains. If so, by analogy with c-command, a minimal domain (Y) can be said to be higher than, or superior to, a minimal domain (X), just in case all nodes that dominate (Y) dominate (X) as in (6):

(6) (Y) is superior to (X) iff all categories that dominate (Y) dominate (X)

Concretely, in (4)-(5) both (I) and (C) are superior to (V), while (C) is also superior to (I). Suppose then that the ordering requirement on dependencies is expressed by saying that for any link (A_i, A_j) of a dependency, the minimal domain of A_i is superior to the minimal domain of A_j , as in (7):

(7) Given a dependency (A_1, \dots, A_n) , for every i , the minimal domains to which A_i belongs is superior to the minimal domain to which A_{i+1} belongs

From (7), it follows that in (4)-(5), movement can take place from (V) to (I) or to (C), and in general upward; but downward movement from (C) to (I) or to (V), and so on, is blocked.

The crucial observation for the present discussion is easily made at this point. On the basis of the notion of superiority in (6), a notion of immediate superiority can

also be defined, under which (Y) is immediately superior to (X) just in case there is no (Z) such that (Z) is superior to (X) and (Y) is superior to (Z), as in (8):

- (8) A minimal domain (Y) is immediately superior to a minimal domain (X) iff (Y) is superior to (X) and there is no (Z) such that (Z) is superior to (X) and (Y) is superior to (Z).

Notice then that in (4)-(5), (I) is immediately superior to (V), and (C) is immediately superior to (I). Thus moving from (V) to (I), or from (I) to (V), means moving from a minimal domain to an immediately superior one, while no other movement in (4)-(5) has this property. If so, it is clear that immediate superiority subsumes locality; indeed in (4)-(5) the net effect of locality is to insure that movement is restricted to take place between (V) and (I), or (I) and (C). Since in turn immediate superiority obviously embeds superiority, it appears that it is no longer necessary to state two separate locality and ordering constraints, as in (1) and (8). Rather the two can be collapsed, precisely in the form of an immediate superiority requirement, formulated in (9) as the Basic Requirement on Dependencies:

- (9) *Basic Requirement on Dependencies*

Let (X_i) be the minimal domain to which A_i belongs. (A_1, \dots, A_n) is a dependency only if for every i , (X_i) is immediately superior to (X_{i+1}) .

A theory including (9) is of course simpler in principle than any theory including separate locality and ordering constraints. On the other hand, Manzini (1994) derives strong islands precisely by assuming that locality and ordering are separate notions, and that they cannot be satisfied together by dependencies formed across subjects and adjuncts. The discussion to follow will then be devoted to solving the empirical problem of strong islands within the framework defined by (9).

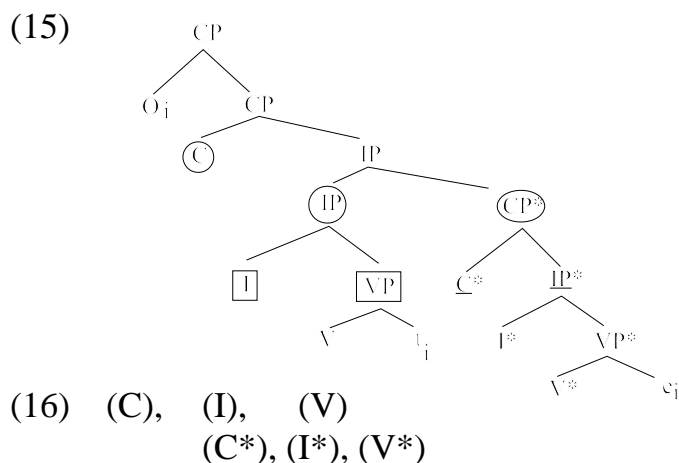
2 Strong islands and parasitic gaps: the problem

Consider the canonical examples of adjunct and subject island violations, involving wh-movement, as in (10) and (11) respectively:

