

Binary Branching and Linguistic Theory: Morphological Arguments

Emiliano Guevara*

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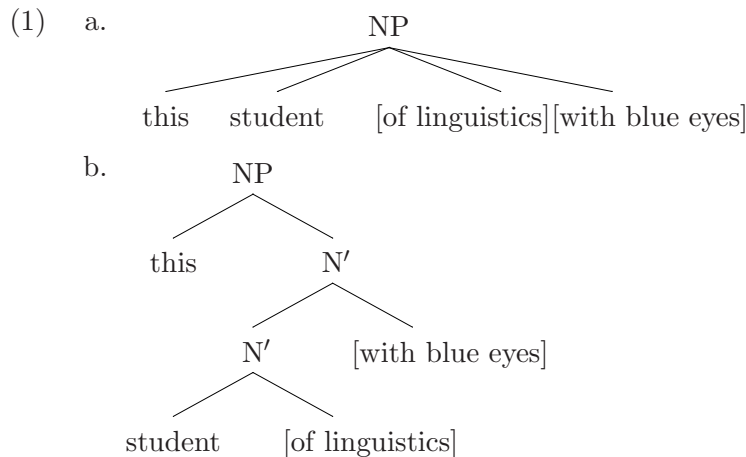
1 Introduction

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 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 principle (e.g. MP) 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 e Letterature Straniere, Università di Bologna. To appear in *Proceedings of the XXXII Incontro di Grammatica Generativa*, Università di Firenze. Remarks and suggestions are welcome. To contact the author please write to: emiliano@lingue.unibo.it



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. 3.1 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.

This article is organized as follows: in section 2 we will briefly expose some main points of Culicover and Jackendoff (2005)'s theory of Simpler Syntax, especially in relation to binary branching; in section 3 we will briefly review some of the most important exponents of binarism in generative linguistics, both in the fields of syntax and morphology; section 4 introduces the phenomena of word-formation that provide pertinent data to argue for or against binary branching on empirical grounds and attempts to evaluate them in a theory-neutral fashion; finally, section 5 presents some provisional concluding remarks on the role of binary branching in linguistic theory, the SSH and the relation between syntax and morphology.

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 Jackendoff (following Jackendoff 1997) 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 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 Different Flavors of Binary Branching

In this article we will review well-known data from a *neutral* field, the domain of Word-formation, i.e., morphological derivation and compounding¹. In doing so, we will try to maintain a theory-neutral position throughout the discussion. However, our starting point is not totally innocent: in order to we are assuming that at least some of the fundamental principles that govern syntax and morphology are (or should be) the same principles. In particular, we are assuming that:

- (2) a. If binary branching is a valid principle in syntax, then it must also be valid in morphology.
- b. On the contrary, if binary branching is *not* a valid principle in syntax, then it must *not* be a valid principle in morphology

The order in which syntax and morphology appear in (2a-b) is not relevant for our present objectives. We do not want to imply that morphology is in some way less important than (or a part of) syntax (or viceversa). Our interest is in stressing the fact that the whole faculty of language – as a system – is characterized by a core of fundamental “technologies”, extensively used in every component. The complexity of branching structures, given the centrality it has been given in the theory, seems like a one of the top candidates to the list of essential “technologies” in human language.

¹This decision leaves out of the discussion, for now, inflectional morphology. As a side remark, inflectional morphology, at least for some morphologists, is a totally different phenomenon, subject to a different set of principles (e.g. inflectional paradigms, suppletion, cumulative exponence, etc., cf. among many others, Stump (2001)).

Some morphologists extend the isomorphy between syntax and morphology to the extreme, arguing that exactly the same set of principles governs both modules of the grammar (e.g., among others, Lieber (1992), Ackema and Neeleman (2004)). This position is (and has been) object of much debate in morphological theory because, in practice, it has meant the subsumption of all morphology into syntax. We will not treat this topic here (for a thorough discussion, cf. Scalise and Guevara (2005)).

However, if the assumptions in (2) prove to be true, it would be a very desirable fact for the sake of minimalism and uniformity in human language. In any case, it must not be forgotten that, whatever position one prefers, for or against binary branching, one's arguments need to be strictly empirical in nature. But, before getting to the data, let us briefly summarize the development of the BBH in linguistic theory.

