

## ON AUXILIARY CHAINS: AUXILIARIES AT THE SYNTAX-SEMANTICS INTERFACE\*

Ana Bravo, Luis García Fernández & Diego Gabriel Krivochen  
*Universidad de Murcia, Universidad Complutense, University of Reading*

**ABSTRACT.** The present paper is focused on the study of those relations that auxiliary verbs can establish among themselves when chained in a sequence. Regarding those sequences, which in Spanish can be considerably long, the literature has displayed primarily interest in formulating a set of principles that can predict possible relative orderings among auxiliaries. On the contrary, our paper delves into a less walked path: the description of relations established within an auxiliary chain. We will start from the traditional definition of auxiliary verb as a unit that modifies the ‘main’ or ‘lexical’ verb, and proceed to show that such a conception makes the wrong predictions when it comes to explain those internal relations, for it only accounts for a subset of the cases. This explanatory problem is common to both traditional and more formal models. In our opinion, the distinction between *lexical* and *functional* auxiliaries that we propose in this work, in the context of a dynamic computational model that includes and derives this distinction, allows us to overcome these shortcomings of traditional analyses.

**Keywords.** Auxiliary verbs; auxiliary chains; modal deontic verbs; mixed phrase structure

**RESUMEN.** El presente trabajo se centra en el estudio de las diferentes relaciones que los verbos auxiliares pueden establecer entre sí cuando aparecen encadenados en una serie. De las series de auxiliares, que en español pueden ser bastante largas, ha interesado fundamentalmente encontrar los principios que permitieran predecir los órdenes relativos posibles y sobre este asunto en particular nuestros conocimientos son bastante amplios, a la vez que precisos. Nuestro trabajo se centra, por el contrario, en un tema menos estudiado: describir las relaciones de dependencia interna que permiten los diferentes auxiliares. Partimos de la descripción clásica de verbo auxiliar como unidad que modifica al verbo principal o léxico, que por este motivo se denomina auxiliado, y mostramos que realiza las predicciones incorrectas cuando se trata de explicar el funcionamiento de los diferentes auxiliares que componen una cadena dado que únicamente puede dar cuenta de la gramática de un subgrupo de ellos, no de la totalidad. Este problema, por otra parte, es característico tanto de las descripciones tradicionales como de las que se enmarcan en modelos de análisis más formales. La distinción que proponemos en este trabajo entre auxiliares léxicos y funcionales, junto con un modelo computacional dinámico que tiene en cuenta esta distinción, permite en nuestra opinión superar los inconvenientes y errores de generación del análisis clásico.

**Palabras clave.** Verbos auxiliares; cadenas de auxiliares; modales deónticos; estructura de frase mixta

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## 1. Introducing the topic

Sequences of auxiliaries -that is, those periphrastic verbal constructions in which there is more than a single auxiliary verb- have been the object of a relative amount of attention. This has been not so much as constructions *per se*, but as a means to examine the factors that may allow us to explain the relative order of auxiliaries in such sequences. We can mention the works of Picallo (1990) and Laca (2002, 2004, 2005) about modal and aspectual periphrases in Spanish, as well as Cinque (2004) and Nauze (2006). To those, we can add previous ones, like Boertien (1979), Palmer (1983), or Schater (1983), and within the Generative framework, Chomsky (1965). The phenomenon that Ross (1991) calls ‘the size of niches’, that is, the determination of the number and type of elements that can appear between subsequent terms in an auxiliary chain has also received some attention, even though the focus has always been set in the question of whether or not there is restructuring (see, for instance, Aissen & Perlmutter 1976).

The goal of this paper is, on the contrary, to examine an aspect of auxiliary chains that, as far as we are aware, has received little attention in the bibliography: the way in which the information provided by each of the auxiliaries relates with both the main lexical verb and the rest of auxiliaries in the chain.

In particular, the aim of this paper is two-fold:

Firstly, we are interested in describing how functional content is distributed along the various auxiliaries that form a sequence, and how that content is interpreted. As far as we know, this issue has not been addressed along the lines we will pursue here. In order to do that, we will show that the natural class of auxiliary verbs (identified as such since Ross, 1969) should be split into two categories: the category of LEXICAL AUXILIARY VERBS and the category of FUNCTIONAL AUXILIARY VERBS. We will argue that this split is necessary, in conjunction with other criteria, in order to explain (i) differences among the auxiliaries pertaining to the compatibility with temporal and aspectual information and (ii) the relative order of co-occurring auxiliaries.

Secondly, we aim to describe verbal periphrases at the syntax-semantic interface. We consider that verbal periphrases represent an interesting challenge for the Minimalist Program, inasmuch as auxiliaries are not a homogeneous class and hence we can expect some consequences for the computational system. Specifically, we show how a dynamic model of the computational system (like the one proposed in Krivochen 2015) handles the distinction between lexical and functional auxiliaries and the interpretative differences that stem from it.

The paper is organized as follows. In Section 2 we introduce some background about sequences of auxiliaries. In Section 3, we present what we call the Cumulative approach, then we introduce the concepts of functional auxiliary and lexical auxiliary and we discuss about Guéron and Hoekstra’s (1988) T-Chain hypothesis. In Section 4, we present our proposal: the Split Hypothesis. Finally, in Section 5, we discuss the relationship between tempo-aspectual verbal morphology and auxiliary verbs.

## 2. Verbal periphrases and chains of auxiliaries

Let us begin by defining what a verbal periphrasis is. It is evident that the concept of periphrasis is neither natural nor primitive, but constitutes a theoretical construct. This means that certain constructions will be considered periphrases or not strictly depending on the grammatical properties assigned to the notion of ‘verbal periphrasis’. In NGLE (2009: § 28.1a), RAE defines the concept as follows –the translation is approximate:

A verbal periphrasis is the syntactic combination of an auxiliary verb and a main verb that is interpreted as a single predication. The lexical verb is formally an infinitive, a gerund or a past participle. The auxiliary verb may be inflected or not (...), depending on the syntactic properties of the clause (...). In any case, auxiliary verbs can be embedded in one another.<sup>1</sup>

Classical examples of Spanish verbal periphrases are in (1) with a single auxiliary, and in (2) with a sequence of auxiliaries:<sup>2</sup>

- (1) a. Juan **suele**<sub>Aux</sub> levantarse tarde.  
*John AUX-HAB-PRES.3SG get-up.INF late*  
 ‘J. normally gets up late.’
- b. Juan **sigue**<sub>Aux</sub> levantando=se tarde.  
*John keeps get.up-PROGR=REFL.3SG late*  
 ‘J. keeps getting up late.’
- c. **Tener**<sub>Aux</sub> **que** trabajar en agosto es agotador.  
*have.INF that work.INF in August is exhausting*  
 ‘To have to work in August is exhausting.’
- (2) a. Juan **debía**<sub>Aux1</sub> **ir**<sub>Aux2</sub> colocando los ejemplares uno a uno.  
*John must.PST.IPFV.3SG go.AUX.INF putting the exemplars one to one*  
 ‘J. must put the exemplars one by one.’
- b. Juan **suele**<sub>Aux1</sub> **poder**<sub>Aux2</sub> **empezar**<sub>Aux3</sub> a trabajar tarde.  
*John AUX-HAB-PRES.3SG can.INF start.INF to work.INF late*  
 ‘J. can normally start to work late.’
- c. Juan afirma **haber**<sub>Aux1</sub> **tenido**<sub>Aux2</sub> que pagar por todo en su crucero.  
*John asserts have.INF had.PTCP that pay.INF for everything in his cruise*  
 ‘J. asserts that he had to pay for everything in his cruise.’

Some of the basic features mentioned in the definition above are largely language-specific, although other Romance languages may present them as well. Thus, as it is well known, in descriptive terms, in Spanish, French, or Italian any auxiliary verb may show inflection, whereas in English this possibility is highly restricted. However, the fact that despite having two verbs there exists a single clause -a property usually referred to as MONO-CLAUSALITY- is what defines a verbal periphrasis cross-linguistically. The centrality of this property has been widely acknowledged in the relevant literature, regardless of the framework (see, among many others, Anderson, 2006: 7, 2011: 795; Cinque 2004; Gómez Torrego 1999: 3325; Hirtle 1996/1997; Roberts 1997; Rochette 1999: 151; Wurmbrand 1998, 2001, 2004).<sup>3</sup> Thus, Anderson (2011: 796) states that “A(uxiliary) V(erb) C(onstructions)

<sup>1</sup> “Se denominan PERÍFRASIS VERBALES las combinaciones sintácticas en las que un verbo AUXILIAR incide sobre un verbo AUXILIADO, llamado a veces principal o pleno, construido en forma no personal (es decir, en infinitivo, gerundio o participio) sin dar lugar a dos predicaciones distintas. El verbo auxiliar suele aparecer conjugado (...), pero puede no estarlo en función de las características sintácticas de la oración. (...) Aun así, los verbos auxiliares se pueden encadenar.”

<sup>2</sup> Abbreviations used in this paper that are not in the Leipzig convention rules’ list: HAB = habitual.

