On what goes left and what goes right

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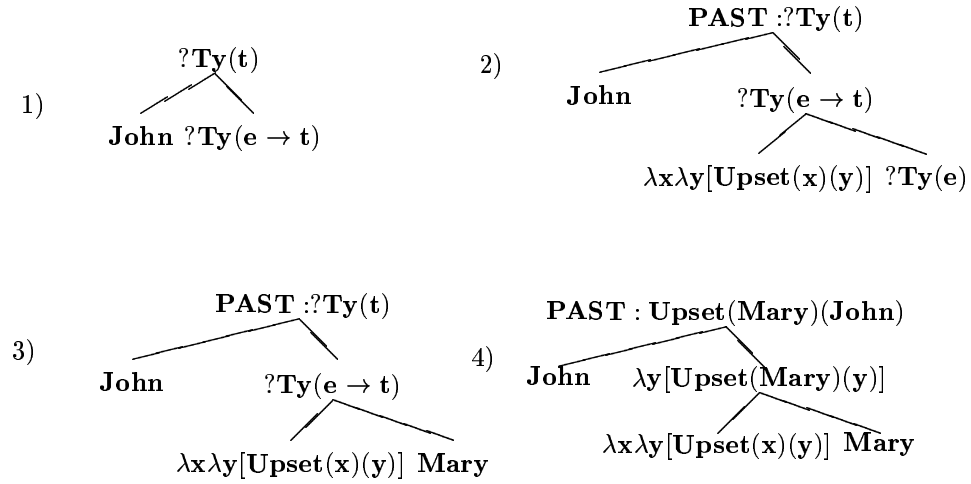
In this paper, we take the Dynamic Syntax Framework, and explore the extent to which it enables us to express the differences between left and right periphery phenomena in a revealing way. What we shall show is that manipulating the dynamics of tree growth reflecting the left-right sequence of words as the form of syntactic explanation enables us to characterise both left and right-periphery phenomena in similar terms, while nevertheless bringing out the difference between them. The relative success of these analyses in delineating natural classifications of the phenomena across the range of cross-linguistic data provides welcome confirmation of the claim of Dynamic Syntax that modelling the process of interpreting a string as a left-right process of tree growth provides a basis for natural-language syntax. What we shall argue is that the concept of nodes initially unfixed within a tree structure, the concept of inducing linked tree structures with the dynamics of passing information from one structure to another, and the analysis of anaphora as involving term substitution as an integral part of the tree growth process, enable us not only to analyse individually puzzling phenomena such as clitic doubling, heavy NP shift and right-node raising, but to do so in ways which naturally bring out the asymmetry between these right-peripheral effects and the range of topic structures contrarily available at the left periphery.

1 The Flow of Language Understanding

According to Dynamic Syntax, the process of natural language understanding is a monotonic tree growth process defined over the left-right sequence of words, with the goal of establishing some propositional formula as interpretation (= "$?Ty(t)$"). Intrinsic to this process are concepts of syntactic underspecification. First is the concept that all nodes are introduced with requirements to be filled later, as displayed graphically in Figure 1. As figure 1 displays, each node, as it is introduced, has an assigned 'goal' which is



Note $Ty(e)$ the semantic type of DP
$Ty(e \rightarrow t)$ the semantic type of VP.

Figure 1: Parsing *John upset Mary*

the requirement on wellformed completion of that node that it meet the requirement imposed on it. Moreover, it is characteristic of such requirements that they are satisfied sometimes only substantially later in the construction process.

Secondly, the concept of long-distance dependency is analysed as a tree-growth process involving initially unfixed Nodes whose position in the emergent tree structure is fixed later in the construction process[1] Again, we display the phenomenon graphically:

(1) Mary, John upset

[1] This process bears close formal resemblance to the concept of 'functional uncertainty' of Kaplan and Zaenen, articulated within LFG, but that framework lacks the dynamics of updating such uncertainty as part of the structural characterisation.

Interacting with both these structural forms of underspecification is the processing of anaphoric expressions, the assignment of interpretation to a pronoun. This phenomen of content underspecification, which we here take in representationalist spirit (cf Kempson et al 1998, Kempson et al 2000 ch.1 for arguments), involves lexical projection of a metavariable to be replaced by a process of substitution by some selected term. This process is taken to be a pragmatic, system-external one, restricted only in so far as locality considerations distinguishing individual anaphoric expressions preclude certain formulae as putative 'antecedent' values to assign the projected metavariable:

(2) Q Who upset Mary? Ans: John upset her.

Thus in processing the pronoun in (2), the object node is first decorated with a meta-variable **U** within $Fo(\mathbf{U})$, this being replaced by a copy of some other term, eg $Mary$, copied from the structure constituting the interpretation of the previous sentence. Notice that the substituend for the meta-variable is not the English word *Mary* but the term taken to represent the individual referred to by that word in the given context.

1.1 The Formal Framework

1.1.1 Decorated Partial Trees

As figures (1)-(2) have informally displayed, decorated partial trees are progressively constructed, each node of which is initially decorated with requirements and subsequently with annotations. Such trees are described by a modal logic of finite trees (LOFT - see Blackburn and Meyer-Viol 1994), with modal operators:

$$\langle\downarrow\rangle, \langle\downarrow_0\rangle, \langle\downarrow_1\rangle, \langle\uparrow\rangle, \langle\downarrow_*\rangle, \langle\uparrow_*\rangle, \langle L\rangle, \langle L^{-1}\rangle, \langle D\rangle, \langle U\rangle$$

In LOFT, modalities are interpreted on the nodes of the trees: e.g. the existential modality $\langle\downarrow\rangle$ is evaluated over the daughter relation, and $\langle\downarrow\rangle Ty(e \rightarrow t)$ 'holds' on a node n if there is a daughter where $Ty(e \rightarrow t)$ holds. More specifically, LOFT has $\langle\downarrow_0\rangle$ $\langle\downarrow_1\rangle$ interpreted over first and second daughters respectively, $\langle\downarrow_*\rangle$ over the reflexive transitive closure of the daughter relation (dominance), $\langle\uparrow\rangle$ over the mother relation, $\langle\uparrow_*\rangle$ over the inverse of dominance, $\langle L\rangle$ over a relation of LINK between trees, $\langle L^{-1}\rangle$ over its inverse, and finally $\langle D\rangle$ interpreted over the reflexive transitive closure of the union of daughter and LINK relations. The decorations that may hold at a node include specification of a value for the formula predicate Fo, a type

specification, expressed as an argument of the predicate Ty, a tree-node position, represented as an argument of the predicate Tn, and so on. Thus if $\langle D\rangle Fo(Run)$ holds at a node n, there is some node m that can be reached from n following daughter and link relations arbitrarily far, and $Fo(Run)$ holds at m. Included within possible specifications are meta-variables, being place-holders for some fixed value to be provided.

The specific and novel advantage of LOFT emerges from the use of the LOFT operators in combination with a generalisation of the concept of requirement $?X$ to any LOFT formula X. So the requirements that may be imposed are by no means restricted to nonmodal or simple modal requirements. To the contrary, any formula may be used to express a requirement. So while $\langle\downarrow_*\rangle Fo(\alpha)$ holding at a node n implies that n dominates a node where $Fo(\alpha)$ holds, $?\langle\downarrow_*\rangle Fo(\alpha)$ holding at n implies that $Fo(\alpha)$ is REQUIRED to hold at a node dominated by n. By this means requirements may constrain subsequent development of the tree; and this provides a mechanism for pairing noncontiguous expressions according as one imposes some requirement on a node which is fulfilled by an annotation on some discrete node supplied by the other. In particular, as we shall see, complementisers may impose complex modal requirements on the topnode of a newly introduced tree, to be met by some annotation in the subsequent construction of that tree.

1.1.2 The Dynamics of Tree Growth

LOFT is a language for describing (partial) trees. To describe the tree growth process, we define transitions between partial trees. There are three types of action: computational actions, which are general (albeit possibly language-specific); lexical actions, which are associated with individual words; and pragmatic actions, which are substitution operations, using terms/structure antecedently available. To exemplify the pattern of computational actions defined, we list **-Adjunction* which licenses the introduction of an unfixed node:

***-Adjunction**

$$\frac{\{\{Tn(a), \ldots ?Ty(t), \Diamond\}\}}{\{\{Tn(a), \ldots, ?Ty(t)\} \quad \{\langle\uparrow_*\rangle Tn(a), \ldots, ?Ty(e), \Diamond\}\}}$$

A rule like this should be read as follows: this transition is defined as starting from a partial tree (described as a structured set of nodes) containing only one node (described by the set of formulae holding at that node), here some

arbitrary tree node a with requirement $?Ty(t)$. The transition then adds to that one-member set the node described as being dominated by a, $\langle\uparrow_*\rangle Tn(a)$, requiring a type e decoration, with the pointer indicating that it becomes the node currently under development. (Notice how the rule conforms to the general pattern of defining information-preserving transitions from partial tree to partial tree.) Any node introduced by this rule has ultimately to be assigned a fixed tree position by a process, *Merge*, which unifies tree nodes. Characteristically *Merge* takes place (as displayed in figure 2), where co-present in a tree are an unfixed node annotated with a formula α of a certain type and a fixed node requiring that type.

Lexical actions defining the contribution of individual words are, equally, procedures for updating partial tree descriptions. The lexical specifications are of the form $\langle\ IF\ \Sigma, THEN\ \alpha_1,\ ELSE\ \alpha_2\ \rangle$, with the 'IF' condition specifying decorations which must hold on the node at which the pointer resides if the actions given by 'THEN' is to be carried out. For example, the conditions for the actions induced by the English verb *upset* require the pointer to be at a node decorated with the requirement $?Ty(e \rightarrow t)$, from which it initiates the addition of a subtree – a daughter node annotated with $Fo(Upset)$ – and the addition to its mother of the requirement for a daughter:[2]

upset	
IF	$\{?Ty(e \rightarrow t)\}$
THEN	go($\langle\uparrow\rangle$), put(Tns(PAST)), go($\langle\downarrow_1\rangle$), make($\langle\downarrow_1\rangle$); **go**($\langle\downarrow_1\rangle$); **put**($Fo(Upset), Ty(e \rightarrow (e \rightarrow t)), [\downarrow]\bot$); **go**($\langle\uparrow_1\rangle$); **put**($?\langle\downarrow_0\rangle(Ty(e))$)
ELSE	ABORT

If the condition is not met, the current sequence of actions aborts.

Pronouns illustrate how the structure projected by a word may underdetermine content. They supply a meta-variable which has to be replaced by some fixed value to yield a wellformed output.[3] Notice the specification of case, here nominative, as imposing a constraint on tree position that the mother node in the resulting tree be of type t:

[2] The detailed specification of condition and actions in the lexical specifications of verbs, including numbers of nodes to be constructed, varies from language to language, and indeed from verb to verb. This lexical description highlights the various basic actions DS uses to construct trees: put, go, make....

[3] The pragmatic process of substitution is also used to model the incremental way in which some scope choices are established (see Kempson et al 2001).

he

IF	$\{?Ty(e)\}$
THEN	put$(\{Fo(\mathbf{U}), Ty(e),$
	$?\langle\uparrow_0\rangle Ty(t), [\downarrow]\bot\})$
ELSE	**ABORT**

Both lexical specifications determine through the annotation '$[\downarrow]\bot$' that the annotated node in question is the terminal node of a tree, a general property of lexical items.

It is the interaction of computational, lexical and pragmatic processes which determines the assignment of interpretation to a string. A wellformed string is one for which at least one complete logical form can be constructed from the words in sequence within the context of a given class of computational and pragmatic actions WITH NO REQUIREMENTS OUTSTANDING. In consequence, as we shall see, the imposition of requirements and their subsequent satisfaction are central to explanations to be given.

