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Locality in Syntax 🔓

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Summary and Keywords

Phenomena involving the displacement of syntactic units are widespread in human languages. The term *displacement* refers here to a dependency relation whereby a given syntactic constituent is interpreted simultaneously in two different positions. Only one position is pronounced, in general the hierarchically higher one in the syntactic structure. Consider a wh-question like (1) in English:

(1) Whom did you give the book to <whom>

The phrase containing the interrogative wh-word is located at the beginning of the clause, and this guarantees that the clause is interpreted as a question about this phrase; at the same time, *whom* is interpreted as part of the argument structure of the verb *give* (the copy, in <> brackets). In current terms, inspired by minimalist developments in generative syntax, the phrase *whom* is first merged as (one of) the complement(s) of *give* (*External Merge*) and then re-merged (*Internal Merge*, i.e., *movement*) in the appropriate position in the left periphery of the clause. This peripheral area of the clause hosts operator-type constituents, among which interrogative ones (yielding the relevant interpretation: *for which x, you gave a book to x*, for sentence 1). Scope-discourse phenomena—such as, e.g., the raising of a question as in (1), the focalization of one constituent as in *TO JOHN I gave the book (not to Mary)*—have the effect that an argument of the verb is fronted in the left periphery of the clause rather than filling its clause internal complement position, whence the term *displacement*. Displacement can be to a position relatively close to the one of first merge (the copy), or else it can be to a position farther away. In the latter case, the relevant dependency becomes more long-distance than in (1), as in (2)a and even more so (2)b:

(2)

a Whom did Mary expect [that you would give the book to<whom >]

b Whom do you think [that Mary expected [that you would give the book to <whom >]]

50 years or so of investigation on locality in formal generative syntax have shown that, despite its potentially very distant realization, syntactic displacement is in fact a local process. The audible position in which a moved constituent is pronounced and the position of its copy inside the clause can be far from each other. However, the long-distance dependency is split into steps through iterated applications of short movements, so that any dependency holding between two occurrences of the same constituent is in fact very local. Furthermore, there are syntactic domains that resist movement out of them, traditionally referred to as *islands*. Locality is a core concept of syntactic computations. Syntactic locality requires that syntactic computations apply within small domains (*cyclicdomains*), possibly in the mentioned iterated way (*successive cyclicity*), currently rethought of in terms of Phase theory. Furthermore, in the Relativized Minimality tradition, syntactic locality requires that, given X . . . Z . . . Y, the dependency between the relevant constituent in its target position X and its first merge position Y should not be interrupted by any constituent Z which is similar to X in relevant formal features and thus intervenes, blocking the relation between X and Y. Intervention locality has also been shown to allow for an explicit characterization of aspects of children's linguistic development in their capacity to compute complex object dependencies (also relevant in different impaired populations).

Keywords: islands, phases, intervention, agree, featural relativized minimality, edge

1. Locality and Syntactic *Islands*: Ross (1967) Agenda

There is little doubt that the any overview of what locality in syntax refers to should start out with the mention of a cornerstone of formal generative linguistics: J. R. Ross' dissertation *Constraints on variables in syntax* (Ross, 1967), which set up an agenda that is still active, since it highlighted a crucial property of human language(s). Any formal theory of the human language capacity should express the fact that syntactic computations are local.[1] Ross' list of so-called *islands* provided a first clear identification of syntactic domains that appear to be inaccessible/impermeable so that constituents cannot be extracted out of them. Thus, to phrase the point with a more recent terminology, whereas phenomena involving the displacement of syntactic units are widespread in human languages, the dependency created between the position in which the displaced element is pronounced and the one of its first merge within the clause cannot be adequately established across an *island*.

Take the following interrogative sentences in English:

(1)

Whom did you give the book to <whom>

Since the phrase containing the interrogative wh-word fills the clause in initial position, the clause is interpreted as a question about this phrase; at the same time, the wh-phrase *whom* is interpreted as part of the argument structure of the verb *give* (its original copy).[2] In current terms, inspired by minimalist developments in generative syntax, the phrase *whom* is first merged as (one of) the complement(s) of *give* (through preposition *to*, *External Merge*) and then re-merged (*Internal Merge*, i.e. *movement*) in the appropriate position in the left periphery of the clause. This peripheral area of the clause hosts operator-type constituents, among them interrogative ones (yielding the relevant interpretation *for which x, you gave a book to x*, for sentence 1; Bresnan, 1970 for the first identification of this layer of the clause; Chomsky, 1977 on *Wh-movement*; Rizzi, 1997 for a first cartography of the CP area). Scope-discourse phenomena—such as, e.g., the raising of a question as in (1), and the focalization of one constituent as in *TO JOHN I gave the book (not to Mary)*, etc.—have the effect that an argument of the verb is fronted in the left periphery of the clause rather than filling its clause internal complement position. The same fronting operation can occur across a clause boundary, as in (2) where the wh-phrase is extracted from the embedded clause, complement of the verb *expect*:

(2)

Whom did Mary expect [that you would give the book to <whom>]

As Ross' list of islands made clear, extraction cannot occur outside a number of syntactic domains, the *islands*. For instance, it cannot occur out of the clausal complement of a noun or out of a relative clause. This is the complex-NP constraint illustrated in the impossible examples (3)b, d in English.

(3)

  a Mary reported the he fact that John talked to Bill
  b *Whom did Mary report [the fact [that John talked to <whom>]

  c Mary bought the book that John gave to Bill
  d *Whom did Mary buy [the book [that John gave to <whom>]

Ross' list contained various other domains, such as coordinate structures, sentential subjects, and extraposed clauses.

The list does not illustrate the operation of one single factor accounting for the impossibility of all types of extractions for all types of constituents, as much later work has shown. For instance, some islands appear to give a weaker sense of violation than others, and the strength may also vary from language to language and depending on the morphosyntactic environment (e.g., finite vs. non-finite, indicative vs. subjunctive etc.). This is the case of so called weak- islands, such as the wh-island constraint or the negative island (Rizzi, 1978, 1990; Ross, 1984; Cinque, 1990).

