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Exocentric Compounds  
Language and Proto-language

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I address the question of whether language includes living fossils of proto-language (Bickerton 1990, 1998, and the Continuity Paradox), as argued for recently by Progovac (2010, 2011) and Progovac and Locke (2009) on the basis of an analysis of the form and function of exocentric VN compounds in English, such as *daredevil*, *scare-crow*, and *pick-pocket*. According to Progovac and Locke (2009), these forms are analyzed as living fossils of the very beginning of syntax or Proto-Merge (Progovac and Locke 2009). Thus, they have a flat structure. According to these authors, English exocentric VN compounds were used for ritual insults and are possibly related to evolutionary forces such as sexual selection.

Exocentric compounds raise basic biolinguistic questions on the origin of language, on language variation and evolution, whether languages carry living fossils of Proto-language, whether Proto-language exists at all. They also raise specific questions on Merge, whether there is a more primitive operator alongside full-fledged Merge.

Adopting the emergent view of language evolution (Chomsky 2008, 2011, Berwick and Chomsky 2011, Di Sciullo 2011), I argue that compounds, including exocentric VN compounds found in English as well as in other languages are syntactic words derived by Merge. They do not have a flat structure, but rather unpronounced functional projections. I bring empirical, theoretical, and experimental evidence to substantiate this claim.

This paper is organized as follows. First, I consider how the notions of fossil and Proto-language have been defined in the gradualist view of language evolution, along with the operation of Proto-Merge, and I contrast the properties of the former with the properties of Merge, defined in the emergent view of language development. Second, I consider Progovac and Locke's (2009) analysis of VN exocentric compounds as derived by Proto-Merge, and raise issues related to the arguments supporting their claim that exocentric compounds are fossils based on language internal variation observed in the form of these compounds. Third, I report results from an experiment on the acceptability of novel deverbal compounds differing with respect to their covert projections, indicating that the brain is sensitive to difference in hierarchical complexity. In the last section, I summarize the findings and I point to further research.

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## 1. Fossils

To claim that a language includes living fossils of a pre-syntactic stage of that language is to assume a gradualist view of language development.

**In the gradualist view of language development** (Bickerton 1990, 1998, Jackendoff 1999, 2002, 2011) proto-language is an intermediate step in the historical development of language:

(1) pre-syntactic (one-word) stage > proto-syntax (two-word) stage > modern syntax

According to Bickerton (1990), although words may have been uttered in short sequences, there were no rules defining well-formedness of strings, and therefore words in proto-language could not be said to belong to separate syntactic classes, such as Noun or Verb.

(2) Proto-language = a kind of communication system with no syntax. (Bickerton, 1990)

Theories of proto-language differ. Some theories of proto-language relate to the development of subject-predicate relations, (Gil 2011). Other theories take proto-language to be limited to concatenation of predicates only. According to Hurford (2001) proto-thought had something like predicate calculus, but had no quantifier or logical name.

Jackendoff (1999, 2002) proposed that the relatively flat (non-hierarchical) structure of adjuncts, as well as raw concatenation of compounds, still retain a bit of proto-linguistic flavor, and can be analyzed as syntactic ‘fossils’ of a previous stage of syntax (see also Bickerton 1990, 1998, for the notion of linguistic ‘fossil’). For Jackendoff (1999, 2002), minimal syntactic specification, and extensive involvement of pragmatics are the hallmarks of what have been proposed to be syntactic fossils.

(3) Fossils of proto-language = constructions dating back to a proto-syntactic stage, now co-existing with more complex syntactic constructions.

**In the emergent view of language development** (Chomsky 2008, 2011, Berwick and Chomsky 2011, Di Sciullo 2011) there is no proto-language, nor a preceding pre-syntactic (one word) stage in language evolution. The language faculty emerged late in historical development, and its main operator is Merge. According to this view, language did not start from something simpler, and it did not evolve from simpler stages.