1.2 Linked Structures and Relative Clauses

The Dynamic Syntax framework also licenses the construction of pairs of trees in tandem connected by a 'LINK' relation, described by the operator $\langle L\rangle$.[4] This adjunction introduces the top node of a new tree and copies information from one tree to the other. Taking nonrestrictive relatives as the most transparent case, consider the steps involved in projecting the construal of:

(3) John, who I like, chain-smokes.

Having processed the word *John* to yield a partial tree in which the formula $Fo(John)$ annotates a subject node (the 'head' node), a transition is licensed which builds a LINK relation from that node, introducing a new (LINKed) tree with topnode decorated with the requirement $?Ty(t)$ PLUS the requirement for a copy of the formula $Fo(John)$ without further specification as to where in that tree this formula might be located. This is expressed, for English, as the introduction of an unfixed node with a requirement of the form $?Fo(\alpha)$ for some $Fo(\alpha)$ annotating the head node:

[4] Analogous to the modal operators $\langle D\rangle$ (which is the union of $\langle\downarrow\rangle$ and $\langle L\rangle$ relations) $\langle U\rangle$ is the union of $\langle\uparrow\rangle$ and $\langle L^{-1}\rangle$ relations, hence ranging over any sequence of such relations in combination. It is these operators that allow a relation to be defined between any one node in a set of linked trees and any other node in such a set.

Link Adjunction (English)[5]

$$\frac{\{..\overbrace{\{X, Fo(\alpha), Ty(e), \Diamond\}}^{\text{head}}\}}{\{..\underbrace{\{X, Fo(\alpha), Ty(e)\}}_{\text{head}},}$$

$$\underbrace{\{\langle L^{-1}\rangle X, ?Ty(t)\}}_{\text{linked node}}\ \underbrace{\{\langle\uparrow_*\rangle\langle L^{-1}\rangle X, ?Fo(\alpha), ?Ty(e), \Diamond\}\}}_{\text{unfixed node}}$$

The relative pronoun itself then provides the required copy at the unfixed node. The subsequent construction of an interpretation for the relative clause follows the general pattern of left-dislocation structures; that is, it unifies the unfixed node with some node with an appropriate type requirement.

This *LINK Adjunction* rule also applies to yield nonrestrictive relative clause construals. The internal structure resulting from processing an NP contains TWO nodes of type e: the node projected by the variable to be bound by the determiner, which is introduced in parsing the noun, and the node projected by the NP as a whole.[6] In both cases the *wh* relatives serves the anaphoric function of ensuring the presence of the copy in the LINKed structure. Restrictive relatives involve a copy of the variable: nonrestrictive relatives involve a copy of the formula decorating the containing node of type e. Figure 4 displays the process of *Link Adjunction* for the case of restrictive relative construal, imposing a requirement on an unfixed node in the newly introduced linked structure which is fulfilled by the relative pronoun *who* which copies the variable as the head.

(4) the man$_i$ who$_i$ Sue likes e$_i$

[5]The rule here does not extend to pied-piping cases, but this minor simplification is for purposes of exegesis. See Kempson et al 2001 for a fuller definition which applies to such more complex cases:
(i) A Givenchy shirt, the collar of which was faded, was in the sale.

[6]Nonstandardly all NPs are taken to project expressions of type e with quantified expressions characterised as variable-binding term operators. That is, NP contents involve the building up of interpretation from a variable, a restrictor, and a variable-binding operator introduced by the determiner, which combines with some formula of *cn* type (an open formula constructed from variable plus restrictor) to yield a term of type e. See Kempson et al 2001 ch.4,7. We suppress here all details concerning the intrinsic content of the definite determiner.

The major alternative construction process for interpreting relative clauses involves the obligatory resumptive use of pronouns, as is displayed by Arabic. In (Egyptian) Arabic, a pronoun is essential in all non-subject positions for the strings to be wellformed:

(5) *il* *mudarris* *illi* *Magdi* *darab-u*
the teacher who Magdi hit him
'the teacher who Magdi hit' Egyptian Arabic

To reflect this distribution, we propose an analysis in which the complementiser induces the introduction of the required linked tree with its associated requirement for a copy. Unlike the English relative pronoun, it does not provide the required copy.[7] This requirement, which singularly lacks any restriction that the copy occur in some subtree, is expressed using the $\langle D \rangle$ operator, which is interpreted over an arbitrary sequence of daughter or LINK relations (see figure 5).

[7] As a subject pro-drop language, we take verbs in Arabic to have a condition for lexical action of $?Ty(t)$. From this node, the subject node is constructed as well as the predicate-internal structure. In addition, that subject is annotated with a meta-variable needing substitution exactly as a lexical pronominal.

This analysis of *illi* ensures that there is only one way of meeting the requirement which it imposes, and that is to use the regular copy process of the language - i.e. selecting as interpretation for some pronoun the value of the formula provided at the head node.[8] Such an interpretation is essential, since any other substituend will leave the LINKed structure with a requirement outstanding, hence not wellformed. In consequence, a pronominal MUST occur in the the subsequent string in a position from which an argument to the predicate can be directly constructed, and, moreover, MUST be interpreted as providing a copy of the formula annotating the head. This obligatory occurrence of a resumptively construed pronominal needs no separate stipulation, and the substitution process updating the pronominal remains a purely pragmatic process. It is merely its interaction with the modal form of requirement on the topnode of the LINKed tree which determines the result. As we have seen, the pattern displayed by Arabic arises in virtue of a relatively loose modal requirement imposed on the top node of the newly introduced LINKed structure. We can straightforwardly define a modal requirement with a more stringent locality condition. Such a restriction is motivated for Romanian relative clauses as introduced by the particle *care*, a structure in which, as in Arabic, resumptive pronouns are obligatory in all non-subject positions.[9] The only difference from Arabic is that such resumptive pronouns are required to occur locally to the complementiser *care* in the sense that they project a copy of the head formula in the same LINKed tree that the complementiser initiates, and cannot occur in a relative clause (in more common parlance across a strong island boundary):

(6) *băiatul* *pe* *care* *l-* *am* *văzut*
the boy pe which him have$_{1.SING}$ seen
'the boy that I saw' [Romanian]

(7) * *băiatul* *pe* *care* *am* *văzut*
the boy pe which have$_{1.SING}$ seen
'the boy that I saw'

[8] In most variants of Arabic except classical Arabic, *wh*-questions are the only form of left-dislocated structure in which a resumptive pronoun is not required. This suggests that *Adjunction needs to be defined in Arabic to be sensitive to the presence of a +Q feature (see Kempson et al 2001 for analyses in detail, and all formal specifications of the framework).

[9] Romanian and Italian both have more than one relative pronoun, one of which demands a gap. These can be distinguished according to whether they project an annotation for an unfixed node, or merely a (modal) requirement for the required copy, lexically distinguishing two variants, unlike Hebrew in which a single morphological form has two divergent uses.

(8) * *Omul* *pe* *care* *cunosc* *femeia* *care* *l-a*
the man$_j$ pe which$_j$ (I) know the woman$_i$ which$_i$ him$_j$ have
întîlnit
met e_j
'the man who I know the woman who met him'

Such a distribution is characterisable in the same terms as the Arabic restriction, except in the choice of modal operator with which the requirement is expressed - i.e. with a requirement on the top node of the LINKed structure of the form $?\langle\downarrow_*\rangle Fo(\alpha)$.

1.3 Topic structures as a pair of linked structures

The concept of building linked structures has so far been restricted to inducing a new tree (whose top node is duly decorated with a requirement $?Ty(t)$) from some node WITHIN a given partial structure. However, we can also straightforwardly define a process of LINK Adjunction between a tree with TOP node type e and some second structure of type t, duly imposing a requirement on that second structure that it contain an occurrence of the formula annotating the topnode of the first. Such a pair of trees can be used to model so-called topic structures in languages in which a left-peripheral NP, characteristically indicated to be separated from the following string by intonation, is associated with the presence in the following string of a coreferring pronoun:[10]

(9) As for Ali, I like him.

Notice what such an analysis of topic structures would lead us to expect. First, since there is no analogue to a relative pronoun in topic structures, their analysis as projecting linked trees would require the construal of the pronoun as identical to the interpretation assigned to the left-peripheral NP. This is because, given the modal form of requirement on the top node of the LINKed structure projected for interpreting the clause following that NP, together with the lack of any morphological expression analogous to an English relative pronoun, some pronoun MUST be interpreted as identical to the Fo value projected by that NP in order to yield a wellformed result. As in the case of Arabic relative clauses, this does not require any particular

[10]Here, for simplicity, we assume that the compound preposition *as for* induces an annotation on a node of type e, in addition to the construction of the required LINK relation.

stipulation for the pronoun itself: it is a consequence of the interaction between requirements and the availability of placeholding devices subject to a pragmatic process of substitution.

Secondly, we anticipate an asymmetry between those languages which have a full relative pronoun and those which do not. Where the relativiser does not itself induce the required copy in the LINKed structure, as in languages such as Arabic and Romanian, there should be parallelism between topic structures and relative clauses, both requiring a suitably construed pronoun in some position within that string. In languages/structures in which a relative pronoun DOES secure the presence of the copy of the formula at an unfixed node within the introduced LINKed structure, there should be no such parallelism. This asymmetry is indeed reflected in the data. In Arabic and Romanian (in relative structures using *care*), the two structures display parallel effects. In Arabic for example, a suitably construed pronoun is obligatory in all nonsubject positions, as it is in Romanian:

(10) *l-bint illi ali abilha.*
the girl that Ali met-her
'the girl who Ali met'

(11) *nadja, ali abil-ha*
Nadia, Ali met her
'As for Nadia, Ali met her.'

(12) *baiatul pe care l-am vazut* [Romanian]
the boy pe which him-have$_{1.SING}$ seen
'the boy that I saw'

(13) *Ion l-am intilnit anul trecut.* [Romanian]
John him-have$_{1.SING}$ met year last
John, him I met last year'

In eg English to the contrary, with its anaphoric complementiser, it is only in topic structures that a suitably construed pronoun is required (as in (9). In relative clauses it is not, and is merely an option associated with markedness effects:[11]

[11] Such resumptive pronouns are characteristically ignored in accounts of English relative clauses, see Sag 1997 which in other respects provides a comprehensive coverage of different kinds of relative clause. Nevertheless they occur commonly enough in all styles of speech. In this connection, we are grateful to Tami Kaplan of Blackwell's for passing me her collection made over a period of six years indicating that speakers of all ages use such

(14) The head of the department, who (even) he admits that he needs a holiday, is coming to the conference.

(15) That offensive professor, who I took great care to ensure that I didn't get HIM as a tutor, is complaining to the head that I don't go to his classes.

Setting relative clause sequences aside, the immediate consequence of an analysis of topic structures in terms of pairs of linked trees is that we have an additional strategy available for analysing left-dislocated NPs. Beside decorating an unfixed node within a single structure, we now also have them as annotating a head for a LINKed structure projected from the remainder of the sentence. And this gives us a natural basis for a left-dislocation typology – as we shall now see.

2 Towards a Left-Dislocation Typology

The problem faced in analysing left-dislocation data is that there is more variation than orthodox assumptions about long-distance dependency effects would lead one to expect. There are, familiarly, languages with the left-dislocated expression paired with 'a gap' and displaying island restrictions:

(16) Mary, John thinks Tom had upset.

(17) *Mary, I dislike the man that married.

