

Local Dependencies and Word-order Variation

Intermediate article

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Certain syntactic displacement operations target clause-internal positions. These movement types are typically clause-bound, and they are responsible for word order variation within and across languages.

INTRODUCTION

Certain syntactic displacement operations target clause-internal (IP-internal, where IP = inflection phrase) positions; among them are noun phrase (NP)-movement, scrambling, pronoun movement, and extraposition. A conspicuous common property of these movement types is that they are clause-bound: they cannot cross a complementizer phrase (CP) and target an IP-internal position in a higher clause. Because of this strict locality property, it is more difficult to establish the existence of a syntactic movement operation (and a trace) than in the case of movement types that target IP-external positions and are not clause-bound (such as *wh*-movement to SpecC). Accordingly, analyses that do without syntactic displacement have been proposed for all local dependencies addressed below (see, e.g., Williams (1994) on NP-movement, Fanselow (2001) on scrambling, and Culicover and Rochement (1990) on extraposition). In what follows, a movement analysis will nevertheless be presupposed throughout – first, because there is a growing body of empirical evidence in support of this view (see the Further Reading); second, because a displacement analysis is forced under a general, conceptually attractive assumption, the *Uniformity of Theta Assignment Hypothesis* (UTAH; Baker, 1988) according to which identical thematic relationships between items must be represented by similar structural relationships between those items at deep structure (D-structure). (See **Phrase Structure and X-bar Theory; Constraints on Movement; Government–Binding Theory**)

NOUN PHRASE MOVEMENT

Passive

The core property of passive constructions is that the external argument of a verb cannot be realized as an NP in the subject position SpecI (specifier of the IP). This argument reduction effect typically goes hand in hand with a morphological reflex (e.g. special passive morphology on the verb, presence of a passive auxiliary). In some languages (e.g. in Ukrainian), this is all there is to say; a remaining internal argument receives objective Case, and SpecI can remain empty. However, in many languages (e.g. in English), argument reduction is accompanied by Case absorption – a passivized verb cannot assign objective Case any more. An internal argument that receives objective Case in active sentences (see (1a)) is moved to the subject position SpecI in passive sentences (see (1b)), where it is assigned nominative Case. This operation is called NP-movement. Chomsky (1981) argues that NP-movement is possible in (1b) because SpecI is not a Theta-position (so that a general ban on movement into Theta-positions is respected); and it is necessary because NP₂ would otherwise violate the Case Filter (that demands that every NP is assigned Case).

- a. [_{IP} John₁ I[_{VP} kissed Mary₂]]
 b. [_{IP} Mary₂ was[_{VP} kissed t₂] (by John)] (1)

The thematic relations between the two arguments are identical in (1a, b). Hence, the UTAH not only implies that the argument bearing the Theta-role Theme (NP₂) is base-generated in VP in (1b); it also requires a syntactic representation of the argument bearing the Theta-role Agent in this sentence. Proposals as to what acts as the external argument in (1b) include the passive morphology itself, the

by-phrase, and various kinds of empty categories (pro, PRO).

Some languages (e.g. German) behave like Ukrainian in that NP-movement is not required, and like English in that an internal argument is assigned nominative rather than objective Case. The question arises of which Case is absorbed by passivization in double object constructions. In English, it is normally the object Case assigned to the first NP in double object constructions that is absorbed by passivization (see (2a, b)); but there is considerable variation in this domain, and even closely related languages (like Norwegian and German) may behave differently.

- a. [_{IP} Mary₁ was [_{VP} given t₁ a book₂]]
 b. *_{IP} A book₂ was [_{VP} given Mary₁ t₂]] (2)

Raising to Subject, Exceptional Case Marking, and Control

NP-movement is also involved in raising constructions like (3).

- [_{IP} John₁ [_{VP} seems [_{IP} t₁ to be a fool]]] (3)

The matrix predicate *seem* shares two properties with passivized verbs: it does not take an external argument NP, and it does not assign objective Case. Given that the SpecI position of an infinitive is not assigned nominative Case by nonfinite I in English, NP₁ in (3) can and must move to the matrix SpecI position, where it is assigned nominative Case by finite I. Raising to subject must be distinguished from two related constructions. *Exceptional Case Marking* (ECM) differs from raising in that the matrix verb takes an external argument (hence, raising is not possible), and in that the matrix verb ‘exceptionally’ assigns objective Case to an embedded subject that it does not Theta-mark (hence, raising is not required); see (4):

- [_{IP} Mary₂ [_{VP} believes [_{IP} John₁ to be a fool]]] (4)

It seems that a verb’s ability to assign objective Case and the presence of an external NP argument go hand in hand; this observation is known as ‘Burzio’s generalization’.