- (10) *Who_i did you leave before seeing t_i

- (11) *Who_i did seeing t_i bother you

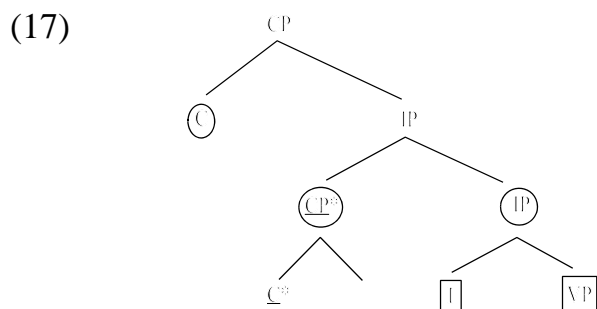
Consider then the abstract structure for (13), as in (15). In (15), (14) allows a forking dependency to be formed whose head is O_i and whose roots are e_i and t_i . In particular, the forking dependency in (15) can include the minimal domains indicated in (16):



In (16), it is easy to verify that the immediate superiority requirement is satisfied by all members of the dependency. Crucially, it is a property of the adjoined structure in (15) that (C) is immediately superior to both members of the adjunction, (I) and (C*). Thus the Basic Requirement on Dependencies is satisfied for both (I) and (C*) by (C).

In short, at least as far as adjuncts are concerned, the theory predicts the wellformedness of parasitic gaps inside them without need for stipulation. Some other explanation however is needed to predict the illformedness of simple extraction from them.

Subject islands, as in (11), remain at this point to be considered. A parallel treatment for subject and adjunct islands requires that they have all relevant structural properties in common, hence that subjects are generated like adjuncts in an adjoined position, as suggested by Kayne (forthcoming), rather than in a Spec position. If so, the abstract structure associated with (11) is as in (17):

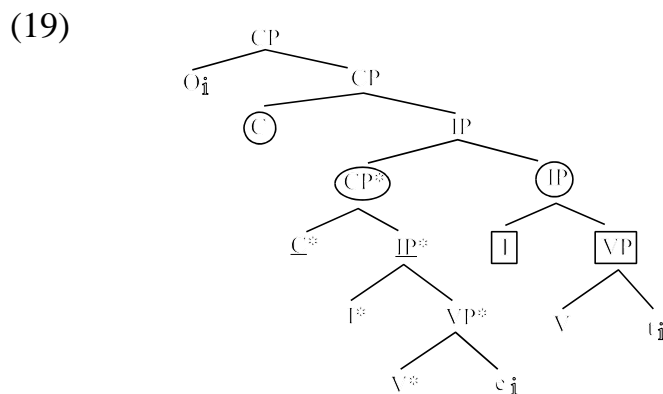


In (17), if movement takes place from (C*) to (C), the Basic Requirement on Dependencies is satisfied, in that (C) is immediately superior to (C*). Thus we are left without an explanation for the ungrammaticality of (11) as well.

Consider on the other hand parasitic gaps. These are insensitive to subject islands, so that a parasitic gap inside a subject is wellformed, as shown in (18):

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

Consider the abstract structure for (18), as in (19). In (19), (14) allows a branching dependency to be formed whose head is O_i and whose roots are e_i and t_i :



The forking dependency in (19) can include the minimal domains indicated in (20). The Basic Requirement on Dependencies is then satisfied, in that crucially (C) is immediately superior to both (I) and (C*):

(20) (C), (I), (V)
(C*), (I*), (V*)

We can conclude that the results established for adjunct islands hold for subject islands as well. The Basic Requirement on Dependencies correctly allows for extraction from adjuncts and subjects in parasitic gap configurations, but cannot predict the illformedness of simple extraction from them.

3 Strong islands and parasitic gaps: a solution

Let us consider the properties of adjuncts in more detail. An adjunct is in fact introduced not by a C, but rather by a P, such as *before* in (10), though this has been disregarded so far to simplify the discussion. P's such as *before* effectively are two-

place predicates, so that if the adjunct sentence represents the internal argument of P, the main sentence, or part of it, must represent its external argument.

