Scrambling

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1. Introduction.

Scrambling is the term used to refer to the phenomenon of free word order variability in natural languages. Ross (1967) is among the first generative syntacticians to apply this term to languages that permit word order freedom such as German, Latin and Russian, among many others. The following example from Hungarian, another such language, shows this free word order property. The different orders correlate with different discourse properties of the sentence:

(1) a. Kati megevett egy szelet tortát
Kate ate a piece of cake

b. Egy szelet tortát Kati evett meg.
A piece of cake Kate ate.

c. Kati egy szelet tortát evett meg.
Kate a piece of cake ate

d. Egy szelet tortát evett meg Kati.
A piece of cake ate Kate.

Thus, the term scrambling has been used to describe any word order variation at the sentential level that appears optional.

The topic of scrambling gained considerable theoretical attention with the introduction of a richer theory of movement in the 1980s, and this interest has continued to the present. For instance, scrambling has been the main focus of four edited volumes (Corver and Van Riemsdijk 1994, Grewendorf and Sternefeld 1989, Karimi 2003, Saito and Sabel 2005), three monographs (Hinterholzl 2006, Karimi 2005, Richards 2004) and innumerable papers.

Thus, I will not be able to do justice to all aspects of scrambling in the literature, and I will focus in the aspects and generalizations that have guided the investigation over the last 25 years. These include two major views of scrambling: the base generation approach and the movement approach. We will examine each in the following sections.

2. Base generation approaches of Scrambling.

Base generation approaches to free word order are those that deny any movement or transformation between the different word order possibilities in the language. Early in the 1970s Ken Hale assumed that word order variability in a language like Walpiri was due to the fact that the arguments instantiate a flat structure (a structure in which arguments depend directly from the same sentential node), while languages with strict word order have a hierarchical structure in the sentence. The difference between one type of language and the other has been attributed to the configurationality parameter (Hale 1983). This parameter for free word order could be due to various factors. One is that in a language with a rich inflectional system, all the arguments of the verb are indicated morphologically (i.e., the so called poliysynthetic languages or head-marking languages in Baker 2002). According to Baker (1996) and Jelinek (1984) the arguments of the verb are the

agreements, and the overt complement counterparts are adjoined to the sentence linked via a chain. The fact that overt arguments are adjoined in a peripheral position explains why they can be moved easily, since adjunction does not impose a restriction on the order on which elements might appear.

Instead of proposing flat structures, other linguists assume that scrambling is the product of a free order of merge of the different arguments of the verb. Thus, in NON scrambling languages merger of arguments is strict because assignment of case and assignment of theta role needs to be done under strict adjacency. However, in scrambling languages case and theta role are freely assigned in alternative D-structures (Neeleman 1994) or they can be assigned in different positions under the same projection line of the inflectional projection (Bayer and Kornfilt 1994).

In the minimalist literature, the base generation approach has taken new forms. Scrambling, in fact, poses two major problems for the minimalist program: a) It is not clear what kind of feature checking is taking place in scrambling orders and b) the change of order appears optional in all these languages, contrary to the guiding idea that all movement is necessarily motivated. Bošković and Takahashi (1997) circumvent the second problem by assuming that scrambled orders are merged in their surface position. Thus in a Japanese sentence both the scrambled order in (2b) and the unscrambled order in (2a) are generated via merge:

(2)	a. John-ga	[Mary-ga	sono hon-o	katta to	] omotteiru.
	John-NOM	Mary-NOM	that book-ACC	bought that	thinks
	'John thinks that Mary bought that book.'				

b. Sono hon-o_i John-ga [Mary-ga katta to] omotteiru.

that book-Acc John-NOM Mary-NOM bought that thinks

'John thinks that Mary bought that book.'

However, in order to relate both orders Bošković and Takahashi (1997) assume that the scrambled object in (2b) lowers at LF to a case and theta role position adjacent to the embedded verb.[1]

(3) Sono hon-o_i John-ga [Mary-gat katta to] omotteiru.

that book-Acc John-NOM Mary-NOM bought that thinks

From this perspective, theta role assignment is done configurationally at LF. Languages differ as to whether theta roles must be assigned in their theta and case positions, yielding non scrambling languages and languages in which the assignment of theta role and case can be delayed until LF, yielding scrambling languages.[2] The parametric difference is due to feature strength of theta-role features. Theta role features can be strong, in which case they must be assigned configurationally at merge (i.e., non scrambling languages), or they can be weak and just be assigned at LF via a lowering operation (i.e., scrambling languages).