<sup>3</sup> Within generative grammar it has been discussed whether this monoclausal condition is achieved in different ways throughout the derivation, or, on the contrary, is there from the beginning. On this topic, we refer the reader to Wurmbrand (1998: 42-47; 2001: 9-15) and Cinque (2004: 1, fn. 1).

are ... mono-clausal verb phrases that minimally consist of an auxiliary verb component ... and a lexical verb component.”<sup>4</sup>

It is convenient to make a terminological precision at this point. The term ‘verbal periphrasis’ is characteristically found on works written in or about Romance languages. This concept has a long standing tradition in Hispanic Linguistics (see *Diccionario de perífrasis verbales*, Fernández de Castro 1999; Gómez Torrego 1999; Olbertz 1998; RAE-ASALE 2009; Roca Pons 1958; to cite but a few). It is also found in Morphology studies, albeit with a much more restricted meaning. A (verbal) periphrasis in this case is a ‘syntagmatically sequence of forms’ (Vincent 1987: 241) that has entered the inflectional system (Brown *et alii* 2012; Matthew 1991: ch. 9; Vincent 1987, 2011). Leaving aside these two traditions, the particular of Romance languages, and that belonging to Morphology, other terms are used. Thus, sometimes they are referred to as AUXILIARY VERB CONSTRUCTIONS, as in Anderson (2006, 2011). More frequent is to mention just the auxiliary, as in Akmajian, Steele and Wasow (1979), Chomsky (1957) and Ross (1969), among many others. Within the generative tradition, the expression RESTRUCTURING VERBS is also very common, as can be seen in Cinque (2004), Rizzi (1976, 1979), Roberts (1997), Rosen (1990) or Wurmbrand (1998, 2001). Throughout this paper we are using as equivalent the expressions VERBAL PERIPHRAISIS, or simply PERIPHRAISIS, AUXILIARY VERB CONSTRUCTION, and VERBAL PERIPHRASTIC CONSTRUCTIONS, and leave other less descriptive formulae aside.

According to the definition given above, verbal periphrases, at least in Spanish, allow for at most a single inflected verb in a personal form, although there can be none, as in (1c) and (2c) above. Thus, constructions such as the ones in (3), in which the two verbs are conjugated, are immediately ruled out:<sup>5</sup>

- (3) a. Cogió                    y se                    marchó.  
       *take.PST.PFV.3SG and REFL.3SG leave.PST.PFV.3SG*  
       ‘He/She took and left.’  
       b. Agarró                    y le dijo                    lo                    que pensaba.  
       *take.PST.PFV.3SG and him tell.PST.PFV.3SG ACC.3SG.N that think.PST.IPFV.3SG*  
       ‘He/She took and spoke his/her mind.’

According to Anderson (2006: 23), there are four possible periphrastic structures from a cross-linguistic standpoint:

- A. Inflected auxiliary with unmarked lexical verb or marked as a non-finite form
- B. Non-finite auxiliary with non-finite lexical verb
- C. Inflected auxiliary with inflected lexical verb
- D. Unmarked or non-finite auxiliary with inflected lexical verb.

<sup>4</sup> Monoclausality correlates, in the most widely accepted analyses, with expressing what in the aforementioned definition is described as ‘just one predication’. It is also quite frequent to identify predication with event and, thus, verbal periphrasis are said to only describe one event (Rochette 1999: 151 for periphrases with aspectual auxiliaries, and Rosen 1990, among others).

<sup>5</sup> Anderson (2006: 16) observes that, while coordinated structures constitute one of the possible combinations that originate an auxiliary construction, it is not among the most frequent. As far as Spanish is concerned, these constructions have been studied –among others– in Coseriu (1966) and, more recently, Arnaiz and Camacho (1999) and Garachana (2015). See also Bybee, Perkins and Pagliuca (1994: 59), Bourdin (2008), Bravo (2013: 188), and Heine and Kuteva (2002: 156-157).

It must be noted that, if we consider periphrases as defined by RAE, Spanish behaves like (A) in matrix sentences (*Puede salir* ‘He/She may go out’-) and inflected subordinate structures (*Dijo que tendría que irse* ‘He/She said he/she would have to go’); and like (B) in infinitival or gerundial subordinate clauses (*Es una lata tener que escucharle* ‘It is a pain in the neck having to listen to him/her’). However, if we include constructions of the kind of (3) Spanish also features structures of the (C) type (*Cogió y se marchó sin decir ni adiós* ‘He/She took and left without even saying goodbye’).

To summarize, Spanish verbal periphrases consist, minimally, of an auxiliary verb, conjugated or not, and a lexical verb. Let us also recall that auxiliaries can be chained, yielding what we will call a CHAIN OF AUXILIARY VERBS, or simply AUXILIARY CHAIN, as in (2) above or (4) below:

- (4) a. Podrían estar siendo interrogados toda la tarde.  
*might.3PL be.INF being interrogate.PTCP all the afternoon*  
 ‘It is possible that they are interrogated during the whole afternoon.’  
 b. Va a tener que seguir trabajando.  
*go.PRES.3SG to have.INF that keep.INF working*  
 ‘She/He is going to have to keep working.’

We shall define an AUXILIARY CHAIN any sequence considered a verbal periphrasis in which there are *at least two* auxiliary verbs at the left of the final lexical verb:

- (5) An auxiliary chain  $CH_{AUX}$  is a string  $\{ \{x \wedge y \wedge z \dots n\} \wedge VP \}$  where  
 i)  $\{x, y, z \dots n\} \in \text{Auxiliary Verb}$   
 ii)  $n > 2$

At this point in the development of the argument, it is important to spell out some assumptions we will make in the remainder of the paper.<sup>6</sup>

To begin with, we will define a *string* as a *linear concatenation of symbols* (and we will use  $\wedge$  to denote such concatenation). That string, in and of itself, *has* no structure, a structural description is *assigned* to it by an interpreter. The structural description assigned to a string of natural language symbols (regardless of its well-formedness), which we will represent by means of tree graphs or square bracketing, will be referred to as a *phrase marker*. Syntactic conditions are thus conditions over properties of the phrase markers *qua* graphs (Steiner trees, more specifically), while semantic conditions pertain to the relations among the symbols thereby represented. It is important to take into consideration that the primarily descriptive statement in (5) makes no reference to hierarchy or syntactic relations whatsoever, although it does clarify that the rightmost element in an auxiliary chain is adjacent to a lexical verb (and transitively, precedes not only the verb, but also its complement(s)). We will come back to order issues below, when discussing a purely positional criterion.

### 3. Sequences of auxiliaries

#### 3.1. Internal dependencies among auxiliaries

There exists general (and perhaps involuntary) agreement among linguists from different theoretical approaches (including traditional grammarians) that auxiliary

<sup>6</sup> See also Uriagereka (1998: Appendix) for clarification about notational issues and more formal definitions, which we cannot afford to include here.

verbs modify the main verb<sup>7</sup> (Gómez Torrego 1999: 3346, Guéron & Hoekstra 1988: 36-37, Zwicky 1993, among many others). Regardless of how “modification” is defined (and orthogonally to the argument/adjunct distinction, see in any case the discussion following examples (15) and (16) below), this seems to be the case when there is just one auxiliary, as in (6):<sup>8</sup>

- (6) a. Juan **suele**<sub>Aux</sub> levantar=se tarde. (=1a)

*John AUX-HAB.PRES.3SG get-up.INF=REFL late*  
 ‘J. usually gets up late.’

- b. Aux - Verb

Accordingly, if auxiliaries are thought of as always modifying the main V, in a sequence of auxiliaries, we would expect something along the lines of (7):

- (7)  $\{\{Aux\ 1 \wedge Aux\ 2 \wedge Aux\ 3\} \wedge VP\}$

That is, we were to expect a situation in which all the auxiliaries have scope over the main verb and thus do not modify the auxiliary verb on the right.<sup>9</sup> This is exactly what happens, we argue, in (8):

- (8) Va            a haber    sido asesinado.  
*go.PRES.3SG to have.INF been murdered.PTCP.M*  
 ‘He is going to have been murdered.’

Bear in mind that we are working with the verbal domain: while extensions of the monotonic modification hypothesis to the nominal domain are possible<sup>10</sup> (and in fact Cinque’s 1999 stacking of functional phrases to capture multiple adjectival

<sup>7</sup> Not the lexical verb, in all truthfulness, but the VP it heads, as stated in the formula in (7). However, in 3.2 below we show that in some cases it makes a difference.

<sup>8</sup> The question of what happens with Tense-Aspect inflection in Aux begs, and will be addressed in Section 5.

<sup>9</sup> Note that if one of the features that characterizes an auxiliary verb is the lack of argument structure, it follows that they need to combine with a lexical verb (which do have A-structure). Under standard assumptions, this verb is responsible for A-structure and the assignment of Theta-Roles. In a periphrasis of the form  $\{Aux \wedge VP\}$ , this requirement is readily satisfied. In an auxiliary chain  $\{\{x \wedge y \wedge z \dots n\} \wedge VP\}$ , however, this requirement is not met until a lexical verb appears (for an auxiliary combines with another, *n* times), provides closure to the chain, and turns the construction into a verbal periphrasis. Thus, from this point of view, it is logical to think that all members of the chain modify the lexical verb, which appears in the last position.