Raising and ECM constructions have in common that the infinitive is transparent (for movement and Case assignment, respectively). This is often accounted for by assuming that raising and ECM infinitives possess less structure than other clauses: they are bare IPs, not CPs. A CP destroys the transparency of an infinitive, whereas an IP does not. Accordingly, exceptional Case assignment is

impossible in *control* constructions like (5) (where the matrix verb takes an external NP argument) if we assume that a CP projection with a phonologically empty complementizer C is present.

- [_{IP} Mary₁ [_{VP} tries [_{CP} C [_{IP} PRO₁ to work hard]]]] (5)

The embedded CP is a *barrier* for exceptional Case assignment. Hence, the subject of the embedded infinitive cannot be realized as an overt NP (which would violate the Case Filter). A possibility that is often entertained is that the infinitive’s external argument is nevertheless realized syntactically, albeit as an empty category PRO; PRO is confined to ungoverned positions. (Chomsky (1981) suggests that this can be derived from independent assumptions; hence, the restriction on PRO is sometimes referred to as the *PRO theorem*.)

More on Control

PRO is co-indexed with the matrix subject (which acts as its controller) in (5) and (6a), but depending on lexical and structural factors, PRO may also be co-indexed with a matrix object (as in (6b)), or may receive an arbitrary, generic, or discourse-based interpretation (as in (6c, d)).

- a. [_{IP} Mary₁ [_{VP} promised John₂ [_{CP} C [_{IP} PRO_{1/*2} to leave]]]]
 b. [_{IP} Mary₁ [_{VP} persuaded John₂ [_{CP} C [_{IP} PRO_{*1/2} to leave]]]]
 c. [_{IP} [_{CP} C [_{IP} PRO_x To behave oneself in public]] would help John]
 d. [_{IP} John₁ does not know [_{CP} C [_{IP} how PRO_x to prove the theorem]]] (6)

Examples like (5) and (6a, b) are often said to involve *obligatory control* (OC); examples like (6c, d) show *non-obligatory control* (NOC). It has been argued that the theory of control can be based on the assumption that PRO is an anaphor that obeys an appropriately revised version of principle A of the binding theory (Manzini, 1983; Koster, 1987): PRO must be bound within its binding domain if it has one. The next-higher clause is the binding domain in OC contexts; however, there is no binding domain for a PRO in subject clauses and *wh*-clauses, which are therefore NOC contexts. A complication is that control tends to be even more local than predicted by the binding theory: with the exception of certain verbs like ‘promise’ (see (6a)), the interpretation of PRO follows a *Minimum Distance Principle* (MDP) according to which PRO picks the minimally *c*-commanding NP as its antecedent in OC contexts. (See **Anaphora; Binding Theory**)

Another kind of approach is developed by Hornstein (2001). He argues that the locality of control in OC contexts results from the fact that movement rather than anaphoric binding is involved. Under this view, PRO is a trace of NP-movement, and control and raising are similar after all, the main difference being that movement is to a Theta-position in OC, but not in raising contexts. (Note that this analysis is incompatible with the ban on movement into Theta-positions mentioned above.) MDP effects are traced back to the *Minimal Link Condition* (MLC), which is independently known to restrict movement (Chomsky, 1995). Furthermore, NOC contexts are assumed to involve an empty pronominal (*pro*) that is inserted as a last resort operation in syntactic environments that block movement.

At present, it is an open question to what extent such structural explanations (based on binding or movement) can succeed in accounting for the varieties of control, and to what extent non-structural properties (such as the thematic properties of matrix predicates) play a role (Culicover and Jackendoff, 2001).