Proto-Merge derives flat concatenation/adjunction structures (Jackendoff 1999, 2002) and not hierarchical structures, as it is the case for Merge:

(4) Proto-Merge = recursive  $n$ -ary operation concatenating  $n$  elements and deriving a flat structure.

(5) Merge = recursive binary operation deriving hierarchical binary branching structures.

Merge (Chomsky 1995)

Target two syntactic objects  $\alpha$  and  $\beta$ , form a new object  $\Gamma \{\alpha, \beta\}$ , the label LB of  $\Gamma(\text{LB}(\Gamma)) = \text{LB}(\alpha)$  or  $\text{LB}(\beta)$ .

There are similarities between these operations:

One similarity is that both Proto-Merge and Merge are recursive operations; that is they may apply to their own outputs. If they apply only once, this does not affect their recursive property.

(6) Proto-Merge  $(\alpha, \beta) \rightarrow \alpha\beta$

(7) Merge  $(\alpha, \beta) \rightarrow \{\alpha, \{\alpha, \beta\}\}$  or  $\{\beta, \{\alpha, \beta\}\}$

There are major differences between these operations:

i) Merge is a binary operation; this is not the case for Proto-Merge.

Consequently, additional constraints must be part of a theory including Proto-Merge, to limit the concatenation to two elements.

(8) Proto-Merge  $(a, b, c) = abc$

(9) Merge  $(a, b) = \{a, b\}$

Merge  $(c, \{a, b\}) = \{c, \{a, b\}\}$

ii) Merge creates hierarchical structure, this is not the case for Proto-Merge.

Consequently, constituent structure can be derived by Merge and not by concatenate.

iii) Merge applies to structured elements to derive more complex structured elements. This is not the case for Proto-Merge, which applies to strings and derives a single string.

In Logic concatenation is a function that forms a single string of symbols from two given strings by placing the second after the first.

In the theory of computation, the concatenation operation on strings is generalized to an operation on sets of strings as follows:

For two sets of strings  $S_1$  and  $S_2$ , the *concatenation*  $S_1S_2$  consists of all strings of the form  $vw$  where  $v$  is a string from  $S_1$  and  $w$  is a string from  $S_2$ .

To claim that a language includes living fossils of a pre-syntactic stage of that language is to assert that both Proto-Merge and Merge contribute to the derivation of linguistic expressions.

Given that Proto-Merge and Merge are different operations, the coexistence of both primitive (Proto-Merge) and full-fledged Merge introduces complexity in FLN.

## 2. Exocentric compounds as derived by Proto-Merge

VN exocentric compounds are found in English as well as in other languages, as exemplified in Progovac and Locke (2009) and in Progovac (2011) (a.o.):

### English

(10) scare-crow, kill-joy, pick-pocket, cut-purse, spoil-sport, scatter-brain, turn-coat, hunch-back, dare-devil, wag-tail, tattle-tale, saw-bones, rattle-snake, cry-baby, Shake-speare, Burn-house, Bere-water, Drynk-pany, Pinch-penny

### German

(11) Tauge-nichts, be.worth-nothing, 'good-for-nothing'  
Habe-nichts 'have-nothing'

### Serbian

(12) cepi-dlaka, split-hair 'hairsplitter'                      deri-koža, rip-skin 'who rips you off'  
ispi-čutura, empty-flask 'drunkard'                      jebi-vetar, screw-wind 'charlatan'  
muti-voda, muddy-water 'who muddies waters'            pali-drvice, ignite-stick 'matches'  
pali-kuća, burn-house 'who burns houses'                podvi-rep, fold-tail 'who is crestfallen'  
priši-petlja, sow-loop, 'who clings onto another'        raspi-kuća, waste-house, 'who spend'  
vrti-guz, spin-butt, 'restless person, fidget'              vuci-batina [pull-whip, 'good-for-nothing'