3.1 Kayne's Unambiguous Paths and Antisymmetry

Kayne (1981) (reprinted in Kayne 1984) is generally cited as the source of the BBH, more specifically, thanks to the notion "unambiguous path," a condition on various syntactic relations (government and binding): any given non-terminal node may dominate at most two daughters. Kayne does not stipulate that branching is at most binary. Instead, binary branching is required if there is to be an "unambiguous path" between, for instance, an antecedent and an anaphor, to instantiate syntactic relations. In this theory, binary branching is an effect, rather than a precondition, of well-formedness.

Kayne (1994) proposes the Antisymmetry hypothesis, which boils down to asserting that only rightward binary branching structures can be mapped into a linear ordering of constituents. In other words, at the most abstract level, all languages exhibit the same ordering relations amongst heads, specifiers, and complements that English does on the surface, i.e. all languages essentially belong to the SVO type. Again, Kayne does not stipulate binary branching directly but, instead, calls it into being as necessary for the satisfaction of some other syntactic relation, asymmetric c-command and, crucially, the Linear Correspondence Axiom (LCA), responsible for establishing the ordering of terminal and non-terminal nodes.

3.2 Binary Branching in the Minimalist Program

Chomsky (1995, chapter 4) takes a position that is very similar to the one adopted by Kayne (1984, 1994): binary branching is neither directly stipulated, nor argued for straightforwardly. Binary branching is at the heart of the operation Merge, although Chomsky is not very clear on this point: without stipulations, Merge should build n -ary constituents and Chomsky doesn't constrain it explicitly.

However, Chomsky seems to take the position that no more than binary

branching is required by *virtual conceptual necessity* (Chomsky, 1995, 249). The MP takes for granted most of the ingredients of Kayne’s approach to binary branching (crucially, Antisymmetry and the LCA): consequently, it is virtually impossible to tell the difference between the MP and Kayne’s point of view regarding binary branching.

Again, principled empirical arguments for binary branching are missing from the theory. Only rather vague possibilities of a general nature are given occasionally:

“[...] conditions of argument structure imposed at the C-I interface.
Another possibility, [...] minimization of search in working memory.”
(Chomsky, 2005, 16)

This kind of theoretical indeterminacy and poverty of empirical argumentation is the main reason why Culicover and Jackendoff (2005) (and many others as well, e.g. Construction Grammar) try to develop a whole syntactic framework without stipulating (directly or indirectly) notions such as binary branching.

3.3 Binary Branching in Morphological Theory

The BBH has a long-standing tradition in morphology. The first formalizations of binarism in morphological theory were proposed even before the classical reference in syntactic studies, i.e. Kayne (1984): the first two comprehensive monographs in generative morphology (published in the late seventies, Aronoff (1976) and Booij (1977)) already introduce binarism as a constraint on the complexity of complex morphological structures². For example, Booij (1977) uses the *one affix one rule* rule-of-thumb for derivational morphology:

“The “one affix a rule hypothesis” is the hypothesis that WF-rules add only one affix to a word. Generally, this hypothesis seems to be correct. The only counterexamples are such words as *gebergte* (‘mountain range’) ; *berg* (‘mountain’) and *geboomte* (‘trees’) ; *boom* (‘tree’). But *ge-te* can be considered a discontinuous affix because *ge-* and *-te* do not contribute individually to the meaning of the complex word.” (Booij, 1977, 32)

This citation partly anticipates the topics that we will discuss in sections 4.2 and 4.3 below, that is, the difficulties in distinguishing circumfixes (or discontinuous affixes) and parasynthesis.