The idea of theta roles as features has also been adopted by Fanselow (2001) to explain free word order. He proposes that formal case and categorical features are associated with thematic features. Scrambled and unscrambled orders are all base generated. Theta roles and formal features are assigned in tandem at LF in scrambling languages without the need to any specific configuration for their assignment. This proposal is a theoretical

implementation of the idea that free word order is permitted in languages with overt case marking (Argument Marking Languages in Baker 2002´s typology).

Finally, Kiss (2008) presents a mixed position. According to her, Hungarian preverbal orders of arguments are fixed, as opposed to postverbal orders. This puzzling state of affairs can be explained, if one assumes that preverbal orders must follow a specific locality restriction on checking different functional projections. Thus there is a fixed position for focus, predicates to which different arguments move to preverbally. On the other hand, postverbal orders correspond to flat structures. This asymmetry between configurational structures to the left of the verb and non-configurational ones to the right of the verb is explained if a) all postverbal orders indicate there is verb movement to the left and b) when the verb is moved up to the left, the structure left behind gets flattened. Kiss (2008) has a specific implementation of this intuition in terms of phase theory, which is that when the verb moves up to the next phase, the previous phase gets flattened. It is important to signal that the mirror image of Hungarian does not seem to have been attested. Thus, there is no language that shows configurationality diagnostics to the right of the verb and flat structure to the left of the verb.

3. Movement approaches of Scrambling

The movement approaches to free word order all assume the initial order in all languages is configurational.[3] That order is altered via movement of the different phrases to different positions in the sentence or outside the sentence. The questions that arise under a movement approach are the following:

a) What elements are targeted by scrambling. Arguments? Predicates? Adjuncts? Others?

b) What are the locality restrictions of this movement? Can it occur long distance?

c) Does this movement reconstruct?

d) Is this movement motivated for feature checking?

e) What is the landing site of this scrambling movement?

There is no consensus in the literature on any of the questions above. In many cases the answers to the previous questions depend on the language or group of languages one is looking at, and at some point to the specific data one is focusing on (Boškovic 2004). However, there seems to be a descriptive taxonomy which linguists seem to agree upon, depending on the locality movement. In that sense, scrambling can be divided in three subtypes: object shift, clause bound scrambling (i.e., internal to the sentence) and long distance scrambling (i.e., scrambling across a finite sentence).

3.1. Object shift

Object shift is the term used to describe the overt movement of objects internal to the sentence. It has been widely described for Scandinavian languages such as Icelandic, Norwegian and Danish (Holmberg 1991, Holmberg and Platzack 1995, Vikner 1994). The movement is strictly local. It only affects object arguments (as opposed to PP or other arguments of the verb). In some languages, it only affects pronominal object obligatorily as in Danish and Swedish shown in the contrast in (4). However, in Icelandic it might affect

DP´s as well. Importantly, object shift occurs when there is overt verb movement. This correlation is called Holmberg´s generalization (Holmberg 1986).

(4) a. Han Köpte den_i inte t_i.
He bought it not t

b. *Han Köpte $boken_i$ inte t_i.
He bought the book not
'He did not buy the book.'

The facts that object shift only affects case marked elements (e.g., pronominals) and that it is very local, have led linguists to assume that it might be a case related movement like an instance of A movement. Moreover, like A-movement object shift also licenses floating quantifiers (Déprez 1994, Vikner 1994). Contrary to A´-movement object shift cannot license parasitic gaps (Vikner 1994)[6].

3.2. Clause Bound Scrambling.

Probably the most widely spread form of scrambling is clause bound, which affects most types of arguments. In some languages like Dutch, however, it only moves the arguments around adverbs (Neeleman 1994). Possibly, for this reason, the first investigations of scrambling in terms of movement concluded that it was an adjunction operation (Saito 1985, Webelhuth 1992). One of the most important debates on this type of movement has been to establish whether it can be classified as A-movement or A´-movement. Webelhuth (1992) concluded that this type of scrambling in German is a mixture of both A- and A´-movement. Depending on the type of diagnostic, we might reach one conclusion or the other.