There are also languages/structures that display pairing of the left-dislocated expression with a pronoun with no subjacency effects:

(18) *il-kita:b* *da,* *'inta* *tkallimt* *ma9a* *l-walad* *'illi* *katab*
the-book this, you talked with the-boy who wrote
9aley-h [Egyptian Arabic]
on-it
'You talked with the boy who wrote on this book'

(19) As for Mary, I talked to the boy who had scribbled on her book.

However this is by no means all the types of variation allowed. There are left-dislocation structures which use a pronoun which nevertheless displays some of the properties of movement, eg strong island effects (as first explored for Italian in Cinque 1990):

structures. See Kempson et al 2001 for evidence that restrictions on their use in relative clauses in English is solely pragmatic.

(20) Ton Petro ton nostalgo poli [Greek]
The Peter$_{ACC}$, Cl$_{ACC}$ miss-1sg much
'I miss Peter a lot'

(21) *Tin Maria, gnorisa ton andra pu tin patreftike
'Mary, I met the man that her married'

Conversely, there are left-dislocation structures which lack subjacency restrictions without apparent reliance on a lexical pronoun, as in Japanese:

(22) *Ano hon-wa$_i$ Hanako-ga e_j t_i katta hit-o$_j$*
That book-TOPIC Hanako-NOM bought person-ACC
sagasite iru rasii [Japanese]
looking for seem
'It seems Hanako is looking for the person who bought that book'

There is also interaction with case effects. Left dislocated constituents may optionally display case-matching with some twinned pronominal; and, if so, the pairing displays subjacency restrictions (compare Greek (21) with (23)):

(23) *I Maria xtes gnorisa ton andra pu tin*
The Maria$_{NOM}$, yesterday I met the man who her
pantreftike [Greek]
married
'As for Maria, yesterday I met the man who married her.'

(24) *?*Tin Maria$_{ACC}$, xtex gnorisa ton andra pu tin*
The Maria$_{ACC}$, yesterda I met the man who her$_{ACC}$
pantreftike
married
'As for Maria, yesterday I met the man who married her.'

Then, yet further, there are mixed effects in which left-dislocated constituents may be paired with a pronoun which is itself dislocated:

(25) As for Shalom, he I think should be given the position.

(26) Shalom, ?ani xošev še ?alav ?amarta še sara katva šir
Shalom I think that about-him said-you that sara wrote poem
[Hebrew]

And finally, clitic pronouns twinned with some left-dislocated element may depend on the particular form of the predicate as to whether or not they occur in some displaced position:

(27) Gianni, chidi-lo$_{ACC}$ domani
Gianni, ask him tomorrow [Italian]

(28) Gianni, lo vedro domani
Gianni, him$_{ACC}$ I will see tomorrow

This heterogenity appears to demand a number of different analyses with structure-specific stipulations and these data have been a focus of attention since the problems were first aired in detail for Italian in Cinque 1991 (see Anagnastopoulou 1996 for a representative range of analyses).

¿From a DS perspective, the range of possible effects can be seen as a consequence of interaction between two parameters for variation: on the one hand the distinction between annotation and requirement, and on the other hand, various locality restrictions. First, we classify strings according to how the annotated formulae projected by the left-peripheral NP is introduced into the structure constituting the interpretation of the main clausal sequence. There are two possibilities. Either the left-peripheral NP projects an ANNOTATION on an unfixed node within a single tree. Or it is taken as annotating a fixed node of type e as head to which a tree interpreting the main clause is LINKed, hence imposing a REQUIREMENT on that second tree (columns (a) and (b) in figure 6). This distinction between unfixed annotation in a single structure and modal requirement imposed on a LINKed structure from an independent tree yields the distinction between strings for which no pronoun is required (the 'Move α' type of case and the various processes of scrambling as in Japanese, German etc (Saito 1985 and many others subsequently) and strings for which a pronoun IS required (covering both the topic structures corresponding to 'Hanging Topic Left Dislocation' (van Riemsdijk 1997) and Clitic Left Dislocation (Cinque 1990)).

Secondly, we classify strings according to where the underspecified aspects of the information associated with that left-peripheral NP are resolved – i.e. whether the update of such specification (either annotation or modal requirement) has to occur within the same tree, and in this sense locally restricted, or may be provided in an additional LINKed tree, hence possibly in a relative clause (rows (i) and (ii) in figure 6). This gives us a means of distinguishing languages in which topic structures are associated with a strong island restriction on the relation between left-dislocated expression

and the twinned pronoun (identified in Romance as the Clitic Left Dislocation effect - Cinque 1990), and languages where the topic structure has no such restriction as in Arabic and the English *as for* construction (column (iib)).

It also gives us the distinction between left-dislocation effects without an accompanying pronoun in a language such as English and topic structures in Japanese which, in the latter, may be resolved across a relative clause boundary, despite the lack of morphological pronoun.

Within these major divisions, interaction between pronoun construal and the decoration associated with the left-peripheral NP provides variation in how the requirements for completing the tree are resolved. Taking first the class of LINKed structures (column (b)) with the *Formula* value constructed from the left-peripheral NP imposed as a requirement on their top node, there is the possibility of the two-step update from requirement to annotation at a fixed node VIA an annotation at an unfixed node, as is exemplified by Hebrew, and also by English (25).[12] Hence the subdivision in (iib). In languages in which the realisation of the LINK-imposed requirement of a copy of the head-formula is restricted to being WITHIN the same structure, as in the Romance Clitic Left-Dislocation effect, there is the further possibility that the annotation provided by the pronoun may be introduced into the tree description at a node which is unfixed relative to an individual predicate projected by the verb. In such a case the clitic pronouns will be processed prior to the verb, hence occur preceding it.[13] Hence the subdivision within the box (ib) of figure 6.

Taking next the set of structures in which the left-dislocated constituent is taken to annotate an unfixed node, there is also interaction between pronoun construal and the interpretation of the left-peripheral expression. Nothing precludes an unfixed node merging with a fixed node annotated with a meta-variable. So the tree-node position for an unfixed node may be established by unifying it with a node decorated by the meta-variable supplied by a pronoun. For successful application of *Merge* in these cases however, given that in general lexical items have an associated restriction

[12]In so far as these Hebrew and English strings involve restriction to having the copy of the head formula resolved within a single structure as in (i), this is due to the constraint imposed by constructing an unfixed node which the pronoun is taken to annotate, not to a restriction imposed in the construction of the LINK relation:
(i) *As for John, him I met the woman admires.

[13]The distribution of clitic pronouns in Romance languages is sensitive to restrictions imposed by the particular form of the verb, with imperatives, for example, requiring any clitic pronouns to occur after the verb. There are minor variations on this ordering between individual Romance languages, which have to be lexically defined. Note that though the clitic pronouns may have triggering conditions discrete from a discrete strong form of pronoun as to where in the tree they project a meta-variable as annotation, the *Fo* value lexically projected, hence the analysis of their lexically projected content, is the same as the full form.

that they decorate a terminal node (see section 1.1.2), one of two conditions must hold. Either the unfixed node in question must be a terminal node so this restriction is not violated (as in relative clauses where only a *Formula* value is copied over). Or the pronoun of the language in question must have a form which lacks the terminal-node restriction which words characteristically project. This second possibility provides a basis for including the case-matching effects of eg Greek left-dislocation structures within the overall picture – and the alternant non-matching of topicalised constituent and its paired pronominal. If a left-peripheral NP is marked with a case-requirement such as accusative indicating a relative position within a tree, then the NP MUST be analysed as decorating an unfixed node to be unified through *Merge*, for otherwise the requirement imposed by the case specification will not be met. To enable that node-unification process to take place however, the pronoun decorating the node to be merged must not impose a terminal-node restriction. On the other hand, if a left-peripheral NP is taken to induce the construction of an independent tree to which the remaining string provides a LINKed structure, then that NP cannot be assigned a case requirement indicating, for example, that the node must be immediately dominated by a predicate node (= accusative), as such a requirement would never be met. Such NPs are then either not marked morphologically for case at all, or they are marked for a case which is analysed in more abstract terms than that of some fixed tree-node relation.[14]

In this way, the framework can capture the asymmetry between languages such as Greek and English. In Greek, having lost the terminal-node restriction characteristic of lexical specifications, the clitic pronouns have shifted towards becoming an agreement device that merely imposes a requirement, with clitic dislocation being freely available for case-marked NPs as in (20).[15] In English to the contrary, the pronoun retains its terminal node restriction, and no such function is available for pronominal elements.[16]

[14]It is notable that analyses of many languages report that nominative case is morphologically null. The more abstract requirement of nominative case for such languages in which NOM is morphologically marked is that the node in question can be in a one-step relation to the root, whether that relation be L or $\downarrow$.

[15]Arguably, this is the formal reflex of a process of language change from a full anaphoric process towards one in which the element is defined as an agreement device (see footnote 20).

[16]See Kempson et al 2001 for an account of strong crossover in terms of the ability of construal of a pronoun to be provided by *Merge* in English. It is notable that in relative clauses, where a formula is copied across as an annotation of a node within the linked structure, no violation of the terminal-node restriction associated with the canonical definition of a pronoun is involved, unlike the case-matched left-dislocation structures of

Notice that this typology is a classification of strings in terms of distinct processes available for building up a logical form. It does not display a typology of individual languages. An individual string may indeed be subject to more than one analysis. For example, the clitic left dislocation data of Romance languages as in (27)-(28), in which there is no case marking on full NPs, classified in figure 6 as a pair of linked structures, may in addition be analysed with that left peripheral NP taken to decorate an unfixed node which is merged with the node decorated by the pronoun. In order to conform to the latter analysis, as in Greek, the pronoun must not imposed the constraint of decorating a terminal-node.[17] A second example of a string for which more than one analysis is available are Japanese topic constructions. Though classified as falling within (iia) in figure 6, i.e. as projecting an unfixed node, the *wa*- marked expression might also be analysed as projecting a tree to which the propositional formula subsequently projected is LINKed, hence leading to an interpretation in which the formula projected from the *wa*-marked expression is retained as an independent term. This availability of more than one analysis without any denotational distinction in the resulting interpretation is a bonus provided by a framework which focusses on the process of building up interpretation and not just on the resulting interpretation.[18]

This typology is incomplete, lacking as it does the projection of a pair of linked structures, both of type t. This is a problem we return to in section 4 having established a right-periphery typology, and we shall find, in the required extension suggested by parallelism with right-periphery effects, a basis for characterising across-the-board extraction and parasitic gap phenomena.

Greek.

[17] That there is a gradient range of effects in the Romance languages is indicated by the Spanish dative clitic: while the other clitics in Spanish have lost this "bottom" restriction so that *Merge* provides a form of update, the dative clitic has shifted from projecting such a weak form of annotation on some node to an even weaker 'expletive' specification that projects only a requirement, hence obligatorily requiring further lexical input to provide the annotation on that node:

(i) Le rompi la pata a la mesa

$\text{it}_{3.sing.Dative}$ $\text{broke}_{1.sing.}$ the leg to the table

'I broke the table's leg.'

[18] This flexibility provides a point of departure for an explanation of language change since discrete analyses may be available within any given system, hence allowing nonagreement over assigned analysis between speaker-hearer without either the risk of any breakdown in communication or the need to posit multiple grammars for an individual.

3 Towards a Right-Periphery Typology

The second task of this paper is, then, to extend this form of analysis to right-periphery effects, exploring the applicability of the concepts of a LINK transition and an initially unfixed node to their characterisation.

