

BINARY BRANCHING AND LINGUISTIC THEORY: LEL 2007 EXAMPLE

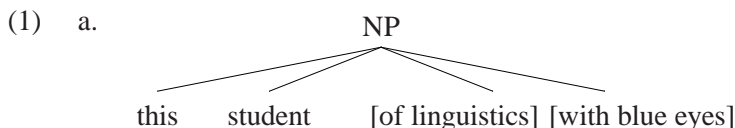
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1. INTRODUCTION

One of the fundamental issues in the design of linguistic theory concerns the overall complexity of the grammar. By Occam's razor, given two competing grammars (or theories) of equal descriptive power, the one that is less complex should be preferred. Since the beginnings of generative linguistics, a number of principles and constraints have been devised in order to keep this complexity to the barest minimum. The *Binary Branching Hypothesis* (BBH) is, perhaps, the single most important principle limiting the complexity of the grammar in mainstream generative linguistics.

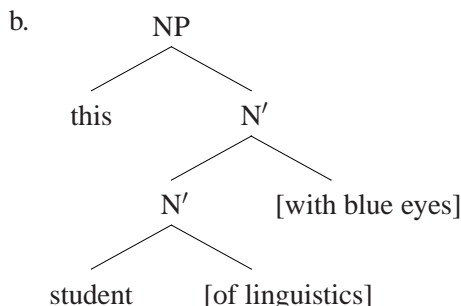
Binary branching is generally assumed as the most restrictive hypothesis of phrase structure. Its consequences are far reaching. Since Kayne's (1984) work on unambiguous paths, it has been commonly assumed that syntactic constituents are mostly binary; from then on, binary branching has been generalized to all lexical and functional projections: it is at the core of the the VP-shell hypothesis (Larson 1988), it has been incorporated as a fundamental property of X' -bar theory, it lies at the heart of Antisymmetry (Kayne 1994), it forms the basis for the fundamental operation Merge in the Minimalist Program (Chomsky 1995: henceforth MP), etc.

A theory that assumes binary branching as a guiding principle¹ has the advantage of minimizing the class of possible structures while ensuring that the relations between their constituents are unambiguous. This advantage does not come for free: it comes at the cost of generating a great amount of structure. For instance, consider the following representations:



* Dipartimento di Lingue, Università di Bologna. Real paper *Binary Branching and Linguistic Theory: Morphological Arguments*, to appear (2007) in *Proceedings of the XXXII Incontro di Grammatica Generativa*, Università di Firenze. Here, a few sections are used as example for the *Lingue e Linguaggio* L^AT_EX template. Remarks and suggestions are welcome. Please write to: emiliano.guevara@unibo.it

¹ For example, the Minimalist Program.



Quite clearly, the representation in (1a) *looks* much more straightforward than that in (1b). Remarkably, introductory books in linguistics usually represent phrasal structure with flat diagrams like (1a).

However, binary branching is usually assumed *a priori*; there are, of course, a number of arguments in support of the BBH, but they are all either extreme generalizations (which are difficult to prove) or depend on theory-internal principles, e.g.: learnability (binary structures are simpler and thus should be easier to acquire), simplicity and/or minimality (the simplest possible structures are binary), C-command and unambiguous paths (cf. ?? below). In any case, a detailed and extended discussion of binary branching in the human faculty of language has still not been undertaken: pushing the line a bit further, we might say that the status of the BBH in linguistic theory is (still) that of an axiom, a statement for which a demonstration is deemed unnecessary.

Culicover and Jackendoff (2005) propose another way to minimize the complexity of the grammar: in their view, a theory that outputs the smallest possible structure is preferable (in spite of *n*-ary branching). This constitutes the *Simpler Syntax Hypothesis* (henceforth SSH). According to the SSH, therefore, the syntactic representation in (1a) is better than that in (1b).