Besides the type of island, whether strong (e.g., Complex-NP-Constraint, (3) above) or weak (e.g., wh-island; see below for more), among the factors that have appeared to play a role in modulating the possibility of extraction out of islands, the following can be listed as specially prominent:

a) The nature of the extraction domain, whether it is part of the argument structure or not. Argument clauses count as more accessible domains for extraction than adverbial clauses (as formalized in Huang, 1982 and Chomsky, 1986). (2) is a fine question—the clause from which extraction occurs is part of the argument structure of the verb *expect*—but (4) is impossible—the reason *because*-clause being an adverbial clause, somehow less connected to the adjective *happy*:

(4)

*Whom was John happy [because you gave a book to <whom>]

b) The categorial status of the extracted constituent. E.g., all other things being equal, PPs are sometimes harder to build a dependency with than DPs. This is possibly due to the fact that in the latter case alternative strategies can be made use of not involving the same type of displacement, as in, e.g., Cinque (1990) resumptive *pro* strategy only available for DPs. A relevant example is given by the contrast between (5)a vs. (5)b. Conversely, a PP seems to be more readily extractable than a DP from a left-branch subject island, as illustrated in (6) vs. (7) (Chomsky, 1986):

(5)

a The person whom I went to London without talking to (___/pro)
 b*The person to whom I went to London without talking (___)

(6)

*The man who [pictures of ___] are on the table

(7)

?The person of whom [pictures ___] are on the table

For recent discussion of the latter point, see Bianchi and Chesi (2014, 2015, quoting Chomsky, 1986), according to which extraction possibilities from subject islands correlate with the availability of interpreting the preverbal subject into the vP- internal position of its first merge (this aspect will not be developed further here).

c) The complement or adjunct status of the extracted constituent, i.e., whether it is a complement of the verb on the one side or an adverbial on the other or whether it is a preverbal subject. Classical so-called argument/adjunct asymmetries fall within this domain, of which (8) is an example of extraction from a weak island (wh-island). Similarly, the debate surrounding the ECP principle within the Government and Binding framework also capitalizes on the argument/adjunct asymmetry, with the relation "government" playing the crucial role, as in the literature on *that*-trace effects on subject extraction of which (9) is an illustration (Chomsky, 1981; Kayne, 1981; Lasnik & Saito, 1992; Rizzi, 1982, 1990; Perlmutter, 1971; Pesetsky, 1982; Taraldsen, 1980, to cite some representative references of a very rich debate; Manzini, 1992 for a unification approach).

(8)

a *How do you wonder [whether to speak <___>]?
                                    (e.g: One wonders whether to speak well> how)

b ?Who do you wonder [whether to speak to <___>]?
                                    (e.g: One wonders whether to speak to John > to whom)

(9)

*Who do you think [that <___> left]?

Modulating factors such as a–c[3] aside, a core sense of syntactic locality can be expressed in the following way: the position to which a constituent is displaced cannot be too far from the position where it is first merged in the clause. In example (2), the wh-constituent is extracted from the embedded clausal complement of the verb *expect*. As illustrated in (10), extraction of the wh-constituent can also occur at a greater distance:

(10)

Whom do you think [that Mary expects [that you would give the book to <____>]]

Indeed—unless an island is encountered or any of the conditions in a–c is not met in the appropriate way—the extraction site can be far away from the final landing site position of the displaced constituent, *whom* in (10). The dependency between the two positions can become very long-distance. There is in principle no upper limit to the size of the long-distance dependency. There may be memory limits in the actual realization of the dependencies, which are not in fact indefinitely long-distance. However, the recursive application of the merge operation building the syntactic structure does not per se impose limits to the distance of the relation. In other words, the dependency appears potentially not to be local at all (*islands* and a–c aside).

The last 50 years or so of research on locality in generative syntax have shown that this is in fact not the case. What appears to be a very long-distance dependency is in fact decomposed into smaller iterated instances of movement steps, all very local indeed. Movement applies in small domains of computations, the cycles of Chomsky (1973). According to this system, clauses—i.e., CPs in current terms—are cyclic domains, namely domains in which derivations are completed and can only continue within the next cycle up. The derivation is incremental, so that once all of the operations in a given cycle are completed and the following cycle is reached, the derivation does not go back to the lower cycle to perform an operation within that cycle (so called *strict-cyclicity*; Chomsky, 1973; Bošković & Lasnik, 1999). Given a conception of this type, the extraction in (10) must take place in a successive cyclic fashion in the way informally illustrated in (11):

(11)

[$_{CP3}$ whom [do you think [$_{CP2}$< __ > [that Mary expected [$_{CP1}$ <___> that [you gave the book to <___>]]]]]]

The so-called COMP-to-COMP movement is a clear illustration of a successive cyclic derivation in which each step of the derivation is very local, as it occurs within one cycle (as in CP1) and to the next cycle up (CP2, CP3). Beside the clear conceptual appeal of an approach that reduces the apparent length and complexity of a computation to the compounding of shorter and simple computational steps, its explicative force has been demonstrated by the massive amount of empirical evidence that has been accumulating over the years showing that this is indeed the way in which long-distance dependencies are computed, across languages and in seemingly unrelated phenomena; these include, e.g., occurrence of stylistic inversion in the clause from which extraction takes place in French (Kayne & Pollock, 1978), shape and type of complementizer in Irish (McCloskey, 1979), inversion as V-to-C in the embedded clause from which extraction takes place in Spanish (Torrego, 1984), phenomena of partial wh-movement in Hungarian (Horwarth, 1997), and reconstruction effects in the intermediate complementizer position (Fox, 1999), just to quote few items of a very rich literature (see section 2 for some further cases expressed within Phase theory). Thus it is natural to think that should it turn out to be impossible to split a long movement into smaller, shorter steps, the output of the operation should be ill-formed, as locality is not respected. This is precisely the way in which the strong Complex NP constraint island has been reinterpreted in terms of the principle called *Subjacency* (Chomsky, 1973). To put it informally, as there is no complementizer-type position in noun phrases, the extracted wh-phrase has to move in one step out of both the noun phrase and the complement (or relative) clause. But this is too far, whence the violation in examples like (3), schematically illustrated in (12) for (3)b (using the current labels DP and CP, replacing the traditional NP and S'):

(12)

* Whom did Mary report [$_{DP}$ the fact [$_{CP}$ that John talked to <____>]

The noun phrase and the clause should be considered domains of similar types, i.e., cyclic domains, or bounding nodes in a different, and partly overlapping, terminology (Chomsky, 1980). The principle of *Subjacency* requires that at most one bounding node could be passed in the extraction process but not two (the distance idea again).