<sup>10</sup> This is an issue raised to us by both the reviewers. Nevertheless, as we say in the main text, the extension from the verbal to the nominal domain is not obvious, against what is currently assumed within the generative framework, and thus deserves further research. Consider, for instance, the topic of the relative order of the elements in each of the domains: while there seems to exist general agreement that crosslinguistically grammatical aspect linearly and semantically precedes lexical aspect or *Aktionsart*: Grammatical Aspect > Lexical Aspect, \*Lexical Aspect > Grammatical Aspect, see de Swart (2012: 765-766) and references therein, adjectives (both relational and qualifying) may appear in different orders, not only within the same language (cf. *coche americano rojo grande* lit. car american red big vs. *coche grande rojo americano* lit. car big red american) but also among languages (cf. Eng. *big red American car*).

modification over nouns makes specific predictions regarding scope interaction between adjectives and adjectives and the noun head), they are not trivial or straightforward. We will thus restrict the scope of our analysis to lexical and functional modification within the verbal domain, with parallelisms and possible consequences for the analysis of the nominal domain being left for future research.

The somewhat naïve analysis in (7), in which auxiliaries always modify the main V predicts both (9a) and (9b), which in turn are independent from each other:

- (9) (a) The order in which auxiliaries appear can not have any interpretative effects  
 (b) The class of auxiliary verbs is a homogeneous class that behaves in an equally homogeneous way (a *strong uniformity* hypothesis)

Regarding (9a), effectively, if all auxiliaries modify the main verb without modifying the other auxiliaries, then (10) -with the linear order  $x$ - $y$ - $z$ - should be equivalent to (11), with linear order  $y$ - $z$ - $x$  (for  $x, y, z$ , auxiliary verbs):



Let say something about how this could be the case. The string in (7) (=10)) requires some memory for its interpretation (as we need to keep each auxiliary active until the lexical VP, which they all modify, is introduced in the derivation), although not necessarily for its creation, which can proceed serially, step-by-step, with no reference to past states of the system: since building and parsing are orthogonal to each other, this does not entail a contradiction. If the parser proceeds from left-to-right, it first encounters Aux 1, and must keep it in an active memory. Then comes Aux 2, and we are faced with a choice: do we assume the parser is a simple, last-in-first-out kind of automaton (in which case Aux 1 goes from the stack to the output and Aux 2 enters the memory stack), or do we allow for certain flexibility in memory and several parallel memory stacks that can be accessed during the derivation (such that the information provided by Aux 1 can be kept active even *after* Aux 2 is introduced)? Notice that only the latter option derives the facts represented in (7), for the former *necessarily* yields a monotonic structure of predication (an example of which we will see in (12)): if Aux 1 leaves the active memory as soon as Aux 2 is introduced, we are left with an extremely local structure of modification, in which we proceed  $VP \rightarrow Aux\ 1(VP) \rightarrow Aux\ 2(VP)$  –since Aux 1 and Aux 2 cannot be both active at the same time-, for ‘ $\rightarrow$ ’ denoting a derivational step. Unification grammars, of the kind developed by Shieber (1986) prove helpful in this point, unlike Merge-oriented formalisms. Informally:

- (12)  
*Input:*  
 Aux 3(VP)  
 Aux 2(VP)  
 Aux 1(VP)

*Unify*: (Aux 1, Aux 2, Aux 3, VP) [see Shieber, 1986; Jackendoff, 2011]<sup>11</sup>

*Output*:

(Aux 1, Aux 2, Aux 3(VP))

where there is no hierarchical dependency between auxiliaries, but there *is* between the auxiliary chain and the VP argument. Can we actually do that? We certainly can, if the assumption that the generative engine is *not uniform* in terms of the structural dependencies it can generate is hold (a claim that has been explored in depth in Krivochen 2015). The dependency established *among auxiliaries* is of a different kind than the dependency established *between Aux and the VP*, and this is to be expected if phrase structure is *semantically* based: if we distinguish lexical from non-lexical verbs, it is to be expected that there should be some consequences at the level of phrase structure. However, as we will see, overgeneralizing such consequences would entail imposing a template over structure generation (as is the case with uniformly binary-branching structures), which makes it insensitive to semantic requirements: this is what we want to avoid.

In effect, trivially, (9a) would hold for a fixed order of auxiliaries. However, we are not interested in such a scenario since auxiliaries in Spanish allow for a high degree of flexibility with respect to their linear order. That (7) cannot be the only possible situation can be easily proven. Otherwise, we would expect (13a) and (13b) to have the same meaning, which is not the case:

- (13) a. Juan tiene que estar trabajando en la biblioteca.  
*John has that be.INF working in the library*  
 ‘J. has to be working in the library.’  
 b. Juan está teniendo que trabajar en la biblioteca.  
*John is having that work.INF in the library*  
 ‘J. is having to work in the library.’

The examples of (13a) and (13b) are not synonymous. Note that this fact can only be explained if in (13b) the progressive auxiliary [estar] does *not* modify the lexical verb [trabajar]. Effectively, in (13b) it is obvious and necessary that [tener que] modifies [trabajar], for it is immediately adjacent to it. This being the case, if [estar] were to modify [trabajar] as in (13a), then both sequences should necessarily be synonymous, which they are not. In (13a) there is an assertion of the necessity, epistemic or deontic, that it is the case that Juan is working, whereas in (13b) it is asserted that Juan currently has the deontic necessity to work (a state reading), but not that he is actually doing so (activity reading) at the moment of utterance. We think the semantic difference between both sentences is clear and indisputable. At this moment, however, it should already be clear that the order issue is a *consequence* of a deeper one<sup>12</sup>: the different properties of each of the auxiliary in a CH<sub>Aux</sub>.

To summarize, then, (9a) and (9b) should be restated as in (14):

- (14) The order in which auxiliaries appear does not *linearly* correlate with interpretative effects, for a given string of symbols can display several kinds of

<sup>11</sup> In formal terms, we define the unification of two feature structures D' and D'' as the most general feature structure D, such that D' ⊆ D and D'' ⊆ D. We notate this D = D' ∪ D'' (Shieber, 1986: 14)

<sup>12</sup> This means that the ordering is not forcing the interpretation, an issue we will come back to repeatedly: the positional criterion in and of itself is not reliable.

structural dependencies which are all in principle applicable; this is what we refer to as a DYNAMIC ACCOUNT.

Observe that introducing *nonlinearity* in the relation between a string and its interpretation allows us to say that the order of auxiliaries in the morpho-phonological string does *not* deterministically correspond to an interpretation: there are, in principle, several interpretations to be assigned to a string of auxiliaries, even if we assume that the class of auxiliaries actually contains heterogeneous members (*contra* (9b)). And this is precisely what we need in the light of contrasts such as the one shown in (13).

The only way to avoid such a conclusion, and hence, to account for the data in (13) and similar, is, we argue, to divide the class of auxiliary verbs into two different subclasses. In this paper we show that depending on the type of auxiliary, namely, whether it is LEXICAL or FUNCTIONAL (essentially a semantic distinction related to the availability of a root node), we may have *not only* (7) *but also* (15) as a structural description for auxiliary chains (*i.e.*, our computational system *allows both*, depending on the kind of semantic contribution –modal, aspectual, temporal- the relevant auxiliary makes), the latter of which illustrates a situation in which each auxiliary takes the one immediately right-adjacent to it as an argument:

(15) [Aux 1 [Aux 2 [Aux 3 [Lexical Verb]]]]



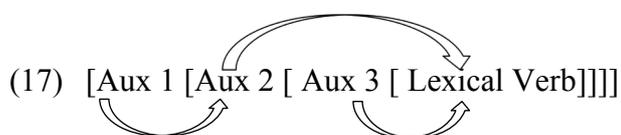
which would correspond to a sentence of the kind of (16):

(16) En verano **solía** **poder** **empezar** a trabajar más  
*in summer AUX.HAB.PST.IPFV.3SG be-able.INF start.INF to work.INF more*  
 tarde.  
*late*  
 ‘In summer, he/she would be able to start working later’.

This is a situation that involves a monotonic phrase structure building mechanism (Uriagereka, 2002), in which each element that enters the workspace is merged (lower case) with a syntactic object that is taken as a unit for the purposes of further computations (see also Epstein et al. 1998), which yields a structure in which each new element is a functor that takes whatever is in the workspace as an argument, yielding a recursive function of the kind  $f(g)$ , where  $g$  is itself a function (a situation that is normal in multivariable calculus, for instance). In (16) we have a structure of predication of this kind, where each auxiliary to the left of the VP takes whatever is at its right as an argument. If that rightside element is itself a structure of predication, we have a recursively defined function:  $g(x) = \text{empezar}(\text{trabajar})$ ,  $f(g) = \text{poder}(\text{empezar}(\text{trabajar}))$ ...and so on. We see that the uniform phrase structural dependencies we have here contrast with the mixed finite-state / phrase structural dependencies we saw apply to (8) above: this leads us to claim that a uniform, transparent mapping between order and structure is necessarily procrustean.

