

On the Asymmetry of Aspect Structure*

1. Focus

- Asymmetry: Property of a relation in a set. (Set theory)
Sister-containment relation between two nodes in a tree. (GG)
- Aspect structure: Spatio-temporal articulation of the event denoted by a verbal projection.

1.1 Aspect in word-structure

- Morphological objects are structure dependent (e.g. Selkirk 1982, Di Sciullo and Williams 1987, Lieber, 1992, Hale and Marantz 1992, Roeper 1995, Di Sciullo 1996, 1999, Roeper and Snyder 2003). Certain affixes in a verbal projection may affect aspect structure. Sequential (e.g. iterative and inverse) and spatial (e.g. directional and locational) affixes contribute to determine the aspectual properties of verbal projections, i.e. whether an event has or not an end point, whether it is a single event or part of a sequence of events.
- Current works on aspect under the word-level differ with respect to the position of aspect modifying affixes in verbal projections. For Roeper and Keyser (1992) and Hale and Keyser (2002), the iterative affix is generated as a sister to the verb and moves to a higher position in the verbal projection. For Di Sciullo (1997), the iterative affix is generated outside of the verbal projection, while directional affixes are more locally related to the verb. In Asymmetry Theory (Di Sciullo, 2003), aspectual affixes are part of a bipartite structure, the Asp-Shell sister-containing the elements in the verbal shell.

1.2 Theoretical and psycholinguistic results contribute to our understanding of the properties of aspect structure under the word-level

- Psycholinguistic experiments can provide evidence for the cognitive representation and processing of aspectual affixes and, in particular, if there is a configurational difference between sorts of affixes.
- If there is no structural difference between aspectual affixes with respect to a verbal head, psycholinguistic experiments (lexical decision tests, priming, Event-related brain potentials etc.) should reveal no significant difference in the processing of prefixed verbs, whether the affix is iterative or spatial.
- If there is a configurational difference between sorts of affixes, significant differences in processing should emerge.

1.3 Outline

- Linguistic evidence for the configurational asymmetry between affixes
- Psycholinguistic experiments on the asymmetric properties of aspect
- Consequences of the results for our understanding of human processing

2. Asymmetry

- Asymmetry is a basic predicate of the Grammar (Chomsky 1965-2003, and related works including Kayne, 1994, Munn 1992, Sportiche 1995, to name a few).
- Asymmetric relations are core relations of the language faculty (Di Sciullo 2003)
Configurational asymmetry is crucial for the legibility/interpretation of linguistic expressions by the external systems C-I and A-P.

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2.1 Asymmetry, symmetry, and antisymmetry

Asymmetry is part of the definition of central predicates of the grammar, such as the notion of asymmetric c-command (Chomsky 1981) and the more recent notion of sister-containment relations (Chomsky 2000). The set theoretical definition of asymmetry is used in the Minimalist program to define the operations of the grammar.

$$(1) \quad \begin{array}{c} x_1 \\ / \backslash \\ z \quad x_2 \\ / \backslash \\ x_3 \quad y \end{array}$$

In set theory, asymmetry is a property of a relation. A relation is a set of ordered pairs. Asymmetry is the property of a relation such that there is no pair in which the same coordinates are in the inverse order. Thus, for example, in the set $A = \{ a, b, c \}$, the following relation R is asymmetric: $R1 = \{ \langle a, b \rangle, \langle b, c \rangle, \langle a, c \rangle \}$. A symmetric relation includes pairs in which the same coordinates occur in the inverse order. So for example, given the set A , the following relation $R2$ is symmetric: $R2 = \{ \langle a, b \rangle, \langle b, c \rangle, \langle b, a \rangle \}$. Finally, an antisymmetric relation is a symmetric relation which may include a pair in which the first and the second coordinates are the same. Thus, given the set A , the relation $R3$ is antisymmetric: $R3 = \{ \langle a, b \rangle, \langle b, c \rangle, \langle a, a \rangle \}$.

The set theoretical definition of antisymmetry is used in Kayne (1994) to express the property of syntactic relations and linearization. The notions of symmetry and asymmetry are also used in Moro (2000) to express the property of syntactic relations subsequent to the effect of movement as symmetry-breaking. Furthermore, these notions are used in Raimy (2000, 2002) to express the property of phonological relations that makes a precedence structure interpretable at the phonetic interface.

