THE (NON-)TREE-REPRESENTABILITY OF SYNTACTIC OBJECTS. A GRAFT-THEORETICAL APPROACH TO NOMINAL COORDINATION

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Abstract: The present paper deals with nominal coordination and the way Graft Theory can be applied to this domain. As introduced and defined by van Riemsdijk (1998, 2000 and 2001), Graft Theory was initially applied to the domain of syntactic amalgams (Lakoff 1974) and transparent free relative clauses. The paper claims that Graft Theory can equally apply to the domain of coordination and a range of syntactic phenomena that are associated with coordination. The main idea that this paper advances is that Graft Theory could solve the problem of syntactic representability with coordinate structures, which are known to pose serious difficulties for binary branching. By endorsing the main tenets of Graft Theory, the paper also touches upon an issue with far-reaching implications: the (im)possibility of representing certain syntactic objects as syntactic trees.

Keywords: nominal coordination, grafts, linearization of conjuncts, multidimensional trees

1. Introduction

Chomsky (1982) acknowledges two different directions of analysis for coordination:
(i) The standard approach, where *John saw Bill and Tom saw Mary* is base-generated as a phrase marker with two parts, one to the left of the other;
(ii) The non-standard approach, where *John saw Bill and Tom saw Mary* is a three-dimensional phrase marker, i.e. *John saw Bill* and *Tom saw Mary* have no order, each being just a phrase marker in different dimensions. One can think of two rules, one that puts the two in the same dimension and a phonological one that, at some point, gives them an order.

The non-standard approach as formulated in Chomsky (1982) is one of the first hints at the existence of multidimensional syntactic trees, which could constitute a more appropriate syntactic structure for syntactic objects that pose problems for the principle of binary branching. In Chomsky's own words: "That's just a rather different approach, not only to coordination, but to the whole mass of phenomena that go along with it, such as gapping. That I think would be really worth exploring" (Chomsky 1982).

2. On the insufficiency of the standard tree-representation formalism

According to van Riemsdijk (1998), there are two main ways in which the standard tree-representation formalism has been thought to be insufficient.

A single terminal string has sometimes been assumed to be simultaneously structured by two or even more trees, this being the case of reanalysis, for example.

(1) John talked to Bill.
(2) Bill was talked to by John.

This reanalysis proposal amounts to saying that (2) has two structures associated with it, one a VP with a V and a PP, the other a VP with a V and an NP. To represent this linearly, two

different types of brackets can be used, […] for one dimension and {…} for the other dimension, resulting in the structure in (3):

(3) $Bill_i$ was [VP {V [V talked] [PP [P to] } [NP e]$_i$] by John]

Two strings (or substrings) can be associated with a single tree structure, this being the case of fully parallel coordinated structures (gapping) and Right Node Raising. On this view, (4) would have a structure like (5):

(4) John and Mary learn Spanish and Portuguese respectively
(5) [IP NP [VP NP AP]]
John learn Spanish respectively
Mary Portuguese

Structure (5) would then be linearized to (4) and (5) could be linearized to (6), omitting the adverb *respectively*:

(6) John learns Spanish and Mary Portuguese.

In the RNR construction, we have a shared part of the string and a non-shared part. Examples such as (7) show that shared parts may be thought to not only share the terminals but also the relevant part of the structure while the non-shared part can diverge greatly in structure (cf. van Riemsdijk 1998):

(7) John loves, but he knows even more people who hate, opera.

Example (7) can be seen as two trees, each with its own terminals and structure, which share the rightmost part of their strings. These are *grafts*.

Van Riemsdijk (1998) offers the following classification of syntactic representations:

(8)

Name	Description	Examples
Trees	One string – one tree	(most) simple syntactic sentence structures
Reanalysis	One string – two trees	Pseudo-passives, double passives
Parallel structures	Two strings – one tree	Constituent coordination, gapping
Grafts	Two strings – two trees	RNR, *wh*-prefixes, transparent free relatives

In what follows, we will take a closer look at grafting and the potential candidates for these syntactic structures.

3. Grafts

Having enumerated a few illustrations of syntactic grafts, it is now time to see which potential candidates there are for this syntactic status. Along with this extensive illustration, we will also go through a brief history of the ideas that led to the articulation of Graft Theory.

3.1 Candidates for grafting

The first candidate that lends itself to an analysis in terms of grafting is the syntactic amalgam, which was first defined and investigated by Lakoff (1974). Syntactic amalgams were reinterpreted in terms of Graft Theory by van Riemsdijk (1998, 2001 and 2006).