General Properties

NP-movement has several characteristic properties, some of which distinguish it from movement types that target an IP-external position, such as *wh*-movement. First, like *wh*-movement, NP-movement obeys the *Relativized Minimality* constraint (Rizzi, 1990), according to which α -movement must not cross an intervening α -position. Thus, NP-movement must be successive-cyclic if a SpecI position intervenes between the base position and the target SpecI position (see (7a, b)); note that a passivized ECM verb behaves in every respect like an ordinary raising verb).

- a. *A man₁ seems/is believed [_{IP} there to have been kissed t₁]
 b. A man₁ seems/is believed [_{IP} t'₁ to have been kissed t₁] (7)

However, in contrast to *wh*-movement, NP-movement is clause-bound: it cannot cross a CP. Thus, NP-movement from a finite clause (*super-raising*) is impossible in English (see (8a)), whereas *wh*-movement is not (see (8b)):

- a. * [_{IP} Mary₁ seems [_{CP} (t'₁) that [_{IP} t₁ likes John]]]
 b. [_{CP} Who₁ do you think [_{CP} t'₁ that [_{IP} Mary likes t₁]]]? (8)

A second difference concerns *binding of anaphors* (i.e. reflexive and reciprocal pronouns). NP-movement creates new possibilities for anaphoric binding (see (9a)), whereas *wh*-movement does not (see (9b)).

- a. [_{IP} The students₁ seem [_{PP} to each other₁]
 [_{IP} t₁ to be intelligent]]
 b. * [_{CP} Which man₁ does himself₁ think
 [_{CP} t'₁ that Mary likes t₁]]? (9)

Third, there is a difference with respect to *weak crossover*. In a weak crossover configuration, a quantified NP has been moved across a co-indexed personal pronoun that does not c-command the trace of NP. This configuration leads to ungrammaticality with *wh*-movement, but not with NP-movement; see (10a, b):

- a. [_{IP} Every girl₁ seems [_{PP} to her₁ mother]
 [_{IP} t₁ to be intelligent]]
 b. * [_{CP} Which girl₁ does [_{NP} her₁ mother]
 think [_{CP} t'₁ that John likes t₁]]? (10)

Fourth, NP- and *wh*-movement diverge with respect to *parasitic gaps*. A parasitic gap is a trace (noted here as 'e') in a position that is typically not accessible to regular movement (because of locality constraints). However, e is permitted if it is in a sufficiently local relation with a well-formed movement chain with the same index. As shown in (11a, b), NP-movement does not license parasitic gaps in English, whereas *wh*-movement does (Chomsky (1982), who also notes that (11a) is grammatical with *them* in place of e, which implies that the construction is not ill formed because of a control failure with the PRO subject of the *without* phrase).

- a. * [_{IP} The books₁ can be sold t₁ [_{CP} without reading e₁]]
 b. [_{CP} Which books₁ did they sell t₁
 [_{CP} without reading e₁]]? (11)

Further Dissociation of Case-positions and Theta-positions

In NP-movement constructions, the first member of the movement chain is in a position to which Case is assigned, and the last member occupies a Theta-position. NP-movement has so far been motivated on the basis of passive and raising (also recall the above remarks on an NP-movement approach to control), but it has also been argued to underlie other constructions.

The VP-internal subject hypothesis

The assumption that an external argument of a verb is base-generated in the verb phrase (VP)-external SpecI position has been called into question in recent years. The alternative (suggested by Sportiche (1988) and many others, and now widely adopted) is that all arguments of V are base-generated in a VP-internal position; this is known as the *VP-Internal Subject Hypothesis* (VISH). (Since this assumption is usually taken to hold for all predicates, a more adequate term is *Predicate-Internal Subject Hypothesis*.) Under this view, the 'external' argument of V is base-generated VP-internally, in SpecV. Given that SpecI is the position to which nominative Case is assigned in English, NP-movement to SpecI must then take place in active sentences as it does in passive sentences; see (12):

[_{IP} John₁ I [_{VP} t₁ wrote the book₂]] (12)

The VISH raises a question concerning the structure of double object constructions, where there are three argument NPs but, it seems, only two VP-internal positions (specifier and complement). The most widely adopted approach to this problem is one that relies on a *shell* (Larson, 1988; Chomsky, 1995): on top of the lexical VP, there is a vP shell with an empty head v. Two internal arguments can now be base-generated in VP, and the remaining external argument is base-generated in Specv. Obligatory V-to-v movement and Case-driven NP-movement to SpecI yield the correct surface string. (13) is a possible analysis of an English double object construction.