The aim of this article is to provide empirical arguments in support of binary branching, while exploring whether Culicover and Jackendoff's critical viewpoint on binarism can be extended to the domain of word-formation, a domain which the authors do not consider in their book. This task is not an easy one, for the fundamental nature of binarism in the design of linguistic theory and description makes it often impossible to compare – or even apply – opposed analyses (like 1a vs. 1b) in the domain of syntax. Choosing to concentrate on word-formation, we hope to be able to overcome this methodological and architectural restriction while providing with data that might offer a more neutral point of view on the subject.

2. THE SIMPLER SYNTAX HYPOTHESIS

Culicover and Jackendoff (2005) put forward a comprehensive theory which is meant to serve as an alternative to mainstream generative grammar. They argue that modern generative approaches (e.g. Minimalism) are headed in the wrong direction, proposing ever more complex (and abstract) structures and derivations, and resting on unproven assumptions about language universals. In contrast to the traditional view that syntax is the only generative component in the language faculty, Culicover and Jackendoff² assume that also the semantic and phonological components are generative, and that there is a constraint-based mapping between the three of them, which does not privilege any component over the others.

It is interesting to note that, despite a long-standing tradition in generative theories of morphology, Culicover and Jackendoff do not contemplate the possibility of an independent generative component responsible for morphology or word-formation.

The SSH is intended to produce uncomplicated and straightforward analyses. While mainstream generative grammar measures the simplicity of a structure on the basis of the *number of branches departing from each node*, Culicover and Jackendoff (2005) measure it on the basis of the overall *depth of the structure*. Both these views (and the criteria they are based upon) are minimalist, though in different ways:

“Simplifying the branching possibilities requires the tree to have more nodes, and reducing the number of nodes requires more branching possibilities. It seems that in the absence of an independently justified measure of complexity on the basis of which we can take a particular minimalist position, *the most we can say is that the question is an empirical one*” (Culicover and Jackendoff 2005: 113) [emphasis mine]

Culicover and Jackendoff (2005) provide with a full grammatical *n*-ary branching description of English according to the SSH. However, they fail in giving strong and theory-independent arguments *against* the BBH, and limit themselves to pointing out (rightly) that the literature lacks convincing arguments *for* binary branching. The SSH is just as axiomatic and vague in nature as the mainstream alternatives which assume binarism as a principle of the grammar:

“[...] the Simpler Syntax Hypothesis is by necessity a matter of degree. [...] the appropriate complexity for syntax is relatively flat: *headed phrases* that are *linearly ordered* and that *correspond to constituents in Conceptual Structure*, but not more.” (Culicover and Jackendoff 2005: 108) [emphasis mine]

Given the centrality of binary branching in mainstream generative syntax, once we deny it any value in the theory, the whole analytical apparatus falls

² Following Jackendoff (1997).

apart. The same is true of the SSH: one just needs to assume binary branching at the outset and the rest of the theory is totally undermined. To argue for or against binary branching, thus, we need to leave syntax aside.

3. N-ARY BRANCHING CANDIDATES IN WORD-FORMATION

In the domain of word-formation, the problem of binary vs. n -ary structure becomes pertinent only when more than two morphological elements (affixes or words) co-occur in the same structure to form a complex word. When this is the case, the logically possible arrangements of the constituents in the structure are:³

- (2) a. [A + B + C]
 b. [[A + B] + C]
 c. [A + [B + C]]

These configurations (except (2a)) are commonly found in multiple complex-words, which as a rule do not constitute counterexamples to binary branching; cf. (3) for some Italian examples:

- (3) a. [[in + utile] + ità]
 b. [in + [mangia + bile]]

Such complex words have a clear binary structure and should not pose any analytical difficulty. The innermost constituent in the examples in (3) – the base – is a regularly grammatical and existing word in Italian which, by chance, just happens to have a (binary) complex internal structure. A derivational affix then applies to the complex base.

