Strange Loops: Phrase-Linking Grammar Meets Kaynean Pronominalization

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Abstract

As shown earlier by Gärtner (2002), linked trees, the graphs used by Phrase-Linking Grammar (Peters & Ritchie 1981) to capture (unbounded) dependencies, can be cyclic under the special condition that two „displaced“ constituents end up as sisters of each other. Such „PLG-loops“ closely match the particular kind of crossing dependency familiar from Bach-Peters sentences. We will show how PLG-loops allow implementing Bach-Peters configurations within the movement-based approach to binding by Kayne (2002). The resulting structures correspond to QR-derived adjunction structures of the kind introduced by May (1985).

1 Introduction

Syntactic structures are commonly assumed to be quite adequately representable by *directed acyclic graphs*. Syntactic frameworks usually come with an explicit assumption of acyclicity (cf., e.g., Pollard & Sag 1987:27; Shieber 1986:20) or rely on acyclicity as a theorem of the (axioms defining the) structures adopted. Thus, frameworks using (counterparts of) standard constituent structure trees, as defined for example by Partee, ter Meulen and Wall (1993:443f.), are of the latter kind. Moving away from trees, however, may complicate matters, and the property of cyclicity becomes an interesting object of study by itself.[1]

In this paper, I will characterize a curious special case of cyclicity arising in *Phrase-Linking Grammar* (PLG), a framework for modeling (unbounded) dependencies in terms of *multidominance* developed by Peters and Ritchie (1981) (cf. Engdahl 1986; Joshi, Vijay-Shanker & Weir 1991). The structures in ques-

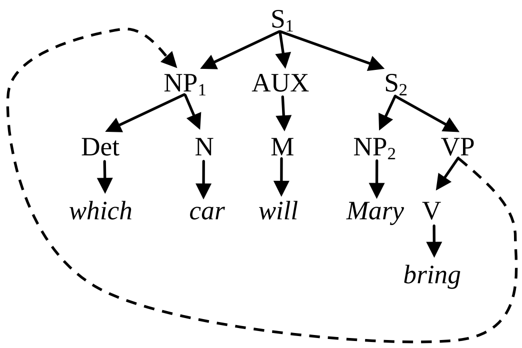
[1] The following remarks are confined to the very narrow domain of (certain aspects of) constituent structure. Aczel (1988) and Barwise and Moss (1996) provide a broader outlook.

tion will be called *PLG-loops* (Section 2). It will be shown that PLG-loops have a certain formal affinity to *Bach-Peters configurations*. This will allow us to provide an analysis of these structures within the movement-based approach to binding by Kayne (2002). The implementation will appeal to adjunction structures of the kind employed by May (1985) for the LF-treatment of QR (Sections 3 & 4). Section 5 explores some technical ramifications of this analysis.

2 Phrase-Linking Grammar and (A)Cyclicity

Phrase-Linking Grammar (PLG) constitutes an alternative to approaches to (unbounded) dependencies that build on (bound) *traces* (e.g., Chomsky 1981) or specific non-terminal vocabulary encoding „missing constituents" (Gazdar et al. 1985). In PLG, the familiar dominance relation is supplemented with *links* that relate a „displaced" constituent to its „launching site." This is illustrated in (1) (Peters & Ritchie 1981:3).

(1)



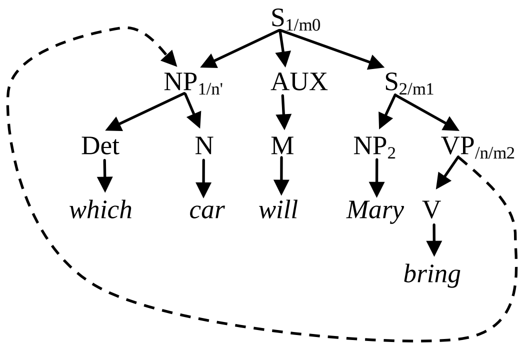
The directed graphs with links used in PLG are called *linked trees* and defined as follows (Peters & Ritchie 1981:6) (cf. Engdahl 1986:44f.) ($\mathbf{V_T}$ and $\mathbf{V_N}$ refer to terminal and non-terminal vocabulary, respectively):

