X-within-X Structures and the Nature of Categories

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This paper discusses the existence of X-within-X structures in language. Constraints to same-category embedding have been the focus in a number of recent studies. These studies follow a long-standing tradition in linguistic theory that assumes a ban on the adjacency of same-category elements. In the present work, data drawn from a typologically broad variety of languages suggest that the postulated constraints are not so robust. It is shown that X-within-X structures do exist in language. In this context, an argument is made in favor of an unrestricted conceptualization of Merge, independent from category distributions, while recursion is taken to be a property of procedures and not of structures. The discussion of X-within-X patterns provides insights with respect to the attested category distributions, the nature of categories, and the language faculty, from a biologically plausible point of view.

1.   Introduction

The nature of recursion in language is a topic frequently addressed in recent linguistic theory across different frameworks. Linguistic recursion, "the foundational linguistic universal" (Watumull *et al*. 2014), is defined as the ability to generate an infinite set of hierarchically structured expressions by iteratively using operations in syntax. This ability has been at the core of many heated linguistic debates and has received attention from a variety of disciplines and points of view (e.g., Hauser *et al*. 2002, Pinker & Jackendoff 2005, Fitch *et al*. 2005, Jackendoff & Pinker 2005, Chomsky 2008, Fitch 2010). Long before Hauser *et al*. (2002) revived interest in recursion, restrictions on the elements that Merge puts together have been discussed in a number of studies from the perspective of a

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well-formedness condition that precludes adjacency of same-category elements in order to avoid a linearization crash (Perlmutter 1971, Ross 1972, van Riemsdijk 1998, and, more recently, Grohmann 2000, Richards 2010).

The nature of the ban is not syntactic per se; as Manzini (2014) notes, the anti-identity condition in syntax has parallels in phonology and morphology. Lohndal & Samuels's (2014) conclusion is similar: "[N]on-distinctness is dispreferred across various linguistic domains, though the levels at which it is disallowed may vary from language to language" (p. 79). The present work is precisely an exploration of how non-distinctness is manifested across various spoken and sign languages. In the syntactic domain, Richards's (2010) formulation of the condition on linearization called *Distinctness* argues that "if a linearization statement <a, a> is generated, the derivation crashes". Discussing this condition, Alexiadou (2011, 2014a) correctly observes that Richards's exploration of different ways of reaching Distinctness raises concerns as to why morphological richness would affect syntax. In Alexiadou's (2011) words, "[t]his is especially unexpected under views according to which morphology merely interprets syntax" (p. 2).

Arsenijević & Hinzen (2012) discuss category distribution and argue that direct category embedding—not mediated by other categories—of a syntactic category X to another element of the same category X (henceforth, X-within-X or [XX]) is "surprisingly rare in human language" (p. 423), and possibly not existent at all. They approach counter-examples of X-within-X recursion of lexical categories, such as noun–noun compounds like $[_N [_N [_N [_N war_N film_N] studio_N]$ committee$_N]$ session$_N]$, by noting their counter-cyclic, 'anti-recursive' derivation, adopting the analysis in Roeper & Snyder (2005). Crucially, the absence of X-within-X with respect to functional categories is explicitly predicted, in line with claims in previous literature: In their words, "[e]mpirically speaking, counterexamples, which would involve adjacent articles (*the a book*) […] are not found in human language" (Arsenijević & Hinzen 2012: 425) and this absence carries, according to the authors, important implications for the nature of phasehood and cyclicity which bans unmediated X-within-X recursion in language.

In this context, it seems that the effort to lift combinatorial restrictions that predict the absence of X-within-X patterns is of key importance to linguistic theory because such a task is essentially an inquiry into the innately unconstrained nature of the combinatorial operation that lies at the core of grammar—namely, Merge. In what follows, I argue (i) in favor of viewing apparent restrictions on category distribution that predict the absence of X-within-X patterns as the consequence of interface filters, and (ii) against the robustness of such restrictions by presenting X-within-X patterns in a typologically broad range of languages. Highly relevant, in this context, is what one defines as X—in other words, what is a sufficient degree of difference to tease apart category X from category Y. Therefore, the present discussion also reflects on the nature of categories. Throughout this article, when I talk about 'X-within-X structures/patterns' or 'X-within-X recursion', which is a term used in the literature, I refer to [X(P)X(P)] structures. Recursion is not a property of structures but of procedures, as Watumull *et al.*

(2014) note, therefore I take 'X-within-X recursion' to be a misleading term and I use 'X-within-X structures/patterns' instead.[1]

The paper is structured as follows: In section 2, I illustrate the existence of X-within-X patterns for determiners (D), complementizers (C), and prepositions (P). Section 3 interprets the data in relation to (functional) categories and the treatment they receive, mainly in the cartographic enterprise. Section 4 concludes with a brief outlook.

2.   X-within-X Patterns

Limits to same-category embedding boil down to the interaction of syntax with the interfaces: If the syntactic outcome amounts to strings such as [XXXX], the relevant utterances would quickly become uninformative, with zero information value (Boeckx 2014: 89). The fact that some structures are infrequent is in itself, of course, no evidence against the existence of computational mechanisms that would generate such structures. Miller & Chomsky (1963: 471) discussed this in a different context:

> There are many syntactic devices [...] for the construction of sentences with nested dependencies. These devices, if permitted to operate freely, will quickly generate sentences that exceed the perceptual capacities (i.e., in this case, the short-term memory) of the native speakers of the language. This possibility causes no difficulties for communication, however. These sentences, being equally difficult for speaker and hearer, simply are not used, *just as many other proliferations of syntactic devices that produce well-formed sentences will never actually be found*.   (emphasis added—EL)[2]

Arsenijević & Hinzen (2012) are right to claim that patterns like [XXXX] are not frequent in language but rather mediated by other categories, and usually so by phase boundaries. However, the fact that such patterns are not frequent does not entail that they are completely absent. In principle, Merge *can* put together elements of the same category giving rise to [XX(X)] patterns. In the following sub-sections, I show the existence of X-within-X patterns for three types of functional elements in different languages, arguing that Merge remains silent with respect to the types of elements on which it operates and that this is what allows for the existence of X-within-X patterns.