It is a general fact, however, that counting does not appear to be the appropriate way to express properties of human languages, which are typically systems in which computations do not count items but only look at hierarchical structures (see Moro, 2008 for illustration of some relevant experimental evidence); somehow a principle which counts nodes in the syntactic hierarchy should then look suspicious, and it might in fact suggest that something is missing and that some deeper explanation should be looked for.[4] This leads to the consideration of a more recent revisitation and development of cyclic syntax in terms of Phase theory, to which section 2 is dedicated.

2. Locality and Phases: The Domains of Syntactic Computations

One of the most important developments in the conception of syntactic structures over the last almost 30 years (at least since Pollock's 1989 article), is the idea that the morphosyntactic specifications present and often audible to different degrees in the verbal inflectional morphology in several languages are in fact part of the clausal structure. The node Infl of Chomsky (1981) already represented a step toward the direction that later naturally led to the so-called Split-Inflection hypothesis. The clause structure has a rich functional architecture that constitutes what has sometimes been called the extended projection (Grimshaw, 2000) of the verbal component of the clause, the traditional VP. The simplified label TP is used to refer to this functionally articulated part of the clause where tense and (verbal) agreement are expressed as well as other modal modifications, realized through adverbs in English-type languages according to an ordered hierarchy (Cinque, 1999). The left periphery of the clause, the part immediately external to the TP, is also split into several positions in the spirit of Rizzi (1997) and much subsequent work in syntactic cartography (Cinque & Rizzi, 2010; Rizzi & Cinque, 2016, and references cited there). Thus the traditional CP is articulated in positions expressing scope-discourse interpretive properties such as question, focus, etc., as mentioned in 1, as well as the force of the clause (e.g. declarative, interrogative etc.). A close link is established between CP and TP, under the assumption that Tense is ultimately an anchoring Operator hosted in the left periphery but connected to the lower layer of the clause, the TP, the domain where tense is typically expressed if the language has tense morphology (Chomsky, 2001, 2008). Overall, the articulated CP which contains the TP can thus be seen as a complete domain in which both the nominal arguments of the verb are distributed in dedicated (case-related) positions (such as the subject Spec-TP position, or Spec-SubjP in the cartographic structure of Cardinaletti, 2004; Rizzi & Shlonsky, 2007), and the event described by the verb is also realized and anchored to Tense (and other related aspectual) properties. According to Phase theory, the CP domain containing the TP with the described properties is the largest prototypical phase, i.e., the complete domain in which syntactic computations occur. Thus, the notion phase can be seen as an update of the traditional cycle discussed in section 1, enriched by the functional articulation that has come to be recognized as an essential part of clause structure, expressing both morphosyntactic properties and properties at the interface with discourse and the interpretive systems (the CI/Conceptual-Intentional and the SM/Sensory Motor interfaces of minimalist syntax, Chomsky, 1995 and much subsequent literature). Although syntactic structures are generally given with a rather impoverished functional articulation in minimalism as compared to representations inspired by syntactic cartography, there is no conceptual tension between the two approaches, minimal representations being an abbreviation of functionally rich structures (Belletti, 2004ʙ; Chomsky, 2002 for comments along similar lines).

In a somewhat similar vein, the traditional VP is also seen as a more complex and articulated domain enriched by quasi-functional layers generally dubbed "v" (small v), sometimes overtly manifested as in so-called serial verb constructions (Collins, 1997 and references cited there). In the spirit of Larson's (1988) original analysis of double object constructions in English, all verb phrases are currently conceived of as articulated vP-shells in which the internal and the external arguments (in the original sense of Williams, 1981), and other (oblique) arguments of the verb argument structure, are hierarchically organized. There is a sense then in which vP is a complete domain as well: it is the domain in which all the arguments present in the verb lexical semantics are organized within a hierarchical syntactic structure (Hale & Keyser, 1993, and much subsequent literature on lexical decomposition: Harley, 2012; Levin & Rappaport, 2011, etc.). Moreover, in several languages the domain immediately above vP has been shown to host various types of discourse marked constituents, such as new information focus constituents (e.g., post-verbal new information subjects in Italian, as in Belletti, 2001, 2004ᴀ; Brody, 1990; Jayaseelan, 2001; Tsai, 2015, for related proposals on Hungarian, Malayalam, Chinese, etc.), right dislocated elements (Antinucci & Cinque, 1977; Cardinaletti, 2001; Cecchetto, 1999), constituents carrying a specific topic-like interpretation (Holmberg, 1999 and the phenomenon known as object-shift), etc. The existence of a vP-peripheral area in the low part of the clausal TP is thus strongly supported by a rich array of phenomena in a variety of languages. Thus, given its parallelism with CP in different dimensions—it is a complete domain in terms of argument structure and contains a discourse related periphery—it is

natural to also view vP as a phase, a domain in which syntactic computations occur in a complete way in a sense to be made precise. This characterization spells out one fundamental insight on the nature of phases as domains of computation that are "relatively independent in terms of interface properties" (Chomsky, 2000; Citko, 2014, p. 29). Hence, given:

(13)

$$[_{CP}\ldots[_{TP}\ldots\ldots[_{vP}\ldots\ldots]]]$$

CP and vP are phases, TP is not, it is part of CP phase.

