Phase-recursion, Restricted Linguistic Systems, and Full Language

Gertjan Postma
Meertens Institute, Amsterdam
gertjanpostma@mac.com

Johan Rooryck
Leiden University
j.e.c.v.rooryck@let.leidenuniv.nl

Abstract
In this article, we argue that Restricted Language Systems (RLS) constitute a subsystem of Full Language (FL). We have identified an RLS within FL, as expressed in particle imperatives and participial expressions in Dutch and many other languages. This RLS exhibits specific restrictions, including restricted syntax and morphology, non-displaced reference, and a restricted semantics. We observe that these same properties are characteristic of the RLS constituted by primate calls. We propose that RLS and FL do not differ in the presence of syntax (*recursive merge*) per se, but in the presence of *phase recursion*. We propose that both primate calls and human RLS constitute a restricted language system in which phase recursion is inactive.

1. Introduction

Hauser, Chomsky & Fitch (2002) suggest that the difference between human and animal communication lies in the fact that Full Language in the narrow sense (FLN), i.e. the part of the language faculty that is uniquely human, "comprises only the core computational mechanism of recursion (…) and the mappings to the interfaces". It is also often claimed that the more complex properties of human language had their basis in changes in the hardware: a more complex neuro-anatomical substrate, or an increase in the size of the brain. However, the timing of these changes constitutes a problem for this correlation. The neuro-anatomical substrate of the human language capacity emerged for the first time some 2 million years ago in *Homo habilis* (Wilkins & Wakefield 1995), while a restricted form of language - referred to as "protolanguage" - arose about a million years ago in *Homo erectus* (Bickerton 1990). Full language emerged between 100,000 and 150,000 years ago in *Homo sapiens sapiens* (Aitchison 1996). In other words, there is a gap between the rise of appropriate form and its function. Similar results have been reached in systematic biology: neither brain size, lateralization, genome, nor any neuro-anatomical property seems to be immediately and incontrovertibly tied to the human language capacity. King & Wilson (1975) show a similarity in genome between the closest primates and humans. Hauser (1999) shows that lateralization can be found both in animals and in humans. Petrides, Cadoret & Mackey (2005) show that there is similarity in brain morphology: Broca's area turns out not to be a specific human feature. In sum, when it comes to hardware, humans are not so different from their next of kin.

Alleged 'software' distinctions between human language and the restricted language systems of animals have been challenged as well. As early as the seventies, Premack & Premack (1972) showed that chimps could acquire a substantial lexicon, which seems to be as open-ended as the human lexicon. Seyfarth & Cheney (1992) show that animal vocalization in velvet monkeys has referential meaning, just as human language does. Fitch (2000) points outs the similarity in speech properties. Arnold & Zuberbühler (2006) show that primate communication has the possibility of sign composition, i.e. primate communication seems to display syntactic properties, just like human communication.

These results seem to challenge the fundamental distinction between animal and human communication, as claimed by Hauser, Chomsky & Fitch (2002). Are the restricted linguistic systems in animals really different from full-fledged human language? It seems that either the distinction should be given up entirely, or the distinction between full language and

restricted language should be rethought entirely from a deeper language-theoretical perspective: what exactly is the distinction in formal terms? We believe that the relevant distinction does not lie in some directly observable empirical property, but rather that it must be more subtle, and is to be found in some formal distinction that can be captured in properly linguistic terms.

In this paper, we propose to rethink the relationship between Restricted Linguistic Systems (RLS) and Full Language (FL). First, we argue that a Restricted Linguistic System (RLS) with specific formal characteristics can be identified *within* Full Language (FL). We then present a linguistic hypothesis about the relation between this Restricted Linguistic Systems (RLS) and Full Language (FL). The hypothesis proposed can be formulated as follows:

(2) A Restricted Linguistic System (RLS) constitutes a subsystem of Full Language (FL).

We define FL rather uncontroversially as the full-fledged human language faculty instantiated in the various languages of the world. With respect to RLS, we will concentrate on syntactically and semantically restricted systems, and define these as possessing the following set of features:

(3) *Grammatical properties of RLS*
- a. Restricted (morpho)syntactic composition
- b. Limited lexicon/ Restricted semantics
- c. Restricted morphology
- d. No displaced reference (reference restricted to the here-and-now)

We argue furthermore, and more controversially, that these properties of RLS are properties that are also characteristic of primate communication. In this way, we will try to address the issue about the evolution of language by reasoning backwards on the basis of an RLS hidden in full view within FL. To some extent, our endeavor is similar to that of Wilkins & Wakefield (1995), who try to reason backwards on the basis of neurolinguistic data.