## Non-Indo-European language

### Tashelhit Berber, Morocco

- (13) slm-aggrn, suck.in-flour, 'butterfly'  
ssum-sitan, suck-cow, 'insect,  
ssum-izi, suck-fly 'thrifty person'

### Asante Twi, Ghana

- (14) Atoto.botom, dip-in pocket, 'pickpocket'  
Nom-mmodža, suck blood, 'vampire'  
Wodi.nii, kill person, 'killer'  
Kukru.bin, roll feces, 'beetle'  
Cɔrɛ. Dujɛ, write stick, 'pencil/pen'

Parallel expressions are found cross-linguistically. Progovac (2011) mentions that Tashelhit Berber, a language belonging to the Afro-Asiatic language family, which is spoken in Southern Morocco, *ssum-sitan* 'suck-cow' (insect) is closely parallel to Old English *burst-cow*, which also meant 'insect'. In addition, the drinking image for a miser *drynk-pany* is reminiscent of *ssum-izi* (suck-fly) in Berber (see Progovac 2006, 2007).

Compounds present different properties than the ones generally observed in phrasal syntax, including lack of agreement, headedness, as well as specific prosodic and semantic properties. The fact that exocentric compounds violate several rules and principles of modern syntax does not make them different from what Di Sciullo and Williams (1987) referred to as 'syntactic words'. This cannot be taken as an argument in favor of their being formed in proto-syntax, which may have facilitated a transition from a pre-syntactic (one-word) stage to modern syntax.

“While these compounds violate several rules and principles of modern syntax their structure, as well as their persistence, do provide some continuity with modern syntax. If so, then the syntax that supports their formation (proto-syntax) may have facilitated a transition from a pre-syntactic (one-word) stage to modern syntax.” (Progovac 2009)

Progovac (2011) argues that exocentric VN compounds have a flat structure on the basis of the following properties of these constructs: i) they are not recursive, which would suggest that they cannot be derived by Merge; ii) the nominal element may in some case be interpreted as the complement or the subject of the predication, which would suggest that no hierarchical structure is derived that structurally differentiates the complement from the non-complement.

These arguments are weak in the following sense.

The fact that exocentric VN compounds do not present recursion of their parts, as in *\*scare.kill.joy* (one who scares away killjoys) (Progovac 2011) does not entail that the operation that derives them is not recursive. If the nominal constituent can be interpreted as the subject, hierarchical structure is needed to differentiate these cases from the ones where the nominal constituent is interpreted as an object. In each case an unpronounced category is part of the structure.

- (15) a. [<sub>VP</sub> Ø v [<sub>VP</sub>V N]]  
b. [<sub>VP</sub> N v [<sub>VP</sub>V Ø]]

Both the internal and the external argument of the verbal predicate must be saturated within the compound. This can be illustrated with the examples in (16). In (16a), *scare-crow* is a name qualifying *John*, in (16b) *John* cannot be interpreted as the subject (external argument) of the

verb included in the compound, and in (16c), where the internal argument of the verb cannot be saturated twice.

- (16) a. John, the scare-crow  
 b. John's scare-crow  
 c. #the scare-crow of crows

Differences in hierarchical structure are needed for semantic interface legibility considerations. The structure of English exocentric VN compounds cannot be a flat structure. Progovac and Locke (2009) however, claim that they are derived by Proto-Merge, and thus they would have a flat structure, as in (17).

- (17)  $\wedge$   
 scare crow

This analysis contrasts with the view that they are reduced relative clauses. Exocentric VN compounds are analyzed as reduced relative clauses, as in Panini's work on Classical Sanskrit (Gillon 2007). A reduced relative analysis (Tollemache, 1945, Coseriu 1978, Bok-Bennema and Kampers-Mahne, 2005) is also argued for in more recent works. For example, Franco (2010) provides a nanosyntax analysis based on data from Romance languages, such as the ones in (18). According to his analysis, exocentric compounds are derived from the spell-out of a node occupying the specifier position in the cartographic projection of N, (21).