Later work in morphological theory – especially within the lexicalist framework, cf., among others, Lieber (1980), Selkirk (1982), Scalise (1984)

²An earlier formulation of binary branching is found also in Kiparsky (1973) (cited in Scalise (1984))

– has repeatedly stressed the fundamentally binary nature of morphological phenomena. Consider for, instance, how Lieber (1980) expresses this empirically based fact:

“[...] my system [...] will generate unlabeled binary branching tree structures. Nothing in the following discussion hinges on the choice of binary branching, as opposed to *n*-ary branching tree structure: there simply seem to be no phenomena in the languages I have examined so far for which *n*-ary branching lexical structure is necessary.” (Lieber, 1980, 82)

Contrary to the situation in syntactic theory, the BBH in lexicalist morphology is strongly based on empirical observation. Later on, during the second half of the 1980s, morphological theory undergoes a “transformational” upsurge: many researchers attempt to explain word-formation phenomena with the theoretical apparatus used to explain syntactic phenomena. As a result, since this framework-shift took place, the arguments for binary branching in morphological theory are the usual ones used in syntax (i.e., essentially theory-internal motivations).

4 *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 are³:

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

These configurations (except (3a)) are commonly found in multiple complex-words, which as a rule do not constitute counterexamples to binary branching; cf. (4) for some Italian examples:

- (4) 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 (4) – the base – is a regularly grammatical and existing word in Italian which,

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

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: parasynthetic 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.

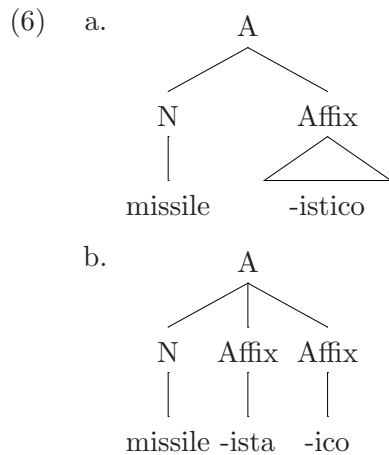
4.1 Synaffixation

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. (5) for relevant Italian examples:

- | | | | |
|-----|-------------------|------------------------|--------------------|
| (5) | 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 |

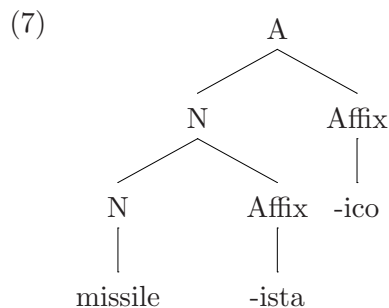
The examples in (5) involve two easily recognizable suffixes, *-ista* and *-ico* attaching to a nominal base. The intermediate recognizable sequence [N+ista] sounds odd (although it could be judged grammatical). We could be tempted to propose a ternary structure for these formations: [base + *-ista* + *-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 (5) is (6a) and not (6b).

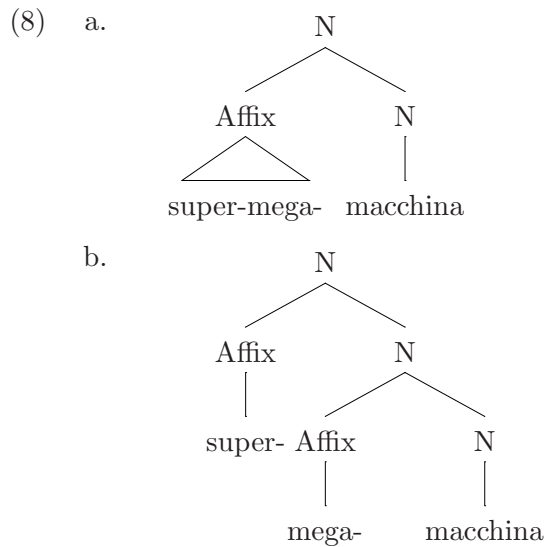


Bauer (1990) adopts the explanation in (6a), and so does Booij (2001). At present we are not aware of any proposal in the literature explicitly defending the option in (6b).

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. 8a); the second option is to analyse it as two different prefixes being applied successively to the same derivation (cf. 8b). There is apparently no reason to propose a flat (ternary) analysis in this case.



4.2 Discontinuous Synaffixation: Parasyntesis

Parasyntetic derivation can be defined as the simultaneous affixation of a prefix and a suffix to a base: both affixes are independent, semantically and functionally. Parasyntesis 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:

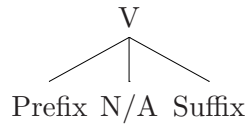
- | | | | | |
|--------|--------------|----------------|---------|----------|
| (9) a. | ingiallire | ‘turn yellow’ | giallo | ‘yellow’ |
| b. | arrossire | ‘blush’ | rosso | ‘red’ |
| c. | decaffeinare | ‘decaffeinate’ | caffé | ‘coffee’ |
| d. | abbottonare | ‘button up’ | bottone | ‘button’ |

Given the three elements in a parasyntetic 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.