Right-periphery phenomena appear to present two entirely different types of phenomena. On the one hand, there are right-DISLOCATION effects, in which some full term seems to be displaced to the right periphery of some clausal sequence, eg Heavy NP Shift and Right Node Raising:

(29) I have been visiting for a long time now a woman in her eighties who used to be a painter

(30) I upset but Bill then comforted, an old woman in her eighties who I have been visiting.

Though such dislocations do not require the presence of a lexical noun phrase within the expected position in the clausal sequence, a pronoun may also occur in anticipation of a right dislocated expression, when that expression is itself referential:

(31) I have been visiting her for a long time now, that cousin of yours you tend to forget about.

There are obligatory right-dislocation effects which are associated with expletive lexical items, eg existential *there*:

(32) There is going to be another storm.

On the other hand, there are apparent right dislocation effects with clausal sequences, in that clausal modifiers are able to occur right-peripherally, in the phenomenon that has been called Extraposition from NP:

(33) A woman has just died, who used to be a painter

Moreover, just as with some types of noun-phrase right-dislocation, there may be an itemised expletive for securing a right-dislocated sentential sequence:

(34) It is likely that I am wrong.

Falling into this general phenomenon of clausal sequences presenting a right-PERIPHERY effect in a clausal string are correlatives, which involve a relative-like structure but apparently involving a relation between clauses, with the correlative occurring right-peripherally (or indeed also left-peripherally):

(35) Ich muss gelesen wen sie gelesen hat. 'I must read what she read.
[German]

(36) Wen Sie gelesen hat, den muss ich auch gelesen
'What she reads, that I must also read'

The challenge is to see to what extent the concepts of unfixed node and linked structures can provide a means of characterising this notoriously intransigent set of data.[19] First, a terminological matter. We shall use the term 'right-dislocation' for those phenomena which we analyse as involving construction of an unfixed node projected once some propositional structure has been projected, hence requiring a step of Merge with some node within that structure. The term 'right-periphery' will be used to describe any end-placed constituent, for example, the second in a pair of clauses from which we assume a LINKed structure is constructed. Under this use of these terms, there may be right-dislocation effects inside a right-peripheral structure as we shall see. One question, then, is in what respect right dislocation differs from left-dislocation, and why. As we shall see, the differences turn on the fact that left-dislocation phenomena involve initially unfixed nodes, whose fixed tree position has be provided by some update step. In the case of right-dislocation phenomena, the structure projected by the clausal sequence is already provided, and the update provided by the right-dislocated constituent is a provision of a content formula for some node already established. So the difference lies in the nature of the different processes involved in such resolution.

3.1 Expletives

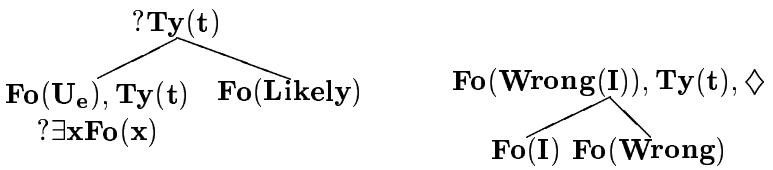
We start with the concept of unfixed nodes constructed from the right-periphery of a string, projected as some final set of construction steps within a single structure from some sequence of words at the right-periphery of a string. The first thing to note is that such nodes are not the simple mirror-image of the parse process, for given that the tree construction process depends upon lexical updates matching some node requirement and otherwise leading to that update aborting, we would not expect there to be the equivalent of a 'gap' preceding some right-peripheral constituent:

(37) *I heard was sick, that woman at the cashdesk

[19] On movement analyses....

(37) is ungrammatical because with the pointer at a constructed subject node (through rules of Introduction and Prediction), the update provided by the auxiliary cannot update that node, and the parsing process crashes. It is thus ONLY in the presence of some device which can satisfy the type requirement on the subject node that the parsing process can proceed, and in (37) there is no such device. What is required to prevent any such parse breakdown is a device such as a metavariable which satisfies the type requirement, but nevertheless requires a fixed *Formula* value to be provided subsequently. We know independently that this is needed if right-peripheral unfixed nodes are to be able to constructed at all for some right-peripheral expression; for any structure constructed as unfixed at the end of a parse process for a propositional type could only be wellformed if there were a node projected earlier in that construction process which was in some sense incomplete, itself to be completed through a merge process with an unfixed structure of matching type. This we suggest is precisely what is needed for 'it' expletives – they are, by definition, anticipatory.

(38) It is likely that I am wrong.



MERGE

Accordingly, we extend our basic vocabulary to include essentially anticipatory meta-variables $\mathbf{U}_e$, $\mathbf{V}_e$,... These need to be defined to preclude substitution by any previously constructed term in the context, or any assignment of values to variables current given the partial tree so far constructed).[20] Expletive pronouns, then, are taken to project such a specialised meta-variable.

[20]To give formal substance to this concept, we shall turn to concepts of Stage, and Stage transition as defined in Fernando 1999. In Fernando 1999, discourse understanding is defined in terms of sequences of ordered pairs of sentences and logical forms, called Stage, with concepts of inference defined successively for logical forms, Stage, and sentences, with context as previous sequences in Stage and an accompanying concept of Stage update. A range of anticipatory metavariables can be defined – with a value determined by some next expansion of assignment of values to variables, in some subsequently constructed logical form of type t, or as a constraint on the next Stage update. We leave this here as a promissory note for further work nesting the DS framework within some such larger discourse perspective, relying on the intuitive content of the concept of an essentially anticipatory variable for present purposes.

Such a formula will satisfy the type requirement on that (subject) node, but leave a requirement for a fixed formula value. In the presence of such a formula, the annotation of a formula of propositional type will be successful, here establishing the formula 'likely($\mathbf{U}_e$)'. However there will remain a requirement for an update to the meta-variable $\mathbf{U}_e$, an update which – given the completed structure of all subterms of the propositional tree – can ONLY be by the construction of an unfixed node with application of merge. The question then arises as to whether to use some generalised form of *-Adjunction, allowing introduction of unfixed nodes at arbitrary points in the tree-construction process. This we do not do, preferring to retain two discrete **Adjunction* processes in order to capture:
(i) the fact that such clausal sequences must be post-predicate:

(39) *It is that John will succeed likely

(40) *It that John will succeed is likely

(ii) the freedom for such right peripheral adjunction to apply iteratively (as we shall see in the analysis of Right-Node Raising), which left-peripheral *Adjunction (at least as defined for English) precludes. What the rule states is that in the presence of a type-completed propositional structure whose rootnode however lacks a full formula value (hence containing at least one metavariable), a transition is licensed to introduce an unfixed node within the same tree:

Right-Adjunction*

$$\frac{\{Tn(a), Ty(t)..\{(MOD)Tn(a), Fo(\mathbf{U}), Ty(X), ?\exists x Fo(x)\}.., \Diamond\}}{\{Tn(a), Ty(t)..\{(MOD)Tn(a), Fo(\mathbf{U}), Ty(X), ?\exists x Fo(x)\}.. \{\langle\uparrow_*\rangle Tn(a), ?Ty(X), ?\exists x Tn(x), ?\ \uparrow_0\uparrow_*^1 Tn(a), \Diamond\}\}}$$

where X is an address and $(MOD) \in \{\langle\uparrow_0\rangle, \langle\uparrow_1\rangle\}^*$

Notice the two requirements that it match the type of that metavariable and be resolved within the local subgoal to yield a structure of type t into which the variable is introduced (a sub-goal we call "most-local").[21]

This transition necessarily follows the development of a predicate within that structure (this follows from the type requirement on the topnode being satisfied). However, what is disallowed is any such propositional structure

[21] A node projected in a clausal sequence will be "most-local" on a resulting structure to a node $Tn(a)$ to which it is related along a chain of one argument relation and a possibly empty sequence of functor relations. This relation is expressed in LOFT as $\uparrow_0\uparrow_*^1 Tn(a)$. This domain is analogous to the concept of locality articulated in other frameworks as the (principle A) restriction for anaphors.

induced from expressions occurring between those projecting annotations for the subject and predicate nodes. This possibility is precluded not only because there is no free *Adjunction, but also because once a variable satisfies a type requirement, albeit emptily, no further development of that node by application of the rules of Introduction/Prediction is possible because the required input condition for such rules is not met – viz. ?Ty(X). Hence the ungrammaticality of (39)-(40). The fact that a complement clause may follow immediately subsequent to an object expletive , apparently contrary to this restriction, is due to their right-peripheral position, and not to any weakening of this restriction:

(41) I proved it to my step-mother that John was a genius.

(42) *I proved it that John was a genius to my step-mother.

The rule is defined for all types of metavariable, so equally could apply in the construal of (43) on the assumption that a value for the metavariable projected by the pronominal has not already been provided:

(43) He's a monster, my brother

In any case where some pronoun is, to the contrary, interpreted indexically, there will be no means of updating the treenode position of the unfixed node for the resulting formula will not merge with that annotating the unfixed node: hence the assignment of a fixed value for the metavariable by some right-dislocated expression and the availability of an update for the unfixed node it annotates are essentially correlated.[22]

With this discrete subvariant of **Adjunction*, we allow the projection of unfixed nodes at two points in the parse process only: initial in the projection of a tree structure (though possibly following upon the projection of an independent LINKed structure, so not necessarily string-inital); and following the development of the predicate. As defined, this rule is an additional stipulation, but we shall see shortly that it provides a systematic

[22]It might be argued on the basis of this complementarity of indexical construal of pronouns and aplication of *Merge* that no discrete concept of anticipatory variable is required: the mere requirement for a *Fo* value for some unsubstituted metavariable is sufficient. It is notable that *Right*adjunction* must be defined to apply in the presence of a metavariable in a completed propositional structure of type t without distinguishing whether the variable is anticipatory or not. However, we believe there are grounds for exploring locality effects for a range of anticipatory devices, and so retain a sub-class of anticipatory metavariables.

basis for characterising word order variation within the string projecting the predicate ("within the VP").

3.1.1 There Expletives

Perhaps surprisingly, the same rule of Right*Adjunction also characterises 'there' expletives:

(44) There is someone knocking at my door.

In these, one primary question is the relation between the full noun phrase *someone* following the verb *is* in (44), and the predicate term *knocking* following it. Is this a regular subject-predicate relation, or is that predicate term rather to be analysed as inducing a linked structure? For starters, we know that these structures must be distinguished from 'it' expletives, for they have different distribution. For example, the term providing a value for a metavariable projected by *there* may precede the expletive, but the *it* is essentially anticipatory:

(45) Several people there were, who got very drunk at the party.

(46) I borrowed everything there was on Left Dislocation from the library.

(47) *That I am wrong, it's likely.

Furthermore, though in 'it' expletives the value to be assigned to the variable projected by the expletive must be constructed by the projection of structure AFTER the predicate, in existential expletive constructions, the value assigned to the variable projected by the expletive is standardly projected by some noun phrase sequence immediately after the auxiliary-like verb in second position BEFORE the predicate is developed; though they do in addition allow Right-node-raising effects:

(48) *It is that Mary will be wonderful certain on every occasion that she sings.

(49) There is a soprano singing tonight.

(50) There is singing tonight a world-class soprano from Chicago.

(51) It is certain on every occasion that she sings that Mary will be wonderful

If we analysed both type of expletives as projecting an anticipatory metavariable, without further distinction, then the distinctiveness of their distribution will go unexplained.