There is an essential difference between ‘predication’ functions in natural languages and strictly mathematical functions<sup>13</sup>, though: the most embedded element *needs* to be a bare lexical root, but on top of that we can pile up non-lexical information, yielding a chain of functional material in which modification relations are strictly local, and which always ‘ends’ in a Lexical Verb. Computationally, this can be represented by means of a simple regular string, if the Finite State limit on Phrase Structure proposed by Uriagereka (2012: 53), according to which a strictly asymmetrically branching structure of the [X, YP] kind can be expressed in a finite-state fashion, holds. In computational terms, we have finite-state *and* phrase structural relations within the same phrase marker, such that the relation between the auxiliaries in the output in (12) is limited to adjacency, but there are no discontinuous dependencies. The relation between the finite-state domain defined by the auxiliary chain acts as a whole over the lexical VP, which amounts to a simple structure of predication in which functional information takes lexical information as its argument.

A combination of both (7) and (15) is, while formally simple (still computable in polynomial-time as an upper bound), empirically more constrained. Consider (17) and the corresponding example of (18):



- (18) a. **Ha tenido** que ser ayudado por personal del centro.  
*Has have.PTCP that be.INF help.PTCP by staff of-the center*  
 ‘He has had to be helped by the center staff.’

In (18a) it is evident that *ha* (‘has’) is an auxiliary for *tenido* (‘had’), and that the obligation is located in a moment in the past which is relevant for the present; this corresponds to the temporal structure of a present perfect (‘pretérito perfecto compuesto’). Note that, in reality, the traditional idea of a ‘composite form’ would support our claims. For this very same reason, it could be objected that (18a) does not constitute a valid datum, under the claim that *ha tenido* is a single verb; put differently, that *ha tenido* is part of the conjugation paradigm of *tener*. Let us provide further examples for which the same paradigm-based objection does not hold. Notice that in (18b) and (18c) we have the same phenomenon as in (18a):

- (18) b. *Va* a tener que ser ayudado por personal del centro.  
*Go.PRS.3SG to have.INF that be.INF help.PTCP.M by staff of-the center*  
 ‘He is going to have to be helped by center staff.’
- c. *Está* teniendo que ser ayudado por personal del centro.  
*Is have.PROGR that be.INF help.PTCP.M by staff of-the center*  
 ‘He has to have help from center staff’

In effect, in (18b) it is asserted that necessity will hold for the future, which shows that *va a* (‘is going to’) auxiliates *tener*. In (18c), necessity holds for the present, which, again, eloquently shows that the auxiliary verb to the left of *teniendo* (*estar*)

<sup>13</sup> A working definition of ‘function’, which suffices for our purposes, is the following: *A function is a deterministic relation between a set of inputs and a set of permissible outputs with the property that each input is related to exactly one output.*

modifies it. We believe there are reasons to claim that *va a tener* and *está teniendo* cannot be considered part of the conjugation paradigm of *tener*.

Thus, going back to the phrase marker in (17), exemplified in (18), we have an example of ‘crossing dependencies’, which require memory capacities that go beyond a last-in-first-out stack-based automaton, going up to automata capable of processing Context-Sensitive languages (e.g.,  $A^nB^nC^n$ ). However, it has been claimed since the seminal work of Joshi (1985) that natural languages are Mildly-context sensitive (see also Uriagereka, 2008: 229, ff.; 2012: 231-232), meaning –among other things, see above– the dependencies that can be established are limited below a linear function of the input. If a structure like (17) was freely available for auxiliary chains, it would be a serious empirical challenge to the computational theory derived from Tree Adjoining Grammars, implying that there is at least one structure that goes beyond ‘mild’ context sensitivity. If we assume the dynamical approach to phrase markers developed in Krivochen (2015), according to which we can have not only computationally mixed strings, but also strings whose properties are even orthogonal to the Chomsky Hierarchy (see also Krivochen and Matlach, 2015), this is no problem, yet it deserves careful analysis.

There is a condition that seems inevitable for an instantiation of (17) to be an acceptable sentence: Aux3, which directly modifies V and is also structurally the closest one, *must* be a passive auxiliary. This is not a trivial requirement, that we will not discuss (but see Börjars et al., 1997 for some discussion).

In the following, we firstly show how the available theories for auxiliaries implicitly lead to a conclusion such as the one sketched in (7), due to their assumption that syntactic dependencies are uniform (X-bar theory being the clearest example of such a line of thought). On the contrary, we will advance the theoretical arguments put forth in Krivochen (2015) in favor of a *mixed* approach to phrase structure, and claim that any model that leads us *only* to *either* (7) *or* (15) should be replaced by a model that can generate both kinds of dependencies, plus the context-sensitive (17) with equal ease, and no added stipulations. We offer some arguments in favor of our analysis in Section 5.2. In order to distinguish between the two theories, we will refer to the traditional one, the one sketched in (7) as a strictly CUMULATIVE hypothesis (because functional information cumulates through the auxiliary chain). In addition to this, we reject the structural uniformity implicitly argued for in these models as long as they generate *either* dependencies like (7) *or* dependencies like (15), thus leaving data unaccounted for, since we would need at least both to achieve descriptive adequacy.

To conclude this section, let us say that the problem is not only that we are able to generate just one kind of dependencies, say (7) or (15). The problem is that, as we have shown, current theories about auxiliary verbs only predict the existence of internal dependencies of the kind of (7), where all the auxiliaries modify the auxiliary verb as a whole, and this, regardless of whether our theory allows us to generate monotonic dependencies as well or not. However, we have seen that (7) this is not always the case. Hence, we need (i) to go over the definition of auxiliary verb, and (ii) to adopt a mixed approach to phrase markers. In contrast with the cumulative theories, we will refer to the theory defended here as the DYNAMIC hypothesis, based on the mixed approach to phrase markers defended in Krivochen (2015), Krivochen and Schmerling (2015), see (14) above. Crucially, a dynamic approach properly contains all the dependencies generable by a strictly cumulative approach, and goes even further, by combining the computational dependencies in (7-17) and allowing free structure generation in a constraint-based architecture. We have called this approach

‘dynamic’ not only because there is no aprioristic structural template and the model generates different computational dependencies depending on semantic requirements, but also because the assignment of a structural description to a string is not deterministic and extemporary, but performed in real processing time. Here we will focus only on the former characteristic.

In the following we delve in the shortcomings of available theories when it comes to dealing with the data shown in this section.

### 3.2. Some problems with the CUMULATIVE approaches

Among the theories that address auxiliary verbs, we are interested in those that, either directly or indirectly, tackle the issue of the modification relation between the lexical and auxiliary verbs. In particular, we will briefly review the accounts that assume some version of Extended Projections (Grimshaw 1991), on the one hand; and the proposals regarding temporal chains (T-Chains), following Guéron and Hoekstra (1988), on the other. As we will see, both types of hypothesis derive incorrect predictions when it comes to account for internal dependencies within an auxiliary chain, as well as the meaning resulting from such chain.

Let us consider an example like (19) to examine this matter:

- (19) Van            a estar    siendo interrogados            durante toda la tarde.  
*Go.PRES.3PL to be.INF being interrogate.PTCP.PL. during all the afternoon*  
 ‘They will be interrogated the whole afternoon.’

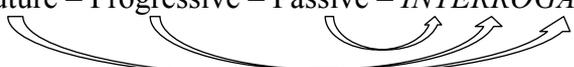
As we have seen, if an auxiliary verb is that which modifies a lexical or main verb (Zwicky 1993, *inter alios*), the following prediction with respect to auxiliary modification in the verbal domain can be derived straightforwardly:

- (20) a. In an auxiliary chain, intermediate auxiliaries are *transparent* for the purposes of modification by other auxiliaries.

Or, more formally,

- (20) b. In  $CH_{AUX} = \{\{Aux_1 \hat{\ } Aux_2, \hat{\ } \dots Aux_n\} VP\}$  intermediate auxiliaries (assigned an integer  $i$  such that  $n > i > 1$ ) are always *functors*, never *arguments* of an auxiliary *functor*.

What is claimed in (20) is independent from the possibility that either each auxiliary directly modifies the lexical V, as in (21):

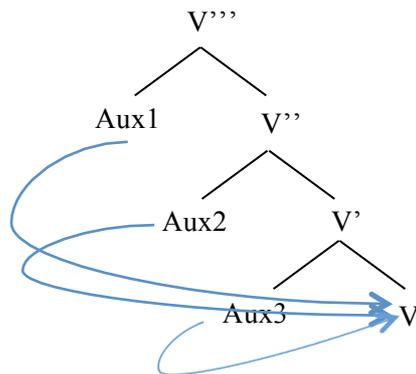
- (21) Future – Progressive – Passive – INTERROGAR
- 

Or that such modification should be indirect via feature percolation through the auxiliary chain, as in (22):

(22) Future – Progressive – Passive – *INTERROGAR*<sup>14</sup>

Within the Generative paradigm, (21) is the analysis derived from the proposals that represent auxiliaries as specifiers of the lexical verb (see discussion in Huddleston (1980), Schachter (1983) y Zagona (1988: ch. 2)). Except for the fact that the main verb was considered superordinate with respect to auxiliaries (which were thus considered subsidiary to it)<sup>15</sup> the idea that every auxiliary modify the main verb is perfectly represented in this approach:

(23)



In the previous section we pointed out that available theories about auxiliary modification effectively predict that what we get is, using the notation in (12):

(12)

*Output of Unification:*

(Aux<sub>1</sub>, Aux<sub>2</sub>, Aux<sub>3</sub>(VP))

Or, in ‘Merge’ terms,

Merge(Aux<sub>1</sub>, VP)

Merge(Aux<sub>2</sub>, VP)

Merge(Aux<sub>3</sub>, VP)

*Spell-Out:*

({Aux<sub>1</sub>, {Aux<sub>2</sub>, {Aux<sub>3</sub>, {VP}}}})

In this section we have added the proviso that analyses that rely exclusively on feature percolation mechanisms lead to a single kind of computational dependency (and thus to a single model of auxiliary modification), which we have illustrated in (8). We will now illustrate our claim.