On the basis of the discussion surrounding (11) and (12), CP (previous S') is traditionally considered a cyclic domain. Specifically, it is a domain through which a constituent transits in order to undergo extraction and land into the upper clause in a successive cyclic manner. The position of transit in CP is at its *edge*. A relevant notion of phase thus takes shape: a phase is a complete domain with an *edge*. In a system in which syntactic movement is feature-driven (Chomsky, 2000, 2008, as well as in the Relativized Minimality tradition, Rizzi, 2004, 2006), a phase is a complete domain of syntactic computation with an *edge* position. To the extent that a vP is considered a phase on the basis of the considerations above, vP should then possibly contain an *edge* through which movement of a constituent out of vP should transit.[5]

As discussed in 1, evidence has been accumulating over the years showing that movement is local as it proceeds successive cyclically; in phase-theoretic terms, movement proceeds through the *edge* of CP. Beside the evidence mentioned in 1, further evidence in support of this conclusion comes from several phenomena in different languages. The following is a short list of some contexts showing that the assumed intermediate positions in CP can be overtly realized in different ways in different languages (a point already mentioned in section 1). Thus they are visible and audible. This further supports the conclusion that syntactic computations are local in the intended sense, at the core of the phase theoretic approach (see Citko, 2014, pp. 71–91 for systematic overview; see Lutz, Müller, & von Stechow, 2000 and Müller, 2011 for more):

(14)

a   In a *Quantifier Floating* structure (Q-Float) Q can be stranded in an intermediate CP-*edge* position (Mc Closkey 2000 on West Ulster English, iii.):

i. What all did you get <___> for Christmas
ii. What did you get *all* <___> for Christmas   (Q-Float, with Q stranded within the same clause)
iii. [What did he say [*all* that [he wanted <___>]]   (Q-Float, with Q stranded in the intermediate CP)

(On *Q-Float* as Q-stranding Sportiche 1988 and much subsequent literature)

b   In a wh-question, *wh-coping* occurs in the intermediate CP-*edge* position (Fanselow and Mahajan 2000, Felser 2004, on German, i.; Mc Daniel 1989 on Romani, ii.; Du Plessis 1977 on Afrikaans, iii.)

i. *Wen* glaubst du, *wen* sie getroffen hat <___>?
   Who think you who she met   has
    'Who do you think she met?'

ii. *Kas*   o Demìri mislenola *kas*   **i** Arìfa dikhla <___>?
   Who Demìri   think   who Arìfa saw
  'Who does Dimìri think Arìfa saw?'

iii. *Waarvoor* dink   julle *waavoor* werk ons <___>?
   Wherefore think you wherefore work we
   'What do you think we are working for?'

c   In a wh-question, the phenomenon of *partial wh-movement* occurs in some languages: the moved wh-phrase is pronounced in the intermediate CP-*edge* position and the scope of the question is signaled by a wh-expletive scope marker in a higher CP (Mc Daniel 1989, German, i.; Citko 2014, Polish, ii.; Stepanov 2000, Russian, iii.; Horvarth 1997, Hungarian, iv.)

i. *Was* glaubt Hans [*mit wem*   Jacob   jetzt   spricht <___>]?
   What believe Hans with whom Jacob now talk
   'Whom does Hans believe Jacob is now talking with?'

ii. *Jak* myślisz [*co* Maria zrobi]?
   How think$_{2.sg}$ what Maria do$_{3.sg.}$
   'What do you think Maria will do'

iii. *Kak* vy dumaete [*kogo* ljubit Ivan]?
   How you think$_{2.pl}$ whom love$_{3.sg}$ Ivan
   'Who do you think Ivan loves?'

iv. *Mit* gondolsz [*hogy* *kit* látott János]?
   what$_{acc}$ think$_{2.sg}$ that who$_{acc}$ saw$_{3.sg}$ János$_{nom}$
   'Who do you think that János saw'

Furthermore, much as in the adult grammars of the different languages illustrated in (14)b, English-speaking children have been shown to undergo a stage in their development in which they pronounce the intermediate position (Thornton, 1992):

(15)

Who do you think *who* is in the box?

Among other considerations, this child option strongly suggests that breaking the long extraction into shorter steps somehow optimizes the computation, despite the fact that at least one extra step is added to it. This is a relevant consideration for the complexity issue hinted at in 1 (footnote 4).

Under the hypothesis that vP is also a phase, a natural expectation is that the extraction out of the vP should in fact proceed stepwise, through the vP *edge*. Hence, some cross-linguistic overt evidence of this step is expected. And indeed, this evidence can be provided. One clear case is the phenomenon of wh-agreement in Chamorro discussed in Chung (1982). Other cases are illustrated in (16), with examples of so-called *short wh-movement* in Malayalam (16a, Jayaseelan, 2001), Hindi-Urdu (16b, Manetta, 2010), Polish (16c, Citko, 2010), possibly Hungarian (16d, Cable, 2008; see Citko, 2014, pp. 91–107 for a systematic overview, also considering other indirect signs of the step through vP-*edge* bearing on interpretive properties). The examples in (16) a–c are especially revealing, since either the ergative subject or the accusative object precedes the preposed wh-phrase, strongly suggesting that the latter is located in a low peripheral position such as precisely the vP-*edge*:

(16)

a   nin-ne *aarə* aTiccu?
you$_{acc}$ who   beat$_{pst}$
'Who beat you?'

b   Hamid-ne *kya*: par.ha?
Hamid$_{Erg}$ what read
'What did Hamid read?'

c   Co   Ewa *komu* dała?
what$_{acc}$ Ewa who$_{dat}$ gave
'What did Ewa give to whom'

d   János kit mutatott   be Marinak?
János who$_{acc}$ introduced Part Mary-to
'Who did John introduce to Mary?'

(All things being equal, the Hungarian case may have the subject as a topic, in a higher clause external position, thus being less clearly an indication of the low position of the wh-constituent; a similar analysis is less readily available for the other examples in 16.)