The distinction between the two forms of expletive is straightforwardly captured by positing two primary differences, in addition to the type specification. First, with expletive 'there', the metavariable projected by *there* is not essentially anticipatory, hence its ability to follow the indefinite in (45)-(46). (It is this difference which necessitates defining *Right *Adjunction* without explicit reference to anticipatory variables.) Secondly, noting that the predicate following the indefinite noun phrase is optional, the update process associated with existential *there* constructions is analysed as involving not just an unfixed right peripherally projected structure, but a combination of an unfixed node projected in completion of a propositional structure plus an optional LINK transition; and it is this optional added structure that accounts for the predicate expression following the indefinite:

(52) There is at least one counterexample.

(53) There was one debt outstanding.

(54) There was one debt which was outstanding.

(55) There emerged a man singing.

So, the analysis we propose is that the existential *there* lexically induces the construction of a subject node annotated with an anticipatory metavariable (hence its restriction to subject position), imposing a restriction on scope construal on the topnode that the epsilon term to be constructed take narrow scope with respect to the construal of tense at that mother node). It also imposes a requirement for a particular sub-class of 'existence' predicates:

$\text{There}_{expletive}$

IF	$?Ty(t)$		
THEN	IF	$\downarrow \exists x.Ty(x)$	
	THEN	ABORT	
	ELSE	IF	$Te(\alpha)$,
		THEN	$\mathtt{make}(\langle\downarrow_0\rangle);\mathtt{go}(\langle\downarrow_0\rangle);$
			$\mathtt{put}(Fo(\mathbf{U}), Ty(e), ?\exists x Fo(x));$
			$\mathtt{go}(\uparrow_0);\mathtt{put}(\alpha < \mathbf{U});$
			$\mathtt{put}(?\langle\downarrow_1\rangle Ty(e \rightarrow t) \wedge +BE)$
	ELSE	$\mathtt{make}(\langle\downarrow_0\rangle(Ty(e)), \mathtt{go}(\langle\downarrow_0\rangle));$	
		$\mathtt{put}(Fo(\mathbf{U}), ?\exists \mathbf{x} Fo(\mathbf{x}))$	
		$\mathtt{go}(\langle\uparrow_0\rangle);\mathtt{put}(?\exists y(Te(y) \wedge y < \mathbf{U});$	
		$\mathtt{put}(?\langle\downarrow_1\rangle(Ty(e \rightarrow t) \wedge +BE)$	
ELSE	AB		

This lexical specification dictates that if there is either an established subject or predicate, then the update action aborts, but otherwise, if there is already a tense specification as in the construal of questions, then a subject node is constructed and a metavariable projected as annotation, restricted to take scope relative to such tense specification, and if there is not yet such tense specification, then a subject node is constructed and then a requirement put on the topnode that the scope assignment for the formula at that subject node be relative to some later constructed tense specification.[23] In either such case, a stipulated feature +BE is used as a classificatory device for those predicates which co-occur with existential *there*, of which *be* is the canonical case.

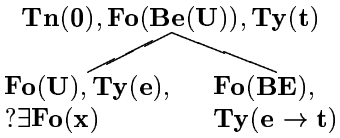
The following auxiliary-like form, if it is the verb ' to be', is taken, contrary to appearances, to be a token of a full (intransitive) *be* (unless it is part of a complex sequence of auxiliaries plus *be* as in *is going to be*), projecting a one-place predicate of existence. Upon this analysis of the copula, both the predicate type requirement, and the subject node, will be satisfied after this superficially auxiliary-like verb is processed. Thus, what follows expletive *there* is taken to be a full verb – recall the small class of verbs other than *be* that can appear in this position:

(56) There followed an interval of 30 minutes.

[23] Te is a tense predicate taking sortally restricted temporal variables as argument (see Kempson et al 2001 ch.7 for an account of interaction between such variables and quantification). Where temporal construal is dictated by a higher predicate, as nonfinite constructions, a value for the Te predicate may be projected despite the lack of morphological tense marking.

(57) There appeared a solitary male dancer at the extreme right wing of the stage.

With both subject and predicate nodes with requirements fulfilled, we have the same condition as with the 'it' expletives that the propositional type can be satisfied, albeit with only a promissory note in subject position in the form of a metavariable as Fo value, and Right* Adjunction is accordingly licensed. Application of Right*Adjunction leads to update of the subject metavariable by the formula projected from the noun phrase expression following the verb. Application of this rule, though optional, is effectively obligatory, for without it the subject node will be left with a requirement for a Fo value, a metavariable as annotation with an outstanding requirement $?\exists \mathbf{x} Fo(\mathbf{x})$. Moreover, the noun phrase from which this unfixed node is projected however can always be further developed by a LINK transition either with an explicit relative pronoun and tense, or by the process copying the head onto the adjoined LINKed structure. This will secure construal of (53) as an assertion of an entity such that it is a debt and that it is outstanding, exactly as we want.



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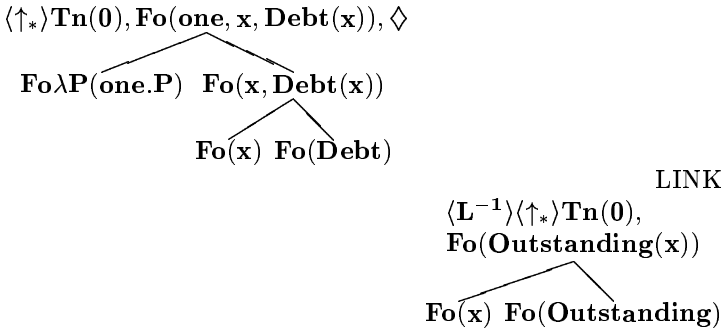


Like expletive 'it', 'there' cannot allow its anticipatory meta-variable to be immediately subsequently developed by a replacement, and for the same reason:

(58) *There a man emerged singing

Once the node is annotated with a meta-variable, that node cannot be further developed structurally (through Intr/Prediction), leaving the construction of an unfixed node of appropriate type subsequent to the construction of the predicate, to merge with the node decorated with the meta-variable as the primary means of resolution.[24] However nothing prevents the occurrence of such a full term annotating an unfixed node projected from some noun phrase preceding the expletive by application of *Adjunction, with the subject node and this unfixed node then merged together, hence (45)-(46).

3.2 Right-Peripheral LINKed Structures

When we turn to the possibility of projecting right-peripheral structures as linked structures, we note as before that a LINK transition expresses the building of two independent trees, albeit correlated, so an analysis in terms of linked structures will be well suited to appropriately paired structures.

In left-dislocation structures we explored only construction of a LINK relation between a node of type e and a node requiring Type t. A natural candidate at the right periphery for the converse transition from some completed node of type t onto one requiring type e is the so-called Clitic Doubling construction:

(59) She talks too fast, Ruth Kempson.

(60) He's an idiot, that man at the cashdesk

In these structures, an anaphoric expressions identified as coreferential with the formula annotating the right-peripheral structure is not anticipatory in the expletive sense, for the postposed structure is optional:[25]

(61) He's an idiot.

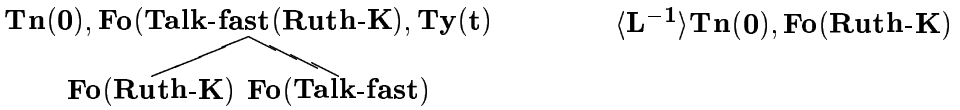
[24] There is the alternative of constructing a LINK relation. However predicative use of indefinite NPs appears to be quite generally debarred as a LINK structure projected from a quantifying expression:
(i) *Everyone a teacher lost out
(ii)*Most friends of mine teachers lost out
And, likewise, existential constructions appear to be subject to the same restriction. Pending a better understanding of predicative NPs, we do not characterise this restriction.

[25] We do not analyse such pronouns as a free cataphoric device, retaining the distinction between expletive pronouns which are specifically defined to project anticipatory metavariables in such environents, and regular pronouns, which only exceptionally have cataphoric uses.

Nevertheless the final expression must be construed as coreferential with some anaphoric expression within the preceding string for the structure to be wellformed:

(62) *He's an idiot, my mother.

The analysis of such structures as interpreted through a LINK transition, defined from the rootnode of the propositional tree to some following structure of requiring type e, with that term required to be identical to some subterm of the just constructed propositional structure, provides a natural characterisation of the required adjacency of such structures. They are, notably, the mirror-image of topic constructions. Their restriction to referring expressions follows from the characterisation provided for these expressions (which we take to project meta-variable place-holders for some term to be substituted). accordingly the pronoun can duly be processed and its variable identified from some larger context, this assigned value then carried across as a requirement on the development of the LINKed structure to be of type e, which then ensures that however that referring expression is subsequently constructed it must also be assigned the same term as value, a necessary prerequisite for the LINK-imposed requirement, hence wellformedness of the string, to be fulfilled.[26]



The availability of this analysis of such right-dislocated 'topics' in terms of a pair of linked structures gives rise to the situation in which two alternative sequence of transitions may be available for the same string for any pronoun which is assigned discrete lexical specification, both as an anaphoric and as an expletive device. On the former they are analysable as projecting a pair of linked structures, on the latter as the projection by the pronoun of an anticipatory metavariable, with the right-peripheral constituent providing a value to that variable by decorating an unfixed node that merges with the subject node.[27]

[26]We would expect that an analogous LINK transition between two structures of type *e* (with no periphery effects) would be possible, and indeed it is:
(i) He, that man at the cash desk, is an idiot.

[27]The presence of such dual processes of update is a bonus for the analysis, since it provides a prototypical scenario for syntactic change. Across time, should the presence of the pronoun become essentially twinned with some right dislocated element, then we have a lexical shift to allow an extension of the pronominal with an expletive use. This is

3.3 Paired LINKed structures

3.3.1 Preliminaries

Though the concept of LINK adjunction is defined as a transition from a node of type e to a node requiring type t, this is something of a stipulation, since the modal operator $\langle L \rangle$ is clearly not type- or node-specific. Furthermore the concept of a pair of trees sharing a sub-term is not node- or type-specific either. So we might seek to generalise the concept of a pair of linked structures to any pair of trees meeting the constraint:

$$\{X, \downarrow_* Fo(\alpha)\}, \{\langle L^{-1} \rangle X, \langle D \rangle Fo(\alpha)\}$$

(This is a pattern which in due course we shall see is needed in an extension of the left-periphery typology, as well.) We now take up the structures in which the LINK transition is defined from the rootnode of one propositional structure imposing a requirement on the development of some following propositionally typed tree. These can either be analysed as a left-peripheral effect for the first structure relative to the second, or as a right-peripheral effect for the second relative to the first. Considered as a right-peripheral effect, a LINK transition from some propositional type with sub-term α onto some second structure introduced as requiring both type t and α as a subterm, provides a natural means of characterising the right-roof restriction of extraposition-from-NP structures:

(63) A man entered, who was sick

(64) A man entered crying.

There is doubt as to whether these structures have to be interpreted restrictively. Within our system, the natural interpretation would be one in which the "postposed" relative was analysed as a LINKed structure, with the interpretation of the NP during the construction process carried over as the element to be common in the two structures.[28]

exemplified by the clitic doubling phenomenon in Romance languages, which is generally optional, but obligatory for certain itemised cases in individual languages (specifically dative clitics in (some forms of) Spanish – see Kempson and Marten 1999).

[28] Quantified terms are taken to project promissory notes for the individual term-operators which are compiled finally at propositional level, eg $(\epsilon, x, Man(x))$ for *a man*. Such values can be carried across a LINK relation as a requirement on the development of the LINKed tree, ensuring that the content of that LINKed structure is projected in the main body of the assertion. If it is required also to project such structures as having restrictive construal, as some report, then we would require that the requisite LINK transition from the rootnode of the primary tree could be licensed prior to the evaluation of

We leave correlative structures in English and other languages relatively unexplored here, though they are of considerable interest in their own right, merely noting that a pair of linked structures both of the same type might allow, as do relatives, for the pronominal element that ensures the copied term in the linked structure to occur after or before the primary structure:

(65) I introduced them all to one another, whoever came to the party.