[_{IP} John₁ I [_{VP} t₁ gave₂ [_{VP} Mary [_v t₂ a book]]]] (13)

The vP shell analysis is usually extended to simple transitive and intransitive verbs, such that an external argument is base-generated in Specv throughout; it thereby qualifies as 'external' in the literal sense again.

Raising to object

There is an alternative analysis of ECM constructions that goes back to Postal (1974). Under this view, (4) does not involve exceptional Case assignment of the matrix verb to the subject position of the infinitive, but raising of the embedded subject to the object position of the matrix clause, as in (14).

[_{IP} Mary₁ I [_{VP} t₁ believes John₂ [_{IP} t₂ to be a fool]]]] (14)

As before, the construction would then depend on the transparency of IP, but it would be transparency for movement, not for Case assignment.

The empirical evidence that might decide between the two possibilities is not decisive. On the one hand, adverbials that belong to the matrix clause may usually not intervene between the lower external argument and the rest of the infinitive; see (15). This is an argument for the ECM analysis.

*John believed Mary sincerely to have left (15)

On the other hand, the external argument of the infinitive c-commands a matrix adverbial that follows the infinitive, as shown by binding of the reciprocal in (16). This piece of evidence supports the raising to object analysis.

The DA proved the defendants₁ to be guilty during each other's₁ trials (16)

The raising to object analysis has been refined and generalized in such a way that all NPs that bear objective Case must undergo raising to a Case-related position provided by a functional head (e.g., the specifier of an 'object agreement' phrase AGR_{OP}). In such an approach, there is a complete dissociation of Theta-positions and positions to which structural Case is assigned; see Johnson (1991) and Chomsky (1995).

SCRAMBLING

Many languages exhibit a considerable amount of clause-internal free constituent order. For instance, all permutations of three argument NPs in a double object construction can result in well-formedness in German (on which the following discussion will focus). Given the UTAH, only one of the orders can be base-generated; the remaining orders are derived by *scrambling*, a movement type introduced by Ross (1967). For present purposes, we can assume (following what is arguably the standard view) that subject → indirect (dative) object → direct (accusative) object is the base order in German. Thus, (17b–f) are derived from (17a) by scrambling.

- a. dass [_{IP} die Frau₁ dem Mann₂ das Buch₃ gegeben hat]
that the woman_{nom} the man_{dat} the book_{acc} given has
- b. dass [_{IP} die Frau₁ das Buch₃ dem Mann₂ t₃ gegeben hat]
- c. dass [_{IP} das Buch₃ die Frau₁ dem Mann₂ t₃ gegeben hat]

- d. dass [_{IP} dem Mann₂ die Frau₁ t₂ das Buch₃ gegeben hat]
- e. dass [_{IP} dem Mann₂ das Buch₃ die Frau₁ t₂ t₃ gegeben hat]
- f. dass [_{IP} das Buch₃ dem Mann₂ die Frau₁ t₂ t₃ gegeben hat] (17)

An independent argument for a scrambling approach is provided by the fact that clause-internal word order variation is not confined to co-arguments of a predicate in German. Scrambling can also move an item that is base-generated within an object NP to a clause-internal position. This is shown for extraction of a pronoun *da* (lit. 'there', here 'it') from a prepositional phrase (PP) embedded in an object NP in (18).

- dass [_{NP} da₁ keiner [_{NP} eine Ahnung [_{PP} t₁ von] gehabt hat]
- that it no one_{nom} a notion_{acc} of had has (18)

There are different views as to what the landing site of scrambling is. Data such as (17e, f) show that scrambling can be iterated. This requires either additional functional categories that provide a unique landing site for each scrambling operation, or a general mechanism that produces as many landing sites as are needed in one domain. Assuming the latter, we can postulate that scrambling in German (where NP-movement to SpecI is not obligatory) is movement within the vP domain – adjunction to vP (as was standardly assumed), or substitution in (outer) specifiers of v (see Chomsky (1995) on the possibility of multiple specifiers).

Scrambling (in German) differs from NP-movement (in English) in being optional. It has so far proven difficult to find a trigger for scrambling, which is required in syntactic theories that adopt economy principles and thereby require each movement operation to be forced in some way. Triggers that have been suggested include abstract features and information-structural requirements.