2.1 The Phase Impenetrability Condition/ PIC and the Relation Agree

Implicit in the discussion in 2 is the idea that once the vP-phase is completed and a targeted constituent has been moved out of it, that vP-phase is no longer accessible to other computations (as in the classical *strict cycle*, mentioned in 1). Similarly, in cases of long extraction, once the moved constituent has transited through the intermediate CP, that CP-phase is no longer accessed by other computations.[6] In phase theoretic terms, at that point the phase, vP or CP, its *edge* excluded, is sent to the interpretive interfaces. This is a particular instantiation of the general property of phases as independent domains, the smallest domain of syntactic computation (Chomsky, 2007). They only communicate through their *edge* position, as it is visualized in (17), which illustrates the derivation in (11) again, incorporating the vP-*edge* steps. For clarity, the intermediate steps are indicated as <__>, and only the position of first merge of the moved wh-phrase is indicated as its full copy <whom>:

(17)

[$_{CP3}$ Whom [do you [$_{vP3}$<__>think [$_{CP2}$< __> [that Mary [$_{vP2}$<__>expected [$_{CP1}$ <__> that [you [$_{vP1}$ <__> gave the book to <whom>]]]]]]]]]]

Syntactic displacement is feature-driven. This is the case for other morphosyntactic operations as well, such as agreement in phi-features (as number, person, gender, case, etc.). Concentrating on displacement for now, this means that if a question is going to be asked, an attracting feature is present in the relevant CP, signaling the position to which the target constituent is attracted (similarly for other processes, e.g., focalization, topicalization, etc.). This is the position defining the scope domain of the question. A search operation is the engine of displacement. The attracting feature acts as a Probe looking for a Goal, the constituent that is targeted to undergo displacement (see Kayne, 2004 for extending the Probe searching role to prepositions). In minimalist syntax, this kind of Probe _____ Goal relation is referred to as the relation *Agree*. Thus, a wh-Q feature is present in CP_3 in (17), attracting the wh-constituent carrying the same wh-Q feature in the most embedded CP_1. The same *Agree*-type relation is also established in the intermediate positions of the derivation in (17). How exactly the *Agree* relation in the intermediate steps of (17) should be implemented becomes a rather technical issue, which cannot be discussed in any detail here (for some concrete proposals, see Felser, 2004; Rizzi, 2009). The crucial point to highlight here is that the attracting Probe and its Goal are always found within the same phase, or, as in the case of long-distance movement, the Probe is located at most in the next phase up and enters *Agree* with the Goal in the *edge* of the lower phase. This manifestation of syntactic locality is explicitly expressed in phase-theoretic terms through the *Phase Impenetrability Condition/PIC*, of which the following is a first formulation (see Chomsky, 2000, 2001, 2008 for various refinements and references):

(18)

PIC: In a phase HP with head H, the domain of H is not accessible to operations outside HP, only H and its specifier are accessible to such operations.

$$[_{XP} X [_{HP} [\mathbf{H} \ YP]]]$$

The specifier of H is considered the *edge* of the phrase. Without entering into the discussion of a number of details of implementation, the crucial idea of PIC, which is at the core of phase-theoretic syntax, is that no *Agree* relation is ever established between a Probing feature and a Goal inside a lower phase, except in the case in which the goal fills the *edge* position of the lower phase. This is what happens in the numerous cases of successive cyclic movement, illustrated in section 1 and, in more detail, in section 2. In other words, syntactic computations are strictly local. Each phase, CP or vP, is a complete domain of syntactic computation. This is a very innovative way to express the domain of action of syntactic locality; in particular, the identification of vP as a phase in the relevant formal sense is an important enrichment of previous versions of cyclic syntax along the lines mentioned in section 1, in which vP was not singled out next to CP (on vP phases, see Legate, 2003, 2012).

In contrast with *subjacency*-type accounts like the one mentioned at the end of section 1, no counting of cyclic/bounding nodes is ever at work, as every phase is a complete domain of computation. So, for instance, in the case of Ross' (1967) complex noun phrase island, the conclusion must be reached that either the *edge* of the CP from which extraction takes place or the *edge* of the containing DP are not accessible, and this is what makes this configuration a strong island, an impenetrable and inaccessible domain. Some recent thorough rethinking on the reasons why this should generally be the case when (sentential) complements of nouns are involved is provided in Bošković (2015, 2016). Some questions remain open; e.g., the proper definition and nature of the *edge* position do not appear to always be straightforward and may vary depending on a number of different factors (see Rackowski & Richards, 2005 for some relevant considerations). The status of DP as a phase is also not uncontroversial and uniform across DP types (with definiteness, specificity playing an important role; Citko, 2014, pp. 108–123 and references cited there; Svenonius, 2004, 2007, and the classical literature on extraction from DP stemming from Szabolcsi, 1994). These are among the issues under current investigation and refinement, still mainly derived from Ross' original agenda. The core insight of the phase approach to syntactic locality, however, remains sharp and clear in its explicative power.

T acts as a probing head entering *Agree* with the external argument/EA of vP (possibly yielding overt subject-verb agreement in phi-features, depending on the morphological properties of the language). If T has a feature, referred to in the literature as the *EPP* feature EA is raised into the (relevant) subject position, say Spec/TP for simplicity (the *EPP* feature is a formal concept emanating from the *Extended Projection Principle* of Chomsky, 1981; Svenonius, 2002). This core syntactic computation is schematically illustrated in (19):

(19)

The DP/EA is at the *edge* of the vP in the relevant sense, so that it can be probed by the head T which is contained in the next phase up, the CP phase. PIC rules out in principle that the probed DP be the IA. Thus PIC derives the crucial fact that it is always the closest element to the Probe carrying the relevant feature(s)—a DP with phi-features in the case at issue—that enters into *Agree* with it. The movement step of the computation in (19) thus results in an instruction to the computational system such as *attract the closest* (Chomsky's *Minimal Link Condition*). In (19) the derivation is illustrated linearly for convenience. In (20) it is given in the form of a tree diagram. It must always be kept in mind that syntactic constituents are hierarchically organized, and thus operations always take place within the syntactic hierarchy, along the lines in (20), with the highest position of the Probe c-commanding the position hosting the Goal:[7]