I use asymmetry to express the property of morphological relations, to the exclusion of symmetry and antisymmetry.

Morphological relations can be defined in terms of ordered pairs of features in Spec positions or in Head positions. In the case of the Asp-Shell, repeated here in (3), the relevant ordered pairs are the functional heads F_E and F_I , the affixes are spelled out in the Specifier of the functional Heads. The ordered pair in (4) can be identified, the Aspectual features F_E and F_I are subject to strict ordering and strict scope.

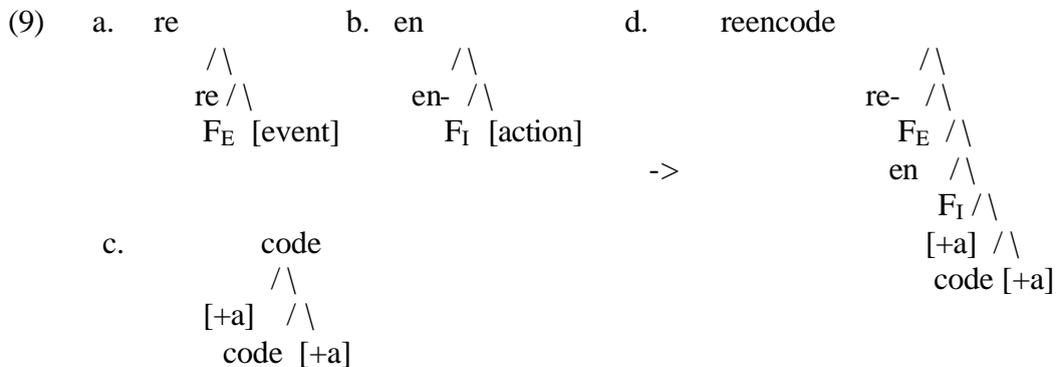
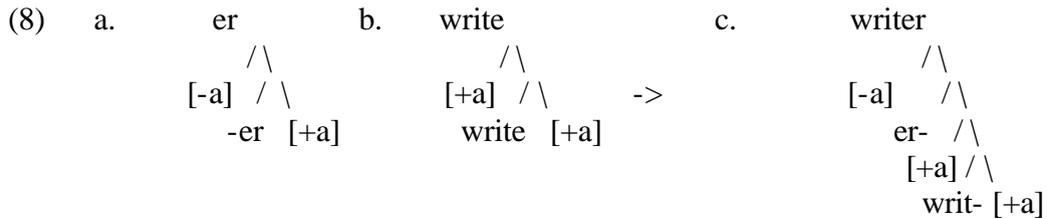
$$(3) \quad [_{FE} E\text{-Asp } F_E [_{FI} I\text{-Asp } F_I \delta]$$

$$(4) \quad \langle F_E, F_I \rangle$$

$$(5) \quad \textit{Strict Asymmetry of Morphology: Morphological relations are asymmetric only.} \\ \text{(Di Sciullo 2003)}$$

According to (5), morphological relations are reduced to asymmetric relations. This follows from the operations of the grammar at stake in the derivation of morphological objects. In Asymmetry Theory, affixes and root head trees which minimally consist of one specifier and one complement. Morphological merger substitutes the tree of a root to the complement position of the tree headed by an affix. The specifier and the complement are the locus of formal and semantic features, such as the argument features $\pm a$. This is illustrated in (6) with the deverbal noun *writer*. There are two sorts of affixes with respect to the positions they occupy in the minimal tree. Some affixes are heads, as it is the case for the agentive/instrumental affix *-er*, while other affixes are in the specifier of minimal trees headed by the functional feature F , as it is the case for spatial and repetitive prefixes. The merger of the second sort of affixes with a root is illustrated in (7) with *reencode*.

- (6) a. [-a [-er +a]]
 b. [+a [write +a]]
 c. [-a -er [+a write +a]]
 |_____|
- (7) a. [re- [F_E e]]
 b. [en- [F_I e]]
 c. [+a [code +a]]
 d. [re- F_E [en- F_I [+a [code +a]]]



I assume that affixes and roots are part of minimal trees and that affixes select roots with given feature structures (see Di Sciullo 1996). In the case of prepositional and adverbial affixes, the features are aspectual, as can be seen by the fact that these affixes merge with verbs with certain aspectual properties, as shown in Di Sciullo (1997).