<sup>14</sup> The representation in (22) must not be confused with (15): (15) sketches monotonic modification relations, whereas in (22) the arrows mean ‘feature percolation’ down the tree, such that what modifies [*interrogar*] is the result of cumulative downwards percolation from Future to Passive.

<sup>15</sup> In this case, it was assumed that the semantic dependency between the auxiliary and its argument was determinant when deciding the roles of verbal heads (as either functors or arguments). This explains the inversion of the relational functions, and the fact that the main verb took the functions of an auxiliary (and the auxiliaries took the functions of arguments). Obviously, what has changed is the approach, for the semantic dependency is inherent to the very nature of the auxiliary verb. On the nature of auxiliary verbs, as both syntactic heads and semantic functors see Zwicky (1993).

Feature percolation theories (among which the best known is Grimshaw's 1991 Extended Projection; but see also Abney's 1987 semantic domains, and Adger's 1994 aspectual chains) were conceived to account for the process via which a feature that is either high up or deeply embedded in the tree is still syntactically and semantically accessible for an operation triggered by an element outside the feature's domain. Thus, these theories predict that the relevant feature will reach the last element of the chain (in our case, the lexical verb), after going through the rest of intermediate elements, but without modifying them -the 'transparency' claim in (20)-.

Since (19), *Van a estar siendo interrogados toda la tarde*, constitutes an assertion about an event of interrogating someone, it is not entirely incorrect to claim that all the auxiliaries modify the event denoted by the main verb and its complements. Differently put, in (19) the state of affairs that is temporally localized is that which is denoted by the lexical verb [*interrogar*] and its VP projection (including its arguments):

(24)  $\exists(T) \mid T > u \ \& \ T(e) \ \& \ (\text{PROGR}(\sqrt{\text{ser-interrogado}}(e,y)))$

This means that, for examples of the kind of (8), *Va a haber sido asesinado*, 'He/She will have been murdered', (20) holds. The predictions derived from a strict percolation account are, however, utterly incorrect when it comes to accounting for the meaning of a sentence like (25):

(25) Hemos            tenido        que enviar    refuerzos.  
*Have.PRS.IPL have.PTCP that send.INF reinforcements*  
 'We have had to send reinforcements.'

in which it is evident that what is temporally localized in the past is not the event of sending reinforcements, but the need to do so. The pair (13a) and (13b), repeated here as (26a) and (26b), provides further evidence:

(26) a. Juan tiene que estar    trabajando en la biblioteca.  
*John has that be.INF working    in the library*  
 'J. has to be working in the library.'  
 b. Juan está teniendo        que trabajar    en la biblioteca.  
*John is have.PROGR that work.INF in the library*  
 'J. is having to work in the library.'

Recall that, against what is predicted by feature percolation and extended projection theories, (26a) and (26b) are not synonymous, since in (26b) the progressive only affects the modal auxiliary, but not the lexical verb. However, within a model based on structural uniformity and extended projections (in the Grimshaw-Abney sense), intermediate auxiliaries are not affected, a claim we made explicit in (20b), repeated here:

(20) b. In  $\text{CH}_{\text{AUX}} = \{\{\text{Aux}_1 \wedge \text{Aux}_2, \dots, \text{Aux}_n\} \text{VP}\}$  intermediate auxiliaries (assigned an integer  $i$  such that  $n > i > 1$ ) are always *functors*, never *arguments* of an auxiliary *functor*.

That is, according to (20b), *tener* in (26b) cannot be affected by the progressive, and a theory in which features percolate (or form smaller chains by identification of

the denotative argument until reaching the main verb, as in Adger (1994)), directly yields the prediction that the lexical verb will be interpreted as in (26a). In other cases, lack of explicitness in the formulation of the theory prevents us from deriving any kind of predictions, as is the case of Svenonius' (1994) head-chains approach, for it is only pointed out that in a relation of morphological dependencies between functional and lexical elements in the verbal domain, each head successively selects the next one, until reaching the lexical verb. In this way, in [*has gone*] 'the auxiliary *have* will simply license a certain value for Aspect, and Aspect will in turn exert influence over the lower VP', without it being specified what 'exert influence' means, or in which cases (if any) this succession can be interrupted.

Surprisingly, as a matter of fact, we can conclude that in this respect the proposals stemming from a Generative perspective have represented neither a significative advance nor a substantial differentiation from functionalist analyses, beyond the condition that each auxiliary heads its own projection. In non configurational approaches, mainly in functional frameworks, auxiliaries and main verb are said to form a complex predicate, "a cluster of syntactic, semantic, and morphosyntactic features" (Anderson 2006: 7), whose head is determined accordingly to various criteria (see Anderson 2006: 21-25), among which being the locus of inflection seems to be the preferred one along with being the carrier of the semantic content. See also Brown *et alii* (2012: 261-263), and for Spanish in particular Gómez Torrego (1999: 3346-3347) and Fernández de Castro 1999:16, 138-139). Thus, (19) would be represented in these frameworks as in the phrase marker (27):<sup>16</sup>

- (27) [<sub>V</sub> Van-a<sub>Aux1</sub> +    estar<sub>Aux2</sub> + siendo<sub>Aux3</sub> + interrogados<sub>Head</sub>]  
       *go-to.PRES.3PL be.INF    being            interrogate.PTCP*  
       *durante toda la tarde.*  
       *during all the afternoon*  
       'They will be interrogated the whole afternoon.'

Observe that both configurational and non configurational analyses led to the same two conclusions: (i) auxiliary verbs are treated as if they were inflectional affixes, and (ii) internal dependencies among auxiliary verbs are largely left unanalyzed. It seems to us that the focus is set on the morphological side of periphrases, while their syntax and semantics are left unaccounted for.<sup>17</sup>

In the light of the previous discussion, *strictly* (i.e., linear) cumulative theories make wrong predictions with respect to the possible dependencies between auxiliaries in a chain, limiting possibilities to (7). This, however, does *not* mean cumulative modification is *never* the case, for we can establish a local domain in which cumulative theories actually work, but we add the proviso that a theoretically elegant and empirically adequate approach to auxiliary chains should be able to generate all attested modification patterns, which, we claim, is only possible if we relax the structure uniformity argument (see Culicover and Jackendoff, 2005 for more

<sup>16</sup> In Rizzi (1976, 1978) it is explicitly argued that after a restructuring process the restructuring verb and the main verb form a verbal complex, as in (27). For syntactic arguments against Rizzi's verbal complex analysis, see Cinque (2004: 13-17). In Rosen (1990) restructuring verbs are said to form a complex predicate with the main verb by sharing the argument structure. We are not dealing with this issue here.

<sup>17</sup> There have been also at least two attempts to treat the combination of an auxiliary verb and a main verb as a prosodic unit. See Matthew (1979: 178-179) and Schmerling (1983). Auxiliaries being functional categories, prosody should be taken into consideration without any doubt. We leave this question open for further research.

arguments against an aprioristic structural uniformity approach). The establishment of such domains, however, depends on dynamic considerations, at the levels of both syntax and semantics. The size and number of these local domains is determined, we argue, by the class of the auxiliaries that form the chain,<sup>18</sup> that is, it depends on whether they belong to the class of the *functional* auxiliaries or to the class of the *lexical* auxiliaries. Before presenting our analysis in Section 4 below, we will briefly go over Guéron and Hoekstra's (1988) theory.

### 3.3 Problems with Guéron and Hoekstra's (1988) 'Temporal Chains'

In this section we will revisit Guéron and Hoekstra's (1988) proposal about 'temporal chains' (T-chains). Guéron and Hoekstra theory is, to the best of our knowledge, the only one that explicitly divides the class of the auxiliary verbs into two different classes, and derives some general consequences from the distinction.

As we will see, even though the problems it proposes are somewhat different, the T-chain hypothesis leads to the same conclusion than strictly cumulative approaches namely, that only the lexical verb is susceptible of modification by the successive auxiliary verbs. The former is different from the latter, however, insofar as it addresses a much larger number of auxiliary verbs including modals, which allows the theory to take into consideration these verbs' variable behavior.

Thus, according to Guéron and Hoekstra, auxiliary verbs are separated in two classes: *Temporal Auxiliaries* or *T-Auxiliaries*, and *Neutral Auxiliaries*, depending on whether they can T-mark their complement, the VP headed by the lexical verb, as in (28):

- (28) a. A *T-Auxiliary* assigns a T-role (Tense role) to its complement; a *Neutral Auxiliary* does not.  
 b. A *Neutral Auxiliary* combines with the T morpheme of its complement [the VP] to form a complex tense morpheme defining the tense of S.  
 c. A *T-Auxiliary* governs a VP with an independent tense morpheme.  
 (Guéron and Hoekstra 1988: 47, ex. (32))

In the view of these authors, the composite tenses auxiliary *haber* is a *neutral auxiliary* (28b), whereas the passive auxiliary *ser* is a T-auxiliary, as it has no T specification of its own (28c).