The phenomena that we will review in the following subsections are relatively less frequent and natural: they are plausible candidates to argue for and/or against binary branching because, in them, it is difficult to assign constituenthood to the possible groups of starting elements. The pertinent morphological phenomena, thus, are: *synaffixation* (more than one affix applying to a base at the same time: parasyntetic derivation, stacking up of prefixes, stacking up of suffixes), *circumfixation*, *coordinate compounding* and *synthetic compounding*. A thorough presentation of these phenomena would demand a great deal of space; we will limit ourselves to introducing them in so far as the possibility n -ary branching is concerned. For the sake of simplicity, in the following discussion we will use examples from Italian and English, although the represented phenomena are well attested in other languages, also typologically unrelated to these two languages.

³ For the sake of simplicity, we only represent combinations of three elements here

3.1 Synaffixation

Synaffixes (Bauer 1990) are morphologically complex affixal clusters consisting of more than one analyzable morphological formant and which operate simultaneously on the base. From the functional and semantic point of view, the cluster behaves as a single unit. Cf. (4) for relevant Italian examples:

- | | | | |
|-----|-------------------|------------------------|--------------------------------|
| (4) | a. ballettistico | ‘relative to ballet’ | cf. [?] ballett-ista |
| | b. contenutistico | ‘relative to content’ | cf. [?] contenut-ista |
| | c. faunistico | ‘relative to fauna’ | cf. [?] faun-ista |
| | d. missilistico | ‘relative to missiles’ | cf. [?] missil-ista |

The examples in (4) involve two easily recognizable suffixes, *-ista* and *-ico* attaching to a nominal base. The intermediate recognizable sequence [N+ista] sounds odd (although it could be judged grammatical). We could be tempted to propose a ternary structure for these formations: [base + *-ista* + *-ico*].

In the cases under analysis here, however, no trace of the typical agentive semantics of derivations in *-ista* (e.g. *chitarrista* ‘guitarist’) can be found in the *-istico* formations. The affix-cluster *-istico* is functioning as a single suffixing unit which builds binary structures, despite the fact that three recognizable morphological formants seem to be joined at once. That is to say, the most plausible structural representation for (4) is (5a) and not (5b).

- (5) a.
- ```

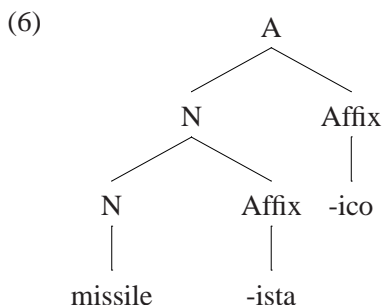
 A
 / \
 N Affix
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 | missile -istico

```
- b.
- ```

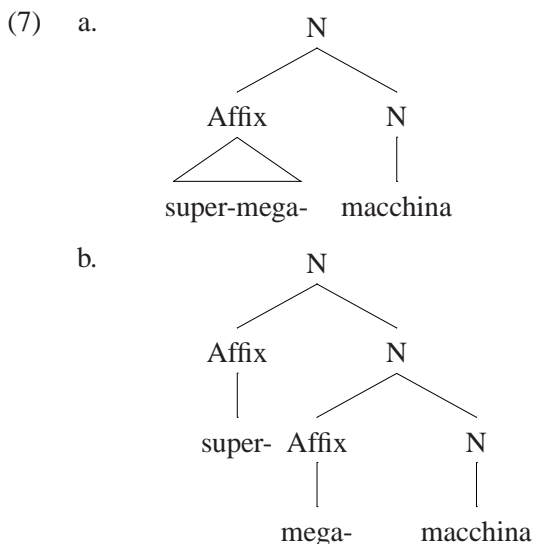
      A
     / | \
    N  Affix Affix
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    | missile -ista -ico
  
```

Bauer (1990) adopts the explanation in (5a), and so does Booij (2001). At present we are not aware of any proposal in the literature explicitly defending the option in (5b).

Scalise (1984) proposes a different analysis, motivated by the fact that his theory does not consider synaffixes as possible morphological constituents. Scalise accepts the intermediate step in the derivation as a possible base even when it is not attested (thus giving rise to an instance of overgeneration). However, Scalise’s solution is always binary:



Besides such clusters of two or more suffixes, there exist also prefixal clusters. A very productive example is the colloquial use in Italian of prefixal clusters such as *super-iper-* or *super-mega-* (*superiperottimista* ‘very very optimistic’, *supermegamacchina* ‘a super duper car’). Also in this case, the cluster can be said to function as a single unit operating on a base – thus constituting a binary structure (cf. 7a); the second option is to analyse it as two different prefixes being applied successively to the same derivation (cf. 7b). There is apparently no reason to propose a flat (ternary) analysis in this case.