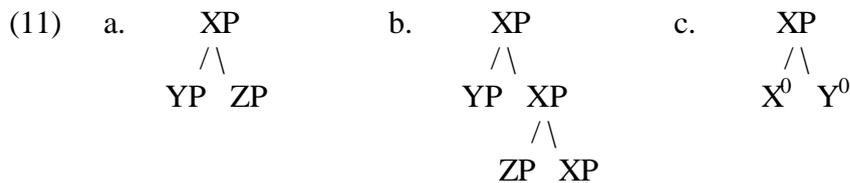
Thus, all affixes precede the roots and asymmetrically c-command the roots in the derivation to LF. There is no relation such as (10) which is part of a morphological object.

$$(10) \quad \{ \langle a, b \rangle, \langle b, a \rangle \}$$

No operation can derive such a relation moving an affix to a higher position than the root, as an affix is not f-complete and thus has no feature to check. On the other hand, linearization occurs at PF, by an operation that reorders the specifier to the right of the head on which it is dependent and the complement to the left of that head just in case the specifier has no visible PF features. Thus, PF reordering will occur in (8) but not in (9). At PF, the terminal elements of a morphological object constitute a set and the relation formed by all the ordered pairs of terminals is asymmetric.

2.2 No points of symmetry in morphology.

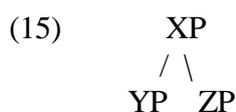
Moro (2000) developed a weak version of Kayne's (1994) Antisymmetry Theory and argued that movement is symmetry-breaking. Points of symmetry are derived when the LCA is violated, as in (11a) for small clauses, (11b) for multiple-spec constructions, and (11c) for clitic structures, from Moro (2000: 32).



According to Moro (2000), movement is forced by the requirement of eliminating symmetric relations or “points of symmetry” generated in the course of the derivation. Points of symmetry are postulated on the basis of “mirror structures” found in syntax across categories (cf. Den Dikken 1999, Kayne 1994, Moro 2000, Zamparelli 1995, among others). The examples in (12)-(14) illustrate this phenomenon in the IP, DP, and AP domains.

- (12) a. a picture of the wall is [t the cause of the riot]
 b. the cause of the riot is [a picture of the wall t]
- (13) a. John bought [books of [t this type]]
 b. John bought [this type of [books t]]
- (14) a. you are [t kind]
 b. it's [kind of [you t]]

In each of these cases, two phrases can alternatively move to give the correct output given that there are two distinct ways to neutralize a point of symmetry. In each pair, the two moving elements are linked by one and the same semantic relation, namely predication, the relation between a subject and a predicate which Moro (2000), following Williams (1980), analyzes as a symmetric structure. According to Williams (1980), predication is mapped onto syntax by a symmetric configuration involving mutual m-command between two maximal projections. In (15), there is a predication relation that holds between the subject *John* and the predicate *see Mary*. Mutual m-command holds between the subject XP and the predicate YP.



If points of symmetry are made of two elements and movement is a way to neutralize them, then, potentially, given X and Y constituting a point of symmetry, whenever it is observed that X moves, it should also be possible to observe an associated structure in which Y moves. This prediction appears to be borne out in XP structure with cases of canonical vs. inverse copular structure discussed above, as well as with preverbal or post-verbal subjects in Italian.

In morphology, such an alternation is not observed, and this fact constitutes strong support for the absence of symmetry in morphology. In effect, if the derivation of morphological objects gave rise to mirror structures, alternations such as the ones in (16)-(18) would be expected, contrary to facts.