2.1.   Determiners

If in the X-within-X pattern, X is D, then [D D] patterns should not be attested in the absence of any mediating category, but (1) shows that they are available.

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[1]   Lobina (2015) does a fine job pointing out issues related to the term 'X-within-X recursion'. Quite usefully, he also correctly draws the indeed "subtle distinction between process and generation", arguing that "Merge applies iteratively, but *constructs* a recursive [syntactic] object *recursively*" (p. 4, emphasis in the original).

[2]   I am grateful to an anonymous reviewer for helpful discussion on this point.

(1) afto to telos   [Greek]
     this the ending
     'this ending'

(1) involves two adjacent D elements: a demonstrative and a definite article. The properties of this phenomenon of 'demonstrative doubling' have been addressed in the literature (see Grohmann & Panagiotidis 2015 and a host of references cited there). Following Panagiotidis (2002), both articles and demonstratives fall under the same category, that of D heads. If so, this example shows an instance of X-within-X for the functional category D. The same phenomenon is found, among other languages, in Hungarian and Javanese (Alexiadou *et al.* 2007).

     Even if (1) is taken, under a different analysis, to show two functional elements that belong to two *distinct* functional categories (an issue to which I return later in this section and in section 3), in which case this would not be an instance of X-within-X, (2) involves two indefinite articles.

(2) ena kapço telos   [Greek]
     a a ending
     'an ending'

Actually in (2), the plural forms of *kapço* are what substitutes for the plural of *ena*, which lacks such forms (Michael 2011). Both *ena* and *kapço* are indefinite articles; thus (2) seems to be a licit instantiation of the type of category distribution that Arsenijević & Hinzen (2012) make reference to when they suggest that "[e]mpirically speaking, counterexamples, which would involve adjacent articles (*the a book*) […] are not found in human language" (p. 425). Within the nominal domain, X-within-X patterns do not limit their existence to adjacent articles. Relevant patterns have been reported in Blackfoot for which Frantz (2009) and Bliss (2013) provide examples of adjacent demonstratives.

     Beyond doubt, there is a limit to the number of unmediated determiners in a row one may find, but this limit is not syntactic per se. In other words, one can argue in favor of an unconstrained Merge which may give rise to X-within-X syntactic patterns, even assuming that any restrictions that preclude the overt realization of adjacent elements of the same category pertain to phonology and not to syntax. One such example is the phonological realization of one determiner, even if two determiners are assumed underlyingly; see, for instance, Lefebvre & Massam's (1988) surface filter rule on adjacent determiners and Davis' (2010) 'Determiner Deletion' PF rule.

     At a syntactic level, the main difference between (1) and (2) relates to the fact that the two D elements in (1) can be shown to fall under different categories according to some analyses (e.g., D for determiner *to* and Dem for demonstrative *afto* in Leu 2008). (2), on the other hand, involves two indefinite articles and no demonstrative, therefore a syntactic analysis that places one element under D and another under Dem is not pursuable in this case. However, it can be argued that in (2) the indefinite article *ena* is a quantifier, introduced in NumberP and subsequently moving to DP (as argued in Alexiadou 2006). Following Alexiadou (2006) and Kariaeva (2009) in placing *ena* in the D position, the structure under-

lying (2) should be the following: [$_{DP}$ ena [$_{DP}$ kapço [$_{NumP}$ ~~ena~~ [$_{NP}$ telos]]]], giving rise to [$_{DP}$ D [$_{DP}$ D ...]], an X-within-X structure. (3) presents another case of the [$_{DP}$ D [$_{DP}$ D ...]] configuration, but crucially one that shows the two D heads being occupied by the same indefinite article *kapço*. (3), then, is not subject to any syntactic analysis that could present the relevant Ds as elements of different categories, as there are no semantic or intonational properties that would facilitate such a distinction between the two.

(3) (Kapçi) kapçi kala θa   kanun   na   kitun   ti   ðulia tus. [Greek]
     some   some well FUT do.3PL SUBJ see.3PL the work POSS
     'Some people would do well to mind their own business.'

Based on Ioannidou & den Dikken's (2006) analysis, where multiplication of definite articles in Greek polydefinites is due to different copies of the same article, I take (3) to show two adjacent copies of the same indefinite article. I agree with Ioannidou & den Dikken (2006: 4) that both the D head and the C head "represent abstract bundles of morphological features; the answer to the question of whether some overt element will end up spelling out C or D depends on whether something raises up to C/D in the course of the derivation" (see also Pesetsky & Torrego 2001). Multiple instantiations of this raising are bound to give rise to [XX] structures such as the ones in (2)–(3).

The idea that categories do not boil down to a property to be inherently found in the syntactic objects they characterize has been repeatedly voiced within the framework of Distributed Morphology (DM) as well as in Chomsky's recent work on labeling (e.g., Chomsky 2013). To this end, Marantz (1997: 215) argues that "[r]oots like √DESTROY and √GROW (to borrow notation from Pesetsky 1995) are category neutral, neutral between N and V. When the roots are placed in a nominal environment, the result is a 'nominalization'; when the roots are placed in a verbal environment, they become verbs". In other words, a 'category' feature is not intrinsic to mergeable items according to standard assumptions of DM.

It is significant for the purposes of the present discussion that Chomsky (2013) points to the same direction when he argues that Merge yields a set {X, Y} without a label and that the syntactic object SO receives its label through a labeling algorithm: "We assume, then, that there is a fixed labeling algorithm LA that licenses SOs so that they can be interpreted at the interfaces, operating at the phase level along with other operations" (p. 43). The 'categoryless' nature of categories and the idea that SOs are *defined contextually* (Pesetsky & Torrego 2004), receiving their label at the interfaces, outside narrow syntax proper, is precisely the message that seems to transpire when one considers the data from Riau Indonesian discussed in section 3.2. The discussion of complementizers and prepositions in the next two sections is concordant with Chomsky's claim that Merge yields unlabeled SOs. It is precisely because of this constraint-free (i.e. understood here as 'anti-identity condition'-free) application of Merge that adjacent SOs of the [XX] type may at times arise.