(20)
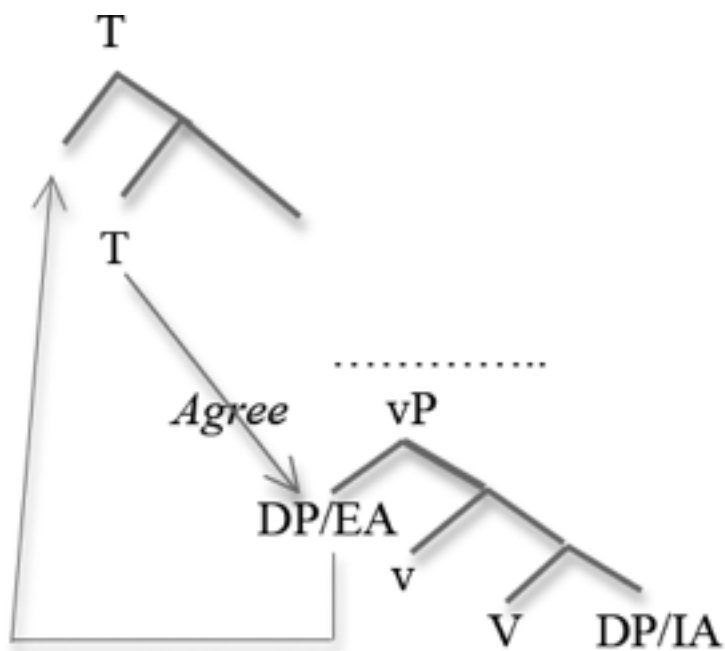
Agree and *attract the closest* are the crucial points in which the phasal approach to syntactic locality and the Relativized Minimality/RM approach originally developed in Rizzi (1990) meet. The latter is in turn a development and a generalization of Chomsky's (1986) Minimality condition (in a system expressed in terms of *Barriers*). Rizzi's (1990) RM falls within the context of a tradition of "Minimal distance" principles a classical approach to interpretive relations (such as control, Rosenbaum, 1967; C. Chomsky, 1969, based on child language). In a more recent perspective, the closer relation is in fact between the phasal approach as outlined above and the featural interpretation of the Relativized Minimality principle, dubbed featural Relativized Minimality/*fRM* (Rizzi, 2004, 2013; Starke, 2001). *fRM* operates in a system in which the search procedure between a Probe and a Goal leading to *Agree* is the fundamental engine of the syntactic computation. Section 3 is devoted to a review of some basic aspects of the *fRM* approach to syntactic locality, an approach that capitalizes on the notion of intervention.[8]

3. Locality and Intervention: Featural Relativized Minimality/fRM

A natural way to express the property that *Agree* should always target the *edge* of the relevant domain, say the vP in the illustration in (20), is in terms of intervention. *Agree* never crosses an intervener. Thus, in (20), if *Agree* were to be established between T and the DP/IA, the DP/EA should be "skipped," as it hierarchically intervenes between T and DP/IA. Informally speaking, an intervener cannot be skipped if it shares properties with the higher Probe which are critical to establish the relevant relation with a lower Goal (where both Probe and intervener c-command the position of the lower Goal). As both DP/EA and DP/IA in (20) carry phi-features, they could both in principle enter *Agree* with T. An intervener is thus an element that could enter a given relation with the high Probe more easily, as it is closer to it than a lower Goal. Intervention configurations are pervasive in human languages, an inevitable consequence of the widespread presence of displacement processes. The *fRM* approach aims at capturing the fact that some intervention configurations do not lead to the deviance of the resulting structure, whereas others do. Thus, the following definition of the principle can be given

(Rizzi, 2013):

(21)

Featural Relativized Minimality/fRM:

Given: $\quad\quad\quad\quad\quad\quad\quad\quad\quad$ X…. Z….Y

a local relation cannot hold between X and Y if Z intervenes and Z matches the specification of X in the relevant morphosyntactic features.

X = the Target of the dependency carrying relevant features, i.e. movement attracting features in movement dependencies
Z = the Intervener, sharing relevant features with X
Y = the Origin of the dependency,

In a structure like (20) with X=T, Z=DP/EA, Y=DP/IA, it is necessarily the DP/EA that is attracted to the subject position, and cannot be the DP/IA, which is thus the direct object of the sentence.

Consider now a wh-island context as in (22) (a weak island mentioned in section 1; cf. Rizzi, 2013 for thorough discussion of this point):

(22)

* [$_{CP1}$When [do you wonder [$_{CP2}$who [left \<when\>]
$\quad$ X $\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad$ Z $\quad\quad$ Y
$\quad$ [+Q] $\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad$ [+Q]

In (22) a Q feature, sometimes called wh-feature, is responsible for questions in (the relevant dedicated head of) the matrix CP1 and attracts a wh-constituent into its specifier. This position cannot host the wh-phrase *when* (Y) present in the embedded interrogative clause as *who* (Z) intervenes in the embedded CP2 carrying the same relevant Q feature. In other words, Y could be attracted to CP2 but cannot be attracted to CP1, due to the presence of *who* in CP2 expressing the same attracting feature as in CP1. As is clearly visible in the representation (20), the necessary dependency between X (*when*) and Y (the origin position of *when*) cannot be established, due to intervention of Z (*who*). The *fRM* approach is indeed generally phrased in representational terms, rather than in derivational terms, whereby it is the final representation that the grammatical system computes. Chomsky's *Minimal Link Condition* can be seen as the derivational counterpart of *fRM*, expressed in terms of the *attract the closest* instruction mentioned in subsection 2.1. The often subtle (and technical) partly different consequences that may follow from a derivational approach to syntactic locality and from a representational one will not be discussed here in any further detail.