- | | | | | |
|---------|--------------|------------|------------|-------------|
| (10) 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 parasyntetic derivations. However, we have found only one ternary-branching proposal for this phenomenon:

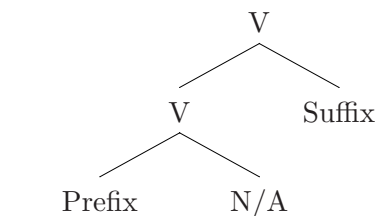
(11) Serrano-Dolader (1999)



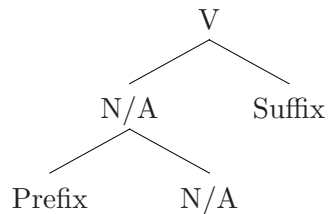
A structure like (11), although descriptively adequate, has very little explanatory power. It entails concomitant prefixation and suffixation, but it is not clear if the affixes form a constituent or not. Serrano-Dolader stipulates that syntactic category percolation proceeds from the suffix only.

Most morphologists view parasynthetic derivations as binary structures, although the final shape of the proposed structure depends on secondary theory-internal arguments; cf. (11). However, all these proposals have advantages over (11):

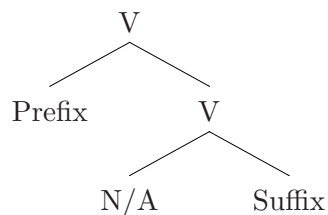
(12) a. Corbin (1980)



b. Alcoba Rueda (1987)



c. Scalise (1984, 1994)



(12a), (12b) and (12c) 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 (12c) 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

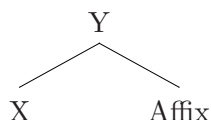
not postulate instances of category-changing prefixation (cf. instead 12a), a totally marginal and dubious phenomenon in right-branching languages.

4.3 Circumfixation

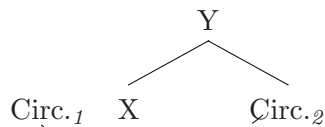
Circumfixation involves the affixation of a single *circumfix* or *discontinuous affix* to a base. Superficially, circumfixation and parasynthesis are the same phenomenon: simultaneous attachment of two morphological elements, one to the left and one to the right of the base. This is the reason why many 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:

- (13) 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 (12a), (12b) or (12c) 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.

4.4 Coordinate compounding

Following the long tradition (e.g. Lees (1960); Marchand (1969); Levi (1978); Lieber (1992); Jackendoff (2002)) that sees compounding as a sort of “proto-syntax”, or the result of a transformation from an underlying sentence, we assume that each compound structure is correlated to a certain phrasal configuration and to a certain grammatical relation, which could be explicitly realized in sentential syntax.⁴

The grammatical relation holding between the constituents in coordinate compounding is a relation of coordination. Coordinate compounds have a number of properties that can be observed cross-linguistically: the constituents belong to the same syntactic category and – broadly – to the same semantic class. Determining which of the constituents is to be considered the semantic head of the whole compound is not a trivial task. The same can be said with respect to the syntactic head, although in languages with more than one morphologically marked grammatical gender, sometimes the syntactic head is self-evident. Cf. (14) and (15) for relevant examples in Italian and English, respectively.⁵

- | | | |
|------|---------------------------------|--|
| (14) | a. studente-lavoratore (m.) | studente (m.) + lavoratore (m.)
'student worker' |
| | b. casalinga-imprenditrice (f.) | casalinga (f.) + lavoratrice (f.)
'housewife businesswoman' |
| | c. nave-traghetto (f.) | nave (f.) + traghetto (m.)
'ship ferryboat' |
| | d. bar-pasticceria (m.) | bar (m.) + pasticceria (f.)
'bar pastry-shop' |

⁴This idea lies at the heart of the proposal for a classification of compounds in Bisetto and Scalise (2005), to which we refer the reader for a thorough description of the chosen criteria and background information.