- (16) a. [write [-er [t]]]
 b. *[-er [write [t t]]]

- (17) a. [en [code [t]]]
 b. *[code [en [t t]]]
- (18) a. [re [code [t]]]
 b. *[code [re [t t]]]

Thus, the relation between an affix and a root is not symmetric, the affix and the root are not sisters. If this were the case, mirror structures could be created by the displacement of either the affix or the root, thus destroying the point of symmetry. This is not the case, notwithstanding that an Xo predication relation could be assumed to hold between the “agentive” nominal affix *-er* and the predicative root *writ-* before movement takes place, as depicted in (16a). The examples in (17) and (18) are cases of modification, or secondary predication. They bring further support to the hypothesis that no point of symmetry can be created in the course of a morphological derivation.¹

Points of symmetry are never created in the morphological derivations, precisely because morphology combines and manipulates asymmetric relations only.

- **The Abstract clitic Hypothesis (ACH)** (Roeper and Keyser 1992, Hale and Keyser 2002, Roeper and Snyder 2003).

The iterative prefix is Head-adjoined to a verb and must move to a superior position in the verbal projection.

- (19) a.
$$\begin{array}{c} V \\ / \backslash \\ V \quad CL \end{array}$$
- b.
$$\begin{array}{c} V \\ / \backslash \\ CL \quad V \\ / \backslash \\ V \quad \cancel{CL} \end{array}$$

- Natural class of categories (affixes, datives, phases, idioms) Roeper and Keyser (1995)
- Feature-checking (Chomsky 2000, 2001)

¹ Considering deverbal compounds, there is a class of compounds in which predication holds between the conjuncts. The examples in (i)-(iii) show that such compounds can be found cross-linguistically. In (i), the deverbal compound *walk-man* consists of the unergative verbal predicate *walk* and its subject *man*. In (ii) the Italian compound *scorri-mano* ‘ramp’ consists of the unergative predicate *scorrere* ‘to slide’ and its subject *mano* ‘hand’. In German, there are also compounds consisting of a subject and a predicate; examples such as *vogel sprech*, in (iii), are given in Toman (1998). Assuming that movement is symmetry breaking, the deverbal constituent and the bare noun cannot be sisters before movement takes place, as mirror structures cannot be created. This can be seen by the fact that b. examples do not qualify as compounds. Thus, there is no evidence that points of symmetry are introduced in the derivation of deverbal compounds based on predication.

- (i) a. [walk [man [t]]]
 b. *[man [walk [t t]]]
- (ii) a. [scorri [mano [t]]] (It)
 slide hand ‘banister’
 b. *[mano [scorri [t t]]]
- (iii) a. [sprech [vogel [t]]] (Ge)
 speak bird ‘talking-bird’
 b. *[vogel [sprech [t t]]]

- Romance languages do not have the Abstract CL position (Roeper and Snyder 2003)
 - no incompatibility of the iterative affix and the dative recursion
 - no recursion in Romance compounds

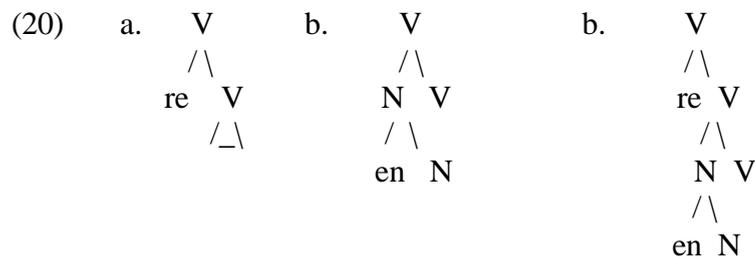
The Abstract CL position would be available in English, but not in Romance.

• **ASP structure asymmetry**

The position of a sequential iterative affix is a modifier position, whereas the position of a spatial affix, whether directional or locative, is more closely related to the argument structure and the aksionsart of the verbal projection of which they are part.

• **The Internal/External prefix hypothesis** (Di Sciullo 1997).

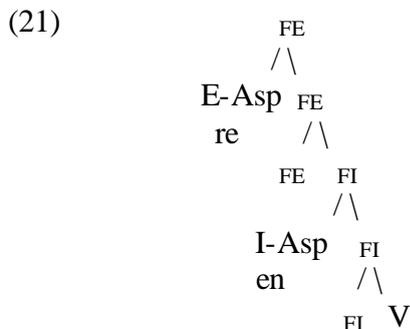
Aspectual features (affixes) are adjuncts (sister adjoined) to the verbal projection.