(2) A *linked tree* is a structure $\boldsymbol{LT} = \langle \mathbf{N}, \mathbf{I}, \mathbf{L}, \mathbf{P}, \mathbf{f} \rangle$, where
N is a finite set of nodes (vertices),
I is a binary relation on **N** (of immediate tree domination),
L is a binary relation on **N** (of immediate link domination),
P is a function from **N** to $\mathbf{N}\times\mathbf{N}$ (of left-to-right precedence), and
f is a function from **N** to $\mathbf{V_T}\cup\mathbf{V_N}$
(which labels nodes with vocabulary symbols),
satisfying conditions (i)-(v):
(i) *Linear Precedence Ordering of Siblings:*
$\mathbf{P}(n)$ is a strict linear ordering of $\{ m \mid \langle n,m \rangle \in \mathbf{I}\cup\mathbf{L} \}$, for all $n \in \mathbf{N}$,
(ii) *Root:* there is an r in **N** such that $\langle r,n \rangle \in \mathbf{I}^*$ for all $n \in \mathbf{N}$,

(iii) *Unique Tree Parent:*
$\mathbf{I}^{-1}$ is a partial function defined just at members of $\mathbf{N}-\{r\}$,
(iv) *Tree Parent Dominates Link Parent(s):*
if $\langle n,n'\rangle \in \mathbf{L}$, then there are $m_0, \ldots, m_p \in \mathbf{N}$ ($p > 0$) such that
$m_1 \neq n'$, $m_p = n$, $\langle m_0,n'\rangle \in \mathbf{I}$, and $\langle m_i, m_{i+1}\rangle \in \mathbf{I}$, whenever $0 \leq i < p$,
for all $n,n' \in \mathbf{N}$,
(v) *Node Labeling:*
$\mathbf{f}(n) \in \mathbf{V_N}$ iff there is an n' in $\mathbf{N}$ such that $\langle n,n'\rangle \in \mathbf{I}\cup\mathbf{L}$, for all $n \in \mathbf{N}$.

In the following, we will only deal with conditions (ii)-(iv), precedence[2] and labeling being orthogonal to our concerns. In particular, condition (iv), i.e., *Tree Parent Dominates Link Parent(s)* (TPDLP), will be central, given its crucial role in enforcing a counterpart to the c-command condition on (unbounded) dependencies (cf. Chomsky 1981). In essence, TPDLP says that all ancestors of constituents have to be „**I**-connected.“ To verify (iv) in (1) consider (3):

(3)



VP is link parent of NP_1, i.e., $\langle VP,NP_1\rangle \in \mathbf{L}$. (iv) then requires a non-trivial path in $\mathbf{I}$ from the tree parent of NP_1, S_1, to NP_1's link parent, the second member of which differs from the link child, NP_1. In (3), $\langle S_1,S_2,VP\rangle$ constitutes such a path, given that $\langle S_1,S_2\rangle \in \mathbf{I}$, $\langle S_2,VP\rangle \in \mathbf{I}$, and $S_2 \neq NP_1$.[3]

Interestingly, Peters and Ritchie (1981:1) state as an informal aside that

> [...] in language it is impossible for one phrase to be a constituent of another phrase, and for the latter also to be a constituent of the former – except in the special case where the two are in

[2] Gärtner (2002:3.2) discusses formal aspects of precedence in multidominance structures in detail. More recent work has been done by Chen-Main (2006), Wilder (2008), de Vries (2009), and Gračanin-Yuksek (2013).

[3] Due to the strict surface orientation of TPDLP, PLG rules out remnant movement. Consider the case of remnant VP-topicalization in (i).

(i) $[_{CP}$ $[_{VP1}$ t_i *gelesen* $]_j$ *hat Hans* $[_{AgrOP}$ $[_{DP}$ *das Buch* $]_i$ $[_{VP2}$ *nicht* t_j]]]
„Hans hasn't read the book“

Here, $\langle AgrOP,DP\rangle \in \mathbf{I}$ and $\langle VP1,DP\rangle \in \mathbf{L}$ but $\langle AgrOP,VP1\rangle \notin \mathbf{I}^+$, i.e., the tree parent of DP, AgrOP, does not (tree-)dominate the link parent of DP, VP1.

fact the same phrase. This fact motivates a restriction to employing only acyclic graphs as structural descriptions, which restriction we adopt henceforth.