2.2.   *Complementizers*

In relation to C-within-C it has been argued that "C never embeds in C, directly. A sequence in which Cs occur in Cs really is a [C–*v*…[C–*v*… [C–*v*]]] sequence, as seen in [(4a)], or even a [C–*v*–D… [C–*v*–D… [C–*v*–D…]]] sequence, as seen in [(4b)]" (Arsenijević & Hinzen 2012: 425):

(4)   a.   [$_{CP}$ Allegedly, [$_{TP}$ John will [$_{vP}$ deny
               [$_{CP}$ that [$_{TP}$ Bill has ever [$_{vP}$ said [$_{CP}$ that …]]]]]]]
      b.   [$_{CP}$ Allegedly, [$_{TP}$ John will [$_{vP}$ deny [$_{DP}$ the very possibility
               [$_{CP}$ that [$_{TP}$ Bill has ever [$_{vP}$ defended [$_{DP}$ the claim [$_{CP}$ that …]]]]]]]]]
                                              (Arsenijević & Hinzen 2012: 425)

These examples provide the basis for assuming that any [C C] sequence should be mediated by sequences of other categories, such as [*v*–V], to be licit. (5), however, shows a [C C] sequence (unmediated by [*v*–V], yet licit), which is available with the so-called 'way of asking/speaking verbs'. Although some analyses (e.g., Brucart 1993) put the non-interrogative C in [Spec,CP], other analyses argue in favor of a 'doubly filled Comp' in Spanish (Plann 1982, Suñer 1992).

(5)   Me   preguntó   que   qué   quería.   [Spanish]
      CL   ask.3SG   that   what   want.1/3SG
      'He/she asked me (*that) what did I/he/she want.'
                       (adapted from Demonte & Fernández-Soriano 2009: 30)

According to Suñer (1992), (5) shows a recursive C. Suñer's argument was questioned in Demonte & Fernández-Soriano (2009), who argued against a recursive C and in favor of an analysis along the lines of the *wh*-element being merged in FocP and the declarative *que* 'that' occupying the head position in ForceP.

Since the analysis adopted seems important in deciding whether or not (5) shows a recursive C, it is useful to discuss the two main counterarguments that Demonte & Fernández-Soriano bring up in their critique of Suñer's proposal. First, they argue that if C was really recursive, we should see verbs like that in (5) taking a bare declarative C. They correctly note the impossibility of having this combination with *preguntar* 'to ask', but (6) shows it to be possible with *decir* 'to say' in the context of a bare declarative and (7a) in the context of recursive C headed by a declarative that selects an embedded interrogative.

(6)   Me   dijo   que   Juan   es   listo.   [Spanish]
      CL   say.3SG that   John   is   smart
      'He/she told me that John is smart.'

(7)   a.   Me   dijo   **que qué** quería.   [Spanish]
           CL   say.3SG that   what   want.1/3SG
           'He/she told me what did I/he/she want.'

b.   Me   dijo   qué   quería.
CL   say.3SG what   want.3SG
'He/she told me what he/she wanted.'

Thus, the incompatibility they notice might boil down to lexical selection rather than the nature of C as being (non-)recursive.

The second argument Demonte & Fernández-Soriano (2009) offer relates to the observation that interrogative sentences in 'doubly filled C' constructions cannot be infinitival (8), which cannot be justified under the recursive C hypothesis.

(8)   a.   *Preguntó/dijo   que   adónde   ir.   [Spanish]
            ask/say.3SG   that   where   go
            'He/she asked/said where to go.'
       b.   Preguntó/dijo   adónde   ir.
            ask/say.3SG   where   go
            'He/she asked/said where to go.'

(Demonte & Fernández-Soriano 2009: 31)

Demonte & Fernández-Soriano (2009) explain the contrast in (8) by arguing that "[w]ithin the same Complementizer system a ForceP node is included, headed by a declarative *que* [cf. (7a) above]. One can argue that this element only appears in finite clauses […] therefore excluding infinitival interrogatives" (p. 31). However, the same assumption (namely, that declarative *que* only appears in finite clauses) can also be held under a recursive C hypothesis, where the higher C position is filled by declarative *que*.

Leaving aside the nuances of their analysis, Demonte & Fernández-Soriano (2009) are right in placing these two elements in different functional positions: It can be argued that the two adjacent instances of *que* in (7a) belong to two different categories because they come with different flavors; one is clearly declarative (*que*), while the other is interrogative (*qué*). Another counterargument to the claim of a doubly filled C in (7a) is that the interrogative element could be analyzed as a specifier instead of another head. Both these counterarguments can be legitimately voiced; hence, my goal is to demonstrate the existence of X-within-X in the complementizer system with elements of the *same (non-interrogative) flavor*. (9) seems an instantiation of recursive C, not mediated by [*v*–V] and not involving any interrogative element.

(9)   Acho   **que** amanhã   **que** a   Ana **que** vai   conseguir
       think.1SG that   tomorrow   that   the   Ana   that   will   manage
       acabar   o   trabalho.   [European Portuguese]
       finish   the   assignment
       'I think tomorrow Ana will manage to finish the assignment.'