3.1.1 Syntactic amalgams

There are several subtypes of syntactic constructions which may fall under the cover term *syntactic amalgam*:

(9) inserted sluices
  a. John invited *you'll never guess how many people* to his party.
  b. John is going to, *I think it's Chicago* on Saturday.
(10) inserted hedges
  John is taking *did he say his daughter?* out today.
(11) syntactic *wh*-prefixes (cf. van Riemsdijk 1998)
  a. God knows who
  b. The devil knows why
  c. You know what
  d. The devil knows why God knows who has stolen you know what
  e. Why the hell has God knows who stolen you know what?

In the case of syntactic amalgams, the predicate XP is the semantic nucleus and the rest is a hedge by means of which the speaker distances himself from the choice of the term or calls it into doubt. The shared element seems to have the status of a quote, as shown in (12a-d), where (12c) and (12d) are not hedges but rather statements, since they are in the scope of an intensional operator.

(12) a. John is going to, *is it Chicago?* on Saturday.
  b. John is going to *I'm sorry to say it's Chicago* on Saturday.
  c. *John is going to *God knows it's Chicago* on Saturday.
  d. *John is going to *it's odd that it's Chicago* on Saturday.

3.1.2 *Far from* constructions

Another candidate for grafting is the so-called *far from* construction (cf. Kajita 1977, van Riemsdijk 1998, 2001 and 2006), which is illustrated in (13):

(13) a. The airport is far fom the city.
  b. These people are far from innocent.

In (13a) *from the city* is a PP-complement to the head *far*; in (13b) *innocent* seems to be the semantic head, while *far from* is a kind of adverbial modifier. The same property is shared by constructions such as *close on*, *other than*, *next to*, *greater than*, which have both the analytical uses (as in 14a) and the "adverbial" use (as in 14b):

(14) a. There are next to no statistical data available.
  b. He greeted me with greater than normal politeness.

Kajita notes that when used attributively there is a contrast between the two cases (see 15a, b). Example (15a) is ungrammatical since it deviates from the principle that says prenominal adjectives must be adjacent to the noun they modify. If we believe the structure of (14b) is parallel to that of (14a), the same principle should rule it out. The only way in which one can explain this is by assuming that *far from* is demoted (van Riemsdijk 1998), inserted as an adverb, with *innocent* being the relevant head.

(15) a. *the far from the city airport
b. those far from innocent people

In view of such data, van Riemsdijk (1988) concludes that the *far from* construction is a graft.

3.1.3 Transparent free relatives

Other candidates for grafting are transparent free relative clauses (cf. Kajita 1977, van Riemsdijk 1998 and 2001). In non-transparent FRCs, the non-overt antecedent is interpreted either as a definite NP or as a universally quantified NP.

(16) a. Give me what you bought.
b. Give me the specific thing that you bought. (definite reading)
c. Give me whatever you bought. (universal reading)

In transparent FRCs (TFRs), the invisible head is interpreted as indefinite:

(17) a. The man entered the cockpit carrying a gun, a razor, and a can of something that the crew took to be gasoline.
b. He is what one without exaggeration would call corpulent.
c. They served us what they euphemistically referred to as a steak.

According to van Riemsdijk (2001), there is not really an invisibile head but the predicate nominal is the head of the relative clause. The rest of the RC is interpreted as a hedge. An element which is deeply embedded in the syntactic structure is prominent from the point of view of the semantics and the pragmatics of the sentence. The predicate constituent is shared between the matrix clause and the free relative. After a thorough investigation of TFR characteristics, van Riemsdijk (2000) concludes that they are grafts.

3.2 Grafts – metaphor and terminology

The terminology suggested by van Riemsdijk (1998, 2000 and 2001) to describe such complex tree structures is of botanical origin[1]. The shared constituent is called the *callus*, the host tree is called the *stock* and the (sub)tree which is grafted onto the stock is called the *graft* or the *scion*.

The main problems that arise from the theory-internal considerations have to do with: (i) adequate and economic formalization; (ii) a mechanism that should restrict the types of representation that are allowed under graft theory; (iii) linearization of the conflicting lines of terminals: should the upper line be linearized before the lower or the other way round?

[1] Van Riemsdijk (1998) confesses to having hesitated between the metaphor of grafting and the metaphor of siamese twins. One argument in favor of choosing one over the other was precisely the fact that grafting is applied to *trees*.