Formally, it is assumed that (***LT***-condition) „(iv) together with (iii) insures that $\langle \mathbf{N}, \mathbf{I} \cup \mathbf{L} \rangle$ is a directed acyclic graph“ (Peters & Ritchie 1981:6), i.e., that acyclicity is a theorem of (2). For further reference, I provide (4) as an explicit statement of acyclicity for linked trees.

(4) ***LT****-Acyclicity*

$$\neg(\exists n,n' \in \mathbf{N})[\langle n,n' \rangle \in (\mathbf{I} \cup \mathbf{L})^{+} \wedge \langle n',n \rangle \in (\mathbf{I} \cup \mathbf{L})^{+}]$$

Let us check how the simple cyclic graphs in (5) are ruled out as linked trees.

(5) a.

$$\begin{tikzcd} & 1 \arrow[dl] & \\ 2 \arrow[rr] & & 3 \arrow[ul] \end{tikzcd}$$

b.

$$\begin{tikzcd} & 0 \arrow[d] & \\ & 1 \arrow[dl] & \\ 2 \arrow[rr] & & 3 \arrow[ul] \end{tikzcd}$$

For expository purposes, $(\mathbf{I} \cup \mathbf{L})$ will alternatively be called **ID** („immediate dominance“) and the following notation is adopted (cf. Kracht 1999):

(6) a. $\downarrow x := \{\ y \mid \langle x,y \rangle \in \mathbf{ID}^{+}\ \}$
b. $\Downarrow x := \{\ y \mid \langle x,y \rangle \in \mathbf{ID}^{*}\ \}$
c. $\uparrow x := \{\ y \mid \langle y,x \rangle \in \mathbf{ID}^{+}\ \}$
d. $\Uparrow x := \{\ y \mid \langle y,x \rangle \in \mathbf{ID}^{*}\ \}$

Turning first to (5a), one can verify that (ii), *Root*, is satisfied, given that $\Downarrow 1 = \Downarrow 2 = \Downarrow 3 = \{1,2,3\}$. (ii) does not in fact require a *single* root. However, condition (iii), *Unique Tree Parent* (UTP), is violated because $\mathbf{I}^{-1}$(5a) is not undefined at r, i.e., the root nodes are not parentless:

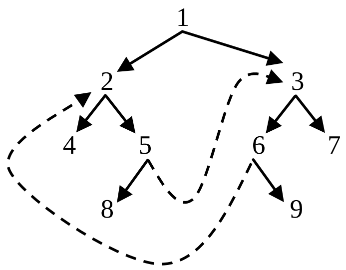
(7) $\mathbf{I}^{-1}(5a) = \{\langle 1,3 \rangle, \langle 2,1 \rangle, \langle 3,2 \rangle\}$

Adding 0 in (5b) as a single parentless root, i.e., assuming $\langle 0,1 \rangle \in \mathbf{I}$(5b), allows two interpretations. Either this leads to a violation of UTP: $\langle 1,0 \rangle \in \mathbf{I}^{-1}$(5b) and $\langle 1,3 \rangle \in \mathbf{I}^{-1}$(5b). Or else, if $\langle 3,1 \rangle$ is taken to be a link, i.e., a member of **L**, TPDLP rules out (5b): the link child, 1, must not be part of the „**I**-connection“ from tree parent, 0, to link parent, 3. Yet, in (5b) this cannot be avoided, i.e., $m_1 = n' = 1$.[4]

[4] In standard constituent structure trees, acyclicity of $\mathbf{ID}^{+}$ follows from the definition of the dominance relation, **D** (= $\mathbf{ID}^{*}$), as a *weak partial order*. This means that **D** is transitive, reflexive, and antisymmetric. Antisymmetry requires that if $\langle x,y \rangle \in \mathbf{D}$ and $\langle y,x \rangle \in \mathbf{D}$, then x = y (Partee, ter Meulen & Wall 1993:440). Going from dominance, **D** (= $\mathbf{ID}^{*}$), to proper dominance, $\mathbf{ID}^{+}$, i.e., the irreflexive transitive closure of **ID**, means removing all remaining symmetric pairs. Thus, since there is no x such that $\langle x,x \rangle \in \mathbf{ID}^{+}$ (trivially), $\mathbf{ID}^{+}$ is asymmetric and any graph based on $\mathbf{ID}^{+}$ must be acyclic.