(Mascarenhas 2007: 10)

As Mascarenhas correctly observes when presenting (9):

> In general, it seems clear that an analysis under the cartographic hypothesis that argues that the identical complementizers delimit the C-domain is bound to fail for E[uropean] P[ortuguese]. If one were to commit to that analysis, one would be forced to either assume that three 'que's in a Portuguese triple-C construction occupy three different functional positions, or that the whole domain is recursive. Both options are very undesirable.
>
> (Mascarenhas 2007: 9)

When comparing the different options for explaining (9), he implicitly deals with the following question: Why would one treat C_1, C_2, and C_3 in (9) as [XXX] and not as [XYZ]? The answer is the following: In the absence of any argument for a distinct semantic import or syntactic function that would set apart C_1 from C_2 and C_3, the three "identical complementizers" (to borrow Mascarenhas's term) in (9) should be treated as such. All else being equal, a theory that assumes an unconstrained Merge that permits recursive C constructions has to do less explaining (and as a result needs less defending) than any richer theory that duplicates the entire domain or assumes that phonologically and semantically identical elements are assigned distinct labels in terms of their syntactic status.

Complementizer doubling has also been noted in Icelandic with two phonologically distinct C elements.

(10) Þetta er bókin   sem (að) ég keypti.   [Icelandic]
      this is book   that that I bought.1SG
      'This is the book that I bought.'

(Larsson 2014: 447, from Thráinsson 2007: 450)

Under the claims of the present analysis, [CC] in European Portuguese and Icelandic is similar to the [DD] pattern that one finds in Greek: They are examples of X-within-X structures which involve functional heads; that is, the sort of structures one would not expect to find if one believed that Merge came with restrictions that preclude merging an element of a category C with another element of the category C without the mediation of [v–V]. However, since Merge comes with no such restrictions, these patterns arise. Under this assumption, it is not necessary to resort to either doubling or tripling the entire left periphery, or to assuming different functional positions for the different C elements. If these posited C elements do not have different functions or distinct semantic import, they should be analyzed uniformly, as elements of the same category.

The existence of data like (9)–(10) is not a problem under a recursive C hypothesis, where multiple instances of C are possible. The most important point at stake is that this analysis is more economical because it neither forces us to seek different functional positions for elements that do not have different functions, nor duplicates the entire left periphery to accommodate the data. Put differently, from a syntactic point of view, the recursive C analysis should be preferred over alternatives, by virtue of the most widely accepted minimalist guiding principle of methodological economy (as Hornstein 2001 puts it): Occam's razor.

2.3. *Prepositions*

The X-within-X patterns below are intriguing because they are immune to any form of criticism that may suggest that, instead of X-within-X, they amount to X-within-Y. In other words, (11)–(12) do not seem amenable to cartographic, articulated functional structure analyses of the P domain such as den Dikken's (2009), which discusses cases of P recursion of locative and directional PPs. Indeed, in his examples, two different flavors can be assumed: PP$_{DIR}$ and PP$_{LOC}$. However, the prepositions in (11)–(12) do not contribute different kinds of (spatial) information, hence labeling them in a different way is unmotivated—and, therefore, uneconomical and undesirable.

(11)   amb   sense   mobles   [Colloquial Catalan]
        with   without   furniture
        'without furniture'

(12)   me   ðixos   onira   [Greek]
        with   without   dreams
        'without dreams'

Even more convincing from a syntactic point of view are data that show preposition doubling in Dutch. The reason for this is that even if one tried to analyze (11)–(12) as involving two different types of prepositions (e.g., [$_{PP-X}$ amb [$_{PP-Y}$ sense [$_{DP}$ mobles]]]),[3] an analysis along these lines would probably not work for Dutch because, in parallel to what has been observed above for complementizers in European Portuguese, in the prepositional domain too, it is possible to find doubling of the exact same element in an [XX] configuration.

(13)   Hij   heft   zijn   t-shirt   verkeerd   om   (om)   aan.   [Dutch]
        he   has   his   t-shirt   wrong   around   around   on
        'He is wearing his t-shirt inside out.'   (Aelbrecht & den Dikken 2013: 41)

The two *om* elements couldn't possibly be taken to fall under different categories; as Aelbrecht & den Dikken (2013: 41) clarify "[t]hat the second *om* in [(13)] is a double of the first, and not an independent particle, is clear from the fact that there is already a particle present (*aan* 'on') in the sentence". In this context, they describe these two elements as "two *immediately adjacent identical* P-elements" (p. 41, emphasis added).

Similar to (3), (13) shows two adjacent identical elements ([DD] and [PP] in (3) and (13), respectively). There are two empirical arguments that I put forth for the examples in this section—and particularly those examples which involve [XX] structures that feature two occurrences of the exact same element. The first one is that, to the best of my knowledge, *there is no analysis* of (3) or (13) that suggests that the two elements in the [XX] configuration belong to two different categories. My classification of (3) as X-within-X then is not due to an underlying burden-of-

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3   To the best of my knowledge, such a claim has not been pursued in the literature.

proof argument—although I do agree with Hornstein's (2001, 2009) claim that, methodologically speaking, the burden of proof is on those that postulate the richer theory—rather, it boils down to an empirical argument. One cannot show why an [XX] analysis of (3) should be preferred over an alternative [XY] analysis because the latter analysis simply does not exist, probably due to the fact that there are no grounds to support it (e.g. distinct semantic import, different syntactic function). In a similar vein, (13) shows an [XX] structure, and nowhere do Aelbrecht & den Dikken (2013) imply that this might be an [XY] structure. On the contrary, they are explicit about the fact that their example shows two adjacent tokens of the same preposition. In this case, too, there is no [XY] proposal to be contested; [XX] is the only analysis available.[4]

The second argument is that, even if an alternative analysis of (3) or (13) existed, according to which the first of the two identical elements belongs to a category X that embeds a category Y (so that these examples would actually show an element X embedding YP rather than X embedding XP), this analysis would make the 'no X-within-X' claim vacuous if one adopted the earlier mentioned DM idea that a 'category' feature is not intrinsic to mergeable items. Assuming that syntactic categories are bundles of features, but that a categorial feature is not among them, one would need to endow one of the two elements with a different feature, which would be a property of either element but not of both. In the absence of any such feature, and any distinctness between the two elements across levels of linguistic analysis, and pending a better understanding of syntactic categories, $[_{XP} X [_{XP} X \dots]]$ appears to be a possible configuration.