Much recent work has focused on how scrambling fits into the typology of movement operations that is based on the distinction between NP-movement and *wh*-movement. (This distinction is often generalized to a dichotomy of *A*- versus *A-bar* movement, with NP-movement an instance of the former, and *wh*-movement an instance of the latter.) In some respects, it does not seem to fit at all. For instance, since scrambling can cross an intervening scrambled item (see (17e, f)), it appears to be exempt from Relativized Minimality effects. In most cases, however, scrambling patterns with either NP-movement or *wh*-movement.

First, in many languages, scrambling is clause-bound. Thus, scrambling in German can never leave a finite CP (see (19a)), like NP-movement and unlike *wh*-movement. Depending on the nature of the matrix verb, scrambling may or may not take place from a nonfinite clause. This is often taken to show that so-called *restructuring* verbs select a bare IP infinitive, whereas *non-restructuring* verbs select a CP infinitive (see (19b, c)).

- a. *dass den Fritz₁ keiner sagt [_{CP} (t'₁) dass Maria t₁ mag]
- that ART Fritz_{acc} no one_{nom} says that Maria_{nom} likes
- b. *dass den Fritz₁ keiner [_{CP} (t'₁) C t₁ einzuladen] abgelehnt hat
- that ART Fritz_{acc} no one_{nom} to invite rejected has
- c. dass den Fritz₁ keiner [_{IP} t₁ einzuladen] versucht hat
- that ART Fritz_{acc} no one_{nom} to invite tried has (19)

However, in some languages (among them Russian, Persian, Korean, and Japanese), long-distance scrambling across a CP is possible, like *wh*-movement in English.

Second, scrambling at first glance seems to pattern with NP-movement as regards the binding of anaphors. (20a) shows that a direct object can bind an indirect object that follows it; given that the reverse order is base-generated, this implies that scrambling creates new possibilities for anaphoric binding. However, it is then unclear why an indirect object can never bind a direct object; see (20b). Furthermore, scrambling in front of a subject cannot license a nominative anaphor, like *wh*-movement; see (20c). All this might be taken to show that anaphoric binding is not solely regulated by structural factors, but relies on linear precedence and dominance on a thematic hierarchy, in which case the evidence is neutral between an NP-movement and a *wh*-movement analysis (see Jackendoff, 1990; Williams, 1994).

- a. dass der Fritz die Gäste₁ einander₁ t₁ vorstellte
- that ART Fritz_{nom} the guests_{acc} each other_{dat} introduced
- b. *dass der Fritz den Gästen₁ einander₁ vorstellte
- that ART Fritz_{nom} the guests_{dat} each other_{acc} introduced
- c. *dass den Fritz₁ sich₁ t₁ mag
- that ART Fritz_{acc} self_{nom} likes (20)

Third, German scrambling does not give rise to (clear) weak crossover effects, like NP-movement; see (21)

dass jeden Jungen₁ [_{NP} seine₁ Mutter]
 t₁ liebt
 that every boy_{acc} his mother_{nom}
 loves (21)

Fourth, scrambling licenses parasitic gaps, like *wh*-movement; see (22):

dass das Buch₁ jeder [_{CP} ohne e₁
 zu lesen] ins Regal t₁ zurückgestellt
 hat
 that the book_{acc} everyone_{nom} without
 to read into the shelf put
 has (22)

Thus, scrambling in German seems to share some properties with NP-movement, and some with *wh*-movement. To preserve the strict A-/A-bar dichotomy mentioned above, scrambling must be assimilated with either NP-movement or *wh*-movement, and conflicting pieces of evidence must be explained away. Alternatively, the non-homogeneous evidence can be taken to indicate that the A-/A-bar distinction should be dispensed with, and be replaced by a finer-grained system according to which, for example, scrambling forms a natural class with NP-movement insofar as it targets an IP-internal position, and with *wh*-movement insofar as it is not Case-driven. Syntactic constraints can then refer to these distinctions. (See **Anaphora, Binding Theory**)

PRONOUN MOVEMENT

Object Shift

Unstressed object pronouns move out of the vP to a clause-internal position in Scandinavian languages, thereby crossing vP-external material such as adverbs and negation; this operation is known as *object shift*. The landing site follows the canonical subject position SpecI; see the contrast between (23a) and (23b) in Danish.