Curiously, however, as earlier pointed out by Gärtner (2002:133,fn.21), there is a way of introducing acyclicity into linked trees. This possibility arises when two or more link children are sister nodes. A simple instance is shown in (8).

(8)

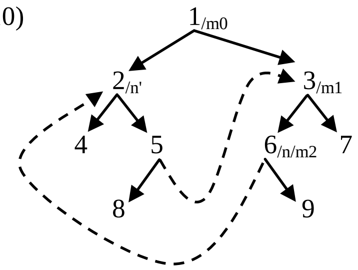


Cyclicity arises for the loop including link parents and link children as (partially) indicated in (9):

(9) a. $\{2,5,3,6\} \subseteq \downarrow 2, \downarrow 5, \downarrow 3, \downarrow 6$
b. $\{\langle 2,5\rangle,\langle 5,2\rangle\} \subseteq (\mathbf{I}\cup\mathbf{L})^{+}$

(9b) states only one of several violations of (4). (10) shows that TPDLP is satisfied for $\langle 6,2\rangle \in \mathbf{L}$, given that $\langle 1,3\rangle \in \mathbf{I}$ and $\langle 3,6\rangle \in \mathbf{I}$, i.e., given that tree parent and link parent can be „**I**-connected“ ($\langle 1,6\rangle \in \mathbf{I}^{+}$) without requiring a path via the link child ($m_1 = 3 \neq n'$). Clearly, the same can be shown *mutatis mutandis* for $\langle 5,3\rangle \in \mathbf{L}$, given that $\langle 1,2\rangle \in \mathbf{I}$ and $\langle 2,5\rangle \in \mathbf{I}$ ($\langle 1,5\rangle \in \mathbf{I}^{+}$ / $m_1 = 2 \neq n'$).

(10)



Cyclic (sub)graphs arising in linked trees such as the one in (8)/(10) will be called *PLG-loops* from now on.

The further interest of PLG-loops may, of course, be questioned. Thus, one way of dealing with them would be to define them away.[5] However, the particular kind of crossing configuration involved (8)/(10) is reminiscent of binding

[5] The simplest way of doing so would be to add (4) to the ***LT***-conditions. Alternatively – and more parsimoniously – one can disallow link children as second members of the „**I**-connection“ between tree parent and link parent defined in TPDLP. To do this it is sufficient to require in addition to $m_1 \neq n'$ that $\neg\exists n''[\langle n'',m_1\rangle \in \mathbf{L}]$.

configurations occurring in so-called *Bach-Peters Sentences*. We are going to see that this fact can be instrumentalized in bringing about a somewhat surprising case of theory convergence.

3 Kaynean Pronominalization

Kayne (2002) undertakes to „explore the idea that binding should be rethought in movement terms [...], including what we think of as Condition C effects“ (p.133). This exploration adopts a Chomskyan minimalist setting and the following conditions are – more or less explicitly – adhered to.

(11) *Inclusiveness Condition* (p.134)
No indices/coindexation occur/s in (narrow) syntax

(12) *Extension Condition* (p.150)
Movement targets (the sister position of) the current root node

(13) *Theta-Conditions* (p.135)
a. Θ-roles can be acquired by movement
b. Argument chains have one and only one Θ-role

The derivation of a simple case of pronominal coreference in (14a) crucially involves the stages in (14b) and (14c). (Indices are purely expository devices here and the overall phrase structure is simplified.)