One reviewer suggests that if X_1 and X_2 are identical, this would seem to suggest doubling at work: If doubling is an instance of a general PF reduplication process, then there is no evidence for additional syntactic structure for X_1 at all. Following standard DM assumptions, I take PF to not function as a generative system than can derive nodes/words. In the words of Embick & Noyer (2007: 293):

> While PF processes may be possible for certain aspects of word formation broadly construed, the important point is that such PF processes do not constitute a separate generative system for deriving words. Rather, PF processes effect modifications to the structures generated by the syntax, modifications that are limited to minor operations that manipulate nodes in a sharply constrained fashion.

Data from Catalan, Greek and Dutch suggest that same-category embedding is found in the P domain, too, similar to what happens in the other functional categories discussed above. It seems a safe claim to make that same-category embedding is not a marginal phenomenon restricted to one category of functional heads or one language. It is not even restricted to functional categories. Data from sign languages can be particularly telling in relation to instances of X-within-X in lexical categories.

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4   Of course, the fact that one finds an analysis of type A in the literature, but not of type B, does not mean that analysis A is right and analysis B is wrong. However, this absence may be an indication of the (un)controversial status of the data at hand. I am grateful to an anonymous reviewer for comments on this point.

Recall that Arsenijević & Hinzen (2012) discuss noun–noun compounds like [$_N$ [$_N$ [$_N$ [$_N$ war$_N$ film$_N$] studio$_N$] committee$_N$] session$_N$] and stress the counter-cyclic, 'anti-recursive' derivation of such compounds. According to the analysis of Roeper & Snyder (2005), recursive applications of Merge in this example expand the syntactic structure downward—in a violation of the Extension Condition—and target the bottom position of an already projected structure. Under Roeper & Snyder's (2005) analysis, a compound like [$_N$ [$_N$ [$_N$ [$_N$ war$_N$ film$_N$] studio$_N$] committee$_N$] session$_N$] involves base-generation of [war] as an abstract clitic complement of the head [film]. Upon movement and left-adjunction of the complement to the head, the complement position is rendered available again and [studio] can be merged there. In relation to noun–noun compounds, it is important to notice that it is not direct X-within-X embedding that is at stake anymore. The possibility of having an unbounded, direct X-within-X pattern is now straightforwardly assumed and, as Arsenijević (2012: 5) notes, this sort of "N–N compounds are known exactly for their structurally unbounded recursive nature". The issue at stake is the syntactic derivation of these compounds which, according to some analyses, proceeds in a way best described as 'anti-recursive'. Crucially, the above analysis relies on assuming an *endocentric* compound that involves a head–complement relation between [film] and [war] and then between [war film] and [studio], and so on. Consider, however, some of the compounds from Al-Sayyid Bedouin Sign Language (ABSL) that Meir *et al.* (2010) list.

(14) a.   gun+police   [ABSL]
            'soldier'
      b.   sweat+sun
            'summer'
      c.   tap-on+strong
            'iron'   (Meir *et al.* 2010: 319)

It is hard to trace a head–complement relation in the above compounds; hence, it is equally difficult to assume a syntactic analysis that relies on such a configuration. Compounds like the ones given in (14) are by no means restricted to ABSL, but still observing patterns in a language that is only a few decades old can be very insightful when the discussion revolves around how certain constructions emerge and how they are linked with the operations that give rise to them. With respect to syntactic configurations in compounding, *dvandva* compounds (i.e. reduplication of Sanskrit *dva* 'two', literally 'pair') can be quite informative (15).

(15) a.   car+plane+train   [American Sign Language]
            'vehicle'
      b.   clarinet+piano+guitar
            'musical instrument'
      c.   mother+father+brother+sister
            'family'   (Klima & Bellugi 1979: 234–235)

The X-within-X patterns observed in the *dvandva* compounds in (15) show no head–complement relation and no counter-cyclic derivation. Therefore, they cannot be linked to arguments about 'anti-recursion'. Needless to say, exocentric compounds are also found in spoken languages, though I do not deem it necessary for the present discussion to provide an exhaustive list of compound patterns across languages. The above examples sufficiently illustrate the existence of X-within-X structures with functional and lexical categories across different languages in different modalities.

At this point, one may wonder about how exactly the data presented in this section would deal with all the evidence that exists in the literature in support of the anti-identity condition (summarized recently in Alexiadou 2014a; see also Hoekstra 1984, Pesetsky & Torrego 2006, Heck 2010). The answer is that the present discussion does not cast any doubt on the mechanics of Distinctness through which anti-identity is achieved in a number of cases (e.g., by adding structure in nominalizations: *the destruction of the city* vs. **the destruction the city*; Alexiadou 2014a). Many examples can be cited here as illustrating the existence of an anti-identity thesis: structure that is added or deleted in a way that splits [X(P)X(P)] into [X(P)Y(P)X(P)] or an extra feature on one of the elements that participate in an apparent [XX] construction would call for an [XY] analysis (e.g., see Heck 2010 on a fine-grained analysis of double complementizers in Polish, recursive prepositions in English, and other phenomena). It is important to note at this point that both the conceptualization of Merge presented here and the above listed examples complement such analyses rather than not question or even replace them.

To explain this further, I have proposed that unmediated [X(P)X(P)] structures do surface cross-linguistically. Of course, this does not alter the fact that in *many* other cases the mechanics of Distinctness mediate same-category embedding, and some analyses correctly point this fact out. In terms of the conceptualization of Merge, I argued in this section that (i) [XX] structures surface cross-linguistically because any possible restrictions to same-category embedding do not arise in narrow syntax but at the level of the interaction of syntax with the interfaces, (ii) Merge is unconstrained in this respect, and (iii) categories/labels do not boil down to a property (i.e. a categorial feature) to be inherently found in the SOs they characterize. Crucially, these are precisely the conclusions individually hinted at in much recent work on Distinctness. For example, Alexiadou (2011, 2014a) notes that well-formed examples that violate Distinctness exist and that the insertion of morphological material as a means to mediate [XX] is unexpected if one accepts that morphology merely interprets syntax (point (i)). Heck (2010: 18), after reviewing a broad range of phenomena across languages, reaches the conclusion that "[o]ne might […] suspect that categorial features do not exist to begin with" (point (iii)). For van Riemsdijk (2008), the anti-identity condition (what he refers to as Identity Avoidance) is neither a syntactic ban nor a property of narrow syntax, but rather a property that holds at the interfaces (points (i) and (ii)).