The syntactic analysis of phrasal exocentric compounds goes back to Di Sciullo (1982), where the properties of these compounds, which I refer to as 'syntactic compounds' are given an account in terms of X-bar theory. Di Sciullo (1982) shown that these constructs share cross-categorical regularities with syntactic projections (V, N, A, P) and locality conditions expressed in terms of government, while they contravene to headedness and they show opacity effects with respect to agreement and modification. The hypothesis that exocentric compounds have a syntactic hierarchical structure is integrated in Di Sciullo and William's (1987) theory, where they fall into to set of objects referred to as 'syntactic words'. That is words that are derived in the syntax. Syntactic words differ both from 'listemes', listed in the lexicon, and from 'morphological objects', derived in the morphological workspace. According to Di Sciullo and Williams (1987:81), the structure of exocentric compounds, such as the ones in (23) is (24). The rule in (25a) is generalized to (25b), on the basis on the fact that exocentric compounds may be formed with other phrasal constituents than VP, (26).

- (18)  $\nu$ limpia<sub>n,pl</sub>botas (Spanish);  $\nu$ lustra<sub>n,pl</sub>scarpe (Italian)  
 'shoeshine'

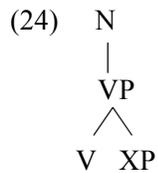
- (19) vano portabagagli; aiuola spartitraffico; pistola sparachiodi/scacciacani (Italian)  
 'compartment car trunk'; 'flower bed traffic divider'; 'nail gun/dummy pistol'

- (20) mozzafiato; strappalacrime; spaccatimpani (Italian)  
 'breathhtaking'; 'tear-jerking'; 'eardrum-breaking'

- (21) [Quniv . . . [Dem . . . [Numord . . . [RC . . . [Numcard . . . [Cl . . . [A . . . NP]]]]]]]]

(22) *EXTENDED PROJECTION REBOOT PRINCIPLE*: If a modifier, hosted in Spec of an X° in an extended projection (exP) of NP, happens to be phrasally spelled-out as XP, the aforementioned exP can freeze, so that XP can inherit NP categorial status. Iff the (phrasal) modifier inherits NP status in XP, exP reset/reboot up from there.

- (23) a.  $\sqrt{\text{rabat}}\text{-}_{\text{n}}\text{joie}$  (French)  
 flap joy ‘killjoy’  
 b.  $\sqrt{\text{gagne}}\text{-}_{\text{a}}\text{petit}$   
 earns little ‘small win’  
 c.  $\sqrt{\text{couche}}\text{-}_{\text{adv}}\text{-tard}$   
 sleeps late ‘night-owl’  
 d.  $\sqrt{\text{saute}}\text{-}_{\text{p}}\text{dessus}$   
 jumps over ‘jump above’



- (25) a.  $N \rightarrow VP$   
 b.  $N \rightarrow XP$

- (26) a.  $\sqrt{\text{fend}}\text{-}_{\text{Dpl}}\text{a-bise}$  (French)  
 smash the air ‘tempestuous’  
 b.  $\sqrt{\text{monte}}\text{-}_{\text{pp}}\text{en-l’air}$   
 rise in the air ‘cat burglar’  
 c.  $\text{N}_{\text{homme}}\text{-}_{\text{pp}}\text{de-paille}$   
 man of straw ‘stooge’  
 d.  $\text{A}_{\text{bon}}\text{-}_{\text{ppa}}\text{-rien}$   
 ‘good for nothing’  
 e.  $\text{psans}\text{-}_{\text{Dpl}}\text{e-sous}$   
 without the penny ‘penniless’

Exocentric compounds are nominalization of clausal constituents in Di Sciullo and Williams’ framework, which can be spelled out by VP or CP. The merger of an unpronounced NP head with a CP derives a relative clause analysis for these compounds, (27a). The fact that a nominal constituent, such as PERSON in the case of the exocentric compound *kill-joy*, cannot be remerged outside of the exocentric compound, (27b) vs. (27c), indicates that it is already part of the compound. Consequently the relative pronoun is not pronounced either, (27d) vs. (27e). Furthermore, in addition to semantic opacity, syntactic words also exhibit syntactic opacity, and no agreement relation or other syntactic operation may further affect the internal structure of the compound.