⁵Grammatical gender is signaled in (14) and (15) with the following codes:
m. = masculine, f. = feminine, c. = common.

- | | | |
|------|------------------------|----------------------------|
| (15) | a. king-emperor (m.) | king (m.) + emperor (m.) |
| | b. dancer+singer (c.) | dancer (f.) + singer (f.) |
| | c. fighter+bomber (c.) | fighter (c.) + bomber (c.) |
| | d. comedy+drama (c.) | comedy (c.) + drama (c.) |

All the examples in (14) and (15) are of the N+N type, which is probably the most frequent type of coordinate compound cross-linguistically. However, also other patterns are found: cf. A+A (e.g. *deaf-mute*), V+V (e.g. It. *sali+scendi*, ‘lit. go up + go down, sliding bar’)⁶.

Just like syntactic coordination, coordinate compounds can in principle include an unlimited number of coordinated constituents. There seem to be no grammatical restrictions to the recursiveness of coordination, other than memory limits on processing extremely complex coordinations.

- (16) a. Il partito *marxista-leninista-maoista* iniziò nel 1979 [...] ‘The marxist-leninist-maoist party started in 1979 [...]’
 b. The *actor-governor-president-icon* Ronald Reagan died at age 93

(16a) and (16b) present examples of coordinate compounds with three and four constituents. Although such examples are totally compatible with *n*-ary (flat) analysis such as (17a) and (18a), there is no evidence against strictly binary representations along the lines of (17b-c) and (18b-d).

- (17) a. [marxista + leninista + maoista]
 b. [[marxista + leninista] + maoista]
 c. [marxista + [leninista + maoista]]
- (18) a. [actor + governor + president + icon]
 b. [[[actor + governor] + president] + icon]
 c. [actor + [governor + [president + icon]]]
 d. [[actor + governor] + [president + icon]]

All the possibilities in (17b-c) and (18b-d) are grammatical options in Italian and English, and give rise to compounds which can have slightly different interpretations due to the principle of compositionality: these differences

⁶*Sali+scendi* is an exocentric compound (the output category is N, while the constituents are both V). Endocentric coordinate V+V compounds are not easily found in the European languages. Cf. Dutch *zweef+vliegen* ‘lit. hover + fly, glide’: it is not clear whether the constituents stand in a relation of coordination (roughly, ‘to fly *and* hover’) or in a relation where one of them is prominent (for instance ‘to fly in some particular way, i.e. hovering’). Other languages, instead, have very productive patterns of V+V compounding, e.g. Chinese, but then again, it is not clear if these are really cases of coordination or some other phenomenon – a sort of resultative construction, or a different subordinative relation, cf. Packard (2000, 94-5).

cannot be captured by n -ary analyses. However, we may say all these different structures can be equally used by the speakers, depending on a variety of factors, and that there is no reason to prefer one of them over the others. In particular, we find no reason to prefer a n -ary analysis over any of the binary alternatives.

Other examples seem to require a flat representation (cf. 19), but but they are very plausible cases of lexicalization:

- (19) Fr. la combinaison bleu-blanc-rouge
 'the blue-white-red combination'

4.5 (Para-)synthetic compounding

Some languages productively build complex words using a blend of compounding and derivation simultaneously. There is little accord on the phenomenon, which is considered to represent a bracketing paradox in word-structure.

- (20) a. *Blue-eyed* parents can have brown-eyed kids (cf. *eyed)
 b. open-minded, broad-shouldered, one-armed, tiger-footed

To a certain extent, this type of compound is also present in Italian and in the other Romance languages: e.g. *sottomarino* 'submarine' (*sotto+mare+ino*). These words have often been analysed as ternary structures (e.g. [blue+eye+ed]), but although this option is superficially descriptive, it cannot account for other properties of (para-)synthetic compounds. Their semantics suggests that they are actually derived from an underlying phrase: [[blue+eye]NP + -ed]A 'having blue eyes'. On the contrary, their morpho-phonological properties seem to indicate that the affix attaches to the rightmost constituent, and not to the whole NP: [[blue]A + [[eye]N + -ed]A]A.

5 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 (cf. 4.4), 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.