(14) a. $\textit{John}_{(i)}$ *thinks* $\textit{he}_{(i)}$ *is smart*
b. $[_{IP}\ [_{DP1}\ [_{DP2}\ \textit{John}\ ]\ [_{D'}\ \textit{he}\ ]\ ]\ [_{I'}\ \textit{is smart}\ ]\ ]$
c. $[_{IP}\ [_{DP2}\ \textit{John}\ ]_{(2)}\ [_{I'}\ \textit{thinks}\ [_{IP}\ [_{DP1}\ t_{(2)}\ [_{D'}\ \textit{he}\ ]\ ]\ [_{I'}\ \textit{is smart}\ ]\ ]\ ]\ ]$

Coreference is taken to be the consequence of base-generating antecedents and pronouns in complex DP configurations like the one shown in (14b). On the assumption that in such a configuration DP2 lacks a Θ-role and that Θ-roles are assigned to constituents in Spec,IP, (14c) constitutes a necessary step toward ensuring that condition (13b) is satisfied.[6]

Principle C violations like the one in (15) are then taken to follow from the additional constraint that „[e]xtraction of a phrase from within a doubling constituent like [*John he*] is limited to extraction of the Spec,“ which is explicitly related to the „Phase Impenetrability Condition and the earlier ban against movement of nonmaximal phrases“ (Kayne 2002:137).

[6] In the semantics, a complex pronominal DP like $[_{DP1}\ t_{(2)}\ [_{D'}\ \textit{he}\ ]\ ]$ can be interpreted such that the trace (or copy) in its specifier is translated as a variable bound by the antecedent (generalized quantifier). Consequently, D', containing the surface pronoun, must be semantically vacuous, i.e., translated as an identity function.

(15) * *He*$_{(i)}$ *thinks John*$_{(i)}$ *is smart*

For the sake of completeness, let us look at an attempt at circumventing this constraint by a sequence of short extraction of DP2 and remnant raising of DP1:

(16) [$_{IP}$ [$_{DP1}$ t$_{(2)}$ [$_{D'}$ *he*]]$_{(1)}$ [$_{I'}$ *thinks* [$_{IP}$ [$_{DP2}$ *John*]$_{(2)}$ [$_{IP}$ t$_{(1)}$ [$_{I'}$ *is smart*]]]]]

(16) violates condition (13b) twice, given that DP1 will receive two Θ-roles and DP2 none.[7]

Now, since Kayne's theory is a variant of earlier pronominalization approaches (e.g., Lees & Klima 1963), it faces similar kinds of objections as its predecessors. In particular, as argued by Bach (1970), so called *Bach-Peters Sentences*, such as the one in (17), are a challenge.

(17) [*Every pilot who shot at it*$_{(ii)}$]$_{(i)}$ *hit* [*some MIG that chased him*$_{(i)}$]$_{(ii)}$

Famously, the attempt to replace the (bound) pronouns by their antecedents – or to match them in the way Kayne proposes – leads to an infinite regress here. This is indicated in (18).

(18) a. *it* > [$_{DP1}$ [$_{DP2}$ *some MIG that chased <u>him</u>*] [$_{D'}$ *it*]]
b. *him* > [$_{DP3}$ [$_{DP4}$ *every pilot who shot at <u>it</u>*] [$_{D'}$ *him*]]
c. [$_{DP1}$ [$_{DP2}$ *some MIG that chased*
[$_{DP3}$ [$_{DP4}$ *every pilot who shot at <u>it</u>*] [$_{D'}$ *him*]]] [$_{D'}$ *it*]]
d. [$_{DP1}$ [$_{DP2}$ *some MIG that chased*
[$_{DP3}$ [$_{DP4}$ *every pilot who shot at*
[$_{DP1}$ [$_{DP2}$ *some MIG that chased <u>him</u>*] [$_{D'}$ *it*]]] [$_{D'}$ *him*]]] [$_{D'}$ *it*]]

Substituting the full representation of *him* given in (18b) within the full representation of *it* given in (18a) results in (18c), which contains a new placeholder for *it*, namely, *<u>it</u>*. The attempt at getting rid of this new *<u>it</u>* by substitution produces (18d), which, however, reintroduces placeholder *<u>him</u>*. And so on.