A T-chain is defined as in (29) (Guéron and Hoekstra 1988: 79):

- (29) A T-Chain defines a tense domain.  
 And a tense domain is the domain that configures the tense of a clause.

It is interesting to cite here –for it is presented with some detail– how a T-chain (and, by extension, a tense domain) is configured, according to these authors:

As auxiliary verbs have no referential value, they cannot function as semantic head of VP and consequently cannot integrate the T-index. An auxiliary verb passes the T-index on to the VP it governs. This process is repeated until the index is absorbed by a lexical verb. (Guéron y Hoekstra 1988: 73)

Schematically:

<sup>18</sup> Something already advanced in Carlson (1983), although he didn't contemplate the possibility of a dynamic account.

(30)  $T^k - [\text{aux}^k]^* - [\text{VP}^k V^k]$

As can be seen, the T-Chains (1988) hypothesis yields, for root modals (deontic and dynamic), and verbs like *acabar de* (in its ‘recent past’ reading), and *soler* exactly the opposite of what actually happens, for these verbs have the capacity of absorbing the temporal and aspectual information conveyed by preceding auxiliaries in a chain. This is precisely what was shown in (25) and (26) for *tener que* ‘to have to’ and in (16) above for *soler*. With respect to *tener que*, recall that in (25) what gets localized in time is the content of the modal, and *not* the event denoted by the lexical verb. Otherwise, we would expect no contrast between the pair in (26), repeated here for ease of reference:

- (26) a. Tiene que estar trabajando en la biblioteca.  
 ‘J. has to be working in the library.’  
 b. Está teniendo que trabajar en la biblioteca.  
 ‘J. is having to work in the library.’

According to the T-chain proposal, what would be located in time would be the lexical verb *trabajar* in both (26a, b), because it is the element that absorbs temporal information.

It is evident as well that in (16), repeated below as (31), what is located in a moment previous to that of the utterance is not the event of working –or even start working–, but the ‘macro-event’ consisting on *the habit of being able to start to work late*, and which is introduced by the verb *soler*, as is made explicit in (32):

- (31) Juan **solía** **poder** **empezar** a trabajar.  
*John AUX.HAB.PST.IPFV.3SG be-able.INF start.INF to work.INF*  
 tarde.  
*more late*  
 ‘J. would be able to start working later.’

(32)  $\exists(T) \mid T < u \ \& \ T(e) \ \& \ (\text{HAB} (\text{MOD}(\text{INCH} (\text{trabajar-tarde} (e,y))))$  [for T a time *specification*, *u* the utterance time, *e* an event, ‘<’ previous to]

As far as the composite tenses auxiliary *haber* is concerned, the T-chains theory is not adequate either. Guéron & Hoekstra (1988) assert that this verb introduces a tense that, together with that of the VP configure a complex tense, which reminds us of the analyses that reproduce syntactically the temporal structures of Reichenbach, such that each node corresponds to S(peech Time), R(eference Time), and E(vent Time). In this particular case, R corresponds to *haber*, and E to VP. Apart from the problems that Reichenbach’s model poses in and of itself, it is evident that Guéron and Hoekstra’s (1988) model is formulated to syntactically reflect the difference between composite and non-composite tense (which is supposed to yield different specific syntactic behaviors) *a posteriori*. We also consider it contradictory to assert *both* that an auxiliary verb lacks referential content (and thus cannot absorb tense, as seen in (29) and its corresponding discussion) and at the same time that *haber* is a neutral auxiliary with its own temporal specification. This distinction seems to us to be arbitrary insofar as it is subordinated to the morphological nature of *haber* as part of a composite tense. We do want to stress, however, that the T-chain proposal is the only

attempt, apart from Rivero (1994), which proposes to differentiate between two general classes of auxiliaries (Zagona, 1988, for instance, only focuses on *haber* and *ser*). This is an interesting idea we will develop in the next section, with the rest of our proposal.<sup>19</sup>

#### 4. Our Proposal

##### 4.1. A Dynamic Account: The Split Hypothesis

In this work we will propose as the decisive criterion to differentiate between *lexical* and *functional* auxiliary verbs the capacity to ‘absorb’ temporal and aspectual information, or, on the contrary, to introduce it. We thus formulate the difference between lexical and functional auxiliary as follows:

(33) In a chain of auxiliaries  $CH_{AUX} \{ \{x \wedge y \wedge z \dots n\} \wedge VP \}$  as defined in (5)

- (i) LEXICAL AUXILIARY VERBS absorb the temporal and aspectual information.
- (ii) FUNCTIONAL AUXILIARY VERBS contribute the temporal and aspectual information.

That being an auxiliary verb is a matter of gradience is something widely acknowledged, mostly among functionalists (see Anderson 2006: 3); within the generative tradition the category “semi-lexical” verb has been proposed in order to give account of verbs which share properties with both lexical verbs and auxiliary verbs (see, among others, Cardinaletti and Giusti 2006 and Emonds 2006). Our proposal allows us to take into consideration the existence of different patterns (i) of internal dependencies among auxiliaries, and consequently (ii) of dependencies with respect to the main verb, a possibility that is lacking in the aforementioned classifications.

Going back to (33), it could be said that lexical auxiliaries behave as ‘opaque’ auxiliaries, while functional auxiliaries are ‘transparent’ to the effect of allowing grammatical information to pass through (as in (20)), without in any case implying that ‘transparent’ should be equated to ‘meaningless’. Thus, we will equate the labels of *functional* and *transparent* on the one hand, and *lexical* and *opaque* on the other. The idea we put forth here is that the verbs we shall call *functional auxiliaries* have no denotation, but only grammatical meaning<sup>20</sup>; we include in this category Spanish auxiliaries of (external) Aspect, Tense, and Voice. Lexical / opaque auxiliaries, on the contrary, have denotation, and therefore they are modified by the auxiliaries appearing to their left.

The statement in (33) allows us, as expected, to account for those cases in which a lexical auxiliary is localized by a functional auxiliary, as well as those cases in which only functional auxiliaries appear. (26b) is an example of the former scenario, in which –as shown in (34), what is modified by the aspectual auxiliary is the modal:

(26) b. Está teniendo      que trabajar    en la biblioteca.

<sup>19</sup> There is a related proposal, due to Falk (2003, 2008). Although we share with this author the same insight regarding the need for distinguishing between at least two kinds of auxiliaries, our aims are still different since we analyze the consequence of such a split in the light of its consequences for the overall system of internal dependencies among auxiliaries.

<sup>20</sup> This is a label and a definition in and of itself, and thus we do not claim that ‘functional’ *has* to have this meaning.

*is have.PROG that work.INF in the library*  
 ‘He/She is having to work in the library.’

(34)  $\exists(T) \mid T \in u \ \& \ T(e) \ \& \ \text{PROGR}(\text{N}(p))$

Contrastingly, (19) is an example of the latter case. Here, it is the event introduced by the lexical verb (plus its complements) that gets modified by temporal and aspectual information, as shown schematically in (35):

(19) Van a estar siendo interrogados durante toda la tarde.  
*go.PRES.3PL to be.INF being interrogate.PTCP during all the afternoon*  
 ‘They will be interrogated the whole afternoon.’

(35)  $\exists(T) \mid T > u \ \& \ T(e) \ \& \ (\text{PROGR}(\sqrt{\text{ser-interrogado}}(e,y)))$  [for > ‘posterior to’]

A dynamic approach requires us to re-think naïve notions of modification, which are often related to proposals sensitive to linear order rather than semantic scope or structural conditions. In this sense, and within  $\text{CH}_{\text{AUX}}$ , an auxiliary is a terminal that can be a functor *as well as* an argument (as long as they take an argument themselves); a lexical verb *cannot* be a functor. The first clause allows for the presence of *lexical auxiliaries*, for which the transparency hypothesis (20) does not hold (call them ‘opaque’), but they *must* take scope over a VP argument. VPs cannot take other VPs as arguments, which makes for a neat distinction between lexical auxiliaries and lexical verbs (notice that in the case of periphrastic causative constructions, of the kind [make + V], involve a functional  $v$  head taking a VP complement). Notice that the distinction makes no reference to the relative place of auxiliaries and ‘auxiliees’ in the linearity, but *within a structure of predication*. Schematically,

(36) For  $f(g)$ ,  $g = g(x)$  within clause boundaries:

$f$  is a functional auxiliary

$g$  is a lexical auxiliary or a functional auxiliary

$x$  is a VP

We also assume that, since lexical auxiliaries are opaque in the sense that (20) does not hold, a lexical auxiliary does not take a functional auxiliary as its argument, for the lexical auxiliary blocks the information flow through the structure. However, since functional auxiliaries are transparent, they can take either other functional auxiliaries or a lexical auxiliary as a complement.