(66) Whoever came to the party, I introduced them all to one another.

Apart from the adjacency of the two structures which the analysis as a pair of linked structures ensures, there are no induced right-dislocation effects within the clausal sequence itself that are particular to such correlative constructions, so they remain peripheral to our current task of characterising right-dislocation effects (cf. Cann and Kempson in preparation). [29]

3.3.2 LINK transitions and unfixed nodes in combination

This is not to say that right-peripheral correlative structures themselves preclude right-dislocation effects within the string projecting the second linked structure. To the contrary, with the combination of LINK, unfixed nodes, and anticipatory variables, we are can characterise Right-Node Raising in just such terms – as a pair of linked structures with a finally projected unfixed node within the linked structure. So the node which is constructed from the right-most constituent in a sequence of words in a Right-Node Raising construction is not only in the second of a pair of linked structures, but is projected as the right-edge constituent of that linked structure:

(67) John criticised and then Mary reassured that woman from Birmingham.

---

that tree, then allowing the variable used in the construction of such incomplete terms to be imposed as a requirement on the LINKed structure, with the subsequent construal as part of the restrictor of the term-operator. We leave this issue open.

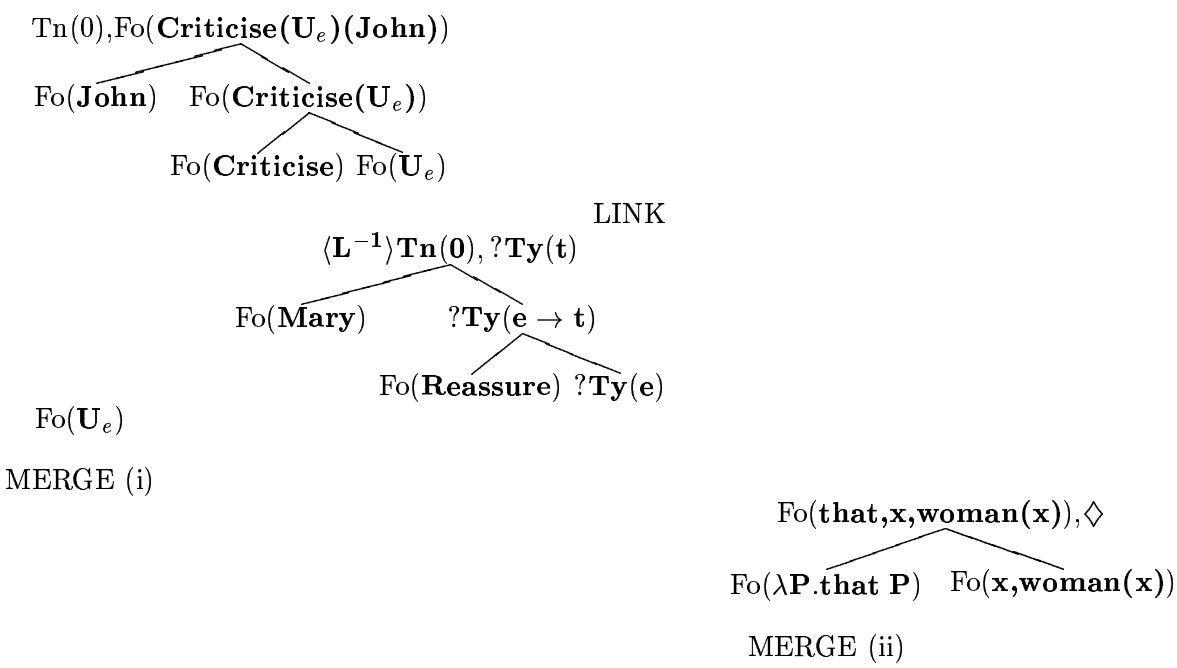
[29] A primary issue in analysing these structures is whether they display dialect variation as to what is called the case-matching effect, i.e. whether the indefinite has to display the same case as both the main clause and the relative sequence, or not, as in this English example. We do not address this here, merely noting that it is part of a much broader question of possible asymmetry between right and left conjuncts, in which either agreement phenomenon in languages reflects the output structure without sensitivity to intermediate stages in the construction process, or it reflects some intermediate stage in the building of that output structure without having to match the output. See Marten 2000 for a detailed exploration of asymmetries of agreement across coordination in these terms.

(68) John gave to Mary and subsequently Harry retrieved from Sue the notes from Ruth's course that John had diligently taken.

(69) John passed on and Harry distributed the notes from Ruth's course to any student that asked for them.

What these examples show is that Right-Node Raising, though characteristically indicative of some constituent missing from a final position in both clauses from which it appears to have been "raised", is not necessarily so (68). Moreover, what is "raised" appears to be able to more than one constituent (69). As a phenomenon not apparently restricted to a single constituent, it might seem that these would need to be expressed in terms of string-movement (or string-deletion at PF), hence intransingent for a framework like DS which can only make reference to partial semantic structures, and not to (structure defined over) strings. However, to the contrary, there is a straightforward account if we assume that an anticipatory metavariable MAY be constructed as a promissory note allowing parsing to proceed, even though no fixed formula value has been provided. Such a variable, once constructed, has a life like any other variable, and MAY be copied over a LINK transition to a second correlative LINKed structure where the node it is annotated is merged with a right-adjoined unfixed node (see figure (xx) for characterisation of (67):[30]

[30] The predicate 'woman from Birmingham' is simplified in the display for space reasons. Nothing hinges on this.



Accordingly, with a correlative form of LINK transition, we propose one novel form of computational rule – that a predicate which has a node requiring some type e node may be filled with an essentially anticipatory meta-variable allowing its later update replacement:[31]

Variable Updating

$$\frac{\{X, ...?Ty(e \rightarrow t)....\{(MOD)X, ?Ty(e), \Diamond\}..\}}{\{X, ...?Ty(e \rightarrow t)....\{(MOD)X, Fo(U_e), Ty(e), ?\exists x Fo(x), \Diamond\}..\}}$$

where $MOD \in \{\uparrow_0, \uparrow_1\}^*$

This rule must occur only within the development of the predicate in order to preclude (37) and (70):

(70) *I know was clever but Sue rightly said was arrogant that dreadful bully from LA.

[31] This option is invariably associated with a particular form of intonation making that transition manifest. We have however stated the rule with no encoding of the intonation itself, taking this to be merely a means of ensuring suitable manifestness of this option. Note the parallel with topic structures, where some requisite intonation is almost universally said to be a defining characteristic of the structure. Without the characteristic intonation associated with RNR, the first conjunct will be construed as the intransitive predicate, cp:
(i) John sang, and Mary read a book.
(ii) John sang, and Mary translated, that Schubert love-song.

The correlative LINK transition-rule that is needed for construal of right-node raising phenomena is as follows:[32]

Correlative-LINK Introduction:[33]

$$\frac{\{X..\{(MOD)X, Fo(\mathbf{U_e}), Ty(e), ?\exists \mathbf{x} Fo(\mathbf{x})\}, ..Ty(t), \Diamond\}}{\{X..\{(MOD)X, Fo(\mathbf{U_e}), Ty(e)\},}$$

$$\{\underbrace{\{\langle L^{-1}\rangle X, ?Ty(t), \Diamond\}}_{\text{linked node}}, \underbrace{\{\langle \uparrow_* \rangle \langle L^{-1}\rangle X, Fo(\mathbf{U_e}), Ty(e), ?\exists \mathbf{x} Fo(\mathbf{x})\}}_{\text{unfixed node}}\}$$

where $MOD \in \{\uparrow_0 \uparrow_1\}^*$

It allows this metavariable to be copied over a constructed LINK relation as an annotation on an unfixed node in the newly introduced LINKed tree. The output of this rule feeds *Merge* which in its turn feeds *Right *Adjunction*, the presence of the anticipatory variable inducing the introduction of a right-peripheral unfixed node. Once constructed, this node, with its formula value established, is duly merged with the anticipatory variable in the second conjunct, simultaneously updating its tree-node value while providing a Fo value for the meta-variable, an update which enforces the update of the first occurrence of that variable in the first conjunct – hence (67).

Though incompleteness will normally only be straightforwardly expressible at some recognised right periphery of the first clause, this is not necessary to the characterisation of the semantic structure (hence the possibility of nonfinal constituents in the conjuncts being construed through Right-Node Raising (68)). Furthermore, since, in principle, there may be more than one such variable in an incomplete structure, this process of *Adjunction could occur more than once, subsequent Merge happening successively. Hence (69).

This analysis signally differs both from the more traditional movement anal-

[32]Whether this rule should be restricted to applying only in the presence of an anticipatory variable is unclear, but it is notable that extraposition from NP, being the other English correlative construction, involves essential use of a relative pronoun:
(i) I left John at the station, who was clearly upset.
(ii) A man came in, who was clearly upset.
(iii)*I left John at the station, was clearly upset.
This rule is the correlative analogue of the *LINK-copy* rule characterising complementiser-less relatives.

[33]In the light of examples such as (i), this rule imposes no restriction on where in that LINKed structure, the copy finally ends up:
(i) John wrote a report about, and Sue then interviewed, that woman who forged cheques for the Treasury.

yses, but also from the in-situ analyses, in characterising the "right-node-raised" structure as right-peripheral, i.e. unfixed, but locally within the second conjunct: the occurrence of the formula from that node within the first conjunct is secured solely through the cataphoric properties of the anticipatory metavariable. This leads us to expect an asymmetry not available to any other analysis - whether a "raising" (Postal) or "in-situ" form (Hartemann) of analysis:[34]

(71) John read but he hasn't understood any of my books.

(72) *John hasn't understood but he has read any of my books.

(73) Fred cooked, but didn't eat, any vegetables

(74) *Fred didn't eat, though he cooked, any vegetables.

(75) John prefers but Sue would rather not eat meat.

(76) *John prefers but Sue would rather not to eat meat.

Suppose for negative polarity data, we analyse negative polarity items as having a context-sensitive condition for their update action – taking *any* to project an indefinite term as Fo value only in the presence of a negative (or 'affective') feature decorating its locally dominating propositional type node. This condition is met by the second conjunct, hence the update is licensed. Upon this account, in conjunction with the present analysis of right-node raising, the object node in the first conjunct of (71) is first decorated with an anticipatory metavariable and then subsequently annotated with a term identical to whatever value is assigned to the second occurrence of the metavariable constructed in the second conjunct. This being the indefinite term projected by *any*, its presence is duly licensed also in the first conjunct, despite the lack of negation in the first conjunct. Sensitivity to the presence of negation is NOT required for the indefinite term itself: it is merely a condition on the tree in which the lexical item *any* is to provide an update. Hence the asymmetry of (71) and (72). Similarly (73) and (74). (75) and (76) display an analogous asymmetry with requirements on the form of the predicate for the verbs in the two conjuncts.