- (27) a. [ $\text{NP NP CP}$ ]  
 b. a/the kill-joy  
 c. \*a/the person kill-joy  
 d. \*a/the person who kill-joy  
 e. a/the person who kills joy

The exocentric compounds in (23) and (26) include constituents, which are in some case complements, and in other case adjuncts. A Proto-Merge (concatenation) analysis does not provide the hierarchical structure differentiating each case, assuming that adjuncts sister-include complements in the extended projection of a category.

### 3. VN exocentric compounds as fossils of Proto-language

If VN exocentric compounds with a derogative function are fossils of Proto-Language and if Proto-Language is an intermediate stage in the evolution of language, we expect to find them in any languages, including French, as the examples in (23a) and (28) illustrate.

- (28) trompe-mort, cheat-death, ‘death-dodger’, crève-faim, die-hunger, starvation (French)  
gratte-cenne ‘scrape-penny’, porte-malheur, ‘bring-woe’, vaut-rien ‘worth-nothing’

This fact could be thought of as providing further empirical support to the hypothesis that they are fossils of a pre-syntactic stage of language. However, the variation in the form of exocentric compounds in Romance is problematic for such a hypothesis. By definition a fossil is an object with fixed properties and does not present variation. According to Ridley (1993: 525), ‘living fossils’ are species that have changed little from their fossil ancestors in the distant past (e.g., lungfish). However, the variation in the form of French exocentric compounds cannot be qualified as minimal. Thus, certain exocentric compounds may or not include an overt determiner, (29), other compounds must include a DP, (30), yet other include a PP (31). In some cases, the syntactic constituent is a complement of V, (30), and in other cases it is an adjunct (31). Moreover, in some cases, an unpronounced complement is part of the expression, (32).<sup>1</sup>

**V-N /V-DP**

- (29) crève-faim, crève-la-faim (French)  
trompe-mort, trompe-la-mort  
gratte-cenne, gratte-la-cenne

**V-DP**

- (30) fend-la-bise, tire-l’oeil  
trompe-l’oeil, coupe-la-faim

**V-PP**

- (31) a. tourne-à-gauche, tire-au-flanc, saute-au-paf, saute-au-crac  
garde-du-corps, garde-à-vous, porte-à-faux  
b. va-de-la-gueule, pue-de-la-gueule,  
pince-sans-rire, monte-en-l’air, monte-à-regret

**V-~~DP~~-PP**

- (32) pousse-DP-au-crime, boit-DP-sans-soif

The overtly phrasal exocentric compounds show the same opacity with respect to agreement and modification than covert forms, (33), (34) which suggest that they are the same kind of objects.

- (33) a. Toi, le vaut-rien  
b. Eux, les vaut-rien  
c. \*Eux, les vaut-rien  
d. \*Toi, le vaut-vraiment-rien

- (34) a. Toi, le bon-à-rien  
b. Eux, les bon-à-rien  
c. \*Eux, les bons-à-rien  
d. \*Toi, le bon-à-vraiment-rien

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<sup>1</sup> There are cases where the nominalization of the V (N<sub>V</sub>) is part of the compound, and the DP complement is covert N<sub>V</sub>-~~DP~~-PP (deverbal nouns)

(i) mise en jeux, mise en échec, mise en oeuvre, mise à pied, mise au point,  
mise à prix, mise de cote, mise en page, mise en demeure

Furthermore, exocentric compounds are not limited to V-DP or V-PP, rather they can be formed on the basis of any major syntactic phrase, as illustrated in (27). This productivity and diversity would not be expected if they were fossilized forms.