Let us flesh out the hypothesis in (2), and be more specific about the possible relations between human communication (FL) and primate communication (RLS). *A priori*, there are three possible relations between RLS and FL. The first is that both systems are *sui generis* and have no relation at all. The second possibility is to assume that FL involves an increase or an extension of properties of RLS. The third possibility, and the one that we will entertain here, is that FL results from the activation of a subsystem that lies dormant and inactive in RLS. These three possibilities are schematically represented in Figure 1:

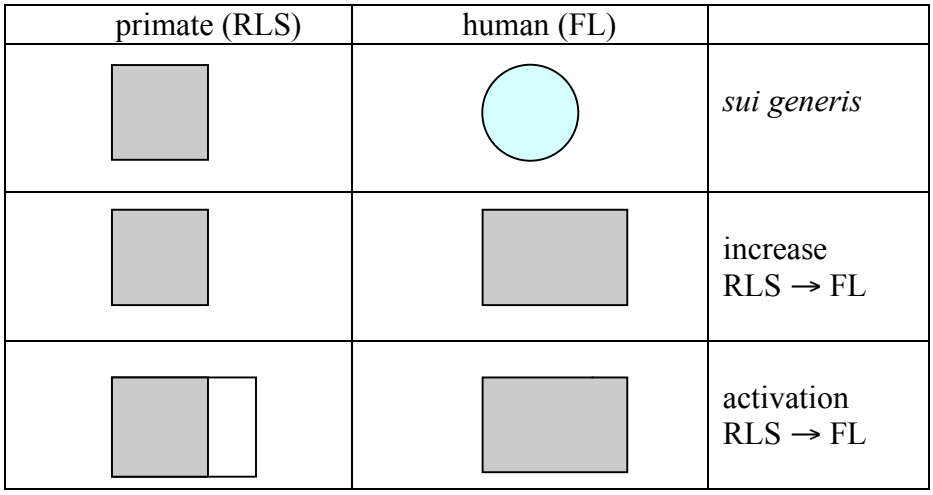


Figure 1: possible relationships between RLS and FL

These possible relationships each immediately raise far-reaching research questions. If FL and RLS are *sui generis*, there are no meaningful questions about the relation between human and primate communication. If the relation between RLS and FL is incremental, the question arises how RLS evolved into FL. If the relation between RLS and FL is one of encapsulation, it should be possible to identify properties of RLS within FL, and to pinpoint the exact nature of the subsystem that was activated, allowing RLS to blossom into FL.

In the remainder of this paper, we will try to answer the questions raised by the activation hypothesis. We will first show that properties of RLS are typical of a set of syntactic constructions in Dutch and a few other languages. We will also argue that the properties of human RLS presented in (3) can to a large extent be traced in the RLS of primates, i.e. their alarm, aggression, and food calls. We will then propose a Minimalist analysis of the relation between RLS and FL, identifying the subsystem distinguishing RLS from FL as so-called phase-recursion, rather than recursion generally (Heine 2006). In our view, the difference between primate and human language lies not so much in the total absence of syntax in primates, but rather in the absence of phase-recursion.

2. The properties of RLS within FL

In this section, we would like to illustrate the properties of RLS that were identified in (3) for a set of syntactic constructions that can be found in Dutch and to some extent in other languages as well. Both constructions involve imperatives.

2.1. Particle imperatives with *op* 'up'

The first type of imperative was identified by den Dikken (1998), and involves speaker oriented particles such as *op* 'up'. An imperative used with the particle *op* 'up' in Dutch manifests properties that are not observed elsewhere, and which can be identified with the features in (3). First of all, the particle only occurs with the imperative, and not with other types of temporal or modal morphology such as the infinitive, as shown in (4). Therefore, it is morphologically restricted (RLS-3c).