4. Pseudo-partitive constructions and grafts

A domain where grafting was thought to apply is that of pseudopartitive constructions. Kajita (1977) was one of the first linguistis to notice that, in complex nominal expressions of the type Det N1 of Det N2 (also referred to in subsequent literature as "qualitative", predicate inversion structures, binominal constructions, pivotal *of* constructions, it is sometimes the second N which is felt to be the semantic head, though the first N is supposed to be the head:

(18) a. A couple of weeks passed.
b. The report does not contain a fraction of truth.
c. We did not find a vestige of evidence.

This type of semantic "bleaching" is reminiscent of the situation of TFRs and hedges, where the element deeply embedded in the structure is actually the most prominent. However, pseudo-partitive constructions are not amenable to an analysis in terms of grafts. The advent of the "extended projection" theory (van Riemsdijk 1998) has made it possible to conceive of the pseudo-partitive construction in terms of an "extended" projection headed by one lexical and one semi-lexical head.[2]

5. Nominal Coordination

Graft Theory could prove instrumental in the analysis of nominal coordination. On the one hand, it could solve the basic problems related to deriving coordinate structures by the rules of binary branching, since resorting to multidimensional trees and structures could override the need for strict binary formalizations. Secondly, it could help to solve intriguing particular cases, such as those under (19) and (20):

(19) [This [man and woman]] are in love. (cf. Heycock and Zamparelli 1999)
(20) [Acest [[prieten si coleg]] scrie un articol. (cf. Dogaru 2005)
[this [[friend and colleague]] write-3rd SG an article
'This friend and colleague (of mine) is writing an article.'
(21) [Şi [prietenul şi colegul]] scriu un articol.
[and [friend-the and colleague-the]] write-3rd PL an article
'Both the friend and the colleague are writing an article.'

The basic questions related to these examples are: (i) What is the structure of the DPs in (19-21)?; (ii) Is the resulting DP *this man and woman* derived via ellipsis of *this*, i.e. *this man and this woman*?; (iii) What is the status of the initial conjunction in (21)?.

5.1 I now pronounce you *man and wife*

Heycock and Zamparelli (1999) take NPs to be predicates so the null hypothesis is that the conjunction of two NPs under a common determiner should behave exactly like the conjunction of two predicative adjectives, as in *My uncle is [short and fat]*. Indeed, this prediction seems correct for (22), where each DP refers to a single individual who has both

[2] For an extensive discussion of the pseudopartitive construction and the evidence pointing to its description as a two-headed extended projection (with the semi-lexical head acting as a Classifier), see Tănase-Dogaru (2009).

the property of being a friend and the property of being a colleague. They refer to this reading of conjunction-containing DPs as the JOINT reading.

(22) a. [DP My [NP friend and colleague]] is writing a paper.
b. [DP That [NP liar and cheat]] is not to be trusted.

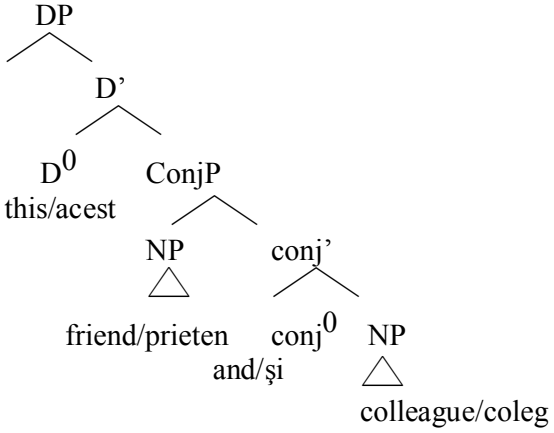
The SPLIT reading of the DP is exemplified in (24):

(23) a. [DP This [NP man and woman]] are in love.
b. [DP This [NP soldier and sailor]] are inseparable.

The DPs in (23) refer to pairs of individuals, as is made clear by the verbal agreement. Despite the singular morphology of the determiner and both Ns, the DPs do *not* each refer to a singular individual with the properties of being both a man and a woman, or a soldier and a sailor.

One of the questions related to such examples concerns the syntactic structure of *[this[man and woman]]* or *[acest[prieten şi coleg]]*. There are various reasons for which a structure like (24) does not capture the idea:

(24)



A syntactic structure like the one in (24) cannot account for the difference between (25a) and (25b) in terms of agreement phenomena:

(25) a. Acest prieten şi coleg scrie un articol.
this friend and colleague write-3rd SG an article
'This friend and colleague is writing an article.'
b. Acest prieten şi acest coleg scriu un articol
this friend and this colleague write-3rd SG an article
'This friend and this colleague are writing an article.'