3.2 Discontinuous Synaffixation: Parasynthesis

Parasynthetic derivation can be defined as the simultaneous affixation of a prefix and a suffix to a base: both affixes are independent, semantically and functionally. Parasynthesis is a very productive process in the Romance languages (but it is attested also in Germanic and in Slavic), especially regarding denominal and deadjectival verb-formation:

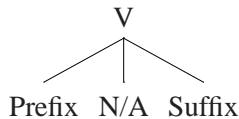
- (8) a. ingiallire ‘turn yellow’ giallo ‘yellow’
 b. arrossire ‘blush’ rosso ‘red’
 c. decaffeinare ‘decaffeinate’ caffè ‘coffee’
 d. abbottonare ‘button up’ bottone ‘button’

Given the three elements in a parasynthetic configuration [ABC], the intermediate derivational steps [AB] and [BC] are usually unattested, but (at least in Romance), only the [BC] sequence is a possible grammatical word.

- (9) a. ingiallire *ingiallo giallire cf. zittire
 b. arrossire *arrosso rossire
 c. decaffeinare *decaffé caffeinare cf. armare
 d. abbottonare *abbottone bottonare

The literature knows an extremely varied number of proposals regarding the structural representation of parasynthetic derivations. However, we have found only one ternary-branching proposal for this phenomenon:

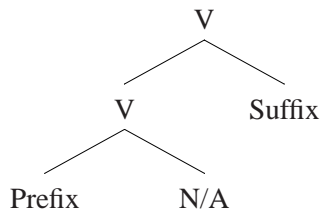
- (10) Serrano-Dolader (1999)



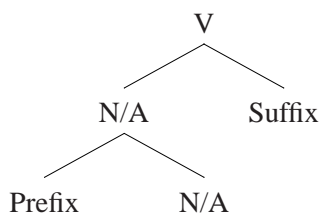
A structure like (10), although descriptively adequate, has very little explanatory power. It entails concomitant prefixation and suffixation, but it is not clear if the affixes form a constituent or not. Serrano-Dolader stipulates that syntactic category percolation proceeds from the suffix only.

Most morphologists view parasynthetic derivations as binary structures, although the final shape of the proposed structure depends on secondary theory-internal arguments; cf. (10). However, all these proposals have advantages over (10):

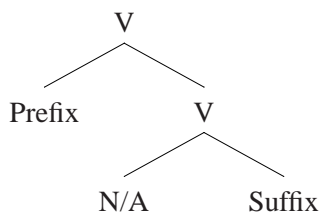
- (11) a. Corbin (1980)



b. Alcobá Rueda (1987)



c. Scalise (1984, 1994)



(11a), (11b) and (11c) differ with respect to the ordering of the operations of prefixation and suffixation and also with respect to the determination of syntactic category of the intermediate nodes.

Scalise (1984, 1994) demonstrates that a binary interpretation following the lines of (11c) is the most desirable possibility – at least for right-branching languages like Italian –, for it is maximally descriptive and consistent with the rest of the system of verbal derivation. Furthermore, it does not postulate instances of category-changing prefixation (cf. instead 11a), a totally marginal and dubious phenomenon in right-branching languages.

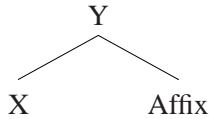
3.3 *Circumfixation*

Circumfixation involves the affixation of a single *circumfix* or *discontinuous affix* to a base. Superficially, circumfixation and parasynthesis are the same phenomenon: simultaneous attachment of two morphological elements, one to the left and one to the right of the base. This is the reason why many morphologists use the terms parasynthesis and circumfixation as synonyms. On the other hand, other researchers make instead a principled distinction between them based on a fundamental criterion: only in circumfixation do the interrupted parts form a single morphological constituent.