(4) a. Geef op! — geven/ *opgeven
give.IMP up — give.INF/ up-give.INF
'Give it to me here and now!' — 'give'

b. Vertel op! — vertellen/ *opvertellen
tell.IMP up — tell.INF/ up-tell.INF
'Tell it to me here and now!' — 'tell'

c. Zeg op! — zeggen/ *opzeggen
say.IMP up — say.INF/ up-say.INF
'Say it to me here and now!' — 'say'

In addition, particle imperatives fail to realize the arguments of the verb, while other imperatives can realize any argument. This is illustrated in (5) and (6). The particleless imperative can realize the direct or indirect object of the verb *geven* 'give', but the particle-imperative cannot:

(5) a. Geef aan Piet!
give.IMP to Peter
'Give it to Peter'

b. * Geef aan Piet op/ *Geef op aan Piet!
give.IMP to Peter up/ give.IMP up to Peter
'Give it to Peter here and now'

(6) * Vertel (*dat andere verhaal) op
Tell.IMP that other story up
'Just tell that other story now!'

This property demonstrates that there is restricted syntactic composition (RLS 3a). Likewise, the construction applies to a restricted lexicon and therefore is also semantically restricted (RLS 3b). Not all verbs combine with the particle: the verb *beschrijven* 'describe', which is semantically minimally different from *vertellen* 'tell', cannot feature in the particle-imperative, nor can a semantically different verb such as *lopen* 'walk':

(7) a. Beschrijf (*op)!
describe.IMP up
'Describe!'

b. Loop (*op)!
walk.IMP up
'Walk!'

Furthermore, the particle-imperative does not allow for displaced reference (RLS 3d). This property can be observed in the interpretation of the empty arguments in the particle-imperatives in (4-6). These unrealized arguments all have to be interpreted as discourse-participants present in the here-and-now. The empty indirect object in (4) is always necessarily interpreted as the speaker, and the unrealized direct object likewise refers to an object that is present in the immediate discourse-context. Particle-less imperatives do not impose such a discourse-restricted interpretation to their unrealized argument. The sentence (8a) shows that the unrealized indirect object need not be the speaker, but may be a third party in the context. In the sentence (8b), the unrealized direct object is likewise 'displaced': its reference is certainly not realized in the context.

(8) a. Geef nou maar!
Give now PRT
'You can give it now'
(context: Father encouraging his child to
give her ticket to the railway employee)

b. Vertel nou maar aan mama!

tell now PRT to mommy
'Go on and tell mommy now!'

The fact that particle-imperatives cannot have displaced reference is perhaps most spectacularly illustrated by the fact that they can neither feature adverbs indicating time or place shift, nor negation:

(9) a. * Vertel straks/ daar op!
tell.IMP later/ there up
'Tell me in a minute/ over there'

b. * Vertel niet op!
tell.IMP not up
'Don't tell it!

Let us sum up the properties which we have gathered under the common denominator of 'no displaced reference' (RLS 3d). The particle *op* 'up' seems to force a 'forum' reading: reference to arguments, time and place have to be strictly identical to the here-and-now. In more formal terms, all arguments must remain unrealized, and these unrealized arguments must be bound within the 'forum' of the speech act. Although (10a) has to be interpreted as (10b), these arguments cannot be expressed, but are interpreted as in (10c)

(10) a. Geef op!
give.IMP up
'Give it to me here and now!'

b. Geef jij dat maar aan mij (*op)!
Give.IMP you that PRT to me up
'You'd better give that to me!'

c. Geef $pro_{SUBJ.2P}$ $pro_{DO.3P}$ $pro_{IO.1P}$ op
give.IMP up
'Give it to me here and now!'

Forum particle imperatives therefore display all properties we have listed in (3) for RLS.

2.2. Participial 'forum' constructions

We will now focus on the second type of syntactic construction that we take to be a manifestation of RLS within FL. Besides the restricted forum particle imperative, Dutch features three types of imperatives: the bare imperative, the infinitival imperative and the participial imperative. The bare imperative and the infinitival imperative do not display any unusual grammatical restrictions. The participial imperative, by contrast, features restrictions that conform to those of RLS as in (3). We have described the properties of this type of imperative more extensively in Postma & Rooryck (in press), showing that the subset of participial imperatives is not just an arbitrary set of fixed expressions, but that it constitutes a subsystem with limited productivity.

(11) a. Let op! (bare imperative)
pay-attention.IMP up
'Pay attention!'

b. Opletten! (infinitival imperative)
pay-attention.INF
'Pay attention!'

c. Opgelet! (participial imperative)
pay-attention.PTC
'Pay attention!'

Participial imperatives do not feature negation (12), nor do they allow for time or location shifts indicated by corresponding adverbs (13). Tense is restricted to the present. These properties illustrate RLS property (3d), the impossibility of displaced reference in participial imperatives:

(12) a. Let niet te goed op! (bare imperative)
pay-attention.IMP not too well up!
'Don't pay too much attention!'

b. Niet te goed opletten! (infinitival imperative)
Not too well up-pay-attention.INF
'Don't pay too much attention!'

c. * Niet te goed opgelet! (participial imperative)
Not too well up-pay-attention.PTC
'Don't pay too much attention!'