Exocentric compounds are not fossils of Proto-Merge as they show the syntactic complexity of hierarchical functional structure derived by Merge, (35). Functional structure higher than the vP is needed to cover the properties of exocentric compounds.

(35) ... [FP ... F ... [vP ... v [vPV ...

If the structure of exocentric compounds is that of a reduced relative clause, and thus is derived by the recursive application of Merge, it is expected that phrasal complements and adjuncts can be generated in these constructs, it is also expected that they can be interpreted semantically as restricted relatives.

Finally, according to Progovac (2009) exocentric VN compounds in English were mainly used as vocatives insults in rituals. However, vocative and non-vocative expressions are found in French, in both V-Compl and V-Adjunct expressions, as evidenced in (36)-(39).

#### Vocative/non-vocative

##### V-N

- (36) a. rabat-joie, porte-maleur, casse-pied, pisse-vinaigre, (vocative V-compl)  
 fait-tout, croque-mort  
 b. vaut-rien, couche-tard, lève-tot, gagne-petit, saute-dessus (vocative V-adjunct)
- (37) a. tue-mouche, atrappe-nigau, abat-jour, (non vocative V-compl)  
 couvre-feu, essui-glace, porte-bonheur  
 b. pense-bête, passe-partout, sent-bon, taille-douce (non vocative V-adjunct)

#### Vocative/non-vocative

##### V-N / V-DP

- (38) creve-faim / crève-la-faim, trompe-mort/ trompe-la-mort (vocative)  
 (39) coupe-faim / coupe-la-faim, coupe-soif / coupe-la-soif (non-vocative)

#### Vocative/non-vocative X-XP

- (40) <sub>v</sub>pince-ppsans-rire / <sub>v</sub>boit-ppsans-soif  
<sub>A</sub>bon-ppa-rien / <sub>A</sub>haut-ppde-forme, <sub>A</sub>juste-ppau-corps  
<sub>N</sub>homme-ppde-paille / <sub>N</sub>boule-ppde-neige, <sub>N</sub>arc-ppen-ciel  
<sub>phors-D</sub>pla-loi, / <sub>phors-ppd</sub>'oeuvre

Given the variation in their form and function, exocentric VN compounds are not likely to be fossils of language. Furthermore, if language is an organ of our biological system, which evolved mainly to express complex thoughts, then the communicative import of exocentric VN compounds, viz., ritual insults beneficial for sexual selection, is irrelevant to language evolution.

## 4. Experimental evidence

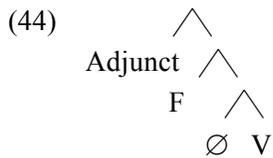
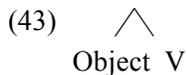
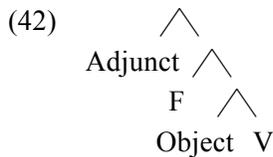
In this section, I discuss experimental results bearing on the difference in the acceptability of novel complement-V vs. adjunct-V compounds in English. These results support the hypothesis that hierarchical rather than string linear properties are relevant in the processing of compounds.

Di Sciullo and Tomioka (2011) report experimental results indicating the difference in the acceptability of novel complement-V vs. adjunct-V compounds in English. These results support

the hypothesis that hierarchical rather than linear proximity is relevant in the processing of compounds. The purpose of this experiment was to test whether the configurational asymmetry between object-verb and adjunct-verb compounds has a processing correlate.

The asymmetry between objects and adjuncts has received much attention in works on compound formation (e.g., Baker 1988, Rosen 1989, Rivero 1992, Spencer 1995). A major puzzle concerning compounds is that, even though Head-movement captures the formation of object-verb type compounds (Baker 1988) (41a), it cannot account for the existence of adjunct-verb compounds (41b). Assuming that the complement occupies a position lower than the adjunct in NV-compounds, as described in the simplified trees in (42)-(44), adjunct-verb compounds are more complex than object-verb compounds, as they require an additional number of applications of Merge.