Much work then revolves around the following very general question: which are the features relevant for determining the locality of long-distance dependencies from the perspective of intervention, in the general sense illustrated by (21)? And furthermore, what counts as an intervener? More specifically: do the same elements count as interveners in all types of dependencies? As for the latter question, at the very core of classical RM is the idea that an element can count as an intervener for certain types of dependencies but not for others.[9] So, for instance, whereas the DP/IA cannot become the subject of the clause crossing over the DP/EA in a structure like (20), an object (direct or indirect or adverbial) can instead move over a subject in wh-questions like (23):

(23)

a [What did [John read \<what\>]]
$\quad$ b[Whom did [John speak to \<whom\>]]
$\quad\quad$ c [When did [John left \<when\>]]

Intervention locality is thus relativized according to the type of syntactic movement involved in a given dependency (traditional A vs. Ā, i.e., movement within TP vs. movement to CP). More generally, intervention locality constrains the possibility of establishing relations across an intervener (see Chierchia, 2004, 2013 for the case of the licensing of polarity items, a relation not involving

displacement, yet sensitive to the intervention configuration). Work on syntactic cartography mentioned in section 2 has enriched the clause structure of (head) positions expressing various types of features: morphosyntactic features within TP on the one side (i.e., inflectional features), and, on the other side, features expressing scope-discourse properties and the force of the clause within the Left Periphery of TP, i.e. the traditional CP (viewed as an area rather than the projection of a single C head; see Rizzi, 1997; Benincà & Poletto, 2004; Rizzi & Bocci, 2016 for further developments, and the references cited therein). Thus, it is to be expected that a position expressing a certain property can act as an intervener with respect to a position carrying the same feature, so that no dependency can be felicitously established across these two positions. This is precisely the insight coming from cartographic studies in relation to syntactic locality. Beside cases of wh-island like (22), many other often rather subtle distinctions are expressed by the described system revealing the strict interaction between syntactic cartography and syntactic locality. They will not be illustrated here for reasons of space (see Rizzi, 2004; Haegeman, 2012 for further developments; Abels, 2012, for further discussion in a partly different perspective).

Further work on *fRM* also indicates that the target position X may be enriched by features that are relevant for the principle, so that the intervention situation may be somewhat modulated, yielding a gradation of deviance in the output. This is for instance the case in wh-island contexts in which enriching the target X of a nominal lexical restriction feature ([+NP]) makes the violation weaker and thus enhances the acceptability of the sentence (on the feature [+NP], see Rizzi, 2013 and references cited there, as well as Friedmann et al., 2009 in the context of children's linguistic development; see 3.1 for more on this). There is a contrast between (24)a, which is a classical case of wh-island similar to (22) and (24)b in which endowing the extracted wh-phrase of a lexical restriction makes the violation milder. The fact that (24)c is still felt as deviant as (24)a indicates that the enrichment must concern the target X, the position to which movement is probed. Enriching the intervener Z in a similar way has no effect, thus clearly highlighting the role of the probe, the features attracting syntactic movement (see Starke, 2001 for a first approach along these lines):

(24)

a *What   do you wonder [how   to solve <___>]
    [+Q]   [+Q]
     X   Z   Y

b ?Which problem do you wonder [how   to solve <___>]
    [+Q, +NP]   [+Q]
       X   Z   Y

c *How   do you wonder [which problem   to solve <___>]
   [+Q]   [+Q; +NP]
    X   Z   Y

The relation between the feature composition of the target X and the feature composition of the intervener Z which is able to modulate locality can be expressed in set theoretic terms: if the relevant features of the intervener Z are properly included in the feature composition of the target X, the dependency can be more readily established. This is the case in (24)b. In contrast, the dependency cannot be built if the relevant features of X and Z are in a relation of identity, as in the classical wh-island case in (24)a (and 22). The featural approach to locality in terms of intervention is thus able to express a gradation in the possible computation of long-distance dependencies. It also appears to be able to express stages in the development of the capacity to compute object long-distance dependencies by children and in forms of language impairment. This aspect is illustrated in subsection 3.1.

3.1 fRM and Linguistic Development

The described approach to *fRM* defines the intervention configuration in a refined way in which not just a coarse definition of the relevant positions is assumed for X, Z, and Y (e.g., in terms of A vs. Ā positions) but rather a detailed and more precise characterization expressed in featural terms. As noted, this allows for a possible gradation in the adult grammar, which immediately suggests that those intervention configurations requiring some feature modulation could be less readily accessible to the developing system in child grammar. This is precisely the proposal developed in Friedmann et al. (2009) and much subsequent related work (e.g., Adani et al., 2010; Belletti et al., 2012; Friedmann et al., 2017; Rizzi, 2013 for further discussion of this point). Indeed, the difficulty with the relation of feature inclusion illustrated in the wh-island case in (24)b appears to characterize a stage in the development of the

capacity to compute complex long-distance object dependencies across an intervening lexical subject. An example of a dependency of this type is provided by object relative clauses, a notoriously difficult domain in acquisition cross-linguistically. The difficulty holds both in comprehension and in production, an important aspect that will not be further developed here but which can be consistently treated in terms of the *fRM* intervention approach (Contemori & Belletti, 2013; Friedmann et al., 2015). Thus, take the object relative clause in (25)a (<__> the object gap, corresponding to the head of the relative clause *the boy*) and compare it to the subject relative clause in (25)b (<__> the subject gap, corresponding to the head of the relative clause *the boy*; for details on the exact position of the subject gap, not relevant to the present discussion, see references above and Rizzi & Shlonsky, 2007):

(25)

a The boy [that [the girl is pushing <__>]]
    X   Z   Y

b The boy [that [<__> is pushing the girl]]
    X   Y

Object relative clauses of the type in (25)a are harder to compute in child development. They are also hard in forms of linguistic impairment such as agrammatic aphasia (see Grillo, 2008 for a first RM approach to these issues in this pathology; Cecchetto & Donati, 2015 for a related approach) and SLI (Friedmann et al., 2015); they are also the ones parsed slower in adult online processing (Gordon et al., 2001; Belletti & Rizzi, 2013 for discussion).