Consider then the parasitic gap structure in (15) or more abstractly the dependency in (16). In (16), the head of each minimal domain in the main branch bears a complementation relation to the head of the immediately superior minimal domain; the same is true of the minimal domains within the parasitic branch. Furthermore, though the head of the adjunct, C* or P, does not bear a complementation relation to C, it still bears a relation to I(P), which is one of its arguments.

By contrast, suppose that the dependency in (16) is reduced to (21), corresponding to (non-parasitic gap) extraction from the adjunct:

(21) (C), (C*), (I*), (V*)

In (21), a complementation relation clearly connects V* to I* and I* to C*; however C* itself does not bear any relation to the remaining head C.

Similar considerations apply to subjects. Consider (20). Under a sufficiently abstract conception of arguments, we can say that C(P)* represents one of the two arguments of I, the other being of course V(P). Alternatively, C(P)* and V(P) represent the two operands of I, under the notion of operator proposed by Cormack and Breheny (this volume); and similarly for adjuncts. In any event, though C* does not bear a relation to the head C of the immediately superior minimal domain, it bears a relation to the head of another minimal domain in the dependency, I. If on the other hand (20) is reduced once again to (21), corresponding to (non-parasitic gap) extraction from the subject, the same problem arises as before, namely that there is no relation linking C*, hence the heads dependent on it, to the remaining head, C.

From what precedes, we can then conclude that the wellformedness of the branching dependencies in (16) and (20) is due to the fact that the head of each minimal domain (except the first one) bears an elementary link to the head of some other minimal domain in the dependency. On the other hand, the reason why (21) is illformed is simply that the initial link of the dependency is not licenced, in the absence of a relation of some sort between the heads of (C) and (C*).

This generalization is of course closely related to those expressed by such classic accounts of strong islands as the Condition on Extraction Domains of Huang (1982), which also underlies Chomsky's (1986) notion of (non-minimality) barrier, or the Connectedness Condition of Kayne (1984). Thus Huang's (1982) Condition on Extraction Domains is equivalent to the requirement that the head of each minimal domain in a dependency must have a complementation relation to the head of the immediately superior domain.

Such a requirement is too strict, precisely for branching dependencies. However, a descriptively adequate condition can be formulated in similar terms, stating that the presence of a minimal domain in a dependency is licenced only if its head bears either a complementation or a checking relation to the head of some other minimal domain; and of course if A licences B, directly or indirectly, B cannot licence A.

It is easy to see that if we impose such a condition, it is in fact satisfied both in (16) and in (20), where I(P) and C* can be assumed to have a checking relation of some sort. The same condition is straightforwardly satisfied if simple extraction takes place along the main branch of the dependency, in which case a complementation link between the minimal domains involved holds throughout. In (21), however, it is clear that the condition is not satisfied, in that C* does not bear any relation to C, the only head that it does not itself licence directly or indirectly.

Let us then provisionally conclude that the condition just suggested is empirically adequate. The problem with it, like with its predecessors, is theoretical. In particular, this kind of condition appears to be essentially ad hoc, not finding any motivation independent of the phenomenon, strong islands, for which it is introduced.

Now, under the classical idea of successive-cyclic movement, long dependencies are formed by combining a number of elementary links; it is of course the Basic Requirement on Dependencies, in any of its versions, that insures this result. Classical realizations of this idea make use of intermediate traces to represent intermediate links. Manzini (1992; 1994) on the other hand suggests that the intermediate links in a dependency are represented by heads, connected by such elementary relations as complementation and checking.

What I would like to suggest is that if this alternative construal is adopted, then the theoretical problem concerning the Condition on Extraction Domains and similar conditions also finds a principled solution. Remember that the question is why the minimal domains in a dependency must be connected by complementation or checking relations involving their heads. The answer is simply that the heads themselves represent the members of the dependency, and this cannot be built if some elementary relation between them does not hold.