It might seem that this characterisation of the phenomenon of right-node raising is over-liberal in allowing right-peripheral *Adjunction at all; and,

[34]Hartmann notes the existence of these examples, but grants that she has no account of them.

worse, in the face of the evidence presented by existential *there* constructions, it isn't even restricted to applying to anticipatory variables exclusively.[35] The availability of this process threatens to wrongly license (78)-(77) and ascribe to (79) an interpretation with object and subject construals reversed:

(77) *Mary annoyed and was rude, Sue

(78) *Mary likes and Sue, John dislikes

(79) John likes and Sue dislikes Mary
≠ 'John likes Sue and Mary dislikes Sue'
≠ 'John likes Sue and Sue dislikes Mary'

In (77) we have what looks like a case-based restriction that the two nodes to be established in the two conjuncts must have the same relative position in the structure. But the restriction does not need to be stated in these terms as (77) is independently debarred because no clausal string (unless imperative) can be initiated by a verb; and construction of some appropriate metavariable is debarred in subject position unless projected from the lexicon. In (78), we need to preclude the availability of a preposed object as a means of construing the two object arguments, and in (79), we need to preclude the availability of a derivation in which both *Sue* and *Mary* are taken to project unfixed nodes wrongly merged with subject and object nodes. (78) is straightforwardly precluded by the restriction on **Adjunction* that it cannot apply recursively, for the introduction of an unfixed node within the LINKed structure by the LINK correlative rule will have the effect of making ** Adjunction* inapplicable. No switched interpretation of the NPs in (79) is possible either, by the combination of this restriction on ** Adjunction*, the status of the variable as an anticipatory variable, and the lack of variable updating in subject position (in English). First, we should note that reversed interprestions of the nounphrases in a simple clause such as *Sue dislikes Mary* is debarred, since Variable Updating cannot apply in subject position, which might otherwise allow the term projected from the NP *Sue* to decorate an initially unfixed node merging with the object and the term projected from *Mary* to decorate a finally introduced unfixed node

[35] Application of *Merge* given a regular pronoun in the characterisation of (i) is not possible in English because pronouns retain a "bottom" restriction that disallows their replacement by a set of nodes:
(i) She's a nuisance, my mother.
In those languages in which over time this restriction comes no longer to hold (as in eg Spanish), two analyses are available.

(through *Right*Adjunction*) merging with the subject node. Secondly, the lack of application of **Adjunction* in the presence of any node in a tree other than a bare topnode requiring type t precludes the formula $Fo(Sue)$ from being taken to decorate an unfixed node subsequent to an application of *Correlative LINK Introduction*, since this introduces an unfixed node into the emergent tree for the second clause, an application which could give rise to a reversed construal of *Sue* and *Mary*, with the anticipatory variable take to merge with the subject node, the node decorated by *Sue* merging with the object node. The restriction that *Variable Updating* introduces anticipatory variables precludes any indexical construal of the variable introduced into the first conjunct, a possibility which might allow a construal of (79) through coreferential construal of that indexically construed variable with the term *Sue* decorating the subject node of the second conjunct. Finally, the introduced variable could not be copied over onto an unfixed node with *Mary* providing a value for some anticipatory variable in subject position, for the same reason as before – anticipatory variables can only be introduced in subject position as a result of lexical action (in English from the actions associated with the expletives *there*), *it*. So, despite the flexibility of defining two forms of *Adjunction which apply at the left- and right- peripheries in processing a string respectively, the system nevertheless appears to be sufficiently restrictive.

As we would expect in the light of the earlier analyses of the expletives 'it' and 'there', both expletives can give rise to a copying of their projected metavariable across a LINK transition, and we get Right-Node-Raising effects with both forms of expletive:

(80) There was and there always will be at least one counter-example

(81) It is likely but it is not unreasonable that our analysis will fail.

Note that in both cases the "extraposed" constituent can be construed relative to the individual conjuncts. Given that this RNR process is part of the construction of the individual conjuncts, this is not surprising as the evaluation of those trees once complete follows any such process, hence allowing different opaque construal of the 'it' expletive, and allowing different choice of scope for the 'there' expletive.

3.3.3 Heavy NP Shift

It is notable that in analysing RNR, we have in effect also provided an analysis of Heavy NP Shift, for the processes required for construal of Heavy

NP Shift are a subset of the processes required for RNR. Again, we assume the possibility in developing a predicate node requiring type $e \rightarrow t$ of projecting an anticipatory metavariable, a possibility, this being a non-subject-pro-drop language which is not licensed for the subject node. All that we require for heavy NP shift, then, is the assumption that in the presence of such a metavariable the only means of achieving wellformedness is to construct a right-peripheral unfixed node of appropriate type so that that constituent can be used to provide a value to the metavariable in the latter stages of the interpretation process through Merge.

(82) John sent to Mary a card that he had painted in Edinburgh.

(83) John submitted for inclusion in next year's ESSLLI a course abstract that was far too long.

(84) John threw across the room at his partner a priceless Limoge vase.

In other words, Heavy NP Shift is the noncorrelative analogue to Right-Node-Raising – involving simply *Variable Updating* and *Right *Adjunction*.

3.4 Typology for Right-Periphery Structures

We can now take a step back and see how the combination of DS forms of tree growth provide a typology of right-periphery structures. Taking first right dislocation effects, one property that distinguishes right- and left-dislocation effects is that the full propositional structure is already projected by the preceding string in parsing a right-dislocated sequence, and the task of projecting an interpretation for such final one or more constituents is to establish the correlation between them and some node(s) whose requirements within that structure are not completely satisfied. As in the case of left-dislocation effects, the first question is whether the update provided for some anticipatory device is realised within a single tree or across a pair of linked structures; but then we consider how the anticipatory variable is projected – as a gap, as a pronoun, and whether lexically or by computational action. At the right periphery the issue of locality is less important a distinguishing factor that at the left periphery, where the structure remains largely yet to be constructed. Indeed structure projected from the right-peripheral sequence MUST be local to some otherwise completed structure – one node is incomplete, and the right-peripheral sequence provides a term which will complete it:[36] Indeed this variable imposes no restriction on how

[36]Notice that this locality restriction applies even if the right-peripheral constituent is internal to a relative clause, for it is the restriction on *Right *Adjunction* which demands

its value be provided, other than being anticipatory and so not independently available upon its introduction into the structure. process

that *Merge* take place with a narrowly local domain, and not any relation between that position and the anticipatory variable introduced into the predicate structure of the first conjunct.

Taking the boxes in figure 2 one by one, within a single tree, we may have right-dislocated noun phrases with no apparent trigger,(ia), either as introduced by some sub-type of predicate (as in Romance subject-predicate inversion),[37] or as in heavy NP shift. With a pronoun as trigger projecting an anticipatory variable defined as a discrete expletive sub-type, we see the basis for the obligatory pairing of anticipatory device and subsequent full-term of matching type – expletives such as English *there*, *it*, and also the Spanish obligatory clitic doubling – (iia).[38] Across a pair of linked structures, we have cases in which the right-peripheral item itself provides the topnode of the LINKed tree, (ib). So with a LINK relation to a tree whose topnode is of type e, we have the postposed NP projecting an independent tree – the "postposed topics". Since pro-drop languages license strings without an overt pronoun in subject position, this gives rise to alternative analyses of strings with postposed subjects according as they are analysed as of type (ia) or (ib):

(85) *Lo* *vedra,* *Maria.* [Italian]
Him she will see Maria.
'She will see him, Maria.'

And the analogous form with a pronoun providing the input, again across a LINK relation is the Romance optional pronoun doubling – (iib):

(86) *Lo* *vedra,* *Giovanni.*
Him she will see Giovanni
'She will see him, Giovanni.'

Notice the difference between optional and obligatory doubling. The former is indicative of a LINK relation and an indexical construal of the pronoun, inferred to pick out the same individual as the term at the topnode of the LINKed structure as the means of satisfying the requirement for a common term in the two linked trees. Obligatory doubling occurs where the lexical definition of the pronominal has shifted into projecting an anticipatory variable imposing the REQUIREMENT of further input to secure a completed tree and hence a pairing essential for the containing string to be wellformed.

[37] Subject posposting in Romance languges is known to be restricted to a particular class of predicates, and these may be defined as licensing a sequence of actions in which the variable annotating the subject node is either a regular anaphoric metavariable or an anticipatory metavariable.

[38] The expletive form developed out of the regular anaphoric form – see Suner 1988.

When we turn to linked trees both of type t, matters are more complex for in either structure application of **Adjunction* is licensed. So combinations of a relation of LINK between trees and unfixed nodes may arise: in particular, either **Adjunction* or *Right*Adjunction* in the second of two linked structures. The first of these will give rise to one form of correlative –(iic):[39]

(65) I introduced them all to one another, whoever came to the party.

Should the first conjunct fail to contain any such pronoun, we then get (ic) exemplified by Right-Node Raising – with application of *Right *Adjunction* to construct the structure projected from the second conjunct. Notice that in both (ic) and (iic) types of case, the result is a structure with two occurrences of some term, since the effect of the LINK relation (and the associated LINK transition rule) is to ensure a copy of the term in question in both structures. This typology thus includes correlative structures, and furthermore displays the basis upon which these form a class with Right-Node Raising constructions (as opposed to Heavy NP Shift)

4 Left-Periphery Effects Reviewed

If we now compare the typological displays for left-dislocation and right-periphery effects, there is one obvious omission from that earlier left-dislocation display – the possiblity that the linked trees be of the same type, i.e. both of type t, with the left-peripheral item being unfixed within the first of the pair of trees. But if we now add this possibility to that typology, we get a basis for characterising structures needed to complete that typology – Across-The-Board Extraction phenomena and parasitic gaps:

(87) John, I support but Mary condemns.

(88) Who did you support and Mary condemn?

(89) ?John I upset, without realising I had ignored.

(90) ?Who did you upset, without realising you had ignored?

Though the analysis of these requires a more extensive account, the processing of both types of string, we suggest, involves the decoration of an

[39]Correlative sequences may occur in either order: in addition to (65), there is the reverse ordering of clauses, in which the pronoun is anaphoric rather than anticipatory:
(i)Whoever came to the party, I introduced them all to one another.

anticipatory metavariable at a fixed position in the first of a pair of linked structures, despite the presence of the initially unfixed node in this structure; and this variable is then carried across as an annotation on an unfixed node in that introduced second structure. This ensures an identical value for a term in the two structures. It is only subsequent to such initiation of the linked structure that the unfixed node in the first conjunct merges with the first occurrence of that variable, with its effect of ensuring the construal of the formula decorating that initially unfixed node also within the second conjunct. So the primary difference between the processes of right node raising (RNR) and across the board extraction (ATB) is that in RNR constructions the unfixed node is finally projected into the linked tree; in ATB and parasitic gap constructions, the unfixed node is initially projected into the first tree – although the tree position for that unfixed node is not determined until after the initiation of the linked structure, with its imposed requirement of a value identical to the variable pro tem decorating the object node in the first structure. The complexity, and partially non-linear process of update for the two conjuncts is, we suggest, the basis for the markedness, at least within speech, of these two structures. This style of analysis would also, incidentally, provide an explanation why, as is commonly observed, parasitic gap structures are consistently more acceptable with ellipsis in the second conjunct:

(91) John, I upset, without noticing that I had.

(92) ??John, I upset, without noticing that I had upset.

(93) Who did you support despite Mary insisting that she couldn't?

(94) ?Who did you support despite Mary insisting that she couldn't support?

All that is required is an account of ellipsis construal as an anaphoric process, reconstructing a predicate from context (see Kempson et al 1999), with English auxiliaries being partial specifications of a predicate constraining possible substitutions. With such an analysis, there is no need to postulate any delaying of assignment of a formula value to the object node of the first structure in the processing of (91) until following that of the second, for the auxiliary in the second conjunct induces a search for an already established predicate, which the evaluated tree, containing the predicate Fo(upset(John)), of type $e \rightarrow t$ duly provides.[40] It is only when nothing but

[40] Auxiliaries must be lexically defined to license VP ellipsis in English by having as a lexical subspecification the projection of a metavariable to the predicate node, as this is

the argument node of the second conjunct is missing that the hearer has to reconstruct a copy of the occurrence of the formula annotating the initially unfixed node in the second structure, a manoeuvre which necessitates carrying over a metavariable from that first object node. Thus it is only if the parasitic gap occurs in an otherwise non-elliptical clausal sequence that the delay in fixing the position of the unfixed node of the first conjunct is required to ensure full update of both conjuncts.[41]

a property idiosyncratic to English auxiliaries. In Kempson in preparation, we analyse auxiliaries as expletive verbs, anticipatory devices for some following verb or verb phrase. The idiosyncracy of English is thus reduced to having an alternant in which the variable which the auxiliary projects as annotation is a regular metavariable.