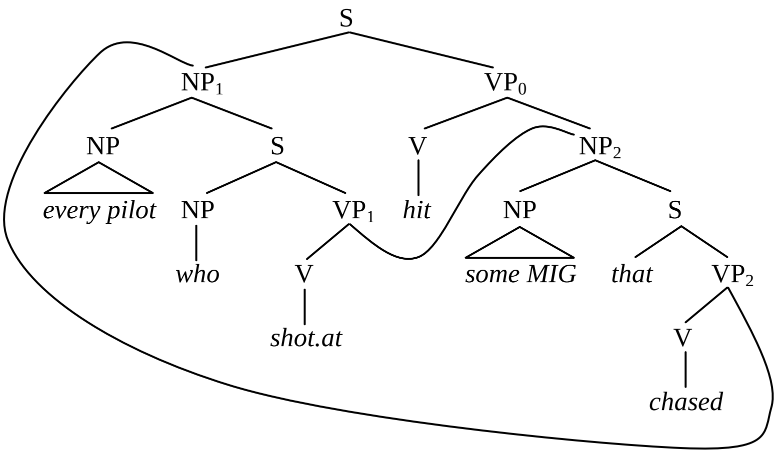
Kayne (2002: section 18) briefly addresses the issue and suggests that one of the containment relations in examples like (17) be suspended via extraposition. Since the proposal is not worked out in any detail, I refrain from speculating on its viability.

[7] A serious systematic discussion of the mechanisms involved in blocking any unwanted derivations would be called for here but is beyond the scope of this paper. In fact, it is not directly clear how just raising [$_{D'}$ *he*] to create the string in (15) could satisfy (13b), This suggests that Kayne (2002) (tacitly) assumes a more flexible Θ-assignment procedure.

4 Phrase-Linking Grammar Meets Kaynean Pronominalization

In a paper on the effects of dispensing with the *Single Mother Condition* (SMC) on phrase structure representations,[8] i.e., introducing multidominance, Sampson (1975:8) sketches a graph-theoretic way out of the „Bach-Peters paradox“:

(19)



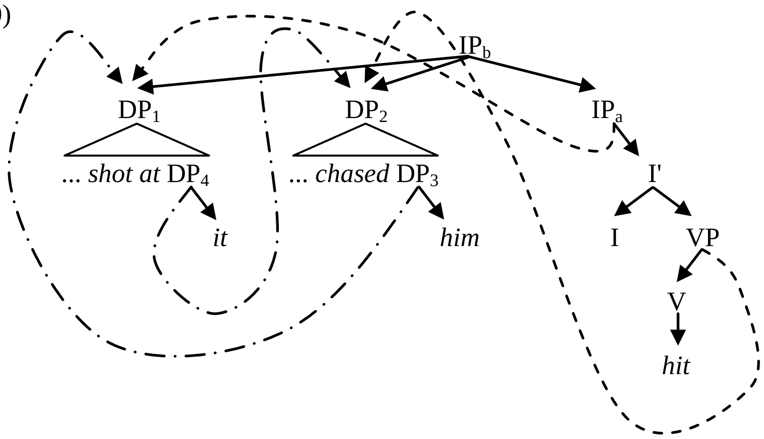
In order to avoid derivational infinite regress in the case of (19), Sampson (1975:2) follows McCawley (1968) in interpreting phrase structure rules as (representational) *node admissibility conditions*. Accordingly, NP_1 satisfies both $S \rightarrow NP\ VP$ and $VP \rightarrow V\ NP$ and NP_2 satisfies the latter rule twice. In addition, it is assumed that „[b]efore reaching surface structure, the Pronominalization transformation will have operated on the two branches which are drawn curved in [(19)] so as to 'unhook' them from the NPs they dominate and attach pronouns to their lower ends instead [...]“ (Sampson 1975:8).

Now, from the perspective of Kayne (2002), one likely major objection to Sampson's approach is the absence of c-command in the case of NP_2. Interpreted as movement configuration, the „link“ between NP_2 and VP_1 in (19) would constitute raising into a non-c-commanding position.[9] But this is where PLG-loops come in handy. To strike a compromise between Sampson and Kayne, what one can do is to allow Bach-Peters configurations to be licensed by PLG-loops at LF. This will have to include adopting the approach to adjunction proposed by May (1985), which amounts to the licensing of ternary (in fact, *n*-ary) branching nodes. The resulting structure is given in (20). (To make the graph more readable, internal structure has been reduced to a minimum and „pronominalization links“ have been made distinct from „QR links.“)

[8] The SMC follows from the definition of constituent structure trees (cf. Gärtner 2002:121f.).