A formalization for the conception of dependency required by the discussion that precedes, as well as independent motivation for it, is provided by Manzini (forthcoming), and it is beyond the scope of this article to go in any depth into it. Notice however that weak islands can also be derived for this type of dependencies, since intermediate heads with operator properties, such as Neg, Q, etc, can block a dependency connecting a variable to some higher operator, quite independently of the presence of intermediate traces.

To conclude the discussion, a final set of data relating to parasitic gaps must be considered. This data are illustrated in (22)-(23). (22) shows that a parasitic gap inside two adjuncts is illformed; the same is true of a parasitic gap inside both a subject and an adjunct, as shown in (23):

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

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

In general, it appears that parasitic gaps are insensitive to one island of the subject/adjunct type; but they are sensitive to two or more.

(22) is associated with a partial abstract structure of the type in (24), where CP represents the least embedded adjunct and CP* the most embedded one:

(24)

C	CP							
			IP			CP*		
	I	IP	VP		C*	IP*		
		V		DP		I*	VP*	
						V*		e _i

(24) is essentially similar to the case of simple extraction from an adjunct. In particular, a link between (C) and (C*) would need to be licenced, for the wh-dependency to reach (C). However the link is not licenced, in the absence of a suitable relation between C and C*, very much as in the case of simple extraction in (21); whence the illformedness of (24). If the DP in (24) is replaced by another gap, the example again becomes wellformed, as expected, since a branching dependency of the type in (16) can now be formed.

Very much the same can be repeated for the parasitic gap embedded under both a subject and an adjunct, as in (23), for which the relevant structure is as in (25):

(25)

C	CP							
			IP			IP		
	C*	CP*	IP*		I	VP		
		I*		VP*		V	DP	
			V*		e _i			

The absence of a gap along the main branch blocks the formation of a branching dependency in (25) exactly as in the case of a simple extraction. But if so, the crucial link between (C) and (C*) is blocked by the absence of a relation between the two heads. Of course, we expect that inserting a gap in the position of DP in (25) improves the sentence once again; as is well-known, this turns out to be correct.

It is worth stressing at this point that though parasitic gaps are not sensitive to strong islands, they are sensitive to other islands. In particular they are known to be sensitive to the Definiteness or Specificity effect. Thus, though the parasitic gaps that we have considered so far are embedded in sentences, a parasitic gap can also be embedded inside a DP; a clear contrast is then obtained according to whether the DP is definite or indefinite, as in (26) and (27) respectively:

(26) Who do friends of e admire t

(27) *Who do the friends of e admire t

Precisely the fact that parasitic gaps cannot circumvent the Definiteness/ Specificity effect strongly argues against its reduction to strong islands, as proposed by Mahajan (1992) and Diesing (1992). Whatever derives this effect, however, the fact remains that parasitic gaps are sensitive to it, and hence demonstrably similar in this respect to other syntactic dependencies.

The last set of data to be introduced here concerns a parallelism that has been drawn more than once between adjunct or subject structures and coordinate structures. In particular, a headed structure for coordination, with one of the conjoints a complement of the head and the other adjoined to its maximal projection, as in (28), is proposed already by Ross (1967) and is argued for most recently by Kayne (forthcoming):

(28) XP
 and XP

Consider then extraction phenomena. Under the Coordinate Structure Constraint of Ross (1967) extraction is possible in a coordinate structure only if it takes place from both conjuncts, in Across-The-Board fashion. This is illustrated in (29):

- (29) a. *Who did you see t and kiss Mary
 b. *Who did you see Mary and kiss t
 c. Who did you see t and kiss t

ATB extractions of the type of (29c) bear a clear analogy to parasitic gaps, where movement takes place at once from the main branch of a sentence and from a subject/adjunct branch. Thus several unification proposals are found in the literature; Williams (1986) proposes to capture parasitic gaps under the theory of ATB extractions of Williams (1978), and so on.