As a matter of fact, van Riemsdijk (2008) makes an even broader and far more interesting claim (especially from a biolinguistic point of view) when he suggests that Identity Avoidance might not even be specific to language but

rather be "a general principle of biological organization" (p. 242). The discussion in Walter (2007) points to the same direction. She argues that an anti-repetition bias is due to the fact that repetition poses a problem to the perceptual system in a way that can affect linguistic processes but also other cognitive domains such as vision. In my view, talking about a general cognitive bias on repetition avoidance instead of a hard linguistic constraint that bans same-category embedding explains why examples like the ones presented in this section are possible, while at the same time Distinctness is achieved through many ways in countless other examples.

Naturally, defining what counts as a category is of key importance in the present discussion. Put differently, the next section asks whether the examples of the present section could be analyzed as X-within-Y.

3.   Restrictions to Same-Category Embedding and the Nature of Categories

Any discussion of same-category embedding advocates the necessity of having a theory about what counts as a category. In the present discussion, I hold a mainstream view of categories. More specifically, I follow Chomsky's (2001) clausal skeleton in assuming that we can reliably talk about 'Core Functional Categories' in terms of their syntactic configuration (e.g., complementizers vs. determiners). Arguments for X-within-X are constructed on the basis of the criteria upon which elements A and B (e.g., demonstratives and determiners) are claimed to be sufficiently different to be considered falling into two categories; and defining 'same' when one talks about *same*-category embedding might turn out to be a very slippery turn. In other words, one should make sure that what is described as X-within-X is not reducible to an analysis of X-within-Y, where X and Y are instances of elements of similar or (closely) related categories but *not* of the same category.

References to cartography are recurrently found in different approaches to (same-category) embedding mentioned in previous sections. For instance, the existence of adjacent PPs where the Ps come with different flavors (e.g., directional, locative, etc.) has its roots in cartography (den Dikken 2009). This resort to cartography is vital and it is no accident that Demonte & Fernández-Soriano (2009) argue against a recursive C in Spanish, acknowledging Rizzi (1997) as their point of departure. Apparently, the cartographic enterprise seems to provide a set of theoretical assumptions that works nicely for postulating restrictions on recursion, on the basis of arguing that functional elements that look alike eventually belong to different syntactic categories.

Consider, for example, the existence of D-within-D in Greek. I have earlier argued for adjacent D heads in (1), repeated in (16) below. (1) involves a demonstrative and a determiner, hence it is subject to different analyses that affect its status as an X-within-X pattern by possibly arguing that the adjacent Ds belong to distinct categories.

(16) afto to telos [Greek]
this the ending
'this ending'

It is likely that different analyses would place the demonstrative in a functional projection other than D; for example, a Dem⁰ preceding an AP (e.g., Leu 2008).[5] If one assumes that the demonstrative and the determiner are different types of elements, (1) is not an instance of X-within-X. The question is whether there really are instances of X-within-X [XX] that *cannot* be described as X-within-Y [XY]. The answer is positive. (3) reproduced as (17) below is one such case; not only are they both indefinite articles, they are two instantiations of the same article too.

(17) (Kapçi) kapçi kala θa kanun na kitun ti ðulia tus. [Greek]
some some well FUT do.3PL SUBJ see.3PL the work POSS
'Some people would do well to mind their own business.'

Returning to the discussion of categories, Rizzi (1997) puts together a variety of constructions from a number of languages to describe the nuances of 'the fine structure of the left periphery'. Within such a cartographic approach that puts forth a highly articulated structure of functional and lexical heads—but also morphemes, certain types of adverbs and adjectives, quantifiers, classifiers, numerals, and many others—a number of instances of X-within-X could be accounted for the basis of one and only one argument: What counts as X is not the same category in both cases. Put differently, even the most minimal morphosyntactic difference could be treated as a sufficient basis for extending one's non-exhaustive inventory of projections by adding yet another element to it. Recent studies in cartography roughly estimate the number of such projections at up to 400 (Cinque & Rizzi 2008: 47).

Given that different heads attract different features and that the inventory of the latter is also a bottomless pit,[6] both postulating more primitives for these

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[5]   Despite the fact that I discuss the possibility that, under this approach, the demonstrative would fall under a functional projection other than D, it is important to emphasize the fact that a syntactic analysis along the lines of Leu's [DP [DemP Dem⁰ [AP A⁰]] D⁰ [NP]] would yield a linear order that does not work for instances of demonstrative doubling in Greek (optionally combined with determiner spreading in (ii)), as (i) shows; see also Alexiadou (2014b) for the structure of DP in Greek.

(i)   *afto kokino to vivlio [Greek]
this.DEM red the.D book
'this red book'
(ii)   afto *(to) kokino (to) vivlio
this.DEM the.D red the.D book
'this red book'

[6]   In effect, these two inventories feed one another, at the end giving rise to a highly stipulative, open-ended array of linguistic primitives. Boeckx (2011) comments on the pervasiveness of features in all domains of linguistic inquiry by arguing that it is dubious whether they can go beyond language-specific particularities and approach language as a biological organ instead of languages through descriptive grammars. In this context, his suggestion to

inventories and dismissing X-within-X patterns on the basis of these primitives is anything but minimalistic; and it certainly does not abide by principles of economy and parsimony. In other words, if one is willing to pursue such an argument, the effortless way to deal with almost every instance of X-within-X that I showed above is that—paraphrasing the old lady's triumphant assertion that "it's turtles all the way down" (Ross 1967: v)—it will always be categories all the way down.