(13) a. Let straks/ daar op! (bare imperative)
pay-attention.IMP in a minute/ there up!
'Pay attention in a minute/ there!'

b. Straks/ daar goed opletten! (infinitival imperative)
In a minute/ there well up-pay-attention.INF
'Pay attention in a minute/ there!'

c. * Straks goed opgelet!/ *Goed opgelet daar! (participial imperative)
In a minute/ there well pay-attention.PTC
'Pay attention in a minute/ there!'

As with forum particle imperatives, the arguments of participial imperatives must remain without phonological realization, and are bound by the participants in the speech act. This illustrates the RLS-property of restricted syntactic composition (3a).

(13) a. Let nu op voor deze oefening! (bare imperative)
pay-attention.IMP now up in a minute/ there!
'Pay attention now to this exercise!'

b. Opletten nu voor deze oefening! (infinitival imperative)
up-pay-attention.INF now to this exercise!
'Pay attention now to this exercise!'

c. Opgelet (*nu voor deze oefening)! (participial imperative)
up-pay-attention.PTC (*now to this exercise)
'Pay attention now to this exercise!'

In addition, participial constructions feature morphological restrictions (cf. RLS 3c), as they strictly involve participles. Another indication of strong morphological restriction on the participles is that in a language like Spanish or Portuguese, these participles never show feminine or plural agreement, but are restricted to default masculine agreement, even when the referent referred to in the context is feminine as with *cuidado* 'be careful' in (14a), when even when the argument is an understood feminine such as *a crise* 'the crisis' as in (14b), or when the referents addressed involve a group, as in *combinado* 'agreed' (14c):

(14) a. Cuidado/*a, mujer! [Spanish]
taken care, woman!

'be careful, woman

b. Resolvido/*a! (a crise) [Portuguese]
'Solved (the crisis)'

c. Combinado/*a! [Portuguese]
'Agreed!'

d. Entendido/*a! [Spanish/ Portuguese]
'Understood!'

This property is unexpected, since other descriptive predicates used elliptically in Spanish and Portuguese can perfectly well be used with masculine or feminine agreement according to the intended referent. Speaking of a house in Spanish, which has feminine gender, the qualification *qué hermosa!* 'how beautiful!' is grammatical, while *cuidada!* 'look out!' spoken to a woman, is not. Though there is agreement in the full sentence *A questão é resolvida* 'the question is solved', the participial expression *resolvido* 'solved' in (9b) does not show agreement even when what is referred to contextually, *a questão* 'the question', linguistically has feminine gender.

Finally, participial imperatives display meaning restrictions (RLS 3b). There seem to be four semantic classes, each allowing for a different degree of relative productivity: alarm, aggression, discovery, and agreement. At this point, it is important to introduce a qualification: not all participial constructions involved have imperative force. The participial constructions involving alarm (15) and aggression (16) are clearly imperative, but the constructions expressing discovery (17) and agreement (18) are not, although they do have exclamative and sometimes interrogative force. We should emphasize that all expressions involved share the grammatical features that we have identified above: restricted morphology, restricted syntactic composition, the absence of displaced reference, and the obligation that all empty arguments be bound by the immediate discourse context.

(15) *Participial imperatives of alarm:*

a. Opgepast!
on-take-care.PCT
'Take care!'

b. Opgelet!
pay-attention.PCT
'Pay attention!'

(16) *Participial imperatives of aggression:*

a. Ingerukt !
in-pull.PCT
'Leave now!' (military)

b. Opgesodemieterd!
on-sodomize.PCT
'Sod off!'

c. Opgerot!
On-rot.PCT!
'Fuck off!'

d. Opgekrast!
on-engrave.PCT
'Fuck off!'

e. Opgehoepeld!
up-hoople.PCT
'Get out!'

f. Opgedonderd!
on-thunder.PCT
'Get out!'

(17) *Participial expressions of discovery:*

a. Gevonden!
Find.PCT
'Found!'

b. Opgelost!
solve.PCT
'Solved!'

(18) *Participial expressions for (checking) agreement:*

a.	Afgesproken!/?	b.	Begrepen!?
	of-speak.PCT		'understand.PCT?'
	'Agreed!'		'Understood!?'