Nevertheless, an obvious and important difference remains between coordinate structures on the one hand, and subject or adjunct structures on the other hand, namely that the latter allow for simple extraction from the main branch of the sentence. The question therefore arises whether the theory of subject and adjunct islands presented here can in fact account for (29).

Given present assumptions, it seems reasonable to seek for an answer to this problem along the following lines. In coordinate structures, contrary to other adjoined structures, the two coordinate X(P)'s are both selected by the head of the immediately superordinate domain. If so, coordinate structures are characterized by a branching complementation link; it is this that is reflected in the obligatorily branching shape of dependencies reaching into conjuncts.

4 Further problems

The assumptions made here concerning the structure of subjects and adjuncts also interact with current theories of phrase structure. In the case of subjects, in particular, the present approach seems to require the theory of phrase structure of Kayne (forthcoming), under which subjects are left adjoined. On the other hand, the fact that adverbials are right adjoined directly contradicts that theory. In any case, the notion of hierarchical order adopted here, superiority, differs from the notion, c-command, crucially adopted by Kayne (forthcoming). Though a reformulation of this part of the theory is again beyond the scope of this article, I shall briefly argue in what follows that the unavailability of right adjunction gives rise to considerable problems, and needs therefore to be revised quite independently of the present proposals.

If no right adjunction is possible, then adverbials must be found a different position. The first candidate available in the grammar of Kayne (forthcoming), is a complement position. This option is independently proposed for simple adverbs by Larson (1988). However when it comes to complex adverbials, it is undermined by the fact that extraction phenomena systematically distinguish them from true complements. Consider just parasitic gaps, as in (30):

- (30) a. *A man who_i t_i knew that I would meet e_i
 b. A man who_i t_i knew me before I met e_i

Given the classical right adjoined structure for adverbials, the difference between (a) and (b) is straightforwardly captured in terms of (anti)c-command, or, in present terms, (anti)superiority. Thus in (a) t_i c-commands e_i , or in present terms, t_i belongs to a minimal domain superior to that of e_i ; but this is not the case in (b). If an anti-ordering requirement holds of the roots of branching dependencies, as already proposed by Taraldsen (1981), then (a) is correctly predicted to be illformed, and (b) wellformed. The reason why such an anti-ordering requirement must hold are explored by Brody (forthcoming). What is immediately relevant here however is that this simple explanation cannot be maintained if (a) and (b) represent instances of the same configuration.

Another alternative proposed by Kayne (forthcoming) uses left adjunction of X to the second of two identical conjuncts. The second conjunct is then reduced, leaving X in the rightmost position in the string. This solution is advocated for right dislocation, but appears to be excluded by Kayne (forthcoming) precisely for complex adverbials. A third alternative is of course to left adjoin apparent right adjuncts and to move other material around them. However in ordinary sentences involving adverbials, this solution is excluded simply by Chomsky's (1993) Greed, since there is no property that forces movement to take place around the adverbial, even if just an (apparently) optional property such as focus, topic, etc.

In short, if what precedes is on the right track, a revision of the theory of Kayne (forthcoming) to make right adjunction possible is needed quite independently of the theory advocated here.

It should be noticed that an obvious way out of this problem is also suggested by Sportiche (1994), who effectively claims that the main branch of a sentence is left-adjoined to an adverbial PP of which it constitutes the external argument. Such a solution, however, fails to explain why it is the left branch that is taken to be the main branch in such a configuration, while in other formally identical configurations, such as those involving subjects, it is the right branch that plays the same role. Yet another line of research is introduced by Brody's (1994) suggestion that the linearization algorithm on trees of Kayne (forthcoming) is to be substituted by a linearization algorithm operating on dependencies. Here I shall simply leave these issues open for future discussion.

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