A syntactic structure like the one in (24) cannot account for the difference between (26a) and (26b) in terms of agreement phenomena?

(26) a. This sailor and soldier are in love.
b. *This sailor and soldier is in love.

My working hypothesis is that the structure *This sailor and soldier are in love* is derived by righthand grafting (cf. van Riemsdijk 2000); there are actually two trees (in different dimensions), which share the element *this*, which is the "callus".

The problems that subsequent work will have to tackle concern: (i) agreement phenomena with nominal compounds and the way grafting can account for them; (ii) the treatment of *and* within the confines of the framework; (iii) the linearization of conflicting lines of terminals.

5.2 Coordinated nouns and determiner agreement

It has been proposed (cf. Wechsler and Zlatic 2000) that there are two types of agreement features associated with nouns, CONCORD features and INDEX features. CONCORD features, closely related to the declension class of a noun, generally control agreement between a noun and its determiners and adjectives. In contrast, INDEX features, closely related to the noun's semantics, control agreement between a noun phrase and a bound pronoun and often control verb agreement.

It can be predicted (cf. King and Dalrymple 2004) that coordinated singular nouns like *(this) boy and girl* behave as if they had a singular CONCORD value but a plural INDEX value, which explains why coordinated singular nouns require a singular determiner but plural verb agreement. They show that the CONCORD value of a coordinate phrase is determined by the CONCORD values of each conjunct: for example, a coordinate phrase has singular CONCORD only if each conjunct has singular CONCORD. In contrast, the INDEX value of a coordinate phrase depends on the properties of a phrase as a whole: a coordinate phrase has singular INDEX if it refers to a single individual, and plural INDEX if it refers to more than one individual.

The framework we are discussing also makes use of the distinction between distributive and nondistributive features. Nondistributive features can be associated with both the coordinate structure as a whole and the individual members of the set. Distributive features can only be associated with the individual conjuncts.

INDEX features are nondistributive, meaning that the set representing a coordinate structure can have INDEX features representing the agreement features for the set. Coordinated nouns typically have a plural value for INDEX NUM, i.e. they refer to more than one individual ("split" interpretation):

(27) Prietenul şi colegul meu au venit la nuntă.
friend-the and colleague-the my have-3rd PL come at wedding
'My friend and colleague came to the wedding.'

Coordinate structures like *prietenul şi colegul* involve a group-forming interpretation of *şi*, which requires the noun phrase to have a plural value for its INDEX NUM feature.

When the coordinate structure refers to a single individual ("joint" interpretation), the phrase behaves like a singular phrase with a singular value for its INDEX NUM:

(28) Acest prieten şi coleg a venit la nuntă.
this friend and colleague have-3rd SG come at wedding.
'My friend and colleague came to the wedding.'

Coordinate structures like *acest prieten şi coleg* involve a Boolean interpretation of *şi*, i.e. requiring that the individual or individuals have each relevant property (each individual must

be both a friend and a colleague). Romanian allows only this interpretation for coordinated nouns with a singular determiner, so that phrases like **acest băiat şi câine* 'this boy and dog' or **al meu băiat şi câine* 'my boy and dog' are disallowed.

We are now in a position to account for the following contrast:

(29) a. Un coleg şi amic e/*sunt cel la care vom merge.
a colleague and friend is are the one at whom will go
'A friend and colleague is the one to whom we will go.'

b. Acest coleg şi amic a/ *au venit la nuntă.
this colleague and friend has have come at wedding
'This colleague and friend has come to the wedding.'

Coordinated structures with a single (and singular) determiner in Romanian contain a Boolean interpretation of *şi*, allowing for singular INDEX agreement. Coordinated structures with double definite articles are ambiguous between a Boolean and group-forming *şi*, which accounts for the ambiguity between "joint" and "split" interpretations:

(30) Prietenul şi colegul meu a / au venit la nuntă
friend-the and colleague-the my has have come at wedding.
'My friend and colleague has/have come to the wedding.'

The double presence of the article triggers either distributive feature agreement (CONCORD) or non-distributive feature agreement (INDEX), causing the structure to enter either plural or singular agreement with the verb.