These participial constructions are lexically and semantically limited. Formally similar participles involving the particle *op* 'on' are ungrammatical under the intended reading with non-displaced reference:

(19)

a.	*Opgegeten	b.	*Opgeschreven
	up-eaten		up-written
	'Eaten up'		'Written down'

Even more strikingly, semantically similar participial verbs with the intended non-displaced reading are equally ungrammatical:

(20)

a.	*Uitgekeken! out-looked 'Look out!'	(semantic equivalent of alarm: *look out!)*
b.	*Weggegaan! away-gone 'Go away!'	(semantic equivalent of aggression: *go away!)*
c.	*Ontdekt! discovered 'Discovered it!'	(semantic equivalent of discovery: *found it!)*
d.	*Overeengekomen! 'Settled!'	(semantic equivalent of agreement: *agreed!)*

Summing up, participial imperatives are morphologically, semantically, and syntactically restricted, and do not allow for an interpretation involving negation or displaced reference.

2.3. RLS in humans and primates

In this section, we would like to compare the properties of human and primate RLS. We claim that the grammatical properties of RLS in humans and primates, as defined in (3), are structurally very similar.

The most striking resemblance between both systems lies in the similarity of the restricted semantic classes that human and primate RLS are restricted to (RLS 3b). Hauser (1999:457) identifies four types of primate calls: fearful, aggressive, hungry, and friendly. These are assumed to express emotions of fear, aggression, hunger and friendliness. We do not take it to be an accident that human RLS, as expressed in particle imperatives and participial expressions, displays exactly the same semantic classes of predicates. The fearful calls of primates are mirrored by the participial imperatives of alarm in (15). The primate aggression calls find their counterpart in human participial imperatives of aggression (16). Calls expressing hunger can be compared to the particle imperatives expressing requests (*geef op* 'Give it to me', and *vertel op* 'tell me'). Finally, friendly calls can be viewed as similar to the participial expressions for agreement as in (18). In addition to these four semantic classes, it has been observed that primates use food calls alerting members of the same social group to newly discovered food sources (e.g. Di Bitetti 2005). These are comparable to human participial expressions for discovery as in (17).

Notice that the commonalities we observe between primate calls and human RLS concern the predicates involved (*fearing, discovering, agreeing, aggression, hunger*), and not the arguments of these predicates (*what* is discovered, feared, aggressed, hungered for). In other words, the predicates of primate and human RLS are identical, but the way in which the (unrealized) arguments involved are interpreted varies. Primates can differentiate food calls for distinct types of food, while the human RLS expressions of discovery in (18) seem to distinguish between discoveries of primarily concrete items (*gevonden!* 'found!') or strictly abstract items (*opgelost!* 'solved!'). Similarly, fearful calls can differentiate according to types of predator, while human RLS expressions for aggression differentiate according to the social status of the person addressed. The participial imperative of aggression *ingerukt!* 'go away' is primarily used in military contexts by a superior to an inferior, *opgesodemieterd* 'get out' is definitely more rude than *opgehoepeld!* 'get out'. In grammatical terms, this means that in both primate and human RLS, predicates exercise selectional restrictions on the arguments they select, even though these arguments cannot be expressed.

We submit that these differences between human and primate RLS are superficial. What is fundamentally identical is much more interesting. Primate calls and human RLS expressions are fundamentally similar in the sense that the predicate itself specifies the type of argument without being able to realize it as a syntactically separate item (RLS 3a). Compare RLS *gevonden!* 'found', which lacks the possibility to syntactically express the item found, e.g. a key, with human FL *John found the key,* in which the direct object syntactically expresses the item found. This last ability is a feature that is part and parcel of human FL alone. Therefore, primate and human RLS show limited syntactic composition. Neither calls nor participial expressions as described above combine into complex utterances. There is some evidence for very limited syntactic combination in primate RLS, as argued by Arnold & Zuberbühler (2006), but this comes nowhere near the syntactic complexity of human FL.

Human and primate RLS also share the restriction of reference to the here-and-now: there is no displaced reference (RLS 3d). It has been argued that primates can use calls to lie, and that therefore reference can at least be partly displaced (Jolly 1999). However, it is not clear that lying involves non-displaced reference in the sense used here.