[9] Kayne (2002: section 17) does, however, adopt „sideward movement,“ so the objection may ultimately be less serious.

(20)



(20) contains four links, i.e., $\langle \mathrm{IP_a,DP_1} \rangle \in \mathbf{L}$ and $\langle \mathrm{VP,DP_2} \rangle \in \mathbf{L}$ due to QR, and $\langle \mathrm{DP_3,DP_1} \rangle \in \mathbf{L}$ and $\langle \mathrm{DP_4,DP_2} \rangle \in \mathbf{L}$ due to „antecedent extraction" („pronominalization"). In order to check TPDLP, (2.iv), we have to check the tree parents of DP$_1$ and DP$_2$, which is IP$_b$ in both cases, i.e., $\langle \mathrm{IP_b,DP_1} \rangle \in \mathbf{I}$ and $\langle \mathrm{IP_b,DP_2} \rangle \in \mathbf{I}$. For the first link, $\langle \mathrm{IP_a,DP_1} \rangle$, the path in **I** from tree parent to link parent is $\langle \mathrm{IP_b,IP_a} \rangle$. For the second link, $\langle \mathrm{VP,DP_2} \rangle$, the path in **I** from tree parent to link parent is $\langle \mathrm{IP_b,IP_a,I',VP} \rangle$. For the third link, $\langle \mathrm{DP_3,DP_1} \rangle$, the path in **I** from tree parent to link parent is $\langle \mathrm{IP_b,DP_2,...,DP_3} \rangle$. And for the fourth link, $\langle \mathrm{DP_4,DP_2} \rangle$, the path in **I** from tree parent to link parent is $\langle \mathrm{IP_b,DP_1,...,DP_4} \rangle$. Each time, a path can be found that does not include the link child in question, so (20) satisfies TPDLP![10]

It should be noted that (20) captures May's approach to Bach-Peters sentences rather exactly: „[...] both pronouns in *Every pilot who shot at it hit some MIG that chased him* [...] qualify as bound variables. But this symmetry of c-command is now found directly represented in the LF-representations of such sentences [...]" (May 1985:36). What has been changed is that binding has been analyzed as a movement relation between pronouns and their antecedents as envisaged by Kayne (2002). And, because the kind of crossing dependencies required for Bach-Peters configurations cannot be defined by standard derivations, we have adopted Sampson/McCawley-style representational licensing.[11]

[10] Given that (20) is an LF-representation, one has to weaken the requirement that tree parents determine surface positions. I sidestep working out the required adjustment.

[11] The order of quantifiers in (20) would actually be reversed in the structures defined by May (1985: chapter 2), which are meant to capture ECP constraints on QR in addition. In order to deal with weak crossover, May (1985:154) slightly modifies his approach by having the object quantifier adjoin to the subject quantifier.

Jacobson (2000; cf. Karttunen 1971) has argued that the first pronoun in Bach-Peters sentences is a so-called *paycheck pronoun*, which introduces a functional referent picked up by the second DP. This requires the latter DP to be referential and therefore *non-quantificational*. It is a matter of

The structures involved turn out to be instances of PLG-loops, so we have gone full circle back to the specific kind of cyclicity diagnosed for linked trees in Section 2.

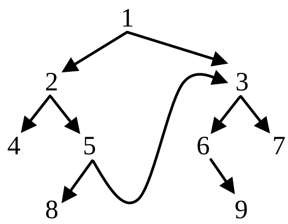
5 Ramifications

Among the many ramifications of the PLG-analysis of a Kayne-style approach to Bach-Peters sentences, I would like to briefly spell out more explicitly two rather pedantic points, namely, (i) the persistence of the „Bach-Peters impasse“ within Merge-based minimalism and (ii) the possibility of eliminating ternary branching.

To begin with, let us first convince ourselves that the derivational impasse created by Bach-Peters configurations persists in minimalist Merge-based derivations. A quick inspection of (8) will be sufficient to confirm what (18) already indicates in this respect. Nodes *8* and *9* correspond to the (bound) pronouns. Starting with *8*, we would like to get *Merge(8,3) = 5*. However, *3* is internally complex. So we have to first have *Merge(6,7) = 3*. Yet, since *6* is internally complex as well, we need to start with its daughters *2* and *9*, which will lead us back to the problem of merging *8* and *3*.