References

- Ackema, P. and Neeleman, A. (2004). *Beyond Morphology; Interface Conditions on Word Formation*. Oxford University Press, Oxford.
- Alcoba Rueda, S. (1987). Los parasintéticos: constituyentes y estructura léxica. *Revista de la Sociedad Española de Lingüística (REL)*, 17(2):245–267.
- Aronoff, M. (1976). *Word Formation in Generative Grammar*. MIT Press, Cambridge, MA.
- Bauer, L. (1990). Be-heading the word. *Journal of Linguistics*, 26:1–31.
- Beard, R. (1995). *Lexeme-Morpheme Base Morphology: A General Theory of Inflection and Word Formation*. SUNY Press, Albany.
- Bisetto, A. and Scalise, S. (2005). The classification of compounds. *Lingue e Linguaggio*, IV(2):319–332.
- Booij, G. (1977). *Dutch Morphology: A Study of Word Formation in Generative Grammar*. Foris, Dordrecht.
- Booij, G. (2001). *The Morphology of Dutch*. Oxford University Press, Oxford.
- Chomsky, N. (1995). *The Minimalist Program*. MIT Press, Cambridge, MA.
- Chomsky, N. (2005). Three factors in language design. *Linguistic Inquiry*, 36(1):1–22.

- Corbin, D. (1980). Contradictions et inadéquations de l'analyse parasythétique en morphologie dérivationnelle. In Dessaux-Berthonneau, A., editor, *Théories linguistiques et traditions grammaticales*, pages 181–224. Presses Universitaires de Lille, Lille.
- Culicover, P. W. and Jackendoff, R. (2005). *Simpler Syntax*. Oxford University Press, Oxford.
- Halle, M. and Marantz, A. (1993). Distributed morphology and the pieces of inflection. In Hale, K. and Keyser, S. J., editors, *The View from Building 20*, pages 111–176. MIT Press, Cambridge, MA.
- Jackendoff, R. (1997). *The Architecture of the Language Faculty*. MIT Press, Cambridge, MA.
- Jackendoff, R. (2002). *Foundations of Language*. Oxford University Press, Oxford.
- Kayne, R. (1981). Ecp extensions. *Linguistic Inquiry*, 12(1):93–133.
- Kayne, R. (1984). *Connectedness and Binary Branching*. Foris, Dordrecht.
- Kayne, R. (1994). *The Antisymmetry of Syntax*. MIT Press, Cambridge, MA.
- Kiparsky, P. (1973). Phonological representations. In Fujimura, O., editor, *Three Dimensions of Linguistic Theory*, pages 1–36. TEC Company, Tokyo.
- Larson, R. K. (1988). On the double object construction. *Linguistic Inquiry*, 19(3):335–391.
- Lees, R. B. (1960). *The Grammar of English Nominalizations*. Mouton, The Hague.
- Levi, J. N. (1978). *The Syntax and Semantics of Complex Nominals*. Academic Press, New York, San Francisco, London.
- Lieber, R. (1980). *On the Organization of the Lexicon*. PhD thesis, M.I.T., Cambridge, MA. Published by Indiana University Linguistics Club, 1981.
- Lieber, R. (1992). *Deconstructing Morphology*. University of Chicago Press, Chicago.
- Marchand, H. (1969). *The Categories and Types of Present-Day English Word Formation*. C.H. Beck, München, 2nd edition.
- Packard, J. L. (2000). *The Morphology of Chinese*. Cambridge University Press, Cambridge.

- Scalise, S. (1984). *Generative Morphology*. Foris, Dordrecht.
- Scalise, S. (1994). *Morfologia*. Il Mulino, Bologna.
- Scalise, S. and Guevara, E. (2005). The lexicalist approach to word-formation and the notion of lexicon. In Stekauer, P. and Lieber, R., editors, *Handbook of Word-Formation*, pages 147–186. Springer.
- Selkirk, E. (1982). *The Syntax of Words*. MIT Press, Cambridge, MA.
- Serrano-Dolader, D. (1999). La derivación verbal y la parasíntesis. In Bosque, I. and Demonte, V., editors, *Gramática Descriptiva de la Lengua Española*, volume 3. Espasa, Madrid.