- a. Hvorfor købte₃ [_{IP} Peter₂ den₁ ikke
 [_{vP} t₂[_{v'} t₃ t₁]]?
 why bought Peter it not
 b. *Hvorfor købte₃ [_{IP} Peter₂ — ikke
 [_{vP} t₂[_{v'} t₃ den₁]]?
 why bought Peter not
 it (23)

The nature of the landing site is not generally agreed on; a possibility is that it is the specifier of

a functional projection like AGR_{OP} that intervenes between IP and vP. Similarly, it is unclear whether pronominal object shift is phrasal (XP) movement or head (X⁰) movement. (See **Phrase Structure and X-bar Theory**)

While being confined to unstressed pronouns in the Mainland Scandinavian languages, object shift can also affect non-pronominal NPs in Icelandic, the main difference being that movement of the latter is optional. Furthermore, object shift can (and, in the case of two unstressed object pronouns, must) be iterated, as we have seen with scrambling. However, Scandinavian object shift differs from scrambling in German (and other languages) in a number of respects. First, in contrast to scrambling, object shift requires movement of the main verb to a higher position ('Holmberg's generalization'; see Holmberg, 1999; Chomsky, 2001). This is ensured by V-to-C movement in (23a), but not in a minimally different sentence where *købte* ('brought') is replaced by the perfect form *har købt* ('has bought'), such that *har* is in C and *købt* stays within vP. Consequently, object shift is impossible in the latter case. (Dependence on main verb movement also explains why object shift is strictly local and cannot even leave restructuring infinitives.) Second, unlike scrambling, object shift does not seem to pattern with *wh*-movement in any respect (e.g. it does not license parasitic gaps). Third, while scrambling typically reverses the D-structure order of arguments, object shift is strictly order-preserving: a shifted direct object can never show up in front of an indirect object.

Pronoun Fronting

German also exhibits obligatory fronting of unstressed object pronouns to a clause-internal position; see (24a, b). This position precedes the scrambling domain vP. However, it can in turn optionally be preceded by the subject; see (24c):

- a. dass es₁ [_{vP} der Fritz der Maria
 t₁ gegeben hat]
 that it_{acc} ART Fritz_{nom} ART Maria_{dat}
 given has
 b. *dass — [_{vP} der Fritz der Maria
 es₁ gegeben hat]
 that ART Fritz_{nom} ART Maria_{dat}
 it_{acc} given has
 c. dass der Fritz₂ es₁ [_{vP} t₂ der Maria
 t₁ gegeben hat]
 that ART Fritz_{nom} it_{acc} ART Maria_{dat}
 given has (24)

Pronoun fronting in German is local in the same way that scrambling is: a finite CP can never be crossed, and movement from an infinitive is possible with restructuring verbs, but not with others:

- a. *dass es₁ keiner [_{CP} (t'₁) C t₁ zu lesen] abgelehnt hat
 that it_{acc} no one_{nom} to read rejected has
- b. dass es₁ keiner [_{IP} t₁ zu lesen] versucht hat
 that it_{acc} no one_{nom} to read tried has (25)

It seems desirable to analyse German pronoun fronting and Danish object shift in the same way. Under this view, the fact that subject NPs precede fronted pronouns optionally in German, and obligatorily in Danish, would result from an independently motivated difference with respect to optional versus obligatory NP-movement to SpecI. Furthermore, multiple pronoun fronting results in a fixed order that is reminiscent of the order-preservation effect with object shift. Still, there are many differences. First, the fixed-order effect is not the same: the order is indirect object → direct object with object shift, but direct object → indirect object with pronoun fronting. Second, pronoun fronting can cross an intervening non-pronominal NP, which object shift cannot. Third, main verb movement does not seem to be required with pronoun fronting. Finally, pronoun fronting in German shares some properties with *wh*-movement (e.g. it licenses parasitic gaps).

Cliticization

Unstressed pronouns may be (pro- or en-) *clitic* in the sense that they must attach to the left or to the right of a suitable phonological host, usually V. Pronominal cliticization is widespread in the Romance and Slavic languages. (26a) is an example from French.