- Aspectual features are functional features modifying the internal or the external properties of the event denoted by a verbal projection. They are adjuncts (P, ADV) in Spec of functional projections (Kayne 1994, 2003; Cinque 1999).

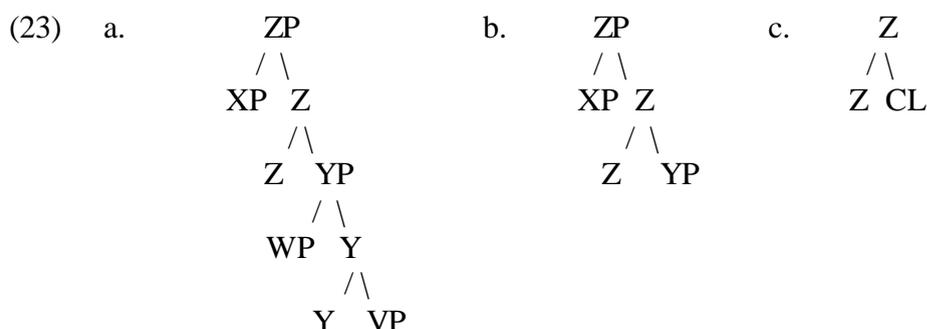
- However, some affixes are either internal or external, e.g. *fermer, enfermer, réenfermer*, ‘to close’, ‘to enclose’, to ‘enclose again’, while other may be either internal or external e.g. *poser, déposer* vs *.composer, décomposer*, ‘to pose’, ‘to depose’ vs. ‘to compose’, ‘to decompose’.

- **Asp Shell** (Di Sciullo, 2003). Aspectual structure takes the form of a Shell, a bipartite structure consisting of two layers of asymmetric relations [α x [β y δ]], follows from a basic property of grammatical relations: asymmetry. In a Shell, every element is part of an asymmetric relation with another element of the same sort. In the Asp-Shell, External aspect (FE) and Internal aspect (FI) head their own minimal tree, and the aspectual affixes sit in the Spec positions, the iterative and the inverse affixes are located in α , while directional affixes sit in β , and the verbal projection is in δ .



- ASP-Shell analysis satisfies Strict Asymmetry, according to which every element in a derivation must be in an asymmetric c-command relation with an element of the same type (X_o, XP).

(22) *Strict Asymmetry*: Every element must be in asymmetric relation with another element of the same type as soon as possible in the derivation.



Thus, in (23) XP, WP and VP are in asymmetric c-command relation, as it is the case for Z and Y. In (23b,c) Z is not in asymmetric c-command relation with another element of the same type.

2.3 . Predictions of the Asp Structure Asymmetry (Romance)

The configurational asymmetry between External and Internal prefixes determines their linear order and their effect on the argument structure and the Aktionsart of the verbal projection of which they are part.

- 1. Configurational asymmetry maps onto precedence. Asp-E > Asp-I.

- (24) a. apportare, riapportare, vs. *ariportare (I)
'to bring to', 'to bring again', 'to bring to again'
- b. emporter, réemporter, vs. *enréporter (F)
'to bring with', 'to bring with again'

- (25) refermer, enfermer, réenfermer (F)
'to close', 'to enclose', 'to reenclose'

- (26) a. Il a refermé le donjon. (F)
'He closed the donjon again.'
- b. Il a enfermé le dragon dans le donjon.
'He locked the dragon into the donjon.'
- c. Il a réenfermé le dragon dans le donjon.
'He locked the dragon into the donjon again.'

- 2. Local configurational dependency (sister-containment) FE > FI requires that in N or A derived verbs, Asp-I must be spell-out if AspE is.

- (27) réembouteiller, *emrebouteiller (F)

to reencapsulate, *to enrecapsulate.

(28) a. Il a réembouteillé le vin. (F)
'He reembotled the wine.'

(29) a. imbarcare, riimbarcare, vs. *ribarcare, *imribarcare (I)
'to embark', 'to embark again'
b. embarquer, réembarquer, vs. *rebarquer, *emrebarquer (F)
'to embark', 'to embark again'

- 3. As they are part of the argument structure domain of the verb, AspI may not be iterated and may not co-occur, AspE may sometimes be.