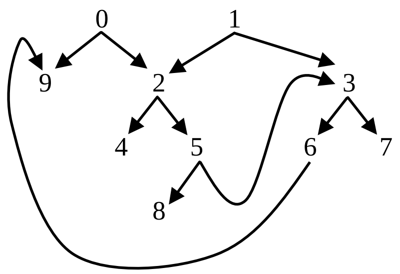
Suppose, instead, that we ignore one of the links at first and derive (21) by the sequence *Merge(6,7) = 3*, *Merge(8,3) = 5*, *Merge(4,5) = 2*, *Merge(2,3) = 1*.

(21)



Given that Merge always creates one additional (dominating) node, combining *2* and *9* at this stage cannot yield the desired outcome in (8), i.e., *2* cannot become daughter of *6*. Instead, we arrive at a „grafting“ configuration of the kind studied by van Riemsdijk (2006).

controversy whether this applies in cases like (17). From the perspective of Kayne (2002), however, the challenge remains the same.

(22) 

Second, in order to eliminate ternary branching from structures like (20) one can slightly modify TPDLP, i.e., condition (2.iv) on linked trees. Thus, instead of requiring that the tree parent *dominates* the link parent(s) one can allow nodes projected from the tree parent under adjunction to go proxy. Following Kracht (1999)[12] collections of nodes standing in such a projection relations, a.k.a. (adjunction) *segments*, are called *blocks*. Blocks are ingredients of *adjunction structures* as defined by Kracht (1999:267)(*y* < *x* says that *y* is properly dominated by *x*):

(23) An *adjunction structure* is a structure $S = \langle$ S, r, <, $\mathcal{B} \rangle$ where
$\langle$ S, r, < $\rangle$ is a tree and $\mathcal{B}$ a partitioning of S into subsets
which are linear with respect to <.

Thus, members of $\mathcal{B}$ are blocks and the members of a block B are the segments of B.

The weakening of TPDLP then requires that the tree parent ***b**-dominate* the link parent(s), the latter relation being defined as follows:

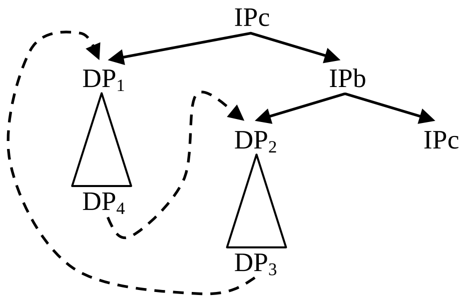
(24) A node x ***b**-dominates* a node y iff (i) or (ii):
(i) x dominates y
(ii) there is a node z and a block B,
such that x and z are non-minimal segments of B, and
z dominates y.

Now consider (25) (next page), a variant of (20) that employs standard adjunction of the quantifiers to binary branching segments of IP.

In (25), the tree parent of DP_1 is IPc and its link parent is DP_3. Since IPc dominates DP_3, by clause (i) of (24), IPc ***b***-dominates DP_3 and the revised TPDLP condition is satisfied. At the same time, the tree parent of DP_2 is IPb and its link parent is DP_4. Although IPb does not dominate DP_4, by clause (ii) of (24), IPb ***b***-dominates DP_4. This is due to the fact that IPc dominates DP_4, where IPc and IPb are non-minimal segments of the (adjunction) block ⟨IPa,IPb,IPc⟩. Again the revised TPDLP condition is satisfied.

[12] A closely related approach is presented by Kolb (2005).

(25)



6 Summary

We have seen that linked trees, the graphs used by Phrase-Linking Grammar (Peters & Ritchie 1981) to capture (unbounded) dependencies, can be cyclic under the special condition that two „displaced“ constituents end up as sisters of each other (Section 2). Such „PLG-loops“ closely match the particular kind of crossing dependency familiar from Bach-Peters sentences. We have shown how PLG-loops allow implementing Bach-Peters configurations within the movement-based approach to binding by Kayne (2002). The resulting structures correspond to QR-derived adjunction structures of the kind introduced by May (1985: chapter 2) (Sections 3 & 4).

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