- (41) a. the meat-cutting knife  
 b. the finger-painted portrait



In Di Sciullo and Tomioka’s experiment, 10 English speakers were shown 60 sentences containing two types of novel compounds – object-verb and adjunct-verb. All the verbs used in the compounds are mono-transitive and the classification of the compound is self-evident from the sentence. When the nominal constituent is the logical object of the verb, the nominal saturates the argument requirement of the verb and hence the compound is an intransitive verb. In contrast, when the nominal constituent is an adjunct, the argument structure requirements of the verb are not satisfied (the predicate is still unsaturated) and the compound is a transitive verb.

Each type of compound appears in three contexts. The compounding is most productive in the control context that corresponds to the participial use. In addition, there are two verbal contexts with different tense/aspect morphology (*-ing* or *-ed*). The object-verb compound is a saturated predicate and hence it appears as a participle with *-ing*, combining with a noun that is interpreted as the object, as in *the meat-cutting knife*. The adjunct-verb compound is an unsaturated predicate and hence it appears as a passive participle with *-ed*, combining with a noun that is interpreted as the object, as in *the finger-painted portrait*. The data in (45)-(50) constitute a sample of the data used in this experiment.

**Object-V**

- (45) The dreamer star-counted all night.  
 The traveler bird-caught in the back yard.  
 (46) The biologist was root-collecting in the forest.  
 The scientist was cell-counting in the lab.

### Adjunct-V

- (47) The valet sand-parked the client's car.  
The pilot desert-landed the small plane.
- (48) The sailor was sea-parking his yacht against the rule.  
The florist was glass-painting the orchid.

### Fillers

- (49) The girl turned on the clock-light on the wall.  
The penguin met her pole-sister after the storm.
- (50) The actor bought a wish-dress for the party.  
The editor inserted the sentence as an afterthought.

The results of this experiment show that compound processing is sensitive to hierarchical relations. As mentioned above, two sorts of NV compounds were used, differing with respect to their hierarchical relations, as illustrated in (42)-(44). The acceptability rates of the two sorts of compounds differ as depicted in Tables 1 and 2.

	Object-Verb	Adjunct-Verb
Past Tense (-ed)	3.43	2.74
Progressive (-ing)	2.72	3.45

Table 1: Acceptability rates for English novel NV compounds where lower scores indicate higher acceptability and higher scores indicate lower acceptability.

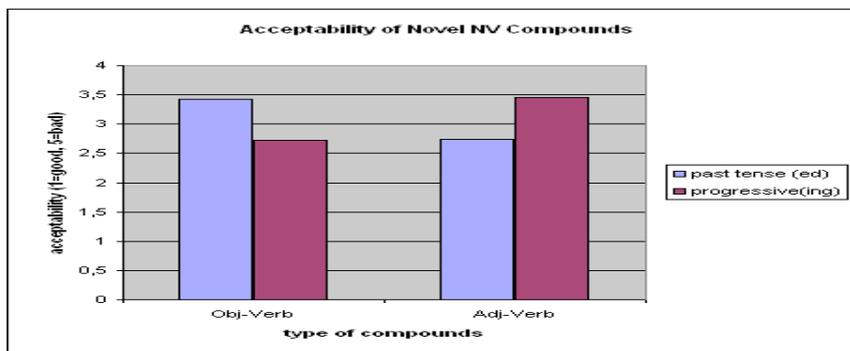


Table 2: Acceptability results for English novel NV compounds where lower scores indicate hier acceptability and higher scores indicate lower acceptability. Di Sciullo and Tomioka (2011)