(30) a. (?)ririfare, ridisfare, vs. *aa/inimportare, *aim/inapportare (I)
'to repeat again', 'to reundo', 'to bring to to', 'to bring to from'
b. (?)rerefaire, redéfaire, vs. *aa/enemporter, *aem/emapporter (F)
'to redo', 'to reundo', 'to bring to to', 'to bring to from'

- 4. AspI may affect the telicity or aspectual class, and the argument structure of the projection to which they are adjoined, AspE, cannot.

The difference in the appropriateness of a punctual or a durative adverbial modification indicates whether the event denoted by the verbal predicate has or not a natural end point or Terminus.

(31) a. Ha (ri)dormito (per ore/?in un ora). (I)
'He slept again (for hours/?in an hour).'

b. Ha addormentato Gianni (subbito/?per ore).
'(S/He) made Gianni sleep (right away/?for hours).'

c. Il a (re)dormi pendant des heures. (F)
'He slept again for hours.'

d. Il l'a (r)endormi immédiatement.
'He made him sleep again immediately.'

- 5. As AspI may change the telicity of the verbal predicate to which they are adjoined, they may not adjoin to telic predicates, whereas AspE can.

(32) a. *anascere, *aeplodere, *avincere (I)
'to be born at', 'to explode at', 'to win at'
b. rinascere, riesplodere, rivingere
'to be born again', 'to explode again', 'to win again'
c. *anaître, *aexploser, *agagner (F)
'to be born at', 'to explode at', 'to win at'
d. renaître, réexploser, regagner
'to be born again', 'to explode again', 'to win again'

Summary

Configurational asymmetry expresses correct semantic and syntactic properties of prepositional prefixation in a Romance verbal projection. Semantically, internal prefixes may change the telicity of the verbal projection they are part of, whereas external prefixes do not

have this effect. The external/internal prefix hypothesis accounts for the linear order properties of prefixes:

- i) external prefixes must precede internal prefixes;
- ii) external prefixes may be iterated and co-occur, while internal prefixes, as they are in the argument-structure domain of a verbal projection, cannot be iterated and cannot co-occur;
- iii) in denominal and deadjectival verbs, an internal prefix must follow an external one in the verbal construct;
- iv) internal prefixes are part of the argument-structure domain of a verbal projection, and thus they may affect the argument structure of the projection to which they are adjoined, as well as the aspectual class of the verbal projection;
- v) finally, as internal prefixes may change the telicity of the verbal projection, they cannot affect telic predicates, whereas, external prefixes are not subject to this restriction, as they do not affect the telicity of the event to which they are adjoined.

2.4 Extension (Bulgarian; see Di Sciullo 2003 for Russian and Hungarian)

We showed in Di Sciullo and Slabakova (in press) that the Internal/External affix hypothesis extends to languages such as Slavic. In Bulgarian, the prefixes *pre-* ('repeated action') and *po-* ('briefly') have adverbial properties in (33a) and (33b) in the sense that they provide adverbial-like modification to the eventuality denoted by the root. On the other hand, the prefix *na-* 'on' has prepositional properties, cf. (35a). It does not contribute anything to the verbal root meaning except telicity, an inherent end point to the eventuality as in (35b.c).

- (33) a. bojadisam 'paint'
b. pre-bojadisam 're-paint'
- (34) a. ceta 'read'
b. po-ceta 'read for a while'
- (35) a. na ulicata 'on the street'
b. piša 'write'
c. na-piša 'write out in full'

The prefixes pre- and po- are external prefixes and na- as an internal one.

1. External prefix must precede an internal one.

- (36) pro-ceta 'read in full'
pre-pro-ceta 'read in full once again'
*pro-pre-ceta 'read in full once again'

2. External prefixes can be iterated, while internal prefixes supplying the end point of the event cannot.

- (37) pre-pre-iz-bra 're-re-elect'
*iz-iz-bra 'elect'
pre-pre-certa 're-re-draw'
*na-na-certa 'finish drawing'

3. Externals can attach to the root only after internals have already attached in deadjectival verbs.

- (38) cervja ‘make red’
 na-cervja ‘redden’ [T]
 *pre-cervja ‘redden again’
 pre-na-cervja ‘redden again’
 *na-pre-cervja ‘redden again’
- (39) debeleja ‘get fat’
 na-debeleja ‘get fat’ [T]
 *po-debeleja ‘get a little fat’
 po-na-debeleja ‘get a little fat’
 *na-po-debeleja ‘get a little fat’