As is clear from the schematic illustration in (25), in the establishment of the relation between X and Y there is an intervener Z in (25)a, whereas there is no intervener in (25)b. If the position to which the head of the relative clause (*the boy*) is probed is endowed with the features [+R] (relative) and [+NP] (since the head is a lexically restricted noun phrase), the resulting intervention structure of (25)a will have the form in (26):

(26)

The boy   [that [the girl is pushing <__>]]
[+R, +NP]   [+NP]

The feature relation between the head of the relative clause and the subject of the relative clause is one of inclusion; i.e., the [+NP] feature associated to the lexical restriction is properly included in the feature composition of the relative head. The situation is thus similar to the one seen in (24)b, with the difference that the feature [+R] is at play in the relative clause (26), whereas the feature [+Q] is at play in the wh-question (24)b. The feature inclusion situation in (24)b leads to an amelioration compared to the feature identity in (24)a in the adult grammar. The hypothesis is that computing such inclusion relation is not yet accessible to the young child's still immature computational system. The fact that (24)b is still marginal, whereas object relatives like (25)a are just fully acceptable (though slower parsed) in the adult grammar, may depend on the status of the features which enter the inclusion relation ([+Q] in the former case, [+NP] in the latter; see Rizzi, 2017 for elaboration of this point in terms of the distinction between criterial vs. non-criterial features). Disjunction in relevant features is the optimal realization of the relation between target X and intervener Z (as in, e.g., extraction from simple declaratives). On the status of the fourth set-theoretic relation, intersection, see Belletti et al. (2012), where the issue is addressed in connection with the study of the gender feature (with interesting cross-linguistic differences, prompted by the comparison between Hebrew and Italian). In conclusion, the point illustrated in this subsection is that the grammatical principle is able to express at the same time developmental stages in child grammar and levels of marginality (or harder parsing) in the adult system. Both systems are constrained by the same strict locality constraint expressed in terms of intervention.

Acknowledgments

Further Reading

Syntactic locality also constrains movement processes involving words and affixes, namely heads, not just phrases, as in all the cases discussed in the sections above. The following classical references will help the reader to address this important chapter of syntactic locality, which cannot be developed here:

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Roberts, I. (2000). Head movement. In M. Baltin & C. Collins (Eds.), *Handbook of contemporary syntactic theory* (pp. 113–147). Oxford: Blackwell.
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Travis, L. (1984). *Parameters and effects of word order variation* (Unpublished doctoral dissertation). MIT, Cambridge, MA.
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Furthermore, syntactic locality also constrains the labeling procedure of syntactic structures, a topic not addressed here, but developed in much recent literature, stemming from the following:

Chomsky, N. (2013). Problems of projection. *Lingua*, 130, 33–49.
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More generally, morphological and phonological computations are also constrained by locality conditions, as is discussed in the following references (and references cited therein):

Calabrese, A. (2015). Locality effects in Italian verbal morphology. In E. DiDomenico, C. Hamann, & S. Matteini (Eds.), *Structures, strategies and beyond* (pp. 97–130). Amsterdam: John Benjamins.
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Nevins, A. (2010). *Locality in vowel harmony*. Cambridge, MA: MIT Press.
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Finally, the following references (quoted in the previous sections, with one exception) can be highlighted from the list of references below to guide a more in depth reading on the topic of syntactic locality:

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Adani, F., van der Lely, H. K. J., Forgiarini, M., & Guasti, M. T. (2010). Grammatical feature dissimilarities make relative clauses easier: A comprehension study with Italian children. *Lingua*, *120*, 2148–2166.

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Belletti A., Friedmann, N., Brunato, D., & Rizzi, L. (2012). Does gender make a difference? Comparing the effect of gender on children's comprehension of relative clauses in Hebrew and Italian. *Lingua*, *122*, 1053–1069.

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Belletti A., & Rizzi, L. (2012). Moving verbal chunks in the low functional field. In L. Brugè, A. Cardinaletti, G. Giusti, N. Munaro, & C. Poletto (Eds.), *Functional heads: The cartography of syntactic structures* (Vol. 7, pp. 129–137). New York: Oxford University Press.

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Belletti, A., & Rizzi, L. (2013). Intervention in grammar and processing. In I. Caponigro & C. Cecchetto (Eds.), *From grammar to meaning* (pp. 294–311). Cambridge, U.K.: Cambridge University Press.
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Notes:

(1.) Locality constraints apply also in interpretive relations such as, e.g., control, binding, agreement, etc. For space reasons, attention will mainly be devoted here to locality in dependencies involving syntactic Ā-movement, in particular instances of *wh*-movement. Thus, locality in A-movement such as in passive will not be discussed here. See Collins (2005) for the analysis of passive through movement of a chunk of the verb phrase/*smuggling* with the effect of eliminating a possible (intervention) locality violation otherwise arising in the standard derivation of passive. See also Belletti and Rizzi (2012) for discussion on related structures, and Belletti (2014) for further relevant considerations bearing on development.

(2.) Indicated by <> brackets, following current practice; cf. the copy theory of traces, Chomsky (1995) and much subsequent related work. Sometimes the notation <___> will also be used to directly indicate the position of the silent copy, i.e., the gap.

(3.) And also others that cannot be illustrated here, e.g., specificity (Fiengo & Higginbotham, 1981); referentiality (Rizzi, 1990; Cinque, 1990).

(4.) Although some type of "counting" may be ultimately relevant to the computational system in order to estimate levels of complexity, as in the derivational theory of complexity/DTC, Miller & Chomsky (1963). The issue of the potential tension between local successive cyclic derivations and the insight provided by DTC is merely noted here and will not be further discussed.

(5.) The issue of the status of unaccusative verb phrases and passives is left open here (see Legate, 2003 for the proposal that they should be considered phases as well). See Citko (2014) for review of some relevant issues, raised in the frame of the literature on phases.

(6.) For the sake of clarity, the illustration has been limited to question formation/wh-movement. But other left peripheral phenomena, e.g., focalization, topicalization, etc., share the same properties.

(7.) "α c-commands β iff β is contained within the sister node of α".

For the first definition of c-command, see Reinhart (1976), and for more recent versions in terms of containment, that maintain the same fundamental hierarchical insight, see Chomsky (1995) and much subsequent work.

(8.) See Rizzi (2009) and Torr (2012) for attempts to unify and reduce the two partly overlapping notions of locality.

(9.) For a semantic approach to intervention, see Abrusán (2007), Beck (1996), Szabolcsi & Zwarts (1997).

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