- Jean les₁ mange t₁
 Jean them eats (26)

The trigger for cliticization is arguably phonological, given the clitic pronoun's need to form a phonological word with an appropriate host. Since nothing can intervene between a clitic pronoun and its host, cliticization is often analyzed as involving head movement (*incorporation*) into the X⁰ position in which the verb shows up. However, whereas head movement is extremely local (Baker, 1988), clitic movement seems to obey roughly the same

locality constraints as scrambling and pronoun movement in German: a finite CP cannot normally be crossed, but cliticization from an infinitive (*clitic climbing*) is permitted in some languages, where a restructuring verb occurs in the matrix clause. Clitic climbing is impossible in French, but applies optionally in Italian: see (27a, b) (alternatively, in (27a), *lo* can attach as an enclitic to *leggere*):

- a. Mario lo₁ vuole [_{IP} leggere t₁]
 Mario it wants to read
- b. *Mario lo₁ odia [_{CP} (t'₁) C [_{IP} leggere t₁]]
 Mario it hates to read (27)

In view of this dual nature, it has been argued that a moved clitic pronoun simultaneously acts as an X⁰ category and as an XP.

EXTRAPOSITION

Whereas NP-movement, scrambling, and pronoun movement involve leftward displacement, extraposition is rightward movement. This movement type is often optional and seems to be motivated at least in part by parsing requirements. Extraposition has been argued to underlie instances of optional rightward PP- and CP-displacement from NP (see (28a, b)), so-called *heavy NP shift* (see (28c)), and argument CP-displacement in languages with subject-object-verb word order (see (28d) from German, which is strongly preferred over the preverbal option).

- a. [_{NP} A review t₁] will appear shortly
 [_{PP} of his new book]₁
- b. [_{NP} A woman t₁] came into the room
 [_{CP} that no one knew]₁
- c. She threw t₁ into the wastebasket
 [_{NP} the letter which she had not decoded]₁
- d. dass er t₁ dachte [_{CP} dass sie schläft]
 that he thought that she sleeps (28)

Extraposition is clause-bound (Ross, 1967), like NP-movement; see (29a). On the other hand, heavy NP shift has been claimed to license parasitic gaps, like *wh*-movement; see (29b):

- a. *John always maintains [_{CP} that [_{NP} a review t₁] will appear shortly] whenever he is asked about it [_{PP} of his new book]₁
- b. John offended t₁ [_{CP} by not recognizing e₁ immediately] [_{NP} his favourite uncle from Cleveland]₁ (29)

Extraposition has a number of peculiar properties that set it apart from other instances of movement. To name just one, subject NPs as in (28a, b)

are barriers for leftward movement; so the well-formedness of these examples is initially surprising. Moreover, rightward movement has been argued to be dubious on purely conceptual grounds (Kayne, 1994).

LOCALITY

There is one fundamental property that all movement types that target an IP-internal position share, and that sets them apart from movement types that target a position in the CP domain: displacement is clause-bound, that is, long-distance movement across a CP is impossible; see (30). (There is evidence that the CP domain can be targeted by scrambling in languages with long-distance scrambling.)

$$* \dots [_{IP} \dots \alpha_1 \dots [_{CP} (t'_1) \dots t_1 \dots]] \dots \quad (30)$$

Thus, there is a correlation between the position targeted by a movement type (low versus high) and the distance over which it can apply (short versus long). This generalization seems hardly accidental; it can be explained by a conspiracy of two constraints. First, there is a locality constraint that permits extraction from a CP only via SpecC (see, e.g., the *Phase Impenetrability Condition* in Chomsky, 2001). This precludes one-step movement without t'_1 in (30). Second, there is a constraint on improper movement according to which movement to an IP-internal position may precede movement to SpecC, but not vice versa; this asymmetry can be taken to reflect the hierarchy of the target positions in the tree. See Williams (1974) for the basic observation, and May (1979), Chomsky (1981), and Müller and Sternefeld (1993) for specific proposals. (See **Constraints on Movement**)

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Localization of function

See **Modularity in Neural Systems and Localization of Function**

Logic

See **Fuzzy Logic; Non-monotonic Logic; Inference using Formal Logics**

Long-term depression

See **Long-term Potentiation and Long-term Depression**