Coordinated structures with demonstratives or indefinite articles repeated on each conjunct have an unambiguous split interpretation, triggering distributive feature agreement (CONCORD) and thus entering plural agreement patterns with the verb:

(31) a. Acest prieten şi acest coleg au /*a venit la nuntă
this friend and this colleague have has come at wedding.
'This friend and this colleague have come to the wedding.'

b. Un prieten şi un coleg au /*a venit la nuntă.
a friend and a colleague have/*has come at wedding.
'A friend and a colleague have come to the wedding.'

5.3 Initial conjunctions and grafts

The semantic difference between (32a) and (32b) can be explained in terms of a grammatical means of marking distributivity, i.e. the relevant property is applied to each conjunct:

(32) a. Băiatul şi fata au făcut o prăjitură.
boy-the and girl-the have made a cake
'The boy and the girl have cooked a cake (together).'

b. Şi băiatul şi fata au făcut o prăjitură
and boy-the and girl-the have made a cake
'The boy and the girl have cooked a cake (each).'

The role of correlative conjunctions becomes even clearer when the examples involve conjunctions of bare nouns. Romanian examples containing coordinated bare (genuine) arguments are either severely ungrammatical or odd in the absence of an appropriate intonational contour:

(33) a. Mi-a dat o cheie, o scrisoare pentru proprietar şi câteva instrucţiuni. *Trebuie să dau cheie şi scrisoare chiriaşului.
'He gave me a key, a letter for the landlord, and some instructions. I have to give key and letter to the tenant.'

b. O pisică neagră şi un câine roşcat se băteau pe stradă. ??Pisică şi câine erau la fel de murdari.
'A black cat and a brown dog were fighting in the street. Cat and dog were equally filthy.'

The ungrammaticality of these examples is less severe when an initial coordinator is heading the conjunction phrase in object position:

(34) a. Mi-a dat o cheie, o scrisoare pentru proprietar şi câteva instrucţiuni. ?Trebuie să dau şi cheie şi scrisoare chiriaşului.
'He gave me a key, a letter for the landlord, and some instructions. I have to give both/and key and letter to the tenant.'

b. O pisică neagră şi un câine roşcat se băteau pe stradă. ??Şi pisică şi câine erau la fel de murdari.
'A black cat and a brown dog were fighting in the street. Both/and cat and dog were equally filthy.'

According to de Vries (2005), correlative conjunctions have a status different from simple conjunctions, i.e. the initial coordinator *şi* heading the correlative structure *şi…şi,* a status that differs from the regular conjunction *şi*. An initial coordinator always triggers focus and an obligatory distributive reading, and has to be treated as a distributive focus particle. Initial coordinators are adverbial phrases that are normally left-adjoined to a coordination phrase. There is a functional projection DistP on top of the coordination phrase whose specifier can host an adverbial phrase. Some initial coordinators are simply the head Dist. Others are AdvPs, which normally surface in SpecDistP. CoP is selected by Dist, which is in a spec-head relation with AdvP. Assuming that every coordinate structure has DistP as its maximal projection, for the simple reason that every coordination is interpreted either collectively or distributively, two possible situations result. First, if either Dist or SpecDistP is filled, the coordination is interpreted as obligatorily [+distributive]; this is the case if there is an initial coordinator. Second, if there is no initial coordinator, Dist or SpecDistP is lexically empty; therefore, the coordination is lexically underspecified for distributivity, hence ambiguous – that is, it is interpreted as either [+distributive] or [–distributive]. The definite interpretation is blocked for Romanian coordinated bare plurals. As in the case of coordinated bare singulars, the ungrammaticality of examples containing "definite" bare plurals in coordination structures is attenuated when a correlative heads the first conjunct. Compare:

(35) a. Am pus pe masă trei farfurii, trei cuţite şi trei linguri. *Cuţite şi farfurii erau murdare rău.

'I placed three plates, three knives and three spoons on the table. Knives and plates were terribly dirty.

b. Am pus pe masă trei farfurii, trei cuțite şi trei linguri. ?Şi cuțite şi farfurii erau murdare rău.
'I placed three plates, three knives and three spoons on the table. Both knives and plates were terribly dirty.

The major questions that grafting applied to nominal coordination will have to answer regard both the syntactic structure and the semantics of *băiatul i fata*. Our working hypothesis is that a coordinate structure like *Şi băiatul şi fata au făcut o prăjitură* is the result of merging two bidimensional trees (in separate dimensions), resulting in a three-dimensional structure with multidominance relations. Further research will hopefully offer an adequate formalization, correctly account for distributivity with initial conjunctions, solve agreement problems and account for linearization of terminals.

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