[41] Equally, the parasitic gaps in (i) might be analysed as licensing the introduction of an anticipatory meta-variable as complement of argument of *picture* which is only resolved when the unfixed WH formula is assigned to a fixed position:
(i) Who did a picture of upset?
The tension of whether or not this WH variable can provide an update for an essentially anticipatory variable provides a possible basis for the very mixed judgements that such data cull. Notice in this connection that with a fully specified term, acceptability judgements plummet:
(ii) ?*John, the picture of upset.

5 Summary

Clambering up out of the detail, we can now compare left and right periphery effects. We have defined typologies for left-peripheral and right-peripheral phenomena in terms of the construction of linked structures into which unfixed nodes may be introduced. The linked structures licensed range over pairs of type t structures or pairs containing one type e and one type t structure. The applications of a LINK transition either from an independent structure of type e onto a type-t-requiring structure, or from a propositional structure to a type-e-requiring node are symmetrical, defined in each case from some completed structure onto a node requiring some type, both sharing the restriction for a common term in the two structures. LINK transitions from one topnode of type t to another are also symmetrical, with the LINKed structure able to be projected initially, or subsequently. The processes of **Adjunction* that apply at the outset of building a propositional structure or subsequent to its completion both involve the building of unfixed nodes. However these rules reflect the different potential for update at the different stages in the interpretation process,and are not symmetrical. At the left periphery a node can be constructed and fully annotated without a specific treenode position, and the task of tree construction must therefore include an identification of when Merge can take place. At the right periphery on the other hand, a fully propositional structure is already projected, possibly containing one node whose *Formula* value is incompletely specified, and, if so, it is the content of one of the nodes of this structure which has to be provided. Both processes of **Adjunction* are applicable independent of whether the containing structure is or is not linked to some other structure, so the various *LINK* transitions and **Adjunction* processes can occur in combination.

As we would wish, clausal strings are modelled as displaying the projection of a core structure, around which other nodes may apparently be constellated. To characterise this property, with variation at left and right peripheries, we have not had to postulate different levels of representation; we have not had to postulate movement of expressions round each other – indeed, we have not postulated movement of ANYthing either right or left. And in the classically intransigent phenomenon of Right Node Raising, the explanation naturally extends to data known to be intransigent in other analyses. Though we have defined subcases of a general process, with a number of LINK transition rules, there are no stipulations particular to an individual type of structure: all we have used is the dynamics of building partial trees as partial decorations, updating these monotonically following

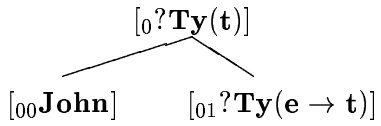
the sequence of words. Accordingly, we take this flying sketch through right and left periphery effects to demonstrate the intrinsic dynamics of natural language syntax.

(a) After processing *Mary*:

$[_0 ?\mathbf{Ty(t)}]$

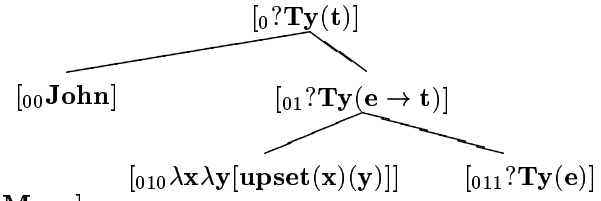
$[_* \mathbf{Mary}]$

(b) Having processed *John*:



$[_* \mathbf{Mary}]$

(c) After processing *upset*:



$[_* \mathbf{Mary}]$

(d) Merging the unfixed node and the unfilled object node:

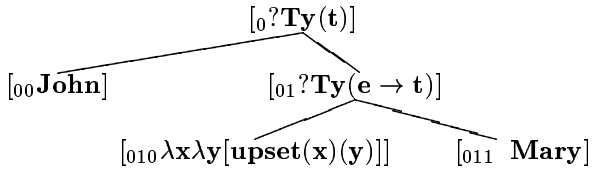


Figure 2: Processing *Mary, John upset.*

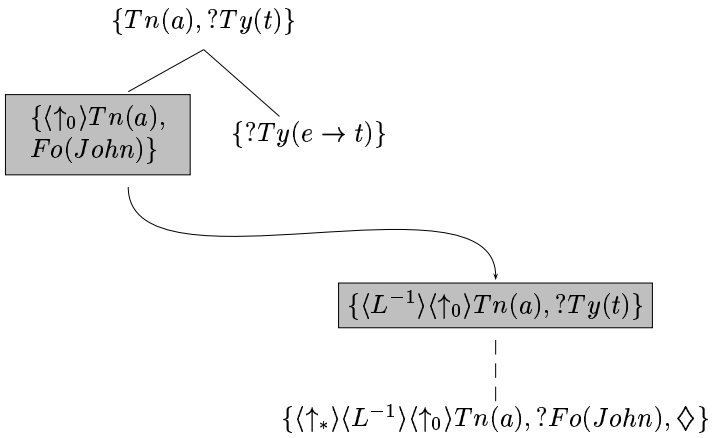


Figure 3: Building a *LINK* transition with *LINK Introduction*

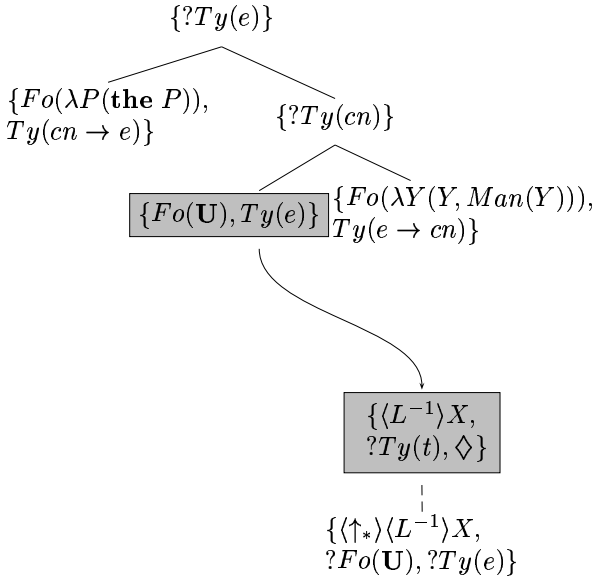


Figure 4: Structure resulting from *LINK-Adjunction* in (4)

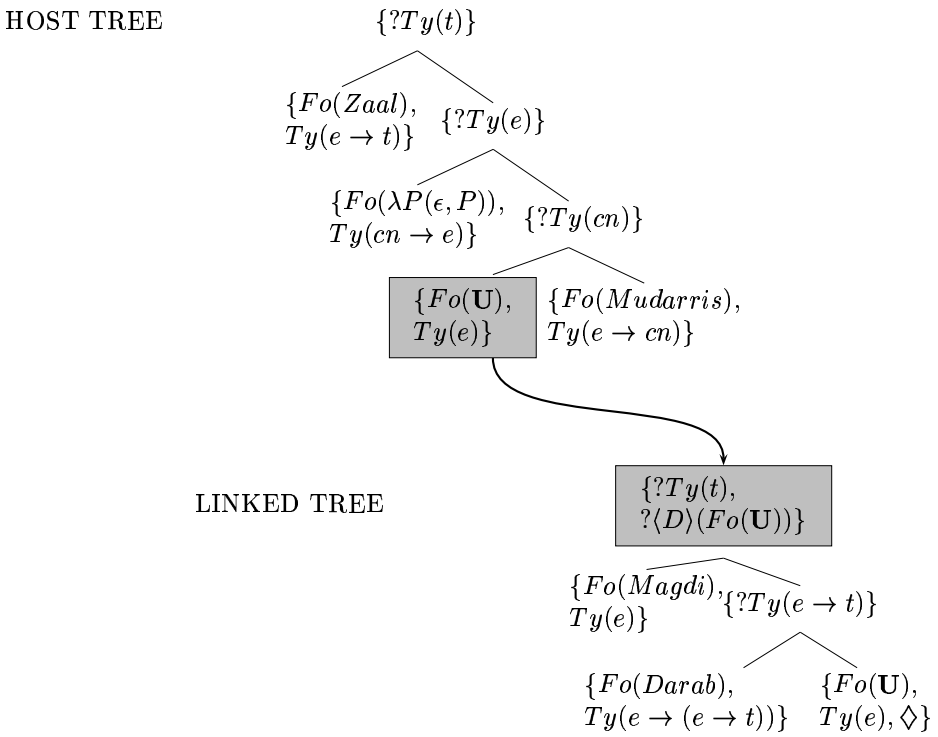


Figure 5: Projection of LINKed trees in Arabic

→ HOW LP item introduced ↓ WHERE resolved	**(a)** Term annotates UNFIXED node pronoun not required case matching obligatory		**(b)** Term annotates topnode of linked tree with REQUIREMENT for copy pronoun essential no case match	
(i) **LOCALLY RESTRICTED**	resolved pronoun without annotates pronoun fixed node German English(16) Greek Italian Italian Greek Move α		pronoun annotates fixed node Romance	pronoun annotates unfixed node relative to predicate Romance
(ii) **NOT RESTRICTED.**	resolved pronoun without annotates pronoun fixed node Japanese Greek (**??**)		pronoun annotates fixed node Arabic (18) English Hebrew	pronoun annotates unfixed node English(25) Hebrew(26)

Figure 6: A Left Dislocation Typology

The form of delaying strategy and how it is resolved

→ How RP item Introduced ↓ Form of Input	**(a) Unfixed node in single tree – locally restricted**	**(b) topnode of LINKed tree**	**(c)** contained in LINKed tree
(i) **Null** input	Merge Predicate introduces variable computationally introduced variable subject-pred inversion Romance Heavy NP shift	Copy Predicate introduces variable postposed topics Romance	Copy and Merge from right Variable computationally introduced: copied to left-unfixed node term at right-unfixed node Right-Node-Raising
(ii) **Pronoun** as input	Merge NP Expletives extrapositn (38) Germanic obligatory clitic doubling Romance	Copy optional pronoun doubling Romance	Copy and merge from left Variable lexically introduced: term at left-unfixed node Correlatives

Figure 7: A Right-Periphery Typology

→ HOW LP item introduced ↓ WHERE resolved	**(a)** Term annotates unfixed node pronoun not required case matching obligatory	**(b)** Term annotates topnode linked tree REQUIREMENT for copy pronoun essential no case match	(c) Term annotates node within linked tree requirement for copy
(i) **LOCAL TREE**	resolved pronoun without annotates pronoun fixed node German English(16) Greek Italian Italian Greek	pronoun annotates fixed node pronoun annotates unfixed node relative to predicate Romance Romance	*wh* annotates L-unfixed node. variable at fixed node copied across LINK relation parasitic gap
(ii) **any where**	resolved pronoun without annotates pronoun fixed node Japanese Greek	pronoun annotates fixed node pronoun annotates unfixed node Arabic (18) English English(25) Hebrew Hebrew (26)	N/A

Figure 8: A Left Dislocation Typology