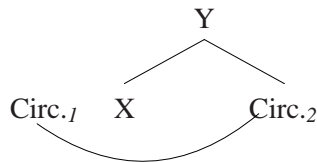
The latter point of view, however, depends on a more general assumption about the architecture of morphology: the Separation Hypothesis, assumed in a number of theoretical approaches, among others, Lexeme-Morpheme Based Morphology (Beard 1995) and Distributed Morphology (Halle and Marantz 1993). The separation Hypothesis holds that Morphosyntax and Morphophonology are two different levels of analysis, and that morphological representations on each level must be allowed a certain freedom of mismatch. Precisely this

theoretical standpoint allows circumfixation to receive a specific treatment: from the point of view of Morphophonology, the affix is interrupted by the base (or splitted around it), while from the point of view of Morphosyntax, only one affix is added. Thus, in this perspective, circumfixes are only apparent counterexamples to binarism, they only pose a problem of graphical representation:

- (12) a. A circumfix in morphosyntax:



- b. A circumfix in morphophonology:



One might prefer not to assume the Separation Hypothesis in one's theory. The resulting theory, in that case, will not be able to distinguish circumfixation from parasynthesis, and both phenomena will receive a representation along the lines of (11a), (11b) or (11c) above.

In any case, we can be safe to conclude that neither linear synaffixation, parasynthesis nor discontinuous affixation – all involving minimally and typically the combination of three morphological formants – pose a threat to the Binary Branching Hypothesis. Quite on the contrary, these phenomena actually provide with data that support the hypothesis in a rather theory-neutral fashion (basically the same principled analyses that we have briefly introduced here can be developed in frameworks that make use of more complex theoretical machinery).

A last remark on discontinuous phenomena: exactly the same rationale that we have applied to circumfixation can be successfully applied to other discontinuous patterns such as transfixation. Thus, we may extend our previous conclusion by saying that our data allow us to state that the whole domain of morphological derivation operates by and large – if not exclusively – in binary terms.

4. CONCLUDING REMARKS

In conclusion, it seems that all the known candidates for n -ary branching in the morphological literature can be successfully analysed as strictly binary constructs. Furthermore, most of the binary analyses seem to offer a number of advantages over the proposed flat structures: they show better descriptive power than n -ary approaches and actually contribute to minimize the number of possible morphological structures in the grammar. Only one of the cases here reviewed appears to be totally compatible with n -ary branching, multiple coordinate compounding, but the data do not exclude binary analyses either.

If we were to follow Culicover and Jackendoff's abolition of binarism from linguistic theory, we would expect all morphological structures to be candidates for n -ary branching; the data strongly contradict this prediction and suggest a very different state of affairs: morphological processes are essentially binary-branching, only marginally n -ary structures are found, but these can be very plausibly represented in binary terms. In other words, if the question of binary vs. flat structure is an empirical one, then morphology provides with overwhelming evidence for the former option, not for the latter.

As a final remark, we may add that in any case, Culicover and Jackendoff are right in pointing out an issue concerning which modern generative grammar has failed to produce convincing arguments. A desirable development in the future of linguistic theory would be to get rid of all such dogmatic and unproven concepts, and this can be achieved in two ways: by providing them with empirical support (as we have tried to do in this article), or by adopting more flexible standpoints. With respect to binary branching, the latter possibility could be accomplished by accepting that some phenomena are better captured as binary structures, others as flat structures.

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SUMMARY: One of the fundamental issues in the design of linguistic theory concerns the overall complexity of the grammar. By Occam’s razor, given two competing grammars (or theories) of equal descriptive power, the one that is less complex should be preferred. Since the beginnings of generative linguistics, a number of principles and constraints have been devised in order to keep this complexity to the barest minimum. The *Binary Branching Hypothesis* (BBH) is, perhaps, the single most important principle limiting the complexity of the grammar in mainstream generative linguistics.