When more than one prefix occur on a given stem, it is only one of them that supplies the end point of the event; the others offer additional meanings similar to adverbial manner modification. The prefix *s-* in (40c) supplies the end point, the prefix *po-* in (40b,d) offers an attenuative meaning of doing something for a little while or to a small degree, and the prefix *iz-* encodes distributivity of the event over a lot of participants. Both *karax se* and *po-karax se* in (40a,b) are grammatical with a durational adverbial like for an hour, while the telic verbs in (40c-e) are not.

- (40) a. karax se ‘I quarreled’
 b. po-karax se ‘I quarreled for a while’
 c. s-karax se ‘I quarreled’ [T]
 d. po-s-karax se ‘I quarreled a little’ [T]
 e. iz-po-s-karax se ‘I quarreled with everyone’ [T]

3. The external iterative prefix does not alter the aspectual class of the verb, while internal prefixes do so, since they signal telicity.

- (41) a. xudožnikǫt na-risuva kartini za pet casa/*pet casa
 the painter PV-paint-AOR/3sg pictures in five hours/*for five hours
 ‘The painter painted some pictures in five hours/*for five hours.’
 b. xudožnikǫt pre-risuva kartini ?za pet casa/pet casa
 the painter PV-paint-AOR/3sg pictures in five hours/for five hours
 ‘The painter re-painted (some) pictures ?in five hours/for five hours.’

4. Some internal prefixes may add an external argument to the structure of intransitive verbs.

- (42) a. decata se smjaja na klouna
 the childrenREFL laugh-AORIST/3PL at the clown
 ‘The children laughed at the clown.’
 b. klouna raz-smja decata
 the clown PV-laugh the children
 ‘The clown made the children laugh.’

Thus, internal prefixes have an effect both on the lexical aspectual class and on the argument structure of the verbal root they attach to.

5. The iterative prefix *pre-* can appear with telic verbs without changing their aspectual class. Thus, the syntactic behavior of these biaspectual verbs confirms the status of internal prefixes as telicity markers and of external prefixes as adverbial modifiers.

- (43) a. mexanicite remontiraxa koli
the mechanics repair-PAST/3pl cars
'The mechanics repaired cars.'
- b. mexanicite remontiraxa kolite [T]
the mechanics repair- PAST/3pl the cars
'The mechanics repaired the cars.'
- (44) a. *mexanicite na-remontiraxa koli
b. *mexanicite na-remontiraxa kolite
- (45) a. mexanicite pre-remontiraxa koli
the mechanics PV-repair- PAST/3pl cars
'The mechanics repaired cars again.'
- b. mexanicite pre-remontiraxa kolite [T]
the mechanics PV-repair- PAST/3pl the cars
'The mechanics repaired some cars again.'

The configurational asymmetry yields differences in the argument structure and aspect modification of the verbal projection. It follows that only AspI (internal affixes) may affect the Aktionsart, and only AspE (external affixes) may affect the sequence of Events.

3. Three Psycholinguistic experiments

It has been shown since the advent of the psycholinguistic research that prefixed forms have a time cost with respect to their bases which can be attributed to the decomposition of the prefix during lexical access (Taft & Forster, 1975). The research question for these studies is whether the configurational type of affix as described in the Asymmetry theory influences lexical processing.

In Tsapki and Jarema (2002), three experiments were conducted in order to test the asymmetry of aspect structure with French prefixed verbs, the case of the internal/external distinction for ambiguous (*de-*) and unambiguous prefixes (*re-* vs. *en-*)

The purpose of the experiments was to investigate whether distinctions in the theory can be manifested in behavioral and psychophysiological measures. According to this theory external prefixes are projected outside the verbal projection, and have no effect on the argument structure or the aktionsart of the projection (e.g., *faire-refaire*, 'I do-I redo'). Alternatively, internal prefixes are more closely related to the verbal projection, and thus may contribute to the argument structure and the aktionsart of the projection (e.g., *fermer-enfermer*, 'I close-I enclose').

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