The results effectively show that there are differences in the acceptability of novel object-verb vs. adjunct-verb compounds. The acceptability of novel object-verb compounds with *-ed* morphology is lower than the acceptability of adjunct-verbs with the same morphology. Furthermore, the acceptability of object-verb compounds with *-ing* morphology is higher than the acceptability of adjunct-verb compounds with the same morphology. However, the fact that *-ed* object-verbs compounds have a lower acceptability rate than *-ed* adjunct-verbs compounds is surprising. Given that the processing of object-verb compounds requires fewer application of morphological merger than adjunct-verb compounds, the acceptability rate of the latter is expected to be higher than the acceptability of adjunct-verb compounds, which require additional applications of Merge. This could be attributed to independent factors, namely the complexity added by the processing of passive morphology *-ed* in a bare object-verb configuration. In contrast, the adjunct-verb structure would provide the functional projection facilitating the processing of NV *-ed* compounds. The results of this experiment indicate that the human brain is sensitive to hierarchical structure, thus it is a function of the recursive application Merge, and it

is not dependent on the string linear properties of the morphemes. However, further work is required to investigate the interaction between the complexity brought about by derivation and compounding. Furthermore, if VN exocentric compounds are reduced relative clauses, we expect differences to be observed in their processing as opposed to the processing of non-exocentric VN compounds. We leave the testing of this prediction for further research as well.

## 5. Summary and further research

In this paper, I approached the question whether there were such objects as fossils of pre-syntactic stages in the development of language, by considering the properties of exocentric compounds, which have recently been claimed to constitute empirical evidence for linguistic fossils.

I distinguished the gradualist from the emergent view of the development of language, as well as I defined so-called fossils of Proto-language derived by Proto-Merge. I also differentiated the properties of Proto-Merge from the ones of Merge, and raised several theoretical and empirical issues with the analysis of exocentric compounds by Proto-Merge. A theoretical issue is the fact that complexity arises from the co-presence of Merge and a more primitive form of Merge (Proto-Merge) for the derivation of linguistic expressions. Regarding the empirical issues related to the derivation of exocentric compounds by Proto-Merge, I discussed cross-linguistic evidence showing that the internal structure of exocentric compounds is asymmetrical, in the sense that in some cases the nominal constituent is the sister of V, in other cases it sister-contains V. I also provided evidence that exocentric compounds in French allow categorical variation VN/V-DP/V-PP as well as may include prepositional and adverbial adjuncts. This fact brings further support to the claim that exocentric compounds are hierarchically structured. Hence they cannot be derived by concatenation or Proto-Merge, which does not derive the syntactic complement/adjunct asymmetry.

Regarding the experimental results, internal-complexity effects are observed experimentally on the basis of the processing of NV compounds in English. Differences in acceptability judgements are observed for novel object-verb and adjunct-verb compounds indicating that compound processing is sensitive to I-complexity. These results corroborate the ones from Tsapkini, Jarema and Di Sciullo (2004) on the processing of French prefixed verbs. The RTS for verbs including prefixes occupying a higher hierarchical position in the structure are significantly longer than those observed for verbs with prefixes occupying a lower position in the structure.

I-language (Chomsky 1986, 2001) – the mentally represented linguistic knowledge – is not string-linear dependent. The complexity brought about by I-language computation is based on the recursive application of Merge and may not necessarily be spelled out by overt forms. I-complexity can be assessed by psycholinguistic experiments, as well as by experiments using brain-imaging techniques. Interestingly for our purpose, expressions that are similar with respect to string linear properties have different I-complexity. Further experiments are required to determine whether differences in brain processing emerge with exocentric vs. non-exocentric compounds.

Theoretical, empirical and neuro- and psycholinguistic results on compound structure undermine the validity of gradualist theories of the development of language, which posit the survival of protolanguage within language. The results discussed in this paper provide instead additional evidence for the emergent view of the language faculty, where syntactic words are not fossils but units of syntactic computation.

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