For instance, if we take Weak Crossover (WCO) as a diagnostic for A´-movement, contrary to overt wh-movement, scrambling of an object quantifier does not create a WCO violation. Instead, scrambling of the quantifier creates a new binding configuration:[7]

(5) a. *?Wh_i [Pro_i NP] t_i V)? wh-movement

b. [QP_i] [Pro_i NP] t_i V? scrambling of a QP

These facts also indicate that Scrambling does not reconstruct, one of the diagnostics of A´-movement. Another diagnostic is used for A-movement is the possibility of a scrambled XP to bind an anaphor from its moved position as in (6), (Mahajan 1990, 1994, Saito 2003, Tada1992) among others:[8]

(6) [DP_i] ….[$ANAPHOR_i$….]……t_i V (Scrambling of a DP over an anaphor)

A third diagnostic that scrambling does not reconstruct is given by the fact that the scrambled XP might circumvent a principle-C effect (Mahajan 1994):

(7) a. *$PRONOMINAL_i$ [$_{XP}$ DP_i]$_j$ V (Principle C effect on the merge order)

b. [$_{XP}$ DP_i]$_j$ $PRONOMINAL_i$ t_j V (scrambling XP =No principle C effect)

Finally, the last dignostic for A-movement is that it licenses floating quantifiers.[9]

(8) DP_i YP [FQ t_i] V (scrambling)

However, not all the diagnostics are equally uniform and do not yield a uniform case against reconstruction effects. In many cases the properties of the binder are crucial to establish whether there is reconstruction or not. Thus, principle-C effects are not circumvented in German, Korean (Lee and Santorini 1994) or Spanish (Ordóñez 1998),

when the binder is the subject as shown in the following schema in (9). Thus scrambling makes no difference for grammaticality of examples in which the subject is a pronominal that triggers a principle-C violation before scrambling.

(9) a. *[$_{subject}$ PRONOMINAL $_i$] [DP$_i$] V

b. * [DP$_i$]$_j$ [$_{subject}$ PRONOMINAL $_i$] t$_j$ V (scrambling over the subject=Reconstruction is requied)

Finally, scrambling of a XP containing a pronoun bound by a subject quantifier requires reconstruction (Lee and Santorini 1994):

(10) a. [$_{subject}$ QP$_i$] [PRONOMINAL$_i$ DP] V

b. [PRONOMINAL$_i$ DP]$_j$ [$_{subject}$ QP$_i$] t$_j$ V (scrambled order)

Moreover, Mahajan (1999), Saito (2003), and Tada (1993), show that the scrambling of an anaphor does not create a principle-C effect. Thus, reconstruction is also required:[10]

(11) a. DP$_i$ ANAPHOR$_i$ V

b. ANAPHOR$_i$ DP$_i$ t$_j$ V (scrambled order)

Another diagnostic in favor A´-movement is the possibility of licensing parasitic gaps. Webelthuth 1992 shows that scrambling of a DP argument can license a parasitic gap in an adjunct clause, in the same way that wh-movement licenses parasitic gaps PG. Other authors like Neeleman 1994 question the ability of scrambling to linsence PG :

(12) Wh$_i$ V t$_i$ [Adjunct V PG$_i$] ? (wh-movement in English)

(13) that…. DP$_i$ [Adjunct PG$_i$] t $_i$. (Scrambling in German)

The diagnostics presented so far show that scrambling is far from being a simple movement amenable to the A-A´-movement distinction. Webelhuth (1992) proposed that scrambling might be characterized as a mixed position, with A and A´-movement properties. He presented the following puzzling situation: a scrambled XP argument licenses a parasitic gap (diagnostic for A´-movement) and at the same time it creates a new binding possibility, circumventing a WCO violation (diagnostic for A-movement). This has been labeled in scrambling literature Webelhuth´s paradox:

(14) that…. QP_i [Adjunct PG_i] t_i [Pro_i DP] V (Webelhuth paradox)