Note that the fact that functional auxiliaries localize both lexical verbs as well as lexical auxiliaries results in a derivational rhythm of the following kind (we use the \* with the same meaning as in Rizzi, 1997, namely, that the nodes can iterate):

(37) [Functional Aux\* [Lexical V / Lexical Aux [...Lexical V]]]

This rhythm is not accidental: it derives, quite independently, from separate considerations. On the one hand, it goes as back as Bally’s (1932) distinction between

*dictum* and *modus*, for functional auxiliaries belong to the *dictum*, anchoring the verbal root in time and expressing the speaker's perspective over the event; whereas lexical auxiliaries can close a proposition by introducing a subjective perspective in epistemic or deontic terms, as in the case of modals. More generally, since they absorb whatever information is being passed down the chain, lexical auxiliaries can be said to close domains, rendering the structure they have scope over opaque for the purposes of further auxiliary modification: no inner probing is allowed, but crucially, this renders the domain modifiable by further functional auxiliaries. Let us delve a little bit further with modals. If we assume, with Generative Semanticists, that VPs and S' (nowadays, CPs, or extended ModP) are propositional in nature (a claim that has also been adopted by those working in Phase Theory, a revamped Barriers framework stemming from Chomsky, 2000) it is to be expected that lexical auxiliaries close domains for the purposes of functional modification just like lexical verbs do. Needless to say, this does not imply that lexical auxiliaries are to be assimilated to lexical verbs, for if both are present, lexical auxiliaries are higher in the 'tense absorption' hierarchy. That is, if T is to be synthetically expressed, prefer a lexical auxiliary before a lexical verb. T inflection in the lexical verb would be a sort of 'last resort' for those cases in which there is no other, syntactically higher, element that can express T morphology.

If our reasoning goes along the right lines, Spanish auxiliary verbs are to be divided in two groups: one with purely (or essentially) grammatical meaning, and other in which lexical content interrupts the chain insofar as it 'blocks' or 'prevents' the semantic relation between a preceding auxiliary and a following verb, be the latter an auxiliary or a lexical verb. We thus say that the former group is *transparent*, whereas the latter is *opaque*. This implies a completely different vision of auxiliary chains and auxiliary relations from what is customarily assumed: an auxiliary chain need not necessarily be a set of verbs that modify another one occupying the last (i.e., rightmost) position and which is an argument. The concept of 'auxiliated verb' cannot be defined considering only the positional criterion, either in the linearity or in a tree-like hierarchical representation which is subsumed to the narrow anti-symmetry constraints, for we have argued (and provided evidence) in favor of a dynamic definition at the syntax-semantics interface. Moreover, the very concept of 'auxiliary verb' must be revisited, as it is possible that the same element is representationally both functor and argument, albeit for the purposes of different computations.

The difference between *transparent* and *opaque* auxiliaries is based on the fact that the latter convey a certain lexical meaning that is susceptible to be located temporally and/or receive aspectual modification. It could be thought that our distinction results *ad hoc* and that we claim, circularly, that an auxiliary is lexical because it absorbs the information of a preceding functional auxiliary, and that this absorption takes place precisely because it is a lexical auxiliary. In the following section we will show that there is independent evidence for our distinction, stemming from an analysis of modal auxiliaries. We shall see that it is logical that it should be possible to determine the time lapse for which necessity or possibility holds.

#### 4.2. Some facts about modal auxiliaries

It is a usual claim to make about modal auxiliary verbs that they are stative. This observation, which is utterly commonsensical, rests on two arguments. The first one is semantic: modal auxiliary verbs are represented in logic by means of two constants, 'it is possible' and 'it is necessary' (see Falk 2008: 882). These two glosses contain a nominal predicate ('possible'; 'necessary') and a copula ('is'), such that it is

absolutely natural that it should be claimed that they are stative predicates, although the existing literature does not fully acknowledge the consequences of such a claim.

From a syntactic point of view, modal verbs share some of the properties that have been proposed as prototypical for stative predicates. Of those, the most salient in our opinion, is the almost absolute impossibility of having an imperative form:

- (38) a. \*Puede hacer=lo tú.  
*be-able.IMP.2SG do.INF=ACC.3SG you.NOM.2SG*  
 Intended: \*‘Be able you to do it.’  
 b. \*Ten que pagar tú.  
*have.IMP.2SG that pay.INF you.NOM.2SG*  
 Intended: \*‘Have you to pay.’

It is necessary to point out, although briefly, that it has been noted that certain stative predicates may not show this constraint:

- (39) a. Sé bueno.  
*be.IMP.2SG good*  
 ‘Be good.’  
 b. Ten amigos para esto.  
*have.IMP.2SG friends for this*  
 ‘Have friends for this.’  
 c. Esta=te quieto.  
*be.IMP.2SG=REFL.2SG quiet*  
 ‘Be quiet.’

The acceptability of the examples in (39) can be easily explained. In (39a) and (39b) we find imperative morphological forms, but they do not constitute orders: in (39c), on the other hand, the subject controls the action. Interestingly, imperative forms of modal verbs display this property more clearly than other stative predicates.

The impossibility for a modal verb to have an imperative form excludes modal verbs to appear in subjunctive mood, subordinated to a *verbum dicendi* unless under the scope of negation. But let us proceed step by step. In the first place, note that it is evident that subjunctive auxiliary verbs are not excluded *per se*, for there is no known grammatical rule that predicts this fact:

- (40) a. Aunque Juan **podiera** fumar, no lo haría.  
*even John can.SBJV.PST.3SG smoke.INF not ACC.3SG do.PST.IPFV.3SG*  
 ‘Even if J. could smoke, he would not do it.’  
 b. Aunque Juan **tuviera** que trabajar, no lo haría.  
*even John have.SBJV.PST.3SG that work.INF not ACC.3SG do.PST.IPFV.3SG*  
 ‘Even if J. had to work, he would not do it.’

However, contrast the grammaticality of examples in (41) with the crashingly bad examples in (42):

- (41) a. Juan le dijo que se rindiera.  
*John DAT.3SG told that REFL surrender. SBJV.PST.3SG*  
 ‘J. told him/her to surrender.’  
 b. Juan le ordenó que saliera.

- John DAT.3SG ordered that go-out. SBJV.PST.3SG*  
 ‘J. ordered him/her to go out.’
- (42) a. \*Juan le        dijo que pudiera                rendir=se.  
*John DAT.3SG told that can.SBJV.PST.3SG surrender=REFL*  
 Intended: \*‘J. told him/her that he/she could surrender.’
- b. \*Juan le        dijo que tuviera                que salir.  
*John DAT.3SG told that have.SBJV.PST.3SG that go-out*  
 Intended: \*‘J. ordered him/her that he/she had to go out.’

From our perspective, the ungrammaticality of the examples in (42) can be accounted for straightforwardly: modal verbs have no imperative, and the embedded clauses in (41) and (42) are imperative noun clauses (strange though the notion might seem). The only way of getting an embedded subjunctive modal verb is under the scope of negation, as in (43) –but in this case, as has been repeatedly noted in the literature, the contribution of the subjunctive is utterly different from (41) and (42):

- (43) a. Juan no le        dijo que no pudiera                fumar, sino que  
*John not DAT.3SG told that not can.SBJV.PST.3SG smoke but that*  
 tenía                que hacer=lo                en el jardín.  
*have.PST.IPFV.3SG that do.INF=ACC.3SG in the garden*  
 ‘John didn’t tell him/her that he/she couldn’t smoke, but that he/she had to do it in the garden.’
- b. Juan no le        dijo que tuviese                que salir, sino que  
*John not DAT.3SG told that have.SBJV.PST.3SG that go.out but that*  
 no podía                hablar        durante el concierto.  
*not can.PST.IPFV.3SG talk.INF during the concert*  
 ‘J. didn’t tell him/her that he/she had to go out, but that he/she shouldn’t talk during the concert’.

The stative character of modals has been appealed to in order to account for certain violations of the obviation principle in which the joint contribution of passive voice and the modal avoid the conflict –in our opinion, semantic rather than syntactic, as suggested by Quer (1998: 51). In effect, if we compare (44a), which displays a violation of the obviation principle, with (44b), which is acceptable for many speakers, we could blame the amendment of the conflict between agents that arises in (44a) on the stativity of the modal, and the passive:

- (44) a. \*pro<sub>i</sub> Quisiera                que pro<sub>i</sub> llegara                a ser    prior  
*want.PST.SBJV.ISG that arrive.PST.SBJV.ISG to be.INF prior*  
 del    monasterio.  
*of-the monastery*  
 Intended: ‘I would want that I could get to be prior of the monastery.’
- b. pro<sub>i</sub> Quisiera                que pro<sub>i</sub> pudiera                ser    recordado  
*want.PST.SBJV.ISG that can.PST.SBJV.ISG be.INF remember.PTCP*  
 únicamente por mis buenas obras.  
*only for my good deeds*  
 ‘I would want that I could be remembered only for my good deeds.’

This situation holds for temporal clauses introduced by *antes* –before-, which has been rarely pointed out in the relevant literature:

- (45) a. *pro*<sub>i</sub> Me        fui                    antes de que *pro*\*<sub>i</sub> hablase.  
           REFL.ISG go.PST.PFV.ISG before of that        talk.SBJV.PST.ISG  
 Intended: ‘I left before that I spoke.’
- b. *pro*<sub>i</sub> Me        fui                    antes de que *pro*<sub>i</sub> pudiese                    hablar.  
           REFL.ISG go.PST.PFV.ISG before of that        can.SBJV.PST.ISG talk  
 Intended: ‘I left before I could speak.’
- c. *pro*<sub>i</sub> Me        fui                    antes de que *pro*<sub>i</sub> fuera  
           REFL.ISG go.PST.PFV.ISG before of that        be.SBJV.PST.ISG  
 interrogado.  
           interrogate.PTCP  
 Intended: ‘I left before I was interrogated.’