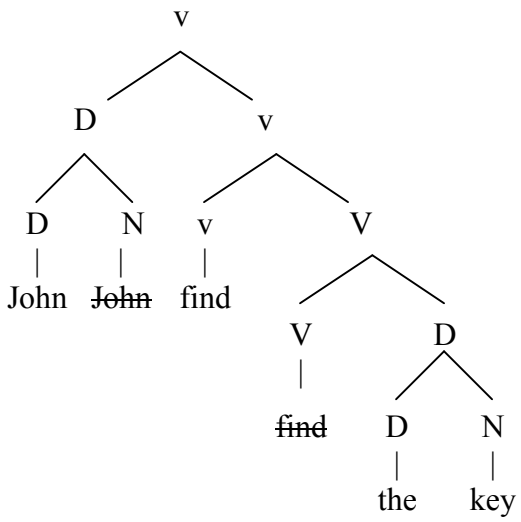
There is one property of human RLS that cannot be checked for primate RLS, and that is morphological restriction (RLS 3c). Primate calls simply lack morphological markers. Nevertheless we hope to have shown that human language has an RLS subsystem that shares substantial grammatical properties with primate communication.

3. The grammar of RLS

It now remains to determine which properties of the grammar would generate all and only the restricted utterances realized in RLS expressions. We will refrain from discussing the full theoretical consequences of this question in this article, but we would like to sketch the outlines of a proposal. The main question we would like to address is whether a specific syntactic mechanism can be identified that would be at the heart of the differences between the syntax of RLS and the syntax of FL.

We assume the syntactic tenets of the Minimalist program as developed by Chomsky (1995, 2001). In this model, syntactic structure is generated bottom-up by the operation Merge. The initial VP for a sentence like *John found the key* would look as follows:

(21)



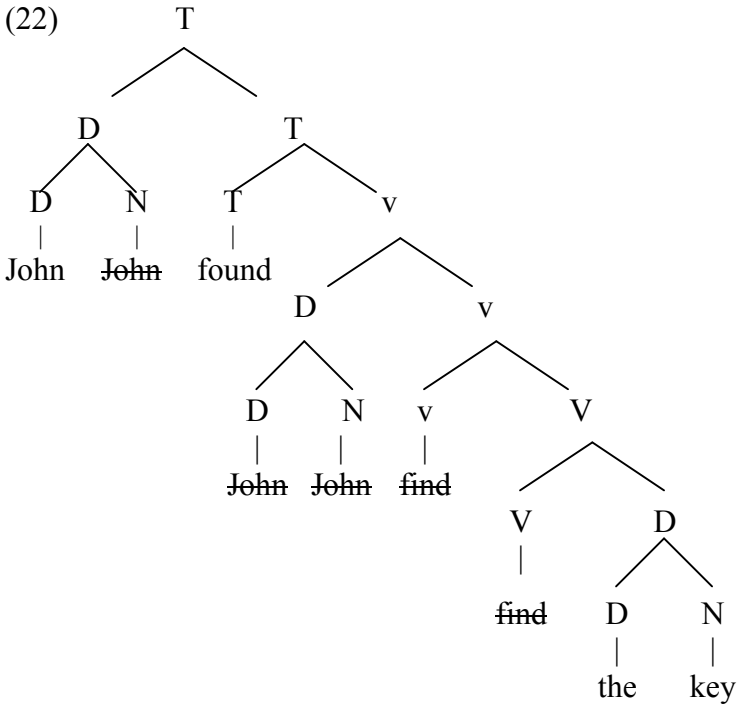
This structure is generated in the following way. From the Lexicon, a set of words (terminals) is drawn that is called the Numeration, N={John$_N$, 0$_D$, find$_V$, 0$_v$, the$_D$, key$_N$}. The subscripts on the lexical items are meant here as no more than convenient mnemonic devices for their categorial features. In fact, terminals are triples of grammatical, phonological, and semantic features, i.e. they are elements that meet interface conditions as well.

The syntactic structure in (21) is built up in the computational module by the recursive operation Merge. The subtree [$_D$ the [$_N$ key]] is formed by Merging *the* and *key* into a single structure. The subtree [$_D$ John [$_N$ ~~John~~]] is formed by first Merging *John* with 0$_D$, and then Moving (remerging) *John* into 0$_D$, leaving behind a copy. For convenience, unpronounced copies are represented with strikethrough. The constituent [$_D$ the [$_N$ key]] is Merged with *find*, which is Merged in turn with little *v*. The verb *find* Moves to little *v*, and this subtree is finally Merged with the subtree [$_D$ John [$_N$ ~~John~~]]. Merge of *the key* with *find* and subsequently *John* with *find*'s little *v* satisfies the selectional and thematic requirements of this predicate. The structure in (21) constitutes a projection of V without specifications of Tense.