This conclusion has been challenged by Hinterhölz (2006), Mahajan (1994), Müller and Sternefeld (1994), Saito (2003), among others. Mahajan (1990, 1994) claims that local sentence bound scrambling does not take the XP to a mixed position. Local scrambling might take the argument either to an adjunct position, in which case it shows the diagnostics for A'-movement, or to a specifier of an agreement projection, in which case it shows the diagnostics of an A-movement. From that perspective (14) simply might hide two movements (Mahajan 1990): movement to an A position from where it can license the pronoun in the complement clause, followed by A´-movement, which would license the parasitic gap. This kind of proposal, however, does not easily fit into the minimalist program on feature checking since Mahajan is permitting optionality on possible landing sites for scrambling in Hindi: either a specifier position or an adjunct position.

On the debate for A-A' diagnostics it is important to establish whether scrambled DP´s permit scrambling out of them. Bošković and Takahashi (1998) point out that scrambling

out of scrambled phrases is permitted in Japanese, which give evidence to the fact that reconstruction occurs.

(15) $[\ XP]_i\ [\ YP\ t_i\ ]_j\ t_j\ V$

However, Müller has pointed out an interesting restriction on XP from which scrambling has taken place (i.e., remnant movement). A remnant YP out of which scrambling has applied, cannot undergone scrambling itself. He attributes this restriction to a principle of Unambiguous Domination (Müller 1996):

(16) $[\ XP]_i\ [\ YP\ t_i\ ]\ V$ (Scrambling out of YP)

(17) $*\ [\ YP\ t_i\ ]_j\ [\ XP]_i\ t_j\ V$ (No scrambling permitted for the remnant YP)

Further restrictions exist on sentential scrambling. Thus, it might only affect arguments in languages like Japanese (see Bošković and Takahashi 1998). In some languages, not all quantifier XPs can scramble. Thus, in German and Spanish wh-words cannot scramble (Muller and Sternefeld 1994, Ordóñez 1998).

Finally, scrambling has effects on the interpretation of indefinites and quantifiers. Thus, Diesing and Jelinek (1995) pointed out that an indefinite NP like *Kinder* in German is interpreted as existential when it is in situ. However when it is moved it is interpreted as generic. Similar effects have been described for Turkish as well (Bayer and Kornfilt, 1994):

(18) a. weil Hans meistens Kinder verführt.
Since Hans mostly children seduces (Existencial)

b.weil Hans Kinder meistens verfuhrt
Since Han children mostly seduces (Generic)

In Japanese, quantifier scope possibilities change with scrambling as well (Miyagawa 1997). In a sentence with two quantifier as (19) is unambiguous with a rigid scope interpretation. However, with the scrambling order, the sentence becomes ambiguous, with the scrambled DP taking scope over the quantifier in situ (from Miyagawa 2006, among others):

(19) a. Dareka-ga daremo-o sikatta.
someone-NOM everyone-ACC scolded
someone >everyone, *everyone > someone

b. Daremo-oi dareka-ga ti sikatta.
Everyone-ACC Someone-NOM scolded
someone >everyone, everyone >someone

While sentence bound scrambling shows this mixture of properties, we will see in the next section that long distance scrambling is more uniformly considered A´-movement.

3.3. Long Distance Scrambling.

While scrambling inside the clause is widespread, not all languages permit scrambling of DPs out of a finite clause. Thus German and Dutch do not permit scrambling out of a finite CP. Moreover, Dutch does not permit scrambling of XP arguments over the subject (Neeleman 1994). German only permits scrambling out of infinitival clauses to which a process similar to restructuring has occurred (the so called coherent infinitives).[12]

(20) daß [$_{IP}$ [den Hund]$_i$ keiner [CP PRO t_i zu futtern] versuchte]]]
that the dog-Acc nobody-NOM to feed tried
'That nobody tried to feed the dog'.

This dichotomy presents an interesting puzzle as to what the source of this parametric difference between languages that permit long distance scrambling versus languages that do not. For one thing, long distance scrambling seems to show the properties of akin to A´-movement. The consensus in the literature is that long distance scrambling does not create new binding possibilities (Mahajan 1994, Saito 2003) whereas it does license parasitic gaps as (Mahajan1990).