3.1.   *Categories All the Way Down*

If one is determined enough to stretch the argument about different categories, almost all [XX] adjacencies could be explained away by claiming that what looks like [XX] is in reality [XY]. Alternatively, the direct nature of the embedding might be questioned, so that [XX] would be [XYX]. The question is whether we wish to insert more pluralism and complexity into an already over-articulated conceptualization of categories in exchange for approaching issues like X-within-X structures and the way these are manifested across languages and modalities. If we do so, by extension, we insert complexity into our conceptualization of innateness as well, since cartographers argue that their inventory of projections is part of Universal Grammar. In my examples of recursive C, cartography might easily facilitate alternative analyses that show the different C heads as falling to different categories. However, cases like (11)–(13) and (17) are harder to dismiss.

The response to analyses that assume categories all the way down requires shifting the object of inquiry from languages to the language faculty. The course of evolution would never have endowed our species with the exuberance of having a UG that encapsulates a humongous array of parameters (Newmeyer 2005: 53)—or projections, features, and whatever other name one may employ— all of which UG-encoded. And in the case of projections, these would even come along with their own possible permutations, since not all languages manifest the same surface linear order for all these projections. We do not capture linguistic primitives this way; we create them. This process lacks explanatory adequacy, since the relevant observations are not derived in any way if they are just taken for granted by means of being relegated to the 'innateness' factor, that is, treated as UG-encoded. When describing linguistic data, one should be clear about what the goal is. Illuminating, in this sense, is the late Sascha Felix's view about the orientation of current work carried out in the field of linguistics:

> In some sense I feel that much (but obviously not all) of current linguistic work displays a relapse to the spirit prevailing in pre-Chomskyan times. *Linguistics is about describing language data. Period. Beyond this there is no deeper epistemological goal. Of course, those who became linguists because they like to play around with language data could not care less, because they can pursue their interests under any development of the field, nowadays possibly with less pressure and stress.* Personally I felt that much of what I was offered to read in recent

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"recover from our severe case of featuritis" (p. 224) finds application also in the case of the endless array of projections that one assumes, usually on the basis of different features/ functional categories.

years was intolerably boring and that the field of linguistics was becoming increasingly uninteresting and trivialized.   (Felix 2010: 71, emphasis added)

One of the goals of the biolinguistic enterprise is to approach the language faculty in a way that facilitates the creation of interdisciplinary bridges between linguistics, biology, neuroscience, and other allied disciplines. Establishing these bridges is easier once the right level of granularity across the primitives of the different disciplines is achieved. By not taking highly articulated syntactic structures for granted in our theory of innateness, we effectively narrow down UG to a *few* computational principles (as Di Sciullo *et al.* 2010 suggest we should do). As a result, we obtain a picture of our endowment for language that is easier to work with from a biological point of view. If anything, it is this picture that has the potential to overcome the 'granularity mismatch problem' (Poeppel & Embick 2005). The anti-cartographic approach pursued in the present work is in line with the view that Bouchard (2012) expresses in his discussion of the nature of UG: When we abide by a false stipulation, "we are not capturing a generalization but creating it, at a cost" (p. 12).

Juxtapose Bouchard's view with Shlonsky's (2010) thesis that cartography attributes a cardinal role to features and that "[t]he study of the feature inventory of UG requires a massive database compiled on the basis of detailed studies of particular grammars" (p. 424). This approach is problematic in three ways: First, it suffers from inserting unnecessary complexity into UG, stemming from the urge to invent ever more features. This is the exact opposite of what Chomsky (2007) had in mind when he suggested "approaching UG from below". Second, precisely because this complexity translates into an evolutionarily implausible theory of UG (cf. Newmeyer's view reported above), interdisciplinary bridges between linguistics and biology remain elusive. Third, this approach seeks to inform the primitives of UG based on the patterns observed in language data. However, observing the environment can be utterly uninformative for under-standing UG: Cartography reflects hierarchies that one finds across different languages. But how can one be sure that language diversity does not fail to project the whole possible range of them? More importantly, even if it does project them, why should one translate this diversity into features and projections in UG?

3.2.   *Categoryless Categories: The Case of Riau Indonesian*

One possible way to go about understanding the nature of categories is to discuss their status in languages that show an idiosyncratic level of complexity due to environmental triggers. Complexity is understood in this context as the development of grammatical markers in a language.[7] Through grammaticali-

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[7] Language is a complex adaptive system, and discussion of the emergence of complexity in language can be linked to other formal systems. A number of recent proposals have grounded generative operations in mathematical approaches to nesting and complexity: Fortuny-Andreu & Corominas-Murtra (2009), for example, present a theory of nesting through an algorithm that gen-erates hierarchically organized linguistic expressions. As they correctly note, "nests are a useful representative tool in other domains besides language where either some recursive algorithm or evolutionary process is at work, which suggests the unifying force of the mathematical abstraction

zation, lexical items lose some of their phonological substance and/or semantic function and develop morphological or syntactic functions. In a nutshell, the process of grammaticalization entails a gradual progression from something being a semantically contentful item (i.e. a lexical element) to a grammatical marker (i.e. a functional element). The link between complexity and environmental needs has been explicitly established in Wray & Grace (2007), who argue that esoteric, intra-group communication allows for grammatical/semantic complexity, whereas exoteric, inter-group communication leads to the development of rule-based regularity and semantic transparency in language. Gil (2009) suggests that the level of grammatical complexity that is needed for some contemporary cultures is no greater than that of an Isolating-Monocategorial-Associational (IMA) language. The second characteristic of such a language, which according to Gil characterizes an early stage in the phylogenetic development of human language, refers to the absence of distinct syntactic categories. According to the description of the IMA prototype in terms of complexity provided by Gil (2009), no contemporary language absolutely satisfies this prototype, but there are some examples of Relative IMA languages. One such language is Riau Indonesian described in Gil (1994 *et seq.*).