Importantly, the projection of *v* constitutes a Phase, as do the D projections *John* and *the key*. Phases are discrete computational units that are interpretable for the Articulatory/Perceptual and Conceptual/Intentional components: they are subject to Spell-Out, but still available for further syntactic computation.

If the Numeration includes a Tense morpheme, the vP Phase Merges with Tense. Tense morphemes allow for the sentence to refer to past and future events, dissociating it from the present. Configurational details of head movement are omitted here for convenience. The D projection [$_D$ John [$_N$ ~~John~~]] is Moved to the domain of T, leaving behind an ultimately unpronounced copy. Further functional projections (Aspect, Mood, Force, Topic, Focus) may be included in the Numeration. In this way, a full-fledged sentence is generated in FL.

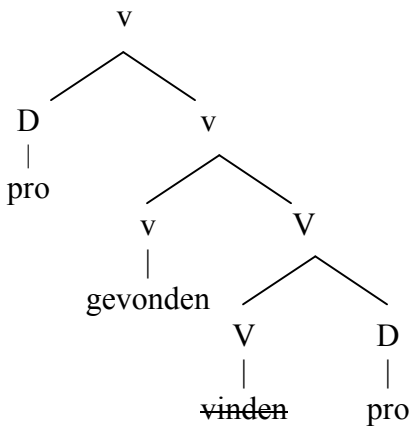
(22)



It is important to note that subtrees are generated in parallel in this model: the subtree [$_D$ John [$_N$ ~~John~~]], a Phase, needs to be fully formed before it can Merge with little *v*. Similarly, the subtree [$_D$ the [$_N$ key]], also a Phase, must be generated before Merger with *find*. Chomsky (1995) does not give a name to the part of the computational module where trees are generated in parallel. Let us call it the Workspace. The ordered set of subsequent states of the Workspace is traditionally called 'the derivation'.

Let us now examine how human and primate RLS, with the properties that we have defined above, could be modeled as involving a subset of the assumptions of the computational module for FL. Setting aside details of participial morphology, the syntactic structure for a participial expression such as *gevonden!* 'found', can be easily expressed as follows:

(23)



This syntactic structure at first sight hardly differs from the one in (21), except for the fact that the arguments of the verb *find* are represented as *pro*. These empty arguments satisfy the selectional and thematic restrictions of *find* in the same way as *John* and *the key* do in (21). Technically, we assume that these empty arguments should be viewed as bundles of phi-features. The existence of empty arguments in FL is hardly controversial. The representation

of the empty arguments in (23) is identical to that of the empty subject and object in a Portuguese one-word sentence such as *Fiz* 'I did it'. What is striking in the case of RLS participial expressions and particle imperatives is that the arguments *must* be left unexpressed, as noted in sections 2.1. and 2.2. The question then is which property of RLS forces arguments to remain unexpressed as *pro*, or, alternatively, which property of FL remains inactive in RLS so that arguments can only appear as *pro*.

The structure in (23) differs from the one in (21) in another important respect. We assume that the structure in (23) cannot be further Merged with Tense morphemes, which allow for the sentence to refer to past or future events. The projection of *v* is the highest possible projection in RLS, both for primate calls and for participial expressions such as the one depicted in (23).

As a result, the *v* projection is spelled out and directly interpreted in the discourse. This means that the empty elements contained in the *v* projection have to be interpreted with respect to the here and now of the speech situation. In our view, this is what explains the absence of displaced reference in RLS: reference to time and place is restricted to the here and now. Similarly, the empty *pro* arguments of the participial expressions must be interpreted as participants in the speech act. The absence of negation, adverbs, and agreement in participial expressions are due to the fact that the projection of *v* cannot Merge with the relevant functional projections that are needed to host these elements. The impossibility of further Merger likewise explains the restricted morphology exhibited by these constructions (cf. RLS 3d). We assume that the participial morphology itself only arises as default morphology on V in the absence of further functional projections.

The assumption that *v* is the highest possible projection in RLS of course needs to be explained. Why would this be the case? It certainly is not a property of FL, in which recursion is unlimited as long as the Numeration contains terminals. We could of course stipulate that the Numeration in RLS is limited, but that would be a rather arbitrary move, difficult to justify independently, especially when RLS is a part of FL as in human language and therefore could have in principle access to the full Lexicon including functional projections above *v*.