(21) *DP$_i$ [$_{IP1}$ [$_{DP}$ Anaphor$_i$]……[$_{CP}$… [$_{IP2}$ t_i]]] (no binding of anaphor)

*QP $_i$ [$_{IP1}$ [$_{DP}$ pronoun$_i$]……[$_{CP}$… [$_{IP2}$ t_i]]] (no binding by QP)

DP$_i$ [$_{IP1}$ [Adjunct PG$_i$] [$_{CP}$… [$_{IP2}$ t_i]]] (licensing of parasitic gaps)

One of the most interesting properties of long distance scrambling involves the so-called radical reconstruction effects discussed by Saito (2003). Thus, a *wh*-word might scramble outside the embedded sentence selected by a verb that requires a wh-words as we saw in (21). This implies that the scrambled wh-word must reconstruct at LF to its embedded clause in order to check the wh-features. Saito (2003) points out that movement of the wh-word outside its embedded CP is not semantically motivated, since the wh-feature must be checked in the lower clause.[13]

(22) ?Nani-o$_i$ John-ga [$_{WH\text{-}ISL}$ Taroo-ga t_i katta ka] siritagatteiru.
what-ACC$_i$ John-NOM [$_{WH\text{-}ISL}$ Taro-NOM t_i bought Q] want.to.know
'John wants to know what Taro bought'.

Takano (2010), on the other hand, notices that long distance scrambling in obligatory control contexts might create new binding possibilities, contrary to what we saw in (21). These new binding possibilities are created when the binder is the quantifier scrambled in front of a pronominal that is the controller of the embedded clause (23). According to Takano this new binding possibility can be explained if a) control involves movement and therefore the $[_{\text{CONTROLLER}}\ \text{Pro}_i\text{-DAT}]_j$ has moved from the embedded CP to the matrix clause and b) the scrambled QP-Dat moves before the lower trace of the controller DAT, yielding the proper configuration for pronominal binding:

(23) $[_{\text{scrambled}}\ \text{DATQP}]_i$ XP-NOM $[_{\text{CONTROLER}}\ \text{Pro}_i\text{-DAT}]_j$ $[_{\text{CP INF}}\ t_i\ t_j\ t_i\ \text{V}]$ V

Thus, all the pronominal binding relations are established in the embedded CP, given the fact that control involves movement.

4- Conclusion.

The phenomena labeled scrambling is a pervasive phenomenon in natural languages. It is linked to the important issue of variability of word order (see Munro, this volume), which is an essential part of syntactic theory . For those who work in transformational grammar, scrambling still poses big challenges for the theories of movement. Thus there is still on going debate about the following issues: a) whether movement takes place b) if so, what kind of movement is responsible for this variation (A or A') c) what is the level of representation in which movement applies, and c) what motivates this movement.

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1. In that sense, strictly speaking, B&T advocate for a movement approach at LF.

[2] For criticism of this proposal see Bailyn (2001) and Miyagawa (2006). For a reply to Baylin´s criticism see Bošković (2004).

[3] The principle that requires hierarchical configuration is the UTAH (Uniformity Thematic Assignment Hypothesis) by Baker (1988).

[6] For a different proposal that object shift is phonetic movement, see Holmberg (1999).

[7] The final position of the verb is irrelevant to compute the WCO violation. Müller and Sternefeld (1994) and Grewendorf and Sabel (1999) argue that this diagnostic is not entirely valid for German.

[8] Not all anaphors permit binding by scrambled arguments. Thus, purely nominative anaphors reject a new binder in German (Müller and Sternefeld 1994) and Spanish (Ordóñez 1998). This might be reduced to a ban against nominative anaphors in these languages.

[9] However, see Ko (2007) for a study of an asymmetry of licensing Floating Quantifiers between the subject and other complements. She resolves this asymmetry in terms of the theory of linearization by Fox and Pesetsky (2004)

[10] In order to deal with this contradictory situation between principles A and principles C, Saito (2003) follows Belletti and Rizzi (1988) and assumes that principle A applies in the derivation.

[12] See Grewendorf and Sabel (1994) for an analysis in terms of incorporation at LF. See Hinterholz (2006) for an analysis in terms of remnant movement

[13] See Miyagawa (1997),(2005) and (2006) for a minimalist view that solves some of the puzzling conclusions posed by this sentence by Saito (2003).