Basic sentence structure in Riau Indonesian might consist entirely of items that reflect the underspecified, monocategorial character of the language. Gil (2009) describes (18) as underspecified in terms of thematic roles and indeterminate with relation to ontological categories. As such, the possible interpretations of (18) go beyond mere ambiguity.

(18)   ayam   makan   [Riau Indonesian]
       chicken   eat
       (an association of CHICKEN and EAT)   (Gil 2009: 23)

(18) might mean, depending on the context, that 'the chicken is/was/will be eating' or 'the chickens that were eaten' or 'the reason chickens eat'. It seems that lexical categories such as V and N or functional categories such as T are underspecified in Riau Indonesian (Gil 2009). The classification of the categorial status of *ayam* or *makan* is not intrinsic to syntax but arises post-syntactically (Leivada 2015). In Yoder's (2010) re-analysis of Gil's examples, the argument is made that

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[their proposal] is based on" (p. 99). With respect to complexity, Lupyan & Dale (2010) present a statistical analysis of over 2,000 languages which shows that language structure and complexity are determined in part by social structure. They present a linguistic learnability landscape for languages and they formalize this landscape as a mathematical model. According to their 'Linguistic Niche Hypothesis', a relationship exists between linguistic structure and social structure in the sense that "the level of morphological specification is a product of languages adapting to the learning constraints and the unique communicative needs of the speaker population" and "the surface complexity of languages arose as an adaptation to the esoteric niche" (p. 7). As Boeckx *et al*. (2013) note, apart from reflecting statistical correlations, the predictions of Lupyan & Dale (2010) map nicely onto the findings elicited by a task that examines interpretations of spatially modulated verbs in Nicaraguan Sign Language. More concretely, Senghas (2003) reports a mismatch in form that can be observed from one age cohort to the cohort that follows and suggests "that each age cohort […] transforms the language environment for the next, enabling each new cohort of learners to develop further than its predecessors" (p. 511). Complexity evolves gradually in natural languages, and thanks to this gradual development, certain insights about the nature of categories can be obtained from languages that are still in their early stages of development.

Riau Indonesian has the absolute basic categories (V, N, A); but still the examples Yoder analyzes are indicative of the reduced grammatical complexity and the underspecified nature of lexical items, for instance, when an adjective functions as an argument of the predicate (19). Even if one accepts that Riau Indonesian possesses basic functional categories, it is clear that these are not as elaborate as cartographic approaches portray them.

(19)   masok putih,   masok putih,   masok putih   [Riau Indonesian]
        enter   white   enter   white   enter   white
        'The white one is going in, the white one is going in, the white one is going
        in.'   (Gil 1994: 182)

Muysken (2009) addresses the origin of functional categories and proposes a co-evolution model: As lexical systems became richer and more complex, functional categories emerged at the syntax–lexicon interface. This gradual co-emergence suggests that it is possible that in the early stages of language development or in cases of languages that come alongside a special 'environment' factor, salient morphosyntactic distinctions of categories might not be present. This possibility is already acknowledged in Chomsky (1980), when he argues that the development of some complex structures is subject to the degree of stimulation received from the environment (see also Boeckx *et al*. 2013). Pursuing this line of reasoning implies that syntactic categories might materialize underspecified in the early stages of language development and then gradually become more complex depending on environmental triggers. In other words, the status of X in X-within-X might be underspecified enough that it is not possible to reconstruct X as Y and argue against same-category embedding.

Given that cartography has long been the point of departure for a plethora of studies, it is probably not easy to dismiss it without proposing alternatives. Therefore, attempts have been made to bring together some of these alternatives such as the collection of papers in van Craenenbroeck (2009). Although different contributions to this volume reached different conclusions (some claiming that there is no alternative to cartography, others recognizing the shortcomings of the cartographic enterprise), it seems that the answer with respect to why direct self-embedding manifests with certain constraints in the majority of modern languages relates both to one's understanding of categories (i.e. what counts as X instead of Y in X-within-X) and to interface filters. Put differently, interface filters constrain the existence of X-within-X patterns once a sufficient degree of complexity has been attained in a given language. However, given the unconstrained nature of Merge, these patterns can still arise. Similarly, the cross-linguistic hierarchy of functional projections that cartographers observe should be approached as the by-product of (UG-externally) imposed conditions on well-formedness and computational efficiency derivable from the syntax–semantics interaction (and possibly other principles involved in language processing) and not merely taken for granted under the designation 'UG'.

One such recent attempt to derive the functional hierarchy is Ramchand & Svenonius's (2014): The clausal tripartition into C > T > V is proposed to have its grounds on conceptual primitives such as events (i.e. VPs), situations (i.e. TPs), and propositions (i.e. CPs). This tripartition is reminiscent of Grohmann's (2000, 2003) suggestion to build phrase structure around three domains (CP, TP, VP),

which may themselves consist of finer structure and in this sense be 'prolific'. Drawing a distinction between Rich Functional Hierarchies and Core Functional Hierarchy, Ramchand & Svenonius (2014) suggest that these two have distinct origins with the former being language-specific and developed individually across languages and the latter universal. Of course this effort to derive hierarchies should expanded to other domains (e.g., adverbs or prepositions), but the details of these analyses remain to be worked out.

4.   Outlook

This paper focused on X-within-X structures across different languages. I showed that restrictions on same-category embedding are not as robust as portrayed in the literature. In this context, restrictions on category distribution should better be approached as by-products of UG-externally imposed conditions on well-formedness and computational efficiency. X-within-X patterns come 'for free' in such a system and need only be constrained by output conditions. In order to ensure efficiency also in terms of the theory of language put forth, we need to cast a limit to the ever-growing inventories of structural primitives—be it features or functional projections. These inventories are nurtured by an approach to language in the following sense: Language is a descriptive set of rules that aims to present a range of grammatical phenomena observed in languages. These presentations of grammatical phenomena play a significant role when one's goal is to describe the grammar of a given language in detail, but may not always be equally informative when one aims to approach the language faculty itself as well as its primitives from a biologically plausible point of view.

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