We propose that the inability of RLS expressions to express arguments other than *pro*, and the fact that *v* is the highest possible projection in RLS, are a consequence of the same computational restriction, which we formulate in (24):

(24) *The Ban on Phase-Recursion in RLS (BPR)*
The computational component of RLS is unable to Merge Phases,
i.e. there is no Phase-recursion in RLS.

This restriction explains why *v*P cannot be Merged with higher functional projections: since *v*P is a Phase, it cannot be Merged further. It also explains why arguments other than *pro* cannot be Merged with V. Any DP argument with lexical contents, noun or pronoun, will involve complex syntactic structure that requires Merge. Such syntactic structures constitute Phases, since they are units resulting from syntactic computation. By virtue of (24), such structures will be unable to Merge with a predicate. By contrast, a D *pro* has no internal syntactic structure, since it has not been subject to Merge. Since it is not a computationally construed unit, *pro* can be assumed to be exempt from Phasehood. Therefore, only non-phase *pro* arguments can be Merged with predicates in RLS.

Phases are syntactic objects that meet the interface conditions (Articulatory/Perceptual and Conceptual/ Intentional). RLS are linguistic systems that lack the possibility to reintroduce Phases in the Merge process. In other words, RLS lack recursive access to the interface modules.[1] As such, BPR as in (24) fleshes out Hauser, Chomsky & Fitch's (2002) idea that Full Language in the narrow sense (FLN) "comprises only the core computational mechanism of recursion (…) and the mappings to the interfaces".[2]

Finally, the restriction in (24) is in line with the hypothesis we had introduced at the beginning of this article about the relation between Restricted Linguistic Systems (RLS) and Full Language (FL). The hypothesis proposed was formulated quite generally as follows:

(2) *General hypothesis on the relation between RLS and FL:*
Restricted Linguistic Systems (RLS) constitute a subset of Full Language (FL).

We are now in a position to conclude that an RLS grammar in which (24) holds constitutes a proper subset of a grammar generating FL.

As it stands, BPR in (24) is strictly descriptive. An explanation is still needed as to what properties of the computational component in RLS correlate with it. We surmise that BPR in RLS is due to a limitation on the computational capacity of the Workspace in RLS. Recall that in FL, several trees can be generated in parallel in the Workspace. We hypothesize that the Workspace in RLS can simply not 'hold on to' (or, alternatively, 'recuperate') Phases which have been shipped off to the Articulatory/Perceptual and Conceptual/Intentional components. In other words, in the Workspace of RLS, the workbench is cleared after every Phase that is produced, while in the Workspace of FL, there is a 'Phase holding bin' allowing them to be recycled into the next Phase.

If this hypothesis is on the right track, it means that, evolutionarily speaking, a small change in the computational capacity of RLS could have given rise to FL. This would be a welcome result from the point of view of the debate on the differences between primates, which only have RLS, and humans, who by assumption have RLS encapsulated within FL. It has long been noted that the similarities between primate and human brains are far greater than their differences. Fisher & Marcus (2006:12) note that human and chimpanzee brains show considerably less absolute divergence than other tissues, such as the liver and the heart, both in terms of the number of genes that are differentially expressed and the magnitudes of the differences. If the hypothesis proposed above is correct, then primates do possess a large number of the properties of human language: a Lexicon, a limited amount of recursion (non-phase Merge), and therefore syntax. They only lack a single computational property: Phase-recursion, the trigger that allows humans to generate infinitely embedded syntactic structures.

4. Conclusion

In this article, we have argued that we have identified a RLS within FL, which is expressed in particle imperatives and participial expressions in Dutch and many other languages. We propose that RLS and FL do not differ in absence/presence of syntax (*recursive merge*) but in

[1] Although the complexity underlying the Articulatory/Perceptual and Conceptual/Intentional interfaces is part of FLB (Hauser, Chomsky & Fitch 2002:1573), it is in our view the recursive access to these interfaces that is part of FLN.

[2] Our proposal here is influenced by Fox & Pesetsky's (2005) idea of recursive access to the PF interface as an important feature of syntax. Our proposal involves recursive access to both interfaces.

absence/presence of *phase recursion*. Other differences between RLS and FL, such as restricted syntax, non-displaced reference, and restricted semantics, can be derived independently. We submit that primate communication is a specifically restricted type of FL in which phase recursion is not active.

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