Note that in (45a) it is impossible to have both subjects bearing the same index, whereas that is possible in (45b) and (45c) it is indeed possible; (45b) displays a modal auxiliary, and (45c), a passive auxiliary.

Accepting the claim that modals are stative, the issue is now to go deeper into the implications of this assertion. From our perspective, asserting that modals are stative amounts to asserting that they denote an event in Vendlerian terms (that is, without opposing states to events, but rather including them; this is a terminological problem, and, thus, not quite relevant). This means that a modalized proposition includes two events: the event denoted by the main verb and the event denoted by the auxiliary verb (we shall not delve into the issue that modality can be expressed by other means). This claim coincides with the classical logic view, according to which modal operators are logical constants that, when modifying a proposition, introduce another proposition.

It can also be claimed that modal verbs in their deontic interpretation introduce an independent event from the one denoted by the main verb. This can be said to hold because adverbial modification by *otra vez* -again- yields different interpretations depending on whether it affects the main verb or the modal (Wurmbrand 1998: cp. 5):

- (46) a. Juan otra vez puede llegar tarde.  
           John another time can.PRS.2SG arrive.INF late  
           ‘J. again can arrive late.’
- b. Juan puede llegar tarde otra vez.  
           John can.PRS.2SG arrive.INF late another time  
           ‘J. can arrive late again.’

As can be seen, (46a) generates the presupposition that there is a previous situation consisting on Juan having permission to arrive late, without it being the case that he should have arrived late in another occasion; (46b) presents a situation in which what has previously been the case is the event of Juan arriving late (the reading in (46a) is still there, but is not relevant).

As a conclusion of this section, let us recall that we have divided auxiliary verbs in *functional* and *lexical*, and we have shown that this division is backed up by facts which hold independently from auxiliary chains.

### 5. The question of the first auxiliary inflection and its relevance for the lexical / functional distinction

We have seen that the cumulative hypothesis treats auxiliary verbs as if they were inflectional affixes for all syntactic purposes. However, first-position auxiliaries, just like lexical verbs, can be inflected themselves. If we claim that in an inflected lexical verb like *comió* (*ate*) there are two kinds of information, that provided by the root [*com-*] and that provided by the desinence [*-ió*], *mutatis mutandis*, we should also claim that in *debió* (*must<sub>PastPerf</sub>*) there are also two kinds of information, that provided by [*deb-*] and that provided by [*-ió*]. The question is, what does the desinence in inflected auxiliaries modify, or, more specifically, what *event* is modified by the temporal and aspectual information of an inflected auxiliary.

Let us consider an example:

- (47) Fue asesinado ante la estatua de Pompeyo.  
*be.PST.PFV.3SG kill.PTC-M in-front-of the statue of Pompey*  
 ‘He was killed in front of Pompey’s statue.’

In this case it is evident that it is not the passive that is located in time (which would make no sense), but the event denoted by *asesinado* (*killed*). That is, the passive auxiliary behaves *transparently* with respect to temporal inflection, in the sense that tense goes right through it to get to the lexical verb, just as it would happen if tense was analytically expressed by means of the future auxiliary *va a* (an irregular inflected form of *ir a*):

- (48) Va a ser asesinado ante la estatua de Pompeyo.  
*go.PRS.3SG to be.INF kill.PTCP-M in-front-of the statue of Pompey*  
 ‘He is going to be killed in front of Pompey’s statue.’

We would expect that *opaque* auxiliaries should behave differently. Let us consider the following examples:

- (49) a. Puede hacer=lo.  
*can.PRS.3SG do.INF=ACC.3SG*  
 ‘He/she may do it.’  
 b. El verano tarda en llegar este año.  
*the summer take-long-time.PRS.3SG in arrive.INF this year*  
 ‘The summer is delayed this year.’

Note that in (49a) what is asserted in the present is the possibility that someone should do something, and not the event of doing it. Thus, the present tense information affects the modal, but not the lexical verb. In (49b) it is also evident that what is asserted about someone or something is that it is delayed, crucially not that he/she/it arrives, quite on the contrary. That is, lexical auxiliaries are also opaque with respect to temporal inflection. This is in fact what we would expect following the lines of what we have exposed in connection to the Split Hypothesis, if we assumed (following standard practice) that tense is a functional category that heads its own projection.

Last but not least, we can ask about those auxiliaries that necessarily appear in first position: *Soler*, *haber de*, *ir a* y *acabar de*. Let us consider (50):

- (50) Juan suele                      desayunar                      con su madre.  
*John AUX.HAB.PRS.3SG have-breakfast.INF with his mother*  
 ‘J. often has breakfast with his mother.’

In this example, as was to be expected, temporal inflection locates the *habit* of having breakfast with his/her mother, not its concrete realization in a particular event. That is, from (50) we cannot conclude that, at the moment of utterance, the person is effectively having breakfast with his/her mother.

We have three first position auxiliaries left: *haber de*, *ir a* y *acabar de*. The first one is a modal, thus (by virtue of being a lexical auxiliary), temporal inflection only affects itself, as in (49a):

- (51) Ha                      de hacer=lo                      mañana.  
*have.PRS.3SG of do.INF=ACC.3SG tomorrow*  
 ‘He/she has to do it tomorrow.’

It must be noted that the fact that [hacerlo] is modified by the adverb [mañana] clearly shows that the present tense inflection does not affect it. In (51) it is asserted that there exists (in the present with respect to the utterance point) the deontic obligation for him/her to do something the next day.

We are thus left with two auxiliary verbs: *Ir a* and *acabar de*. Interestingly, both can be classified as temporal auxiliaries, and, if we consider that they are directly inserted in the tense head (i.e., the head of TP), the question of whether they are opaque or not does not beg. As a matter of fact, we can claim that their obligatoriness to appear in first position derives naturally from their being temporal auxiliaries, just like English ‘will’. We thus say that *those verbs do not inflect, but rather, they are inflectional elements*.

Taking into account that *soler* and *haber de* are opaque since they absorb temporal information, and *ir a* and *acabar de* (in its ‘recent past’ reading) are temporal auxiliaries themselves, we can elaborate the following classification:

Table 1. Classification of auxiliaries

| Not affected (by virtue of being temporal information themselves)   | Transparent / functional   | Opaque / Lexical   |
|---|--|--|
| <i>Ir a</i> (Eng. <i>be going to</i> ), <i>acabar de</i> (in its ‘recent past’ reading, Eng. <i>have just -ed</i> ) | Progressive <i>estar</i> ‘to be’, passive <i>ser</i> ‘to be’, perfective <i>haber</i> , Eng. <i>have -ed</i> . | Phasals, second-position modals, scalars, first-position auxiliaries ( <i>soler</i> , <i>hab aux</i> , <i>haber de</i> ‘have to’), <i>tardar</i> ‘take long time’. |

## 6. Conclusions

We can consider now the following four conclusions: the first one, that it is necessary to distinguish between two kinds of auxiliaries, *lexical* and *functional*. The second one, that some auxiliary verbs can also be ‘auxiliated’: such is the case of those we have called ‘lexical’ auxiliaries. The third one is that the concept of ‘auxiliated’ element (or ‘argument’) cannot be solely defined by reference to a positional criterion, but the concept of ‘auxiliary’ can (as seen in (6)). While it is true that in an auxiliary chain the lexical verb may just be modified by the auxiliary

immediately left-adjacent to it, it is also true that that may be the only auxiliary the lexical verb is modified by (if the relevant auxiliary is opaque). The fourth, and final, conclusion is that auxiliaries can be defined by reference to position: in a periphrastic construction that contains an auxiliary chain, every bond but the rightmost one is an auxiliary, even though some of those auxiliaries can be arguments of other auxiliaries themselves. More generally, this paper extends the idea of a dynamic computational system, which is sensitive to the semantic of the units involved in operations (something that was already implicit in works like Carlson, 1983; more recently, problematized in Lasnik, 2011 under strictly computational assumptions); without such a system, the differences between the classes of auxiliaries we have distinguished could not be implemented in a theory of grammar.

Ana Bravo  
Departamento de Lengua Española y Lingüística General  
Universidad de Murcia  
Campus de la Merced  
c/Santo Cristo, 1  
30001 Murcia  
Spain  
<ana.bravo@um.es>

Luis García Fernández  
Departamento de Lengua Española I y Teoría de la Literatura  
Facultad de Filología – Edificio D  
Universidad Complutense  
Avda. de la Universidad Complutense, s/n  
28040 Madrid  
Spain  
<luis.garcia@filol.ucm.es>

Diego Gabriel Krivochen  
Center for Integrative Neurosciences and Neurodynamics  
School of Psychology and Clinical Language Sciences  
University of Reading  
Whiteknights Road, Earley Gate  
RG6 6AL Reading  
United Kingdom  
<d.g.krivochen@pgr.reading.ac.uk>

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